



# MUNICIPALITY OF ANCHORAGE STANDARD SPECIFICATIONS

## 2024

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The most current version of the Municipality of Anchorage Standards and Specifications (M.A.S.S.) is provided on the Municipality website at [https://www.muni.org/Departments/project\\_management/Pages/MASS.aspx](https://www.muni.org/Departments/project_management/Pages/MASS.aspx).

Notifications will be sent when updates are made to the document, but each user of M.A.S.S. is responsible to verify that they are using the most current version.

If you notice any errors or omissions, or have suggestions for improvements to M.A.S.S., send an email to [massupdate@anchorageak.gov](mailto:massupdate@anchorageak.gov). The emails will be used to develop future updates to M.A.S.S.



**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS  
(M.A.S.S.)**

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**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 10  
GENERAL PROVISIONS**



**STANDARD GENERAL PROVISIONS  
DIVISION 10  
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**STANDARD GENERAL PROVISIONS  
DIVISION 10**

**SECTION 10.01 DEFINITIONS**

In these Contract Documents, the following words or expressions shall have the meaning given below:

AAC	Alaska Administrative Code (x AAC y where x=Title, y= Chapter)
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACS	Alaska Communications Systems
ADA	The Americans with Disabilities Act
ADEC	State of Alaska, Department of Environmental Conservation
ADOT/PF	State of Alaska, Department of Transportation and Public Facilities
AMC	Anchorage Municipal Code (AMC x.y where x=Title, y=Chapter)
ANSI	American National Standards Institute
API	American Petroleum Institute
APWA	American Public Works Association
AS	Alaska Statute (AS x.y where x=Title, y=Chapter)
ASA	American Standard Association
ASTM	American Society for Testing and Materials
ATM	Alaska Traffic Manual
AWS	American Welding Society
AWWA	American Water Works Association
AWWU	Anchorage Water and Wastewater Utility
BMP	Best Management Practices
CEA	Chugach Electric Association
ENSTAR	Enstar Natural Gas Company
EPA	Environmental Protection Agency
FHWA	Federal Highway Administration
GCI	General Communications Incorporated
M.A.S.S.	Municipality of Anchorage - Standard Specifications
MOA	Municipality of Anchorage
MUTCD	Manual of Uniform Traffic Control Devices
NEC	National Electrical Code
NEMA	National Electrical Manufacturer's Association
NESC	National Electrical Safety Code
NPDES	National Pollutant Discharge Elimination System
NFS	Non-Frost Susceptible per Division 20 – Standard Construction Specifications for Earthwork
OSHA	Occupational Safety and Health Act or Administration
POA	Port of Anchorage
POL	Petroleum, Oil, Lubricant

**Addendum (Addenda)** - Written or graphic communications issued prior to the execution of the Contract which modify or interpret the Bidding Documents and become part of the Contract Documents upon execution of the Contract.

**Additional Work** - Work not specifically provided for in the Contract as awarded, but which is consistent with the original scope of Work and a price for similar work is provided in the Contract.

**Assembly** - The Municipal Assembly of the Municipality of Anchorage.

**Bid Proposal** - The written proposal of the Bidder, on the form furnished, for the Work contemplated.

**Bidder** - Any individual, firm, partnership, corporation, or combination thereof formally submitting a Bid for the Work contemplated, and acting directly or through an authorized representative.

**Bidding Documents** - The Invitation to Bid, Special Provisions, Specifications, Forms, Schedules, Bidder's Checklist, proposed Contract Documents, and all Addenda.

**Bid Guarantee** - The security furnished by the Bidder as a guarantee to enter into a Contract for the Work contemplated if the Bidder is awarded the Contract.

**Certificate of Completion** – The Owner issues a Certification of Completion document to the Contractor at the end of the Warranty and Plant Establishment Period (PEP) once all warranty and PEP inspection deficiencies have been corrected. The Final Pay Request can be processed at this time.

**Change Order Proposal** - A written proposal prepared by the Contractor describing and documenting added costs or time extensions that the Contractor claims have been incurred due to unforeseen Work and other matters not contemplated or adequately provided for in the Contract Documents.

**Change Order or Contract Amendment** - A written agreement entered into between the Contractor and the Owner to amend the Contract Documents, or to otherwise provide for unforeseen Work and other matters not contemplated by or adequately provided for in the Contract Documents.

**Cleanup** – The restoration of all surface improvements including contouring; grading; required seeding and landscaping; all signage; removal of construction debris; restoration and cleaning of haul roads; and all other associated Work.

**Contract** - The four (4) page form agreement entitled "Contract" executed by the Contractor and then by the Owner on behalf of the Municipality. The Contract represents the entire and integrated agreement between the parties and supersedes all prior negotiations, representations, or agreements, either written or oral.

**Contract Date** - The date on which the Contract is executed by the Owner.

**Contract Completion Date** - The date specified in the Contract Documents for the full completion of all Work required by the Contract Documents, except as otherwise provided in the Contract.

If a number of calendar days is specified in the Contract Documents for the completion of the Contract, the Contract Completion Date shall be those specified number of days after the effective date of the Notice to Proceed, including authorized time extensions.

**Contract Documents** - The Contract and those documents described in the Contract. The Contract Documents can only be amended by written Change Order. Instructions,

clarifications, and directives issued by the Engineer under Section 10.05, Article 5.1 - Authority of the Engineer are not Contract Documents.

**Contract Item (Bid Item, Pay Item)** - A specifically described unit of Work for which a price is provided in the Contract.

**Contractor** - The individual, firm, corporation, partnership, joint venture, limited liability corporation, or limited liability partnership, or authorized agent thereof, executing the Contract and performing the Work under the terms of the Contract Documents.

**Days** -

**Calendar:** Unless otherwise designated in the Special Provisions, days as used in the Contract Documents shall be understood to mean calendar days.

**Working:** A working day is defined as any day on which the Contractor is required to Work by the Contract Documents or any other day not otherwise defined herein as a non-working day.

**Non Working:** A non-working day is defined as Sunday, a recognized holiday, a day on which the Contractor is specifically required by the Special Provisions to suspend construction operations, or a day on which a suspension order is in effect. Recognized holidays shall be: New Year's Day, President's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, and Christmas Day. When any of the above days falls on a Saturday, the preceding Friday shall be counted as a holiday. When any of the above days falls on a Sunday, the following Monday shall be counted as a holiday.

**Deviation Request** – A Contractor initiated request for a revision in the requirements of the Contract Documents.

**Drawings** - The maps, plans, sheets, or other graphic illustrations listed and referred to in the Contract.

**Electronic Copy** – A digital or other electronically formatted copy of a document that can be transmitted via email, text, facsimile, etc.

**Engineer** - The Engineer identified in the Notice to Proceed as being the authorized agent and/or representative of the Owner.

**Equipment** – All vehicles, machinery and tools to perform all phases of construction including maintenance and repair of such vehicles, machinery and tools.

**Extra Work** - Work not within the original scope of Work but is determined by the Engineer to be essential for the satisfactory completion of the Contract.

**Final Acceptance Date** - The date on which the Work has been constructed, inspected, and accepted pursuant to the provisions of Section 10.05, Article 5.26 - Final Inspection.

**Furnish** - Purchase and deliver to the Project.

**Indicated** - Shown on the Drawings, noted on Drawings, specified, or a combination thereof.

**Inspector** - The authorized agent and/or representative of the Engineer or Owner assigned to observe the Work.

**Install** - Set in place and make usable.

**Labor** – Qualified, certified, and skilled individual(s) with full dexterity to accomplish assigned tasks.

**Liquidated Damages** - The amount prescribed herein to be paid to the Owner, or to be deducted from any payments due or to become due the Contractor, for each calendar day's delay in completing the whole or any specified portion of the Work beyond the time allowed in the Contract or as extended by Change Order.

**M.A.S.S. or MASS** - Municipality of Anchorage Standard Specifications. Internal references to M.A.S.S. are in the form of Division, Section, Article, SubArticle.

**Municipality or Anchorage** - Municipality of Anchorage.

**Necessary** - Needed, as reasonably inferred from the Contract Documents, in order to make the Work complete and available for use.

**Notice-to-Proceed** - The written communication, issued by the Owner to the Contractor authorizing them to proceed with the Work, which identifies the Engineer and establishes the time of commencement and date of completion.

**Notice-to-Resume** - The written notice issued by the Engineer which terminates a period of suspension of Work, reinstates the counting of Contract time and requires the Contractor to resume Contract Work.

**Or Equal** - Whenever a material, article, or piece of equipment is identified on the Drawings or in the Project Manual by reference to manufacturers' or vendors' names, trade names, catalog numbers, etc., it is intended merely to establish a standard; and any material, article, or equipment of other manufacturers and vendors which in the opinion of the Engineer will perform in an equal or better manner the duties imposed by the general design shall be considered equally acceptable provided the material, article, or equipment so proposed will not require a change in the related Work.

**Owner** - The Department or Agency of the Municipality of Anchorage identified in the Contract. Owner does not include those Municipal employees, such as the Building Official or Fire Marshal and their staffs, who enforce certain building, health and safety, and fire codes.

**Performance and Payment Bond** - The form of security approved by the Municipality, furnished by the Contractor and their Surety guaranteeing the complete and faithful performance of all the obligations and conditions placed upon the Contractor by the Contract.

**Product Data** - Brochures, illustrations, diagrams, and other information furnished by the Contractor to illustrate a material, product, or system for some portion of the Work.

**Project** - The total construction of which the Work performed under the Contract Documents may be the whole or a part.

**Project Manual** - The bound documentary information organizing the documents into two general categories: (1) those describing the Bidding Documents, and (2) the Contract Documents.

**Provide** - Furnish and install; perform all Work necessary to complete the Work.

**Purchasing Officer** - That person within the Municipality of Anchorage who is vested under Anchorage Municipal Code with all authority pertaining to the procurement of supplies, services, and construction.

**Record Drawings** - Detailed drawings that accurately depict all changes in location (both horizontal and vertical), material, equipment, and other elements of Work accomplished by the Contractor. Drawings shall also depict the horizontal and vertical locations of all other utilities and obstructions encountered during construction. Final elevations and locations shall be clearly marked with actual dimensions.

**Request For Information (RFI) or Clarification** – A written document prepared by the Contractor to request information or clarification of the Contract Documents. Each RFI shall be numbered consecutively and a log maintained of submittals and responses.

**Samples** - Physical examples which illustrate materials, equipment, or workmanship and establish standards by which the Work or a product will be judged.

**Shop Drawings** - All drawings, diagrams, illustrations, schedules, and other data which are prepared by the Contractor, a Subcontractor, manufacturer, supplier, or distributor which illustrate the equipment, material, or some portion of the Work.

**Special Provisions** - That portion of the Specifications entitled Special Provisions setting forth conditions or requirements unique to the Work.

**Specifications** - The directions, requirements, explanations, terms, and provisions pertaining to the Work.

**Subcontractor** - Any individual, firm, corporation, partnership, joint venture, limited liability corporation, or limited liability partnership, or authorized agent thereof, acting for or on behalf of the Contractor in the performance of a part of the Contract. This does not include those working for hire or suppliers of material or equipment.

**Substantial Completion Date** - The point at which the project (1) can be safely and effectively used by the public without further delays, disruption, or other impediments; and (2) pavement structure, shoulder, drainage, sidewalk/pathway, permanent signing, permanent traffic markings, guardrail and other traffic barrier, safety appurtenance, utilities, lighting, all landscaping installed or areas to be landscaped stabilized and all bridge deck and parapet work (if required) is complete.

In the case where traffic markings cannot be permanently installed due to late season weather limitations then temporary markings shall be placed. In addition, if a permanent lighting system (both street and traffic signal lighting) cannot be completed due to late material delivery then temporary systems shall be installed and functioning before a Substantial Completion is issued.

**Surety** - The Company or Association which is bound with and for the Contractor for the acceptable performance of the Contract and for the payment of all obligations arising out of the Contract. Where applying to the Bid Guarantee, it refers to the Company or Association which shall forfeit the sum of the Guarantee when the Bidder fails to execute the Contract after the Bid is accepted by the Municipality.

**Technical Specifications** - Divisions 20 through 80 of MASS.

**Time and Material Work** - Work performed by the Contractor at the written direction of the Engineer for which no item is provided in the Contract and for which no unit price or lump sum basis can be agreed upon.

**Utility Company** - The entity (person, corporation, company, agency, or other) that furnishes service(s) (including petroleum and petroleum products, electricity, sanitary sewer, communications, water, natural gas, traffic signal control, and storm sewer) utilizing conduit, pipe, wire, cable, or other transmission lines.

**Winter Suspension** - The period of time through which no field work is accomplished due to adverse winter weather conditions as permitted by Section 10.05, Article 5.31 – Winter Suspension.

**Work** - The furnishing of all labor, materials, equipment, and other incidentals necessary or convenient for the successful completion of all the duties and obligations imposed by the Contract.

**Working Titles** – Working titles which may have masculine genders such as “workman” and “flagman” or are pronouns such as “he,” “his,” and “him” are utilized in the Contract Documents for the sake of brevity and are intended to refer to persons of either gender.

**Written Notice** - A written communication delivered in person to the individual or to a member of a firm, or agency, or to an officer of the corporation, or agency for whom it is intended, or sent by mail to the business address stated in the Contract Documents. Communication via electronic copy or electronic mail shall not be considered proper written notice.



## **SECTION 10.02 BIDDING REQUIREMENTS AND CONDITIONS**

### **Article 2.1 Examination of Bidding Documents and Site**

The Bidder shall examine carefully the site of the proposed Work and the Bidding Documents before submitting a Bid. The submission of a Bid shall be an admission that the Bidder has made such examination and is satisfied as to the conditions to be encountered in performing the Work and as to the requirements and accuracy of the Bidding Documents. The Bidder further declares that the amount(s) bid are for the total Work as contained in the Contract Documents.

The Municipality assumes no responsibility for any understanding or representations concerning conditions made by any of its officers, agents, or employees prior to the execution of the Contract, unless such understanding or representations are expressly stated in the Bidding Documents or Addenda.

When soils boring data is provided by the Bidding Documents, the Bidder shall assume responsibility for any conclusions they may draw from such data. The Bidder shall be responsible for obtaining and analyzing such additional data as they may require and shall be responsible for conclusions drawn from that information.

By submitting a bid, the Contractor declares that they has carefully examined the Contract Documents, that they has full knowledge thereof and that they has investigated the site and satisfied as to the conditions affecting the Work, including, but not limited to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electrical power, roads, and uncertainties of weather, physical conditions at the site including all existing utilities, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the Work. The Contractor further declares that they are satisfied as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all prior exploratory work, as well as from information presented by the Drawings and Specifications made a part of the Contract. Any failure by the Contractor to acquaint themselves with the available information shall not relieve them from responsibility for estimating properly the difficulty or cost of successfully performing the Work.

The Bidder is encouraged to support the Municipality's Disadvantaged and Woman-Owned Business Enterprises (DBE/WBE) program. The Bidder shall comply with the DBE/WBE Specifications if included in the Contract. The Bidder shall comply with the requirements of the Equal Opportunity Special Provisions as contained in the Bid and resulting Contract.

### **Article 2.2 Interpretation or Correction of Bidding Documents**

Bidders shall notify the Purchasing Officer promptly of any error, omission, or inconsistency that may be discovered during examination of the Bidding Documents and the proposed construction site. Requests from Bidders for interpretation or clarification of the Bidding Documents shall be made in writing to the Purchasing Officer and shall arrive at least three (3) working days prior to the date for opening Bids. Oral questions may be presented at a pre-bid conference if one is provided for in the Bidding

Documents. Interpretations, corrections, or changes, if any, to the Bidding Documents shall be made by Addendum. Bidders shall not rely upon interpretations, corrections, and changes made in any other manner, including orally at the pre-bid conference. Interpretations, corrections, and changes shall not be binding unless included in an Addendum.

### **Article 2.3 Preparation and Submission of Bids**

Bids shall be submitted on the forms furnished and must be manually signed. Bids should be submitted in a sealed envelope addressed as indicated in the Invitation to Bid and on which the Invitation Number is plainly marked.

Bidders must quote on all items, unless specifically allowed to bid on only a portion of the items within the Invitation to Bid and they are warned that failure to do so shall disqualify the Bid. The Bidder may bid an item at no cost and shall insert the words "no cost" in the space provided for any no cost item. When quotations on all items are not required, Bidders should insert the words "no bid" in the space provided for any item where no quotation is made. If erasures or other changes appear on the forms, each such erasure or change must be initialed by the person signing the Bid.

Bids shall specify a unit or lump sum price, typed or written in ink, for each bid item called for. If the bid is submitted in both words and figures and there is a discrepancy between the written words and figures, the written words shall govern. In case of error in the extension of prices, the unit price shall govern. Bids may be rejected if they show any omissions, alteration of the forms, additions not required, conditional or alternate bids not required, qualified bids, or irregularities of any kind.

### **Article 2.4 Bid Guarantee**

Each Bid shall be accompanied by a certified check, cashier's check, or Bid Bond, in the amount of ten percent (10%) of the total amount of the Bid if the total amount of the bid is \$100,000 or more, with good and sufficient corporate surety acceptable to the Municipality. If the total bid amount of the bid is less than \$100,000, the bid shall be accompanied by a bid guarantee, in the form specified above, in the amount of \$2,000. Bid Guarantees for the three (3) low Bidders shall be held until the Contract is executed. All other Bid Guarantees will be returned within seven (7) days of the bid opening. Power-of-Attorney for the person signing the Bid Bond for the Surety must be submitted with the Bid Bond.

### **Article 2.5 Disadvantaged and Woman Owned Business Enterprises (DBE/WBE) Requirements**

Each Bid shall be accompanied by those (DBE/WBE) Forms provided by the Purchasing Officer and as required by the bidder's checklist. The Bidder shall comply with the Municipality of Anchorage Office of Equal Opportunity Disadvantaged Business Enterprise Program Specifications for Municipal Contracts, including submittal requirements for bids, prior to and after award. See the Disadvantaged and Women-Owned Business Enterprises (D/WBE) Specifications Section of the Invitation to Bid for participation goals for each particular project.

## **SECTION 10.03     AWARD AND EXECUTION OF CONTRACT**

### **Article 3.1    General**

The provisions of this Section are intended to be supplemental to, and not to replace AMC Title 7.

### **Article 3.2    Receipt and Opening of Bids**

Bids shall be submitted to the Municipal Purchasing Department prior to the time of opening specified in the Invitation to Bid and the exact date and time of receipt of Bids shall be recorded. Late Bids shall not be considered, but will be held unopened until the time of award and then returned to the Bidder unless other disposition is requested or agreed to by the Bidder. Time of Bid receipt shall be determined by the time stamp of the Municipal Purchasing Department.

Electronic copy bids shall not be considered. Modification by electronic copy of bids already submitted shall be considered if received in writing by the Purchasing Officer prior to the time of bid opening fixed in the Invitation to Bid. Electronic copy modifications shall not reveal the amount of the original or revised bid. Modifications shall state a plus or minus to the affected bid item.

No liability shall attach to the Municipality for the premature opening of or the failure to open a Bid not properly addressed and/or identified.

Bids may be withdrawn in person, by written letter, or by electronic copy when such request is received by the Purchasing Officer PRIOR to the time specified for receipt of Bids.

If more than one Bid is offered by any one party, by or in the name of their clerk, partner, or other person, all such Bids shall be rejected. A party who has quoted prices to a Bidder is not thereby disqualified from quoting prices to other Bidders, or from submitting a Bid directly for the Work.

### **Article 3.3    Bidder Qualifications**

All bidders shall hold a valid Alaska Contractor's license per AS 08.18.

The Purchasing Officer reserves the right to determine whether or not a Bidder is a responsible Contractor. The Purchasing Officer may require the Bidder to submit such information as they may deem necessary to determine a bidder's responsibility. Failure or refusal on behalf of the Bidder to submit the required information, in whole or in part, may be grounds for the Purchasing Officer to determine the Bidder as non-responsible.

A Bidder's representations concerning their qualifications shall be construed as a covenant under the Contract. Should it appear that the Bidder has made a material misrepresentation, the Owner shall have the right to terminate the Contract for the Contractor's breach, and the Owner may then pursue such remedies as provided in the Contract Documents or as provided at law or equity.

If a Contractor has had a contract terminated by the Owner for cause as provided in Section 10.05, Article 5.28 – Termination of Contract by Owner, the Contractor will not be allowed to bid on the Owner's future contracts for a period of two (2) years. This two

(2) year period shall commence from the date of the termination of the Contractor by the Owner.

Any determination that a Bidder is non-responsible shall be made by the Purchasing Officer using AMC 7.20.030 as the basis for that determination. Such determination shall be made in writing to the Bidder setting forth the reasons for such determination and the Bidder's right to request a review of this determination. Determinations that disqualify a Contractor for two (2) years are similarly subject to review.

### **Article 3.4 Action on Bids**

The Municipality reserves the right to reject any and all Bids, and to waive any informalities and irregularities in Bidding or award of the Contract.

The Municipality may reject any bid which is unbalanced if it is in the best interest of the Municipality to do so. A bid is unbalanced when, in the opinion of the Purchasing Officer, it allocates a disproportionate share of costs or profit, or both, to the price of one (1) or more items of Work and reduces the share of costs or profit, or both, allocated to the price of another item or items of Work, and if there is a reasonable possibility that the bid will not result in the lowest overall cost of the Work to the Municipality.

Unless otherwise stated in the Bidding Documents, the Contract, if awarded, shall be awarded to the responsible Bidder who submits the lowest responsive Bid. When the Bidding Documents contain a basic bid and additive or deductive alternates, only the total of the basic bid and the alternates to be awarded shall be used to determine the low Bidder.

When the Bidding Documents contain a basic bid and additive alternates, the low Bidder shall be determined by the lowest combination of the basic bid and as many additive alternates as may be selected within the funds available. For evaluation purposes, additive alternates shall be chosen in the order listed in the Bid. The Purchasing Officer may bypass any additive alternate whose selection would cause the Contract to exceed the funds available.

When the Bidding Documents contain deductive alternates and the Purchasing Officer determines that including any or all of the deductive alternative is in the best interest of the Municipality, the lowest bid for each Bidder shall be calculated by deducting the value of applicable alternates from the basic bid. The Purchasing Officer may bypass any deductive alternate to maximize the use of available funds.

The Purchasing Officer shall use the list of priorities in the bid schedule to determine the low bidder only. After determining the low bidder, an award may be made on any combination of bid items provided: (1) it is in the best interest of the Municipality; (2) funds are available at the time of award; and (3) the low bidder's price for the combination to be awarded is less than the price offered by any other responsive, responsible bidder.

The amount of the Contract shall be the total sum of the amounts computed from the estimated quantities and unit prices and/or the lump sum awarded by the Purchasing Officer and specified in the Contract.

Unless otherwise specified in the Invitation to Bid, Notice of Award or rejection shall be given within forty-five (45) days of Bid opening. The notice shall be in writing and

signed by the Purchasing Officer or authorized designee. A Notice of Award shall constitute an acceptance of the Bid. No other act(s) of the Municipality or its representatives shall constitute an acceptance of a Bid. The acceptance of a Bid shall bind the successful Bidder to execute the Contract.

### **Article 3.5 Bonds, Insurance, EEO and DBE/WBE Forms**

The successful Bidder shall furnish the Purchasing Officer a Performance and Payment Bond in the full amount of the Contract. The Bond is for the faithful performance of the Contract in all respects including, but not limited to, payment for all materials and labor. All alterations, extensions of time, additional Work and other changes authorized by the Contract Documents may be, at the option of the Owner, made without securing the consent of the Surety or Sureties. Contractor shall provide the Bond with a good and sufficient corporate surety acceptable to the Municipality. A Power-of-Attorney for the person signing the Bond for the Surety must be submitted with the Bond.

The successful Bidder shall furnish the Purchasing Officer a certificate of insurance pursuant to the provisions of Section 10.06, Article 6.9 – Insurance, and shall execute and furnish the Purchasing Officer all the required EEO and DBE/WBE forms.

The Bidder shall exercise positive efforts to comply with the Equal Employment Opportunity and Disadvantaged/Woman Owned Business Enterprise requirement policies of the Municipality. The Bidder shall familiarize themselves with the Equal Opportunity Special Provisions and Disadvantaged/Woman Owned Business Enterprise Specifications for Municipal Contracts, including submittal requirements for bids, prior to award and after award.

### **Article 3.6 Execution of Contract**

The successful Bidder shall execute the Contract and furnish the required bonding and insurance within five (5) working days after Notice of Award of the Contract is issued.

The Contract shall be considered executed by the successful Bidder when two (2) copies of the Contract, signed by an authorized representative of the Contractor, and the required bond and insurance certificate are received by the Purchasing Officer. Failure or neglect of the Contractor to execute the Contract within the time specified may result in a forfeiture of the Bid Guarantee and award of the Contract to the next lowest Bidder.

The Owner shall execute the Contract within ten (10) working days after execution by the Contractor as set forth above. The date the Contract is executed by the Owner is the Contract Date. The rights and obligations provided for in the Contract shall become effective and binding upon the parties as of the Contract Date.

The Purchasing Department will make available to the Contractor an electronic copy of the Contract Documents exclusive of M.A.S.S.

The Notice-to-Proceed shall be issued within seven (7) working days after the Contract Date unless otherwise specified in the Special Provisions. The effective date of the Notice to Proceed shall be within ten (10) working days of the Contract Date. The Engineer or their authorized representative, the Engineer's address, and the completion date shall be designated in the Notice-to-Proceed.

### **Article 3.7 Contractor's Warranty**

The Contractor shall warranty all materials and workmanship for one (1) year from the Final Acceptance Date unless otherwise specified in the Special Provisions. This warranty shall require the Contractor to remedy promptly, without cost to the Owner, any and all defects in material and workmanship including any consequential damages resulting from defective materials or workmanship.

All warranty Work shall be subject to the same Contract provisions, including materials, quality of work, authority of the Engineer and inspection, as provided for in the original Work. All warranty Work shall be at the sole expense of the Contractor. All materials and workmanship directly or indirectly involved in repairs or replacements under this Article shall carry an extended warranty of not less than one (1) year from the date of the Engineer's written acceptance of the repair or replacement Work, or through the warranty period for the original project Work, whichever is longer.

If the defect, in the opinion of the Engineer, is of such nature as to demand immediate repair, the Owner shall have the right to take corrective action and the cost thereof shall be borne by the Contractor.

If the Contract includes Work in different geographic locations, then the Work in each location may be accepted and the warranty period for that location may begin independent of the completion of the Work in the other locations.

The Warranty shall run concurrently with the Plant Establishment Period for landscaping Work pursuant to Division 75 – Landscaping Improvements unless otherwise specified by the Engineer in writing.

At the completion of the Warranty and Plant Establishment Periods, the Contractor and Owner shall conduct a pre-Warranty Inspection. All deficiencies indicated by the pre-Warranty Inspection shall be listed and promptly furnished to the Contractor for action. When all listed deficiencies have been corrected, the Contractor shall notify the Engineer and a final Warranty Inspection will be performed. When the Warranty Inspection verifies correction of any listed deficiencies, the Engineer shall issue a Certificate of Completion.

## **SECTION 10.04 SCOPE OF WORK**

### **Article 4.1 Contract Documents**

The Contract Documents provide the framework for the execution and completion of the Work in its entirety. Except as otherwise specifically provided herein, the Contractor shall furnish all permits, transportation, handling, storage of materials, labor, tools, implements, machinery, supplies, materials, water, heat, utilities, and incidentals, and shall do all things necessary to perform and to complete the Work.

When words that have a common technical or trade meaning are used to describe Work, materials, or equipment, such words shall be interpreted in accordance with that meaning.

Reference to Standard Specifications, manuals, or codes of any technical society, organization, or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest Standard Specification, manual, code or Laws or Regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated.

However, no provisions of any referenced Standard Specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the respective duties and responsibilities of the Owner, the Contractor, or the Engineer nor any of their consultants, agents, or employees from those set forth in the Contract Documents.

With reference to Drawings, the order of precedence is as follows:

1. Figures (numerals) govern over scaled dimensions.
2. Detailed Drawings govern over general Drawings or Standard Details.

### **Article 4.2 Interpretation of Contract, Specifications, and Drawings**

The Contract Documents are intended to be complementary and to describe and provide for a complete description of the entire scope of Work. A requirement occurring in one Section of the Contract Documents is as binding as though occurring in all.

In cases of conflict in the requirements of the Contract Documents such conflict shall be reconciled by the acceptance of the following order of precedence for the various Contract Documents: (1) the Contract; (2) the Bid; (3) Special Provisions; (4) the Technical Specifications; (5) the Drawings; (6) the Standard General Provisions; and (7) specifications incorporated by reference in any of the above.

The apparent silence of the Specifications and Drawings as to any detail or the apparent omission from them of a detailed description concerning any point, shall be regarded as meaning that only the best general practice is to prevail and that only approved material and workmanship of first quality are to be used.

The Contractor shall carefully study and compare the Contract Documents and shall at once report to the Engineer any error, inconsistency or omission they may discover including any requirement which may be contrary to any law, ordinance, rule, regulation, or order of any public authority bearing on the performance of the Work.

The Contractor shall take no advantage of any errors or omissions in the Specifications and Drawings or of any discrepancies in or between same. Work knowingly performed by the Contractor as a result of an error or omission in the Drawings and/or Specifications where such error or omission is not called to the attention of the Engineer shall be at the Contractor's risk and expense.

All Contractor-initiated requests for interpretation or clarification of the Contract Documents shall be accompanied by a completed Request For Information (RFI) form. Each request shall clearly and completely state the basis for lack of clarity in the Contract Documents and shall refer to the applicable Specifications, Drawings and details that give rise to the request. If not provided in the Contract Documents, a copy of the RFI form shall be obtained from the Engineer. Engineer shall respond to the RFI in writing within ten (10) working days. The Engineer's response shall serve to clarify and interpret the existing Contract requirements and shall not be construed as requiring or directing a change in the Work.

#### **Article 4.3 Submittal List**

The Contractor shall complete, submit, and/or comply with all requirements as indicated in the Submittal List located in the Bidding Documents. The Contractor is hereby advised the Submittal List is not an all-inclusive document. The Submittal List does not relieve the Contractor from their obligation to comply with all submittals, certifications, or other requirements as specified in M.A.S.S., the Special Provisions, or the Drawings. The Contractor is responsible to determine that all submittals, certifications, and/or requirements are met, whether or not specifically addressed in the Submittal List.

#### **Article 4.4 Estimates of Quantities**

The quantities shown in the Bid, whether for a unit price contract or a combination of a lump sum contract and unit price contract, are approximate only and are not to be taken to be either representations or warranties. Since quantities in the Contract Documents are estimates only, actual quantities may increase or decrease without constituting a change in the Work unless the increase or decrease involves a major bid item which varies by more than twenty-five percent (25%) as provided below. The cumulative variations in quantities together with other changes in the Work shall not increase the Contract amount by more than the limits set forth in AMC 7.15.080, without Assembly approval.

#### **Article 4.5 Increased Quantities**

The Owner reserves the right to increase the quantity of any bid item. There may be an adjustment of unit prices of major bid items where the actual quantity of the item is increased by more than twenty-five percent (25%) of the estimated quantity. A major bid item is defined as any item where the total bid price of the item exceeds twice the average bid price of an item. Twice the average bid price of an item is calculated by the following formula:

$$\frac{T}{I} \times 2$$

where "T" equals total bid amount of the schedule in which the item appears and "I" equals the number of items in the schedule in which the item appears.



If a major bid item quantity increases by more than twenty-five percent (25%), the unit price for one hundred and twenty-five percent (125%) of the estimated quantity shall remain as set forth in the Bid and the price for additional quantities above the one hundred and twenty-five percent (125%) for said item may be negotiated for a greater or lesser amount upon the demand of either the Owner or the Contractor.

A unit price increase may be allowed only if the Contractor can substantiate to the satisfaction of the Engineer that they incurred increased unit costs in providing the additive quantities over and above that unit cost incurred in providing the estimated quantity of the bid item. A negotiated increase in price may include a maximum of ten percent (10%) for overhead and profit on increased costs.

A negotiated increase in price on any item shall not preclude a claim for increased costs on other items of the Work under Section 10.05, Article 5.21 - Claims for Additional Compensation.

A decrease in unit price for that quantity over one hundred and twenty-five percent (125%) of the estimated quantity shall be allowed only if the Owner establishes that the unit cost for such additional quantities is less than the unit cost for the estimated quantity. For this purpose, the Contractor shall provide job records as required by the Engineer.

#### **Article 4.6 Decreased Quantities**

The Owner reserves the right to decrease the quantity of any Bid item. There may be an adjustment of unit prices of major Bid items where the actual quantity of the item is decreased by more than twenty-five percent (25%) of the estimated quantity and the aggregate total of all quantity revisions decreases the total Contract amount by more than ten percent (10%). Change orders for extra Work shall not be used for this calculation. A major bid item is defined in Article 4.5 - Increased Quantities.

If a major bid item qualifies for a unit price adjustment, the Contractor shall be allowed, upon proper submittals, an allowance for overhead costs for the decreased quantity. The allowance shall be ten percent (10%) of the amount represented by the difference between the actually installed quantities and seventy-five percent (75%) of the Contract estimated quantities. Payment of this allowance does not preclude a claim for increased costs on other items of the Work under Section 10.05, Article 5.21 - Claims for Additional Compensation.

The provisions of this Article shall not apply to reduced quantities resulting from the termination, or partial termination, of the Contract for cause or for the Owner's convenience.

#### **Article 4.7 Reference Stakes and Surveying**

Bench Marks and/or reference points have been identified and/or placed initially by the Engineer, and the horizontal and vertical reference locations are indicated in the Drawings. The Contractor shall ensure that all construction surveying Work required is completed in strict conformity with Division 65 - Standard Construction Specifications for Construction Survey.

#### **Article 4.8 Work Incidental to the Contract**

Several items of Work, not covered in the Bid Proposal, are incidental to the cost of the Contract. These items shall include, but are not limited to, the following:

1. Mobilization and Demobilization
2. Type 1 Storm Water Pollution Plan
3. Removal and replacement of concrete barriers.
4. Dewatering of roadway excavation and pipe trenches, unless payment is specified as a pay item in the contract.
5. Removal and disposal of existing electrical conduit, conductors, and street luminaire and traffic signal pole bases.
6. Removal and delivery of salvaged electrical equipment.
7. Post-construction cleanup.
8. Reimbursement to utilities for associated inspection or relocation.
9. Other items indicated on the Drawings or in these Specifications.
10. Project Information Signs.
11. Sawcutting of asphalt and concrete unless payment is specified as a pay item in the contract.
12. Tack coat asphalt unless payment is specified as a pay item in the contract.

#### **Article 4.9 Disposal Sites**

Except for Removal of Pavement Section 20.09 and Pavement Rotomilling Section 40.10 material, and as otherwise stated in the Special Provisions, the Contractor shall make their own arrangements, assume all costs, and obtain all necessary permits in connection with disposal sites. Unless otherwise specified by the Engineer, the Contractor shall furnish a disposal site for trees, brush, oversized boulders, and other objectionable debris or materials. Contractor shall dispose unusable excavation, unsuitable or surplus material at either the Anchorage Regional Landfill off Hiland Road or at a lawful, permitted disposal site furnished by Contractor and approved by Owner. The Anchorage Regional Landfill shall charge the current disposal fee for unusable excavation or any material containing stumps, brush, or other construction debris or materials. Contractor-furnished disposal sites shall conform to AMC 23.105 Grading, Excavation, and Fill.

Disposal sites shall be located and maintained in such a manner as to prevent a public nuisance.

When the Contractor makes proper arrangements for disposal on private property, they shall obtain written permission from the property owner or owners for such disposal sites and shall furnish the Engineer with a copy of this permission and the appropriate Municipal Permit for grading and/or fill. The written permission shall specifically provide that the property owner shall not hold the Municipality, its employees, agents, or

consultants liable for use of or damage to this property. The Contractor shall be held liable for any trespass and/or property damage incurred outside of the disposal site.

Waste Disposal. Prior to construction, the Contractor shall submit a description of their plan for disposing of unsuitable materials and waste resulting from the Work under the Contract. If any material is disposed of in unauthorized areas, the Contractor shall remove the material and restore the area to the condition of the adjacent undisturbed areas at no cost to the Owner.

#### **Article 4.10 Protection of Persons, Property and Environment**

The Contractor shall be responsible for initiating, supervising, and maintaining all safety programs and precautions in a manner to prevent damage, injury, or loss to the Work employees, site visitors, the public, the environment, and property. These safety requirements are applicable to the Work whether on-site or off the site for Work under the control, custody, or care of the Contractor. These responsibilities apply to all adjacent sites and their improvements including landscaping, walks, roadways, structures, utilities and drainageways. If the Contractor encounters material on the site that may be reasonably identified as asbestos-containing material (ACM), polychlorinated biphenyl (PCB), or other hazardous materials not requiring abatement as part of the Work, the Contractor shall stop the Work immediately in the affected area and notify the Owner's Representative and Owner in writing. The Work shall not be resumed in the affected area until a final determination has been made by the Engineer on the status of the material in question.

Until Contract completion, the Contractor shall be solely and continuously responsible, twenty-four (24) hours per day, seven (7) days per week, for the safety measures outlined in this Article, including, but not limited to, the following:

- (a) Erecting and maintaining, as required by existing conditions and progress of Work, all safeguards for safety and protection, including barricades, danger signs, traffic control devices, and other warnings against hazards. This also includes security fencing for temporary replacement of private residential fencing as well as placement around work zone and staging areas.
- (b) Providing reasonable access at all times for emergency units such as the Anchorage Police Department, the Anchorage Fire Department, and the Anchorage Fire Department's Hazardous Materials Response Team.

During periods of suspension of Work, refer to Section 10.05, Article 5.24 – Suspension of Work and Article 5.31 – Winter Suspension, for areas of responsibilities.

Protection of Water Resources. The Contractor shall control the disposal of fuels, oils, bitumens, calcium chloride, acid, or any other harmful materials, both on and off the premises, and shall comply with applicable federal, state, and municipal laws concerning pollution of waterways while performing Work under the Contract. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, and sewage from entering established drainages.

#### **Article 4.11 Private Property in Right-of-Way**

Unless otherwise specified in the Drawings and/or Specifications, the Engineer shall contact the property owner to remove any fences, trailers, sheds, machinery, or other

miscellaneous personal property is located within the right-of-way, and/or utility easements which interferes with construction. If the property owner cannot be contacted or does not move the item(s) of personal property, the Engineer shall notify the Contractor, in writing, to remove the item(s) from the right-of-way to the property owner's lot or as otherwise directed by the Engineer. When removing personal property from the right-of-way, the Contractor shall take care not to damage the items. Any damage to the item(s) shall be repaired or the items replaced in kind by the Contractor at no cost to the Municipality.

Unless otherwise stated in the Drawings and/or Specifications, payment for the removal of personal property from the right-of-way and the setting of these items down on the owner's lot shall be an incidental item and no separate payment shall be made.

Payment for Work such as resetting fences or restoration of personal property items to their original or alternate locations shall be specified in the Drawings and/or Specifications. If payment for such Work is not otherwise specified in the Drawings and/or Specifications, such Work shall be considered incidental to the Contract unless otherwise negotiated with the Engineer.

#### **Article 4.12 Public Convenience and Access**

The Contractor shall conduct the Work in such a manner as to cause minimum inconvenience to pedestrians and vehicular traffic and to persons conducting commercial enterprises or residing along the route of Work. Without prior approval of the Engineer, entrances or driveways of all kinds shall not be blocked for more than three (3) hours. Temporary pedestrian bridges, ramps, or culverts shall be provided and maintained at entrances and shall be adequate in width and strength for the service required. All Work involved in providing for construction, maintenance, and use of entrances and driveways is the responsibility of the Contractor and shall not be paid for separately and shall be considered incidental to the lump sum and/or unit prices contained in the Contract Documents

One (1) week prior to commencing Work the Contractor shall provide proper written notification to adjacent property owners, businesses and/or tenants of impending construction activities. The notification shall include contact name(s) and phone number(s) for Contractor personnel with the responsibility to inform and coordinate with property owners and businesses. The notification and limit of distribution shall be reviewed and approved by the Engineer prior to distribution.

The Contractor is responsible for any coordination with a property owner or resident regarding Work to be performed on-private-property or adjacent to the project.

The Contractor shall comply with this Article at all times. Under no circumstances shall the public be denied access to the adjoining lots unless proper notification to the property owners and/or tenants has been provided and an alternate access has been provided and approved by the Engineer. The Contractor shall provide the property owners and/or tenants written notification no less than forty-eight (48) hours prior to any closure of access. All notifications shall be reviewed and approved by the Engineer prior to distribution.

The Contractor shall, prior to the commencement of Work, submit any written agreements between the Contractor and property owners regarding access and use of

private property within the project limits for any purposes associated with this Project. Any such agreement shall indemnify the Municipality from any and all actions that result from activities of the Contractor.

The Contractor shall conduct their Work to ensure that there is no disruption of mail service, school bus service as applicable, trash collection, access by emergency vehicles, or any unnecessary disruption of general access to any business or private residence.

If the Contractor's Work is delayed because of any construction and/or transportation activities of nearby construction, regardless of whether authorized by the Owner, the Contractor shall not be entitled to additional compensation from the Owner. The Contractor may be entitled to an extension of time to the extent that such delay was unavoidable through reasonable efforts on the Contractor's part. Except as to a possible entitlement to such an extension of time, the Contractor shall hold harmless, defend, and indemnify the Owner from and against any and all claims, damages, losses, and/or expenses, including attorney's fees, by the Contractor or third-parties, arising directly or indirectly as a result of nearby construction and/or transportation impacts.

#### **Article 4.13 Traffic Control Plan**

The Contractor shall conduct their operations to minimize interference to vehicular traffic. The Contractor shall submit a Traffic Control Plan (TCP) showing street closures, partial closures, detours, and all pertinent traffic control. The Contractor's TCP shall be reviewed by the Traffic Engineer and then submitted for approval to Development Services. Emergency units shall be provided vehicular access at all times. Construction operations involving a closure of an arterial street shall not commence until after 9:00 a.m. unless otherwise approved by the Traffic Engineer. Requests for arterial street closures shall be made sufficiently in advance of the planned closure to allow a minimum of seventy-two (72) hour advance notice to the public.

When a street closure or partial closure is approved, the Contractor shall provide and maintain adequate detour routes, either by appropriately signing existing streets or by the construction of temporary roadways. Detour routes using existing streets must be left in a condition at least equal to their condition immediately prior to use as a detour. The Contractor shall be responsible to provide, erect, and maintain barricades, fences, signs, flags, lights, flagmen, and any other devices necessary to insure traffic safety. Placement and design of signs, barricades, and other devices to be furnished and used by the Contractor shall conform with the standards specified in the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD). Traffic signs no longer required shall be promptly removed. Where operations are performed in stages, only those devices necessary to the stage in progress shall be visible. It shall be the Contractor's responsibility to maintain all barricades, signs, and lights throughout the night hours, weekends, holidays, or other periods of inactivity. Should the Contractor fail in this maintenance obligation, the Owner may erect the necessary barricades, signs, and lights, and deduct the cost thereof from payments due the Contractor. Action by the Owner to erect barricades, signs, or lights does not relieve the Contractor's indemnification obligations set forth in Section 10.06, Article 6.10 - Indemnification.

The Municipal Traffic Department shall require a minimum of three (3) days for TCP review time for streets with the following classification:

1. Minor arterials and higher must be submitted at least ten (10) days prior to the scheduled closure (three (3) day review time, seven (7) day advertisement/public notice time).
2. Streets listed as collectors must be submitted no later than six (6) days prior (three (3) day review time, three (3) day advertisement/public notice time).
3. All other streets must be submitted no later than three (3) days prior (three (3) day review time, no advertisement/public notice required).

The TCP shall conform to the standards in the latest edition of Part VI of the Manual of Uniform Traffic Control Devices (MUTCD), and shall also conform to the requirements in the latest edition and supplements of the Alaska Traffic Manual (ATM) prepared by the Alaska Department of Transportation and Public Facilities. When a conflict exists between M.A.S.S. and the ATM, the requirements of Specifications or any Special Provisions shall govern.

If Work shall be done within a State of Alaska right-of-way as identified in the Special Provisions, the TCP shall also be submitted to the State of Alaska, Department of Transportation and Public Facilities Regional Traffic Engineer for acceptance and approval.

Providing the TCP to the Engineer and the State of Alaska Department of Transportation and Public Facilities Regional Traffic Engineer shall be the responsibility of the Contractor and shall be paid for under the bid item "Traffic Maintenance" and no separate payment shall be made.

When, in the opinion of the Engineer, traffic maintenance is deficient, inadequate, improper, or conditions exist such that public safety would be adversely affected, or public convenience unnecessarily degraded, the Contractor shall be notified in writing by the Engineer. Such notification shall be accompanied by a statement of the corrective action to be taken. If the Contractor fails to promptly comply with such instruction, the Engineer may suspend any or all Work on the project until satisfactory, corrective action is taken. If the Contractor fails to take such prompt action, the Engineer shall order such Work, as deemed necessary to ensure public safety and/or to enhance the public convenience, to be accomplished by an Owner-selected workforce. The cost of this Work shall be deducted from monies otherwise due the Contractor.

#### **Article 4.14 Maintenance and Drainage**

The Contractor shall maintain all detour routes, haul routes, streets under construction, and all ditches, water courses, existing drainage patterns, siltation control, gutters, sidewalks, walkways and bike trails affected by the Work until the Final Acceptance Date. This includes, but is not limited to, shaping, grading, and dust control. The Contractor shall maintain existing drainage patterns disturbed or utilized by construction, including re-establishment of drainage ditches, swales and gutter flowlines to their preconstruction condition, grade, and elevation. This also includes maintaining and restoring a stockpile/materials staging area including access to the area as necessary to complete the Work.

When cleaning paved streets, curb and gutters, alleys, and sidewalks, the Contractor shall not flush the streets using only water, but shall use such methods as established by the Director of Health and Human Services for sweeping operations. The Contractor shall prevent any spillage from entering any storm drains.

All streets, drainage ditches, swales, water courses, gutters, sidewalks, walkways and bike trails, used by the Contractor or interrupted by their Work, shall be restored to their pre-existing condition. The Contractor shall construct and maintain any drainage and siltation control necessary to accommodate water caused by their pumping or dewatering operations, and shall contain the water to prevent inconvenience to pedestrian and vehicular traffic.

Contractor shall repair or replace catch basins, storm drain manholes, or storm drains damaged during construction as an incidental item of construction at no additional cost to the Owner.

All costs associated with maintenance of drainage patterns and repair or replacement of drainage ditches, swales, catch basins, storm drains, gutter flowlines, and any other drainage appurtenances shall be incidental to the Contract or to the item under construction, and no separate payment shall be made.

For dust and mud control, the Contractor shall maintain all excavations, embankments, stockpiles, access roads, waste areas, borrow areas, and all other Work areas free from excess dust and mud to avoid causing a hazard or nuisance to others.

The Contractor shall provide water or other dust palliatives and appropriate distribution equipment as required for dust control on their haul roads and Work areas. The Contractor shall assure that all loose material and debris has been removed from haul vehicles prior to their leaving or entering the site to minimize spills of material on road surfaces.

All existing paved areas and roadways adjacent to the project construction site or used as haul roads, shall be kept clean of dirt, mud, and debris resulting from the Contractor's Work during the construction period.

#### **Article 4.15 Temporary Erosion Control and Storm Water Pollution Prevention Plans for Construction**

Contractor shall provide a Storm Water Pollution Plan (SWPPP) to the Engineer for approval. Please see Division 20, Section 20.02 – Storm Water Pollution Plan for this requirement. Payment for the Type 1 SWPPP is incidental to the Contract and no separate payment shall be made.

#### **Article 4.16 Temporary Utilities**

The Contractor shall provide and pay all costs for temporary utilities including gas, water, sanitary sewer, telephone, and electricity necessary to perform the Work. The Contractor shall pay for these costs during periods of suspensions of Work. The Owner does not represent that utility service is available to the site.

The Contractor shall provide temporary heat, including fuel and power, as required to protect materials and Work from the elements. The Contractor shall provide and

maintain temporary toilets and shall furnish drinking water for all those connected with the Work.

#### **Article 4.17 Utilities**

In accordance with AMC 24.40.180, locations of utilities shown on the Drawings are not exact. Above-ground utilities have been field located. Below-ground utilities are shown as depicted on record documents prepared by others and these documents are not necessarily As-Builts; therefore, the depicted locations may not be exact or complete and the Contractor is cautioned to approach their Work accordingly. The Owner shall not be held liable for damages to utilities incurred during construction, including lost time and/or associated costs, due to deficiencies or omissions on the Drawings or these Specifications, unless otherwise specifically provided for in the SubArticle 10.4.17, A. At least forty-eight (48) hours prior to commencing Work, the Contractor shall contact all local utility companies to obtain underground utility locates. The Contractor shall notify the Owner upon completing all locates or a minimum of seventy-two (72) in advance of commencing construction in order to schedule the Project Inspector to field verify and document the utility(s) locations. The Contractor shall exert due care to prevent damage to utilities. Should a utility be damaged, the Contractor shall immediately notify the utility company and shall have the damage repaired at no cost to the Owner. It is expressly understood that the utility has the right to do Work or have its contractor do Work in connection with making repairs to the utility lines damaged by the Contractor. If any utility company determines that a utility has to be temporarily raised, lowered, moved, guyed, shored, braced, or otherwise protected during construction, it shall be done at the expense of the Contractor and to the satisfaction of the utility company, unless otherwise specifically provided for in the SubArticle 10.4.17, A.

##### **A. Compensation.**

1. Except as otherwise specifically provided in this SubArticle A, no equitable adjustment will be paid by the Department:
  - a. Due to any variations in location, elevation, and nature of utilities shown on the Plans, or the operation of removing, adjusting, or relocating them;
  - b. For any delays, inconvenience, or damage sustained as a result of interference from utility owners, interference from utilities, or interference from the operation of removing, adjusting, or relocating utilities; or
  - c. For any adjustments or relocations of utilities requested for the Contractor's convenience.
2. Except as otherwise specifically provided in this SubArticle A, the Engineer will issue a Change Order with equitable adjustment if:
  - a. Utilities not shown on the Plans require removal, adjustment, or relocation;
  - b. Conflicts occur between utilities not shown on the Plans and other necessary work; or
  - c. Conflicts due to the required elevation of a utility occur between new and existing utilities that are both shown on the Plans.



3. When the Contractor damages utilities, the utility owner may choose to repair the damage or require the Contractor to repair the damage. When the Contractor damages utilities:
  - a. No equitable adjustment will be paid by the Department, and the Contractor shall be solely responsible for repair costs and expenses, when:
    - i. The Contractor failed to obtain field locates before performing the work that resulted in the damage;
    - ii. The Contractor obtained field locates, however removed the locates during construction activities and failed to perform relocates before commencing Work that resulted in the damage;
    - iii. The utility was field located by the utility owner or operator, and the field locate is accurate within 24 horizontal inches if the utility is buried 10 feet deep or less, or the field locate is accurate within 30 horizontal inches if the utility is buried deeper than 10 feet;
    - iv. The utility is visible in the field; or
    - v. The Contractor could otherwise reasonably have been aware of the utility.
  - b. The Engineer will issue a Change Order with an equitable adjustment for the cost of repairing damage if:
    - i. The field locate by the owner or operator of a buried utility erred by more than 24 horizontal inches if the utility is buried 10 feet deep or less, or 30 horizontal inches if the utility is buried deeper than 10 feet;
    - ii. The utility was not shown on the Plans or other Contract documents, and the Contractor could not reasonably have been expected to be aware of the utility's existence; or
    - iii. The Contractor made a written request for a field locate in accordance with AMC 24.30.150 and 24.40.170 and the utility owner did not locate the utility accordingly, and the Contractor could not reasonably have been expected to be aware of the utility's existence or location.
4. If a delay caused by a utility owner is beyond the control of the Contractor, and is not the result of the Contractor's fault or negligence, the Engineer may issue a Change Order with an equitable adjustment to contract time, but no equitable adjustment will be made for the cost of delay, inconvenience or damage. Additional contract time may be granted if the cause of delay is because a utility owner is to perform utility work:
  - a. By dates or a period of time stated in the Special Provisions, and the utility work is not completed by the dates stated; or

- b. In cooperation with the Contractor, and the utility owner does not complete the work in a timely manner, based on a written progress schedule agreed upon by the Contractor and the utility owner.
5. If the Engineer orders the Contractor to make necessary construction or repairs due to incomplete utility work by utility owners, the Contractor will be paid as specifically provided for in the Contract, or the Engineer will issue a Change Order with equitable adjustment.

The Contractor shall be responsible for maintaining all utility service connections whether marked on the Drawings or not. In addition, the Contractor shall repair or replace all utility service connections (at their own cost) that are damaged by their actions.

At a sufficient distance, prior to encountering a known obstacle or tie-in to an existing conduit, pipe or manhole, the Contractor shall expose and verify the exact location of the obstacle, pipe, or manhole so that proper alignment and/or grade may be determined before the pipe sections are laid in the trench and backfilled. The Contractor shall notify the Engineer of the results of this verification, prior to commencement of the Work affected by results of verification, so that any modification to the Drawings or supplementary instructions may be supplied to the Contractor. The Contractor shall allow the Engineer one complete working day to review the verification results and provide any design modifications or supplementary instructions necessary. No additional payment shall be made to the Contractor for this Work.

The cost incurred for removal and alignment of backfilled pipe sections due to improper verification methods shall be borne by the Contractor.

Unless otherwise specified in the Special Provisions, it is the intent of the Contract Documents that utilities shall not be relocated to facilitate construction. If the Engineer determines that an existing utility must be permanently relocated because it is in direct conflict with the facility being constructed, the existing utility shall be relocated by the Utility Company at no charge to the Contractor. In the event a water or sewer service is relocated, it shall be installed in compliance with the minimum separation distances set forth in 18 AAC 80.

The Contractor shall be responsible for coordinating the Work with any Work of a Utility Company and shall not interfere with the initial installation, relocation, reconstruction, or replacement of any utility including the making of necessary service connections by the utility company. If the Work of the Contractor is delayed because of any acts or omissions of the utility company, the Contractor shall not be entitled to additional compensation from the Owner but may be entitled to an extension of time, unless otherwise specifically provided for in the SubArticle 10.4.17, A.

The Contractor is required by Municipal ordinance to request locates from the Locate Call Center (278-3121) a minimum of forty-eight (48) hours prior to any excavation.

No buried utility shall be covered until its owner has inspected and accepted it.

Certain utility companies may have facilities within the project limits and some or all of those utility companies may be relocating their facilities and installing crossings within the project limits throughout the project duration.

The Contractor may be required to shore, remove, reset, relocate, etc. natural gas, electrical and telecommunication companies and associations facilities and amenities, as approved by the utility and requested by the Engineer.

1. Trash

Contractor shall coordinate trash pick-up for local residents affected by the construction Work with the solid waste utility.

2. Water and Wastewater

All existing key boxes, cleanouts, manholes, etc. shall be located and exposed by the Contractor and carefully protected during the course of the Work. The Contractor, in conjunction with the Engineer, shall check all utilities prior to the start of the construction and record their condition. All manholes, catch basins, cleanouts, etc. shall be checked for damage resulting from the Contractor's operation prior to final acceptance by the Owner. The Contractor is responsible for restoring all existing utilities to preexisting conditions, and shall coordinate with the affected utility in having any necessary repairs completed.

Contractor shall schedule a walk-through of the project with AWWU Engineering Division and check the existing condition prior to street reconstruction of sanitary sewer manholes, cleanouts and services, and water mainline valves, key boxes, services, and hydrants. If adjustments are made to AWWU water or sanitary sewer facilities, the Contractor shall schedule and complete a final acceptance walk-through inspection of said facilities with AWWU prior to scheduling this project's prefinal inspection, provide a Record Drawing, and list any new facility components.

The Contractor shall schedule and be responsible for obtaining all required AWWU permits and shall notify AWWU of any change in status or condition of existing water and/or wastewater infrastructure. In the event water service may be interrupted during the course of construction, the Contractor shall adhere to the requirements of AWWU Policy and Procedures, No. 15-4, Customer Notification for Scheduled or Emergency Water Service Outages.

3. Gas

ENSTAR Natural Gas Company's natural gas pipelines shall have continuous support during excavation and backfill in accordance with ENSTAR's Safety Requirements for Excavation Adjacent to Natural Gas Pipeline. Contractor shall exercise extreme caution during excavation and backfill operations to prevent damage to the pipe and pipe coating. Contractor shall place at least twelve inches (12") of classified fill and backfill and compact below exposed gas pipelines, in accordance with Division 20, Section 20.21 - Classified Fill and Backfill.

The Contractor shall call ENSTAR to perform a cathodic protection area sweep after all underground Work (including electrical tie-in work) has been completed and before surface restoration or paving begins. The Contractor shall notify ENSTAR two (2) working days before the sweep is to be performed. The Contractor shall allow time for repairs in the event that underground contacts are detected.

Contractor shall furnish ENSTAR a copy of the construction schedule for Work within the vicinity of gas mains, and shall accommodate ENSTAR's authorized inspectors per Section 10.05, Article 5.14 – Inspection.

#### 4. Electrical and Telecommunications

The Contractor shall accomplish all Work in close proximity to electrical or telecommunications facilities in conformance with clearance requirements in accordance with the latest edition of the National Electrical Safety Code (NESC) and the established codes and guidelines of the affected utilities as well as applicable federal and state laws and regulations.

If excavation is required within five feet (5') of utility poles, pad-mounted equipment or concrete ductwork, shoring is required. Prior to shoring, the Contractor shall provide the serving-utility with the proposed method in writing for utility approval. Contractor shall support and protect exposed cables as prescribed by the respective electric and communications utilities. If Contractor damages an electric or communications cable, installed in accordance with an approved municipal Right-of-Way permit, cable shall be repaired by or replaced by the respective utility at Contractor's expense.

Hand digging is required within two feet (2') of a buried electrical or telecommunications cable. Once the utility's underground cable is exposed, it must be supported every two feet (2'), if it is not lying on the bottom of the trench. Any Work on the electric utility's facilities or infrastructure must be done by a Journeyman Power Lineman, with a State Certificate of Fitness. If an electrical or telecommunications cable is encountered during excavation, the cable shall be inspected for damage by the respective utility's operations personnel. If the cable condition appears acceptable, the cable shall be buried by the Contractor and sand bedded per the utility's specifications. The cable shall be tested by the utility to ensure its integrity. Should the cable be damaged due to the excavation, the utility will install a new cable at the Contractor's expense.

If Contractor requests the electric or telecommunications utility to do any shoring of that utility's infrastructure, Contractor shall coordinate three (3) working days in advance of shoring with that utility's operations department.

For overhead electrical power lines, Alaska State Law requires at least ten feet (10') clearance between energized conductors and construction equipment and structures. Before working under or near electrical power lines, Contractor shall contact that utility's operations division so they will be aware of the situation.

Any landscaping in areas above buried electrical or telecommunications cables should be limited to bedding plants, small shrubs, or grass. No concrete walls or structures can be built over underground cables.

Contractor shall coordinate any changes in grade and/or earthwork fill/cut areas with electric and telecommunications utilities so adequate infrastructure depth of bury may be maintained.

Any relocation or repair of electrical or telecommunications facilities must be done by the respective utility's personnel. All relocation Work performed by the electric

and/or telecommunications utility for the Contractor shall be at the Contractor's expense.

All necessary arrangements to be made with the Utility for compliance with AS 18.60.680 shall be arranged by the Contractor in advance of the project start date. All costs of compliance with these requirements, including charges by the Utilities, shall be borne by the Contractor.

#### 5. Traffic Signal Control and Communications

The Contractor shall follow the requirements set forth in Division 80 – Standard Construction Specifications for Traffic Signals and Illumination.

Prior to start of Work that is in close proximity to the following utilities, Contractor shall coordinate with each utility as required by the respective utility and provide a minimum of forty-eight (48) hours notice.

- Alaska Communication Systems (ACS)
- Anchorage Water & Wastewater Utility (AWWU)
- AT&T Alascom
- Chugach Electric Association (CEA)
- ENSTAR Natural Gas
- GCI Cable
- Verizon
- Municipal Street and Storm Drain Maintenance
- Municipal Traffic Signals Section
- Solid Waste Services (SWS)

Contractor shall provide the Engineer a minimum of forty-eight (48) hours notice of all utility walk-through inspections and area sweeps. Contractor shall conduct the utility walk-through inspection in the presence of the Engineer, unless the Engineer directs otherwise. Contractor shall furnish a copy of all utility inspection reports to the Engineer prior to commencing construction activities, and provide copies of post-construction inspection reports prior to applying for final payment.

The requirements of this Section shall be considered incidental to the Contract and no separate payment shall be made. Further, the Contractor shall hold harmless, defend, and indemnify the Owner from and against any and all claims, damages, losses, and expenses, including attorney fees, by the Contractor or third-parties arising directly or indirectly out of any conflict between the Work under the Contract and any claim, interference, or delay for whatever reasons.

#### **Article 4.18 Utility Connections**

Whenever the Contract Documents require permanent connections to be made to utility lines, the Contractor shall, unless otherwise specified in the Special Provisions, be responsible for making the connection to the utility line, or have the Utility Company make the connection, at the point(s) indicated on the Drawings. The Contractor shall be responsible for making all necessary applications to the Utility Company, for paying all fees and for performing any Work associated with making the connections which is not performed by the Utility Company. The Contractor is not responsible for bringing utility

lines to the point of connection. The Contractor shall pay all costs for utility service prior to the Substantial Completion Date.

#### **Article 4.19 Record Documents**

Contractor shall maintain Record Documents on the job site consisting of a complete set of drawings, survey line and grade books, and all Contract Documents. Contractor shall record (on Record Documents) and keep current on a daily basis all changes in location (both vertical and horizontal), material, equipment, and all changes in the Work. Contractor shall record all horizontal and vertical locations of all utilities encountered, in conformance with the requirements of Division 65, Section 65.02, Article 2.14 – As-built Surveys and Record Drawings. Contractor shall identify design dimensions, elevations, and grades with no change as being accurate by noting “ASB” adjacent to the design value. At all times Contractor shall make the Record Documents available to the Engineer.

The Contractor shall provide horizontal and vertical locations of all water and sanitary sewer service connections at the property line or lease lot line, including swing ties and offsets to property or lease lot corners. The Record Documents shall include two or more swing ties from prominent, permanent features to show the location of each installed water service connection. Contractor shall provide swing ties as close to perpendicular to each other as possible, and when property or lease lot corners are in, use them as swing tie references.

Contractor shall ensure all additions and corrections are neat, clean, and legible. If additional plan sheets are required, Contractor shall prepare them on reproducible mylar or like material and size as the original Drawings. Contractor shall replace Drawings damaged or lost by Contractor at their expense and to the satisfaction of the Engineer.

The Engineer shall review all Record Documents for completeness and conformance to the standards stated above. Contractor shall make all corrections, changes, additions, and deletions required to conform to the standards.

The Engineer may periodically review the status of the Record Documents during the course of the Work. Failure of Contractor to keep the Record Documents current and in the required condition shall be considered cause for additional withholding from the progress payments as provided in Section 10.07, Article 7.5 - Progress Payments.

Contractor shall deliver approved final Record Documents, bearing certification by Contractor that the Record Documents are a complete and accurate representation of the project as constructed, to the Engineer within thirty (30) days after Substantial Completion or prior to Final Acceptance of the project, whichever is earlier.

Certification for Record Drawings shall be affixed to the final reproducible Drawings and shall include the following unqualified statement, which the Contractor must sign and date as a condition to Final Acceptance of the project.

*“This shall serve to certify that these Record Drawings are a true and accurate representation of the project as constructed.”*

A similarly prepared and affixed signed statement shall be included on other required Record Documents.

The development, preparation and presentation of all Record Documents is incidental to other Work and no separate payment shall be made.

#### **Article 4.20 Operating and Maintenance Manuals**

The Contractor shall provide to the Engineer prior to the pre-final inspection four (4) sets of Operating and Maintenance Manuals for all items of material and equipment as required by the Technical Specifications. In addition to the requirements in the Technical Specifications and Special Provisions, the Manuals shall contain an Index, by Specification Section; a key plan which graphically locates items of equipment; a list of manufacturers, suppliers and distributors with addresses and telephone numbers; and a list of local representatives with addresses and telephone numbers.

#### **Article 4.21 Ownership of Contract Documents**

Owner-furnished Drawings, Specifications, and copies thereof are the Owner's property. Contractor shall not use them on other projects and/or Work and shall return them to the Owner on request at the completion of the Work. Reuse of these materials without specific written authorization or adaptation by the Owner is prohibited and shall be at the risk of the user and without liability or legal expense to the Owner or their consultants. The Contractor shall hold harmless the Owner, Engineer, and Design Engineer and their consultants from any liability arising out of reuse of Drawings and/or Specifications supplied to the Contractor under the Contract.

#### **Article 4.22 Project Information Signs**

Prior to beginning of any work on the project, Contractor shall install project information sign(s) (combination owner and contractor supplied materials), in accordance with this Section, in a location as directed by the Engineer. The quantity of signs required to be placed on the project shall be as stated in the Special Provisions. The Owner supplied project information sign(s) shall be available for pick up at 5701 Northwood Drive, Monday thru Thursday from 8:00 a.m. to 4:00 p.m. Contact Street Maintenance Dispatch Center at 343-8277 to coordinate pickup.

Owner-supplied materials are as follows:

- Project Information Sign - 4'x8'x $\frac{3}{4}$ " MDO wood sign.

Contractor provided materials are as follows:

- Sign Frame - 2"x4" lumber pre-assembled in a rectangular shape measuring 4-foot by 8-foot.
- Post Skids – assembled, two (2) EA 4"x6" lumber standing vertical 8-foot in height, with 8-foot base attached with a  $\frac{3}{4}$ " plywood gusset between the 2 vertical pieces.

Assembly shall be constructed per Standard Detail 70-6. Once assembled and positioned as directed by the Engineer, the Contractor shall supply and secure each post skid with two (2) each 60-pound sand bags, or provide equivalent anchoring system as approved by the Engineer. The Contractor shall be responsible for maintaining placement and possible location adjustment if required per the Engineer, and for overall maintenance of the signs.

Following final completion of the project, Contractor shall disassemble the signs and return the owner-provided materials to 5701 Northwood Drive. Contact Street Maintenance Dispatch Center at 343-8277 to coordinate drop-off.

All Work in this Article shall be considered incidental to the project.



## **SECTION 10.05 CONTROL OF WORK**

### **Article 5.1 Authority of the Engineer**

The Engineer shall be the Owner's representative and shall observe the Work in progress on behalf of the Owner and shall be identified at the time the Notice to Proceed is issued. The Engineer shall not be responsible for construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work. Visits and observations made by the Engineer shall not relieve the Contractor of their obligation to conduct comprehensive inspections of the Work and to furnish materials and perform acceptable Work, and to provide adequate safety precautions, in conformance with the intent of the Contract. The Work shall not be considered completed until a Certificate of Completion is issued by the Engineer. The Contractor shall at all times carry out and fulfill the written instructions and written directions of the Engineer regarding the Contract Documents.

The Engineer shall have the authority to order changes in the Work requiring an adjustment in the Contract amount and/or time. The Contractor shall perform such changes in the Work in accordance with supplemental Drawings and instructions as the Engineer may issue. Any single change in the Work, or cumulative changes in the Work, which will cause the total value of the Contract to exceed the limits stated in AMC 7.15.080 requires Assembly approval.

The Engineer shall in all cases make determinations on any and all questions which may arise concerning the quality, quantity, and acceptability of materials furnished, the Work performed, the rate of progress of the Work, the interpretation of Contract Documents, and the merit of all Contractor claims for additional compensation or time extension submitted under Article 5.21 – Claims for Additional Compensation.

If the Contractor determines that instructions, clarifications, or directions issued by the Engineer constitute a change in the requirements of the Contract Documents, the Contractor may make a claim as provided under Article 5.21 – Claims for Additional Compensation.

### **Article 5.2 Prosecution of the Work**

The Work shall not commence until a written Notice-to-Proceed has been received by the Contractor. The Work shall commence within ten (10) days after the effective date specified in the Notice to Proceed and shall be prosecuted vigorously and continuously. No mobilization to the site or field construction activity shall occur until after the required Construction Progress Schedule has been initially submitted in the form and detail required; however, the counting of Contract time shall continue. In this instance, no claim for delay or compensation of any kind shall be considered meritorious and shall not be paid or otherwise recognized. No Requests for Payment shall be accepted until after the schedule has been submitted in the form and detail required.

### **Article 5.3 Construction Progress Schedule and Schedule of Values**

Within ten (10) days after the effective date of the Notice to Proceed and prior to commencement of the Work, the Contractor shall submit to the Engineer a Construction Progress Schedule in the form of a time-scaled bar chart, the elements of which shall be the Divisions and Sections of the Project Manual, weather and ground condition

restraints, and Work suspensions and other significant influences on the Contract amount and/or the time for completion of the Work. The Contractor shall include other significant features of the Work such as the submittal schedule, permit acquisition plan, material procurement milestones, plant and equipment procurement dates, and shipping schedules. Any Work plan requirements including project phasing shall also be included and identified in the Construction Progress Schedule. The bar chart shall include a graph representing the monthly percent of Work to be completed. The bar chart shall be revised and resubmitted as required by the Engineer, when conditions cause changes to the construction schedule, or on a monthly basis, whichever is sooner.

When required by the Engineer, the Contractor shall also deliver, at the same time the Construction Progress Schedule is delivered and in a form satisfactory to the Engineer, a Schedule of Values for Contract Payments for those lump sum items designated by the Engineer. When payment for the Work is based primarily on unit prices identified in the Bid Schedule, no Schedule of Values shall be required. However, when the Bid Schedule includes a mixture of unit prices and lump sum prices, and the lump sum prices represent a significant portion of the total Contract amount, then the Engineer reserves the right to require a Schedule of Values for specified lump sum items. The Contractor shall submit monthly partial Payment Estimates based on the Schedule of Values if they have been required. All Schedules of Values and Payment Estimates shall, as a minimum, be organized to be consistent with the Divisions and Sections of the Project Manual. The Engineer may require submission of revised construction schedules demonstrating the manner in which the Contractor will achieve the necessary rate of progress, all without additional cost to the Owner. Partial Payment Estimates may be appropriately reduced if the Engineer determines that the Contractor has failed to supply the Owner with the requested or necessary information.

In addition to the time-scaled bar chart described above, and when specified in the Special Provisions, the Contractor shall develop and submit to the Engineer for approval a time-scaled Critical Path Method (CPM) schedule. Both a hard copy and electronic copy of the CPM schedule shall be submitted. The Contractor shall revise and resubmit the CPM schedule to reflect any alteration in the sequence of scheduled activities or of the critical path with each partial payment request and at such other times as the Engineer may require, and at any time the Contractor determines that the critical path is altered by changes or other circumstances. The Contractor shall submit the initial CPM schedule to the Engineer no later than twenty-one (21) days from the effective date of the Notice to Proceed and at least monthly thereafter.

The Contractor shall organize the scheduled activities to be consistent with those Specifications, Divisions and Sections, required for the Work. Each Division and Section of the Specifications and each item in the Schedule of Values shall be represented by one or more scheduled activities. In addition, one or more scheduled activities shall be used to represent the submittal schedule, permit acquisition, materials procurement, plant and equipment procurement, shipping, and all other significant elements of the Work. The Contractor shall include activities that address weather and ground condition restraints, critical dates, holidays, periods of Work suspension, and all other restraints (i.e., all events that are critical or will become critical to the schedule).

All schedules, whether they are bar chart schedules or CPM schedules, shall include enough detail to adequately describe all important activities necessary to complete the Work. Unless otherwise agreed to by the Engineer, no single activity in any schedule shall be allowed to represent more than fifty thousand dollars (\$50,000) of the total scope of the Work. The initial schedule and monthly schedule updates shall be considered payable activities and appropriate payment amounts shall be included in the Schedule of Values or the Bid Schedule. Failure to provide adequate schedules shall result in non-payment in accordance with the amounts established in the Schedule of Values or the Bid Schedule.

#### **Article 5.4 Non-Working Hours, Holidays, Saturdays, and Sundays**

The Contractor shall give the Engineer forty-eight (48) hours advance notice of their intention to work overtime, Saturdays, nights, Sundays or holidays, or anytime outside the usual working hours. In no case shall the Contractor do any such Work without first notifying the Engineer to allow arrangements for proper inspection. Contractor shall not be reimbursed for Work performed in violation of this Article unless the Work is in direct response to an Emergency and approved after-the-fact by the Engineer.

The Contractor shall reimburse the Owner labor, overtime, and all other costs for inspection Work performed on Sundays, recognized holidays, and for any Work in excess of a standard work day (excluding meal times) except when the Work is required by a permit issued by an agency after the Contract has been executed, or unless the Work period is designated by the Owner.

#### **Article 5.5 Shop Drawings**

The Contractor shall submit to the Engineer for review an electronic copy of those Shop Drawings required by the Contract Documents within a reasonable time and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate Contractor. Six (6) hard copies of shop drawings that are too large to submit electronically shall be allowed for submittal. A properly completed Submittal Transmittal form shall accompany all submittals. If a substitution is being requested, a Substitution Request form shall be submitted with the appropriate backup documentation.

The Shop Drawings submitted by the Contractor shall bear their specific written and signed certification that they have verified: (1) that the Work shown is in conformance with the Contract Documents; (2) that they have determined and verified quantities, dimensions, field measurements, and related field construction criteria; and (3) that they have checked and coordinated the submittal with the requirements of the Work. The Contractor shall indicate on the Shop Drawing submittal any deviation from the requirements of the Contract Documents.

All Shop Drawings shall be clear and legible. Any Drawings submitted which appear to be carelessly prepared, erroneous, or unchecked shall be returned to the Contractor for further action, and resubmittal.

Within a reasonable time, the Engineer shall review and approve or take other appropriate action on the submittals, but only for conformance with the design concept of the Work and with the information given in the Contract Documents. The Engineer's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

The Engineer shall state the reasons for rejection and/or resubmittal requirements if applicable.

Revisions on re-submittals other than those requested by the Engineer on previous submittals shall be specifically noted by the Contractor.

Upon approval of the Shop Drawings by the Engineer, an electronic copy shall be returned to the Contractor.

The Engineer's approval of Shop Drawings does not relieve the Contractor of responsibility for any deviation from the Contract Documents unless the Contractor has submitted and received written approval of the Deviation Request. Errors and omissions that may occur in the Shop Drawings are the responsibility of the Contractor. The Contractor is not relieved of this responsibility by the Engineer's approval of the Shop Drawings.

When Shop Drawings are required on a portion of the Work, the Contractor shall not commence that portion of Work or any item relying on said portion of Work until such Shop Drawings have been given written approval by the Engineer.

The Contractor shall keep one copy of all Contract Documents, including modifications, and one copy of approved Shop Drawings in good order and available to the Engineer or their representative at the construction site.

#### **Article 5.6 Product Data**

The Contractor shall submit for approval an electronic copy of complete Product Data for those items for which submittals are required by the Contract Documents including, but not limited to, specific performance data, material description, rating, capacity, working pressure, material gage or thickness, brand name, catalog number, and operating and maintenance data. Submittals shall be submitted within a reasonable time and in such sequence as to not cause a delay in the Work, in the Work of the Owner, or any separate Contractor. A properly completed Submittal Transmittal form shall accompany all submittals. If a substitution is being requested, a Substitution Request form shall be submitted with the appropriate backup documentation.

Within a reasonable time, the Engineer shall review and approve or take other action on the submittals. Approval by the Engineer is required before any of the equipment is ordered.

Product Data for equipment approved by the Engineer shall not in any case supersede the Contract Documents. The approval by the Engineer shall not relieve the Contractor from responsibility to correct deviations from Drawings or Specifications, unless they have notified the Engineer in writing of such deviations at the time of submission and secured the Engineer's written approval. The Contractor shall not be relieved from responsibility to correct errors of any sort in the items submitted. The Contractor shall check and approve the item described by the Product Data with the Contract Documents for deviations and errors prior to submittal to the Engineer for approval. The Contractor shall ensure that items to be furnished fit the space available as shown in the Contract Documents.

Upon approval of the equipment by the Engineer, the Contractor shall furnish four (4) copies of Product Data of all equipment or components together with operating and maintenance instructions.

### **Article 5.7 Materials**

All materials and equipment furnished under the Contract shall be new, unless otherwise specified, and shall be of good quality, free from defects, and shall conform to the requirements of the Contract Documents. Substitute materials shall not be used unless approved through the Substitution Request process by the Engineer in writing prior to installation. When required by the Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

In order to establish standards of quality, the Specifications may refer to certain products by name and catalog number. This procedure is not to be construed as eliminating from competition other products of equal or better quality by other manufacturers. The words "approved equal" shall be considered following all such listings regardless of whether or not they so appear, UNLESS the listing(s) specifically state "No Substitutions." In such event, no substitutions shall be accepted.

The Contractor shall furnish the Engineer the complete list of proposed substitutions within ten (10) calendar days of the effective date of the Notice-to-Proceed (or such time as may be approved in writing by the Engineer), together with complete engineering and catalog data in sufficient time prior to their use to give the Engineer adequate time for review. A properly completed Submittal Transmittal form shall accompany all submittals. If a substitution is being requested, a Substitution Request form shall be submitted with the appropriate backup documentation. Failure on the part of the Contractor to obtain the necessary approval prior to ordering or using such alternate material or equipment shall not relieve the Contractor of furnishing acceptable material or equipment as required by the Contract Documents.

The Contractor shall abide by the Engineer's decision when proposed substitute materials or items of equipment are judged to be unacceptable and shall furnish the specified material or item of equipment in such case. The Engineer shall approve or disapprove proposed substitutions in writing within a reasonable time. No substitute materials shall be used unless approved in writing.

Materials shall be stored in such a manner as to insure the preservation of their quality and fitness for use. When considered necessary to protect materials against cold, dampness, or to keep them clean and free from dust, dirt, or other detrimental matter, suitable sheds, platforms, and covers shall be provided. The Contractor shall provide easy access to stored materials for inspection whenever requested by the Engineer.

Manufactured articles, material, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the Manufacturer. In the event of conflict between the manufacturer's directions and the Contract Documents, the higher standard requirements shall govern.

### **Article 5.8 Testing of Materials**

All tests shall be made in accordance with methods as described and designated in the Contract Documents. When tests of materials are required on site, such tests shall be

provided by and at the expense of the Owner unless otherwise specified in the Special Provisions. All factory testing, mill testing and other off site testing shall be as specified or required to conform with codes and industry standards and provided by and at the expense of the Contractor.

The Contractor shall provide such labor and facilities as may be required for collecting and forwarding Samples necessary for testing and shall hold the materials represented by the Samples until tests have been made and the materials found equal to the requirements of the Specifications. The Contractor in all cases shall furnish the required Samples without charge.

In the absence of any definite Specification, it shall be understood that such materials and tests shall meet the Specifications and requirements of the American Society for Testing and Materials (ASTM) or the American Association of State Highway Transportation Officials (AASHTO).

Wherever a particular specification of a Society for Testing and Materials is referred to by number, it shall be understood that such reference shall include all amendments and additions thereto adopted by such organizations prior to the award of the Contract.

Repetitive testing of materials in constant use may be required periodically by the Engineer. Required retesting shall be accomplished at the expense of the Contractor when materials have previously been tested and have not met the requirements of the Contract Documents.

#### **Article 5.9 Contractor's Authorized Representatives and Employees**

The Contractor shall within five (5) days after the Notice to Proceed but no later than the Preconstruction Conference, name the Superintendent, the Safety Supervisor required by Section 10.06, Article 6.8 – Safety, and file with the Engineer a list of all persons who are authorized to sign documents on behalf of the Contractor to fully bind the firm. The name and twenty-four (24) hour phone numbers of two persons that may legally act on behalf of the Contractor in case of emergency at any time shall also be provided.

The Superintendent is the Contractor's representative at the site and has authority to act on Contractor's behalf. All communications given to the Superintendent are as binding as if given to Contractor. A qualified Superintendent is one who is completely familiar with the requirements of the Contract Documents, has experience and ability to direct all Work at the site, is able to read, write, speak and communicate effectively using English, and is present at the job site, or readily available at all times while Work is in progress.

The Contractor shall employ only qualified journeymen, mechanics, tradesmen, and installers who are thoroughly skilled and experienced in their respective trades or specialties. When apprentices and helpers are employed, they shall be under the supervision of qualified journeymen mechanics and tradesmen at all times.

The Contractor shall at all times enforce strict discipline and good order among their employees and Subcontractors and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him. The Engineer may require, at no additional cost to the Owner, the Contractor to remove from the Work any employee or

Subcontractor that the Engineer deems incompetent, careless, or otherwise objectionable.

#### **Article 5.10 Subcontracting**

If any part of the Work to be done under the Contract is subcontracted, the subcontracting shall be done in accordance with the following provisions:

1. All Subcontractors proposed for the Work shall be acceptable to the Owner.
2. Within ten (10) days after the effective date of the Notice-to-Proceed, and prior to commencement of the Work, the Contractor shall provide the Engineer in writing a list of Subcontractors together with a summary of the extent and character of the Work to be done by each Subcontractor. If for sufficient reason, at any time during the progress of the Work, the Engineer determines that any Subcontractor is incompetent or undesirable, they will notify the Contractor accordingly and immediate steps shall be taken by the Contractor for cancellation of such subcontract and new Subcontractor, acceptable to the Owner, shall be provided at no additional cost to the Owner. Subletting by Subcontractors shall be subject to the above.
3. The Contractor shall be fully responsible to the Owner for the acts, errors, and/or omissions of their Subcontractors and of persons either directly or indirectly employed by them. Nothing contained in the Contract Documents shall create any contractual relation between any Subcontractor and the Municipality.
4. The subcontracting of any of the Work to be done shall in no way relieve the Contractor of any part of their obligations under the Contract.

#### **Article 5.11 Right of the Municipality to Do Work**

Contractor expressly understands that the Municipality has the right to do Work and may award other Contracts in connection with the Work under the Contract or nearby projects. Contractor shall conduct their operations so as to interfere as little as possible with other contractors or subcontractors on or near the Work.

#### **Article 5.12 Safeguarding of Excavations**

The Contractor shall provide such safeguards and protections around and in the vicinity of all excavations as may be necessary to prevent damage to property or injury to persons.

The Contractor shall properly barricade all trench excavations with appropriate signs and warning lights placed to prevent inadvertent entry by vehicular or pedestrian traffic.

The Contractor shall backfill all trench excavations to the top of the trench at the end of each working day, except, at Contractor's option, a "bell-hole" may be left open if properly barricaded and adequate signage and warning lights are placed to prevent inadvertent entry by vehicular or pedestrian traffic.

If ground water or surface water results in standing water in the remaining excavation, the Contractor shall provide continuous pumping to maintain the excavation in a dewatered condition.

The Contractor shall maintain all roadways in a drivable condition for normal vehicular and transport operations, including emergency vehicles, at the end of each day's operation.

These requirements shall in no way relieve the Contractor of the obligation to restore private property to its preconstruction condition.

### **Article 5.13 Duties of Inspectors**

Inspectors shall be authorized to inspect all Work and Materials. Such inspection may extend to all or any part of the Work and to the preparation, fabrication, or manufacture of the materials to be used. Inspectors are not authorized to alter or waive the provisions of the Contract. Inspectors are not authorized to issue instructions contrary to the Contract Documents or to act as foreman for the Contractor.

Inspectors shall immediately inform the Contractor of any deficiency known to exist in the Work and any laboratory test results.

As the Engineer's authorized representative, the inspector may reject damaged or other unsuitable materials and direct their replacement in accordance with the Contract Documents. With prior approval of the Engineer, the inspector may issue temporary Work Suspension Orders due to (1) weather conditions; (2) the Contractor's refusal to carry out the orders or directives of the Engineer or their Authorized Representative; or (3) the Contractor's refusal to perform in accordance with the Contract Documents.

The Contractor's responsibility for Work performed under the Contract shall in no way be relieved because of the presence or absence of an inspector. Work shall not be considered acceptable because of the presence of an inspector.

### **Article 5.14 Inspection**

The Engineer or their representative shall be allowed access to all parts of the Work at all times and shall be furnished with every reasonable facility for ascertaining whether or not the Work is being performed in accordance with the requirements and intent of the Contract Documents. Upon the request of the Engineer, the Contractor shall, at any time before Final Acceptance of the Work, remove or uncover such portions of the finished Work as may be directed. After examination, the Contractor shall restore said portions of the Work to the standard required by the Contract Documents. Should the Work thus exposed or examined prove acceptable, the uncovering or removing, the replacing of the coverage or the restoration of the parts removed shall be paid for as extra Work.

Should the Work so exposed or examined prove unacceptable, the uncovering or removing, replacing of the covering and the restoration of the parts removed, shall be at the Contractor's expense.

### **Article 5.15 Work Limits, Easements, and Rights-of-Way**

The Owner shall provide work limits, rights-of-way, and easements for the Work. Information regarding the width and status of the easements is shown on the Drawings. The Contractor shall comply with all Special Conditions, provisions, stipulations, and restrictions thereof. The Contractor shall confine their operations to the designated Work areas, rights-of-way and easements and shall observe all restrictions. Prior to the



start of construction under the Contract, the Contractor shall ensure that all permits necessary for the construction of the project, including right of entry for driveway reconstruction, have been obtained and shall ensure that they are available on the job site at all times.

The Contractor shall be responsible for any trespass upon adjacent property or injury thereto resulting from or in connection with their operations. The Contractor shall be liable for any claims that may be made on account of trespass and shall provide a written statement from the property owner of full restoration or satisfactory resolution prior to Final Acceptance of the Work. The Contractor shall not have the right to remove materials from a right-of-way, easement, or Work area unless otherwise provided in the Contract Documents.

Should the Contractor desire to go outside designated Work areas, rights-of-way or easements, they shall provide the Engineer with written permission from the property owner before entering such property. The written permission shall specifically provide that the property owner shall not hold the Municipality, its employees, agents or consultants liable for use of or damage to this property.

#### **Article 5.16 Responsibility for Damages**

The Contractor shall be responsible for all damages to property, injury to persons, and loss, expense, inconvenience, and delay that may be caused by or that may result from any act, omission, or neglect of the Contractor, their Subcontractors, or their employees in the performance of the Work.

It is specifically understood between the parties executing the Contract that the Contract Documents do not make anyone a third party beneficiary, nor does the Contract authorize anyone not a party to maintain a lawsuit for personal injuries or property damage.

#### **Article 5.17 Repair of Damages Caused by Contractor**

All damage and injury to property that is caused by or that results from the carrying out of the Work, or from any act, omission, or neglect of the Contractor, their Subcontractors, or their employees, shall promptly be remedied by the Contractor either by the repairing, rebuilding, or replacing of the property damaged or in some other manner satisfactory to the owner of such property. In case of failure on the part of the Contractor to promptly and satisfactorily remedy such damage or injury, the Municipality may proceed to repair, rebuild, or replace such property as required and the cost thereof shall be deducted from any monies due or which may become due the Contractor.

In applying the above provisions, the repairing, rebuilding, or replacing of damaged property shall be understood to include the providing of any temporary facilities that may be needed to maintain normal service until the required repairing, rebuilding, or replacing is accomplished.

This provision also applies to all areas used by the Contractor for staging of the construction and shall include restoring those properties to their original condition to the satisfaction of the Engineer.

### **Article 5.18 Changed Conditions**

The Contractor shall notify the Engineer in writing, no later than two (2) working days and before such conditions are disturbed, of: (1) subsurface conditions at the site differing materially from those indicated in the Contract, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract. The Engineer shall promptly investigate the allegations. If the Engineer finds that such conditions do materially alter the Contract requirements so as to cause an increase or decrease in the Contractor's cost of, or the time required for, performance of the Contract, the Engineer may request that the Contractor submit the documentation required under Article 5.21 – Claims for Additional Compensation.

Owner is not aware of any contaminated material within the project limits. If such material is encountered, Contractor shall notify the Engineer immediately for direction. This will be treated as a changed condition, unless the contamination was caused by Contractor's operation.

No claim of the Contractor under this clause shall be allowed unless the Contractor has given written notice as required. However, the time prescribed in this Article may be extended for good cause by the Engineer.

### **Article 5.19 Unauthorized and Defective Work**

Any unauthorized or defective Work found to exist during construction shall be immediately remedied by the Contractor. If the Contractor fails to correct unauthorized or defective Work within three (3) days of receipt of written notice, the Owner may correct such deficiencies and deduct the cost thereof from any payment due the Contractor without prejudice to any other remedy including the use of Article 5.28 – Termination of Contract by Owner.

### **Article 5.20 Changes in the Work**

The Engineer shall have the authority to order changes in the Work which may or may not require an adjustment in the Contract amount and/or time. Such changes in the Work shall be performed in accordance with any supplemental Drawings and instructions as the Engineer may issue. Any single change in the Work, or cumulative changes in the Work, which will cause the total value of the Contract to exceed the limits stated in AMC 7.15.080 requires Assembly approval.

The Owner shall pay for additions to the Work or take credit for reductions to the Work using one of the four methods described below and as specified in Section 10.07, Article 7.4 – Change Order Compensation Adjustments:

1. Negotiated unit or lump sum prices;
2. Contract unit or lump sum prices (if they have been included as a part of the Contract);
3. Time and Material prices (when the Engineer determines that Contract prices or negotiated prices do not apply); or
4. No cost changes (when the Engineer determines that a change is necessary which does not affect the price or time for the Work).

Prior to the Engineer authorizing payment for changed Work, the Contractor shall furnish a Change Order Proposal that is itemized as required by the Engineer for both additions and deletions to the Work.

All Contractor-initiated requests for deviation from the requirements of the Contract Documents shall be accomplished by the submittal of a completed Deviation Request Form and a Contractor's Change Order Proposal. Unless otherwise specified in the Engineer's approval of a Deviation Request, and formalized by an executed Change Order, any and all increased costs or delays resulting directly or indirectly from the deviation shall be borne solely by the Contractor.

The Contractor's Change Order Proposal shall be in sufficient detail to permit an analysis of all materials, labor, equipment, subcontracts, insurance, bonds, overhead costs and profit and shall cover all Work involved to accomplish the modification whether deleted, added or changed. Any amount claimed for subcontracts shall be supported by a similar price breakdown. The Contractor agrees that it will incorporate the provisions of this Article into all agreements with lower tier subcontractors.

Any compensation paid in conjunction with the terms of a Change Order shall constitute total compensation due the Contractor for the Work or alteration defined in the Change Order. By signing the Change Order, the Contractor acknowledges that the stipulated compensation includes payment and Contract time adjustments for the Work or alteration plus all payment for the interruption of schedules, extended overhead, delay or any other impact claim or consequential effects created by the Work or alteration defined in the Change Order, and by such signing specifically waives any reservation or claim for additional compensation in respect to the subject of the Change Order.

If the Contractor's Change Order Proposal includes a request for a time extension, a justification thereof shall also be furnished. The Change Order Proposal together with the price breakdown and time extension justification shall be furnished by such date as may be specified by the Engineer.

The Engineer may, subject to the written approval of the Purchasing Officer, execute a Unilateral Change Order within the limitations set forth in AMC 7.15.080 if:

1. the Engineer determines that adjustment in compensation or time is due either the Contractor or the Owner;
2. negotiations fail to reach mutual agreement on the magnitude of adjustment; and
3. the revised Work is such that, in the opinion of the Engineer, it could not be reasonably conducted at a time or in a manner that would permit determining its value on a Time and Material basis under Section 10.07, Article 7.4, SubArticle F – Time and Material Changes.

A Unilateral Change Order shall have the same force and effect as a mutually executed Change Order, except that the Contractor shall not have waived their rights to pursue additional compensation as a separate claim. A Unilateral Change Order shall incorporate such Contract adjustment as the Engineer may determine, which may not necessarily be the last offer made during negotiations. The incorporation of the Work by Unilateral Change Order shall in no way diminish the Contractor's responsibility to

complete the revised Work in an efficient, timely manner as otherwise required by the Contract Documents.

#### **Article 5.21 Claims for Additional Compensation**

Except where restricted in the Contract Documents, the Contractor may make a claim for additional compensation when they believe that they have incurred additional costs due to the acts, errors, or omissions of the Owner or by reason of changed conditions. If the Contractor becomes aware of any act or occurrence which may form the basis of a claim, the Contractor shall make every effort to mitigate the extent of any amounts claimed for additional compensation and shall immediately notify the Engineer in writing of the potential for the claim, providing sufficient information to outline the basis of the claim. If the matter is not resolved within seven (7) days, the Contractor shall, within the next fourteen (14) days, submit written notice of the facts which may form the basis of the claim.

Thereafter, the Contractor shall submit the claim in writing to the Engineer within sixty (60) days of the submission of the written notice of the facts unless the Engineer agrees in writing to an extension of time for good cause shown. The Engineer may grant up to a sixty (60) day extension only upon the written request of the Contractor in which all reasons for the request are stated. The Contractor agrees that unless these written notices are provided, the Contractor shall have no entitlement to compensation for the acts, errors, or omissions of the Owner, the Engineer or any other Contractor employed by the Owner. The Contractor shall in all cases continue performance of the Contract.

The written claim presented by the Contractor shall be complete and shall specifically include the following:

1. the facts and circumstances surrounding the claim and the Contract provisions under which the claim is made;
2. the Contractor's assertion as to the original requirements of the Contract Documents and the basis for that assertion or position, citing all pertinent Specifications, Details, Drawing notes or other Contract provisions;
3. a clear certification that the Contractor's Bid Costs were in fact based on the stated original interpretation;
4. the Contractor's assertion as to the revised requirements of the Contract Documents, citing all pertinent Contract provisions, or lack thereof, and other records on which that assertion or position is based;
5. a narrative description of the increase in the Scope-of-Work resulting from the revision in the requirements;
6. the Pay Items and quantities affected by the alleged change;
7. references to previous notices of pending claim; and
8. the specific relief requested, including both time extension and additional cost compensation and the basis on which both were calculated.

In the case of cost compensation, such basis for specific relief shall include (1) the labor classifications, rates and additional time; (2) the equipment descriptions, rates and additional time; (3) material descriptions, unit prices and quantities; and (4) appropriate

supporting documentation as to materials, unit prices, labor rates and equipment rates. The permitted rates and allowances shall be as provided under Article 5.20 – Changes in the Work.

Claims presented that do not include the above information or otherwise considered to be incomplete will be returned to the Contractor without review by the Engineer. Within sixty (60) days after receipt of the Contractor's properly submitted and complete claim, the Engineer shall render a Final Determination as to the merit of the claim and, if any are justified, the amount of additional compensation and time due. Any change in the Contract sum or allowable time resulting from such claim shall be authorized only by the execution of a proper Change Order.

#### **Article 5.22 Time for Completion of Work**

The Owner shall indicate in the Special Provisions either a time period for completion of the Work or a completion date. Time is of the essence in the Contract. Therefore, the Work to be performed under the Contract shall be completed in its entirety within the time period specified or before the completion date.

The Contractor shall furnish such manpower, materials, facilities, and equipment and shall work the required hours, including authorized night shifts, overtime operations, and Saturdays, Sundays, and holidays as may be necessary to insure the completion of the Work within the time specified.

Failure of the Contractor to comply with the requirements of this Article may be considered grounds for termination under the provisions of Article 5.28 – Termination of Contractor by Owner.

#### **Article 5.23 Delays and Extension of Time**

If the Contractor is delayed, beyond their control and without fault or negligence on their part, at any time in the progress of the Work by any act or neglect of the Owner or by changes ordered in the Work, or by labor disputes, fire, unusual delay in transportation, adverse weather conditions not reasonably anticipated, unavailability of materials for which orders were placed timely, or by unavoidable casualties, then the time period for completion or the completion date may be extended by Change Order, for such reasonable time as the Engineer may determine, without invalidating any of the provisions of the Contract and without the consent of the Surety.

Any claim for extension of time shall be made in accordance with the procedures set forth in Article 5.21 – Claims for Additional Compensation. In the case of a continuing delay, only one claim is necessary. The Contractor shall provide an estimate of the probable impact of such delay on the progress of the Work.

No extension of time or changes to bid unit prices shall be granted due to the Contractor's failure to properly plan for and deliver bid items that require a long lead-time. The timely delivery of schedule-critical items is crucial and the Contractor shall include in their bid unit price the cost (if any) of expedited delivery to assure that construction can be completed within the time of completion specified in the Contract.

## **Article 5.24 Suspension of Work**

By executing a Contract, the Contractor agrees that the Owner has the undisputed right to suspend the Work and that this right is a material condition of the Contract. The Contractor shall immediately suspend the Work as directed in a written order from the Engineer or Owner. Failure of the Contractor to immediately suspend the Work as directed shall constitute a material and immediate breach of the Contract by the Contractor. The Owner may terminate the Contract for default without providing the ten (10) day notice specified in Article 5.28 – Termination of Contract by Owner, should the Contractor fail, refuse or otherwise not immediately suspend the Work as directed.

The Work may be suspended in whole or in part by a written order of the Engineer for the convenience of the Owner. The Contractor shall take every precaution to prevent any damage or unreasonable deterioration of the Work during the time it is suspended. Suspension of the Work by the Engineer for the convenience of the Owner may furnish grounds for a claim by the Contractor for additional compensation and/or a time extension, in which case the Contractor, when making a claim, shall comply with the provisions of Article 5.21 – Claims for Additional Compensation.

Upon the failure of the Contractor to carry out the orders of the Engineer or to perform in accordance with the Contract Documents, the Engineer may suspend the Work for such period as may be necessary. Time lost by reason of such suspension, or replacement of improper Work or material, shall not furnish any grounds to the Contractor for claiming additional compensation and/or an extension of time and shall not release the Contractor from any liability for damages or for failure to complete the Work within the time prescribed.

In the event that a suspension of Work is ordered in writing by the Engineer due to adverse weather or unforeseen conditions, and, in the opinion of the Engineer, the Contractor has prosecuted the Work with due diligence prior to the time of suspension, the Contractor may be due an extension of time, but not additional compensation.

Where the Contract provides for a time period for completion and the Work is suspended for the convenience of the Owner or adverse weather or unforeseen conditions and the Contractor has prosecuted the Work with due diligence, the time period and liquidated damages provision of the Contract shall be suspended until a Notice to Resume Work is issued by the Engineer.

Where the Work is suspended for adverse winter weather conditions, Contractor is not entitled to additional compensation. However, there may be cases where tasks need to be constructed during winter weather conditions, therefore any additional costs due to working in winter weather conditions may need to be negotiated.

## **Article 5.25 Final Trimming of Work**

The Contractor shall be responsible for all repair to the Work as necessary to overcome deterioration or damage that may occur prior to Final Inspection. The Contractor at all times shall keep the premises free from accumulation of waste materials, rubbish and debris. The Contractor shall grade all existing driveways on, and which have been affected by the project within the rights-of-way or easements as directed by the Engineer. At the completion of the Work, all waste materials, rubbish, debris and temporary structures from and about the Project as well as all their tools, construction

equipment, machinery and surplus materials shall have been removed from the Project area. The Work shall be in a neatly trimmed and well-finished condition throughout at the time of Final Inspection. This Work shall be considered incidental to the Contract unless there is a specific Contract item for this Work.

Any time during the Work that cleanup, in the opinion of the Engineer, is not keeping pace with the rest of the Work, the Contractor shall, at the direction of the Engineer, suspend all operations on the major items of Work until the premises are cleaned up to the satisfaction of the Owner. Any additional expense involved shall be the sole responsibility of the Contractor and the Owner shall not be held liable for this additional expense.

All contours, roadway surfaces, drainage courses, street name signs, traffic control signs, mailboxes, newspaper boxes, property corner markers, survey markers, survey monuments, utility markers, existing vegetation, shrubbery, lawns, trees, fences, rockeries, landscaping, sidewalks, driveways, and other improvements, removed to facilitate or damaged by the Contractor's operations shall be fully restored to original condition at their original location by the Contractor unless otherwise required by the Contract Documents or directed by the Engineer. Items damaged by the Contractor during removal, storage, or restoration shall be repaired or replaced in kind by the Contractor. Repairing or replacing damaged items shall be considered incidental to the Contract and no separate payment shall be made.

#### **Article 5.26 Final Inspection**

When the Contractor, through their own comprehensive inspection, has concluded that all Work is completed, all code compliance inspections have been performed, and all other Contract requirements have been fulfilled; they shall provide a current copy of the red-line drawings, notify the Engineer in writing of completion, and request a pre-final inspection of the Project.

The pre-final inspection shall be performed when requested by the Contractor and ordered by the Owner. The Contractor shall make available copies of all required code compliance inspection reports. Inspections will be performed by the appropriate agencies within the schedule set by the Engineer. The Contractor shall temporarily remove any stormwater BMPs that impede inspection of storm drain structures 24 hours prior to the scheduled MOA Street Maintenance inspection time. If weather conditions prevent the temporary removal of stormwater BMPs at the scheduled inspection time the inspection shall be re-scheduled. All deficiencies indicated by the various pre-final inspections shall be compiled by the Engineer and written comments will be compiled and furnished to the Contractor together for remedial action. Follow-up conversations and/or meetings for clarification will be organized if needed. When all listed deficiencies have been corrected, the Contractor shall provide the final inspection submittals listed below, notify the Engineer, and a Final Inspection will be performed.

The following submittals are required before a Pre-final inspection may be scheduled:

1. Documentation of LED fixture purchase date;
2. O&M Manuals as appropriate;
3. Completion of equipment startup and training as appropriate.

Any partial comments and inspection lists routed to the Contractor before the final list compiled by the Engineer are routed as a courtesy to the Contractor, and shall be considered preliminary and not all inclusive. Changes and additions to the list may occur.

When the Final Inspection reveals uncorrected listed deficiencies, the above outlined procedure shall be repeated and the cost of reinspection shall be deducted from any money due the Contractor. This cost shall include, but is not limited to, salaries, administrative, and transportation costs.

The Final Acceptance Date shall be the date upon which the Final Inspection has been accepted and the Engineer has received and approved, as applicable, the following submittals:

1. Red-lined or Record Drawings;
2. Survey Field Books;
3. Video as appropriate; and
4. Other contractually required documents as noted in the Contract; and

The Engineer shall provide the Contractor a letter specifying the Final Acceptance Date, pertinent warranty information, and applicable information about the landscaping Plant Establishment Period.

#### **Article 5.27 Liquidated Damages**

The Owner may withhold from any progress payment the sum per day identified in the Special Provisions as Liquidated Damages for each and every calendar day that the Substantial Completion Date is delayed beyond the Contract Completion Date. The Owner may withhold out of any progress payment the sum per day identified in the Special Provisions as Liquidated Damages for each and every calendar day that the Final Acceptance Date is delayed beyond the Contract Completion Date. If no money is due Contractor, the Owner shall have the right to recover said sums from Contractor, the Surety, or both.

The Contractor acknowledges that the daily amount of the Liquidated Damages provision is not a penalty, but rather is a reimbursement for damages that the Owner will sustain by reason of delayed completion. The Contractor further acknowledges that the daily amount of Liquidated Damages is a reasonable alternative to the complex calculations that would otherwise be necessary to determine such damages.

Permitting the Contractor to continue and finish the Work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, shall in no way operate as a waiver on the part of the Owner of any of its rights, including liquidated damages, under the Contract.

#### **Article 5.28 Termination of Contract by Owner**

If the Contractor should be adjudged bankrupt, or if they should make a general assignment for the benefit of their creditors, or if a receiver should be appointed on account of their insolvency, or if they should persistently or repeatedly refuse or fail to



supply enough properly skilled workmen or proper materials for the efficient prosecution of the Work, or persistently disregard laws, ordinances, or the instructions of the Engineer, or otherwise substantially violate any provisions of the Contract, the Owner may, without prejudice to any other right or remedy and after giving the Contractor and their Surety ten (10) days concurrent written notice, terminate the Contract and take possession of the premises and of all materials, tools and appliances thereon. Notwithstanding the foregoing, the Owner may immediately terminate the Contract for default without providing a ten (10) day notice if the Contractor fails, refuses or otherwise does not comply with a written order by the Engineer that may involve issues of safety or a Suspension of Work issued under Article 5.24 – Suspension of Work. When the Contractor and Surety are notified of the termination of the Contract, the Owner may demand that the Surety fulfill its obligations under the Performance and Payment Bond. Should the Surety fail to perform its obligations under the Bond after demand of the Owner, the Owner may finish the Work by whatever method that the Owner determines expedient. The Contractor and their Surety shall be responsible for compensating the Owner for all excess costs, including applicable liquidated damages and all reprourement costs, incurred in accomplishment of the Work.

In the event the Owner terminates the Contract, the Owner does not waive any other right or remedy under the Contract or any other right or remedy available at law or equity. The Contractor may not be allowed to bid on any Owner's contracts for a period of two years following the date of this termination by the Owner.

In the case of termination before completion for any cause whatsoever, the Contractor, if notified to do so by the Owner, shall promptly remove equipment and supplies from the premises of the Owner. Failure to do so shall authorize the Owner to remove such equipment and supplies from the premises at the expense of the Contractor.

#### **Article 5.29 Termination of Work for Owners Convenience**

At any time during the term of the Contract, the Owner may terminate the Work, in whole or in part, for any reason that the Engineer shall determine to be in the best interest of the Owner. Any such termination shall be accomplished by delivery of a Notice of Termination to the Contractor, specifying (1) that the termination is for the convenience of the Owner; (2) the extent to which performance of the Work under the Contract is terminated; and (3) the date upon which such termination becomes effective.

Except as otherwise directed by the Owner, after receipt of a Notice of Termination, the Contractor shall:

1. Stop Work under the Contract on the date and to the extent specified in the Notice of Termination;
2. Place no further orders or subcontracts for materials, services, or facilities except as may be necessary for completion of such portion of the Work under the Contract as is not terminated;
3. Terminate all orders and subcontracts to the extent that they relate to the performance of Work terminated by the Notice of Termination;

4. Settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, the cost of which would be reimbursable, in whole, or in part, in accordance with the provisions of the Contract;
5. Submit to the Engineer a list, certified as to quantity and quality, of any or all items of termination inventory exclusive of items the disposition of which had been directed or authorized by the Engineer;
6. Transfer to the Engineer the completed or partially completed plans, drawings, information, and other property which, if the Contract had been completed, would be required to be furnished to the Owner;
7. Take such action as may be necessary, or as the Engineer may direct, for the protection and preservation of the property related to the Contract which is in the possession of the Contractor and in which the Owner has or may acquire any interest.

The Contractor shall proceed immediately with the performance of the above obligations notwithstanding any delay in determining or adjusting the amount of any item of reimbursable cost under this clause.

When the Owner orders Termination of Work effective on a certain date, all completed units of Work within each pay item as of that date shall be paid for at the Contract unit bid price. Payment for materials included in the material inventory described in #5 above shall be paid at actual cost delivered to the project or storage site, including transportation charges. Allowable total markup on the actual cost shall not exceed fifteen percent (15%).

After receipt of a Notice of Termination, the Contractor shall submit to the Engineer their claim for alleged additional damages or costs not covered above or elsewhere in these Specifications as provided in Article 5.21 - Claims for Additional Compensation. In no event, however, shall loss of anticipated profits be considered as part of any claim and/or settlement.

### **Article 5.30 Use of Completed or Uncompleted Portions**

The Owner shall have the right to take possession of and use any completed or partially completed portions of the Work, prior to the date specified for completion, and such action and use shall not be considered an acceptance of that Work. If such use by the Owner causes additional expense to the Contractor and/or delay in the Work, the Contractor may be entitled to additional compensation and/or an extension of time. Claims for additional compensation or a time extension shall follow the procedures set forth in Article 5.21 - Claims for Additional Compensation. The Owner shall be responsible for accomplishing routine maintenance operations during this use and for any damage caused to the Work by those operations.

### **Article 5.31 Winter Suspension**

Unless otherwise specified in the Special Provisions, the Engineer may suspend the Work when adverse winter weather conditions make it impractical to secure the desired results. Where the Work is suspended for adverse winter weather conditions, the Contractor shall not be entitled to additional compensation.

Winter Suspensions generally occur on October 15 of each construction season. Although this date may vary from year to year, the Contractor should plan their Work in anticipation of a Winter Suspension occurring at or about this time each year. The Contractor shall schedule and sequence all operations such that the condition of the Work meets Suitable Conditions for Winter Maintenance, as described in this Article under SubArticle C below, to provide for routine maintenance by the Owner during the Winter Suspension period.

If the Work area is judged by the Owner to not meet Suitable Conditions to provide for routine maintenance during the Winter Suspension period, the Contractor shall be responsible for all costs necessary to establish Suitable Conditions for Winter Maintenance, including costs incurred by the Owner to prepare the site to meet Suitable Conditions and/or the payment of Excess Maintenance Costs as described in SubArticle B below.

A. Coordination with the Owner

The Contractor shall meet with the Engineer no later than September 15th to outline the Work to be completed before Winter Suspension. At the meeting, the Contractor shall provide a written Winter Suspension Plan describing the Work to be completed prior to the Winter Suspension period, including an updated progress schedule, clear definitions of the Work underway and the proposed condition of each element of the Work at the time of the anticipated Winter Suspension. The Winter Suspension Plan shall be prepared to achieve Suitable Conditions for Winter Maintenance, as described in SubArticle C below.

Before Winter Suspension, the Contractor shall, at their own expense, do all Work necessary to establish Suitable Conditions for Winter Maintenance in accordance with the Contractor's Winter Suspension Plan. The Contractor shall then schedule a field review for acceptance by the Engineer. Within two (2) days following the field review, the Engineer shall prepare a punch list of deficiencies the Contractor is required to correct prior to acceptance of Suitable Conditions for Winter Maintenance. The Contractor shall correct all items on the punch list to the satisfaction of the Engineer by the date shown on the punch list. During this period, the Contractor may continue to perform Work, as long as it is performed in such a manner that it does not compromise the Contractor's ability to achieve Suitable Conditions for Winter Maintenance.

If the Contractor meets all the coordination requirements described herein, the Engineer shall issue a Notice of Acceptance for Winter Maintenance by the Owner. If the Contractor fails to satisfy all the coordination requirements described herein, the Owner may impose any and all Remedies for Failure to Comply, as described in SubArticle B below.

If unusual weather, scheduling constraints, or other unforeseen conditions make it difficult to initiate or continue the Work in distinct areas within the project limits, the Contractor may be entitled to a time extension to the Contract Completion Date if:

1. The Contractor notifies the Owner, prior to September 15, of the issues affecting the Contractor's ability to perform the Work; or

2. The Contractor establishes that initiating or continuing the Work will result in conditions not suitable for winter maintenance by the Owner; or
3. The Contractor specifically identifies those distinct areas where the Work cannot be continued or initiated because it will result in conditions not suitable for winter maintenance by the Owner.

If the Owner agrees that a time extension to the Contract Completion Date is warranted, the Owner shall issue a Change Order acknowledging the revised Contract Completion Date. However, the Contractor shall not be entitled to additional compensation as a result of the issuance of such a time extension.

B. Remedies for Failure to Comply

The Engineer may apply any, some, or all of the remedies identified in this SubArticle if (1) the Contractor has not presented a written Winter Suspension Plan prior to September 20th; (2) at any time, in the opinion of the Engineer, the Contractor does not appear to be preparing the Work for Winter Suspension in a reasonable manner; (3) the Contractor fails to correct punch list items for Winter Suspension; or (4) for any reason the Work is found to be unsuitable for maintenance by the Owner during the Winter Suspension period.

Remedies the Engineer may utilize include the following:

1. Direct the Contractor to complete the Work required to meet Suitable Conditions for Winter Maintenance at the Contractor's expense.
2. Using the forces of the Owner or a separate contractor, complete the Work required to meet Suitable Conditions for Winter Maintenance. Costs incurred by the Owner due to the Contractor's failure to obtain a Notice of Acceptance for Winter Maintenance from the Owner shall be borne by the Contractor, including but not necessarily limited to Work required of the Owner's forces, the cost of separate contractors retained by the Owner, and/or any claims made against the Owner by the abutting property owners or the public.
3. If the Contractor fails to prepare the Work to meet Suitable Conditions for Winter Maintenance, and the Owner is unable to correct the Contractor's Work to achieve Suitable Conditions for Winter Maintenance, the Excess Maintenance Costs incurred by the Owner above and beyond those costs reasonably necessary to maintain the road had it been prepared to meet Suitable Conditions for Winter Maintenance shall be borne by the Contractor. Excess Maintenance Costs shall be determined by the Owner and submitted to the Contractor at the end of the winter maintenance period.

If the Engineer determines it is in the best interest of the Owner, the abutting property owners, or the public, they may also apply any of these remedies to specific elements or distinct areas of the Work while applying other remedies to other elements or distinct areas of the Work. If, in the opinion of the Engineer, it is in the best interest of the Municipality to delete portions of the Suitable Conditions for Winter Maintenance, the Engineer may issue written notice to the Contractor.

C. Suitable Conditions for Winter Maintenance

Suitable Conditions for Winter Maintenance shall be determined by the Engineer and shall include the following:

1. Travel ways that are to be paved in their final condition as a part of the Contract shall be paved as follows:
  - a. Final pavement as shown on the Drawings, or
  - b. The bottom layer of pavement shown on the Drawings; placed according to the Contract Documents at the design thickness of the layer. (In the event the layer is less than one and one-half inches (1.5") thick, the Engineer may require the thickness be increased.); or
  - c. Temporary AC Pavement (Class E), typically twenty-four feet (24') wide, two inches (2") in thickness, along the project centerline in those areas designated by the Engineer. If Temporary AC Pavement is designated by the Engineer, the Contractor shall be paid for the installation by Change Order at fifty percent (50%) of the Contract unit rate for AC Pavement.
2. Drainage ways that are to be paved with curb and gutter, valley gutter, paved shoulders or paved swales in their final condition as a part of the Contract shall be paved as follows:
  - a. Final curb & gutter, valley gutter or pavement as shown on the Drawings; or
  - b. Temporary AC Pavement (Class E), two inches (2") in thickness, in those areas designated by the Engineer. If Temporary AC Pavement is designated by the Engineer, the Contractor shall be paid for the installation by change order at fifty percent (50%) of the Contract unit rate for AC Pavement.

For temporary drainage facilities to be deemed suitable, all collection points included in the project design shall be functional. Where Best Management Practices are in place for Erosion and Sediment Control, those features shall be made suitable for the winter to the satisfaction of the Engineer.

3. All obstacles to snow clearing, snow storage, and snow loading and hauling shall be removed or diminished to the satisfaction of the Engineer. The space required for snow clearing, storage, loading and hauling shall be as determined by the Engineer.
4. Illumination, traffic signals, and signage shall be in proper working order.
5. All existing roads affected by the Work shall be returned to full operation.
6. Contractor shall install a minimum of six inches (6") of cover for all utilities below the surface of the travel way during the Winter Suspension period. If subsequent adjustments to the utilities become necessary when the travel ways are completed at a later date, the cost of these subsequent adjustments shall be considered incidental to the Contract.

7. Temporary or permanent backfill must be installed behind all curbs and medians to eliminate tripping hazards during the Winter Suspension period.
8. Contractor shall install temporary flexible delineators at the end of culverts, end of retaining walls, field inlets, and other locations as determined by the Engineer.

Installation of Temporary AC Pavement shall not be a basis for any time extension or additional costs, other than the actual cost to install the Temporary AC Pavement as described above.

**D. Owner and Contractor Responsibilities During the Winter Maintenance Period**

The Owner shall perform the routine winter maintenance operations specified below during the Winter Suspension Period. Routine winter maintenance shall include and is limited to the following:

1. Maintaining the traveled way and/or detour surface.
2. Maintaining drainage facilities except final cleaning of storm drains.
3. Maintaining access to abutting properties.

The Contractor shall remain responsible for all other elements of the Work, including those described by Section 10.04, Article 4.15 – Temporary Erosion Control and Storm Water Pollution Prevention Plans for Construction, throughout the Winter Suspension period.

During the Winter Suspension period, the Contractor shall continue to be responsible for the protection of the Work and shall repair all damage at the Contractor's expense except where the damage is caused by the Owner's maintenance forces. When the Work is resumed, the Contractor agrees to accept the traveled way and drainage system as the Owner has maintained it and no claim shall be made because of its condition or the manner in which the Owner performed the maintenance.

**Article 5.32 Pre-Construction Conference**

Prior to the start of Work and within five (5) working days after delivery of the executed Contract by the Owner to the Contractor, the Owner shall hold a Pre-Construction Conference to (1) review the Contractor's schedules and Drawings; (2) establish procedures for handling shop drawings and other submissions; (3) establish procedures for submitting and processing applications for payment; and (4) address any other general housekeeping issues as necessary. Contractor and their Superintendent and Subcontractors shall attend the conference to meet with the Owner or their Representative, Engineer, and Inspector.

**Article 5.33 Use of Explosives**

Unless specifically authorized in the Special Provisions, the use of explosives is prohibited.

## **SECTION 10.06 LEGAL RELATIONS AND RESPONSIBILITIES**

### **Article 6.1 Laws to be Observed**

The Contract shall be governed by the laws of the State of Alaska. The Contractor at all times shall observe and comply with all Federal, State and local laws, ordinances, and regulations in any manner affecting the conduct of the Work and all such orders or decrees existing or which may be enacted or promulgated by legislative bodies, boards, tribunals or Courts having any jurisdiction or authority over the Work. The Contractor shall defend, indemnify, and hold harmless the Municipality and the officers, employees, and agents of the Owner, including the Engineer, against any claim or liability arising from or based on the violation of any such laws, ordinances, regulations, orders, or decrees, whether such violations be by the Contractor, their Subcontractor(s), or their employees.

### **Article 6.2 Notice to Contractors**

Any written notice to the Contractor by the Owner shall be served on said Contractor or their representative either personally or by mailing to the address given in the Contract. Owner shall not use electronic copy transmissions to serve notice to Contractor.

### **Article 6.3 Notice by Contractors**

Any notice to the Owner by the Contractor shall be made in writing delivered to the Engineer or their representative in person or mailed to the office of the Engineer at the address given in the official Notice to Proceed. Contractor shall not use electronic copy transmissions to serve notice to the Owner.

### **Article 6.4 Successors and Assigns**

The Contractor binds himself, their partners, successors, assigns, and legal representatives to the Owner with respect to all covenants, conditions, and obligations contained in the Contract Documents.

### **Article 6.5 Assignments**

The Contractor shall not assign the whole or any part of the Contract or any monies due or to become due the Contractor without written consent of the Owner. If the Contractor assigns all or any part of any monies due or to become due him, the instrument of assignment shall state that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject to prior claims of all persons, firms, and corporations who performed Work or supplied materials under the Contract.

### **Article 6.6 Permits**

All permits or licenses which are required by any federal, state or local governmental agency or any public utility and not provided by Owner shall be obtained and paid for by the Contractor when such permits or licenses are necessary for the prosecution of the Work. The Contractor shall be responsible for all stipulations of these permits and shall be responsible for all costs associated with these permits and their stipulations.

The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as specified herein. The Contractor shall also be responsible for requesting all code compliance inspections.

The Owner shall obtain the required permits and authorizations for Work within the State of Alaska Railroad rights-of-way and permits from the U.S. Corps of Engineers, U.S. Fish and Wildlife Service, and State Department of Fish and Game. Prior to the start of Work within the scope of such permits, the Contractor shall obtain the necessary approvals and permits relating to the method, plan and exact schedule of construction for any Work within such rights-of-way, creeks and wetlands.

Failure on the part of the Contractor to comply with any of the stipulations of any of the applicable Owner- or Contractor-acquired permits shall be sufficient cause for the Owner to suspend that Work. Suspension of Work based on the forgoing shall not be subject to Section 10.05, Articles 5.21 – Claims for Additional Compensation or 5.24 – Suspension of Work for a basis of a claim by the Contractor.

The payment of basic and special fees, established under AMC 24.30.100, Permit Fees For Permanent Uses of Public Places (street use ordinance), and which are applicable to the project, shall not be the responsibility of the Contractor. These fees shall not be considered a bid item, nor shall they be considered incidental to any bid item.

The Contractor shall obtain permits and fulfill all other requirements of M.A.S.S., the Municipal Code, the Building Official, and the Municipal Engineer.

The Contractor shall obtain and pay for all permits, deposits and connection fees for tapping any required water and/or wastewater service connection for new and disrupted service connections.

Where sanitary sewer is available, the Contractor may apply for a dewatering permit from AWWU for dewatering discharge to the sanitary sewer. Contractor shall comply with Division 20, Section 20.12 – Dewatering for dewatering activities.

#### **Article 6.7 Copyrights and Patents**

The Contractor shall defend, indemnify and hold harmless the Municipality, its officers, employees, and agents of the Owner, including the Engineer from any and all claims, suits, or actions brought for the infringement of any copyright or patent claimed to be infringed by any material, devices, drawings, method, or process to be incorporated in the Work and/or required to be used in connection with the Work, including all attorney's fees and costs.

#### **Article 6.8 Safety**

The Contractor shall be solely and completely responsible for conditions of the jobsite, including safety of all persons (including employees, Owner's representatives, and the public) and property during performance of the Work. This requirement shall apply continuously twenty-four (24) hours per day, seven (7) days per week and shall not be limited to normal working hours. Safety provisions shall conform to U.S. Department of Labor (OSHA), the State Occupational Safety and Health Act, and all other applicable Federal, State, County, and local laws, ordinances, codes, the requirements set forth below, and any regulations that may be detailed in other parts of the Contract Documents. Where any of the aforementioned safety provisions, laws, ordinances, and/or Contract Document requirements is in conflict, the more stringent requirement shall be followed. The Contractor's failure to thoroughly familiarize themselves with the



aforementioned safety provisions shall not relieve them from compliance with the obligations and penalties set forth herein.

The Contractor shall develop and maintain for the duration of the Contract, a safety program that will effectively incorporate and implement all required safety provisions. The Contractor shall appoint an employee who is qualified and authorized to supervise and enforce compliance with the safety program and shall notify the Engineer of the name and contact phone number for this person prior to commencement of the Work.

The duty of the Engineer to conduct construction review of the Work does not include review and/or approval of the adequacy of the Contractor's safety supervisor, the safety program, or any safety measures taken in, on, or near the construction site.

In case of an emergency that threatens loss and/or injury of property and/or safety of life, the Contractor shall act, without previous instructions from the Engineer, as the situation may warrant. The Contractor shall notify the Engineer thereof immediately thereafter. Any claim for compensation by the Contractor, together with substantiating documents in regard to expense, shall be submitted to the Owner through the Engineer. The amount of compensation shall be determined by agreement.

The Contractor shall supply the Engineer, prior to commencement of Work, with an emergency telephone number through which a responsible Contractor's representative can be contacted on a twenty-four (24) hour a day basis.

If death or serious injuries or serious damages are caused, the accident shall be reported immediately by the Contractor via telephone or in person to both the Engineer and the Owner. In addition, the Contractor must promptly report in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the Work whether on, or adjacent to, the site, giving full details and statements of witnesses.

If a claim is made by anyone against the Contractor, including their employees and agents, or any Subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Engineer, giving full details of the claim.

Failure to comply with the Occupational Safety and Health rules and regulations, notwithstanding any other provision of the Contract, is sufficient cause for termination under the provisions of the Contract.

## **Article 6.9 Insurance**

As a prerequisite to execution of the Contract, the Contractor shall obtain all insurance required by the MOA as stated in the bid documents. The Contractor shall maintain this insurance until the Final Acceptance Date. The Contractor shall file with the Purchasing Officer as verification of insurance a certificate of insurance on the forms furnished or otherwise approved form, showing the type and amounts of insurance, the policy number, and expiration date. The certificate must be signed by an authorized representative of the insurance company. Each certificate of insurance shall state that the insurance company will provide written notice in accordance with policy requirements to the Engineer and the Risk Manager of the Municipality of any material change, cancellation, or non-renewal of the insurance policies. All General Liability and Automobile Liability insurance policies required under this Article shall name the

Municipality as an additional insured for the purposes of this Project and shall contain a waiver of subrogation against the Municipality.

#### **NOTICE TO "OUT OF STATE" CONTRACTORS**

A Certificate of Insurance for Alaska Worker's Compensation, or an "other states" endorsement on Contractor's home state Worker's Compensation policy, is required prior to execution of a Contract or commencement of any Contract performance, if any in-state visits or Work is required or anticipated.

#### **Article 6.10 Indemnification**

To the fullest extent permitted by law, the Contractor shall indemnify, defend, and hold harmless the Municipality and the Engineer and their agents and employees from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense is (1) attributable to bodily injury, sickness, disease, death or personal injury, or to injury to or destruction of tangible property including the loss of use resulting therefrom, and (2) caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

In any and all claims against the Municipality or the Engineer or their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation under this Article shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Worker's Compensation acts, disability benefit acts, or other employee benefit acts.

#### **Article 6.11 Claims by Workmen, Suppliers, and Subcontractors**

In the event the Contractor or any Subcontractor fails, neglects, or refuses to make prompt and full payment for labor, services, materials, supplies, or provisions furnished by any person in connection with the Work, the Owner may withhold the amount due from the Contractor's progress payments provided that an affidavit of claim on the form furnished is filed with the Engineer. The withholding by the Owner does not relieve the Contractor or their Surety from their obligations with respect to the payment of such claims. Sums withheld from progress payments shall be disbursed pursuant to Section 10.07 Article 7.6 - Payment of Claimants.

#### **Article 6.12 Certified Payroll**

The Contractor shall file with the Alaska Department of Labor, Wage and Hour Administration, Labor Standards and Safety Division, a certified payroll, as required and at such frequency as required by the State of Alaska.

#### **Article 6.13 Lawsuits**

If a lawsuit is filed by the Contractor or their Surety against the Municipality or by the Municipality against the Contractor or their Surety, the suit shall be commenced in the Third Judicial District in Anchorage, Alaska.

If one of the questions at issue is the satisfactory performance of the Work by the Contractor, and should the appropriate Court decide that the Work of the Contractor was unsatisfactory, then the Contractor or their Surety shall reimburse the Owner for all legal and all other expenses incurred by the Owner because of the lawsuit as may be allowed and set by the Court. Further, it is agreed that the Owner may deduct such costs from any sum or sums then due or that may become due the Contractor under the Contract.

If any clause or condition of the Contract is held as a matter of law to be unenforceable or unconscionable, the remainder of the Contract shall be enforceable without such clause.

#### **Article 6.14 Preference to Local Labor**

Where applicable, the Contractor shall comply with the provisions of AS 36.10 requiring employment preference for Alaska residents.

#### **Article 6.15 State of Alaska Prevailing Wage Scale**

Where applicable, the Contractor shall comply with AS 36.5 for the payment of prevailing wages to their employees.

If the Contract contains State of Alaska wage rates and a Federal Wage Decision, the Contractor and all Subcontractors shall comply with both wage decisions. The Contractor and all Subcontractors shall be responsible for paying the higher pay rate between the state and federal wage decisions. Additionally, the Contractor and all Subcontractors shall be responsible for providing certified payrolls to both the Engineer and the State of Alaska, Department of Labor, Wage and Hour Division on a weekly basis utilizing the appropriate agency's form(s).

#### **Article 6.16 Nondiscrimination**

The Contractor shall not discriminate against any employee or applicant for employment on any basis prohibited by law. The Contractor shall take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to any attribute protected by law. Such action shall include, without limitation, employment, upgrading, demotion or transfer, recruitment or recruiting advertising, lay-off or termination, rates of pay or other forms of compensation, and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth their rights with regard to employment discrimination.

The Contractor shall state, in all solicitations or advertisements for employees for the Work, that all qualified applicants will receive consideration for employment without regard to any attribute protected by law.

The Contractor shall comply with any and all reporting requirements which the Anchorage Office of Equal Employment Opportunity Contract Compliance may establish by regulation.

The Contractor shall include the provisions of this Article in every subcontract or purchase order under the Contract, so as to be binding upon every such Subcontractor or vendor of the Contractor under the Contract.

### **Article 6.17 Rights and Remedies**

The duties and obligations of the Contractor imposed by the Contract Documents and the rights and remedies of the Owner available thereunder shall be in addition to and not a limitation of any duties, obligations, rights, and remedies otherwise imposed or available by law.

The failure of the Owner or the Engineer to insist in any one or more instances upon the strict performance of any one or more of the provisions of the Contract, or to exercise any right herein contained or provided by law, shall not be construed as a waiver or relinquishment of the performance of such provision or right(s) or of the right to subsequently demand such strict performance or exercise such right(s), and the rights shall continue unchanged and remain in full force and effect.

### **Article 6.18 Payment of Taxes**

As a condition of performance of the Contract, the Contractor shall pay all municipal taxes incurred by the Contractor. Satisfactory performance of this paragraph is a condition precedent to payment by the Municipality under the Contract.

## **SECTION 10.07 MEASUREMENT AND PAYMENT**

### **Article 7.1 Method of Measurement**

All Work completed under the Contract shall be measured by the Engineer according to United States standard measures, unless otherwise stated in the Bidding Documents.

When any vehicle delivers to the project classified fill or backfill of any kind, bedding material, leveling course, pavement materials, or any other material measured by weight, the driver of the vehicle shall give to the inspector a legible "original" computer-generated or machine-printed weight ticket with the following information:

1. Vehicle identification number.
2. License number & associated trailer license number(s).
3. Tare weight of the vehicle(s).
4. Gross weight of the loaded vehicle(s) as registered on the scale.
5. Maximum allowable vehicle weight (MAVW) or legal gross weight of the vehicle(s) as permitted by AMC 9.46.090 or AMC 9.46.100.
6. Sequential ticket number, date, time of weight, pay item in words, and project location.
7. Bid Schedule and Number of Item
8. Pit location and name of scale operator.

The Owner shall not be required to pay for that portion of the load in excess of the legal gross weight.

Vehicle(s) shall be tared a minimum of once daily by the scale operator. The Engineer may request additional tares to be done at any time the scale is operational. The Engineer may also require that they be present when tares are done.

If the Contractor is not providing fill materials from a commercially established material source in the Municipality, and if the Contractor currently does not have at the other approved material source a computer-generated or machine printed weight ticket system, the Contractor shall furnish competent scale operators to weigh all materials measured and paid for on a weight basis. The scale operator(s) shall operate the scale(s) and keep records as directed by the Engineer, including the information as listed in the above seven (7) items. In addition, the scale operator shall keep a scale diary on a project by project basis. The scale diary shall be presented to the Engineer, on a daily basis, certifying that entries in the diary are true and correct for the specific project. The Owner shall make no direct payment to the Contractor for furnishing scale operator(s), equipment, and expendables required, the costs thereof being considered an incidental Contractor obligation. The accuracy of all scales, both private and commercial, is the responsibility of the Contractor. The Contractor shall maintain scales according to the specifications, tolerances and regulations for commercial weighing and measuring devices contained in the National Bureau of Standards, Handbook 44, as adopted by AS 45.75.050(d).

If the contract requires the Contractor to provide spare materials, deliver salvaged materials to the owner, etc., the Contractor shall provide proof of delivery which shall include signature and printed name of receiver, delivery date, delivery location, materials delivered, and project name and number.

The Contractor shall verify and agree upon bid item quantities installed or placed with the Engineer at the end of each week and/or at the completion of a Work element.

### **Article 7.2 Scope of Payment**

The Contractor shall accept the compensation as set forth in the Contract Documents in full payment for the Work. The Contractor shall do all things necessary to perform and to complete the Work according to the Contract Documents, including but not limited to furnishing all labor, tools, implements, machinery, supplies, materials, water, heat, utilities, transportation, and permits necessary to perform the Work. The Contractor shall be responsible for all loss, damage, or liability arising from the nature of the Work or from the action of the elements or from any unforeseen difficulties which may be encountered. Work paid for under one item shall not be paid for under another item.

The Contract price shall constitute full compensation for furnishing all plant, labor, equipment and materials, and performing all operations required to complete the Work as specified and as shown on the Drawings or otherwise directed. Notwithstanding the omission or mention of any incident or incidental Work, the Contract price and payment shall also constitute full compensation for all Work incident or incidental to completion of the items, unless such Work is otherwise specifically mentioned for separate payment under another bid item. In the event any Work is required by the Contract Documents, but is not identified as being directly incident or incidental to the completion of any Contract item, the Contract price or prices for all enumerated items shall also constitute full compensation of such Work.

In this Section, the terms "construct, furnish, install, erect, place, and prepare," shall be construed to mean that the bid item(s) is/are complete, in place, and approved by the Engineer.

### **Article 7.3 Advances on Materials**

With the exception of landscaping planting and seeding materials, the Contractor may request advance payment for materials to be incorporated in the Work, provided such materials are delivered and stored at the site, or if approved by the Engineer, at another site within the Municipality. The Contractor shall be solely responsible for protecting, securing and permitting all stockpiled materials for use on the project. Only the Contractor's costs of materials (including freight) as verified by invoices, shall be considered for such advance payments by the Owner.

No payment shall be made on any single class of material valued at less than \$5,000. No advance payment shall be made for fuels, supplies, forms, lumber, falsework, or other materials, or on temporary structures of any kind which will not become an integral part of the finished construction. Retainage shall not be withheld for advance payment for materials to be incorporated in the Work. However, once the materials have been incorporated in the Work and payment is requested the retainage in Article 7.5 - Progress Payments, shall apply.

The Contractor shall make available to the Engineer evidence of payment for the materials for which they are requesting advances, insurance to assure replacement if lost, stolen or damaged, and other information the Engineer may request.

#### **Article 7.4 Change Order Compensation Adjustments**

Each Change Order Proposal shall include a clear summary of the Contract requirements; the reason for the requested change; a description of the change and whether additional time and/or other compensation is requested or credit offered to the Owner. Unless formalized by an executed Change Order, any and all increased costs or delays resulting directly or indirectly from an unapproved Change Order Proposal shall be borne solely by the Contractor.

Any compensation paid in conjunction with the terms of a Change Order shall constitute total compensation due the Contractor for the Work or alteration defined in the Change Order. By signing the Change Order, the Contractor acknowledges that the stipulated compensation includes payment for the Work or alteration plus all payment for the interruption of schedules, extended overhead, delay or any other impact claim or consequential effects and, by such signing, specifically waives any reservation or claim for additional compensation with respect to the subject of the Change Order.

##### **A. Labor**

Labor costs shall include the direct hourly cost of labor stated on the certified payroll for each labor classification plus other direct labor costs including, but not limited to,

FICA, Workers' Compensation, ESC, and public liability and property damage insurance when premiums are based on a percentage of payroll. The labor costs shall include only those direct labor hours required to perform the changed Work for workers and working foremen. Supervision above the level of working foremen (such as general foremen, superintendents, and project managers, etc.) shall not be included in labor costs and shall be considered to be included in the Overhead and Profit.

##### **B. Materials**

Costs for materials and supplies, including freight, shall be based on the net actual cost of the material and supplies required to perform the changed Work, as verified by appropriate vendor and third party invoices. Material costs shall reflect cost reductions available to the Contractor due to trade discounts, volume rebates, and price reductions for prompt payments, if applicable. Material costs shall be itemized to display the unit price for each specific item incorporated into the Work.

##### **C. Equipment**

Time for both owned and rented equipment shall be estimated to the nearest one quarter hour for purposes of computing compensation to the Contractor for

equipment utilized under these rates. The equipment rates for both owned and rented equipment as determined below shall be full compensation for providing the required equipment and no additional compensation shall be made for other costs such as, but not limited to, fuels, lubricants, replacement parts or maintenance. Cost of repairs, both major and minor, as well as charges for mechanic's time utilized in servicing equipment to ready it for use prior to moving to the project and similar charges shall not be allowed.

When it is necessary to obtain equipment from sources beyond the project limits at the request of Owner exclusively for changed Work, the actual cost of transferring the equipment to the site of the Work and return shall be allowed as an additional item of expense. Where the move is made by common carrier, the move-in allowance shall be limited to the amount of the freight bill or invoice. If the Contractor hauls the equipment with their own forces, the allowance shall be limited to the rental rate for the hauling unit plus operator wages. Move-in allowance shall not be made for equipment brought to the project for changed Work which is subsequently retained on the project and utilized for completion of Contract items.

a. Equipment with a new condition purchase value of over \$2,000

For any machinery or special equipment, the Contractor shall include costs for the rental rates in the current edition and appropriate volume of the "Rental Rate BlueBook" (hereinafter referred to as the "Blue Book"), published by EquipmentWatch (<http://equipmentwatch.com/>) or their successors. Hourly rental rates shall be determined as follows:

- i. The established hourly rental rate shall be equal to the monthly rate for the basic equipment plus the monthly rate for applicable attachments as set forth in the "Blue Book", necessary to perform the Work, both divided by 176, all multiplied by the area adjustment factor, plus the estimated hourly operating costs listed in the Blue Book. The area adjustment factor is to be used.
- ii. For Contractor-owned equipment not listed in the "Blue Book", the Contractor shall receive a rental rate as agreed in writing between the parties before the changed Work is begun. If agreement cannot be reached, the Engineer reserves the right to establish a rate based on similar equipment shown in the "Blue Book" or based on prevailing commercial rates in the area.

b. Small Tools and Equipment with a new condition purchase value of under \$2,000

Individual equipment, tools, and other specialty items valued at less than \$2,000 are included in Profit and Overhead and no separate payment shall be made.



D. Allowances for Profit and Overhead

Contractor Change Order Proposals for the performance of changed Work shall include all direct costs for labor, materials, and rented equipment as described above. The Engineer shall review the proposals for reasonableness and adequate detail in order to reach agreement with the Contractor before including allowances as described below:

- a. In addition to the direct costs of labor, materials and equipment incurred by the Contractor, the Contractor shall be entitled to an allowance for profit and overhead. This allowance shall not exceed twenty percent (20%) of the total direct cost of labor and materials. The overhead and profit rate for equipment is not to exceed fifteen percent (15%).
- b. If Work is performed by a subcontractor, the subcontractor actually performing the Work shall be entitled to those allowances for profit and overhead listed above, and each subsequent higher tiered subcontractor or Contractor shall be allowed up to an additional ten percent (10%) markup on the subcontractor's invoice, up to a maximum of two tiers of subcontractors.

In addition, the Contractor shall be allowed to include with the subcontractor's invoice any other indirect or direct costs incurred due to the subcontractor's additional work, and their additional ten percent (10%) markup allowance shall be determined from those combined total costs. Such associated costs may include but not be limited to additional DOL fees, increased bond costs and insurance premiums, and additional SWPPP and traffic control costs.

The allowance made in accordance with the terms outlined above shall be complete reimbursement and compensation for all indirect costs associated with changed Work including, but not limited to, job office overhead, home office overhead, project management, superintendents, general foremen, estimating, engineering, detailing, legal, accounting, shop drawings, costs of small tools and small equipment, bond cost, insurance premiums, profits, delay impacts on the rest of the Work and losses of all kinds and other items of cost not specifically designated. No other reimbursement, compensation or payment shall be made for changed Work.

Any allowance made by the Contractor to a Subcontractor, other than specified herein, shall be at the expense of the Contractor.

E. Negotiated Changes

When extra Work is ordered by the Engineer to be performed on a negotiated unit or lump sum basis, the Contractor shall be required to submit a properly

itemized Change Order Proposal covering all the additional Work and/or Work to be deleted.

The proposal shall be itemized for the various components of Work and segregated by labor, material, equipment and any tiered subcontractor costs in a format satisfactory to the Engineer.

F. Time and Material Changes

When extra Work is ordered by the Engineer to be performed on a time and materials basis, the Contractor shall be required to perform the extra Work at the actual direct cost for labor, materials and equipment plus allowances for profit and overhead.

In order for payment to occur, the Contractor shall document all direct costs in a manner acceptable to the Engineer. At a minimum, Contractor generated documentation shall include daily reports generated in the field identifying all labor, equipment, and materials associated with the extra Work. The daily reports are to be signed off by the Engineer and the Contractor or their assigned designees at the end of each shift or the beginning of the next shift to be eligible for payment. A copy of the signed off daily reports are to be provided to the Engineer within one week of the extra Work being complete to continue eligibility for payment of the extra Work.

The Contractor shall provide daily time sheets with the names of all Contractors employees working on the changed Work, the number of hours each employee works on the changed Work, and a description of the Work performed. In addition, the Contractor shall provide daily records of all equipment used to perform the changed Work showing the number of hours each piece of equipment was used, a description of the Work performed, and the name of the equipment operator. All materials incorporated into the changed Work shall be documented with itemized invoices from vendors and suppliers.

G. Unit Price Changes

When extra Work is ordered by the Engineer to be performed on a unit price basis, payment shall be made for both added quantities and deductive quantities in accordance with those unit prices that have been incorporated into the Contract Documents, unless the Engineer determines there is an alternate method. For changed Work authorized by the Engineer, the Contractor shall submit a Change Order Proposal itemizing the quantities of each item of Work for which there is an applicable unit price. The applicable unit prices shall be applied to the net differences of all quantities of the same item. These unit prices shall be considered to cover all direct and indirect costs of furnishing and installing the item, including all profit and overhead. No additional markup for overhead and profit shall be allowed on unit priced items except where the actual quantity used exceeds one hundred and twenty-five percent (125%) of the estimated quantity.

For additional unit price Work performed by subcontractors, each subsequent higher tiered subcontractor or Contractor shall be allowed up to an additional five percent (5%) markup on the subcontractor's direct costs (not including profit and overhead), up to a maximum of two tiers of subcontractors.

#### H. No Cost Changes

The Engineer shall have authority to order changes in the Work that, at their sole discretion, do not require an adjustment in the Contract amount or an extension of time and are not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders promptly. If the Contractor claims that such written instructions or orders involve extra costs or an extension of time, it shall make their claim by following the procedures set forth in Article 5.21 - Claims for Additional Compensation. The Contractor shall proceed with the Work as directed by the Engineer while their claim is being evaluated and shall not delay the Work while waiting for a decision.

### **Article 7.5 Progress Payments**

The Contractor shall submit to the Engineer their partial payment request form via **[pwpmeconstpayrequest@ci.anchorage.ak.us](mailto:pwpmeconstpayrequest@ci.anchorage.ak.us)**, supported by such data as the Engineer may require substantiating the Contractor's right to payment for Work done during the preceding calendar month. The Engineer shall, within eight (8) days after receipt of the Application for Payment, either approve a Partial Payment Estimate and present it to the Contractor for signature or notify the Contractor in writing their reasons for withholding approval. Approved Partial Payment Estimates shall be received by the Owner within two (2) days after execution by the Contractor. The Owner shall process Partial Payment Estimates and make payment to the Contractor within fifteen (15) days of receipt of the Partial Payment Estimate. If the Owner fails to make payment to the Contractor within thirty (30) days of receipt of the Application for Payment (twenty-one (21) days if the project is funded with State of Alaska grants), the Contractor may, upon seven (7) days written notice to the Owner and Engineer, suspend the Work. The Contractor shall take every precaution to prevent any damage or unreasonable deterioration of the Work during the time it is suspended. The Engineer may require a schedule of values, or cost breakdown for any lump sum payment Contract item.

For projects where a Performance and Payment Bond is required under Section 10.03, Article 3.5 – Bonds, Insurance, EEO and DBE/WBE Forms, progress payments at one hundred percent (100%) of the estimated value of the Work accomplished, less all previous payments or for authorized withholdings as specified below, shall be made to the Contractor and no deductions shall be made, except as provided under the withholding provisions of this Article.

No interest shall accrue and no interest shall be paid on sums which are withheld as provided for hereinafter.

Withholding: The Engineer may withhold funds from a progress payment for any of the following reasons:

1. Defective Work;
2. Claims made directly against the Municipality alleging an act or omission on the part of the Contractor, their employees, their agents, or Subcontractors in connection with the Work;
3. Damage to the Municipality;
4. Reimbursements for Work done by the Owner because of any failure by the Contractor or Subcontractor to carry out the Work in accordance with the Contract Documents;
5. Uncompleted incidental Work, not earning direct payment, including but not limited to testing, cleanup, updating of progress schedules, preparation of Record Documents and Operations and Maintenance Manuals.
6. Liquidated damages;
7. Claims by Subcontractors, suppliers, laborers, or the Alaska Department of Labor;
8. If the Contractor or his/her Subcontractor fails to file reports with the Municipality of Anchorage Office of Equal Opportunity as required by AMCR 7.50.004, AMCR 7.50.005, and by 7.60.004 in a timely manner, monies shall be withheld in the amount of ten percent (10%) of the amount due the Contractor until such time as the reports have been properly filed.

The amount of any withholding for items one (1) through five (5) above shall be the reasonable value of the Work or remedy to be accomplished as estimated by the Engineer, without regard to bid amount or cost to the Contractor. The amount of withholding for items six (6) through eight (8) shall be in accordance with the claimed amount or the applicable Contract provisions.

Progress payments shall not be construed as an acceptance or approval of any part of the Work covered thereby and they shall in no manner relieve the Contractor of responsibility for correcting defective workmanship or material.

The estimates upon which progress payments are based are not represented to be accurate estimates, and all quantities shown therein are subject to correction on any subsequent pay estimate. If the Contractor uses such estimates as a basis for making payment to Subcontractors, Contractor does so at their own risk and Contractor shall bear all loss that may result. All quantities shall be subject to review by the Engineer prior to approval for payment.

The making of any progress payment under the Contract, either before or after the date set for completion of the Work, shall not operate to invalidate any of the provisions of the Contract or to release the Surety.

In addition to certified payroll submittals to the Alaska Department of Labor required under Section 10.06, Article 6.12 – Certified Payroll, Contractor shall attach certified payrolls to each request for payment or partial payment. Certified payrolls attached to Contractor's request for payment or partial payment shall cover all pay periods in Contractor's request for payment or partial payment.

## **Article 7.6 Payment of Claimants**

By submitting a request for Final Payment, the Contractor acknowledges and certifies that all actual or potential claims or issues have been either resolved or withdrawn and that there are no such claims or issues outstanding.

Any claim received by the Engineer against the Contractor or Subcontractors from any materialmen, laborer, supplier, Subcontractor, or the Alaska Department of Labor will be forwarded to the Contractor by certified mail as soon as practical following receipt by the Engineer. Within twenty-one (21) days after the Contractor's receipt of the said notice, the Contractor shall notify the Engineer in writing by Certified Mail that the said claim is contested or provide proof that the claim has been satisfied. If the Contractor contests the claim, the Contractor shall describe in detail how the Subcontractor was paid or why the Subcontractor should not be paid and furnish to Owner the completed three-point statement form described hereafter. If the Contractor does not respond during the time allotted above, this lack of notice shall constitute consent by the Contractor to have the Owner pay the claim from the earnings of the Contractor. The Owner shall not be responsible to the Contractor if the Contractor subsequently contests the validity of the claim.

Sums withheld pursuant to disputed claims shall not be paid to the claimant except where compelled by legal authority. Such sums may be paid to the Contractor upon the filing of a three-point statement by the Contractor and their Surety on the form furnished by the Engineer stating that: (1) the Contractor contests the validity of the claim; (2) that the Surety acknowledges responsibility for the payment of the claim in the event it is valid and; (3) that the Contractor and the Surety specifically agree to hold the Municipality harmless for making payment to the Contractor of the sums withheld.

In the event that the Contractor revokes consent to pay a claimant as provided herein and refuses to execute the three-point statement form referenced above, the Municipality may institute an interpleader action in Superior Court, Third Judicial District, and all Court costs and attorney's fees incurred by the Municipality shall be paid by the Contractor or the Surety. Claimants are not intended beneficiaries of this Article and shall have no recourse against the Municipality for any failure to pay claims from sums withheld from the Contractor.

## **Article 7.7 Final Payment**

Upon completion of the Work and issuance of a Certificate of Completion by the Engineer, the Contractor shall submit a request for Final Payment and the following submittals, as applicable, to the Engineer. No Final Payment shall be made until the Engineer has received and approved the following submittals:

1. Alaska Department of Labor (DOL)-issued written notification of compliance with AS 36.05.045;
2. Other contractually required documents as noted in the Contract; and
3. A notarized Certificate of Compliance in the form substantially as follows:

I (we) hereby certify that all Work has been performed and materials supplied in accordance with the Contract Documents for the above Work, that not less than the prevailing rates of wages as required by the State Statute have been

paid to laborers, workmen, and mechanics, that all payroll taxes have been paid, and that all claims for material and labor and other services performed in connection with these Contract Documents have been satisfied.

There shall be deducted from the final payment any sums withheld pursuant to 7.6 - Payment of Claimants.

**Article 7.8 Correction of Work after Final Acceptance Date**

Placement of the Project on Warranty shall not relieve the Contractor of their responsibility for paying all costs resulting from defects in materials or workmanship supplied under the terms of the Contract, and for correction of those defects, for a period of one year following the Final Acceptance Date. The Owner shall give notice of observed defects within a reasonable time. The Contractor shall initiate corrective action within five (5) days after written notification from the Owner or the Owner shall make other provisions to complete the Work and all costs shall be paid by the Contractor.

## **SECTION 10.08    FORMS**

### **Article 8.1    Current Forms**

The following forms are provided as reference. Electronic versions of the form are available at the Municipality of Anchorage website or from the Engineer.

## Article 8.2 Submittal Transmittal

### SUBMITTAL TRANSMITTAL

PROJECT \_\_\_\_\_ SUBMITTAL NO. TRANS- \_\_\_\_\_  
 CONTRACTOR \_\_\_\_\_ CONTRACT NO. \_\_\_\_\_  
 ORIGINATOR \_\_\_\_\_ PM&E NO. \_\_\_\_\_  
 DATE SUBMITTED \_\_\_\_\_ DRAWING NO. \_\_\_\_\_ SPEC. SECTION \_\_\_\_\_  
 TO: Municipality of Anchorage  
 Project Management and Engineering  
 4700 Elmore Road  
 Anchorage, AK 99507 SHEET \_\_\_\_\_ OF \_\_\_\_\_  
 ATTENTION: \_\_\_\_\_

ITEM _____ SUPPLIER/CONTRACTOR <input type="checkbox"/> Original Submittal <input type="checkbox"/> 3rd <input type="checkbox"/> Other <input type="checkbox"/> 2nd <input type="checkbox"/> 4th  No. (Provide Itemized List of Contents in this Submittal)	REVIEW ACTION						
	COPIES DISTRIBUTED	NO EXCEPTION TAKEN	MAKE CORRECTIONS AS NOTED	AMEND AND RESUBMIT	REJECTED RESUBMIT	COPIES RETURNED	NOTES ATTACHED
	A	B	C	D			

Complete either (a) or (b), following:

(a) We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown (no exceptions), and the submittal is required by the Contract Documents.

(b) We have verified that the material or equipment contained in this submittal meets all the requirements specified or shown, except for the following deviations (list deviations; attach a separate sheet as necessary), and the submittal is required by the Contract Documents.

Corrections or Comments made relative to submittals during this review do not relieve the Contractor from compliance with the requirements of the Drawings and Specifications. This submittal is only for review of general conformance with the design concept of the Project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of other trades; and performing his work in a safe and satisfactory manner.

CONTRACTOR \_\_\_\_\_ (Signature) ENGINEER \_\_\_\_\_ (Signature)

ROUTING	RECEIVED BY (NAME/COMPANY)	DATE RECEIVED	DATE FORWARDED	COMMENTS
PROJ ENGINEER				
CONTRACTOR				



**Article 8.3 Request for Information Form**

**REQUEST FOR INFORMATION (RFI)**

PROJECT \_\_\_\_\_ REQUEST NO. RFI- \_\_\_\_\_  
 CONTRACTOR \_\_\_\_\_ CONTRACT NO. \_\_\_\_\_  
 ORIGINATOR \_\_\_\_\_ PM&E NO. \_\_\_\_\_  
 DATE SUBMITTED \_\_\_\_\_ DRAWING NO. \_\_\_\_\_ SPEC. SECTION \_\_\_\_\_  
 TO: Municipality of Anchorage SHEET \_\_\_\_ OF \_\_\_\_  
 Project Management and Engineering  
 4700 Elmore Road  
 Anchorage, AK 99507 ATTENTION:

**DESCRIPTION OF REQUEST FOR INFORMATION**

CONTRACTOR \_\_\_\_\_ DATE \_\_\_\_\_  
 (Signature) RESPONSE REQUESTED

**RESPONSE TO REQUEST FOR INFORMATION**

DIRECTION

Requested Information/Clarification Provided.  
 Submit a Change Order Proposal and all associated justification/documentation.  
 \_\_\_\_\_

RESPONSE BY \_\_\_\_\_ DATE \_\_\_\_\_  
 (Signature)

<b>ROUTING</b>	<b>RECEIVED BY (NAME/COMPANY)</b>	<b>DATE RECEIVED</b>	<b>DATE FORWARDED</b>	<b>COMMENTS</b>
PROJ ENGINEER				
CONTRACTOR				

**Article 8.4 Substitution Request Form**

**SUBSTITUTION REQUEST**

PROJECT \_\_\_\_\_ SUBSTITUTE NO. SR- \_\_\_\_\_  
 CONTRACTOR \_\_\_\_\_ CONTRACT NO. \_\_\_\_\_  
 ORIGINATOR \_\_\_\_\_ PM&E NO. \_\_\_\_\_  
 DATE SUBMITTED \_\_\_\_\_ DRAWING NO. \_\_\_\_\_ SPEC. SECTION \_\_\_\_\_  
 TO: Municipality of Anchorage SHEET \_\_\_\_ OF \_\_\_\_  
 Project Management and Engineering  
 4700 Elmore Road  
 Anchorage, AK 99507 ATTENTION: \_\_\_\_\_

**SPECIFIED ITEM**

SECTION	PAGE	PARAGRAPH	DESCRIPTION
<b>PROPOSED SUBSTITUTION</b> _____			
<i>JUSTIFICATION</i> _____			
Attached data includes product description, Specifications, Drawings, photographs and performance and test adequate for evaluation of the request. Applicable portions of the data are clearly identified.			
The undersigned states that the following paragraphs, unless modified in attachments, are correct:			
<ol style="list-style-type: none"> <li>1. The proposed substitution does not affect dimensions shown on Drawings and will not require any change in the Contract Documents.</li> <li>2. The undersigned will pay without reimbursement for construction costs and changes to the design including engineering and detailing caused by the requested substitution which is estimated to be \$ _____.</li> <li>3. The proposed substitution will have no adverse affect on other contractors, the construction schedule (specifically the date of substantial completion), or specified warranty requirements.</li> <li>4. Maintenance and service parts will be locally available for the proposed substitution.</li> <li>5. The incorporation or use of the substitution in connection with the work is not subject to payment of any license fee or royalty.</li> </ol>			
The undersigned further states that the function, appearance, and quality of the Proposed Substitution are equivalent or superior to the Specified Item.			

**Submitted by CONTRACTOR**

Signature \_\_\_\_\_  
 Firm \_\_\_\_\_  
 Date \_\_\_\_\_  
 Telephone \_\_\_\_\_  
 Attachments \_\_\_\_\_

**Reviewed by ENGINEER**

Accepted  
 Accepted as Noted:  
 Not Accepted  
 Returned without Review as Noted:  
 By \_\_\_\_\_  
 Title \_\_\_\_\_  
 Date \_\_\_\_\_  
 Remarks \_\_\_\_\_

ROUTING	RECEIVED BY (NAME/COMPANY)	DATE RECEIVED	DATE FORWARDED	COMMENTS
PROJ ENGINEER				
CONTRACTOR				

**Article 8.5 Deviation Request Form**

**DEVIATION REQUEST**

PROJECT \_\_\_\_\_ REQUEST NO. DR- \_\_\_\_\_  
 CONTRACTOR \_\_\_\_\_ CONTRACT NO. \_\_\_\_\_  
 ORIGINATOR \_\_\_\_\_ PM&E NO. \_\_\_\_\_  
 DATE SUBMITTED \_\_\_\_\_ DRAWING NO. \_\_\_\_\_ SPEC. SECTION \_\_\_\_\_  
 TO: Municipality of Anchorage SHEET \_\_\_\_ OF \_\_\_\_  
 Project Management and Engineering  
 4700 Elmore Road  
 Anchorage, AK 99507 ATTENTION: \_\_\_\_\_

<b>DESCRIPTION OF DEVIATION REQUEST</b>	
A. Original Contract Requirements:	
B. Reason for Deviation Request:	
C. Proposed Deviation:	
D. Any Changes in Contract Time or Cost: <input type="checkbox"/> NO <input type="checkbox"/> YES	
CONTRACTOR _____ <small>(Signature)</small>	DATE _____
RESPONSE REQUESTED	

<b>RESPONSE TO DEVIATION REQUEST</b>	
DIRECTION	
<input type="checkbox"/> Approved	<input type="checkbox"/> Approved as Noted
<input type="checkbox"/> Disapproved	
RESPONSE BY _____ <small>(Signature)</small>	DATE _____

<b>ROUTING</b>	<b>RECEIVED BY (NAME/COMPANY)</b>	<b>DATE RECEIVED</b>	<b>DATE FORWARDED</b>	<b>COMMENTS</b>
PROJ ENGINEER				
CONTRACTOR				

**Article 8.6 Affidavit of Claim Against Municipal Contractor Form**

Original to Administering Municipal Agency: \_\_\_\_\_

AFFIDAVIT OF CLAIM AGAINST MUNICIPAL CONTRACTOR

This affidavit is filed pursuant to Article 6.11 of M.A.S.S./M.A.S.S.B. and regards contract number \_\_\_\_\_ between the Municipality of Anchorage and \_\_\_\_\_ ("Contractor"). While the claim is presented to the Municipality, Claimant understands that the **MUNICIPALITY IS NOT RESPONSIBLE FOR PAYMENT OF THE CLAIM. CLAIMANT ALSO UNDERSTANDS THAT FILING THIS CLAIM IN NO WAY AFFECTS OR HAS ANY BEARING UPON CLAIMANT'S RIGHTS, DUTIES, AND/OR OBLIGATIONS AS SET FORTH IN ALASKA STATUTE §36.25.020 (a/k/a "Little Miller Act").**

I, \_\_\_\_\_, on behalf of \_\_\_\_\_ ("Claimant") swear that \_\_\_\_\_ owes Claimant the sum of \$ \_\_\_\_\_ for

\_\_\_\_\_

\_\_\_\_\_ which items of material, labor, and/or service were furnished to Contractor on or about \_\_\_\_\_ at or near \_\_\_\_\_ and aided the Contractor in performing the contract referenced above.

Dated: \_\_\_\_\_

Signature: \_\_\_\_\_

Printed Name: \_\_\_\_\_

SUBSCRIBED and SWORN to before me this \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
NOTARY PUBLIC in and for Alaska  
My Commission Expires: \_\_\_\_\_

**Article 8.7 Request for Payment of Disputed Claim Form**

REQUEST FOR PAYMENT OF DISPUTED CLAIM

Contractor: \_\_\_\_\_

Contract Description: \_\_\_\_\_

Contract No.: \_\_\_\_\_

Construction Management File No.: \_\_\_\_\_

This statement is made under oath pursuant to Article \_\_\_\_\_,  
General Provisions in the Municipal Standard Specifications.

\_\_\_\_\_  
(Contractor)

contests the validity of the claim for \$ \_\_\_\_\_, dated \_\_\_\_\_, and  
filed by \_\_\_\_\_ on this contract.  
(Claimant)

The surety acknowledges responsibility for the payment of said claims in the event  
they are held to be valid.

\_\_\_\_\_  
(Contractor)

and the surety specifically agree to hold the owner harmless from any consequences of payment  
of sums attributable to the claims.

SURETY

CONTRACTOR

By: \_\_\_\_\_

By: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

Subscribed and sworn to before me this  
\_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

Subscribed and sworn to before me this  
\_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_  
Notary

\_\_\_\_\_  
Notary

My Commission Expires: \_\_\_\_\_

My Commission Expires: \_\_\_\_\_



**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 20  
EARTHWORK**





**STANDARD CONSTRUCTION SPECIFICATIONS FOR  
EARTHWORK  
DIVISION 20  
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**STANDARD CONSTRUCTION SPECIFICATIONS FOR  
EARTHWORK  
DIVISION 20**

**SECTION 20.01 GENERAL**

For the purposes of this Division, the terms “unsuitable” and “unusable” are equivalent when used as a description of a type of material and may be used interchangeably.

**Article 1.1 Scope of Work**

The Work covered by this Division consists of providing all plant, labor, equipment, supplies, material, transportation, handling, and storage, and performing all operations pertaining to the: 1) construction of subbase for parking lots, streets, alleys, curbs, gutters, sidewalks and bike trails, 2) construction for all trench excavation, backfill, bedding, and foundation material for utility installation; and 3) excavation and backfill for building structures and retaining walls.

**Article 1.2 Definitions**

**Backfill** - Material placed in an excavated area up to the original or natural ground line.

**Bedding** - Ground or support in which pipe is laid.

**Borrow** - Material used as fill and/or backfill which is obtained from a source other than required excavation.

**Compaction** - Tamping by hand or machine to achieve required density.

**Disposal Site** - Any area where waste, unsuitable, unusable or surplus material from construction is placed. Requirements for Contractor provided disposal sites are delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

**Excavation** - Area or material removed to provide a suitable base for improvement.

**Fill** - Material placed above the original or natural ground line.

**Leveling Course** - Leveling course is compacted material placed above the subbase and below the finishing surface of the improvement.

**Non-Frost-Susceptible Material** - Non-organic soil containing less than three percent (3%) by weight of grains smaller than two hundredths of a millimeter (.02 mm) obtained from minus three inches (-3") material.

**Service Connection** - Any connection from a main line utility or storm drain to a property line for the purpose of providing service to an individual property.

**Subbase** - The subbase is compacted material placed above the subgrade and below the leveling course.

**Subgrade or Bottom Excavation** - The subgrade is material below the bottom of excavation and upon which the subbase material is placed.

**Trench** - Any excavation for a utility or drainage system or where the width of the excavation is less than twice the depth of the excavation.

**Unsuitable or Unusable Material** - Unsuitable or unusable material may consist of any material which is, in the opinion of the Engineer, inadequate for use in the proposed construction.

### **Article 1.3 Applicable Standards**

The latest revision of the following standards of the American Society for Testing and Materials (ASTM) and the American Association of State Highway Transportation Officials (AASHTO) are hereby made a part of these specifications:

ASTM C29	Bulk Density (“Unit Weight”) and Voids in Aggregates
ASTM C117	Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Sieve Analysis of Fine and Coarse Aggregates
ASTM D6913	Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
ASTM D7928	Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis
ASTM D4318	Determining the Liquid Limit of Soils
AASHTO M 147	Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses
AASHTO T 180	Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
ASTM D2167	Density and Unit Weight of Soil In-Place by the Rubber Ballon Method
AASHTO T 310	In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

### **Article 1.4 Equipment**

All equipment, tools, and machines used in the performance of the Work covered by these Specifications shall be subject to the approval of the Engineer and shall comply with all applicable safety requirements. All equipment used on the project shall be adequately maintained and shall be the proper equipment for the Work being accomplished so as to produce the result required by the Contract Documents.

### **Article 1.5 Compaction Standards**

The required density of fill and backfill shall meet the requirements as outlined in Section 20.21 – Classified Fill and Backfill. In areas outside of road rights-of-way, the density shall be as required by the Contract Documents or as directed by the Engineer.

Where compaction density is specified, the maximum density shall be determined in accordance with the current requirements of AASHTO T 180 Method D.

The diameter of the test mold in AASHTO T 180 Method D limits the size of particles which may be included in the test to that passing the three-quarter inch (3/4”) sieve. In those instances where the particles are retained on the three-quarter inch (3/4”) sieve, a correction must be applied to the standard laboratory density prior to calculating the percent compaction. To expedite results, the plus three-quarter inch (+3/4”) material may be sieved wet and the weight computed as a percent of the total weight of the material from the hole. The corrected laboratory density shall be computed in each instance by the formula:



$$\text{Corrected Lab Density} = \frac{62.4}{\frac{A}{C} + \frac{62.4*(B)}{r*D}}$$

- Where: A = Percent by weight of original material retained on the 3/4-inch sieve, expressed as a decimal.  
 B = Percent by weight of original material passing the 3/4-inch sieve, expressed as a decimal.  
 C = Specific gravity of +3/4-inch material (apparent specific gravity) as determined by ASTM C127/AASHTO T 85.  
 D = Uncorrected laboratory density (minimum 3/4-inch material).  
 r = Coefficient with value depending on A, as follows:  
 for A = 0.18 or less, r = 1.00  
 A = 0.19 or more, r = 1.036 - 0.2A

Backfill under traffic and building structures and trench backfill in the public rights-of-way from six inches (6") over the top of the pipe to the surface shall be compacted to ninety-five percent (95%) of maximum density, unless otherwise noted and approved by the Engineer.

The backfill material shall be placed in horizontal lifts not exceeding twelve inches (12") in thickness and compacted. Any excavations improperly filled shall be reopened to the depth required for proper compaction, then refilled and compacted at the Contractor's expense. The use of water in excess of the quantity required to obtain specified density (optimum moisture content) to settle or compact the backfill will not be permitted.

### Article 1.6 Subsurface Investigation

Information pertaining to subsurface exploration, borings, test pit locations, and other preliminary investigation may appear in the Bidding Documents or be available at selected locations for review by the Bidder. This information was acquired for design purposes only and is not considered adequate for construction.

The soils classifications and geotechnical designations recorded are informational only and represent only those subsurface conditions on the particular date, at the specific location, as indicated on each soils log and on the plans. The ground water levels indicated on the test hole logs and shown on the Drawings were recorded at the time the test holes were performed. These water levels may vary seasonally and are shown for design and informational purposes only. Contractor shall assume responsibility for any conclusions that may be drawn from such information and the conclusions shall not be considered just cause for a claim for additional compensation or contract time extension. Contractor should obtain and analyze such additional information as the Contractor may feel necessary and shall be responsible for any conclusions drawn from that information.

The Owner does not warrant the correctness of the soils investigation or of any interpretation, deduction, or conclusion given in the report relative to subsurface conditions. The Bidder shall make their own deductions and conclusions as to the nature of the materials to be excavated, the difficulties of making and maintaining the required excavations, the difficulties which may arise from subsurface conditions, and of doing any other Work affected by the subsurface conditions, and shall accept full responsibility therefore.

### **Article 1.7 Weather Limitations**

Unless otherwise authorized by the Engineer, fill and backfill material, base course, and leveling course shall not be placed when the atmospheric temperature is below thirty-five degrees Fahrenheit (35°F). When the temperature falls below thirty-five degrees Fahrenheit (35°F), it shall be the responsibility of the Contractor to protect all areas of completed Work against any detrimental effects. Any areas of Work not completed in accordance with the Contract Documents that are damaged by weather shall be reconditioned, reshaped, and recompacted by the Contractor in conformance with the requirements of the Contract Document without additional cost to the Owner.

### **Article 1.8 Underground Utilities**

The Contractor shall continuously support underground utilities during backfill placement and compaction. During backfill placement and compaction, the Contractor shall place geotextile fabric with a minimum twelve-inch (12") separation from underground utilities, unless directed otherwise by the Engineer.

### **Article 1.9 Contaminated Material**

Unless otherwise noted in the Contract Documents, the Owner is not aware of any contaminated material within the project limits. If such material is encountered, Contractor shall notify the Engineer immediately for direction. Unless the contamination was caused by Contractor's operation, discovery of contaminated material will be treated as a changed condition per Division 10, Section 10.05, Article 5.18 – Changed Conditions.

## **SECTION 20.02 STORM WATER POLLUTION PREVENTION PLAN**

### **Article 2.1 General**

The Work described in this Section shall consist of providing all labor, equipment, materials, and services to prepare, implement, and maintain a Storm Water Pollution Prevention Plan (SWPPP) for projects that may adversely impact receiving waters or waters of the United States. The type of plan required depends on the area disturbed by the project including the construction site and off-site activities which include, but may not be limited to, material sites, waste disposal sites, borrow and fill sites, and equipment and material storage areas.

For Projects that impact an area greater than five hundred (500) square feet or are deeper than four feet (4'), and less than ten thousand (10,000) square feet, a Type 1 SWPPP is required and the cost of the SWPPP is considered incidental to the Contract and no separate payment shall be made. A Type 2 SWPPP is required for Projects that disturb a project area greater than ten thousand (10,000) square feet and less than one (1) acre. A Type 3 SWPPP is required for all Projects that disturb one or more acres of land.

As a requirement of this Contract, the Contractor shall accept a delegation of authority from the Municipality to act as the Municipality's duly authorized representative for the purpose of overseeing compliance with the APDES Construction Permit at the project site.

### **Article 2.2 Definitions**

**Alaska Certified Erosion and Sediment Control Lead (AK-CESCL)** - A person who has completed training, testing, and other requirements of, and is currently certified as, an AK-CESCL from an AK-CESCL Training Program (a program developed under a Memorandum of Understanding between the Municipality and others). The Municipality recognizes AK-CESCLs as "qualified personnel" required by the CGP. An AK-CESCL shall be recertified every three years.

**Alaska Department of Environmental Conservation (ADEC)** - The State agency authorized by EPA to administer the Clean Water Act's National Pollutant Discharge Elimination System (NPDES).

**Alaska Pollutant Discharge Elimination System (APDES)** - A system administered by ADEC that issues and tracks permits for storm water discharges.

**Best Management Practices (BMPs)** - Temporary or permanent structural and non-structural devices, schedules of activities, prohibition of practices, maintenance procedures, and other management practices to prevent or minimize the discharge of pollutants to waters of the United States. BMPs also include, but are not limited to, treatment requirements; operating procedures; practices to control site runoff, spillage or leaks; sludge or waste disposal; or drainage from material storage.

**Clean Water Act (CWA)** - Federal Water Pollution Control Amendments of 1972, as amended (33 U.S.C. 1251 et seq.).

**Construction Activity** - Work by Contractor, subcontractor or utility company within the project area, that may result in erosion, sedimentation, or a discharge of pollutants into storm water. Construction Activity includes soil disturbing activities (e.g., clearing, grubbing, grading, excavating); construction materials or equipment storage or maintenance areas (e.g., material piles, borrow area, concrete truck chute wash down,

fueling); and activities that may discharge storm water and are directly related to the construction process (e.g., concrete or asphalt batch plants).

**Construction General Permit (CGP)** - The current permit authorizing storm water discharges from Construction Activities, issued and enforced by ADEC. The CGP authorizes storm water discharges provided permit conditions and water quality standards are met.

**Electronic Notice of Intent (eNOI)** - The electronic Notice of Intent submitted to ADEC to obtain coverage under the CGP.

**Electronic Notice of Termination (eNOT)** - The electronic Notice of Termination submitted to ADEC to end coverage under the CGP.

**Environmental Protection Agency (EPA)** - A federal agency charged to protect human health and the environment.

**Final Stabilization** - The CGP defines Final Stabilization as:

1. All soil disturbing activities at the site have been completed and either of the two following criteria have been met:
  - a. A uniform (e.g., evenly distributed, without large bare areas) perennial vegetative cover for the area has been established on all unpaved areas and areas not covered by permanent structures, or
  - b. Equivalent non-vegetative permanent stabilization measures have been employed (such as use of riprap, gabions, porous backfill (DOT&PF specification 703-2.10), railroad ballast or subballast, ditch lining (DOT&PF Specification 610-2.01 with less than three percent (3%) smaller than No. 200 sieve), geotextiles, or fill material with low erodibility as determined by an engineer familiar with the site and documented in the SWPPP.
2. When background native vegetation will cover less than one hundred percent (100%) of the ground (e.g., arid areas, beaches), the seventy percent (70%) coverage is adjusted as follows: if the native vegetation covers fifty percent (50%) ( $0.70 \times 0.50 = 0.35$ ), thirty-five percent (35%) total cover is required for final stabilization. On a beach with no natural vegetation, no stabilization is required.
3. In arid and semi-arid areas only, all soil disturbing activities at the site have been completed and both of the following criteria have been met:
  - a. Temporary erosion control measures (e.g., degradable rolled erosion control product) are selected, designed, and installed along with an appropriate seed base to provide erosion control for at least three years without active maintenance by the permittee:
  - b. Temporary erosion control measures are selected, designed, and installed to achieve seventy percent (70%) vegetative coverage within three years.
4. For individual lots in residential construction, final stabilization occurs when either:
  - a. The homebuilder has completed final stabilization as specified above, or
  - b. The home builder has temporary stabilization including perimeter controls for an individual lot prior to occupation of the home by the homeowner and informing the homeowner of the need for, and benefits of, final stabilization.

**Hazardous Material Control Plan (HMCP)** - The Contractor's detailed project specific plan for prevention of pollution from storage, use, transfer, containment, cleanup, and disposal of hazardous material (including, but not limited to, petroleum products related to construction activities and equipment). The Contractor shall include the HMCP as an appendix to the SWPPP.

**Inspection** - An inspection required by the CGP or the SWPPP, usually performed together by the Contractor's SWPPP Manager and the Municipal Inspector.

**Municipal Separate Storm Sewer System (MS4) Permit** - An ADEC storm water discharge permit issued to local governments (Municipality) and other public bodies, for operation of storm water conveyances and drainage systems. See CGP for further definition.

**Multi-Sector General Permit (MSGP)** - The Alaska Pollutant Discharge Elimination System General Permit for storm water discharges associated with industrial activity.

**Operator(s)** - The party or co-parties associated with a regulated activity that has responsibility to obtain permit coverage under the CGP. "Operator" for the purpose of the CGP and in the context of storm water associated with construction activity, means any party associated with a construction project that meets either of the following two criteria:

1. The operator has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or
2. The operator has day to day responsibility and operational control for all activities at a project which are necessary to fully comply with the CGP and the project SWPPP for the site or other requirements of the permit. For the purpose of a Contractor executing project Work under this Contract with the Municipality, the Contractor is the operator responsible for CGP and SWPPP coverage and compliance under the CGP for the Work.

**Permit** - References to permit pursuant to Division 20, Section 20.02 shall mean the Construction General Permit (CGP) defined above.

**Pollutant** - Any substance or item meeting the definition of pollutant contained in 40 CFR § 122.2. A partial listing from this definition includes dredged spoil, solid waste, sewage, garbage, sewage sludge, chemical wastes, biological materials, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial or municipal waste.

**Project Zone** - The Project Zone includes the area of street, road, highway or other facility under construction; project staging and equipment areas; and material and disposal sites, when those areas, routes and sites are directly related to the Contract.

**Records** - Any record, report, information, document, or photograph required to be created or maintained pursuant to the requirements of the CGP, the CGP storm water requirements of the Clean Water Act and applicable local, state, and federal laws and regulations pertaining to document preservation.

**Spill Prevention, Control and Countermeasure Plan (SPCC Plan)** - Contractor's detailed plan for petroleum spill prevention and control measures that conform to the requirements of 40 CFR 112.

**Spill Response Field Representative** - Contractor's representative with authority and responsibility for managing, implementing, and executing the HMCP and SPCC Plan.

**Storm Event** - A rainfall event that produces more than one half inch (0.5") of precipitation in twenty-four (24) hours and that is separated from the previous storm event by at least three (3) days of dry weather. Event can be measured on site using a rain gauge or Contractor can utilize the nearest National Weather Service (NWS) precipitation gauge station to determine the amount of rain fall during a storm event if the NWS gauge used is located within twenty (20) miles of the site.

**Storm Water Pollution Prevention Plan (SWPPP)** - Contractor's detailed project- specific plan to minimize erosion and contain sediment within the Project Zone and to prevent discharge of pollutants that exceed applicable water quality standards. The SWPPP includes, but is not limited to the plan, amendments, records of activities, inspection schedules and reports, qualifications of key personnel, and all other documentation, required by the CGP and this specification, and other applicable local, state, and federal laws and regulations.

**Storm Water Pollution Prevention Plan Type -**

Type 1- if area of disturbance is five hundred (500) square feet to less than ten thousand (10,000) square feet or four feet (4') or more in depth and is not part of a common plan of development that disturbs ten thousand (10,000) square feet or more.

Type 2- if the area of ground disturbance is ten thousand (10,000) square feet or greater but less than one (1) acre and not part of a common plan of development that disturbs one acre or more.

Type 3 - if the area of disturbance is one (1) acre or greater, or part of a common development that disturbs one or more acres.

**Subcontractor Spill Response Coordinator** - The Subcontractor's Representative with authority and responsibility for coordinating the Subcontractor's activities in compliance with the HMCP and SPCC Plan.

**Subcontractor SWPPP Coordinator** - The Subcontractor's Representative has responsible charge of and authority to direct the Subcontractor's Work; is responsible for the subcontractor's compliance with the SWPPP; and performs coordination with the Superintendent and SWPPP Manager.

**Superintendent** - Contractor's duly authorized representative in responsible charge of the Work. The Superintendent has responsibility and authority for the overall operation of the Project and for Contractor-furnished sites and facilities directly related to the Project.

**SWPPP Amendment** - A revision or document that adds to, deletes from, or modifies the SWPPP.

**SWPPP Manager** - Contractor's qualified representative who conducts inspections, has authority to suspend work and implement corrective actions required for CPG compliance, except they do not have authority to prepare the initial SWPPP or sign inspection reports.

**SWPPP Preparer** - Contractor's qualified representative who is responsible for developing the initial SWPPP.

**Utility Spill Response Coordinator** - a utility's representative with authority and responsibility for coordinating the Utility's activities in compliance with the HMCP and SPCC Plan.

**Utility SWPPP Coordinator** - a utility's representative with authority to direct the Utility's work, and who is responsible for coordination with the Superintendent and SWPPP Manager, and for the utility's compliance with the SWPPP.

### **Article 2.3 Applicable Standards**

The latest version of the following permits, standard and requirements are hereby made a part of these specifications:

- A. Alaska Construction General Permit (CGP) #100000
- B. Alaska Department of Environmental Conservation (ADEC) Storm Water Pollution Prevention Plan (SWPPP) Template
- C. Municipal Separate Storm Sewer System (MS4) Permit

### **Article 2.4 Plan and Permit Submittals**

Partial and incomplete submittals will not be accepted for review. A submittal that is re-submitted or revised after submission, but before the review is completed, will restart the submittal review timeline. No additional Contract time or additional compensation will be allowed due to delays caused by partial or incomplete submittals or required re-submittals.

#### **A. Storm Water Pollution Prevention Plan (SWPPP)**

Contractor shall submit an electronic copy and three hard copies of the SWPPP to the Engineer for approval. Contractor shall organize and bind the SWPPP and related documents for submittal according to the requirements of Article 2.9

The Municipality will review the SWPPP submittals within ten (10) business days after they are received. Submittals will be returned to the Engineer and marked as either "rejected" with reasons listed or as "approved" by the Municipality. When the submittal is rejected, the Contractor shall revise and resubmit the SWPPP. The ten (10) business days review period will restart when the Contractor resubmits an electronic copy and three hard copies of the revised SWPPP to the Engineer for approval.

After the SWPPP is approved by the Municipality, the Contractor shall sign and certify the approved SWPPP.

#### **B. Hazardous Material Control Plan (HMCP)**

Contractor shall submit an electronic copy and three hard copies of the HMCP, as an appendix to the SWPPP, to the Engineer for approval. The HMCP submittal and review timeline, and signature requirements are the same as the SWPPP. The HMCP shall be appended to and submitted with the SWPPP.

#### **C. Spill Prevention, Control and Countermeasure Plan (SPCC)**

When a SPCC Plan is required under Article 2.11, Contractor shall submit an electronic copy and three signed hard copies of the SPCC Plan to the Engineer at least twenty-one (21) days before beginning Construction Activity. The Municipality reserves the right to review the SPCC Plan and require modifications.

D. Construction General Permit (CGP) Coverage

The Contractor is responsible for permitting of Contractor and subcontractor Construction Activities related to the Project, including any material sites, waste disposal sites, borrow & fill sites, and equipment and material storage areas that are not covered by a different permit.

Prior to beginning Construction Activity, Contractor shall submit an eNOI with the required fee to ADEC for coverage under the Construction General Permit (CGP). Submit a copy of the signed eNOI and ADEC's acknowledgement letter to the Engineer as soon as practicable and no later than three days after filing eNOI or receiving a written response from ADEC.

The Contractor shall not begin Construction Activity until in full compliance with the conditions listed in Article 2.14.A.

The Municipality will submit an eNOI to ADEC for Construction Activities on Municipal Projects if required. The Engineer will provide the Contractor with a copy of the Municipality's eNOI and ADEC's written acknowledgment by letter, or other document for inclusion in the SWPPP.

E. Ending CGP Coverage

Contractor shall submit an eNOT to ADEC and submit both a copy of the signed eNOT and ADEC's acknowledgement letter to the Municipality, within thirty (30) days after the Engineer has determined the Contractor has fully complied with the conditions listed in Article 2.16.F.

F. Local MS4 SWPPP Review

When installing Permanent Storm Water Management Controls in accordance with CGP Part 4.9, the Contractor shall submit information required by the Municipality for the project and shall obtain approval prior to commencement of construction activities.

1. transmit a copy of information as required to local MS4 (Municipality); with the required fee using delivery receipt confirmation;
2. transmit a copy of the delivery receipt confirmation to the Engineer within seven (7) days of receiving the confirmation;
3. transmit a copy of any comments by the local MS4 (Municipality) to the Engineer within seven (7) days of receipt;
4. amend the SWPPP as necessary to address local MS4 (Municipality) comments and transmit SWPPP Amendments to the Engineer within seven (7) days of receipt of the comments; and
5. include a copy of the Municipality approval letter in the SWPPP.

G. Modifying Contractor's eNOI

When required by The CGP Part 2.7, Contractor shall modify the eNOI to update or correct information. Reasons for modification include a change in start or end dates, small changes in number of acres to be disturbed, change in decision to use or not use treatment chemicals, or change in location of SWPPP Records.



The Contractor shall submit an eNOT and then submit a new eNOI instead of an eNOI modification when: the operator has changed, the original eNOI indicates disturbed area less than five acres and the project will disturb more than five acres, or a project over five disturbed acres grows by more than fifty percent (50%).

## **Article 2.5 Personnel Qualifications.**

### **A. General**

Contractor shall provide documentation in the SWPPP that the individuals serving in these positions are “qualified Personnel” pursuant to the CGP.

The Municipality accepts persons having either of the following certificates as equivalent to AK-CESCL, if the certificates are current according to the sponsoring organization’s policies:

- CPESC - Certified Professional in Erosion and Sediment Control, or
- CISEC - Certified Inspector in Sediment and Erosion Control

### **B. SWPPP Preparer**

The SWPPP Preparer shall meet at least one of the following qualifications:

- current certification as a Certified Professional in Erosion and Sediment Control (CPESC); or
- current certification as AK-CESCL, and at least three years experience in erosion and sediment control (provide documentation including project names, project timelines, and work responsibilities demonstrating the experience requirement); or
- Professional Engineer licensed in the State of Alaska

For Projects disturbing more than twenty (20) acres, the SWPPP Preparer shall also have completed a SWPPP Preparation course.

### **C. Superintendent**

The Superintendent shall hold current certification as AK-CESCL and be a duly authorized representative as defined in the CGP, Appendix A, Part .12.3 and Section 20.02 definitions.

### **D. SWPPP Manager**

The SWPPP Manager shall have current certification as AK-CESCL, and shall meet the CGP experience, training, and authority requirements identified for the Storm Water Lead and Storm Water Inspector positions as defined in the CGP, Appendix C, Qualified Person.

### **E. Storm Water Inspector & Monitoring Person**

The Storm Water Inspector and the Storm Water Monitoring Person shall have current certification as AK-CESCL.

### **F. Active Treatment System Operator**

The Active Treatment System (ATS) operator shall have current certification as AK-CESCL and shall be knowledgeable in the principals and practices of treatment systems in general, including the operation of the project-specific ATS. Active Treatment System operator shall have at least six (6) months field experience with

ATS, or completion of an ATS manufacturer's training course, or completion of system operator's certification course.

## **Article 2.6 Signature/Certification Requirements and Delegations**

### **A. eNOI and eNOT**

The eNOI and eNOT shall be signed and certified by a responsible Contractor corporate officer according to CGP Appendix A, Part 1.12.2. Signature and certification authority for the eNOI and eNOT shall not be delegated.

### **B. Delegation of Signature Authority for Other SWPPP Documents and Reports**

The Contractor shall use Form F-108 to delegate signature authority and certification authority to the Superintendent position, according to CGP Appendix A, Part 1.12.3, for the SWPPP, Inspection Reports and other reports required by the CGP. The Superintendent position is responsible for signing and certifying the SWPPP, Inspection Reports, and other reports required by the CGP, except the eNOI and eNOT.

Engineer will provide the Municipality's Form F-107, which delegates authority from the Municipality to act as the Municipality's duly authorized representative for the purpose of overseeing compliance with the APDES Construction Permit at the project site. The Contractor shall include Form F-107 in the SWPPP.

### **C. Subcontractor Certification**

Subcontractors shall certify that they have read and will abide by the CGP and the conditions of the project SWPPP.

### **D. Signatures and Initials**

Contractor and subcontractor personnel shall handwrite (wet ink) signatures or initials on CGP documents and SWPPP forms, wherever a signature or initial is required.

## **Article 2.7 Responsibility for Storm Water Permit Coverage**

### **A. Contractor is responsible for permitting and permit compliance.**

### **B. The Contractor has sole responsibility for compliance with ADEC and other applicable federal, state, and local requirements, and for securing all necessary clearances, rights, and permits.**

### **C. An entity that owns or operates a commercial plant, material source, or disposal site receiving materials, waste, or any product generated as a result of the Project is responsible for permitting and permit compliance. The Contractor has sole responsibility to verify that the entity has appropriate permit coverage and to provide a copy of the permit documents to the Engineer.**

### **D. Contractor shall indemnify, defend and hold the Municipality harmless for any and all fines resulting from non-compliance with the permit conditions.**

## **Article 2.8 Utility Responsibilities**

If a utility is working ahead of the main project, the utility shall follow the procedures in this Section, obtain SWPPP approval, and file an eNOI with ADEC prior to starting any ground disturbing activity.

## **Article 2.9 Storm Water Pollution Prevention Plan (SWPPP) Requirements**

### **A. General**

Contractor shall prepare SWPPP in accordance with the applicable standards of this Section. Contractor shall submit and maintain the SWPPP in three-ring binder with tabbed and labeled dividers for each section and appendix.

### **B. SWPPP Preparer and Pre-Construction Site Visit**

Contractor shall hire or designate a SWPPP Preparer to prepare the SWPPP and associated documents according to the requirements of the CGP. The SWPPP shall identify the SWPPP Preparer and include qualifications (including the expiration date of any certifications), title, and company name in the SWPPP.

The Contractor and SWPPP Preparer shall conduct a pre-construction inspection at the project site before construction activity begins. If the SWPPP Preparer is not a Contractor employee, the SWPPP Preparer shall visit the site accompanied by Contractor's superintendent. Contractor shall provide the Municipality at least seven (7) days written notice of the site visit, so that the Municipality may participate.

During the pre-construction inspection, the SWPPP Preparer shall identify or, if a draft of the SWPPP has already been prepared, verify that the SWPPP fully addresses and describes:

1. opportunities to phase construction activities;
2. appropriate BMPs and their sequencing; and
3. sediment controls that shall be installed prior to beginning construction activities.

Contractor shall document the SWPPP Preparer's pre-construction inspection in the SWPPP on Form F-106, SWPPP Pre-Construction Site Visit, including the names of attendees and the date.

### **C. SWPPP Development**

Contractor shall prepare the SWPPP with sections and appendices, in accordance with the current ADEC SWPPP template and the following additional information:

1. Add additional appendices for:
  - a. Appendix L – Hazardous Material Control Plan (HMCP)
  - b. Appendix M – SWPPP Preparer's Site Visit
  - c. Appendix N – Rainfall Logs
  - d. Appendix O – NOT forms and Acknowledgement letters from ADEC (Include both Municipality's and Contractor's)
2. Obtain the following completed forms from the Municipality and include them in the SWPPP:
  - a. SWPPP Delegation of Signature Authority (F-107)
  - b. SWPPP Certification for Municipality (F-109)
3. Use the following Municipality forms for recording information in the SWPPP:
  - a. SWPPP Amendment Log (F-114)
  - b. SWPPP Certification for Contractor (F-111)

- c. SWPPP Construction Site Inspection Report (F-100 parts 1 & 2)
- d. SWPPP Corrective Action Log (F-112)
- e. SWPPP Daily Record of Rainfall (F-115)
- f. SWPPP Delegation of Signature Authority Contractor (F-108)
- g. SWPPP Grading and Stabilization Activities Log (F-110)
- h. SWPPP Pre-Construction Site Visit (F-106)
- i. SWPPP Subcontractor Certification (F-105)
- j. SWPPP Training Log (F-125)

The forms are available on the municipal website, [www.muni.org](http://www.muni.org), under Project Management and Engineering Publications.

D. SWPPP Considerations and Contents

The SWPPP shall provide erosion and sediment control measures for all Construction Activity.

The SWPPP shall include the activities of the Contractor, all subcontractors, and utility companies performing Work. The SWPPP shall describe the roles and responsibilities of the Contractor, subcontractors, and utility companies with regard to implementation of the SWPPP.

The SWPPP shall identify all operators for the Project including utility companies performing Construction Activity and identify the areas over which each operator has operational control and where the Municipality and Contractor are co-operators.

The SWPPP shall include any material sites, waste disposal sites, borrow and fill sites, and equipment and material storage sites. If those sites are covered under a different permit or operated by a different entity, the Contractor shall provide the permit information and/or operational information as part of the SWPPP.

Contractor shall prepare the SWPPP according to the requirements of the CGP and this specification, including accounting for the Contractor's construction methods and phasing, and identifying the amount of mean annual precipitation.

Contractor shall include an Antidegradation Analysis in the SWPPP, if storm water from the Project discharges into a receiving water that is considered a high quality water and constitutes an outstanding national resource. The Municipality does not provide the analysis. The Contractor shall perform this analysis according to the CGP Part 2.1.6.

There are special requirements in the CGP Part 3.2, for storm water discharges into an impaired water body, which may include monitoring of storm water discharges. For projects meeting the permit criteria, the Contractor is responsible for compliance with the CGP Part 3.2 inside and outside the Project Zone.

Contractor shall preserve natural topsoil where possible. Contractor shall delineate the site in accordance with CGP Part 4.1. Contractor shall use stakes, flags, or silt fence, etc. to identify areas where land disturbing activities will occur and areas that will be left undisturbed. Contractor shall minimize the amount of soil exposed during Construction Activity in accordance with CGP Part 4.1.3.3.

Contractor shall conform to the dewatering requirements of CGP Part 4.4.

The SWPPP shall identify specific areas where potential erosion, sedimentation, or pollution may occur. The potential for wind erosion shall be addressed. The potential for erosion at drainage structures shall be addressed.

SWPPP shall include in the "Stabilize Soils" section, a description of how the Contractor will minimize the amount of disturbed and unstabilized ground in the fall season. Contractor shall identify anticipated dates of fall freeze-up and spring thaw. Contractor's SWPPP shall describe how the Contractor will stabilize areas when it is close to or past the seasonal time of snow cover or frozen conditions, and before the first seasonal thaw. Contractor's SWPPP shall include a plan for final stabilization. Plans for Active Treatment Systems shall be submitted to ADEC for review at least fourteen (14) days prior to their application and the Operator of the ATS identified in the SWPPP. Treatment chemicals shall be identified on the NOI.

The SWPPP shall provide designated areas for equipment and wheel washing, equipment fueling and maintenance, chemical storage, staging or material storage, waste or disposal sites, concrete washouts, paint and stucco washouts, and sanitary toilets. These activities shall be done in designated areas that are located, to the extent practicable, away from drain inlets, conveyance channels, and waters of the US. No discharges are allowed from concrete washout, paint and stucco washout; or from release oils, curing compounds, fuels, oils, soaps, and solvents. Equipment and wheel washing water may be treated and discharged.

Contractor shall implement temporary BMPs for a two- (2)-year, twenty-four- (24)-hour storm event. Contractor shall describe BMPs in the SWPPP and in SWPPP Amendments, including source controls, sediment controls, discharge points, and all temporary and permanent stabilization measures. Contractor's SWPPP shall describe the design, placement, installation, and maintenance of each BMP, using words and drawings as appropriate. Contractor shall provide a citation to the BMP Manual or publication used as a source for the BMP, including the title of the BMP Manual or publication, the author (individual or agency), and date of publication. If no published source was used to select or design a BMP, then the SWPPP or SWPPP amendment shall state that "No BMP manual or publication was used for this design."

Contractor shall describe the sequence and timing of activities that disturb soils and of BMP implementation and removal. Contractor shall phase earth disturbing activities to minimize unstabilized areas and to achieve temporary or final stabilization quickly. Whenever practicable, the Contractor shall incorporate final stabilization work into excavation, embankment and grading activities.

Contractor shall identify the inspection frequency in the SWPPP. At a minimum the inspection frequency shall be:

- at least once every seven (7) days during construction; or
- at least once every fourteen (14) days during construction and within twenty-four (24) hours of the end of a storm event of one-half inch (1/2") or greater rainfall in a twenty-four (24) hour period (one-half inch [1/2"] rainfall as recorded at the project site rain gauge)

The SWPPP shall cite and incorporate applicable requirements of the Project permits, environmental commitments, and commitments related to historic preservation. Make additional consultations or obtain permits as necessary for Contractor specific activities which were not included in the Municipality's permitting and consultation.

The SWPPP is a dynamic document. The Contractor shall maintain the SWPPP current by noting installation, modification, and removal of BMPs, and by using amendments, SWPPP amendment logs, Inspection Reports, corrective action logs, records of land disturbance and stabilization, and other records necessary to document storm water pollution prevention activities and to satisfy the requirements of the CGP and this specification.

E. Recording Personnel and Contact Information in the SWPPP

Contractor shall include records of the AK-CESCL cards or certificates for the Superintendent, SWPPP Manager, acting Superintendent and acting SWPPP Managers in the SWPPP.

Contractor shall provide twenty-four- (24)-hour contact information for the Superintendent and SWPPP Manager. The Superintendent and SWPPP Manager shall have twenty-four- (24)-hour contact information for all Subcontractor SWPPP Coordinators and Utility SWPPP Coordinators.

**Article 2.10 Hazardous Material Control Plan (HMCP) Requirements**

Contractor shall prepare the HMCP for prevention of pollution from storage, use, containment, cleanup, and disposal of hazardous material, including petroleum products related to construction activities and equipment. Contractor shall append the HMCP to the SWPPP. Contractor shall compile Material Safety Data Sheets (MSDS) in one location and reference that location in the HMCP.

HMCP shall designate a Contractor's Spill Response Field Representative and provide twenty-four- (24)-hour contact information. Contractor shall designate a Subcontractor Spill Response Coordinator for each Subcontractor. The Superintendent and Contractor's Spill Response Field Representative shall have twenty-four- (24)-hour contact information for each Subcontractor Spill Response Coordinator and the Utility Spill Response Coordinator.

HMCP shall list and provide the location and estimated quantities of hazardous materials (including materials or substances listed in 40 CFR 117 and 302, and petroleum products) to be used or stored on the Project. Hazardous materials shall be stored in covered storage areas. Contractor shall provide secondary containment for all hazardous material storage areas.

HMCP shall identify the locations where fueling and maintenance activities will take place and describe the activities and list controls to prevent the accidental spillage of petroleum products and other hazardous materials. Controls include placing absorbent pads or other suitable containment under fill ports while fueling and under equipment during maintenance or repairs.

HMCP shall use secondary containment under all stationary equipment (equipment that does not have a seat for driving) that contains petroleum products and use secondary containment under pumps, compressors, and generators.

HMCP shall list the types and approximate quantities of response equipment and cleanup materials available on the Project, including a list and location map of cleanup materials at each different work site and readily available off site (materials sources, material processing sites, disposal sites, staging areas, etc.). Spill response materials shall be stored in sufficient quantity at each work location, appropriate to the hazards associated with that site.

HMCP shall describe procedures for containment and cleanup of hazardous materials. Contractor shall describe a plan for the prevention, containment, cleanup, and disposal of soil and water contaminated by spills and a plan for dealing with contaminated soil and water encountered during construction. Contractor shall clean up spills or contaminated surfaces immediately.

HMCP shall describe methods of disposing of waste petroleum products and other hazardous materials generated by the Project, including routine maintenance. Contractor shall identify haul methods and final disposal areas and provide assurance that final disposal areas are permitted for hazardous material disposal.

HMCP shall describe methods of complying with the requirements of AS 46.04.010-900, Oil and Hazardous Substances Pollution Control, and 18 AAC 75, including contact information for reporting hazardous materials and petroleum product spills to the Project Engineer and reporting to federal, state and local agencies.

#### **Article 2.11 Spill Prevention, Control, and Countermeasure Plan (SPCC Plan) Requirements**

Contractor shall prepare and implement an SPCC Plan when required by 40 CFR 112 and when both of the following conditions are present on the Project:

- oil or petroleum products from a spill may reach navigable waters (as defined in 40 CFR 112); and
- total above ground storage capacity for oil and petroleum products is greater than one thousand, three hundred and twenty (1,320) gallons (not including onboard tanks for fuel or hydraulic fluid used primarily to power the movement of a motor vehicle or ancillary onboard oil-filled operational equipment, and not including containers with a storage capacity of less than fifty-five [55] gallons)

HMCP and SWPPP shall reference the SPCC plan.

#### **Article 2.12 Superintendent and SWPPP Manager Responsibility and Authority**

Contractor's superintendent is responsible for the overall operation of the Project and all Contractor-furnished sites and facilities directly related to the Project. The Superintendent shall sign and certify the SWPPP, Inspection Reports, and other reports required by the CGP except the NOI and NOT. The Superintendent may not delegate the task or responsibility of signing and certifying the SWPPP submitted under Article 2.4, Inspection Reports, and other reports required by the CGP.

The Superintendent may assign certain duties to the SWPPP Manager, which may include:

- ensuring Contractor's and subcontractor's compliance with the SWPPP and CGP;
- ensuring the control of erosion, sedimentation, or discharge of pollutants;
- directing and overseeing installation, maintenance, and removal of BMPs;

- performing Inspections; and
- updating the SWPPP including adding amendments and forms.

Contractor shall ensure that Superintendent and SWPPP Manager are knowledgeable in the requirements of this Section, the SWPPP, CGP, BMPs, HMCP, SPCC Plan, environmental permits, environmental commitments, and historic preservation commitments.

Contractor's Superintendent and SWPPP Manager shall have the complete authority and shall be responsible for suspending construction activities that do not conform to the SWPPP or CGP.

### **Article 2.13 Materials**

Contractor shall use:

- materials suitable to withstand hydraulic, wind, and soil forces, and to control erosion and trap sediments according to the requirements of the CGP and the Specifications.
- the temporary seed mixture specified by special provision or use annual rye grass if no temporary seed mix is specified.
- straw that is certified free of noxious weed by the United States Department of Agriculture (USDA), Natural Resources Conservation Service, Local Soil and Water Conservative District (NRCS). Alaska Weed Free Forage Certification Program shall be used when available. Hay may not be substituted for straw.

BMPs shall conform to the latest version of Municipality of Anchorage Storm Water Manual or as approved by the Engineer.

### **Article 2.14 Construction Requirements**

Contractor shall be familiar with the requirements of the CGP. Contractor shall fully comply with the SWPPP and the requirements of the CGP.

#### **A. Prior to Construction**

Contractor shall complete the following actions before construction activity begins:

1. the SWPPP Preparer shall visit the Project, the visit shall be documented in the SWPPP, and the SWPPP shall be developed (or amended) with findings from the visit;
2. the SWPPP shall be approved by the Engineer;
3. the Contractor shall be authorized to begin construction only by the Engineer;
4. the Project eNOIs for the Municipality and for the Contractor, as well as other eNOIs if there are additional operators, shall be listed as Active Status on the ADEC website before construction activity commences.
5. Contractor shall post notices on project site containing the following information:
  - Copy of all eNOIs related to this project;
  - Name and twenty-four- (24)-hour phone number of SWPPP Manager and Superintendent;
  - Location of the SWPPP.



6. Contractor shall prominently post notices on the outside wall of the Contractor's Project office and near the main entrances of the construction project. Postings shall be protected from the weather. Contractor shall locate postings so the public can read them without obstructing construction activities or the traveling public (for example, at an existing pullout). Do not use retro-reflective signs for the SWPPP posting. Do not locate SWPPP signs in locations where the signs may be confused with traffic control signs or devices. Contractor shall update the notices if the listed information changes.
7. Contractor shall install an outdoor rain gauge in accordance with manufacturer's guidance in a readily accessible location on the Project.
8. Contractor shall delineate the site for both ground disturbing activities and areas that will be left undisturbed and install sediment controls and other BMPs that shall be placed prior to the initiation of Construction Activity.

B. During Construction

1. Contractor shall ensure subcontractors understand and comply with the SWPPP and the CGP, and have signed a SWPPP Subcontractor Certification, Form F-105. Contractor shall include SWPPP Subcontractor Certifications as an appendix to the SWPPP. Contractor shall provide SWPPP information to utility companies and coordinate with Subcontractors and utility companies doing work in the Project Zone so that BMPs, including but not limited to, temporary and permanent stabilization, are installed, maintained, and protected from damage.
2. Contractor shall provide on-going training to employees and Subcontractors, on control measures at the site and applicable storm water pollution prevention procedures. Training shall be documented on the SWPPP Training Log Form F-125, including the dates and attendees to these trainings. Contractor shall include the SWPPP Training Log as an appendix to the SWPPP.
3. Contractor shall notify the Engineer immediately if the actions of any utility company or Subcontractor do not comply with the SWPPP and the CGP.
4. Contractor shall not install concrete washout containment within one hundred feet (100') of wetlands and/or other water bodies.
5. Contractor shall comply with requirements of the HMCP and SPCC Plan, and all local, state and federal regulations that pertain to the handling, storage, containment, cleanup, and disposal of petroleum products or other hazardous materials.
6. Contractor shall keep the SWPPP current (refer to Article 2.9.C SWPPP Considerations and Contents)

C. Pollutant and Hazardous Materials Reporting Requirements

Contractor shall immediately report incidents of non-compliance with the CGP that may endanger health or the environment to ADEC. Incident report shall conform to the CGP, Appendix A, Part 3.0. Contractor shall immediately notify the Engineer and coordinate reports to ADEC with the Engineer. The report shall include:

- a description of the noncompliance and its causes;
- the exact dates and times of noncompliance;

- if not yet corrected, the anticipated time the project will be brought back into compliance; and
- the corrective action taken or planned to reduce, eliminate and prevent re-occurrence.

Contractor shall report spills of petroleum products or other hazardous materials to the Engineer and other agencies as required by law. Contractor shall use the HMCP and SPCC Plan for contact information to report spills to regulatory agencies.

D. Corrective Action and Maintenance of BMPs

If a corrective action is not implemented within the time requirements of this Section, the Contractor shall document the situation in the SWPPP, notify the Engineer and immediately implement alternative BMPs.

1. Contractor shall implement maintenance of BMP's as required by the CGP, SWPPP, and manufacturer's specifications, whichever is more restrictive.
2. Contractor shall implement corrective action should any of the following occur:
  - a. if an incident of non-compliance with the SWPPP or CGP is identified;
  - b. if an Inspection identifies the SWPPP or any part of the SWPPP is ineffective in preventing erosion, sedimentation or the discharge of pollutants;
  - c. if the Engineer determines the SWPPP or any part of the SWPPP is ineffective in preventing the erosion, sedimentation, or the discharge of pollutants;
  - d. if any BMP is damaged, undercut, or unable to effectively perform the intended function;
  - e. before sediment or debris fills any BMP (including sediment traps, ponds and silt fences) to 50% of its design storage capacity (or manufacturer's specifications or SWPPP requirements, whichever is lower); or
  - f. whenever there is a change in conditions, design, construction, operation, or maintenance that could result in erosion, sedimentation, or the discharge of pollutants.
3. Contractor shall implement corrective actions so that the following time requirements are satisfied:
  - a. corrective action is completed as soon as possible;
  - b. corrective action is completed before the next storm event;
  - c. corrective action is completed in time to protect water quality; and
  - d. corrective action is completed no later than the Complete-by-Date that was entered in an Inspection Report (see Article 2.16 for more information).

E. Stabilization

Contractor shall stabilize disturbed areas using temporary or permanent BMP's. Contractor shall initiate stabilization of disturbed soils, erodible stockpiles, disposal sites, and of erodible aggregate layers so that all of the following conditions are satisfied:

- as soon as practicable;

- as soon as necessary to avoid erosion, sedimentation, or the discharge of pollutants;
- as identified in the SWPPP; and
- disturbed land or land surface shall be stabilized within fourteen (14) days after the temporary or permanent cessation of land-disturbing activities on a portion of the site, in accordance with the SWPPP.

Contractor shall coordinate work to minimize the amount of disturbed soil at any one time. Contractor shall not disturb more soil than the Contractor can stabilize with the resources available. Land which is disturbed multiple times during a project will require as necessary multiple stabilization efforts.

Contractor shall temporarily stabilize from wind and water erosion those portions of disturbed soils, portions of stockpiles, and portions of disposal sites that are not in active construction. Temporary stabilization measures may require a combination of measures including, but not limited to, vegetative cover, mulch, stabilizing emulsions, blankets, mats, soil binders, non-erodible cover, dust palliatives, or other approved methods.

Before applying temporary or permanent seeding, Contractor shall prepare the surface to be seeded to reduce erosion potential and to facilitate germination and growth of vegetative cover. Contractor shall apply seed, maintain seeded areas, and reseed areas where growth of temporary vegetative cover is inadequate to stabilize disturbed ground.

Contractor shall apply permanent seed, within the time periods required, at locations where seeding is indicated on the Drawings and after land-disturbing activity is permanently ceased.

When installing a culvert or other drainage structure where a stream bypass is not used, Contractor shall install temporary or permanent stabilization concurrently or immediately after placing the culvert or drainage structure in a manner that complies with the SWPPP, applicable project permits and prevents discharge of pollutants. Contractor shall install temporary and permanent stabilization:

- at the culvert or drainage structure inlet and outlet and
- in the areas upstream and downstream that may be disturbed by the process of installing the culvert, culvert end walls, culvert end sections, or drainage structure.

Before deactivating a stream bypass or stream diversion used for construction of a bridge, culvert, or drainage structure, the Contractor shall install permanent stabilization:

- at the inlet and outlet of the culvert, drainage structure, or bridge;
- in the area upstream and downstream of the culvert, drainage structure, or bridge, that is disturbed during installation or construction; and
- under the bridge.

F. Ending CGP Coverage and BMP Maintenance

The Engineer will determine the date that all the following conditions for ending CGP coverage have been met within the Project Zone based on, but not limited to, the following:

- land disturbing activities have ceased;
- Final Stabilization has been achieved (including at Municipality-furnished material sources, disposal sites, staging areas, equipment areas, etc.)
- temporary BMPs have been removed.

After the Engineer has determined the conditions for ending CGP coverage have been met, the Municipality will:

- provide written notice to the Contractor with the date that the conditions were met;
- submit an eNOT to ADEC; and
- provide a copy of the eNOT and ADEC's acknowledgement letter to the Contractor.

Contractor shall end permit coverage within the Project Zone by submitting an eNOT to ADEC within thirty (30) days of meeting the conditions for ending CGP coverage. The Contractor is responsible for BMP maintenance and SWPPP updates until permit coverage is ended.

If the Contractor's coverage includes areas where the Municipality is not an Operator, the Contractor may not be able to file an eNOT at the same time as the Municipality. In this case, the Contractor shall amend the SWPPP to remove the Municipality from CGP coverage and state that the Municipality is no longer an Operator within the Project Zone.

Contractor shall indicate in the SWPPP the areas that have reached Final Stabilization, the dates land disturbing activities ended, and the dates Final Stabilization was achieved. The Contractor shall submit an eNOT to ADEC and insert copies of the Municipality's and the Contractor's eNOTs with ADEC's acknowledgement letters in the appendix of the SWPPP.

Contractor shall submit a copy of each signed eNOT and ADEC's acknowledgement letter to the Municipality within thirty (30) days of receiving them.

G. Transmit final SWPPP

Contractor shall transmit one (1) copy of the final SWPPP, including all amendments and appendices, to the Engineer when the project eNOTs are filed, or within thirty (30) days of the Municipality's eNOT being filed, whichever is sooner. Transmittal shall be by both electronic and hard copy.

**Article 2.15 SWPPP Documents (Location on-site and Record Retention)**

Contractor shall maintain the SWPPP and related documents as the Record that demonstrates compliance with the CGP. Copies of SWPPP documents transmitted to the Engineer under the requirements of this specification are informational and do not relieve the Contractor of their responsibility to maintain complete records as required by the CGP and this Section.

Contractor shall maintain the SWPPP, HMCP and SPCC Plan at the on-site project office. If there is not an on-site project office, the Contractor shall maintain the documents at an onsite project location that meets CGP requirements and this specification. Records may be moved to another office for record retention during winter shutdown or after the eNOTs are filed. Contractor shall update on-site postings if records are relocated during winter shutdown. Contractor shall update and maintain all postings current and shall provide the Municipality with copies of all Records.

Contractor shall retain Records and a copy of the SWPPP for at least three years after the date of eNOT. If EPA or ADEC inspects the project, issues a Notice of Violation (NOV), or begins investigation for a potential NOV before the retention period expires, Contractor shall retain the SWPPP, and all Records related to the SWPPP and CGP until at least three (3) years after EPA and/or ADEC has determined all issues related to the investigation are settled.

The SWPPP and related documents shall be made available for review and copies provided to other regulatory agencies that request them. The project site documents, including related off-site areas or support activities, shall be made available for inspection, or sampling and monitoring, by the Municipality and other regulatory agencies.

#### **Article 2.16 SWPPP Inspections, Amendments, Reports, and Logs**

Contractor shall perform inspections, prepare inspection reports, and prepare SWPPP Amendments in compliance with the SWPPP and the CGP. Contractor shall update the SWPPP Corrective Action Log, SWPPP Amendment Log, SWPPP Grading and Stabilization Activities Log, and SWPPP Daily Record of Rainfall forms. For active projects the Contractor shall update the Records daily.

##### **A. Inspection during Construction**

Contractor shall conduct periodic inspections according to the schedule and requirements of the SWPPP and CGP.

Inspections required by the CGP and SWPPP shall be performed jointly by the Contractor's SWPPP Manager and the Municipality's inspector.

##### **B. Inspection Reports**

Contractor shall use the Municipality's SWPPP Construction Site Inspection Report Form F-100 to record Inspections. Changes or revisions to Form F-100 are not permitted; except for adding or deleting data fields that list the location of discharge points and site specific BMPs. Contractor shall complete all fields included on the Inspection Report form; do not leave any field blank.

Unless otherwise directed by the Engineer, Contractor shall insert a Complete-by-Date for each listed corrective action. Complete-by-date is a date that either complies with the time requirements listed in Article 2.16.D or six (6) calendar days after the date of the inspection, whichever is sooner. Contractor shall provide a copy of the completed Inspection Report to the Engineer by noon of the day after inspection.

The Superintendent shall review, correct errors, and sign and certify the Inspection Report, within three days of the date of Inspection. The Engineer may coordinate with the Superintendent to review and correct errors or omissions before the

Superintendent signs the report. Corrections are limited to adding missing information or correcting entries to match field notes and conditions present at the time the Inspection was performed. Contractor shall deliver the signed and certified Inspection Report to the Engineer on the same day the Superintendent signs it.

The Engineer may make corrections after the Superintendent has signed and certified the Inspection Report. The Engineer will initial and date each correction. If the Engineer makes corrections, the Superintendent shall re-certify the Inspection Report by entering a new signature and date in the white space below the original signature and date lines. Contractor shall deliver a copy of the recertified Inspection Report to the Engineer on the day it is recertified.

If subsequent corrections to the certified Inspection Report are required, Contractor shall document the corrections in an addendum that addresses only the omitted or erroneous portions of the original Inspection Report. The Superintendent shall sign and certify the addendum.

C. Inspection before Seasonal Suspension of Work

Contractor and the Municipality shall conduct an inspection not more than fourteen (14) days before seasonal suspension of work to confirm BMPs are installed and functioning according to the requirements of the SWPPP and CGP.

D. Reduced Inspection Frequencies

Contractor shall conduct inspections according to the inspection schedule in the approved SWPPP. Changes in inspection frequency, including beginning and ending dates shall be approved by the Engineer, and documented as an amendment to the SWPPP.

Inspection frequency during winter work or seasonal suspension of work may be reduced to at least one Inspection every thirty (30) days, if approved by the Engineer, and one of the following requirements is met:

- the entire site is temporarily stabilized;
- runoff is unlikely due to winter conditions (e.g., the site is covered with snow, ice or the ground is frozen, and water flow or seepage is not likely to occur); or
- soil disturbing activities are suspended.

The Engineer may waive winter monthly Inspection requirements until twenty-one (21) days before thawing conditions are expected to result in a discharge, if the following requirements are met:

- frozen conditions are anticipated to continue for more than one month; and
- land disturbance activities have been suspended.

Inspections shall resume according to the normal inspection schedule identified in the SWPPP, at least twenty-one (21) days before anticipated spring thaw.

The Engineer may waive requirements for updating the Grading and Stabilization Activities Log and Daily Record of Rainfall during seasonal suspension of work. If so, Contractor shall resume collecting and recording weather data on the Daily Record of Rainfall form one month before thawing conditions are expected to result in runoff. The

Contractor shall resume recording land disturbance and stabilization activities on the Grading and Stabilization Activities Log when Construction Activity resumes.

E. Stabilization before Spring Thaw

Construction Activities within the Project Zone shall be stabilized in accordance with the CGP by the Contractor with appropriate BMPs prior to spring thaw.

F. Inspection before Project Completion

Contractor shall conduct an inspection to ensure Final Stabilization is complete throughout the Project, and temporary BMPs that are required to be removed are removed. Temporary BMPs that are biodegradable and are specifically designed and installed with the intent of remaining in place until they degrade, may remain in place after project completion.

G. Items and Areas to Inspect

Contractor shall conduct inspections of the areas required by the CGP and SWPPP.

H. SWPPP Amendments and SWPPP Amendment Log

The Superintendent and the SWPPP Manager are the only persons authorized to amend the SWPPP and update the SWPPP Amendment Log, Form F-114. The Superintendent or the SWPPP Manager shall sign and date amendments to the SWPPP and updates to the SWPPP Amendment Log.

SWPPP Amendments shall be approved by the Engineer.

Amendments shall be prepared whenever:

- there is a change in design or construction operation;
- maintenance occurs at the construction site that has or could cause erosion or sedimentation;
- there is a discharge of pollutants that has not been previously addressed in the SWPPP;
- an Inspection identifies that any portion of the SWPPP is ineffective in preventing erosion, sedimentation, or the discharge of pollutants;
- an Inspection identifies a problem that requires additional or modified BMPs;
- a BMP is modified during construction, or a BMP not shown in the original SWPPP is added;
- the Inspection frequency is modified (note beginning and ending dates); or
- a change occurs in personnel who are identified in the SWPPP, according to Article 2.9.D.

Contractor shall record removal of BMPs as amendments to the SWPPP. See Article 2.9.C for documenting removal of BMPs.

Contractor shall amend the SWPPP narrative as soon as practicable after a change or modification, but in no case, later than seven (7) days following identification of the need for an amendment. The SWPPP Amendment shall be signed, dated, and cross-reference the amendment number with the Corrective Action Log or SWPPP page number, as applicable. When a BMP is modified or added, describe the BMP according to Article 2.9.C.

The Contractor shall maintain the SWPPP Amendment Log. Prior to performing each scheduled Inspection, the Contractor shall submit to the Engineer a copy of the pages of the Amendment Log that contain new entries since the last submittal, including copies of any documents amending the SWPPP.

The Contractor shall append the SWPPP Amendment Log to the SWPPP.

I. Site Maps

Contractor shall document installation, routine maintenance and removal of BMPs by annotating the SWPPP Site Maps, including the date and the recording person's initials by these notes. Contractor shall identify areas where Construction Activities begin, areas where Construction Activities temporarily or permanently cease, and areas that are temporarily or permanently stabilized.

J. Corrective Action Log

The Superintendent and SWPPP Manager are the only persons authorized to make entries on the SWPPP Corrective Action Log, Form F 112. Contractor shall document the need for corrective action within twenty-four (24) hours of either:

- identification during an inspection; or
- discovery by the Municipality's or Contractor's staff, a subcontractor, or a regulatory agency inspector.

Modification or replacement of a BMP, installation of a new BMP not shown in the original SWPPP, or overdue maintenance (for example after a sediment trap exceeds fifty percent [50%] of capacity) is a corrective action and shall be documented on the Corrective Action Log. Do not record removal of BMPs on the Corrective Action Log.

After each Inspection Report has been signed and certified, Contractor shall update the Corrective Action Log with the date of inspection and all proposed corrective actions noted on the Inspection Report.

After the corrective action has been accomplished, the Contractor shall note the action taken if a SWPPP amendment was needed and date and initial the entry.

Contractor shall maintain the Corrective Action Log current and submit a copy to the Engineer prior to performing each scheduled SWPPP Inspection.

Contractor shall append the Corrective Action Log as an appendix to the SWPPP.

K. Grading and Stabilization Activities Log

The Superintendent and SWPPP Manager are the only persons authorized to date and initial entries on the SWPPP Grading and Stabilization Activities Log, Form F-110. Contractor shall use the SWPPP Grading and Stabilization Activities Log to record land disturbance and stabilization activities.

Contractor shall keep the Grading and Stabilization Activities Log current and submit a copy to the Engineer prior to performing each scheduled SWPPP Inspection.

Contractor shall append the Grading and Stabilization Activities Log as an appendix to the SWPPP.



#### L. Daily Record of Rainfall

Contractor shall use SWPPP Daily Record of Rainfall, Form F-115 to record weather conditions at the Project and update the form daily, including the initials of the person recording each day's entry. Contractor shall submit a copy to the Engineer prior to performing each scheduled Inspection. Contractor shall append the Daily Record of Rainfall to the SWPPP.

#### **Article 2.17 Failure to Perform Work**

The Engineer will suspend Work and withhold monies for incidents of non-compliance with either the CGP or SWPPP. If the suspension is to protect workers, the public, or the environment from imminent harm, the Engineer may orally order the suspension of Work. Following an oral order of suspension, the Engineer will promptly give written notice of suspension. In other circumstances, the Engineer will give the Contractor written notice of suspension before suspension of Work. A notice of suspension will state the defects or reasons for a suspension, the corrective actions required to stop suspension, and the time allowed to complete corrective actions. If the Contractor fails to take the corrective action within the specified time, the Engineer may:

1. suspend the work until corrective action is completed;
2. withhold monies due the Contractor until corrective action is completed;
3. assess damages or equitable adjustments against the Contract amount; and
4. employ others to perform the corrective action and deduct the cost from the Contract amount.

Reasons for the Engineer to act under this section include, but are not limited to, the Contractor's failure to:

- obtain appropriate permits before Construction Activities occur;
- perform SWPPP Administration;
- perform timely Inspections;
- update the SWPPP;
- transmit updated SWPPP, Inspection Reports, and other updated SWPPP forms to the Engineer;
- maintain effective BMPs to control erosion, sedimentation, and pollution in accordance with the SWPPP, the CGP, and applicable local, state, and federal requirements;
- perform duties according to the requirements of this Section; or
- meet requirements of the CGP, SWPPP, or other permits, laws, and regulations related to erosion, sediment, or pollution control.

No additional Contract time or additional compensation is allowed due to delays caused by the Engineer's suspension of Work under this Article.

#### **Article 2.18 Measurement**

The Work in this Section is measured by lump sum and will consist of all labor, materials, and equipment required to prepare and implement a SWPPP, including all required SWPPP amendments, revisions, inspections, and all other measures necessary to complete the Work.

**Article 2.19 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Storm Water Pollution Prevention Plan (Type)	Lump Sum

## **SECTION 20.03 EXPLORATORY TEST PITS**

### **Article 3.1 General**

Work under this Section consists of furnishing an excavator, operator, and all related supplies in order to dig and fill exploratory test pits as directed by the Engineer prior to the commencement of construction activities.

### **Article 3.2 Materials**

Contractor shall furnish an excavator capable of excavating to a minimum depth of twelve feet (12').

### **Article 3.3 Construction**

Contractor shall excavate as directed by the Engineer. After inspection of the test pit is complete, Contractor shall backfill test pits with native material and compact them so that the ground is returned to its original condition. If directed by the Engineer, Contractor shall segregate the cast piles to avoid contamination.

### **Article 3.4 Measurement**

Work performed under this Section is measured by the cost per hour for all personnel, equipment, and supplies necessary for completion of said Work. Down time or delays caused by equipment failure is included in the measurement and no additional payment will be made.

### **Article 3.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Exploratory Excavation	Hour

## **SECTION 20.04 CLEARING AND GRUBBING**

### **Article 4.1 General**

The Work under this Section consists of removing all vegetation, brush, trees, logs, stumps, roots, root mat, and other objectionable material to a Contractor-provided disposal site, and the preservation from damage of all items designated to remain. Limits of clearing and grubbing shall be in conformance with right-of-way easements, and stipulations, and as shown on the Drawings, staked by the Contractor, and approved by the Engineer.

### **Article 4.2 Construction**

The Contractor shall do all clearing and grubbing necessary in the construction of roadways, bike trails, and utilities. Prior to clearing and grubbing, the Contractor shall stake the clearing limits. The Contractor shall remove all vegetation including, but not limited to trees, shrubs, brush, vines, logs, limbs; stumps, ground vegetative cover, roots, and root systems; organic-laden topsoil; human-generated trash, rubbish, litter, debris, rubble, etc.; and any other objectionable or deleterious items designated by the Engineer. Tree pruning shall be done by an International Society of Arboriculture (ISA) Certified Arborist in accordance with ANSI A300. Materials removed in the clearing, and grubbing operations shall be hauled to a disposal site provided by the Contractor as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

Any areas designated to remain shall be protected per Division 75, Section 75.02, Article 2.3 – Construction. The Contractor shall protect migratory bird habitat in compliance with the Migratory Bird Treaty Act of 1918 located at <https://www.fws.gov/law/migratory-bird-treaty-act-1918>. Additionally, Contractor shall notify the Engineer immediately if any active nests are found at any time during construction of the project.

### **Article 4.3 Measurement**

The measurement of clearing and grubbing shall be by the acre or portion thereof as shown on the Drawings and staked by the Contractor and approved by the Engineer, or lump sum.

### **Article 4.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Clearing and Grubbing	Acre
Clearing and Grubbing	Lump Sum

## **SECTION 20.05 CLEARING**

### **Article 5.1 General**

The Work under this Section consists of clearing the areas shown on the Drawings, staked by the Contractor, and approved by the Engineer of vegetation and other objectionable material, and removal to a Contractor-provided disposal site, and the preservation from damage of all items designated to remain.

### **Article 5.2 Construction**

The Contractor shall remove all woody materials including, but not limited to trees, shrubs, brush, vines, logs, and limbs; human-generated trash, rubbish, litter, debris, rubble, etc.; and any other objectionable items designated by the Engineer using methods that preserve ground vegetation cover, root systems, and organic-laden topsoil. Tree pruning shall be done by an International Society of Arboriculture (ISA) Certified Arborist in accordance with ANSI A300. Tree trunks and woody stems greater than one-half inch (1/2") in diameter shall be cut off at a maximum height of two inches (2") above of the mineral soil surface. Herbaceous plants, such as moss, grass and grass-like plants, forbs, ferns, etc. and woody stems one-half inch (1/2") and less shall be cut or mowed to a maximum height of four inches (4") above the ground vegetation cover. Areas designated to remain shall be protected in accordance with Division 75, Section 75.02, Article 2.3 – Construction. The Contractor shall protect migratory bird habitat in compliance with the Migratory Bird Treaty Act of 1918 located at <https://www.fws.gov/law/migratory-bird-treaty-act-1918>. Additionally, Contractor shall notify the Engineer immediately if any active nests are found at any time during construction of the project.

All material removed in the clearing operation shall be hauled to a disposal site provided by the Contractor as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites. With prior approval of the Engineer, chipping may be an acceptable alternate to clearing and hauling away of spoils.

#### **A. Clearing for Multi Use Paths**

Overhanging limbs shall be pruned to provide a three-foot (3') clear corridor on both sides of the pathway with a ten-foot (10') clearance above finished trail. Where filter fabric is specified, the stumps shall be removed completely or ground to a minimum of six inches (6") below the soil surface and backfilled with the appropriate material.

#### **B. Clearing for Sidewalks/Curb Ramps**

Contractor shall prune overhanging limbs and other vegetation to provide full clearance of the sidewalk to a minimum height of ten feet (10') above and a minimum width of two feet (2') from the outside edges of the sidewalk, unless otherwise specified on the Drawings or directed by the Engineer.

### **Article 5.3 Measurement**

Measurement of clearing shall be by the acre or portions thereof, as shown on the Drawings and staked by the Contractor, or lump sum. Measurement of clearing for multi-use paths, sidewalks, and curb ramps shall be by linear feet along the centerline of the improvement.

**Article 5.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Clearing	Acre
Clearing	Lump Sum
Clearing for Bike Trail/Sidewalk/Curb Ramp	Linear Foot

## **SECTION 20.06      REMOVAL OF TREES**

### **Article 6.1    General**

The Work under this Section consists of the performance of all operations pertaining to the removal and disposal of trees nine and one-half inches (9½”) or greater in diameter measured at Diameter Breast Height (DBH) taken at four and one-half feet (4½’) above the lowest soil line. This item will not be a pay item if Clearing or Clearing and Grubbing is included in the Bid Schedule.

### **Article 6.2    Construction**

Contractor shall dispose of trees, including stumps, of the size described above which interfere with construction under this Contract at a Contractor provided disposal site as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

The Contractor shall protect migratory bird habitat in compliance with the Migratory Bird Treaty Act of 1918 located at <https://www.fws.gov/law/migratory-bird-treaty-act-1918>. Additionally, Contractor shall notify the Engineer immediately if any active nests are found at any time during construction of the project.

Removal and disposal of all trees, including stumps, less than nine and one-half inches (9½”) DBH will be considered an incidental part of the excavation unless either the pay items Clearing and/or Clearing and Grubbing are included in the Bid Schedule.

### **Article 6.3    Measurement**

Measurement for tree removal shall be per tree removed in the size range described.

### **Article 6.4    Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Tree Removal	Each

## **SECTION 20.07      REMOVAL OF P.C.C. SIDEWALK AND APRON**

### **Article 7.1    General**

The Work under this Section consists of performing all operations pertaining to the removal and disposal of Portland cement concrete (P.C.C.) sidewalks and aprons designated for removal, including wire mesh or steel reinforcement within the concrete sidewalk and apron, in accordance with the limits shown on the Drawings or as directed by the Engineer.

### **Article 7.2    Construction**

P.C.C. sidewalks or aprons to be removed shall be saw cut or broken at a joint. Broken joints shall be finished, as required by the Engineer, to eliminate jagged edges. The Contractor shall dispose of this material at a Contractor-provided disposal site as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

### **Article 7.3    Measurement**

P.C.C. sidewalk and apron designated for removal will be measured in square yards regardless of thickness.

### **Article 7.4    Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Remove P.C.C. Sidewalk	Square Yard
Remove P.C.C. Apron	Square Yard



## **SECTION 20.08 REMOVAL OF CURB AND GUTTER**

### **Article 8.1 General**

The Work under this Section consists of performing all operations pertaining to the removal and disposal of existing Portland cement concrete (P.C.C.) curb and gutter designated for removal, including any wire mesh or steel reinforcement within the curb and gutter, in accordance with the limits shown on the Drawings or as directed by the Engineer.

### **Article 8.2 Construction**

P.C.C. curb and gutter to be removed shall be saw cut or broken at a joint. Broken joints shall be finished, as required by the Engineer, to eliminate jagged edges. The Contractor shall dispose of removed curb and gutter at a Contractor-provided disposal site as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

### **Article 8.3 Measurement**

P.C.C. curb and gutter removal designated for removal will be measured in linear feet removed, measured along the face of the curb.

### **Article 8.4 Basis of Payment**

Payment for this item shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Remove P.C.C. Curb and Gutter	Linear Foot

## **SECTION 20.09      REMOVAL OF ASPHALT CEMENT PAVEMENT**

### **Article 9.1    General**

The Work under this Section consists of performance of all operations pertaining to the removal and disposal of existing asphalt cement pavement (A.C.P.) in accordance with the limits indicated on the Drawings and as directed by the Engineer.

The Contractor will remove existing A.C.P. (parking areas, driveways, etc.) within the right-of-way to a line one foot (1') back of the proposed improvements during the initial clearing/excavation operations. Further removal will be as directed by the Engineer in order to provide a proper transition between new and existing pavement. The intent is to minimize unnecessary removal of pavement.

The Contractor shall remove all A.C.P. designated for removal, including asphalt pavement placed within the gutter pan. Removal of pavement within the gutter pan shall be considered incidental to the bid item "Remove A.C.P." and no separate payment shall be made.

### **Article 9.2    Construction**

A.C.P. shall be removed by the Contractor in a manner that will produce a straight, uniform edge along the section removed. The method of producing the straight edge shall be by cutting the section with an air chisel, wheel, power-driven saw, or other methods approved by the Engineer.

Contractor shall dispose of removed pavement in accordance with Division 10, Section 10.04, Article 4.9 – Disposal Sites.

### **Article 9.3    Measurement**

A.C.P. removed will be measured by the square yard of pavement designated for removal, regardless of thickness, except that no measurement will be made of pavement less than one inch (1") thick.

### **Article 9.4    Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Remove A.C.P.	Square Yard

## **SECTION 20.10 GENERAL EXCAVATION**

### **Article 10.1 General**

The Work under this Section consists of furnishing all plant, labor, equipment, supplies, and material in performance of all operations pertaining to the excavation of suitable, unsuitable, and surplus material for streets, alleys, access roads, parking lots, sidewalks, curbs, gutters, pathways, trails, utility lines and other improvements.

Additional excavation may be required when authorized in writing by the Engineer. Contractor shall not be entitled to additional compensation for performing excavation not previously authorized by the Engineer.

### **Article 10.2 Survey Stakes**

Excavation limits shall be shown on the Drawings and staked in the field. The Contractor shall place control stakes on each side of, and beyond the limits of, the proposed excavation. Stakes will be set at grade breaks and on even grades at intervals not to exceed fifty feet (50'), with additional stakes on vertical curves. These shall be marked with the station, offset, and show the cut or fill to centerline or grid design grade.

### **Article 10.3 Miscellaneous**

Public property lying within the right-of-way, such as signs and markers, that interferes with construction shall be removed and reset at the time and place as directed by the Engineer. Any damage by the Contractor shall be repaired or the item replaced in kind at the Contractor's expense.

The work required to remove insulation board, geotextile fabric, warning tape, or other inclusions as shown on the Drawings or found during excavation shall be incidental to the cost of the Contract.

Contractor shall remove culverts designated for salvage. Contractor shall deliver salvaged culverts to the location specified in the Contract Documents or as directed by the Engineer.

A disposal site for non-salvageable materials shall be provided by the Contractor per Division 10, Section 10.04, Article 4.9 – Disposal Sites

All existing valve boxes, cleanouts, manholes, etc. shall be located and exposed by the Contractor and carefully protected during the course of the Work. The Contractor, in conjunction with the Engineer, shall check all utilities prior to the start of the construction and record their condition. All manholes, catch basins, cleanouts, etc. will be checked for damage resulting from the Contractor's operation prior to final acceptance by the Owner. The Contractor is responsible for restoring all existing utilities to pre-existing conditions and shall coordinate with the affected utility in having any necessary repairs completed.

All existing utilities requiring adjustment to grade shall be adjusted by the Contractor in accordance with the applicable Standard Details. Payment for such adjustment shall be as specified under the applicable Section of these Specifications.

### **Article 10.4 Excavation**

The Contractor shall utilize whatever methods and equipment necessary to excavate to the limits designated by the Drawings and Specifications and authorized by the Engineer, except that no equipment or method may be utilized that because of its action deteriorates

the subgrade making additional excavation necessary beyond the limits originally authorized.

Additional excavation required due to the presence of unsuitable materials, must be authorized in writing by the Engineer. Contractor shall not be entitled to additional compensation for performing excavation not previously authorized by the Engineer. The Contractor shall be responsible for any and all costs resulting from unauthorized over-excavation, including the need for additional backfill beyond the maximum pay limits as shown on the Drawings or described herein. In addition, the Contractor shall be responsible for all costs and time required for the repair or replacement of streets, alleys, driveways, buildings, sidewalks, pathways, curb and gutter, drainage patterns, gravel pads, fences, lawns, property corner markers, survey monumentation, street name signs, traffic control signs, light poles, trees, utilities, shrubbery, gardens, retaining walls, utility markers, rockeries, landscaping, or other public or private improvements damaged by the Contractor which are located outside of the horizontal limits defined above.

The cost of repairing damage or replacing such facilities within the horizontal pay limits shall be included as part of the unit price for the pay item under construction or shall otherwise be considered incidental to the Contract.

The Contractor shall provide and maintain adequate barricades to insure public safety at all times during the prosecution of the Work. The Contractor shall erect and maintain continuous barricades around all excavations left open at the end of the workday.

#### **Article 10.5 Usable and Unusable Excavation**

Usable excavation shall consist of non-organic material that is designated by the Engineer as suitable for use as fill or backfill. If usable soil conditions are encountered at elevations different from those indicated on the Drawings, the Engineer may direct, in writing, that the excavation be altered to elevations either above or below those specified usable excavation conforming to the requirements of bedding, foundation material, classified fill and backfill, or unclassified fill and backfill designated for reuse by the Engineer shall be placed in an orderly manner, stockpiled separate from each other, and placed at a distance from the excavation which conforms to all state and/or federal safety codes. Undeveloped or vegetated surfaces used for stockpiling usable excavation shall be first covered with a geotextile fabric to prevent contaminating stockpiled materials.

Unusable excavation shall consist of all excavation which is not suitable for use as fill or backfill, including but not limited to organic-laden soil, peat, roots, large rocks, boulders, mud, muck, cesspools, privy pits, and other objectionable materials, as determined by the Engineer. When clearing and grubbing of stumps, ground vegetative cover, roots, root systems; organic-laden topsoil, human-generated trash, debris, or other objectionable materials is not required elsewhere on the Drawings or Specifications, unusable excavation shall include these materials. The Contractor shall use care in separating unusable excavation from usable excavation.

Where rock or permafrost is encountered, it shall be removed from the excavation, as shown on the Drawings or as directed by the Engineer and shall be replaced with suitable materials. Rock and permafrost may be usable or unusable, as determined by the Engineer.

Any unauthorized excavation beyond the specified lines, grades, and cross sections shall be replaced with classified backfill and compacted without additional cost to the Owner. The Contractor shall control the banks of all excavated areas as necessary to prevent movement of soil in areas supporting existing foundations, slabs, poles, or other structures.

Where unusable materials are encountered in the subgrade at the specified depth below finish grade as indicated on the Drawings, the Contractor shall excavate to a depth such that usable soils are uncovered, or the depth below finished grade as directed by the Engineer. The excavation shall be uniformly shaped so that classified backfill material can be properly placed and compacted. When not limited by right-of-way boundaries or other constraints, excavation walls shall be sloped at an inclination of ten horizontal to one vertical (10H:1V), or as indicated on the drawings to blend into adjoining areas of suitable material. Excavated area shall not be backfilled until cross sectional elevations and measurements of the area excavated have been taken.

The Contractor shall be responsible for keeping all embankments and excavations well shaped and drained. The subgrade shall be maintained, compacted in cut sections if required, and kept free of organic matter and other debris.

The Contractor shall perform whatever work necessary to prevent flow and accumulation of surface water or ground water in excavations. Unless otherwise provided in the Special Provisions, all Work associated with pumping or dewatering shall be considered incidental to the Contract and no separate payment shall be made.

#### **Article 10.6 Utilization of Usable Excavated Material**

Usable excavation conforming to the specifications for bedding in accordance with Section 20.16 – Furnish Bedding Material, foundation material in accordance with Section 20.19 – Furnish Foundation Backfill, or classified fill and backfill in accordance with Section 20.21 – Classified Fill and Backfill shall be used as such where practical, as directed by the Engineer. Usable excavation not conforming to any of the listed sections shall be treated and managed in accordance with Section 20.20 – Unclassified Fill and Backfill. All usable excavation remaining on site shall be compacted in accordance with Section 20.01, Article 1.5 – Compaction Standards. Usable excavation not used on the project site, shall be treated as unusable excavation.

#### **Article 10.7 Disposal of Unusable Material**

Unusable excavation shall be hauled to a Contractor-furnished disposal site as delineated in Division 10, Section 10.4, Article 4.9 – Disposal Sites. Unless otherwise specified in the Special Provisions, the Contractor will not be required to transport usable excavation from one schedule of a Contract for use in another schedule of the same Contract unless they are continuous or adjacent.

If onsite sewage systems, such as septic tanks, cesspools, and privies are encountered within the limits of the project site and must be removed to allow for construction, the following procedures are to be used. Liquid sewage and sludge from the sewage system shall be pumped into a watertight container and disposed of at a location designated by AWWU for such purposes. In addition, all holding tanks, vaults, and other storage facilities shall be thoroughly rinsed and the rinse water pumped into a watertight container prior to

moving or removing the tank, vault or facility. Care shall be exercised in transporting liquid and sludge so that spillage does not occur during transportation and disposal.

If a tank, privy, or other improvement is to be salvaged, the Contractor shall carefully remove the item from the right-of-way area and set the item onto the private property serviced by the item, taking care to not damage the item. The Contractor shall excavate and remove all nonsalvageable improvements, any remaining sludge, pit logs, cribbing, drain field pipe, and overly wet or organic-laden gravel and soil from within the construction limits and shall dispose of these materials at the Municipal Landfill. Disposal of these materials will be coordinated with the Engineer, in order that the materials disposed of can be covered with material by others at the landfill site immediately after they have been dumped. Care shall be exercised in transporting this material so that spillage does not occur during transportation and disposal.

### **Article 10.8 Measurement**

The measurement of general excavation will not include water or other liquids but will include topsoil, mud, muck, or other similar semi-solid material which cannot be drained or pumped away.

Usable excavation will be measured per cubic yard by cross section or at the option of the Engineer per cubic yard by truck count. Cross-section measurement of usable or excavation shall be based on in-place volumes as determined by the average end areas of cross sections. Computation of truck volumes will be by actual weight measurement to arrive at truck loading, multiplied by an appropriate conversion factor as approved by the Engineer.

Unusable excavation will be measured per cubic yard by cross section or at the option of the Engineer per cubic yard by truck count. Cross-section measurement of unusable excavation shall be based on in-place volumes as determined by the average end areas of cross sections. Computation of truck volumes will be by actual weight measurement to arrive at truck loading, multiplied by an appropriate conversion factor as approved by the Engineer.

All work associated with removing and disposing of onsite sewage systems shall be considered as unusable excavation and no separate measurements will be made.

When rock or permafrost is encountered, it will be measured as stated above.

For all weight-measured quantities, the Contractor shall furnish a scale certified by the State of Alaska for weighing excavation at a location agreeable to the Engineer. Weight tickets will be serialized and witnessed at the time of weighing by a Contractor-furnished weighmaster. The Engineer may at any time verify load weights and weighing process. Tickets shall be presented for each load at time of delivery to the Engineer or their designated representative.

### **Article 10.9 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for usable excavation includes the costs of subsequent placement and compaction of the excavated material and shall not be paid separately as Classified or Unclassified Fill

and Backfill. Payment for unusable excavation includes removal from the project site and disposal.

Payment for rock or permafrost excavation includes all costs of subsequent placement within the project site or removal from the site and disposal.

Payment shall be made under the following unit:

ITEM	UNIT
Usable Excavation Placed as Classified Fill and Backfill	Cubic Yard
Usable Excavation Placed as Unclassified Fill and Backfill	Cubic Yard
Rock Excavation Reused or Removed	Cubic Yard
Permafrost Excavation Reused or Removed	Cubic Yard
Unusable Excavation Removed from Site	Cubic Yard

## **SECTION 20.11 GRADING EXISTING SURFACES**

### **Article 11.1 General**

The Work under this Section consists of performing all operations necessary to shape the existing ground prior to placement of fill, backfill, or surfacing material.

### **Article 11.2 Construction**

To the extent indicated on the Drawings, and as directed by the Engineer, the Contractor shall grade the existing ground. Usable excavation removed from high areas shall be placed as fill or backfill in depressions. Where the existing ground has a slope greater than four horizontal to one vertical (4H:1V), the surface of such ground shall be plowed, stepped or broken up in such a manner that graded material will blend with the existing surface.

On trails, the graded material shall be compacted to ninety percent (90%) of the maximum density to a minimum depth of twelve inches (12"). For roads, the required compaction shall be ninety-five percent (95%) of the maximum density to a minimum depth of twelve inches (12").

Water shall be added to graded material that is too dry to be adequately compacted until the moisture content is within the optimum range for compaction. Material shall be scarified, tilled, and mixed as needed to create uniform moisture conditions throughout. Graded material that is too wet to be adequately compacted shall be scarified, tilled, mixed, and aerated by means of blade graders, harrows, or other suitable equipment until the moisture content is within the optimum range for compaction.

When the bid item is "Grading Existing Surfaces", no separate payment will be made for "Usable Excavation".

### **Article 11.3 Measurement**

Measurement for grading shall be per lineal foot along the centerline of the constructed trail or roadway.

### **Article 11.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Grading Existing Surfaces	Linear Foot



## **SECTION 20.12 DEWATERING**

### **Article 12.1 General**

The Work under this Section consists of performing all work and operations pertaining to the dewatering of Work areas, including diversion of surface and subsurface water flows, to provide a dry and stable environment throughout the project for excavation, backfill, and trench Work.

### **Article 12.2 Materials**

Contractor is responsible for preparing, obtaining approval of, and implementing the Dewatering Plan. The Contractor shall provide all equipment, materials, and personnel necessary to prepare and implement the Dewatering Plan; and to provide a dry and stable construction environment throughout the project.

### **Article 12.3 Construction**

Design, installation, and operation of dewatering systems shall comply with current safety and environmental regulations.

The Contractor shall submit their Dewatering Plan to the Engineer a minimum of seven (7) days prior to beginning dewatering activities. The Dewatering Plan shall contain copies of all Contractor obtained permits and approvals. When dewatering approval is required by ADEC, the Contractor shall submit a copy of the approved dewatering plan to the Engineer. Dewatering activities shall not commence until the Engineer has approved the Plan.

Acceptance of Contractor's Dewatering Plan by the Engineer shall not relieve the Contractor of responsibility for the exercise of reasonable precaution, sound engineering judgment, prudent construction practices, overloading or misuse of existing or new structures, the adequacy and safety of such Works, and potential damage or undermining of existing or completed Work. Acceptance of the Dewatering Plan by the Engineer does not relieve the Contractor of the responsibility for providing additional Dewatering Work if implementation of the accepted Dewatering Plan does not result in a dry and stable construction environment throughout the project.

Water resulting from Contractor's dewatering effort may not be pumped or otherwise diverted into existing storm drains unless required permits, including, but not limited to, the Alaska Department of Environmental Conservation and Environmental Protection Agency, are obtained by Contractor. Under no circumstances will Contractor be allowed to divert water from the excavation onto roadways. Contractor shall provide disposal site for excess water and shall be responsible for securing all necessary permits and approvals. Contractor shall provide copies of permits and approvals to the Engineer.

The Contractor shall dispose of all water from trench dewatering in accordance with the Municipality of Anchorage Storm Water guidelines and State of Alaska regulations. Contractor shall treat all ground water to prevent debris and sediments from entering creeks, lakes, ponds, wetlands areas and drainage systems.

### **Article 12.4 Measurement**

The method of measurement for Dewatering is described in the Special Provisions for all Work necessary to provide a dry and stable construction environment throughout the project, including Work not identified in the accepted Dewatering Plan.

**Article 12.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made as specified in the Special Provisions.

## **SECTION 20.13 TRENCH EXCAVATION AND BACKFILL**

### **Article 13.1 General**

The Work under this Section consists of providing all materials and performance of all operations pertaining to items of Work involved in excavation, bedding, backfill, and compaction of trenches. The Work shall be performed in accordance with the applicable requirements for excavation and backfill described in Section 20.10 – General Excavation.

When unsuitable or surplus excavation material is removed from the project site, it will be paid for under Section 20.10 – General Excavation. When material is imported, it will be paid for under the appropriate item.

Any shoring, sheeting, or bracing required shall be considered incidental to Work under this Section.

The Contractor is subject to the same utilities check requirements as described under Section 20.10, Article 10.3 – Miscellaneous.

### **Article 13.2 Trench Excavation and Backfill – Description**

This Work shall consist of all excavation and backfill of trenches as specified for pipe installation and all other miscellaneous items as specified in this Section. Trenches are primarily for installing pipe, but requirements of this section apply to installation of conduit, cable, and other buried utility lines, and construction of French drains, as appropriate.

The Contractor shall minimize the width of the trench. Should the trench be, in the opinion of the Engineer, wider than is necessary for the safety of the workers, a deduction may be made for the excess width.

Trench limits shall be shown on the Drawings and staked in the field. Any reference to “limits” within this Section shall be in regard to trench limits. Trench width at or below the top of the pipe shall be of a width that will allow compaction equipment to be utilized at the sides of the pipe. Trenches shall be of the necessary width for proper laying of pipe, conduit, or cable and the banks shall be sloped so as to conform to the prevailing safety requirements. Trench depth shall be excavated to a minimum of six inches (6”) below the barrel of the pipe, conduit, cable, and other utility unless otherwise shown on the Drawings or as directed by the Engineer. Trenches excavated for French drains (i.e., without pipe) shall be excavated to the depths shown on the Drawings or as directed by the Engineer. Where maximum trench width is limited, as shown on the Drawings or Standard Details, the Contractor shall provide trench shoring or supports systems as necessary to ensure that the trench width does not exceed the established limits.

The Contractor shall provide and maintain adequate barricades to insure public safety at all times during the prosecution of the Work. The Contractor shall erect and maintain continuous trench barricades around all trench excavations left open at the end of the workday.

If at any time the Engineer determines that the construction trench section is greater than the limits shown on the Drawings, in the Standard Details, or described herein, the Contractor may be required to implement appropriate construction techniques to reduce the trench section or absorb all costs associated with the greater trench section, including, but not limited to: replacement of pavement, curb and gutter, sidewalk, street amenities,

landscaping, disposal of surplus material and furnishing classified backfill. The limits as shown on the Drawings and described herein are to limit pay quantities and incidental costs only and are not intended to limit or in any way alter the requirements of Occupational Safety and Health Administration (OSHA) or State of Alaska safety regulations. The Contractor is required to conduct all trenching operations in accordance with current safety standards.

### **Article 13.3 Construction**

#### **A. Trench Excavation**

The Contractor shall perform all excavation of every description and whatever substance encountered including rock and permafrost. Excavation will be to the extent indicated on the Drawings, and as staked in the field. All suitable excavation conforming to the requirements of bedding, foundation material, classified fill and backfill, designated for reuse by the Engineer shall be placed in an orderly manner, stockpiled separate from each other, and placed at a distance from the trench section which conforms to all state and/or federal safety codes. Undeveloped or vegetated surfaces used for stockpiling usable excavation shall be first covered with a geotextile fabric to prevent contaminating stockpiled materials.

All organic matter and other unsuitable excavation shall be either placed in a similar manner at locations such as to not contaminate suitable excavation or directly loaded into a suitable container and removed from the site.

Time is of the essence; therefore, the Contractor shall not begin excavation of the trench until all materials, equipment, and personnel are present to complete the Work in the most expedient manner. Not more than four hundred feet (400') of trench shall be open in advance of pipe, conduit, cable, or other buried utility installation unless authorized, in writing, by the Engineer. Unless otherwise indicated in the Drawings and Specifications, all excavation will be open cut.

Where rock or permafrost is encountered, it shall be removed as shown on the Drawings or as directed by the Engineer and shall be replaced with approved material.

All unusable or surplus material excavated from within the trench section, as shown on the Drawings, shall be removed from the project site. Work performed to remove the unusable or surplus material shall be performed in accordance with Section 20.10 – General Excavation. Unusable or surplus material excavated outside of the authorized trench section shall be disposed of at the Contractor's expense.

#### **B. Trench Dewatering**

Contractor shall protect adjacent utilities and property by trench dewatering and to successfully install the new utility lines. Dewatering shall be performed in accordance with Section 20.12 – Dewatering. Trench dewatering is considered incidental to Dewatering and no separate payment shall be made.

#### **C. Bedding**

All buried utilities shall be placed in bedding material as specified or as shown on the Drawings. Bedding materials for the type specified shall conform to the requirements of Section 20.16 – Furnish Bedding Material. Where specified bedding material is available from trench excavation, the Contractor shall use care to separate it from

unsuitable material. If the Engineer determines that excavated material is unsuitable for bedding, the Engineer may direct the Contractor to “Furnish Bedding Material”.

Bedding material shall be placed so that it does not free fall for a distance greater than two feet (2') above the top of the pipe. If the distance is greater than two feet (2'), the Engineer may require the Contractor to expose the exterior surface of the pipe being bedded. The Contractor shall provide the Engineer an opportunity to inspect the uncovered Work for damage. Upon completion of the inspection, the Contractor shall repair or replace damaged Work to the satisfaction of the Engineer. All costs associated with inspection, repair, replacement, and installation of the Work due to the bedding material free falling greater than two feet (2') shall be incidental to the Contract.

Class B or C bedding material shall be placed under and around the pipe in lifts not to exceed twelve inches (12") and compacted to ninety-five percent (95%) of maximum density. In no case shall bedding material be placed above the spring line of the pipe in a single lift.

Where specified bedding materials are encountered in the trench bottom, the trench shall be accurately graded to provide uniform bearing and support for each section of the pipe for its entire length, except for the portion of the pipe sections where it is necessary to excavate for bell holes and other type joints and for the proper sealing of the joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded and, in order that the pipe will rest on the prepared bottom for as nearly its full length as practical, bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joint.

Where unsuitable material such as, but not limited to hard pan, rock, or permafrost is encountered, the trench shall be over-excavated a minimum of six inches (6"), or as directed by the Engineer. The over-excavated depression shall be backfilled with the specified bedding material to bring the trench bottom up to the specified grade. This bedding material shall be compacted to a minimum of ninety-five percent (95%) of maximum density prior to the installation of the pipe. No separate payment will be made for compaction to ninety-five percent (95%) of maximum density.

#### D. Trench Backfill

Trench backfill is defined as the placement of material above the level of bedding material. Material for backfill shall be obtained from trench excavation if the material is suitable or conforms to the specifications for classified fill and backfill. If the Engineer determines that excavated material is unsuitable for trench backfill, the Engineer may direct the Contractor to “Furnish Trench Backfill”.

Backfill shall be placed in lifts and compacted in such a manner that ninety-five percent (95%) of maximum density is obtained unless otherwise specified in the Contract Documents. No separate payment will be made for compaction to ninety-five percent (95%) of maximum density. Where mechanical compaction is required, compaction shall be accomplished in accordance with Section 20.01, Article 1.5 – Compaction Standards. Backfill shall not contain pieces of asphalt surfacing or Portland cement concrete and shall be placed in accordance with Section 20.21 – Classified Fill and Backfill.

E. Detectable Warning Tape

Contractor shall provide and install detectable warning tape properly coded and labeled identifying the utility or utilities installed in the trench. Warning tape shall not be less than five (5) mil thick, six inches (6") wide, foil backed vinyl tape. The Contractor shall install the warning tape at least twenty-four inches (24") and no more than thirty-six inches (36") above the crown of the pipe, conduit, cable, or other buried utility line and parallel to the axis of the utility with no breaks in continuity. Furnishing and installing the warning tape is considered incidental to Trench Excavation and no separate payment shall be made.

F. Insulation

Refer to Section 20.26 – Insulation and Standard Detail 20-9 for insulation installation requirements.

G. Cleanup

This item consists of cleanup and finishing of all construction areas to their original condition or better. All Work shall be in accordance with Division 10, Section 10.05, Article 5.25 – Final Trimming of Work. Resurfacing of trench excavation and backfill shall conform to the applicable sections of Division 40 – Asphalt Surfacing, Standard Details, Contract Drawings, and Special Provisions, as appropriate.

**Article 13.4 Measurement**

Measurement of trench excavation and backfill will be per linear foot of horizontal distance for the various depths as shown in the Drawings or by cubic yard. On sanitary sewer and storm drain construction, linear distance measurement will be from center to center of manholes, from center of manhole to center of catch basins, from center of manhole to center of cleanout wye, from center of manhole to end of outfall piping. On all other construction, linear distance measurement will be from station to station as shown on the Drawings.

Trench depth shall be measured from original ground to the trench bottom along centerline of pipe. If trench excavation is performed under the same Contract with a roadway project, the depth of trench shall be measured from the bottom of bedding to the subgrade as it exists after the excavation necessary under the roadway project is complete.

When rock or permafrost is encountered within the trench, it will be measured and paid per Section 20.10 – General Excavation.

Trench dewatering and detectable warning tape are incidental to this Bid Item.

**Article 13.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Disposal of unusable or surplus material will be paid under Section 20.10 – General Excavation and no payment shall be made in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Trench Excavation and Backfill (various depths)	Linear Foot
Trench Excavation and Backfill (various depths)	Cubic Yard
Insulation (R-Value)	Square Foot

## **SECTION 20.14 TRENCH EXCAVATION, BACKFILL AND COMPACTION FOR SERVICE CONNECTIONS**

### **Article 14.1 General**

The Work under this Section consists of performing all operations necessary for excavation, backfill, and compaction required for service connections and all other miscellaneous items as specified in this Section. Service connections include Sanitary Sewer Service Connections, Footing Drain Services, and Water Service Lines.

### **Article 14.2 Construction**

#### **A. Excavation**

Excavation for service connections shall be unclassified and the Contractor shall excavate whatever substances that are encountered to the depth required for the connections. However, if rock or permafrost is encountered in the trench section different from what is shown on the Drawings, measurement and payment will be as delineated in Section 20.10 – General Excavation.

Depth for service connections shall be as required by the utility. Variations in required depth will not be grounds for additional payment. It shall be the Contractor's responsibility to familiarize himself with the depth of the main line utilities and storm drain systems for the project. The Contractor shall excavate for service connections in such a manner that the excavation is ninety (90) degrees to the street line, whenever possible. The ditch shall be long enough to allow the service connection to be stubbed at the property line.

Trenches shall be of sufficient width at the bottom to allow for laying of the particular service (minimum two and one-half feet [2½'] for single service).

The Contractor shall be responsible for, and shall bear expenses incurred, in the event that a main line utility should be damaged during excavation or backfilling.

It shall be the responsibility of the Contractor during construction to keep all embankments and excavation well shaped and drained. The subgrade shall be maintained, compacted in cut sections if required, and kept free of organic matter and other debris.

The Contractor shall perform all Work necessary to prevent flow and accumulation of surface water or ground water in trenches. Unless otherwise provided in the Special Provisions, all Work associated with dewatering trenches shall be performed in accordance with Section 20.12 – Dewatering. Trench dewatering is considered incidental to Dewatering and no separate payment shall be made.

The Contractor shall submit as a part of their proposal the method to be used in the dewatering of the trench section.

If any portion of asphalt or concrete surfacing is under-cut or damaged during trench excavation, Contractor shall saw cut, remove, and replace the affected area at no additional cost to the Owner.



B. Backfill

At such time as the Engineer may direct, but only after the service lines and appurtenances have been properly completed and inspected, the trenches and appurtenant structures shall be backfilled. The backfill material, free from clods or boulders, shall be placed by the Contractor in conformance with the codes and regulations of the Municipality. Backfill shall be placed and compacted in conformance with Section 20.13 – Trench Excavation and Backfill.

The material shall be placed and spread uniformly in successive layers not exceeding twelve inches (12") in loose thickness. The Engineer may approve lifts of greater thickness provided the equipment and method used will consistently achieve the specified density. The layers shall be carried up full width from the bottom of the fill to avoid the necessity of widening the edges after the center has been brought to grade. Each layer shall be compacted to a minimum of ninety-five percent (95%) of the maximum density at optimum moisture as determined by the method of testing noted in Section 20.01, Article 1.5 – Compaction Standards. Reasonable time shall be provided the Engineer to make field density determinations prior to placement of successive layers of material.

The maximum dimensions of any particle of the embankment material shall not be greater than two-thirds (2/3) of the compacted thickness of the layer in which it is placed. The top six inches (6") of embankment material for streets shall be Type II-A classified fill and backfill. Oversize material shall be removed. Portions of any layer in which the embankment material becomes segregated shall be removed and replaced with satisfactory material or shall be added to and remixed to secure proper gradation as directed by the Engineer. No separate payment will be made for any material removed or regraded in areas where material becomes segregated.

The Engineer may permit lifts in excess of twelve inch (12") thickness when fill or backfill is placed over swampy or saturated ground, or where the Engineer is satisfied that the Contractor's method and equipment will consistently produce the specified density. No frozen material shall be used for backfill. Backfill shall not be placed in frozen trench.

C. Notification

The Contractor shall notify the Engineer forty-eight (48) hours before starting excavation (excluding Saturday, Sunday and holidays) on all service connection requests which involve twelve (12) or less connections. On connection requested for subdivisions involving more than twelve (12) connections, one (1) week notification prior to excavating is required.

**Article 14.3 Measurement**

Trench excavation, backfill and compaction for service connections are considered incidental to the service connection pay item and shall not be measured for payment.

**Article 14.4 Basis of Payment**

No separate payment shall be made for trench excavation, backfill and compaction for service connections. This Work is considered incidental to the service connection pay item.

## **SECTION 20.15 FURNISH TRENCH BACKFILL**

### **Article 15.1 General**

The work under this Section consists of performing all operations necessary to furnish trench backfill obtained from borrow sources.

### **Article 15.2 Construction**

The Engineer shall order in writing the amount and type of backfill material to be transported to the Project site. No payment will be made for backfill material under this item that has not been ordered in writing. Material hauled to the Project site shall be placed and meet the requirements for the type specified in Section 20.21 – Classified Fill and Backfill.

### **Article 15.3 Measurement**

Furnished trench backfill material will be either measured in tons (2000 lbs.) or linear feet.

When measured by tons, weights shall be obtained on a scale certified by the State of Alaska. All loads shall be accompanied with a serialized weight ticket witnessed at the time of weighing by a Contractor-furnished weighman. The Engineer may at any time verify load weights and the weighing process. Measurement of delivered material may include moisture up to a maximum of four percent (4.0%) of dry weight of material. When tests by the Engineer indicate that moisture contents in excess of four percent (4.0%) may be occurring consistently, the frequency of testing will be increased as necessary, and the results averaged over a period of one week. When the average is greater than four percent (4.0%), the tonnage, as measured over the above period, shall be reduced by the difference. No credit will be due the Contractor when moisture content is less than four percent (4.0%). Testing will be done in accordance with standards provided in this Specification.

When measured by linear foot, measurement of trench backfill will be per linear foot of horizontal distance regardless of depth. On sanitary sewer and storm drain construction, measurement will be from center to center of manholes, from center of manhole to center of catch basins, from center of manhole to center of cleanout wye, from center of manhole to end of out-fall piping. On all other construction, measurement will be from station to station as shown on the Drawings.

### **Article 15.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall be full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish Trench Backfill (Type)	Ton
Furnish Trench Backfill (Type)	Linear Foot

## SECTION 20.16 FURNISH BEDDING MATERIAL

### Article 16.1 General

The Work under this Section consists of performance of all operations pertaining to providing bedding material obtained from borrow sources for underground utilities.

### Article 16.2 Materials

The coarse aggregate material conforming to the requirements specified below shall have a percentage of wear not to exceed thirty (30) after five hundred (500) revolutions, as determined by the current requirements of ASTM C131.

#### A. Class "B" Bedding

Materials furnished by the Contractor for use as "B" bedding classified fill and/or backfill shall be graded within the limitations delineated below:

Class "B" Bedding	
U.S. Std. Sieve	Cumulative % Passing by Weight
1"	100
3/8"	60 – 100
#4	40 – 85
#10	25 – 70
#40	5 – 40
#200	0 – 6*

\* In addition to the grading limits listed above, the fraction of material passing the No. 200 sieve shall not be greater than thirty-five percent (35%) of that fraction passing the No. 40 sieve. The bedding material shall not include mechanically fractured materials.

#### B. Class "C" Bedding

Materials furnished by the Contractor for use as "C" bedding classified fill and/or backfill shall be graded within the limitations delineated below:

Class "C" Bedding	
U.S. Std. Sieve	Cumulative % Passing by Weight
2"	100
1/2"	40 – 100
#4	20 – 75
#10	12 – 60
#40	2 – 30
#200	0 – 6*

\* In addition to the grading limits listed above, the fraction of material passing the No. 200 sieve shall not be greater than twenty percent (20%) of that fraction passing the No. 40 sieve. The bedding material shall not include mechanically fractured materials.

C. Class "D" Bedding

Materials furnished by the Contractor for use as "D" bedding classified fill and/or backfill shall be graded within the limitations delineated below:

Class "D" Bedding	
U.S. Std. Sieve	Cumulative % Passing by Weight
1"	100
3/4"	90 – 100
1/2"	50 – 70
3/8"	20 – 50
#4	0 – 10
#200	0 – 1

The bedding material shall not include mechanically fractured materials.

D. Class "E" Bedding

Materials furnished by the Contractor for use as "E" bedding classified fill and/or backfill shall be graded within the limitations delineated below:

Class "E" Bedding	
U.S. Std. Sieve	Cumulative % Passing by Weight
1/2"	100
3/8"	80 – 100
#4	20 – 75
#8	12 – 60
#30	2 – 30
#200	0 – 6

**Article 16.3 Construction**

Placement of bedding shall conform to the requirements of Section 20.13, Article 13.3 – Construction.

The Contractor shall employ such means and methods to keep the bedding material contained and segregated from potential contaminants until it is placed per the Contract Documents. Bedding material lost, contaminated with other material, or otherwise found to be unusable shall not be used for bedding material and the Contractor shall not be paid for that material.

**Article 16.4 Measurement**

Measurement of bedding shall be per ton or per linear foot of bedding material placed in the trench.

**Article 16.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM

Bedding Material (Class)

Bedding Material (Class)

UNIT

Ton

Linear Foot

## SECTION 20.17 FURNISH FILTER MATERIAL

### Article 17.1 General

This Work under this Section consists of performance of all operations pertaining to providing filter material from borrow sources.

### Article 17.2 Materials

Filter material shall be gravel or sand consisting of crushed or naturally-occurring granular material. It shall be free of clay particles and conforming to the gradation requirements below.

The coarse aggregate material conforming to the requirements specified below shall have a percentage of wear not to exceed thirty (30) after five hundred (500) revolutions, as determined by the current requirements of ASTM C131.

Requirements for Grading of Filter Material:

Filter	Gradation (% Passing by Weight) U.S. Std Sieve										
	2"	1½"	1"	¾"	½"	⅜"	#4	#16	#50	#100	#200
Type A						100	95-100	45-80	10-30	0-10	0-3
Type B						100		0-5			
Type C	100	95-100		0-20		0-5					
Type D			100	90-100	50-70	20-50	0-5				0-1

Foundry sand and other material which may be cementitious or not suitable for water percolation shall not be used.

### Article 17.3 Construction

Filter material is defined as the material which is placed below, above, and on each side of a perforated pipe to form a subdrain. Refer to Standard Detail 55-3 for construction of a subdrain. Filter material may also be used directly in the trenches without a perforated pipe to form a French drain.

### Article 17.4 Measurement

Measurement of filter material shall be per ton or per linear foot of material placed in the trench.

### Article 17.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for furnishing and placing filter material for subdrains is included in payment for Division 55, Section 55.03 – Subdrains and Perforated Storm Mains and no separate payment shall be made.

Payment for this item includes furnishing the required type of filter material.

Payment shall be made under the following unit:

ITEM

Filter Material (Type)

Filter Material (Type)

UNIT

Ton

Linear Foot

**SECTION 20.18 DRAIN/FILTER ROCK**

**Article 18.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing and placing a layer of drain/filter rock as shown on the plans or as directed by the Engineer.

**Article 18.2 Materials**

Materials furnished by the Contractor for drain/filter rock shall be graded within the limitations delineated below:

U.S. Std. Sieve	Drain/Filter Rock	
	Cumulative % Passing by Weight	
	Drain Rock	Filter Rock
8"	100	--
6"	50 – 80	100
4"	25 – 50	50 – 80
3"	0 – 25	--
2"	0 – 10	--
1"	--	0 – 10
#200	0 – 1	0 – 1

**Article 18.3 Construction**

The drain/filter rock shall be handled, dumped, or spread into place so as to secure a stone mass of the dimensions shown on the Drawings.

**Article 18.4 Measurement**

Drain/filter rock shall be measured in tons complete and accepted in place.

**Article 18.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Drain Rock	Ton
Filter Rock	Ton



## **SECTION 20.19 FURNISH FOUNDATION BACKFILL**

### **Article 19.1 General**

The Work under this Section consists of performing all operations necessary for excavation, backfilling, compacting foundation materials and trenches.

### **Article 19.2 Materials**

Foundation material for backfill shall consist of Type II, II-A, III, V, or VI classified backfill as specified in the Contract Documents or by the Engineer.

### **Article 19.3 Construction**

If the trench material at the bottom of bedding does not furnish a suitable foundation, the Contractor shall remove the unsuitable material to whatever depth the Engineer determines and replace with foundation material from borrow. Foundation material shall be placed the full width of trench, in lifts not to exceed twelve inches (12") in thickness and compacted to a minimum of ninety-five percent (95%) of maximum density.

In the event of unauthorized over-excavation, the Contractor shall backfill with foundation material to the proper grade and compact to a minimum of ninety-five percent (95%) of maximum density for the full length of the over-excavated trench, all at no additional expense to the Owner.

### **Article 19.4 Measurement**

Where the Contractor is ordered to remove unsuitable material below grade and replace it with foundation material, the material shall be paid for on a cubic yard or ton basis.

### **Article 19.5 Basis of Payment**

Payment for the Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Foundation Backfill (Type)	Cubic Yard
Foundation Backfill (Type)	Ton

## **SECTION 20.20 UNCLASSIFIED FILL AND BACKFILL**

### **Article 20.1 General**

The Work under this Section consists of furnishing all plant, labor, equipment, supplies, and material in performance of all operations pertaining to the excavation, stockpiling on site, and placement of Unclassified Fill and Backfill.

### **Article 20.2 Materials**

Unclassified Fill and Backfill shall be defined as excavated non-organic material that is determined by the Engineer to be unsuitable for Classified Fill and Backfill and suitable for deposition in non-structural fill zones.

### **Article 20.3 Construction**

Excavated material not conforming to the specifications of Section 20.21 – Classified Fill and Backfill shall be used as Unclassified Fill and Backfill adjacent to embankments to provide additional slope stability to the embankment. Excess Unclassified Fill and Backfill not used shall be disposed of at a Contractor-furnished disposal site as delineated in Division 10, Section 10.04, Article 4.9 – Disposal Sites.

### **Article 20.4 Measurement**

The measurement of excavation will not include water or other liquids, but will include topsoil, mud, muck, or other similar semi-solid material which cannot be drained or pumped away.

Unclassified Fill and Backfill will be measured per cubic yard by cross section.

Cross section measurement of Unclassified Fill and Backfill shall be based on in-place volumes as determined by the average end areas of cross sections.

### **Article 20.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Unclassified Fill and Backfill	Cubic Yard

## SECTION 20.21 CLASSIFIED FILL AND BACKFILL

### Article 21.1 General

The Work under this Section consists of performing all operations necessary to furnish, place, and compact classified fill and backfill.

### Article 21.2 Materials

Classified fill and backfill shall contain no lumps, frozen material, organic matter, or other deleterious matter, and shall be durable and sound. It shall have a plasticity index not greater than six (6) as determined by ASTM D4318 and shall conform to one of the following types as required by the Drawings and Specifications. The coarse aggregate material conforming to the requirements specified below shall have a percentage of wear not to exceed thirty (30) after five hundred (500) revolutions, as determined by the current requirements of ASTM C131.

The portion of the material retained on a No. 4 sieve shall be known as coarse aggregate. Both coarse and fine aggregates shall conform to the quality requirements of AASHTO M 147.

Crushed waste glass (cullet) may be combined with soil-aggregate material and used in Type II or Type II-A classified fill and backfill. If glass cullet is incorporated, classified fill and backfill shall contain no more than ten percent (10%) by weight glass cullet smaller than three-eighths inch (3/8"). Contractor shall ensure that glass cullet is uniformly blended with natural soil aggregate material prior to project delivery and placement. Glass cullet must conform to the specifications in Subarticle G – Glass Cullet of this Article. In addition to the normal gradation documentation for classified fill or backfill, the Contractor shall provide documentation certifying that the glass cullet (1) is comprised only of eligible types of glass, (2) does not contain prohibited materials, (3) meets debris content requirement, and (4) meets blending percentage requirement to the Engineer prior to placement of the material.

#### A. Type II

Materials furnished by the Contractor for use as Type II classified fill and/or backfill shall be graded within the limitations delineated below:

U.S. Std. Sieve	Type II Cumulative % Passing by Weight
8"	100
3"	70 – 100
1½"	55 – 100
¾"	45 – 85
#4	20 – 60
#10	12 – 50
#40	4 – 30
#200	2 – 6*

\* In addition to the grading limits listed above, the fraction of material passing the No. 200 sieve shall not be greater than fifteen percent (15%) of that fraction passing the No. 4 sieve.

B. Type II-A

Materials furnished by the Contractor for use as Type II-A classified fill and/or backfill shall be graded within the limitations delineated below:

Type II-A	
U.S. Std. Sieve	Cumulative % Passing by Weight
3"	100
3/4"	50 – 100
#4	25 – 60
#10	15 – 50
#40	4 – 30
#200	2 – 6*

\* In addition to the grading limits listed above, the fraction of material passing the No. 200 sieve shall not be greater than twenty percent (20%) of that fraction passing the No. 4 sieve.

C. Type III

Materials furnished by the Contractor for use as Type III classified fill and/or backfill shall be approved sand or gravel with a maximum of ten percent (10%) passing the No. 200 sieve.

D. Type IV

Materials furnished by the Contractor for use as Type IV classified fill and/or backfill shall be an approved material consisting of sand or gravel with a maximum of twenty-five percent (25%) passing the No. 200 sieve.

E. Type V

Materials furnished by the Contractor for use as Type V classified fill and/or backfill shall be graded within the limitations delineated below:

Type V	
U.S. Std. Sieve	Cumulative % Passing by Weight
3"	100
1½"	60 – 90
3/4"	40 – 80
#4	25 – 55
#10	15 – 45
#40	4 – 30
#200	2 – 6

In addition to the grading limits listed above, at least thirty percent (30%) of the coarse aggregate particles shall have one or more mechanically fractured face.

F. Type VI

Materials furnished by the Contractor for use as Type VI classified fill and/or backfill shall be graded within the limitations delineated below:

U.S. Std. Sieve	Type VI Cumulative % Passing by Weight
2"	100
1½"	65 – 95
¾"	50 – 80
½"	30 – 60
#4	20 – 50
#10	10 – 30
#40	5 – 25
#200	2 – 6

In addition to the grading limits listed above, at least forty percent (40%) of the coarse aggregate particles shall have one or more mechanically fractured face.

**G. Crushed Waste Glass (Cullet)**

Glass cullet shall be free of prohibited or hazardous substances and the cullet shall contain no more than two percent (2.0%) debris as determined in AASHTO M 318.

Eligible glass products from which glass cullet may be produced include:

- food and beverage container glass,
- plain ceramic or china dinnerware, and
- building window glass.

Prohibited glass products include:

- automobile windshields or other glass from automobiles,
- light bulbs of any type,
- porcelain products,
- laboratory glass, or
- television, computer, or other cathode ray monitor tubes.

**Article 21.3 Construction**

The subgrade shall be cleared of all debris and organic material. All depressions or holes below the general area surface level, whether caused by removal of debris or unacceptable material, or otherwise, shall be backfilled with approved material and compacted to specified density and to a level, uniform surface before the placement of other layers. Embankment shall not be placed on frozen ground, nor on ground having a slope greater than four horizontal to one vertical (4H:1V).

The specified material shall be constructed at the locations and to the lines and grades indicated on the Drawings. The material shall be placed and spread uniformly in successive layers not exceeding twelve inches (12") in loose thickness. The Engineer may approve lifts of greater thickness provided the equipment and method used will consistently achieve the specified density. The layers shall be carried up full width from the bottom of the fill to avoid the necessity of widening the edges after the center has been brought to grade. Each layer shall be compacted to not less than ninety-five percent (95%) of the maximum density at optimum moisture as determined by the method of testing noted in Section 20.01, Article 1.5

– Compaction Standards. Reasonable time shall be provided the Engineer to make field density determinations prior to placement of successive layers of material.

Blading, rolling, and tamping shall continue until the surface is smooth, free from waves and irregularities, and conforms to elevations shown on the Drawings. If at any time the material is excessively wet, it shall be aerated by means of blade graders, harrows, or other suitable equipment until the moisture content is satisfactory. The surface shall then be compacted and finished as specified above.

Contractor shall submit a processing and blending plan to the Engineer for review and approval prior to utilization of classified fill or backfill from more than one source. The plan must be accompanied by materials analysis reports for each material source and fully describe how the material will be placed and blended to ensure that timely and accurate in-place density testing can be achieved.

The maximum dimensions of any particle of the embankment material shall not be greater than two-thirds (2/3) of the compacted thickness of the layer in which it is placed unless specified elsewhere. The top six inches (6") of embankment material for roads, streets, parking lots, and bike trails, shall be Type II-A classified fill and backfill. Oversize material shall be removed. Portions of any layer in which the embankment material becomes segregated shall be removed and replaced with satisfactory material or shall be added to and remixed to secure proper gradation as directed by the Engineer. No separate payment will be made for any material removed or regraded in areas where material becomes segregated.

The Engineer may permit lifts in excess of twelve inch (12") thickness when classified fill or backfill is placed over swampy or saturated ground, or where the Engineer is satisfied that the Contractor's method and equipment will consistently produce the specified density.

Embankments for bike trail sections will be brought to grade in one (1) single lift for embankments less than eighteen inches (18") to finish grade. Trail embankments over eighteen inches (18") shall be brought to grade in lifts as directed by the Engineer.

Contractor shall not use classified fill and backfill incorporating glass cullet:

- within four feet (4') from the face of any embankment slope,
- within one hundred and fifty feet (150') of any surface water body,
- in embankment areas where culvert placement is required,
- in contact with any geotextile or geosynthetic material, or
- in any soil-aggregate base or subbase courses that are not covered by surfacing material.

#### **Article 21.4 Measurement**

Classified fill or backfill material, obtained from borrow sources, will be measured in tons (2000 lbs.) of material delivered and placed in accordance with these Specifications. The measurement may include moisture up to a maximum of four percent (4.0%) of dry weight of the material. When tests by the Engineer indicate that moisture contents in excess of four percent (4.0%) may be occurring consistently, the frequency of testing will be increased as necessary, and the results averaged over a period of one week. When this average is greater than four percent (4.0%), the tonnage as measured over the above period, shall be reduced by the difference. No credit will be due the Contractor when moisture content is

less than four percent (4.0%). Testing shall be done in accordance with Section 20.01, Article 1.3 – Applicable Standards.

Imported classified fill and backfill will be weighed on a scale certified by the State of Alaska. Weight tickets will be serialized and witnessed at the time of weighing by a Contractor-furnished weighman. The Engineer may at any time verify load weights and the weighing process.

Where excavation of unsuitable material beyond the lines and grades shown on the Drawings is ordered in writing, the measurement of classified backfill will include the material required for replacement. No measurement will be made for quantities placed beyond the lines and grade authorized or for quantities placed outside the limits of required excavation.

The Contractor and the Engineer shall verify daily the quantity of material delivered to the Project site. Weight tickets not presented at time of delivery will require special verification by the Contractor before payment can be made.

**Article 21.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Use of glass cullet is incidental to the bid item Classified Fill and Backfill and no additional payments shall be made.

Payment for the placement and compaction of usable excavation shall not be paid under this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Classified Fill and Backfill (Type)	Ton

## **SECTION 20.22 LEVELING COURSE**

### **Article 22.1 General**

The Work under this Section consists of performing all operations necessary to complete construction of the leveling course on the prepared subbase.

### **Article 22.2 Materials**

The leveling course shall consist of crushed gravel, rock, sand, or other approved material. The aggregate shall be free from lumps, balls of clay, or other objectionable matter, and shall be durable and sound. The portion of the material retained on a No. 4 sieve shall be known as coarse aggregate. Both coarse and fine aggregates shall conform to the quality requirements of AASHTO M 147.

Upon written approval by the Engineer, recycled asphalt concrete pavement (RAP) may be substituted for leveling course, on an inch for inch basis. All RAP shall conform to Division 40, Section 40.08 – Recycled Asphalt Pavement. RAP which has been derived from environmentally contaminated aggregates shall not be accepted.

Crushed waste glass (cullet) may be combined with soil-aggregate material and used in leveling course. If glass cullet is incorporated, leveling course shall contain no more than ten percent (10%) by weight glass cullet smaller than three-eighths-inch (3/8"). Contractor shall ensure that glass cullet is uniformly blended with natural soil aggregate material prior to project delivery and placement. Glass cullet must conform to the specifications in Subarticle D – Glass Cullet of this Article. In addition to the normal gradation documentation for classified fill or backfill, when glass cullet is used the Contractor shall provide documentation certifying that the glass cullet (1) is comprised only of eligible types of glass, (2) does not contain prohibited materials, (3) meets debris content requirement, and (4) meets blending percentage requirement to the Engineer prior to placement of the material.

Upon written approval by the Engineer, recycled concrete aggregate (RCA) may be substituted for leveling course, on an inch for inch basis. RCA shall conform to this specification.

#### **A. Coarse Aggregate**

The coarse aggregate material conforming to the requirements specified above shall have a percentage of wear not to exceed thirty-five (35) after five hundred (500) revolutions, as determined by the current requirements of ASTM C131. It shall consist of angular fragments reasonably uniform in density and quality, and reasonably free from thin and elongated pieces, dirt, and other objectionable material. At least fifty percent (50%) of the coarse aggregate particles shall have two or more mechanically fractured faces.

#### **B. Fine Aggregate**

The fine aggregate shall consist of material free of organic or other objectionable matter. The fine aggregate, either naturally combined with the coarse aggregate or separately obtained and mixed therewith, shall be of such character that the composite material will conform to the gradation and other requirements specified.



C. Gradation

The composite mixture of coarse aggregate and fine aggregate, processed as hereinafter specified, shall conform to the following gradation limits as required by the Drawings:

U.S. Std. Sieve	Leveling Course Cumulative % Passing by Weight
1"	100
3/4"	70 – 100
3/8"	50 – 80
#4	35 – 65
#8	20 – 50
#50	8 – 28
#200	2 – 6*

\* In addition to the grading limits stipulated above, fractions passing the No. 200 sieve shall not be greater than seventy-five percent (75%) of the fractions passing the No. 50 sieve.

D. Crushed Waste Glass (Cullet)

Glass cullet shall be free of prohibited or hazardous substances and the cullet shall contain no more than two percent (2.0%) debris as determined in AASHTO M 318.

Eligible glass products from which glass cullet may be produced include:

- food and beverage container glass,
- plain ceramic or china dinnerware, and
- building window glass.

Prohibited glass products include:

- automobile windshields or other glass from automobiles,
- light bulbs of any type,
- porcelain products,
- laboratory glass, or
- television, computer, or other cathode ray monitor tubes.

E. Recycled Concrete Aggregate

RCA shall consist of a manufactured aggregate material and natural aggregate particles derived from the crushing, processing and classification of Portland cement concrete construction debris recovered from roadways, sidewalks, building, bridges and other sources, which conforms to AASHTO M 319 – Reclaimed Concrete Aggregate for Unbound Soil-Aggregate Base Course, and this specification. This material shall not contain deleterious substances in excess of the following amounts by mass-weight:

Deleterious Material	% by Weight
Bituminous concrete materials	5.0
Brick or concrete masonry unit block	5.0

Wood, metal, plastic, plaster, gypsum	0.1
Hazardous materials, any other solid waste not listed above	0.0

Both Coarse and Fine Aggregate shall conform to this specification and the quality requirements from AASHTO M 147 – Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses.

RCA shall have a minimum of seventy percent (70%) of particles with one or more mechanically fractured faces when the RCA is tested in accordance with AASHTO TP 61.

The Maximum Moisture Content is four percent (4.0%) for RCA.

The Liquid Limit for RCA shall not exceed thirty-five (35) when tested in accordance with AASHTO T 89 and the Plasticity Index of the fraction of RCA passing the No. 40 sieve shall not exceed six (6) when tested in accordance with AASHTO T 90.

In accordance with ATM 306, the percent of flat and elongated pieces in RCA shall not exceed eight percent (8.0%).

**Article 22.3 Construction**

The leveling course shall be placed to the lines, grades, and thicknesses shown on the Drawings and shall consist of the materials hereinbefore specified. The leveling course shall provide a smooth stabilized surface on which to place the pavement.

**A. Preparation of Subbase**

Subbase preparation shall consist of dressing, shaping, wetting, and compacting of the subbase to a minimum density of ninety-five percent (95%) in accordance with Section 20.01, Article 1.5 – Compaction Standards. Surfaces shall be cleaned of all foreign substances and debris. Any ruts or soft yielding spots that may appear in the subbase surface shall be corrected by loosening, removing and adding approved material, reshaping, and recompacting the affected areas to the line, grade, and to the specified density requirements.

**B. Surveying**

Subbase and leveling course control stakes shall be wooden bluetops set to finish subbase. The subbase bluetops will be the reference used by the Contractor to set top of leveling course. Subbase bluetops shall be set at breaks in grade and on even grade at intervals not to exceed fifty feet (50’), with additional stakes at vertical curves. Side control will be from the lip or gutter, or in the case of strip paving, additional bluetops shall be provided.

**C. Placing**

The approved leveling course material shall be deposited and spread in a uniform layer to the required contour and grades and to such loose depth that when compacted to the density required will achieve the specified thickness. The material shall be spread uniformly on the prepared subbase from moving vehicles or spreading boxes, then leveled to the required contour and graded with blade graders. Portions of the layer which become segregated in spreading shall be remixed to the required gradation.

Contractor shall not use leveling course incorporating glass cullet:

- within four feet (4') from the face of any embankment slope,
- within one hundred and fifty feet (150') of any surface water body,
- in embankment areas where culvert placement is required,
- in contact with any geotextile or geosynthetic material; or
- in any soil-aggregate base or subbase courses that are not covered by surfacing material.

Contractor shall not use RCA as leveling course:

- within five feet (5') of metal culverts,
- in contact with any geotextile or geosynthetic material,
- over gravel drain fields, drain field piping, subdrains, or open soil-lined stormwater retention or detention facilities, or
- within one hundred and fifty feet (150') of any surface water body when not covered by a surfacing material.

#### D. Compacting

The leveling course shall be compacted to a minimum of ninety-five percent (95%) of maximum density. In all places not accessible to the rolling equipment, the mixture shall be compacted with tamping equipment. Blading, rolling and tamping shall continue until the surface is smooth and free from waves and inequalities. If at any time the mixture is excessively moistened by rain, it shall be aerated by means of blade graders, harrows or other approved equipment until the moisture content is such that the surface can be recompacted and finished as above. The finished leveling course shall be maintained by the Contractor in the above condition until the pavement is applied.

If RCA used as leveling course, any portion of which becomes segregated and/or develops zones of paste or crushed conglomerates during the distribution or compaction process shall be corrected by the Contractor. The correction process shall be conducted full depth and continue until the on-grade RCA meets this specification. The Engineer reserves the right to sample (or resample) the RCA for acceptance after it has been placed, watered and compacted.

#### E. Smoothness Test

The surface of the leveling course, when finished, shall not show any deviation in excess of three-eighths inch (3/8") when tested with a ten-foot (10') straightedge applied parallel with, and at right angles to, the centerline of the area to be paved. Any deviation in excess of this amount shall be corrected by loosening, adding, or removing material and reshaping and compacting to satisfy the above requirement.

Contractor shall obtain written approval from the Engineer for the final leveling course grade prior to pavement placement.

### **Article 22.4 Measurement**

The leveling course shall be measured in tons of materials delivered and placed in accordance with these Specifications. The measurement may include moisture up to a maximum of four percent (4.0%) of dry weight of the material. When tests by the Engineer

indicate that moisture contents in excess of four percent (4.0%) may be occurring consistently, the frequency of testing will be increased as necessary, and the results averaged over a period of one week. When this average is greater than four percent (4.0%), the tonnage as measured over the above period, shall be reduced by the difference. No credit will be due the Contractor when moisture content is less than four percent (4.0%). Testing shall be done in accordance with Section 20.01, Article 1.3 – Applicable Standards.

**Article 22.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Use of glass cullet and/or RCA is incidental to the bid item Leveling Course and no additional payments shall be made.

Payment shall be made under the following unit:

ITEM	UNIT
Leveling Course	Ton

**SECTION 20.23 COBBLES**

**Article 23.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing and placing a layer of cobbles as shown on the Drawings or as directed by the Engineer.

**Article 23.2 Materials**

Materials furnished by the Contractor for cobbles shall be graded within the limitations delineated below:

U.S. Standard Sieve	Cobbles Cumulative % Passing by Weight
12"	100
8"	50 – 80
6"	25 – 50
3"	0 – 25
2"	0 – 10
#200	0 – 1

**Article 23.3 Construction**

The cobbles shall be handled, dumped, or spread into place so as to secure a stone mass of the dimensions shown on the Drawings.

**Article 23.4 Measurement**

Cobbles shall be measured in tons complete and accepted in place.

**Article 23.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Cobbles	Ton

## **SECTION 20.24 RIPRAP**

### **Article 24.1 General**

This work shall consist of furnishing and placing a protective covering of stone as shown on the Drawings or as directed by the Engineer.

### **Article 24.2 Materials**

Stone for this work shall be hard angular quarry stones and have a percentage of wear of not more than fifty (50) at five hundred (500) revolutions as determined by ASTM C535. The least dimension of any piece of stone shall be not less than one-fourth (1/4) its greatest dimension. Stones shall meet the following gradation requirement for the class specified:

A. Class I

No more than ten percent (10%) of the stones by total weight shall weigh more than fifty (50) pounds per piece and no more than fifty percent (50%) by total weight of the stones shall weigh less than twenty-five pounds (25 lbs.) per piece.

B. Class II

No more than ten percent (10%) of the stones by total weight shall weigh more than four hundred (400) pounds per piece and no more than fifteen percent (15%) by weight of the stones shall weigh less than twenty-five pounds (25 lbs.) per piece. The stones shall be evenly graded and a minimum of fifty percent (50%) by weight of the stones shall weigh two hundred pounds (200 lbs.) or more per piece.

C. Class III

No more than ten percent (10%) of the stones by total weight shall weigh more than one thousand four hundred pounds (1,400 lbs.) per piece and no more than fifteen percent (15%) of the stones shall weigh less than twenty-five pounds (25 lbs.) per piece. The stones shall be evenly graded and a minimum of fifty (50%) by weight of the stones shall weigh seven hundred pounds (700 lbs.) or more per piece.

### **Article 24.3 Construction**

A footing trench shall be excavated along the toe of the slope when shown on the plans. The stones shall be handled or dumped into place so as to secure a stone mass of the thickness, height and length shown on the plans, or as staked with a minimum of voids.

Undesirable voids shall be filled in with small stones or spalls. The rock shall be manipulated sufficiently by means of a bulldozer, rock tongs, or other suitable equipment to secure a reasonably regular surface and mass stability.

Riprap protection shall be placed to its full course thickness at one operation and in such manner as to avoid displacing the underlying material. Placing of riprap protection in layers or by dumping into chutes or by similar methods likely to cause segregation will not be permitted.

All material going into riprap protection shall be so placed and distributed that there will be no large accumulation or area composed largely of either the larger or smaller sizes of stone.

Unless otherwise authorized by the Engineer, the riprap protection shall be placed in conjunction with the construction of the embankment with only sufficient lag in construction

of the riprap protection as may be necessary to prevent mixture of embankment and riprap material.

The Contractor shall provide a level compact area of sufficient size to dump and sort typical loads of riprap at approved location(s). The Contractor shall further dump loads specified in this area and assist the Engineer as needed to sort and measure the stones in the load for the purpose of determining if the riprap is within specifications. Mechanical equipment as needed to assist in this sorting shall be provided by the Contractor at no additional cost to the Owner.

**Article 24.4 Measurement**

Riprap shall be measured in cubic yards measured by neat line measure, or tons, completed and accepted in place. Excavation and backfill required for placement of riprap is considered incidental to the bid item.

**Article 24.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

When more than one class of riprap is specified for any pay item, letter suffixes shall be included within the parentheses of the item numbers in order to differentiate between the different classes.

Payment shall be made under the following unit:

ITEM	UNIT
Riprap (Class)	Cubic Yard
Riprap (Class)	Ton

## SECTION 20.25 GEOTEXTILE FABRIC

### Article 25.1 Description

The Work under this Section shall consist of furnishing and installing Geotextile Fabric for embankment separation, subgrade reinforcement of roadways, subsurface drainage, or riprap lining in a manner and at locations as shown in the Drawings or as directed by the Engineer.

### Article 25.2 Materials

Geotextile fabrics furnished as required in the Drawings shall meet conform to the following specifications, based on AASHTO M 288. Additional requirements follow depending on the application of the geotextile fabric.

Property	Test Method	Units	Geotextile Class <sup>a, b</sup>			
			Class 1		Class 2	
			Woven Elongation < 50% <sup>c</sup>	Non-Woven Elongation ≥ 50% <sup>c</sup>	Woven Elongation < 50% <sup>c</sup>	Non-Woven Elongation ≥ 50% <sup>c</sup>
Grab Strength	ASTM D4632	lbs.	315	200	250	160
Sewn Seam Strength	ASTM D4632	lbs.	285	182	225	140
Tear Strength	ASTM D4533	lbs.	115	80	90	56
Puncture Strength	ASTM D6241	lbs.	620	435	495	310

<sup>a</sup> The severity of installation conditions for the application generally dictates the required geotextile class. Class 1 is specified for more severe or harsh installation conditions where there is greater potential for geotextile damage. Class 2 is specified for less severe conditions.

<sup>b</sup> All numeric values represent MARV in the weaker principal direction.

<sup>c</sup> As measured in accordance with ASTM D4632.

#### A. Type A Geotextile (Separation)

Type A Geotextile is used for separation. The Type A Geotextile shall be a woven or nonwoven pervious fabric constructed from long chain polymeric filaments such as polypropylene, polyethylene, polyester, polyvinylidene chloride or polyamide formed into a stable network such that the filaments or yarns retain their relative position to each other. The geotextile shall be inert to commonly encountered chemicals and shall be free from defects.

Non-woven geotextile may be formed by the needle-punched, spun-bonded or melt-bonded process.

Woven geotextile shall be a pervious sheet of yarn woven into a uniform pattern with distinct and measurable openings. Edges of the cloth shall be salvaged to prevent the outer yarn from pulling away from the cloth.

Acceptance of geotextile material is to be determined according to ASTM D4873.



Geotextile manufacturer shall provide a letter certifying that its geotextile product meets the specified requirements.

Type A Geotextile supplied shall be Class 2, unless otherwise specified in the Contract Documents and shall meet the physical and mechanical properties listed below:

Property	Test Method	Units	Requirements
Permittivity	ASTM D4491	Sec <sup>-1</sup>	0.02 <sup>a</sup>
Apparent Opening Size	ASTM D4751	mm	0.60 max avg roll value
Ultraviolet stability (retained strength)	ASTM D4355	%	50% after 500 hr. of exposure

<sup>a</sup> Default value. Permittivity of the geotextile should be greater than that of the soil. The Engineer may also require the permeability of the geotextile to be greater than that of the soil.

**B. Type B Geotextile (Reinforcement)**

Type B Geotextile is used for reinforcement. Type B Geotextile shall consist of a regular grid structure formed by biaxially drawing a continuous sheet of select polypropylene material; it shall have aperture geometry and rib and junction cross sections sufficient to permit significant mechanical interlock with the material being reinforced.

Type B Geotextile shall have high flexural rigidity and high tensile strength at ribs and junctions of the grid structure.

Type B Geotextile shall maintain its reinforcement and interlock capabilities under repeated dynamic loads while in service and shall also be resistant to ultraviolet degradation, to damage under normal practices, and to all forms of biological or chemical degradation normally encountered in the material being reinforced.

Type B Geotextile supplied shall be Class 1 unless otherwise specified in the Contract Documents and shall meet the physical and mechanical properties listed below:

Property	Test Method	Units	Requirements
Permittivity	ASTM D4491	Sec <sup>-1</sup>	0.05 <sup>a</sup>
Apparent Opening Size	ASTM D4751	mm	0.43 max avg roll value
Ultraviolet stability (retained strength)	ASTM D4355	%	50% after 500 hr. of exposure

<sup>a</sup> Default value. Permittivity of the geotextile should be greater than that of the soil. The Engineer may also require the permeability of the geotextile to be greater than that of the soil.

**C. Type C Geotextile (Drainage/Riprap Lining)**

Type C Geotextile is used for drainage or riprap lining. The geotextile shall be constructed from long chain polymeric filament or yarns such as polypropylene, polyethylene, polyester, nylon, polyvinylidene chloride or polyamide formed into a stable network such that the filaments or yarns retain their relative position to each other. The geotextile shall be inert to commonly encountered chemicals and shall be free from defects.

Non-woven geotextile may be formed by the needle punched, spun-bonded or melt-bonded process.

Woven geotextile shall be a pervious sheet of yarn woven into a uniform pattern with distinct and measurable openings. Edges of the cloth shall be salvaged to prevent the outer yarn from pulling away from the cloth.

Geotextiles made from yarns of a flat, tape-like character are not allowed.

Type C Geotextile supplied shall be Class 2, unless otherwise specified in the Contract Documents and shall meet the physical and mechanical properties listed below:

Property	Test Method	Units	Where in Situ Soil		
			Percent Passing No. 25 Sieve <sup>a</sup>		
			< 15	15 to 50	> 50
Permittivity	ASTM D4491	Sec <sup>-1</sup>	0.5	0.2	0.1
Apparent Opening Size	ASTM D4751	mm	0.43	.25	.22
Ultraviolet stability (retained strength)	ASTM D4355	%	50% after 500 hr. of exposure		

<sup>a</sup> Based on grain size analysis of in situ soil in accordance with AASHTO T 88.

Acceptance of geotextile material shall be determined according to ASTM D4759.

**D. Submittal Requirements**

The Contractor shall submit the following information to the Engineer for review and acceptance:

5. Full-scale laboratory testing and in-ground testing of pavement structures reinforced with the proposed geotextile product which illustrates significant structural contribution of the geotextile product to the pavement structure.
6. Certified test results stating that the geotextile product meets the material and physical properties in all respects.
7. Guidelines to pavement design using proposed geotextile product.
8. A list of not less than ten (10) comparable projects, in terms of size and application, in the United States, with references and phone numbers, where the results of the proposed geotextile product's use can be verified after a minimum of three years continuous service life.
9. Geotextile product samples and certified material property data sheets.
10. Recommended installation instructions.
11. Geotextile manufacturer shall provide a letter certifying that its geotextile product meets the specified requirements.

**Article 25.3 Construction**

**A. Surface Preparation**

Prepare surface by removal of stumps, boulders, and sharp objects in accordance with Section 20.05 – Clearing. Contractor shall fill holes and large ruts with material shown on the Drawings or as approved by the Engineer.

Clearing shall be considered incidental to this item. Material used to fill ruts and holes shall be paid for at the unit price for the type of material used, as shown on the Drawings or as approved by the Engineer.

In Areas to Be Surcharged: All trees and brush having a trunk base diameter greater than one-half inch (1/2") shall be cut to within two inches (2") of original ground surface. Grass shall be flattened with no more than two passes of a tracked vehicle.

B. Geotextile Placement

Unroll geotextile directly onto the prepared surface. Exposure of geotextile to the elements after removal of protective covering shall not exceed five days.

Unroll geotextile for embankment reinforcement parallel to the embankment centerline.

Geotextile shall be placed in daily work sections so the lap adjustment can be made should movement of the geotextile occur during placement of fill.

C. Joining

1. Type A Geotextile

Fabric shall be joined with adjacent pieces of fabric by sewing or overlapping.

If fabric is joined by sewing, the fabric shall have all seams sewn by butterfly or J-seams and shall develop a minimum of eighty-five percent (85%) of the specified strength. Seams shall be sewn with a double-thread chain-lock stitch. High strength polyester, polypropylene or Kevlar thread shall be used. The seam shall be one and one-half inch plus or minus one-quarter inch ( $1\frac{1}{2}'' \pm \frac{1}{4}''$ ) from the outside edge of the geotextile. If fabric is joined by overlapping, one piece shall directly overlie the adjacent piece a minimum of three feet (3') or as shown on the Drawings.

2. Type B Geotextile

Sections shall be overlapped a minimum of three feet (3'), or as shown on the Drawings, to prevent shifting of geotextile during installation and filling.

Lap joints shall be tied with plastic ties specifically manufactured for this purpose at five-foot (5') intervals.

3. Type C Geotextile

Fabric shall be joined with adjacent pieces of fabric by sewing or overlapping.

If fabric is joined by sewing, the fabric shall have all seams sewn by butterfly or J-seams and shall develop a minimum of eighty-five percent (85%) of the specified strength. Seams shall be sewn with a double-thread chain-lock stitch. High strength polyester, polypropylene or Kevlar thread shall be used. The seam shall be one and one-half inch plus or minus one-quarter inch ( $1\frac{1}{2}'' \pm \frac{1}{4}''$ ) from the outside edge of the geotextile. If fabric is joined by overlapping, one piece shall directly overlie the adjacent piece by a minimum of three feet (3') or as shown on the Drawings.

D. Material Placing and Spreading

Fill material placement shall not occur until the Engineer accepts surface preparation and geotextile laps.

Contractor shall maintain minimum laps and fabric continuity without fabric loops or kinks during material placement and spreading.

Follow the manufacturer's recommendations for material placing and spreading of the geotextile. During placing and spreading, the Contractor shall maintain a minimum depth of one foot (1') of cover material at all times between the fabric and the wheels or tracks of the construction equipment. At no time shall equipment operate on the unprotected geotextile. Construction equipment shall not make sudden stops, starts, or turns on the over material. Use a smooth drum roller to achieve the specified density.

Spread the material in the direction of the fabric overlap.

On weak subgrades, spread the cover material simultaneously with dumping to minimize the potential of a localized subgrade failure.

E. Geotextile Repair

Should it be determined during or after embankment construction that specified geotextile lap widths have not been achieved, or that the Contractor otherwise damaged the installed geotextile, the Contractor shall correct the geotextile installation at no additional cost to the Municipality.

The Contractor shall expose the geotextile and add additional geotextile extending in all directions to achieve specified laps and anchorage. After correcting the geotextile, the embankment shall be reconstructed in accordance with the Contract Documents.

**Article 25.4 Measurement**

Geotextile shall be measured in square yards of ground surface covered by fabric as shown on the Drawings or as approved by the Engineer. Overlapping and stitching of fabric will be considered incidental to this pay item and no additional payment will be made.

Material used to fill ruts and holes shall be paid for at the unit price of the appropriate bid item for the type of material used, as shown on the Drawings or as approved by the Engineer.

**Article 25.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Geotextile (Type)	Square Yard

## SECTION 20.26 INSULATION

### Article 26.1 General

The Work under this Section consists of performing all operations including labor and material pertaining to the placement of insulation. Contractor shall provide polystyrene insulation board(s), extruded or expanded, in conformance with the Drawings and these Specifications.

The Work under this Section also includes shaping and compacting a level area under the horizontal insulation boards and placing the insulation as indicated on the Drawings.

### Article 26.2 Materials

The insulation board shall have a minimum full board size of two foot by eight foot (2' x 8'), have the minimum thickness specified in the Contract Documents, meet the specified R-Value or better, and conform to the requirements of AASHTO M 230. R-Value of insulation shall be based on manufacturer's warranted R-Value. The insulation board shall be rigid, homogeneous, and conform to the following:

Property	Test Method	Value
Compressive Strength psi, minimum at yield or 5 percent strain	ASTM D1621	60.0
Water Absorption, maximum percent by volume	ASTM C272	0.3%
Thermal Resistance, minimum R-Value at 75°F, °F-Ft <sup>2</sup> -Hr/BTU	ASTM C177	As Specified

### Article 26.3 Construction

Contractor shall install the insulation board with staggered joints. Layering of insulation to obtain the specified R-Value is allowed as long as joints are overlapped at least one foot (1'). Contractor shall blade, shape, and compact the area prior to placing the insulation board in accordance with this Division. Contractor shall shape the subgrade to the lines and grades shown on the Drawings and provide a smooth surface on which to place the insulation board. Prior to placing the insulation board on the prepared subgrade, the Contractor shall furnish straightedges to the Inspector for checking surface uniformity. Surface irregularities shall not exceed one inch (1") within eight feet (8'), or three-eighths inch (3/8") in two feet (2'). Contractor shall uniformly compact the subgrade. Contractor shall hand-rake smooth and recompact the ridges left by the compaction equipment. Contractor shall accurately set the horizontal insulation boards to the line and grade established and in such a manner as to hold the board firmly in place by mechanically connecting it to the subgrade.

Contractor shall replace or repair insulation panels broken, crushed, or cracked, as determined by the Engineer, at no additional cost to the Owner.

Contractor shall cover the insulation board with approved three-inch minus (3"-) Classified Fill and Backfill material, placed in a twelve-inch (12") lift, spread, and compacted for the full width of the insulation layer prior to placing subsequent lifts. Contractor shall place, spread, and compact in such a manner as not to damage the insulation board. Engineer will approve spreading and compacting equipment prior to its use.

**Article 26.4 Measurement**

The insulation board is measured per square foot regardless of thickness, complete and accepted in place.

Additional Work required for preparing the subgrade to the smoothness required is incidental to the bid item(s) in this Section and no separate payment is made.

**Article 26.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Insulation Board (R-Value)	Square Foot

**SECTION 20.27 THIS SECTION INTENTIONALLY LEFT BLANK**

## **SECTION 20.28 RECONSTRUCT DRIVEWAY**

### **Article 28.1 Description**

The Work under this Section consists of performing all operations and furnishing all materials pertaining to removing, disposing of, re-grading and replacing existing driveway approaches, including removal and disposal of existing pavement, excavation, surfacing, classified fill and backfill, leveling course, and working adjacent to existing landscaping amenities, as indicated on the Drawings.

Driveway reconstruction consists of installing a section of driveway that provides a smooth transition from the existing driveway to the street improvements. The transition length is measured from the back of curb or back of sidewalk and shall be as shown on the Drawings or as directed by the Engineer.

Contractor shall not disturb existing driveways that have imbedded heating systems.

### **Article 28.2 Materials**

Materials used for constructing Portland cement concrete (P.C.C.) driveways shall conform to the requirements of Division 30 – Portland Cement Concrete. Materials used in to construction asphalt concrete pavement (A.C.P.) driveways shall conform to the requirements of Division 40 – Asphalt Surfacing. Base and subbase material shall conform to the requirements of this Division.

### **Article 28.3 Construction**

All construction practices, tests and other controls shall conform to Division 20 – Earthwork, Division 30 – Portland Cement Concrete, and Division 40 – Asphalt Surfacing.

The Contractor shall neatly, and cleanly saw cut and remove existing driveway surfacing. Contractor shall saw cut a minimum of two inches (2") deep for asphalt surfaces and three inches (3") deep for concrete surfaces. If any portion of the remaining asphalt or concrete surfacing is under-cut or damaged during construction operations, Contractor shall saw cut, remove, and replace the affected area at no additional cost to the Owner.

Contractor shall provide all areas of reconstructed driveway with a minimum eighteen inches (18") of Type II-A Classified Fill and Backfill subbase, and, when required on the Drawings, geotextile fabric. The Contractor shall reconstruct driveways with asphalt or concrete surfacing to match existing driveway surface. For asphalt driveways, Contractor shall place two inches (2") of A.C.P. over two inches (2") of leveling course. For P.C.C. driveways, the thickness shall be six inches (6"). Concrete driveways shall have a minimum six by six inch (6" x 6") woven wire mesh reinforcement installed.

Contractor shall perform asphalt paving by utilizing a mechanical spreader and compact by a mechanical roller weighing not less than ten (10) tons, except that where the area of the asphalt replacement patch is less than three hundred (300) square feet, a mechanical spreader need not be employed.

Contractor shall tamp small inaccessible areas to produce a compression and surface texture equivalent to that produced by the specified rolling. Hand tampers shall have a maximum tamping face of fifty (50) square inches and minimum weight of twenty-five (25) pounds.



Contractor shall maintain access and parking accommodations for each resident during driveway work. Contractor shall notify and coordinate with the affected resident(s) prior to necessary driveway closures.

#### **Article 28.4 Measurement**

Demolition and removal of existing driveway components are measured in accordance with the contract document bid items for removal of P.C.C. sidewalk and apron, removal of P.C.C. curb and gutter, removal of A.C.P., excavation for traffic ways, and disposal of unusable or surplus material. Installation of the replacement driveway components are measured in accordance with the contract document bid items for grading existing surfaces, geotextile fabric, classified fill and backfill, leveling course, P.C.C. and A.C.P. No separate measurement is to be made for clearing and grubbing, clearing, dewatering, or woven wire mesh reinforcement, as these items are incidental to the Work. No measurement is made for temporary relocation of driveways or required driveway maintenance during construction as these items are incidental to the Work.

## **SECTION 20.29 PIPE CASING**

### **Article 29.1 General**

The Work under this Section consists of performing all operations necessary for furnishing and placing a casing by trenchless method under structures, roadways, railroad tracks, or runways.

### **Article 29.2 Materials**

Materials shall be as required by the Contract Documents.

### **Article 29.3 Construction**

Method of installing a pipe casing shall be optional to the Contractor, except that prior to commencing jacking or augering operations, the Contractor shall furnish a work plan to the Engineer and show that their planned method of installation has worked satisfactorily in other areas under similar conditions. The excavation at both ends of the casing shall be considered incidental to this bid item and no separate payment shall be made.

A vertical and horizontal tolerance shall be as shown on the Drawings, provided that the Contractor will be responsible, and use such fittings as are required to adjust alignment and grade to accomplish the connections.

The pipe within the casing (carrier pipe) shall be arrested from movement by sand filling or wood slats and banding according to Standard Detail 20-11.

### **Article 29.4 Measurement**

Measurement shall be from end to end of pipe casing acceptably installed and completed. No measurement will be made for trench excavation and backfill where casing is installed. No compensation will be made for casing installations abandoned or aborted due to deviations in excess of allowable tolerances.

### **Article 29.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment and shall include full payment for all Work described in this Section, including arrestment of pipe.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish and Install Casing	Linear Foot

## **SECTION 20.30      SHORING, SHEETING AND BRACING/SHORING AND SHEETING LEFT IN THE TRENCH AND PORTABLE**

### **Article 30.1    General**

The Work under this Section consists of all operations pertaining to furnishing and installing sheeting, shoring, and bracing to support the trench section to prevent any movement that might damage adjacent facilities or injure workers or the public, and the use of portable steel shielding.

### **Article 30.2    Materials**

The Contractor shall obtain approval from the Engineer for all sheeting, bracing and shoring materials and/or equipment to be used on the project. Materials used shall be in accordance with Section 1926.651, Subparagraph 1 of the Federal Register, Volume 37, No. 243, OSHA Regulations.

### **Article 30.3    Construction**

All construction requirements for design, installation, and use of sheeting, shoring, bracing, and shielding shall be in accordance with current safety regulations. All sheeting, shoring, bracing, and shielding shall be designed by a Professional Engineer commissioned by the Contractor. All shop drawings and design data shall be submitted to the Engineer for approval.

When shoring and sheeting is left in the trench, sheeting must be lower than the bottom of the pipe and cut off one foot (1') below ground surface. No transverse bracing will be permitted to remain.

Any Contractor provided portable trench shielding shall comply with relevant OSHA regulations. The Contractor shall provide the Engineer certification of such compliance from the portable shield manufacturer or supplier.

### **Article 30.4    Measurement**

No measurement will be made for Work in this Section.

### **Article 30.5    Basis of Payment**

No separate payment shall be made for shoring, sheeting, bracing, or portable shields. Any single technique or combination of techniques used for shoring, sheeting, and bracing shall be considered incidental to the Contract.

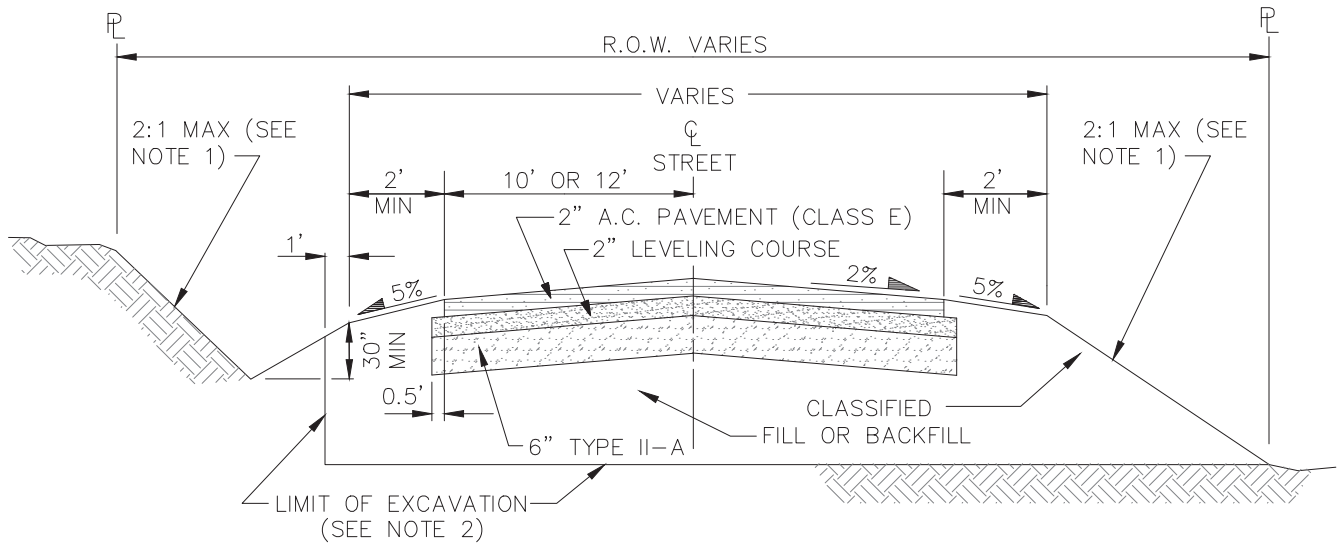


**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

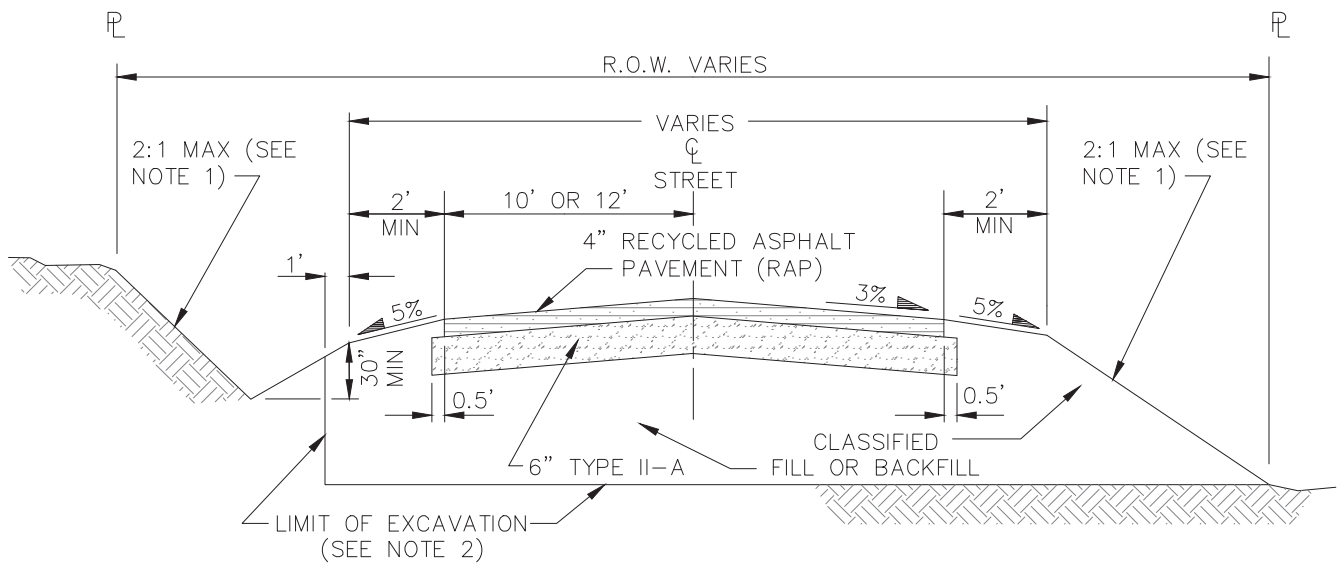
**DIVISION 20  
EARTHWORK  
STANDARD DETAILS**

**STANDARD CONSTRUCTION SPECIFICATIONS  
DIVISION 20  
INDEX OF STANDARD DETAILS**

20-1	Typical Sections - 20'/24' Strip Paved and RAP Streets
20-2	Typical Sections - Secondary Streets
20-3	Typical Sections - Primary Streets
20-4	Typical Section - Deep Excavation
20-5	Typical Section - Alley
20-6	Typical Section - Pathway
20-7	Driveway Connection Detail
20-8	Trench Backfill and Bedding Layout
20-9	Pipe Insulation
20-10	Foundation Materials
20-11	Pipe Encasement
20-12	Compaction of Backfill within the Right-of-Way



**TYPICAL SECTION – 20’/24’ STRIP PAVING**



**TYPICAL SECTION – 20’/24’ RECYCLED ASPHALT STREET**

**NOTES:**

1. PLACE OR REMOVE AND GRADE MATERIAL IN A NEAT MANNER FROM EXCAVATION LIMITS TO EXISTING ELEVATION AT PROPERTY LINE OR AS DIRECTED BY THE ENGINEER. (MAXIMUM 2:1 CUT AND FILL SLOPES)
2. ENGINEER WILL DETERMINE THE DEPTH OF EXCAVATION.
3. UNLESS OTHERWISE APPROVED, THE CENTERLINE OF STREET SHALL BE THE CENTERLINE OF R.O.W.
4. RECYCLED ASPHALT PAVING (RAP) SHALL BE SEAL-COATED AS SPECIFIED IN DIVISION 40, SECTION 40.08 – RECYCLED ASPHALT PAVEMENT.

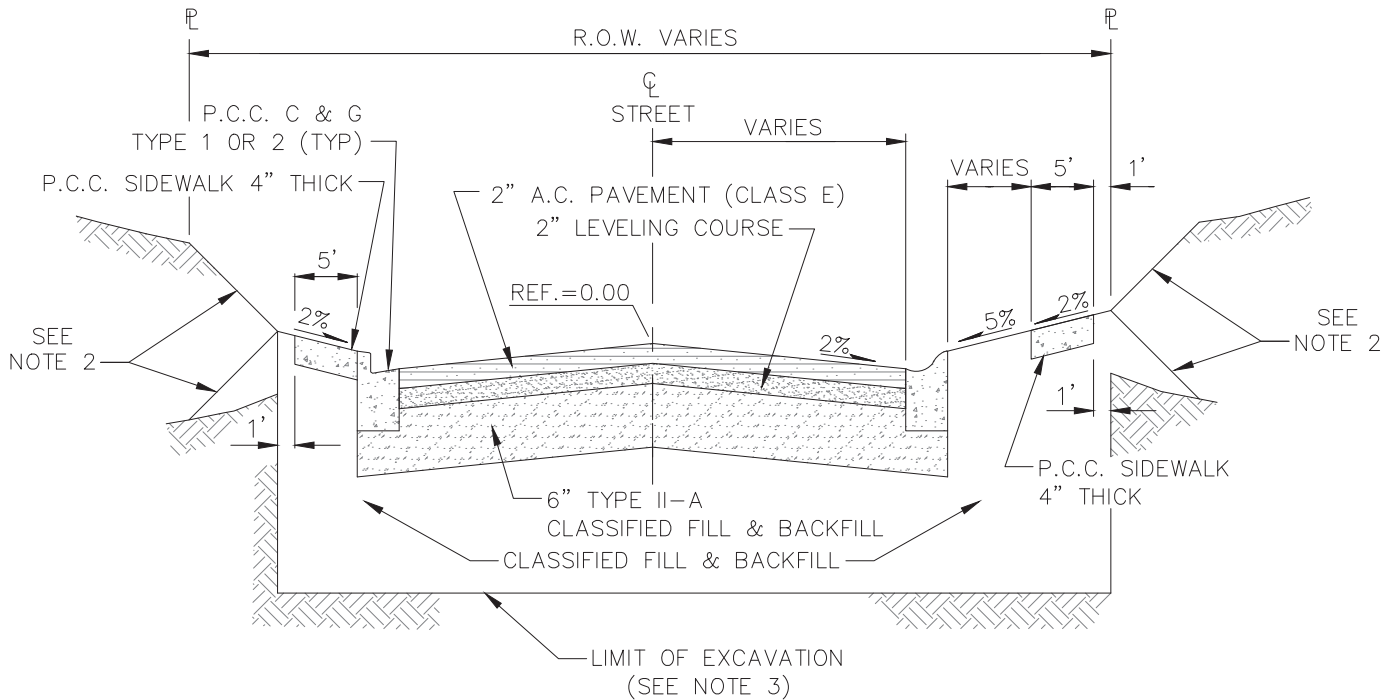
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MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
N.T.S.  
 APPROVED:  
 REVISED:  
2/24

**TYPICAL SECTIONS  
 20’/24’ STRIP PAVED AND  
 RAP STREETS**


SECTION #  
DIV 20  
 DETAIL #  
20-1



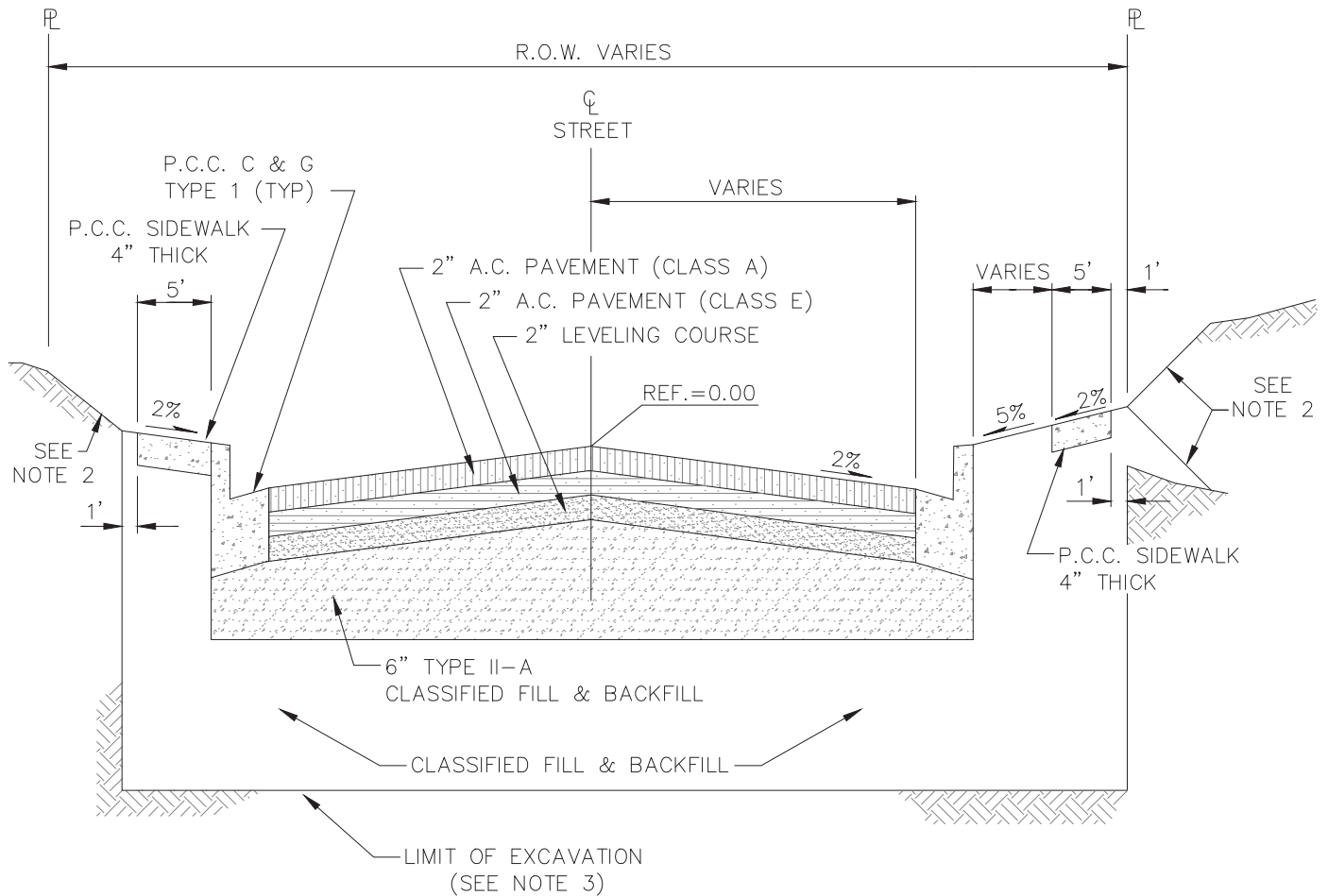
**NOTES:**

1. DIMENSIONS AND ELEVATIONS SHOWN ON THIS STANDARD DETAIL ARE TYPICAL. PROJECT SPECIFIC DIMENSIONS SHOWN ON THE DRAWINGS SHALL CONTROL.
2. PLACE OR REMOVE AND GRADE MATERIAL IN A NEAT MANNER FROM EXCAVATION LIMITS TO EXISTING ELEVATION AT PROPERTY LINE OR AS DIRECTED BY THE ENGINEER. (MAXIMUM 2:1 CUT AND FILL SLOPES)
3. ENGINEER WILL DETERMINE THE DEPTH OF EXCAVATION.
4. UNLESS OTHERWISE APPROVED, THE CENTERLINE OF STREET SHALL BE THE CENTERLINE OF R.O.W.
5. WHERE SIDEWALKS ARE NOT CONSTRUCTED, SEE STANDARD DETAIL 20-4 FOR SLOPING BETWEEN CURB AND PROPERTY LINE.

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 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>TYPICAL SECTIONS SECONDARY STREETS</b></p>	<p>SECTION # DIV 20</p> <p>DETAIL # 20-2</p>
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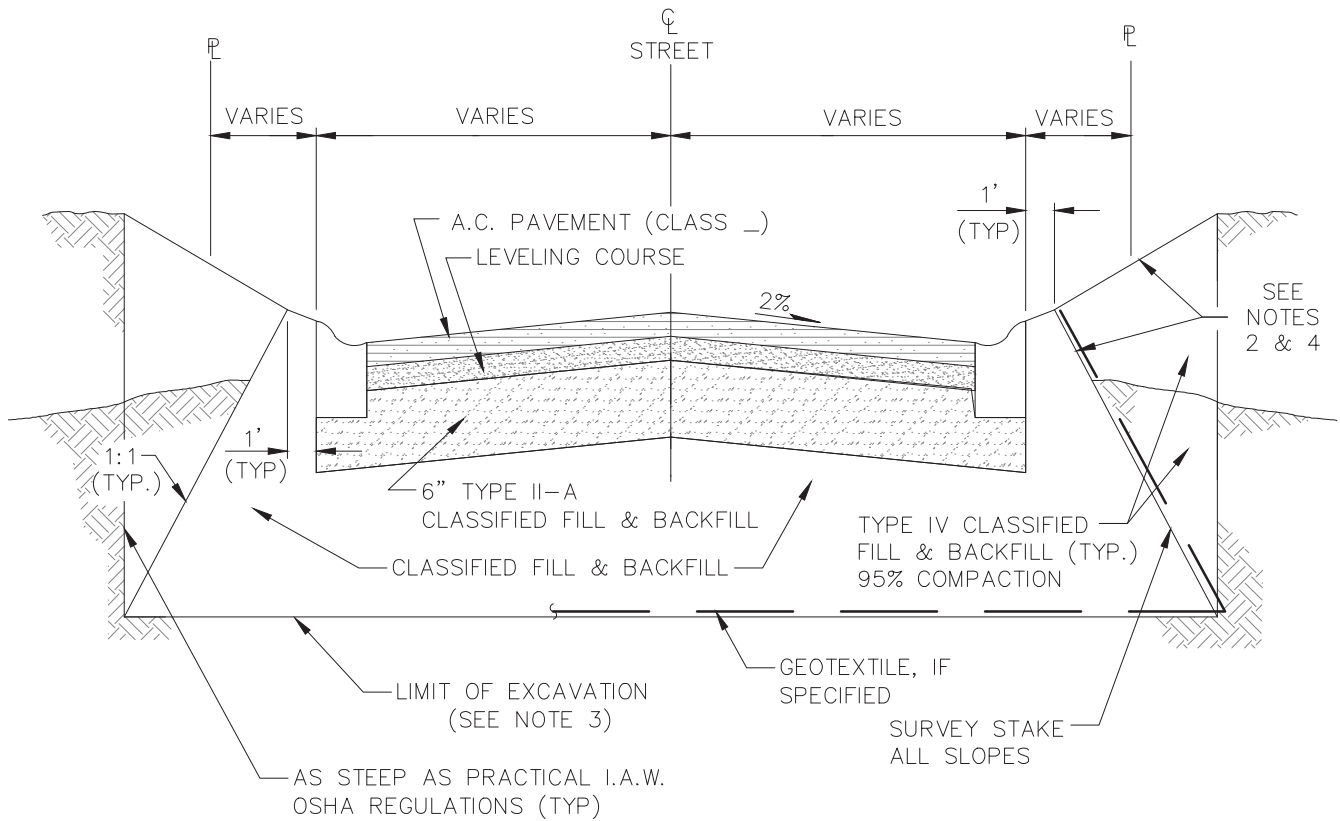


**NOTES:**

1. DIMENSIONS AND ELEVATIONS SHOWN ON THIS DRAWING ARE TYPICAL. PROJECT SPECIFIC DIMENSIONS SHOWN ON THE DRAWINGS CONTROL.
2. PLACE OR REMOVE AND GRADE MATERIAL IN A NEAT MANNER FROM EXCAVATION LIMITS TO EXISTING ELEVATION AT PROPERTY LINE OR AS DIRECTED BY THE ENGINEER (MAXIMUM-2:1 CUT AND FILL SLOPES).
3. ENGINEER WILL DETERMINE THE DEPTH OF EXCAVATION.
4. UNLESS OTHERWISE APPROVED, THE CENTERLINE OF STREET SHALL BE THE CENTERLINE OF R.O.W.
5. WHERE SIDEWALKS ARE NOT CONSTRUCTED, SEE STANDARD DETAIL 20-4 FOR SLOPING BETWEEN CURB AND PROPERTY LINE.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h1 style="margin: 0;">TYPICAL SECTIONS PRIMARY STREETS</h1>	SECTION # DIV 20  DETAIL # 20-3
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NOTES:

1. DIMENSIONS AND ELEVATIONS SHOWN ON THIS DRAWING ARE TYPICAL. PROJECT SPECIFIC DIMENSIONS SHOWN ON THE DRAWINGS SHALL CONTROL.
2. PLACE OR REMOVE AND GRADE MATERIAL IN A NEAT MANNER FROM EXCAVATION LIMITS TO EXISTING ELEVATION AT PROPERTY LINE OR AS DIRECTED BY THE ENGINEER. (MAXIMUM 2:1 CUT AND FILL SLOPES)
3. ENGINEER WILL DETERMINE THE DEPTH OF EXCAVATION.
4. SEE APPLICABLE STANDARD DETAIL FOR SPECIFIC STREET DIMENSIONS.

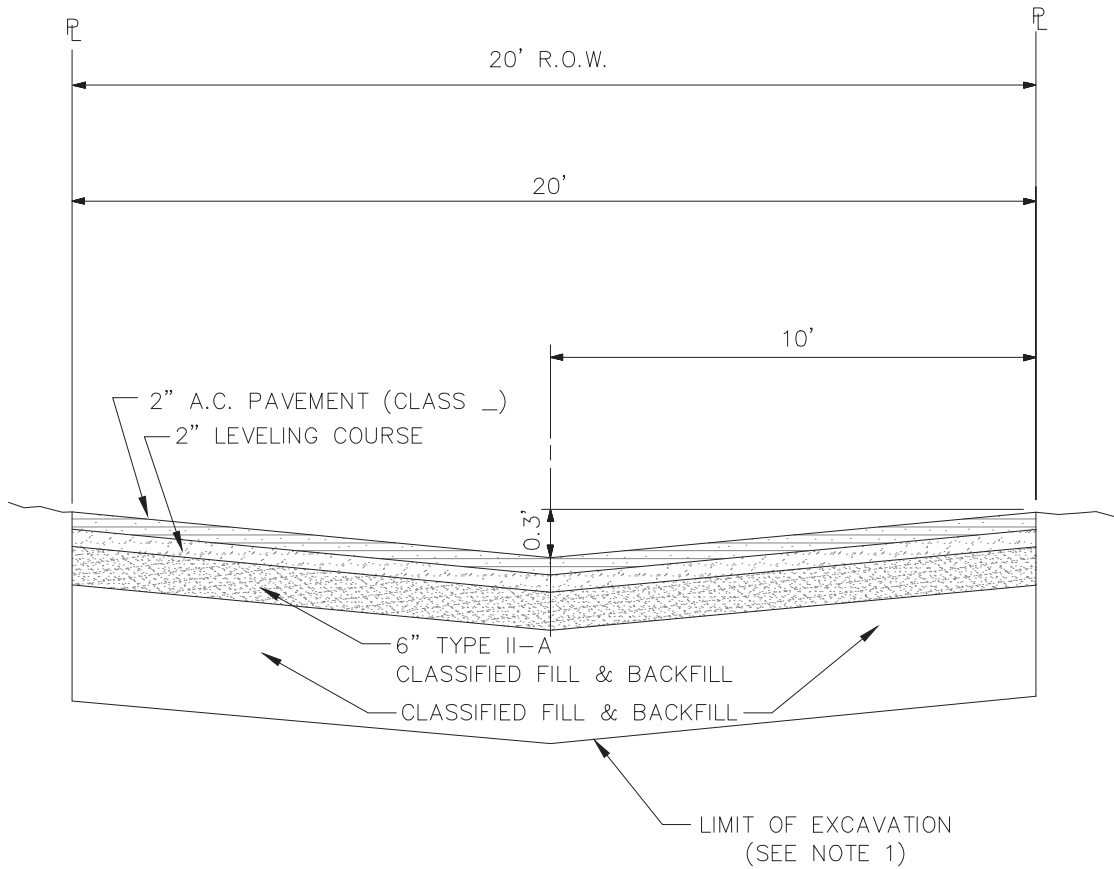
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MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
N.T.S.  
 APPROVED:  
 REVISED:  
2/24

# TYPICAL SECTION DEEP EXCAVATION

SECTION #  
DIV 20  
 DETAIL #  
20-4



NOTE:

1. ENGINEER WILL DETERMINE THE DEPTH OF EXCAVATION.

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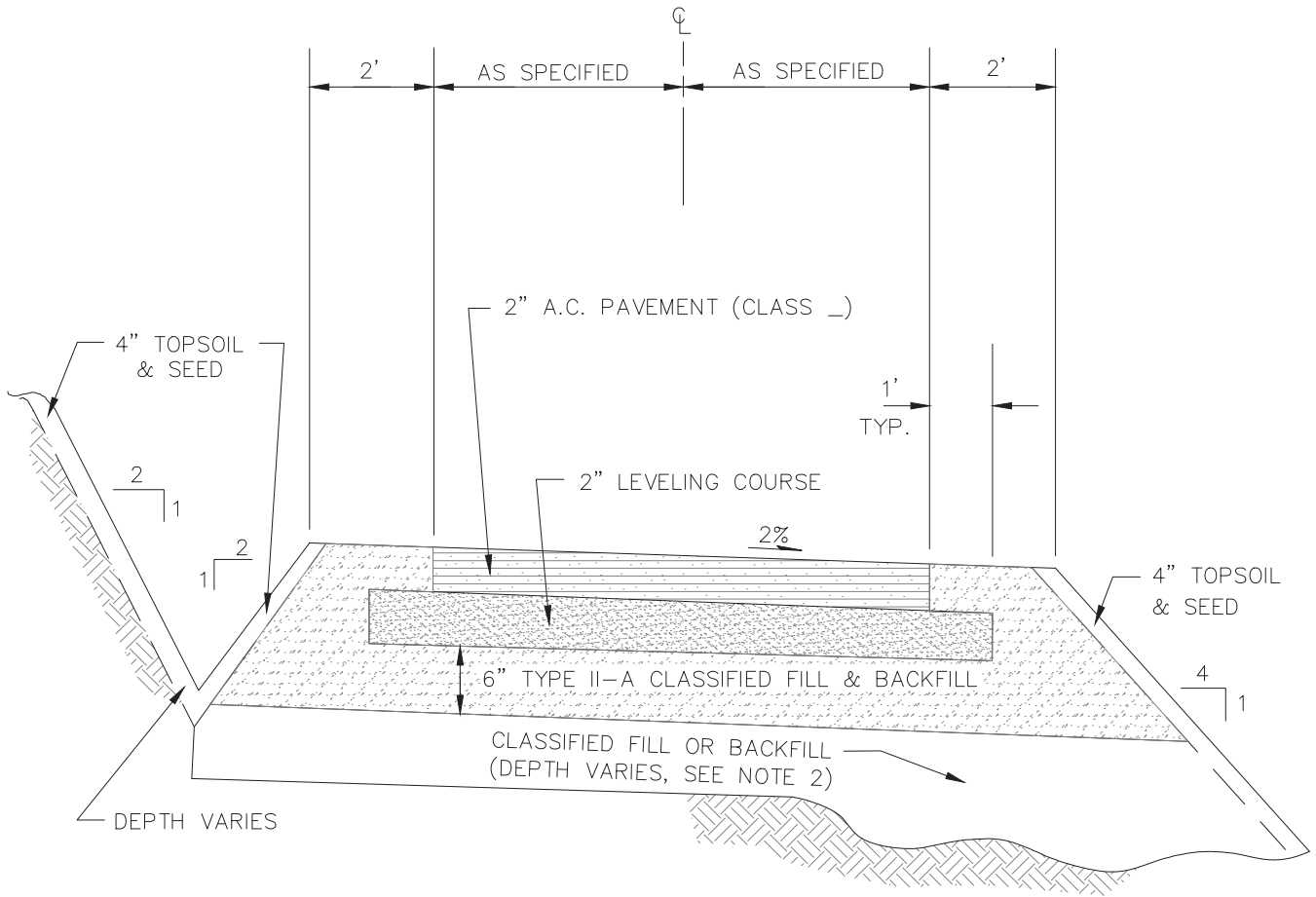
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2/24

**TYPICAL SECTION  
ALLEY**

SECTION #  
DIV 20

DETAIL #  
20-5



NOTES:

1. DIMENSIONS AND ELEVATIONS SHOWN ON THIS STANDARD DETAIL ARE TYPICAL. PROJECT SPECIFIC DIMENSIONS SHOWN ON THE DRAWINGS SHALL CONTROL.
2. ENGINEER WILL DETERMINE THE DEPTH OF EXCAVATION.
3. ADJUST DEPTH OF DITCH AS NECESSARY FOR POSITIVE DRAINAGE AS SHOWN IN THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
4. PLACE CROSS CULVERTS AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER

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MUNICIPALITY



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SCALE:  
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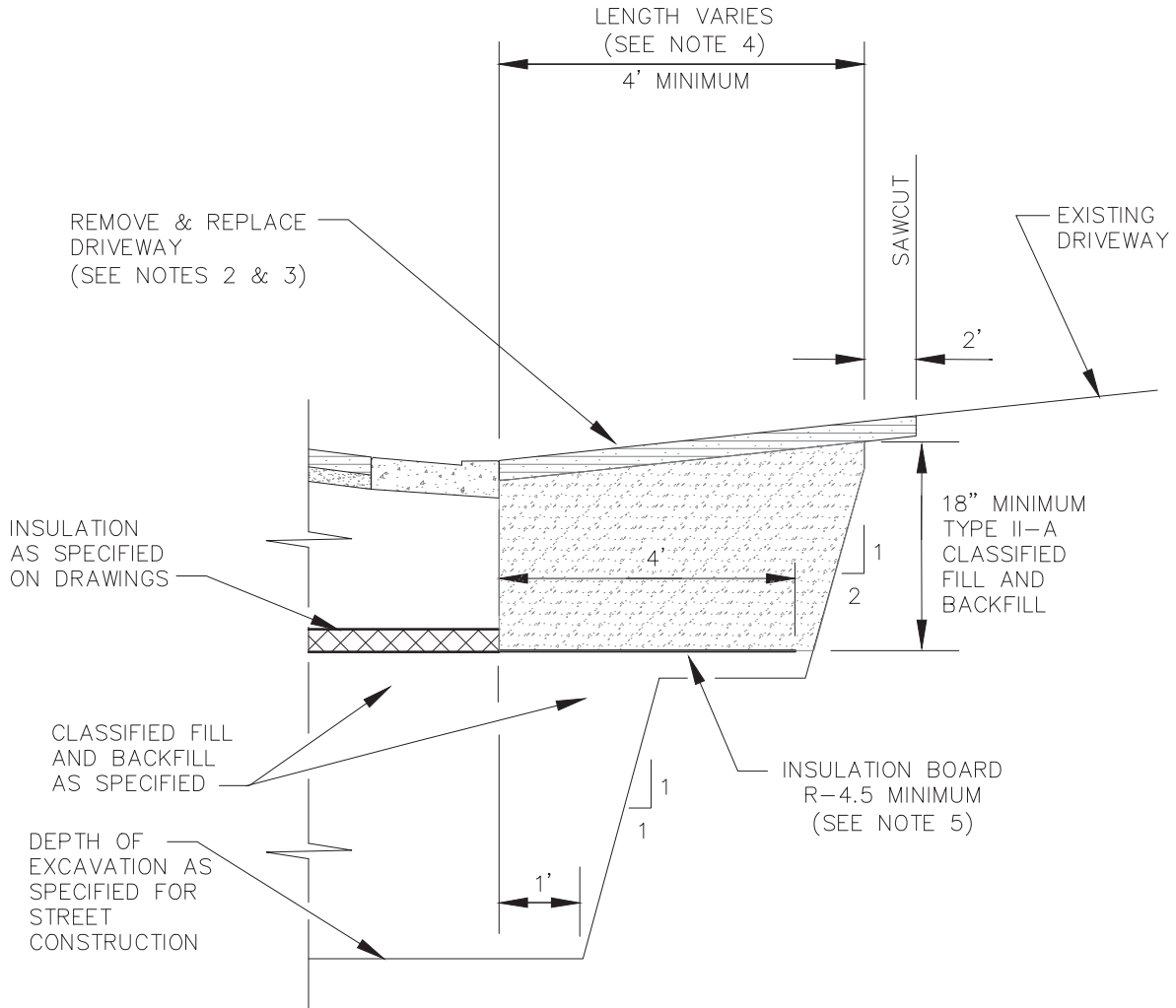
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2/24

**TYPICAL SECTION  
PATHWAY**

SECTION #  
DIV 20

DETAIL #  
20-6

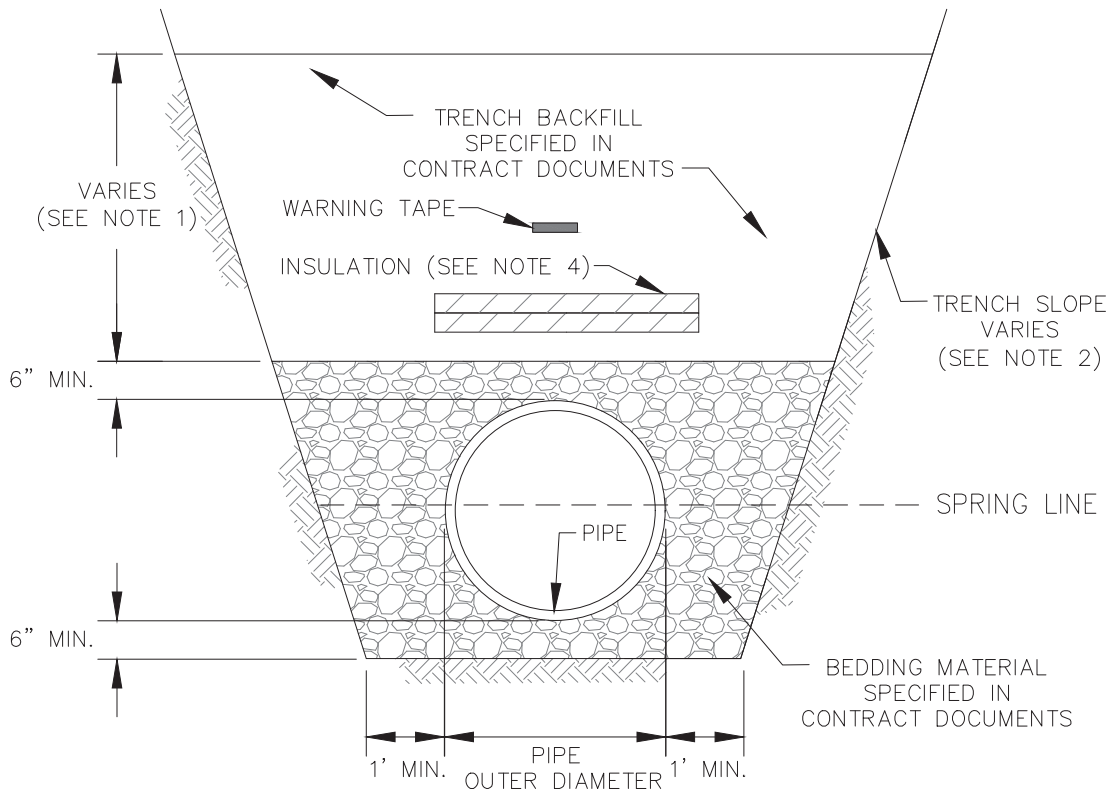


**NOTES:**

1. SURFACING SHALL MATCH EXISTING DRIVEWAY.
2. ASPHALT PAVEMENT SHALL CONSIST OF 2" LEVELING COURSE AND 2" AC PAVEMENT (CLASS E). APPLY TACK COAT AT SAWCUT AND BACK OF CURB.
3. CONCRETE PAVEMENT SHALL CONSIST OF 6" P.C.C. WITH BROOM FINISH PARALLEL TO CURB AND GUTTER. PROVIDE EXPANSION JOINT AT CURB UNLESS SIDEWALK IS ADJACENT TO CURB AND GUTTER, THEN PROVIDE EXPANSION JOINT ONLY BETWEEN SIDEWALK AND DRIVEWAY.
4. LENGTH OF DRIVEWAY REMOVED AND REPLACED VARIES AS SHOWN IN THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
5. INSULATION TRANSITION SHALL BE PROVIDED BELOW DRIVEWAY WHEN ADJACENT TO AN INSULATED ROADWAY.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h1 style="margin: 0;">DRIVEWAY CONNECTION DETAIL</h1>	SECTION # DIV 20  DETAIL # 20-7
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NOTES:

1. TRENCH BACKFILL MATERIAL PLACED AND COMPACTED TO DEPTHS SHOWN IN THE DRAWINGS OR AS DETERMINED BY ENGINEER. COMPACT TRENCH BACKFILL TO A MINIMUM OF 95% MAXIMUM DENSITY.
2. TRENCH WALL SLOPES WILL VARY WITH SOIL STRENGTH AND CHARACTER. SLOPES SHALL CONFORM TO OSHA SAFETY STANDARDS.
3. BACKFILL SHALL BE FREE OF CLAYS AND ORGANIC MATERIALS.
4. WHEN SPECIFIED IN CONTRACT DOCUMENTS, SEE STANDARD DETAIL 20-9 FOR INSULATION DETAILS.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
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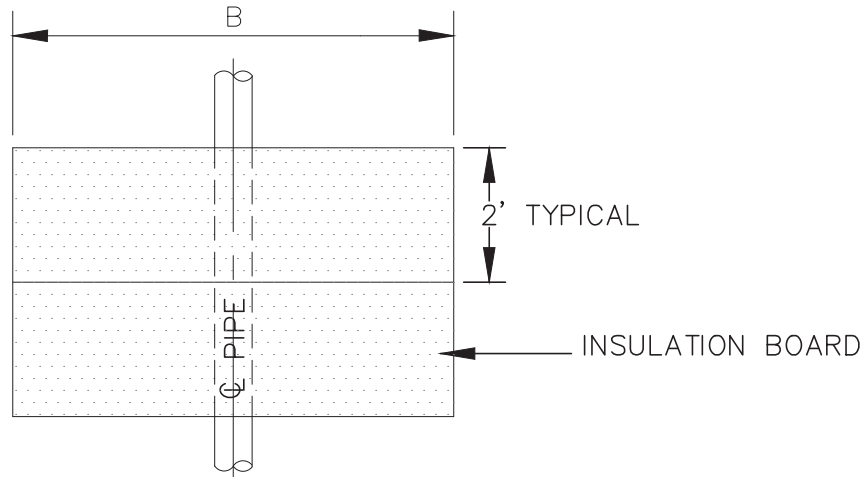
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2/24

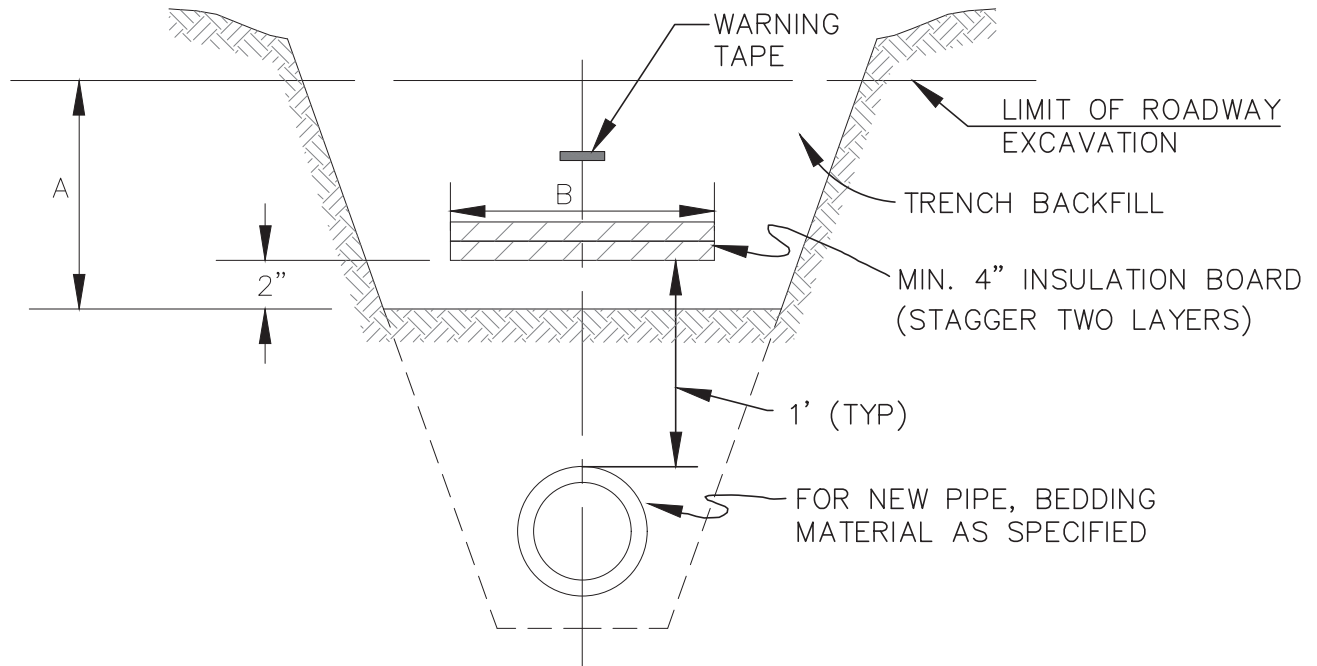
## TRENCH BACKFILL AND BEDDING LAYOUT

SECTION #  
20.13-  
20.16

DETAIL #  
20-8



PLAN VIEW



NOTES:

1. THIS DETAIL APPLIES ONLY WHERE INSULATION IS REQUIRED.
2. "A" IS DEPTH FOR PAYMENT UNDER "TRENCH EXCAVATION AND BACKFILL" WHERE INSULATION IS PLACED OVER EXISTING PIPE.
3. "B" AS SHOWN ON DRAWINGS OR TO BE DETERMINED BY ENGINEER, FOUR FOOT (4') MINIMUM.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

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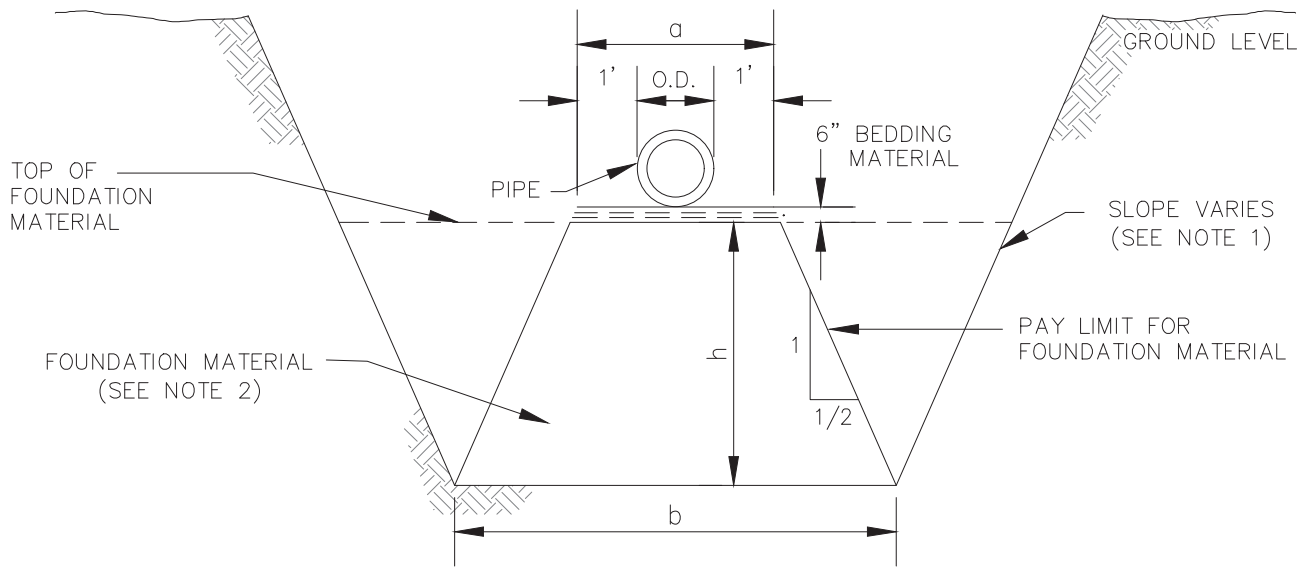
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2/24

**PIPE INSULATION**

SECTION #  
20.13

DETAIL #  
20-9



### AREA FORMULA

#### PAY LIMITS

O.D. = OUTSIDE PIPE DIAMETER

$$a = 2' + \text{O.D.}$$

$$b = a + h$$

h = HEIGHT OF FOUNDATION MATERIAL

$$\text{Area} = 1/2 (a + b)h$$

### SAMPLE CALCULATION

FOR 18" SINGLE WALL HDPE,  
3' FOUNDATION HEIGHT

OUTSIDE PIPE DIAMETER = 21.8"

$$h = 3'$$

$$a = 2' + 21.8" = 45.8" = 3.82'$$

$$b = a + h = 3.82' + 3' = 6.82'$$

$$\text{Area} = 1/2 (a + b)h$$

$$= 1/2 (3.82' + 6.82') * 3'$$

$$= 15.96 \text{ SQUARE FEET}$$

### NOTES:

1. TRENCH WALL SLOPES WILL VARY WITH SOIL STRENGTH AND CHARACTER. SLOPES SHALL CONFORM TO OSHA SAFETY STANDARDS.
2. FOUNDATION MATERIALS PLACED AND COMPACTED TO DEPTHS SHOWN IN THE DRAWINGS OR AS DETERMINED BY THE ENGINEER. COMPACT FOUNDATION MATERIAL TO 95% MAXIMUM DENSITY, UNLESS OTHERWISE SPECIFIED.
3. USE THE AREA FORMULA TO CALCULATE THE AREA OF PAY LIMITS FOR ALL TYPES AND SIZES OF PIPE.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

## FOUNDATION MATERIALS

SECTION #  
20.19

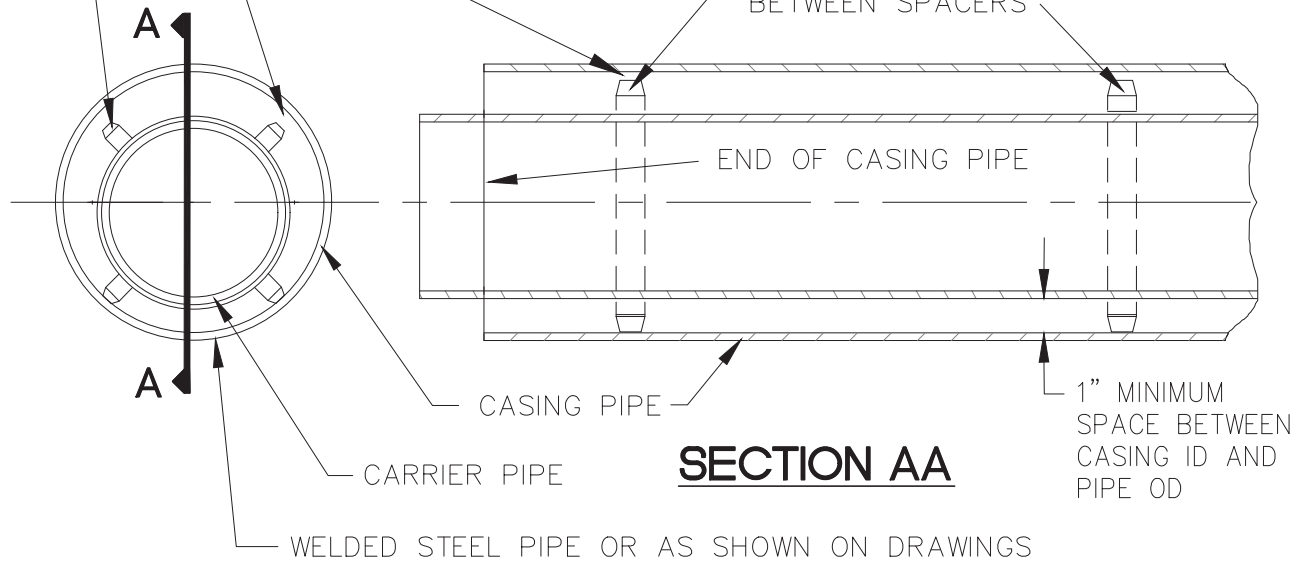
DETAIL #  
20-10



CASING SPACERS SHALL BE CASCADE WATERWORKS MFG. OR APPROVED EQUAL.  
INSTALL PER MANUFACTURERS RECOMMENDATION

3/4" MAXIMUM BETWEEN RUNNER AND CASING PIPE

8 FOOT MAX.  
BETWEEN SPACERS




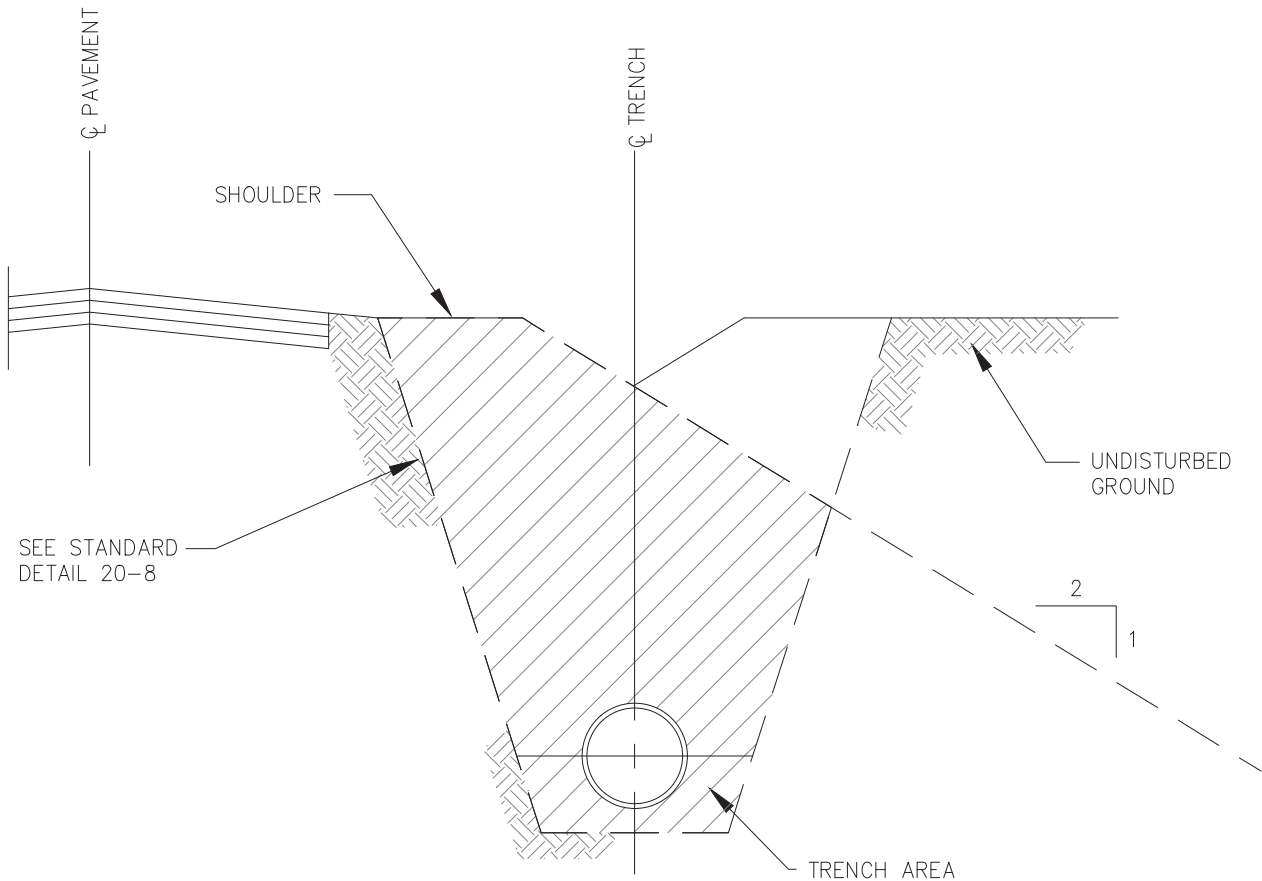
**SECTION AA**

NOTES:

1. CASING PIPE SHALL BE WELDED STEEL PIPE, AND GAUGE SHALL BE AS SHOWN ON DRAWINGS. CASING PIPE SHALL BE DESIGNED FOR ALL LOADS FOR EACH APPLICATION.
2. INSTALL CASING SPACERS A MAXIMUM OF ONE FOOT (1') FROM EACH SIDE OF EACH PIPE JOINT. CASING SPACERS SHALL BE CASCADE WATERWORKS MFG. STAINLESS STEEL WITH POLYETHYLENE RUNNERS OR APPROVED EQUAL.
3. ENDS OF CASING PIPE SHALL BE SEALED WITH SYNTHETIC RUBBER SEAL WITH STAINLESS STEEL BANDS. CASING SHALL BE WATERTIGHT. END CAPS MAY BE DELETED BY THE CORROSION ENGINEER.
4. CARRIER PIPE SHALL HAVE FIELD LOKd GASKETS OR APPROVED EQUAL INSTALLED ENTIRE LENGTH OF CASING PIPE AND AT A MINIMUM SHALL EXTEND ONE FULL PIPE LENGTH BEYOND END OF CASING.
5. JOINT BONDS OR THAW WIRES SHALL BE INSTALLED THE ENTIRE LENGTH OF CARRIER PIPE PER AWWU DCPM CORROSION CONTROL MAGNESIUM BAG ANODE INSTALLATION DETAIL.
6. CORROSION ANALYSIS SHALL BE PERFORMED FOR CASING PIPE.
7. FILL CARRIER PIPE WITH WATER PRIOR TO FILLING ANNULAR SPACE WITH CDF GROUT.
8. GROUT ANNULAR SPACE WITH CONTROLLED DENSITY FILL (CDF) 50-150 PSI 28 DAY STRENGTH, pH MIN II.
9. VOIDS CREATED BY CASING INSTALLATION ON OUTSIDE OF CASING SHALL BE PRESSURE GROUTED.

REVISION: 2024 M.A.S.S. UPDATE

<p>MUNICIPALITY</p>  <p>OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>PIPE ENCASEMENT</b></p>	<p>SECTION # 20.29</p> <p>DETAIL # 20-11</p>
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NOTES:

1. REPLACE ALL MATERIAL THAT IS TO BE BACKFILLED WITHIN THE ABOVE-DESCRIBED AREA IN ONE-FOOT LIFTS PER DIVISION 20, SECTION 20.21, ARTICLE 21.3 - CONSTRUCTION.
2. BACKFILL SHALL BE FREE OF CLAYS AND ORGANIC MATERIALS.
3. COMPACT BACKFILL BY MECHANICAL MEANS WITHOUT THE AID OF WATER.
4. RESHAPE DITCH LINE IN SUCH A MANNER AS TO PROVIDE PROPER DRAINAGE; REPLACE SHOULDER OF THE ROAD AT A UNIFORM SLOPE NOT TO EXCEED 2 TO 1.

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<p>MUNICIPALITY</p>  <p>OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>COMPACTION OF BACKFILL WITHIN RIGHT-OF-WAY</b></p>	<p>SECTION # 20.30</p> <p>DETAIL # 20-12</p>
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**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 30  
PORTLAND CEMENT CONCRETE**



**STANDARD CONSTRUCTION SPECIFICATIONS FOR  
PORTLAND CEMENT CONCRETE  
DIVISION 30  
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**STANDARD CONSTRUCTION SPECIFICATIONS FOR  
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**SECTION 30.01 GENERAL**

**Article 1.1 Scope of Work**

The Work covered by this Section consists of providing all plant, labor, equipment, supplies, material, transportation, handling, storage and protection for performing all operations in connection with the placement of Portland Cement Concrete in accordance with the Specifications and the Drawings.

**Article 1.2 Applicable Standards**

The latest revision of the following standards of the American Society for Testing and Materials (ASTM) and American Society of State Highway and Transportation Officials (AASHTO) are hereby made a part of these Specifications:

American Concrete Institute		"Manual of Concrete Practice"
Concrete Reinforcing Steel Institute		"Manual of Standard Practice"
ASTM A184		Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	AASHTO M 31	Specification for Deformed and Plain Carbon and Low Alloy Steel Bars for Concrete Reinforcement
ASTM C31	AASHTO T 23	Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Field
ASTM C33		Specification for Concrete Aggregates
ASTM C330		Specification for Lightweight Aggregates for Structural Concrete
ASTM C39	AASHTO T 22	Test for Compressive Strength of Cylindrical Concrete Specimens
ASTM C40	AASHTO T 21	Test for Organic Impurities in Fine Aggregates for Concrete
ASTM C42	AASHTO T 24	Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C90		Hollow Load-Bearing Concrete Masonry
ASTM C94	AASHTO M 157	Specification for Ready-Mix Concrete
ASTM C143	AASHTO T 119	Test for Slump of Hydraulic-Cement Concrete
ASTM C150	AASHTO M 85	Specification for Portland Cement
ASTM C156	AASHTO T 155	Test for Water Retention Efficiency of Liquid Membrane-Forming Compounds and Impermeable Sheet Materials for Curing Concrete.
ASTM C171	AASHTO M 171	Specification for Waterproof Paper for Curing Concrete
ASTM C172	AASHTO T 141	Sampling Fresh Concrete

ASTM C192	AASHTO T 126	Method of Making and Curing Concrete Compression and Flexure Test Specimens in the Laboratory
ASTM C226	AASHTO M 134	Specification for Air-Entraining Additions for Use in the Manufacture of Air-Entraining Portland Cement
ASTM C231	AASHTO T 152	Test for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	AASHTO M 154	Specification for Air-Entraining Admixture for Concrete
ASTM C270		Mortar for Unit Masonry (Including Tentative Revision)
ASTM C309	AASHTO M 148	Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C330	AASHTO M 195	Specifications for Lightweight Aggregates for Structural Concrete
ASTM C494	AASHTO M 194	Specifications for Chemical Admixtures for Concrete
ASTM C1240	AASHTO M 307	Specification for Silica Fume Used in Cementitious Mixtures
ASTM D1557	AASHTO T 180	Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.)
ASTM D1751	AASHTO M 213	Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
	AASHTO M 6	Specification for Fine Aggregate for Portland Cement Concrete
	AASHTO M 32	Specification for Cold Drawn Steel Wire for Concrete Reinforcement Cement
	AASHTO M 80	Specification for Coarse Aggregate for Portland Concrete
ASTM A1064	AASHTO M 336	Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

### **Article 1.3 Materials**

#### **A. Reinforcing Steel**

Concrete reinforcing shall be deformed steel bars conforming to the requirements of ASTM A615 (AASHTO M 31). It shall be free from loose scales, excessive rust, and coatings of any character which will reduce the bond between steel and concrete.

If reinforcing bars are to be welded, these Specifications shall be supplemented by requirements assuring satisfactory weldability in conformity with AWS D12.1, "Recommended Practices for Welding Reinforcing Steel, Metal Inserts and Connections in Reinforced Concrete Construction."

#### **B. Welded Steel Wire Fabric**

The welded steel wire fabric shall be cold-drawn steel wires, fabricated into mesh formed by the process of electric welding. The grade of wire shall conform to AASHTO M 32. Welded Steel Wire Fabric shall conform to ASTM A1064 (AASHTO M 336).



C. Cement

The cement shall be of a recognized standard brand of Portland Cement conforming to the specification requirements listed below and of a type listed below:

<u>Specification</u>	<u>Type Portland Cement</u>
ASTM C150	Type I, III*
AASHTO M 85	Type I, III*

\*Type III cement may be used upon written authorization of the Engineer subject to the following modification:

Minimum design strength shall be achieved in seven (7) days in lieu of the twenty-eight (28) days required for Type I cement.

For architectural concrete only one brand of cement shall be used unless otherwise approved by the Engineer. When no type cement is specified, the requirements of Type I shall govern.

Cement reclaimed from cleaning bags or leaking containers shall not be used.

The Engineer may require an additional one-half sack of Portland concrete over the design specification.

D. Water

Water used for the mixing of concrete shall be clean and free of oil or acid, and shall not contain salt, alkali, or organic matter.

E. Aggregates

Aggregates for Portland Cement Concrete shall be well graded, clean, hard gravel, and coarse sand, non-frost susceptible material, and free of deleterious (organic) matter, and coatings of silt or clay. The gradations shall be determined by standard laboratory sieves with square openings. Material retained on a No. 4 screen shall be classified as coarse aggregate, which shall conform to the requirements of AASHTO M-80 and have the following limits of gradation:

Coarse Aggregate for Portland Cement Concrete

U.S. Standard Sieve Size	AASHTO No. 67 (¾" to #4)	AASHTO No. 4 (1 ½" to ¾")
	Cumulative % Passing By Weight	Cumulative % Passing By Weight
2"	-----	100
1 ½"	-----	90-100
1"	100	20-55
¾"	90-100	0-15
½"	-----	-----
⅜"	20-55	0-5
#4	0-10	-----
#8	0-5	-----

All material passing a No. 4 sieve shall be classified as fine aggregate and shall conform to the requirements of AASHTO M 6 and have the following gradation:

Fine Aggregate for Portland Cement Concrete

U.S. Standard Sieve Size	Cumulative % Passing By Weight
¾"	100
#4	95-100
#8	80-100
#16	50-85
#30	25-60
#50	10-30
#100	2-10

Aggregates shall consist of washed sand gravel; fine and coarse aggregates shall be regarded as separate ingredients. Aggregates for normal weight concrete shall conform to the requirements of ASTM C33 and aggregates for light weight concrete, shall conform to the requirements of ASTM C330.

The maximum size of coarse aggregates shall not exceed one and one-half inches (1 ½") nor one-fifth (1/5) of the narrowest dimension between the forms nor three-quarters (¾) of the clear spacing between reinforcing bars nor one-third (1/3) of the depth of slabs. The combined aggregates, coarse and fine, shall be of such composition of sizes that when separated on the No. 4 standard sieve, the weight passing shall not be less than thirty percent (30%) nor greater than fifty percent (50%) of the total weight.

The volume removed by sedimentation shall not exceed three percent (3%). Proportioning of the coarse and fine aggregate shall be obtained by weight. The weighing equipment shall be accurate within one percent (1%) of the net weight of the batch and shall permit adjustment for variations in the water content of the aggregate. Batching for fractional sacks of cement will not be permitted unless the cement is weighed for each batch. The water added shall be measured by an approved calibrated device capable of metering within one percent (1%) of the total amount of water to be used for each batch.

F. Air-Entrainment

Air-entrainment agents shall be used in all concrete. Entrainment shall be achieved by the addition of an approved air-entraining mixture to the concrete mix. Air-entrainment shall conform to ASTM C231 (AASHTO T 152). Refer to Article 1.6 - Mix Requirements for Classes of Concrete for air-entrainment percentages for each class of concrete.

G. Curing Materials

Curing materials shall be one the following types as approved by the Engineer:

1. Kraft paper conforming to the requirements of ASTM C171 (AASHTO M 171).
2. Mats of commercial quality and of a type used for curing concrete.
3. Burlap of commercial quality weighing not less than fourteen (14) ounces per square yard.
4. Membrane curing compound conforming to the requirements of ASTM C309 (AASHTO M 148).

H. Expansion Joints

Premolded joint filler for use in expansion joints shall conform to the requirements of ASTM D1751 (AASHTO M 213).

**Article 1.4 Mix**

Portland Cement Concrete may be mixed at a central mixing plant or in transit mixers. All mixing equipment and operations shall conform to the requirements of ASTM C94 (AASHTO M 157). All concrete shall be delivered to the work site thoroughly mixed to a uniform color and show uniform distribution of aggregates and cement throughout the mixture.

Concrete shall be delivered to the Project site, discharged from the truck completely and in the forms ready for vibration within one and one-half (1-1/2) hours after introduction of the cement to the aggregates. At the discretion of the Engineer, the above period may be extended one (1) minute for every degree of temperature at which the concrete is delivered below seventy degrees (70°) Fahrenheit to a maximum total time of two (2) hours.

In hot weather, or under conditions contributing to quick setting of the concrete, a discharge time less than one and one-half (1-1/2) hours may be required by the Engineer. Any concrete remaining undischarged at the end of the respective time period shall be rejected.

The use of non-agitating equipment for transporting concrete will not be permitted. The mixing drums of transit-mix trucks shall be thoroughly washed after discharging each load to prevent the accumulation of adherent layers of concrete. The discharge of particles of hardened concrete with any batch will be sufficient grounds for the rejection of the entire batch. On curb, gutter and sidewalk work, transit mix trucks shall be operated parallel to the forms while discharging.

The addition of water to the mix at the job site will be permitted with the approval of the Engineer. Any additional water that is added shall be documented and recorded on the delivery ticket by a representative of the supplier.

**Article 1.5 Subbase**

Prior to placement of forms, the Engineer shall inspect the subbase to insure that it is smooth, compacted and free of soft or yielding spots and that compaction at optimum moisture is at least ninety-five percent (95%) of maximum density (AASHTO T 180 D). Backfilling within the forms will be permitted if the subbase is brought to the above specification and care is taken to maintain the forms to line, shape elevation.

**Article 1.6 Mix Requirements for Classes of Concrete**

The minimum mix requirement for classes of concrete shall be as set forth below, unless otherwise specified in the Contract Documents.

		CLASS OF CONCRETE							
		C-6	B-3	B-6	A-3	A-6	AA-3	AA-6	
Maximum Water Cement Ratio in Lb./Lb.		0.55	0.55	0.55	0.45	0.45	0.40	0.40	
Slump Ranges in Inches		1-5	2-4	1-3	2-4	1-3	2-4	1-3	
Entrained Air Range in Percentage		6±1.5	6±1.5	6±1.5	6±1.5	6±1.5	6±1.5	6±1.5	
Coarse Aggregate (AASHTO Gradation)		No.4 and No. 67	No. 67	No. 4* and No. 67	No. 67	No. 4* and No. 67	No. 67	No. 4* and No. 67	

Fine Aggregate Shall Conform to AASHTO M-6 Gradation

Minimum Design Strength (fc), psi	2000	3000	3000	4000	4000	5000	5000
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Minimum design compressive strength specification shall be achieved in twenty-eight (28) days.

\*The coarse aggregate for Class B-6, A-6, and AA-6 concrete shall be furnished in two (2) separate sizes.

Alternate mix designs will be considered upon submitting to the Engineer the following information:

1. MOA mix design designation for which the substitution is intended.
2. Design strength.
3. Air content.
4. Slump.
5. Aggregate gradation and maximum size.
6. Maximum water/cement ratio.
7. Minimum cement content.
8. List of admixtures, strength overdesign, and other special features.
9. Fine aggregate weight/percent moisture of fine aggregate.
10. Intermediate aggregate weight/percent moisture of intermediate aggregate.
11. Coarse aggregate weight/percent moisture of coarse aggregate.
12. Weight of cement.
13. Weight of water.
14. Unit weight.

Water shall not be used to increase slump beyond four inches (4"). If additional slump is desired, a plasticizing agent may be used subject to the Engineer's written approval.

#### **Article 1.7 Ready-Mixed Concrete**

Ready-mixed concrete shall conform to the requirements of ASTM C94 (AASHTO M 157). For each batch of concrete, it is the responsibility of the Contractor to furnish to the Engineer, before unloading at the site, a delivery ticket from the manufacturer on which is printed, stamped or written, information concerning said concrete as follows:

1. Name of ready-mix batch plant.
2. Serial number of ticket.
3. Date and truck number.
4. Name of Contractor.
5. Specific designation of Project (name and location).
6. Specific class of concrete in conformance with that employed in Specifications.
7. Amount of concrete (cubic yards).
8. Time loaded or first mixing of cement and aggregate.
9. Type of cement.
10. Admixtures and amount of same.
11. Slump requested by the Contractor and recorded in inches.
12. Percentage of entrained air requested by the Contractor.
13. Fine aggregate weight/percent moisture of fine aggregate.
14. Intermediate aggregate weight/percent moisture of intermediate aggregate.
15. Coarse aggregate weight/percent moisture of coarse aggregate.
16. Weight of cement.
17. Weight of water.
18. Unit weight.

## **Article 1.8 Sampling and Testing**

The Engineer shall take concrete samples for concrete cylinders in accordance with AASHTO T 141. Samples shall not be taken at the beginning or end of discharge. Making and curing the specimens shall be done in accordance with AASHTO T 23. Testing and sampling shall be done by the Engineer.

Slump tests shall be taken in accordance with AASHTO T 119 or ASTM C143. Slump tests shall be taken by the Engineer.

Should the analysis of any test cylinder not meet the requirements of these Specifications, all concrete placed from the batch represented by the cylinder shall be removed and replaced at the Contractor's expense.

## **Article 1.9 Weather Limitations**

Placement of Portland Cement Concrete is subject to the following requirements:

1. Salt, chemicals, or other material shall not be mixed with the concrete to prevent freezing.
2. Placement of concrete shall be prohibited whenever there is standing water on the grade or in the forms, the subgrade is yielding due to saturation, or rain is threatening.
3. Approved admixture shall be used in accordance with the manufacturer's recommendations.

Ensure the concrete temperature is between fifty degrees (50°) Fahrenheit and ninety degrees (90°) Fahrenheit when placed. If ambient air temperature falls below forty degrees (40°) Fahrenheit at any time during the cure period defined in Article 1.10 Protection of Work, concrete shall be protected by the placement of insulating blankets over the surface area and/or application of heat as necessary to maintain a surface temperature greater than fifty degrees (50°) Fahrenheit.

Placement of concrete shall be prohibited at an ambient air temperature above ninety degrees (90°) Fahrenheit and below forty degrees (40°) Fahrenheit or where the foundation material is frozen, except in special situations where authorized by the Engineer in writing. Exemption from the temperature clause of these Specifications shall be considered only under the following conditions:

A written proposal shall be submitted by the Contractor to the Engineer outlining a procedure for maintaining the placed concrete temperature of at least fifty degrees (50°) Fahrenheit for seventy-two (72) hours where Type III cement has been used and one hundred and twenty (120) hours where Type I cement has been used. When the temperature is reduced, the drop in temperature must be gradual and not exceed thirty degrees (30°) Fahrenheit in the first twenty-four (24) hours.

## **Article 1.10 Protection of Work**

The Contractor shall protect all newly placed concrete from damage of any kind to prevent disfigurement during the curing period. Do not apply loads to the concrete until curing operations are completed and until the Engineer determines the concrete has attained sufficient strength to safely carry the applied loads without damage. Damaged

concrete shall be repaired or replaced to the Engineer's satisfaction at no additional cost.

Type I/II/III Portland Cement Concrete shall be placed, finished, cured at a minimum temperature of fifty degrees (50°) Fahrenheit. The concrete shall be protected until lab testing of field-cured specimens has attained at least 80 percent of the Specified Compressive Strength prior to material being distributed against, or vibrated (compaction) adjacent to the structure, as directed by the Engineer. In the event where concrete samples are misplaced or stolen in the field or lab testing is unavailable, a minimum of seven (7) days protection period shall be provided.

#### **Article 1.11 Clean-up**

When all concrete Work has been completed and cured, the Contractor shall remove the forms, stakes, blocking, and concrete spoil from the site. The area adjoining the concrete that was excavated to permit the construction and placement of forms shall be filled with select material, and the slopes and parking areas, if any, shall be filled, shaped and smoothed to the level as shown on the Drawings or Standard Details.

## **SECTION 30.02 PORTLAND CEMENT CONCRETE, CURB AND GUTTER AND VALLEY GUTTER**

### **Article 2.1 Description**

The Work covered under this Section consists of the construction of Portland Cement Concrete curb and gutter, valley gutters, and curb noses.

### **Article 2.2 Materials**

Portland Cement Concrete, joint filler, reinforcing steel, and curing materials shall conform to Section 30.01, Article 1.3 - Materials. Concrete mix for curb and gutter, valley gutters, and curb noses shall conform to the requirements for Class A-3 for hand formed construction and Class A-6 for machine formed construction unless otherwise specified.

High-Performance Portland Cement Concrete, joint filler, reinforcing steel, and curing materials shall conform to Section 30.12, Article 12.2 – Materials with the exception the color of the concrete shall be a standard grey. Concrete mix shall conform to Section 30.12, Article 12.3 – Mix Requirements.

#### **A. Reinforcing Steel and Steel Dowels**

Refer to Section 30.01, Article 1.3, SubArticle A. - Reinforcing Steel and SubArticle B. - Welded Steel Wire Fabric.

#### **B. Preformed Expansion and Dummy Joint Filler**

Refer to Section 30.01, Article 1.3, SubArticle H. - Expansion Joints.

#### **C. Curing Compounds**

Refer to Section 30.01, Article 1.3, SubArticle G. – Curing Materials.

#### **D. Forms**

Forms may be of wood or metal or any other material at the option of the Contractor, provided that the forms as set will result in a curb, or curb and gutter of the specified thickness, cross section, grade and alignment shown on the Drawings.

Forms may be removed the same day following pour if the concrete is sufficiently set that removal can be accomplished without danger of chipping or spalling. Form materials shall be free from warp, with smooth and straight upper edges, and if used for the face of a curb, shall be surfaced on the side against which the concrete is to be placed. Wooden forms for straight work shall have a net thickness of at least one and one-half inches (1.5"). Metal forms for such a work shall be of a gage that will provide equivalent rigidity and strength. Curb face forms used on monolithic curb and gutter construction shall be a single plank width when the curb face is ten inches (10") or less, except for those used in curb returns. All forms used in curb returns shall not be less than three-quarters inches (3/4") in thickness, cut in the length and radius as shown on the Drawings, and held rigidly in place to line and grade by the use of metal stakes and clamps. The curb face form shall be cut to conform exactly with the curb face batter as well as



being cut to the required length and radius. Forms shall be of sufficient rigidity and strength, and shall be supported to adequately resist springing or deflection from placing and tamping of concrete.

Form material shall be clean and free from defect at the time of use.

All forms including back planks of curb shall be set with upper edges flush with specified alignment and grade of the finished surface of the improvements to be constructed, and all forms shall be not less than a depth equivalent to full specified thickness of the concrete to be placed.

Forms shall be held securely in place by means of metal stakes to insure no irregularities in the forms. Placement of the metal stakes shall not exceed three feet (3'). Clamps, spreaders, and braces shall be used to the extent as may be necessary to insure proper form rigidity. Forms for walk and similar work shall be firmly secured by means of stakes driven at intervals not to exceed four feet (4'). Form stakes shall be of sufficient size and be driven so as to adequately resist lateral displacement.

Commercial form clamps for curb and gutter may be used provided they fulfill the requirements specified herein.

Pump trucks may be used upon approval of the Engineer. Prior to approval, the Contractor must demonstrate to the satisfaction of the engineer that the pumping equipment will not segregate, or in any other way degrade, the concrete. Additional test samples for such alternate placement methods may be taken from the discharge side of the machine for compressive strength determination assurance tests.

## **Article 2.3 Construction**

### **A. Erecting Forms**

All forms shall be set to the lines, grade, and dimensions shown on the Drawings. The forms shall be thoroughly braced and secured to resist deformation or displacement under load, and shall be installed to permit easy removal without hammering or prying against the fresh concrete. The top of the forms shall not deviate more than one-eighth inch (1/8") in ten feet (10'), and the alignment of forms shall be within one-fourth inch (1/4") in ten feet (10').

Before placement of concrete, steel forms shall be lightly oiled with a good grade of form oil. Excess oil shall be removed by wiping with clean rags, dampened in diesel or fuel oil. Wooden forms may be oiled in the same manner as metal forms, or they may be watered immediately in advance of the placement of concrete. Watering of the form shall be done with clean water of the same quality as that specified for mixing water, and only when the atmospheric temperature is not less than forty degrees (40°) Fahrenheit. Concrete shall not be placed until all forms have been inspected and approved by the Engineer. Wherever form work is exposed to pedestrian traffic, bridges (not attached to the forms) shall be provided at all regular pedestrian crossings where it is required to maintain safety standards. Barricades and other safety features shall be installed as necessary.

## B. Placing Concrete

Prior to the delivery of the first load of concrete for curbs, the Contractor shall furnish rigid straightedges, ten feet (10') or sixteen feet (16') in length, to the Engineer for checking surface uniformity. String shall not be used as a straightedge. Surface irregularities, as measured along the top face of curb and the curb pan, shall not exceed three-sixteenth inch (3/16") within ten feet (10'), or five-sixteenth inch (5/16") within sixteen feet (16'). Non-conforming surfaces shall be subject to rejection by the Engineer. All surfaces rejected by the Engineer shall be corrected by the Contractor at the Contractor's expense.

The subgrade shall be properly compacted and brought to specified grade in accordance with the Drawings before placing concrete. The subgrade shall be thoroughly dampened immediately prior to the placement of the concrete. Forms shall not be splashed with concrete in advance of placing.

Concrete shall be discharged from transport vehicle to the point of final placement in a continuous manner as rapidly as practicable. The rate of placement shall not exceed the rate at which the various placing and finishing operations can be performed in accordance with these Specifications. Concrete shall not be allowed to free fall more than three feet (3').

If concrete is to be placed by the extruded method, the Contractor shall demonstrate to the satisfaction of the Engineer that the machine is capable of placing a dense, uniformly compacted concrete to exact section, line and grade. Extruded curb which does not meet all requirements of the Contract Documents, shall be replaced at the Contractor's expense.

## C. Stripping Forms and Finishing

The face form of the curb shall be stripped at such time in the early curing as will enable inspection and correction of all irregularities that appear thereon.

Forms shall not be removed until the concrete has set sufficiently to retain its true shape. The face of the curb shall be troweled with a tool cut to the exact section of the curb and at the same time maintain the shape, grade, and alignment of the curb. Both front and back edges shall be troweled to a radius of one-half inch (1/2"). Final finish shall be obtained by brooming the surface, including the troweled edge to a gritty finish after all free moisture has disappeared from the surface. Sprinkling of cement or sand for blotting will not be permitted.

It is the intent of this Specification to insure the highest quality of workmanship in the construction and finishing of P.C.C. curb and gutter.

Unightly or poorly finished surfaces will be considered grounds for rejection of the Work. The top and/or face and gutter of the finished concrete surfaces shall be true and straight, of uniform width and free of cracks, humps, sags, or other irregularities. The finished concrete surface shall not vary more than two-hundredths of a foot (0.02') from a ten foot (10') straight edge, except at grade changes or curves. No freestanding water is permitted on slopes at or greater than one percent (1%). No freestanding water deeper than one-sixteenth inch (1/16") is permitted on slopes of less than one percent (1%). The Contractor shall flow test

all new concrete curb and gutter. Curb and gutter failing to meet this requirement will be rejected.

All defective areas shall be removed and replaced at the Contractor's expense, unless permission to patch is granted by the Engineer. Such permission shall not be construed as an acceptance of the Work or as a waiver of the Engineer's right to require the complete removal of the Work, if in his opinion the patch does not satisfactorily restore the quality or appearance of the surface.

Should patching be permitted, the area shall be chipped clean to a depth of one inch (1") perpendicular to the surface and saturated with clean water prior to being patched. The patch shall be made with a mortar extracted from fresh concrete by passing it through a three-eighths inch (3/8") screen. The mortar shall be thoroughly compacted and screeded off slightly higher than the surrounding surface to allow for contracting or setting after the maximum shrinkage has taken place. After one (1) to two (2) hours, the patch shall be troweled to the same finish as the surrounding area and shall be cured as specified herein. The use of special patching material will be permitted if approved by the Engineer.

#### D. Curing

Curing compounds shall be applied to all exposed surfaces immediately after finishing. Transparent of sufficient strength to render the film distinctly visible on the concrete for a minimum period of four (4) hours after application.

If, at any time during the curing period any of the forms are removed, a coat of curing compound shall be applied immediately to the exposed surface. The curing compound shall be applied in sufficient quantity to obscure the natural color of the concrete. Additional coats shall be applied if the Engineer determines that the coverage is not adequate. The concrete shall be cured for the minimum period of time set forth in Section 30.01, Article 1.10.

When forms are removed before the expiration of the curing period, the edges of the concrete shall be protected with moist earth, or sprayed with curing compound.

Other standard methods of curing the curb and gutter may be used upon approval of the Engineer. Concrete shall not be placed unless curing compounds and necessary equipment for applying such is on the Project site.

#### E. Expansion and Contraction Joints

##### 1. Expansion Joints

Expansion joints shall be placed along all structures, as shown in the Drawings and/or Standard Details, and around all features that project into, through, or against the concrete. An expansion joint shall be constructed at the intersection of sidewalks; between sidewalk crossings and sidewalks; between curbs and sidewalks (except parallel curb); where existing and proposed curbs and sidewalks meet; and at the beginning and end of curb returns. Additionally expansion joints shall be constructed every fifty feet (50'). Expansion joint material shall conform to the requirements of ASTM D1751 (AASHTO M 213). Expansion joints shall not exceed one half inch plus or minus one-eighth inch ( $1/2" \pm 1/8"$ ) in width. Expansion joint

material shall extend the full width of the structure and shall be cut to such dimensions that the base of the expansion joint shall extend to the subgrade and the top shall be depressed not less than one-quarter inch (1/4") nor more than one-half inch (1/2") below the finished surface of the concrete. The material shall be of one (1) piece in the vertical dimension and shall be securely fastened in a vertical position to the existing concrete face against which fresh concrete is to be placed. After the concrete has set, the expansion joints shall be filled flush to the finish concrete surface with an approved polyurethane sealant applied according to the manufacturer's recommendation.

Before sealing, the joint shall be cleaned of all dirt, gravel, concrete mortar, and other extraneous material. Sealing shall be done in a neat workmanlike manner.

## 2. Contraction Joints

Transverse contraction joints, cut to a depth of one inch (1") prior to the final set of the concrete, shall be tooled in the sidewalks at intervals of five feet (5'), and at ten feet (10') intervals in the curb and gutter. Where the sidewalk adjoins the curb (parallel to it), contraction joints in the sidewalk and curb shall be made to match where practicable.

### **Article 2.4 Measurement**

Curb or integral curb and gutter shall be measured per linear foot along the face of the curb. Mountable (rolled) curb and gutter shall be measured per linear foot along the gutter line. Portland Cement Concrete (P.C.C.) Valley Gutter shall be measured as shown on the Standard Detail.

Curb containing steel curb facing shall be measured per linear foot along the face of the curb and the designation "Steel Curb Facing" shall be included in the "Type" description of the pay item. Steel curb facing is incidental to the "P.C.C. Curb and Gutter (Steel Curb Facing)" bid item.

High-Performance Portland Cement Concrete (P.C.C.) curb or integral curb and gutter shall be measured per linear foot along the face of the curb.

Medians with curb noses shall be measured as follows: P.C.C. curb and gutter per linear foot, curb noses as units complete in place. Striping on curb noses will be paid under Division 85 and no payment shall be made in this section.

## Article 2.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment and shall include full payment for all Work described in this Section.

Payment shall be made under the following units unless otherwise specified:

ITEM	UNIT
P.C.C. Curb and Gutter (Type)	Linear Foot
P.C.C. Curb and Gutter (Type) (High-Performance)	Linear Foot
P.C.C. Valley Gutter	Linear Foot
Curb Nose	Each

Extra payment will not be made for depressed curb or special sections.

## **SECTION 30.03 PORTLAND CEMENT CONCRETE SIDEWALKS**

### **Article 3.1 Description**

The Work covered under this Section consists of all Work necessary for the provision of Portland Cement Concrete sidewalks.

### **Article 3.2 Materials**

The Portland Cement Concrete, joint filler, reinforcing steel, and curing materials shall conform to Section 30.01, Article 1.3 - Materials. Concrete mix for sidewalks shall conform to the requirements for Class A-3 unless otherwise specified.

### **Article 3.3 Construction**

#### **A. Excavation and Embankment**

Excavation and embankment for sidewalks shall be as described in Division 20 - Earthwork. Where directed by the Engineer, unsuitable material in the subgrade shall be removed to a specific depth and then backfilled with classified fill. Payment will not be allowed for excavation below grade or for backfill materials required when such excavation is caused by negligence of the Contractor.

Embankment shall be compacted to ninety-five percent (95%) maximum density in accordance with Division 20, Section 20.01, Article 1.5 - Compaction Standards. In areas that are inaccessible to normal compaction equipment, approved tampers shall be used.

Before the forms are set, the subgrade shall be graded to within one inch (1") of established grade and the area between the sidewalk and the adjacent private property line shall be shaped to line, grade, and section shown on the Drawings.

#### **B. Forms and Fine Grading**

Forms shall conform to requirements outlined in Section 30.02 - Portland Cement Concrete, Curb and Gutter, and Valley Gutter. Wood forms against unexposed concrete surfaces shall be No. 2 Common Lumber or better. Those against surfaces to be exposed shall be dressed and matched boards of uniform thickness, and widths not exceeding ten inches (10"). Rigid, nonporous and waterproof sheet material may be used provided the end result will be a smooth unmarked concrete surface without waves, fins or other noticeable markings.

Plywood conforming to the requirements for form work, as set forth by the American Plywood Association, may be used against both exposed and unexposed concrete surfaces. This plywood shall be not less than five (5) ply and at least nine-sixteenths inch (9/16") thick. Low areas in the subgrade shall be backfilled with classified fill or with suitable native material as directed by the Engineer. The backfill shall then be compacted to ninety-five percent (95%) maximum density and any dry areas in the subgrade shall be thoroughly dampened prior to the time the concrete is placed. No payment will be made for water, and the work of placing and cost thereof shall be considered as incidental to the construction of the concrete sidewalk.

C. Welded Steel Wire Fabric

The welded steel wire fabric shall be positioned as indicated on the Drawings or as hereinafter specified. Concrete sidewalks adjoining driveways shall be reinforced with welded steel wire fabric.

D. Placing and Finishing Portland Cement Concrete Sidewalk

The concrete shall be spread uniformly between the forms and thoroughly compacted with a steel shod strikeboard. After the concrete has been thoroughly compacted and leveled, it shall be floated with wood floats and finished at the proper time with a steel float. Joints shall be edged with a one-quarter inch (1/4") radius edger and the sidewalk edges shall be tooled with a one-half inch (1/2") radius edger. After final troweling, sidewalk on grades of less than six percent (6%) shall be given a fine hair broom finish applied transversely to the centerline. On grades exceeding six percent (6%), walk shall be finished by hand with a wood float. Walk shall be re-marked as necessary after final finish to assure neat uniform edges, joints, and score lines. Unsightly, poorly finished, and sidewalk failing to meet the requirements of the Drawings, Specifications, and this Section will be rejected.

The sidewalk shall be divided into panels by scoring one inch (1") deep every five feet (5'). Refer to Section 30.02, Article 2.3, SubArticle E - Expansion and Contraction Joints for requirements for contraction and expansion joints. The expansion joints shall be placed at all structures such as catch basins and manholes, at driveways, and at all points of tangency and points of curvature.

Additional requirements for placing and finishing concrete in cold weather shall be as outlined in Section 30.01, Article 1.9 - Weather Limitations.

For all other exposed aggregate concrete sidewalks, Contractor shall float and trowel all surfaces to receive the exposed aggregate finish. Seeding the surface with aggregate shall not be allowed. After the concrete has taken its initial set, the surface aggregate shall be exposed using a water fog spray and brooms to remove the surface matrix. The coarse surface aggregate shall be exposed very lightly, approximately one-sixteenth inch (1/16"). After the concrete has taken its final set, a weak acid wash shall be applied to clean and wash the exposed aggregate surfaces. The weak acid wash shall be thoroughly neutralized and flushed from the finished surface. Under no circumstances shall Contractor allow the acid wash to enter the storm drain lines.

Contractor shall protect adjacent construction, plantings, finishings, structures, and the public from damage and harm due to the acid wash. The finished appearance of the exposed aggregate concrete sidewalk shall produce an appearance and texture that matches the adjacent exposed aggregate sidewalk. Any significant difference in texture or appearance between two adjacent concrete panels, as determined by the Engineer, shall result in removal and replacement of concrete panels by Contractor at no additional cost.

Contractor shall provide a two foot by two foot (2' x 2') exposed aggregate concrete test panel or provide three (3) projects within the Municipality of Anchorage of exposed aggregate that have been poured prior to constructing the

exposed aggregate concrete sidewalk. Location of the test panel will be on-site as approved by the Engineer. Notification of providing this test panel shall be made to the Engineer no less than 24 hours prior to making the test panels to allow the Engineer and materials analysis personnel to be present. The Engineer may require the Contractor to provide additional panel(s) if the test panel does not produce an appearance that matches the adjacent exposed aggregate sidewalk.

Providing the test panel and any other required test panel shall be considered incidental to the bid item "P.C.C. Sidewalk 4" Thick (Exposed Aggregate)" and no separate payment shall be made.

#### E. Curing and Protection

The materials and procedures outlined in Section 30.02, Article 2.3 - Construction, shall prevail. The curing agent shall be applied immediately after finishing and be maintained for a period of seven (7) days. The curing agent(s) and/or concrete mixtures shall in no way deter or prevent final finishing of concrete. The use of surface retarders may be permitted if application methods are accepted by the Engineer, in writing, no less than twenty-four (24) hours prior to concrete placement.

The Contractor shall have readily available sufficient protective covering, such as waterproof paper or plastic membrane, to cover the pour of an entire day in event of rain or other unsuitable weather.

The sidewalk shall be protected against damage or defacement of any kind until it has been accepted by the Owner. Sidewalk which is not acceptable to the Engineer because of damage or defacement shall be removed and replaced at the expense of the Contractor.

Additional requirements for curing in cold weather shall be as outlined in Section 30.01, Article 1.9 - Weather Limitations.

### **Article 3.4 Measurement**

**Sidewalk:** Sidewalks shall be measured per square yard, complete in place, for both four (4") and six inch (6") thicknesses.

**Sidewalk Retaining Walls:** Sidewalks of specified thickness constructed in conjunction with sidewalk retaining walls shall be measured under the provisions of Section 30.05 – Structures and Retaining Walls.

**Welded Steel Wire Fabric:** Sidewalk with welded steel wire fabric shall be incidental and no separate payment shall be made.



**Article 3.5 Basis of Payment**

Payment for this item shall be in accordance with Division 10, Section 10.07 - Measurement and Payment and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
P.C.C. Sidewalk (Thick) (Type Finish)	Square Yard

## **SECTION 30.04 PORTLAND CEMENT CONCRETE CURB RAMPS**

### **Article 4.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing and constructing Portland Cement Concrete curb ramps with a detectable warning surfacing in conformance with the Drawings. The ramps shall comply with the Americans with Disabilities Act Title II as identified in 28 CFR Part 35 – Nondiscrimination on the Basis of Disability in State and Local Government Services.

### **Article 4.2 Materials**

#### **A. General**

Portland Cement Concrete, joint filler, reinforcing steel, and curing materials shall conform to Section 30.01, Article 1.3 – Materials. Concrete mix for curb ramps shall conform to the requirements for Class A-3 unless otherwise specified.

The Contractor shall not apply a troweled pattern to the curb ramps. Contractor shall provide a coarse broom finish for the ramps perpendicular to direction of pedestrian traffic.

#### **B. Detectable Warning Panel**

Each detectable warning panel shall have a truncated domed surface twenty-four inches (24") in depth for the width of the ramp. The truncated domes shall have a height of two-tenths inch (0.2"), a diameter of nine-tenths inch (0.9"), a center-to-center spacing of one and six-tenth inches (1.6") minimum and two and four-tenth inches (2.4") maximum, and a base-to-base spacing of sixty-five one-hundredth inch (0.65"), measured between the most adjacent domes.

Contractor shall provide panels Federal Yellow in color. The specified color shall be homogeneous throughout the panel.

Contractor shall provide a cast iron detectable warning plates, or panels (s), manufactured by:

Advantage Tactile Systems	OR	EJ Group, Inc.
241 Main Street, Suite 100		301 Spring Street
Buffalo, NY 14203		East Jordon, MI 49727
Phone: 1-800-679-4022		Phone: 1-800-626-4653
OR		Tuf Tile
		905 Telser Road
		Lake Zurich, IL 60047
		Phone: 1-888-960-8897

or an approved equal.

### **Article 4.3 Construction**

The Contractor shall construct each curb ramp and install the detectable warning panel(s) in conformance with the Contract Documents and the manufacturer's recommendations.

No later than five (5) days prior to construction of the curb ramps, Contractor shall submit to the Engineer for review and approval, a layout drawing for each curb ramp to resolve issues related to pattern repeat, tile cuts, reinforcements, expansion joints, control joints, ramp curves, ramp end returns and surface interfaces, and truncated dome spacing.

Contractor shall install reinforcement with welded steel wire fabric and shall be positioned as indicated on the Drawings or as hereinafter specified. Ramp runs longer than ten feet (10') in length shall be reinforced with welded steel wire fabric. No joints shall be placed within the ramp unless noted otherwise.

Contractor shall install and finish the P.C.C. in accordance with the Contract Documents prior to installation of the detectable warning panel(s). Contractor shall tamp the plate(s) or panel(s) with a small sledge hammer with a two inch by six inch by twenty inch (2" x 6" x 20") wood tamping plate, or lightly vibrate into the fresh concrete to ensure that the panel's field level (base of truncated dome) is flush with the adjacent concrete and top back of curb. Contractor shall ensure that the panel's field level is flush with the adjacent concrete surface, proper water drainage is provided, and potential tripping hazards are eliminated. Contractor shall ensure that the back edge of the detectable warning panel(s) form a smooth arc and is parallel to the top back of the curb.

Immediately after the panel placement, Contractor shall check and adjust accordingly the panel's or plate(s) field level to be flush with the adjacent concrete surface. Following final field-level adjustment(s), conforming to the manufacturer's recommendations, on each panel and additional weights at panel-to-panel joints as necessary to provide a solid contact between the panel underside and the concrete.

During and after the panel installation and concrete curing time, Contractor shall ensure that there is no walking, leaning, or any external forces placed on the panel, thereby causing a void between the underside of the panel and the concrete.

After the concrete has cured, Contractor shall remove protective plastic wraps. If "concrete bleeding" occurs between the panels, Contractor shall remove the residue without damage to the panel surfaces, in accordance with the manufacturer's recommendation.

Contractor shall maintain, on-site, an electronic level, a five foot (5') diameter circle template, and a three foot by five foot (3'x5') rectangular template. Template may be of any material, including paper. Contractor shall, when requested, demonstrate to the Engineer that there are adequate landing and turning areas that meet the dimensions and slopes required on the Drawings.

Backfill and grade areas disturbed by curb ramp construction and restore ground surface as shown on Drawings.

#### **Article 4.4 Tolerances**

In accordance with the Americans with Disabilities Act Public Rights-of-Way Accessibility Guidelines (PROWAG), dimension not stated as "maximum" or "minimum" are absolute. All dimensions are subject to conventional industry tolerances, except

where the requirement is stated as a range with specific minimum and maximum end points.

Conventional industry tolerances recognized by the ADAAG include those for field conditions that may be a necessary consequence of a particular manufacturing process. Information on specific tolerances may be available from industry or trade organizations, code groups, building officials, and published references. (Example: American Concrete Institute Standard Specifications for tolerances for concrete construction and materials (ACI-117)).

#### **Article 4.5 Measurement**

The Work paid for under “P.C.C. Curb Ramp” shall be measured as furnished, constructed, finished, and accepted in place for each installation or the actual horizontal square yardage of curb ramp (including curb ramp under detectable warnings) and back curb. P.C.C. Curb Ramp with welded steel wire fabric shall be incidental and no separate payment shall be made.

The Work paid for under “Detectable Warnings” is measured by the actual horizontal square footage of detectable warning tiles furnished, installed, and accepted in place. When P.C.C. Curb Ramp is paid per each, the Detectable Warnings are incidental to each installation and no separate payment shall be made.

#### **Article 4.6 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for restoration of existing ground surface disturbed by curb ramp construction is made under “A.C. Pavement,” “P.C.C. Sidewalk,” “Topsoil,” and “Seeding,” as applicable. No separate payment is made for backfilling and grading in preparation of paid surface treatment. No separate payment is made for backfilling and grading in locations where the existing surface is gravel.

Payment shall be made under the following unit:

ITEM	UNIT
P.C.C. Curb Ramp (Type)	Each
P.C.C. Curb Ramp (Type)	Square Yard
Detectable Warnings	Square Foot

## **SECTION 30.05 STRUCTURES AND RETAINING WALLS**

### **Article 5.1 Description**

The Work under this Section consists of the construction of Portland Cement Concrete structures and retaining walls.

### **Article 5.2 Materials**

Portland Cement Concrete, joint filler, reinforcing steel, and curing materials shall conform to Section 30.01, Article 1.3 – Materials. Concrete mix shall conform to the requirements for Class AA-3 unless otherwise specified.

### **Article 5.3 Construction**

#### **A. Reinforcing Steel**

Reinforcing bars shall be bent cold and shall conform accurately to the shape and dimensions shown on the shop drawings. Bent-up bars, unless otherwise specified, shall be bent up at an angle of forty-five degrees (45°). In no case shall the radius of any bend be less than six (6) times the diameter of the bar except #3, 4, and 5 ties may be bent at five (5) times the diameter of the bar.

The reinforcement shall be positioned as indicated on the Drawings or as hereinafter specified. It shall be rigidly blocked and wired in place, using metal supports or concrete blocks and securely tied at each intersection with annealed iron wire of at least twelve (12) gauge.

Splicing bars at points not indicated on the Drawings will not be permitted except as an emergency measure and with the consent of the Engineer. Such splices shall be at the points of minimum tensile stress and the lap shall be not less than thirty-six (36) bar diameters.

Bar lists and Bending schedules shall be furnished by the Contractor for approval of the Engineer. Shop drawings shall be submitted to be approved by the Engineer. Materials shall not be ordered until such lists and bending diagrams have been approved by the Engineer. The approval of order lists and bending diagrams will in no way relieve the Contractor of responsibility for the correctness of such lists and diagrams. Any expense incidental to the revision of material furnished in accordance with such lists and diagrams, to make it comply with the design drawings, shall be borne by the Contractor.

#### **B. Forms**

Forms shall conform to the shape and dimensions shown on the Drawings and shall be accurately set to line and grade. All sheeting in contact with concrete surfaces shall be matched tongue and groove lumber, sized to uniform thickness and free from wane, warp, splits, loose knots or other defects which will prevent obtaining a smooth, tight form. Forms for exposed surfaces shall be lined with plywood conforming to the requirements for form plywood as specified by the American Plywood Association. All plywood lining shall be used in as wide pieces as possible. Areas less than four feet (4') in width shall be lined with a single width of plywood. Joints in lining and backing shall not occur at the same place and the

abutting edges of adjacent sheet shall be nailed to the same board. Re-used forms shall be cleaned and free from defects.

Joints in the lining shall be filled with cold water putty, patching plaster, plastic wood, or other plastic filler satisfactory to the Engineer. Lining material may be re-used if it is in satisfactory condition, well cleaned, re-oiled, and if specific permission from the Engineer is obtained for each separate operation.

All forms shall be securely tied with bolts, rods, or snap ties in such manner that after stripping, such bolts, rods, or snap ties may be either entirely removed or may be removed for a distance at least one inch (1") below the concrete surface. Such bolts or rods shall be threaded and provided with nuts to prevent slipping and to provide adjustments. No wire ties or clamping devices shall be permitted.

Forms for walls, etc., shall have large cleanout openings at their lowest points, which shall not be closed until just before placing concrete. All forms shall be thoroughly cleaned and soaked with water immediately before filling.

Weep drains shall be provided by the Contractor and installed as shown on the Drawings.

#### C. Placing

Concrete shall be placed by means of a bottom dumping bucket, cart, concrete chute, tremie, or concrete pump. At no time shall concrete have a free fall or more than three feet (3'). The concrete shall be brought up in approximately horizontal layers. The concrete shall be placed continuously from one side or end of the section to the other, using precautions to not put the full hydrostatic load upon any given area of form as rapidly as possible. The rate of delivery of concrete to the work shall be such as to insure continuity of placement. No partially completed surface shall be allowed to stand more than forty-five (45) minutes before continuing the placing of concrete thereon. If the time exceeds 45 minutes the joint shall be considered a cold joint and prepared as described in "Joints, Horizontal and Vertical".

#### D. Consolidating Concrete

All concrete shall be thoroughly spaded, especially along the forms, to prevent the formation of gravel pockets and to permit the escape of trapped air. In addition to spading, the Contractor shall also provide suitable internal vibrating tampers of the type designed to be placed directly in the concrete. Vibration shall be such that the concrete becomes uniformly plastic. Vibrators shall be inserted to a depth sufficient to vibrate the bottom of each layer effectively, but shall not be allowed to penetrate partially hardened concrete which will not become plastic under the vibrator action, nor shall the vibrator be applied directly to steel which extends into partially hardened concrete. Placing of concrete shall not commence until the vibrator is on the job site and the mechanical efficiency of the vibrator is proven in the presence of the Engineer. For critical structures a spare vibrator shall be available at the site.

#### E. Finishing Concrete

All irregularities such as gravel pockets, bolt holes, etc., shall be patched with mortar of the same proportions as used in the concrete. The surface film of all such patches shall be rubbed off after initial setting has taken place.

All exposed surfaces shall, after irregularities have been corrected, be thoroughly wetted and brushed with a grout composed of one (1) part fine sand and one (1) part cement. It shall then be kept wet for forty-eight (48) hours.

All outside edges are to have three-quarter inch (3/4") chamfered corners, unless noted otherwise. They shall be obtained by putting a triangular strip of wood in the corners of the forms.

#### F. Joints, Horizontal and Vertical

Joints shall be made in walls or structures as indicated on the Drawings or where directed by the Engineer. If not indicated on the Drawings, the maximum distance between contraction joints shall be twenty-five feet (25'), and the maximum distance between expansion joints shall be fifty feet (50'). Where expansion joints are required, one-half inch (1/2") precast expansion joint material conforming to the requirements of ASTM D1751 (AASHTO M 213) shall be used. The walls shall be poured one section at a time. The joint material shall be accurately cut to fit the bulkhead between sections, and nailed to the bulkhead with 6d nails. These nails shall be driven into the lumber only enough to hold the material in place, the heads being embedded in the concrete. The bulkheads between sections shall be removed not sooner than twelve (12) hours after the concrete has been placed and the nail points clinched into the joint material.

At the surface of the wall, unless otherwise shown, the joint shall end in a V-shaped groove, two inches (2") wide and one inch (1") deep. Unless noted otherwise, all joints will be truly horizontal or truly vertical. Prior to placing fresh concrete, construction joints shall be roughened to one-quarter inch (1/4") amplitude, cleaned and wetted.

#### G. Removal of Forms

Unless otherwise directed by the Engineer, forms may be removed from structures and retaining walls, which are not subject to supporting loads, after a period of twenty-four (24) hours. All other forms shall be removed upon approval of the Engineer.

#### H. Curing

Unless otherwise specified, all exposed surfaces shall be covered by layers of absorptive burlap, mats or other approved material to a thickness weighing not less than fourteen (14) ounces per square yard, immediately after finishing. The cover material shall be kept saturated with clean water for a minimum initial curing period of twenty-four (24) hours.

Following this initial curing, the concrete shall be completely covered with a plastic waterproof membrane, or equal, for an additional six (6) days. Liquid spray type waterproof membrane will not be considered a satisfactory material for curing concrete used for retaining walls or structures.

If ambient temperatures are expected to drop below forty degrees (40°) Fahrenheit, the Contractor shall provide a cold weather curing plan and provide protection to meet ACI recommendations.

I. Waterproofing

Unless otherwise specified, the back side of retaining walls and backfilled surfaces of other structures shall be painted with two (2) coats of a cold bituminous waterproof coating which shall be approved by the Engineer prior to application. Application shall be with a stiff masonry type brush, or as recommended by the manufacturer.

J. Earthwork

All earthwork involved in the construction of retaining walls shall be constructed as specified in Division 20 - Earthwork.

Excavation for retaining walls and structures shall be to the limits shown on the Drawings. Where limits are not indicated, excavation shall be sufficient to properly construct the work.

Where directed by the Engineer, unsuitable material in the subgrade shall be removed to a specific depth and then backfilled with classified fill.

The subbase under footings shall be compacted to ninety-five percent (95%) density at optimum moisture content in accordance with Section 30.01, Article 1.5 - Subbase.

Backfilling the lower portion of structures and retaining walls shall not begin until lab testing of field-cured specimens has attained at least 80 percent of the Specified Compressive Strength after concrete placement. Where High-Early Strength Cement is used, backfilling the lower portion of structures and retaining wall shall not begin until four (4) days after concrete placement. Waterproofing shall not be left exposed for longer than twelve (12) days before backfill. Where drain holes or drain tile are involved, or where the Engineer may direct, a filter fabric shall be used in conjunction with a six inch (6") layer of coarse gravel which shall be spread and compacted around the drains in such a manner that earth will not clog the voids in the gravel. The remainder of the backfill shall be classified fill placed in layers not exceeding one foot (1') in thickness. Each layer shall be thoroughly rammed with a rammer not more than ten inches (10") in diameter and weighing not less than forty (40) pounds, or with an approved mechanical tamper. A Controlled Low Strength Material (CLSM) used as a substitution to backfill shall be a flowable sand/cement mix with a compressive strength of 100 psi to 1,200 psi and shall be allowed with the approval of the Engineer. Unsuitable earth or vegetable matter shall not be used as backfill. Filling with loose earth and hydraulic jetting will not be allowed except by written permission of the Engineer. Imported material for backfill shall conform to Division 20, Section 20.21 - Classified Fill and Backfill.

K. Concrete walls shall include an anti-graffiti coating. Anti-graffiti coating shall be Sherwin Williams Protective & Marine Coatings, Series B97-150, or accepted equal. Anti-graffiti coating shall be applied per manufacturer's recommendations.



**Article 5.4 Measurement**

Concrete shall be measured per cubic yard for structures and retaining walls including sidewalks constructed in conjunction with retaining walls. Measurement will be determined from the neat line dimension. In the case of minor field changes such as changing the length, height, etc., payment shall be based on the same unit price per cubic yard as bid. Measurement shall be determined by the Engineer and Contractor prior to placing concrete.

Graffiti protection is incidental to the construction of the structures and retaining walls and no separate payment shall be made.

**Article 5.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section. Extra payment will not be made to the Contractor if he places additional concrete over and above the neat line volume to facilitate his operation and save on form work.

No additional payment shall be made for excavation and backfill around retaining walls and structures. Payment for disposal of unusable excavation shall be in accordance with Division 20, Section 20.10 – General Excavation. Payment for classified fill shall be made in accordance with Division 20, Section 20.21 – Classified Fill and Backfill.

Payment shall be made under the following unit:

ITEM	UNIT
P.C.C. Structure/Retaining Wall (Class)	Cubic Yard

## **SECTION 30.06 CONCRETE MASONRY RETAINING WALLS**

### **Article 6.1 Description**

The Work covered under this Section consists of the construction of concrete masonry walls on a reinforced, poured Portland Cement Concrete footing. This Work includes all excavation, classified fill or backfill, and mechanical compaction.

### **Article 6.2 Materials**

Portland Cement Concrete, joint filler, reinforcing steel, and curing materials shall conform to Section 30.01, Article 1.3 – Materials. Concrete mix shall conform to the requirements for Class AA-3 unless otherwise specified.

### **Article 6.3 Construction**

#### **A. Reinforcing Steel**

Reinforcing steel shall conform to Section 30.05, Article 5.3 - Construction.

#### **B. Survey**

The Contractor shall set control stakes for the footings. The stakes will be set at breaks in grade and on even grade intervals not to exceed fifty feet (50'). They will be marked with the station offset, and the cut or fill to the top of the footing.

#### **C. Forms**

Forms may be of wood, metal, or any other material at the option of the Contractor, provided that the forms as set will result in a footing in accordance with thickness, cross section, grade, and alignment as required by the Contract Documents.

Forms may be removed after a period of three (3) days, unless otherwise directed by the Engineer.

#### **D. Excavation and Embankment**

Excavation and embankment for Masonry Retaining Walls shall be as described in Section 30.05, Article 5.3, SubArticle J - Earthwork.

#### **E. Constructing Masonry Wall**

The Contractor shall omit the head joint in the first course every thirty-two inches (32") O.C. to provide for weep holes.

All cells of the concrete masonry retaining wall shall be filled solid with grout. The grout shall develop a minimum compressive strength of 2,000 P.S.I. in 28 days. The grout mix shall be of a fluid consistency and mixed in the ratio by volume of one (1) part Portland cement, three (3) parts concrete sand, and two (2) parts No. 8 Coarse Aggregate. The concrete sand is to conform to the gradation requirements of AASHTO M 6. The coarse aggregate is to comply with gradation requirements as follows:

### Coarse Aggregate Gradation Requirements

Sieve Size	Percent Passing by Weight
1/2"	100
3/8"	85-100
#4	10-30
#8	0-10
#16	0-5

Mortar shall be freshly prepared and uniformly mixed in the ratio by volume of one (1) part cement, one-half (1/2) part lime putty, and four and one-half (4-1/2) parts sand and shall conform to requirements of ASTM C270.

The use of admixtures shall not be permitted in mortar or grout unless substantiating data is submitted and approved by the Engineer.

Masonry units shall be Grade A Units, conforming to the requirements of ASTM C90. These units shall be sound, dry, clean, and free from cracks when placed in the structure. Where masonry unit cutting is necessary, all cuts shall be neat and true. Unit size and surface finish shall be as indicated on the Drawings.

Portland Cement Concrete used in footings, shall conform to Section 30.01, Article 1.3 - Materials.

Block layup shall be running bond unless otherwise specified.

The starting joint on the footing shall be laid with full mortar coverage on the bed joint. All mortar joints shall be straight, clean and uniform in thickness and shall be tooled.

Tooling shall be done with a round bar to produce a dense, slightly concave surface well bonded to the block at the edges. Tooling shall be done when the mortar is partially set but still sufficiently plastic to bond. All tooling shall be done with a tool which compacts the mortar, pressing the excess mortar out of the joint rather than dragging it out. Joints which are not tight at the time of tooling shall be raked out, pointed, and then tooled.

If it is necessary to move a unit after it has been set in place, the unit shall be removed from the wall, cleaned and set in fresh mortar.

All capping units shall be set in a full bed of mortar.

#### F. Curing and Waterproofing

Curing and waterproofing of concrete masonry retaining walls shall conform to the specifications for structures and retaining walls in Section 30.05, Article 5.3, SubArticles H - Curing, and I - Waterproofing.

### Article 6.4 Measurement

The item concrete masonry retaining walls shall be on a lump sum basis, complete in place and no measurement of quantities shall be made.

**Article 6.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Concrete Masonry Retaining Walls	Lump Sum

## **SECTION 30.07 PORTLAND CEMENT CONCRETE DRIVEWAY**

### **Article 7.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing and constructing a Portland Cement Concrete driveway.

### **Article 7.2 Materials**

Portland Cement Concrete, joint filler, and curing materials shall conform to Section 30.01, Article 1.3 – Materials. Concrete mix shall conform to the requirements for Class A-3 unless otherwise specified.

### **Article 7.3 Construction**

Contractor shall place concrete surfacing at a thickness of six inches (6"). Concrete driveways shall have a minimum six by six inch (6" x 6") woven wire mesh reinforcement installed.

### **Article 7.4 Measurement**

Concrete driveways shall be measured per square yard, complete in place, for six inch (6") thicknesses. Concrete driveways with woven wire mesh reinforcement shall be incidental and no separate payment shall be made.

### **Article 7.5 Basis of Payment**

Payment for this item shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
P.C.C. Driveway	Square Yard

## **SECTION 30.08 PORTLAND CEMENT CONCRETE CLUSTER MAILBOX BASE**

### **Article 8.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing and constructing a Portland Cement Concrete cluster mailbox base.

### **Article 8.2 Materials and Installation**

Each cluster mailbox base shall be constructed in conformance with the Drawings. Materials and installation shall meet the requirements of Section 30.03 - Portland Cement Concrete Sidewalks and the Drawings. Concrete mix shall conform to the requirements for Class A-3 unless otherwise specified.

Post installed anchors shall be stainless steel rods with adhesive installed per the adhesive manufacturer's instructions.

### **Article 8.3 Construction**

Contractor shall contact the Manager of the Address Management Department, Anchorage District, United State Post Office at 564-2846, forty-eight (48) hours prior to beginning construction of the cluster mailbox base to schedule the final placement of the cluster mailbox unit by the United State Post Office.

### **Article 8.4 Measurement**

The Work shall be measured per each actual cluster mailbox base furnished, constructed, and accepted in place.

### **Article 8.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
P.C.C. Cluster Mailbox Base	Each

## **SECTION 30.09 CONCRETE PARKING BUMPERS**

### **Article 9.1 Description**

This Work item includes the forming, casting, and installation of concrete parking bumpers as shown on the Drawings.

### **Article 9.2 Material**

Reference Section 30.01 - General Provisions.

Concrete class shall be A-3.

### **Article 9.3 Construction**

Contractor shall construct precast concrete parking bumpers in accordance with applicable construction techniques specified in Section 30.02 - Portland Cement Concrete Curb and Gutter, and Valley Gutter. Parking bumpers shall be seven feet (7') long and seven inches (7") tall. Parking bumpers shall be ten inches (10") wide at the base and taper to six inches (6") wide at the top. Parking bumpers shall be firmly set in place with two (2) eighteen inch (18") long #5 rebar.

### **Article 9.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment will be made under the following unit:

ITEM	UNIT
Concrete Parking Bumpers	Each

## **SECTION 30.10 COLORED CONCRETE**

### **Article 10.1 General**

The Work under this Section consists of providing all operations and materials necessary to install colored concrete. All Work shall be in accordance with this Section and shall be placed at the locations shown on the Drawings.

### **Article 10.2 Materials**

The Portland Cement concrete and curing materials shall conform to Section 30.01, Article 1.3 - Materials, as modified below:

#### **A. Concrete**

Concrete mix for imprinted colored concrete shall conform to Section 30.01, Article 1.6 – Mix Requirements for Classes of Concrete, requirements for Class AA-3, normal weight concrete. Contractor shall make white concrete using white cement, white aggregate, and white sand. Contractor shall use Davis Color #160, Brick Red, available from Davis Color, Los Angeles, California or approved equal, at a rate of 5 pounds of color per sack of cement to make colored concrete.

#### **B. Imprint**

Where imprinted concrete is called for on the Drawings, the Contractor shall use “Bomanite Running Bond Tile” available from Bomanite Corporation, Palo Alto, California, or another concrete imprinting system of approved equal performance.

#### **C. Expansion Joints**

Filler material shall be non-asphaltic material, one-half inch (1/2") wide and four inches (4") deep, with the top one inch (1") strippable. Primer shall be “Externaflex” 1993 or approved equal. Backer rod shall be closed cell polyethylene. Sealant shall be “Sika-Flex” polyurethane or approved equal. Contractor shall use the appropriate sealant color to match the colored concrete, including Brick Red sealant to match the red concrete.

### **Article 10.3 Construction**

The excavation and embankment, forms and fine grading, placing and finishing, curing and protection operations for imprinted colored concrete shall conform to Section 30.03, Article 3.3 – Construction as amended below:

Place imprinted colored concrete in dry weather with temperatures above forty degrees (40°) Fahrenheit.

Where imprinted concrete is called for in the Drawings, the Contractor shall apply the imprinting tool while the concrete is still in the plastic stage of set in conformance with the manufacturer’s specifications.

### **Article 10.4 Measurement**

Imprinted colored concrete shall be measured per square yard, complete and in place.



**Article 10.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Colored Concrete (Color) (Thickness) (Imprinted)	Square Yard

## **SECTION 30.11    SIDEWALK JOINT SEALANT**

### **Article 11.1 General**

The Work under this Section consists of performing all operations pertaining to preparing and sealing joints in existing sidewalk for the purposes of sealing and repair. This Section is not applicable to joint sealant utilized during the construction of new concrete work.

### **Article 11.2 Materials**

Sealant materials shall be a polyurethane long lasting, and resist deterioration caused by weather, street, movement, traffic, and water. Sealant materials shall be approved by the Engineer prior to use. The sealant color shall closely match adjacent concrete sidewalk.

### **Article 11.3 Construction**

Joint sealant shall be applied to joints with dimensions between one-half inch (1/2") and one inch (1") in width, as directed by the Engineer. The sealant shall be applied in conformance with the manufacturer's instructions and to full depth of the joint.

The joints shall be cleaned and all loose material shall be blown out to the full depth of the joint. The interior of the joint shall be completely dried and existing sidewalk surfaces shall be exposed.

### **Article 11.4 Measurement**

The application of joint sealant shall be measured per linear foot of sealant applied as directed by the Engineer for sidewalk patch and repair. Payment for joint sealant used during construction of new concrete work is governed by the appropriate Section for that installation, is considered incidental to that pay item, and no payment shall be made under this Section.

### **Article 11.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Joint Sealant	Linear Foot

## **SECTION 30.12 HIGH-PERFORMANCE CONCRETE**

### **Article 12.1 General**

The Work under this Section consists of providing all operations, materials, and labor necessary to install high-performance concrete in accordance with these Specification at the locations shown on the Drawings or as directed by the Engineer. The concrete shall be reinforced and colored per the Drawings.

The concrete shall be a special high-performance design intended to have the following special characteristics:

- increased strength and durability
- increased resistance to spalling and freeze/thaw cycles
- increased workability during placement
- decorative color (when specified)

The high-performance concrete shall be a redi-mix concrete in conformance with M.A.S.S. Section 30.01 General.

### **Article 12.2 Materials**

The Portland Cement concrete, joint filler, reinforcement steel, and curing materials shall conform to Section 30.01, Article 1.3 – Materials, as modified below:

#### **A. Cement**

The cement shall be Type I/II in accordance with ASTM C150. Only one brand of cement shall be used for the high-performance concrete to minimize variations in overall appearance.

#### **B. Aggregates**

The aggregates shall meet the requirements of ASTM C33.

#### **C. Admixtures**

All admixtures shall be added to the concrete mix at the manufacturing plant. The following admixtures shall be used in the concrete mix:

1. Viscosity modifying admixture – The admixture shall be designed to produce concrete with enhanced viscosity and stability and increased resistance to segregation to facilitate placement and consolidation. The admixture shall be Rheomac VMA 362 as manufactured by BASF or approved equal.
2. Silica fume – The admixture shall be designed to produce extremely strong durable concrete meeting the requirements of ASTM C1240. The admixture shall be Rheomac SF 100 as manufactured by BASF or approved equal.
3. High-range water-reducing admixture – The admixture shall be designed to create a concrete with a slump as specified free from segregation and with relatively low water/cement ratio. The admixture shall be Rheobuild 1000 as manufactured by BASF or approved equal.

4. Air entraining admixture – The admixture shall be in accordance with ASTM C231 (AASHTO T 152).

#### D. Coloring Materials

Coloring shall be integral for the full depth of the concrete. It shall be added at the redi-mix concrete manufacturer plant per the manufacturer's instructions and uniformly distributed throughout the mix.

The concrete shall be provided with integral color pigment as follows:

- Davis Color #160, Brick Red, as manufactured by Davis Color, Los Angeles, California or approved equal, at a rate of 5 pounds of color per sack of standard grey cement, with standard grey sand and standard grey aggregate to make colored concrete.

#### E. Expansion Joints

Filler material shall be non-asphaltic material, one-half inch (1/2") wide and four inches (4") deep, with the top one inch (1") strippable. Primer shall be "Sika-flex" polyurethane or approved equal. Contractor shall use the appropriate sealant color to match the colored concrete, including Brick Red sealant to match the red concrete.

#### F. Evaporation Reducer

An evaporation reducer shall be used to reduce surface moisture evaporation and reduce plastic shrinkage cracking. The material shall be Confilm as manufactured by BASF or approved equal applied in accordance with the manufacturer's recommendations. The product should not be considered a finishing aid.

### Article 12.3 Mix Requirements

Below are general mix requirements for high-performance concrete:

Property	Value
Cement (sacks/CY) min	7.0
Water Cement Ratio (Lb./Lb.) max	0.35
Slump (inches)	3-5
Entrained Air (%)	4-6
Silica Fume (% of cement material)	5-8
Coarse Aggregate (ASTM C33)	Grade 67
Medium Aggregate (ASTM C33)	Grade 8
Fine Aggregate (ASTM C33)	Concrete Sand
Integral Color	As Required
Viscosity Modifying Admixture	As Required
High-Range Water-Reducing Admixture	As Required

The concrete shall have the following minimum compressive strengths as tested in accordance with AASHTO T 141:

Cure Time (days)	Minimum Compressive Strength (psi)
1	2,500
3	3,500
7	4,500
28	7,000

A detailed mix design shall be submitted to the Engineer for approval with the following information:

1. Design designation for which the substitution is intended.
2. Design strength.
3. Air Content.
4. Slump.
5. Aggregate gradation and maximum size.
6. Maximum water/cement content.
7. Minimum cement content.
8. List of admixtures, strength overdesign, and other special features.
9. Fine aggregate weight/percent moisture of fine aggregate.
10. Intermediate aggregate weight/percent moisture of intermediate aggregate.

11. Coarse aggregate weight/percent moisture of coarse aggregate.
12. Weight of cement.
13. Weight of water.
14. Unit weight.

Water shall not be used to increase slump. If additional slump is desired, additional plasticizing agent shall be used.

#### **Article 12.4 Mock-up Sample**

A mock-up sample of the concrete shall be provided at an off-site location as directed by the Engineer. The area shall be at least 4 feet square and 4 inches thick. The sample slab shall be used to test the acceptability of the overall mix design, workability, release agents, finish, colors, curing methods, and overall appearance. Mock-up samples that do not result in the required surface pattern or do not meet minimum strength requirements will be rejected. The Engineer may require the Contractor to provide additional samples if the sample is unacceptable.

Concrete samples for test cylinders shall be taken for each mock-up concrete mix in accordance with AASHTO T 141. Testing and sampling shall be performed by the Engineer. Compressive testing shall be made at the intervals listed in the table in Article 12.3.

The mock-up samples shall be constructed at least 10 days before the planned installation of the final concrete slab. The final concrete slab shall not be installed before the Engineer approves the mock-up samples.

#### **Article 12.5 Construction**

##### **A. Concrete Placement**

High-performance concrete shall be placed to the lines and grades shown on the Drawings as verified by Contractor in the field. Contractor shall remove and replace concrete not installed in accordance with the Drawings and Specification at no additional cost to the owner.

##### **B. Reinforcing Steel**

The reinforcement shall be positioned as indicated on the Drawings or as hereinafter specified. It shall be rigidly blocked and wired in place, using metal supports or concrete blocks and securely tied at each intersection with annealed iron wire of at least twelve (12) gauge.

##### **C. Evaporation Reducer**

An evaporation reducer shall be applied to the surface of the concrete while it is in the plastic state before the finishing phase. The product should not be considered a finishing aid. It shall be applied in accordance with the manufacture's recommendations and it shall not be allowed to remain on the surface of hardened concrete.

##### **D. Finishing Phase**

The finishing operations should not begin until the water sheen on the surface is gone and excess bleed water on the surface has had a chance to evaporate. If this excess water is worked into the concrete because the finishing operations are begun too soon,

the concrete on the surface will have too high a water content and will be weaker and less durable. Special care shall be taken to make sure that concrete is not overworked while finishing which can result in discolorations and fewer aggregates near the surface resulting in a less durable material.

**E. Broom Finish**

After final finishing of the concrete surface with wood and steel floats, the surface shall be rushed with a fiber hair brush. The brushing shall be performed transverse to the predominant direction of pedestrian travel. The resulting surface shall be smooth with a linear texture resulting in a slip-resistant surface.

**F. Curing**

After finishing has been completed, provide a moist-cure topping to attain the proper design strength, surface impermeability, and wear resistance without cracking. Mist spray the surface with water and cover it with weighted polyethylene sheeting for a minimum of 7 days. When mist spraying is not possible, use soaker hoses with burlap or 2 layers of saturated burlap (or similar moisture-retaining sheet material) and cover surface with polyethylene for 7 days.

**G. Protection**

All vehicular/pedestrian traffic shall be kept off the concrete slab for the entire cure period. Concrete shall be protected against damage or defacement of any kind until it has been accepted by the Owner. Concrete which is not acceptable to the Engineer because of damage or defacement shall be removed and replaced at no additional cost to the Owner.

**Article 12.6 Measurement**

High-performance concrete slab shall be measured per square yard, complete and accepted in place in the specified thickness, color, and surface finish. There shall be no separate measurement or payment for subbase preparation, samples, mockups, forms, reinforcing steel, dowels, joints, concrete mix, pigment, finishing, curing or protection as they will be considered incidental to this Work item.

**Article 12.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment as amended in these specifications and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
High-Performance Concrete (Thickness, Color, Finish)	Square Yard



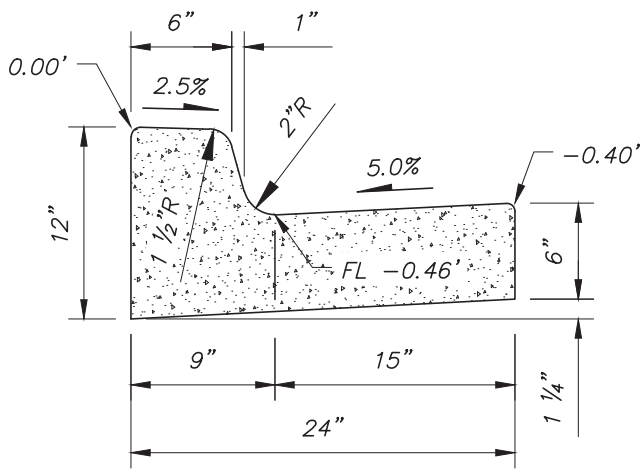


**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

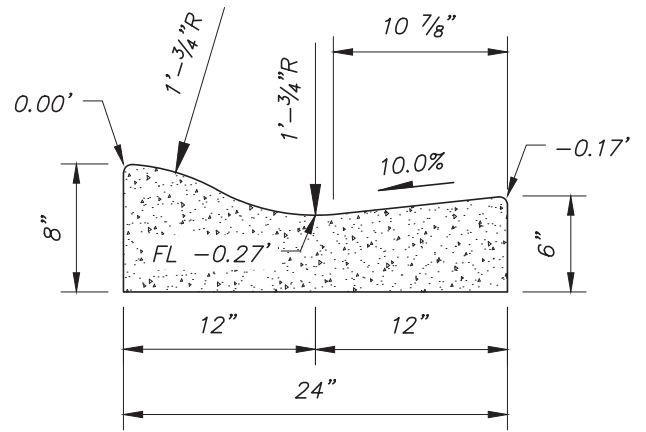
**DIVISION 30  
PORTLAND CEMENT CONCRETE  
STANDARD DETAILS**

**STANDARD CONSTRUCTION SPECIFICATIONS  
DIVISION 30  
INDEX OF STANDARD DETAILS**

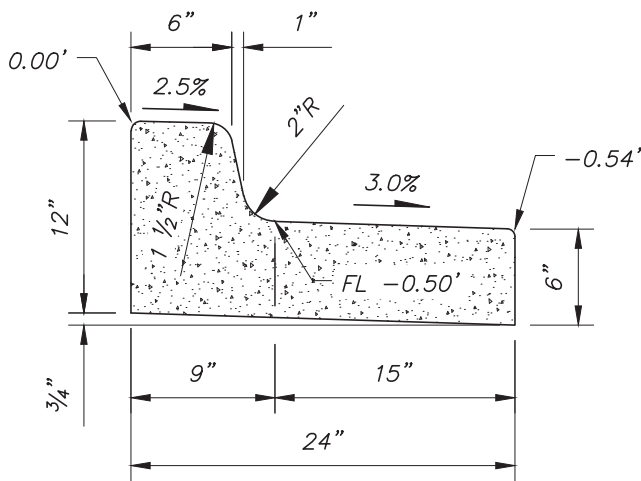
30-1	Curb and Gutter Cross Sections
30-2	Curb and Gutter Termination Transition
30-3	Valley Gutter
30-4	Median/Curb Nose
30-5	Curb and Gutter with Steel Curb Facing
30-6	Driveway Curb-cut with Attached Sidewalk
30-7	Driveway Curb Return with Attached Sidewalk
30-8	Curb Ramp Notes
30-9	Perpendicular Curb Ramp
30-10	Parallel Curb Ramp
30-11	Blended Transition Curb Ramp
30-12	Unidirectional Curb Ramp
30-13	Accessible Curb and Gutter Sections
30-14	Curb Ramp Clearances
30-15	Pedestrian Push Button Access
30-16	Curb Type Retaining Wall - 2' to 3'
30-17	Sidewalk Retaining Wall - 6" to 24"
30-18	Sidewalk Retaining Wall - 2' to 5'
30-19	P.C.C. Cluster Mailbox Base



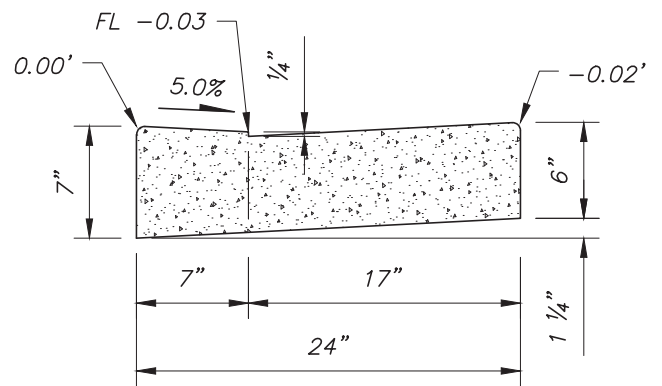
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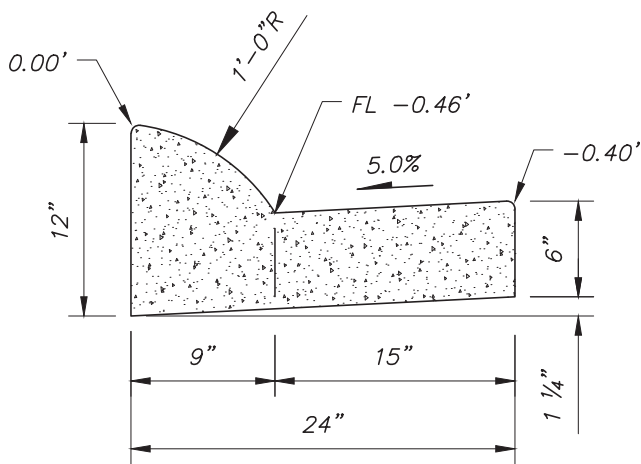
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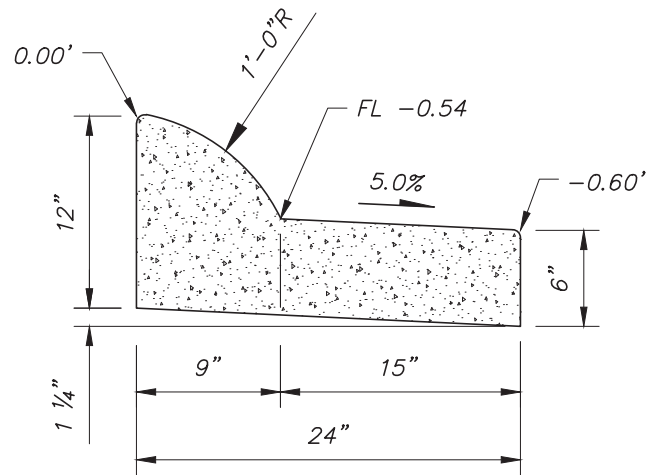
TYPE 3



TYPE 4  
(USED AT CURB CUTS)



TYPE 5



TYPE 6

NOTE:

1. TROWEL BOTH FRONT AND BACK EDGES OF THE CURB & GUTTER TO A RADIUS OF ONE-HALF (1/2) INCH.

REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.  
APPROVED:  
REVISED:  
2/24

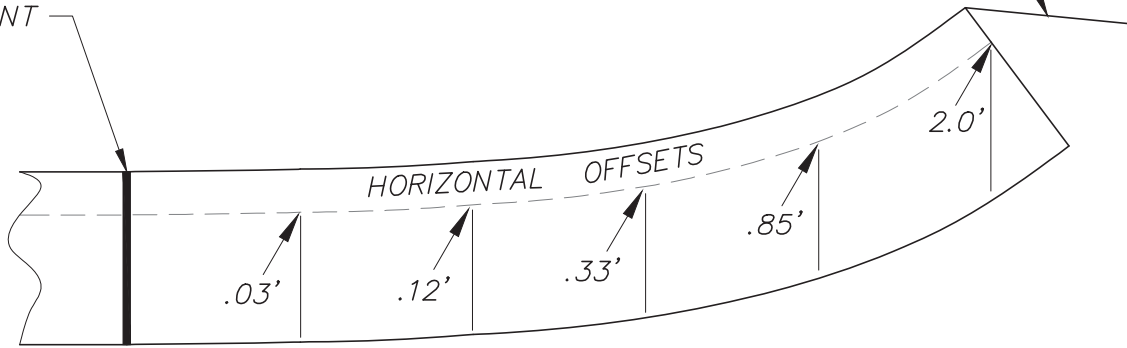
**CURB AND GUTTER  
CROSS SECTIONS**

SECTION #  
30.02

DETAIL #  
30-1

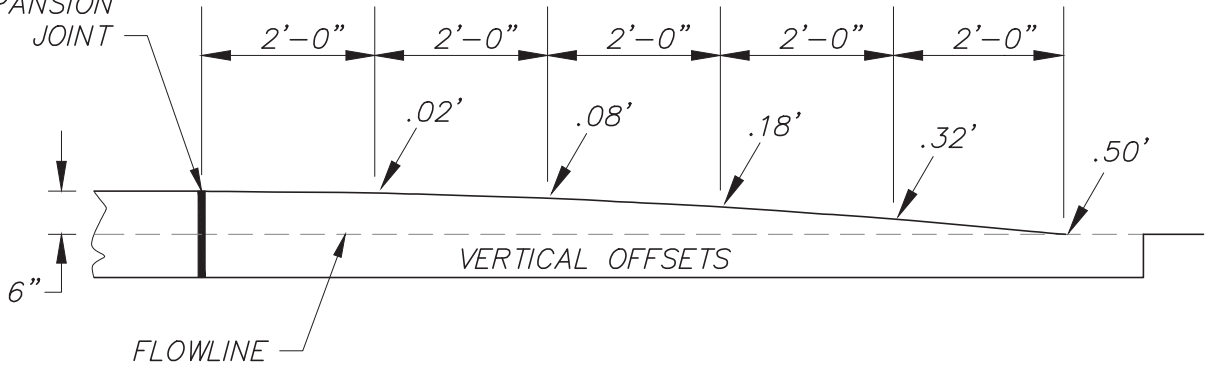
0.5"  
EXPANSION  
JOINT

LIMITS OF PAVING



PLAN

0.5"  
EXPANSION  
JOINT



PROFILE

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

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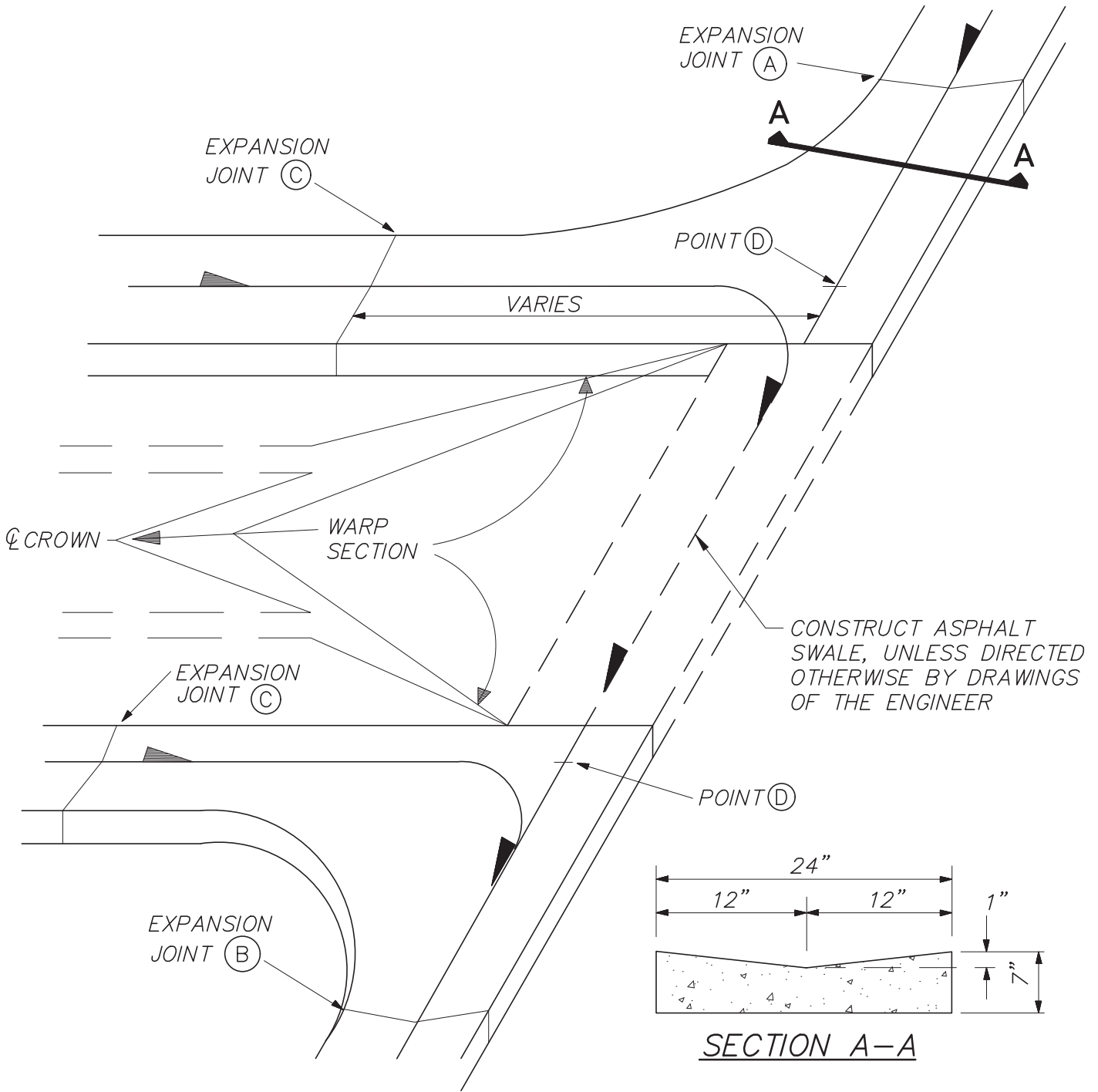
APPROVED:

REVISED:  
2/24

# CURB AND GUTTER TERMINATION TRANSITION

SECTION #  
30.02

DETAIL #  
30-2



NOTE:

VALLEY GUTTER SHALL BE PAID PER LINEAR FOOT UNDER BID ITEM "VALLEY GUTTER". MEASURE LENGTHS ALONG THE STRAIGHT FLOW LINE FROM EXPANSION JOINTS "A" AND "B" TO POINT "D" AND ON BOTH SIDES FROM EXPANSION JOINT "C" TO THE POINT "D". THE STREET SECTION SHALL BE MEASURED FROM POINT "D" TO POINT "D". IF P.C.C., THE STREET SECTION SHALL BE INCLUDED UNDER BID ITEM "VALLEY GUTTER". IF ASPHALT, THE STREET SECTION COST SHALL BE INCLUDED UNDER THE APPROPRIATE PAVING BID ITEM.

REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

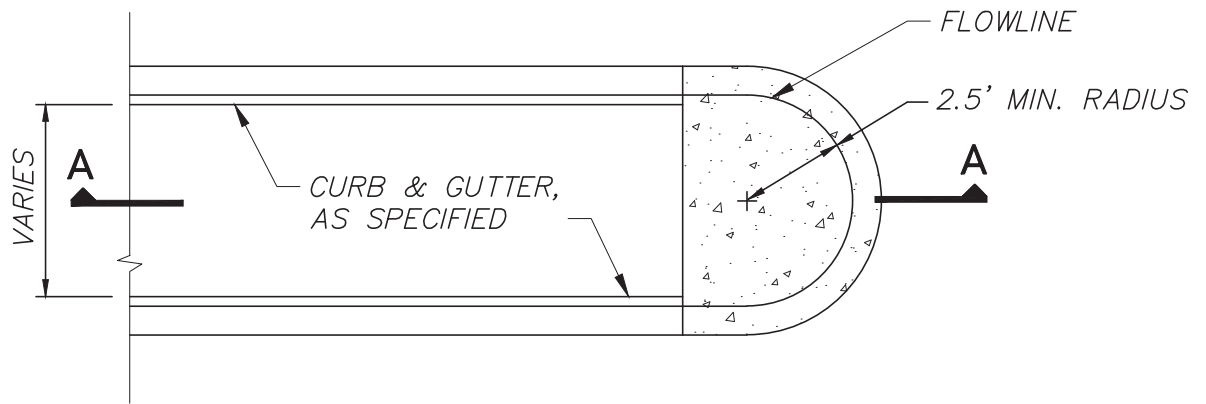
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REVISED:  
2/24

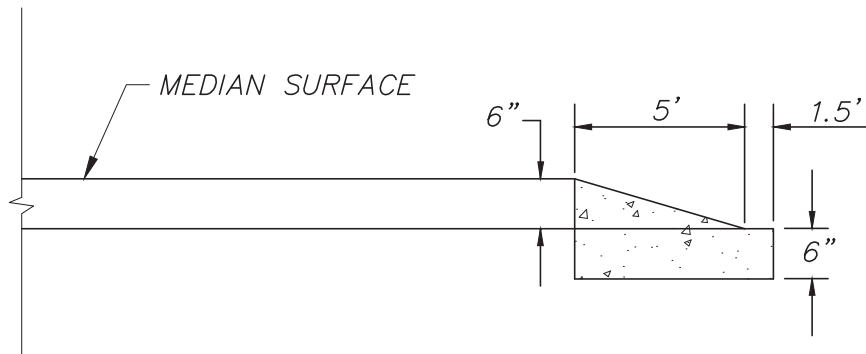
**VALLEY GUTTER**

SECTION #  
30.02

DETAIL #  
30-3



PLAN VIEW



SECTION A-A

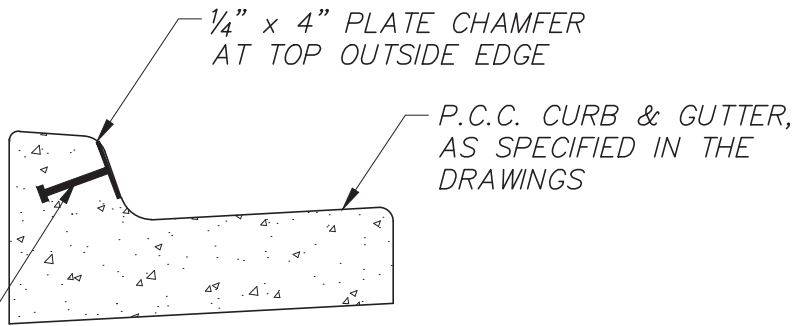
REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.  
APPROVED:  
REVISD:  
2/24

**MEDIAN/CURB NOSE**

SECTION #  
30.02  
DETAIL #  
30-4



$\frac{1}{2}$ " $\phi$  STUDS @ 12" O.C.

SECTION A-A

BACK OF CURB

CURB FACING

GUTTER PAN

A A

1- $\frac{1}{2}$ " TO 2" END TREATMENT ROLLED INTO CURB (SEE NOTE 1)

EXPANSION JOINT

NOTES:

1. BEND LEADING AND TRAILING EDGES 90° AND EMBED IN 1- $\frac{1}{2}$ " MINIMUM CONCRETE.
2. STEEL CURB FACING SHALL BE INSTALLED ONLY IN LOCATIONS WHERE THERE IS A CURVILINEAR TRANSITION TO THE CURB FACE SUCH AS IN A CURB BULB OR TRANSIT PULL-OUT.
3. CONTRACTOR SHALL INSTALL STEEL CURB FACING SO THAT THE CHAMFERED EDGE IS FLUSH WITH THE TOP OF CURB.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

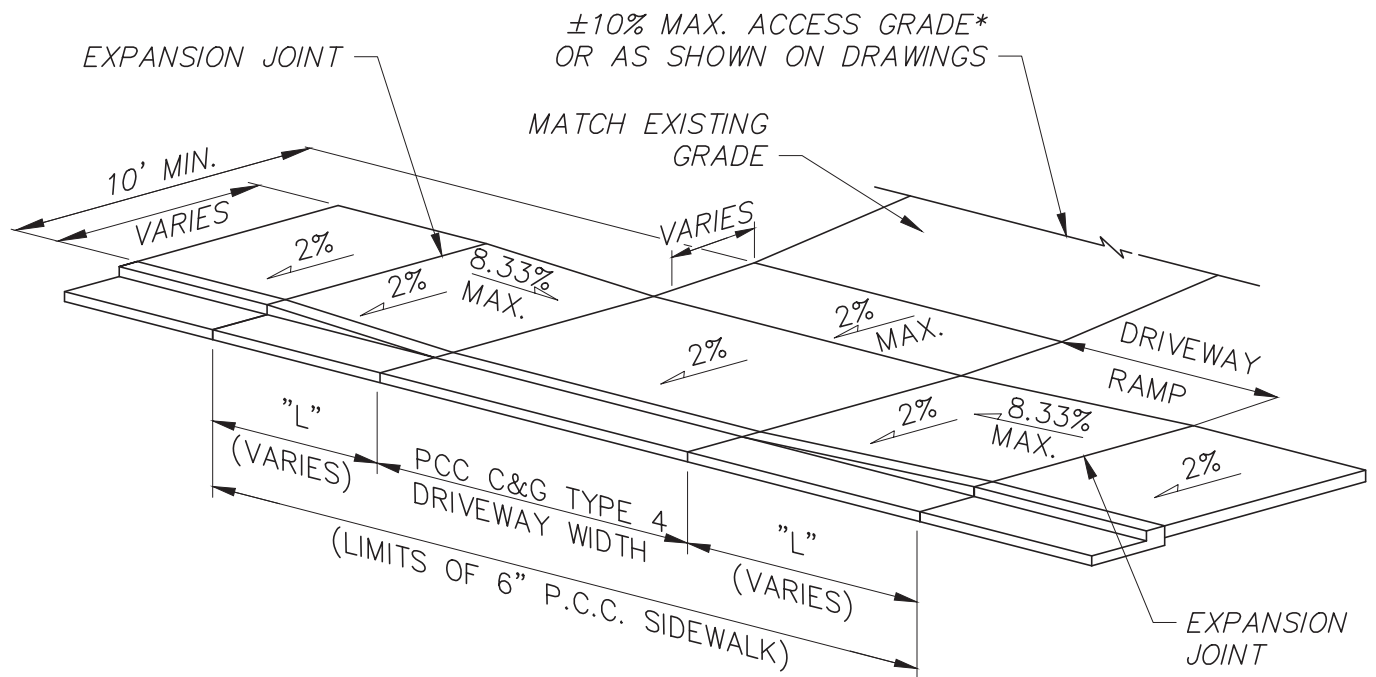
APPROVED:

REVISED:  
2/24

**CURB AND GUTTER WITH  
STEEL CURB FACING**

SECTION #  
30.02

DETAIL #  
30-5



TYPICAL DRIVEWAY ENTRANCE  
(WITH ATTACHED SIDEWALK)

DRIVEWAY RAMP RUNNING SLOPE TABLE		
STREET RUNNING SLOPE	MINIMUM UPHILL RAMP LENGTH "L"	MINIMUM DOWNHILL RAMP LENGTH "L"
0.0% TO 0.5%	6.0'	6.0'
> 0.5% TO 1.6%	7.0'	6.0'
> 1.6% TO 2.4%	8.0'	5.0'
> 2.4% TO 3.1%	9.0'	5.0'
> 3.1% TO 3.6%	10.0'	5.0'
> 3.6% TO 4.0%	11.0'	4.0'
> 4.0% TO 4.4%	12.0'	4.0'
> 4.4% TO 4.7%	13.0'	4.0'
> 4.7% TO 5.0%	14.0'	4.0'
> 5.0%	15.0'	4.0'

\* MAXIMUM ALGEBRAIC DIFFERENCE IS 8% ON COMMERCIAL/INDUSTRIAL DRIVEWAYS.

NOTE:

1. THE CURB TRANSITION LENGTH "L" AT DRIVEWAYS WITHOUT ATTACHED SIDEWALK SHALL BE IN ACCORDANCE WITH THE DRIVEWAY RAMP RUNNING SLOPE TABLE.

REVISION: 2024 M.A.S.S. UPDATE

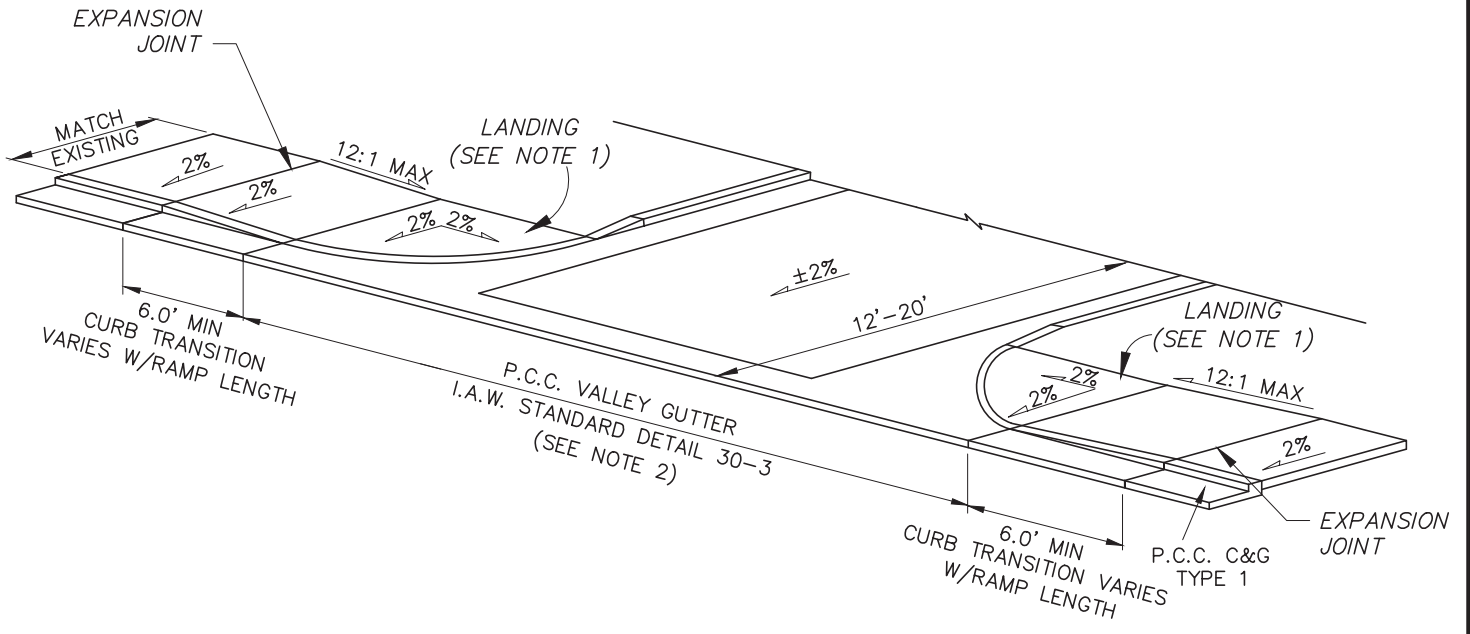


SCALE:  
N.T.S.  
APPROVED:  
REVISED:  
2/24

**DRIVEWAY CURB-CUT WITH  
ATTACHED SIDEWALK**

SECTION #  
30.03  
DETAIL #  
30-6





NOTES:

1. SIZE LANDING TO MEET ADA REQUIREMENTS.
2. ASPHALT CONCRETE SWALES TO BE CONSTRUCTED ON ALL ROADWAYS UNLESS P.C.C. VALLEY GUTTER IS SPECIFIED ON DRAWINGS. CONTRACTOR TO DEPRESS LIPS OF GUTTER TO ENSURE ADEQUATE DRAINAGE.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	DRIVEWAY CURB RETURN WITH ATTACHED SIDEWALK	SECTION # 30.03  DETAIL # 30-7
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## GENERAL CURB RAMP NOTES:

1. SEE DRAWINGS FOR REFERENCE POINT STATION AND OFFSET.
2. CONSTRUCT PERPENDICULAR AND PARALLEL RAMPS AND LANDINGS WITH A BROOM FINISH PARALLEL TO THE CURB. CONSTRUCT UNIDIRECTIONAL RAMPS AND LANDINGS WITH A BROOM FINISH PERPENDICULAR TO THE LONG DIRECTION OF THE RAMP.
3. THE CONTRACTOR SHALL CONSTRUCT THE RAMP PORTION OF THE CURB RAMP WITH A 2.0% MAXIMUM CROSS SLOPE WITH NO MANHOLES, UTILITY JUNCTION BOXES, OR OTHER OBSTRUCTIONS. THE MAXIMUM RUNNING SLOPE SHALL BE 8.33%, BUT SHALL NOT REQUIRE THE RAMP LENGTH TO EXCEED 15 FEET MEASURED ALONG THE BACK OF THE RAMP. NO JOINTS SHALL BE PLACED WITHIN THE RAMP UNLESS NOTED OTHERWISE.
4. THE CONTRACTOR SHALL CONSTRUCT LANDINGS WITH A 2.0% MAXIMUM RUNNING SLOPE AND CROSS SLOPE WITH NO MANHOLES, UTILITY JUNCTION BOXES, OR OTHER OBSTRUCTIONS.
5. SLOPES INDICATED AS MAXIMUM ARE NOT SUBJECT TO CONSTRUCTION TOLERANCES. WHEN FINISHED SLOPES EXCEED MAXIMUMS INDICATED ON THE DETAILS, RAMP INSTALLATIONS WILL BE REJECTED AND RE-CONSTRUCTION WILL BE REQUIRED AT THE CONTRACTOR'S SOLE EXPENSE. DESIGNERS AND CONTRACTORS ARE ENCOURAGED TO PLAN FOR SLOPES LESS THAN THE MAXIMUM INDICATED ON THE DETAILS.
6. THE CONTRACTOR SHALL INSTALL DETECTABLE WARNING PANELS (D.W.) IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND THE DRAWINGS. SET DETECTABLE WARNING PANELS SO THAT THE FIELD AREA AT THE BASE OF THE DOMES IS FLUSH WITH THE SURROUNDING CONCRETE. NO LIP IS ALLOWED AT THE EDGE OF THE DETECTABLE WARNING PANELS. D.W. SHALL BE FEDERAL YELLOW, OR APPROVED EQUAL. WHERE RADIAL D.W. ARE REQUIRED TO MEET OFFSET DIMENSIONS AND MANUFACTURED RADIAL D.W. ARE NOT AVAILABLE, CONTRACTOR SHALL CUT D.W. I.A.W. MANUFACTURER'S RECOMMENDATIONS TO PROVIDE RADIAL D.W. AS SHOWN ON THE DRAWINGS. WHERE POSSIBLE, FINISHED EDGES WILL BE PLACED ON THE OUTER BOUNDARIES OF THE D.W.
7. THE DETECTABLE WARNING PANEL SURFACE SHALL SPAN THE FULL WIDTH OF THE CURB RAMP, SHARED USE PATH, OR OTHER ROADWAY ENTRANCE, AS APPLICABLE, A GAP OF 2 INCHES MAXIMUM FROM THE EDGE OF THE DETECTABLE WARNING SURFACE TO THE EDGE OF THE CURB RAMP OR SHARED USE PATH IS PERMITTED WHEN DETECTABLE WARNING PRODUCT REQUIRES A CONCRETE BORDER FOR PROPER INSTALLATION.
8. TRIM OUTSIDE EDGES AND JOINTS OF RAMP AND FLARES WITH ONE-QUARTER INCH (1/4") RADIUS EDGING TOOL.
9. TOP OF A.C. PAVEMENT SHALL BE AT THE SAME LEVEL AS LIP OF CURB FOR P.C.C. CURB AND GUTTER TYPE 1A AND/OR 2A.
10. CONTRACTOR SHALL CONSTRUCT P.C.C. CURB BEHIND LANDING AND RAMPS WHERE SHOWN OR AS DIRECTED BY THE ENGINEER. P.C.C. CURB IS INCIDENTAL TO CURB RAMP AND NO ADDITIONAL PAYMENT WILL BE MADE.
11. FOR UNIDIRECTIONAL RAMPS, IF LANDING LENGTH IS LESS THAN 5', CONTRACTOR SHALL INSTALL D.W. AT THE BOTTOM OF THE RAMP. IF THE LANDING LENGTH IS EQUAL TO OR GREATER THAN 5', CONTRACTOR SHALL INSTALL RADIAL DETECTABLE WARNING ALONG TOP BACK OF CURB FOR THE WIDTH OF THE LANDING. ONLY ONE OF THE DETECTABLE WARNING CONFIGURATIONS SHOWN WILL BE CONSTRUCTED.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

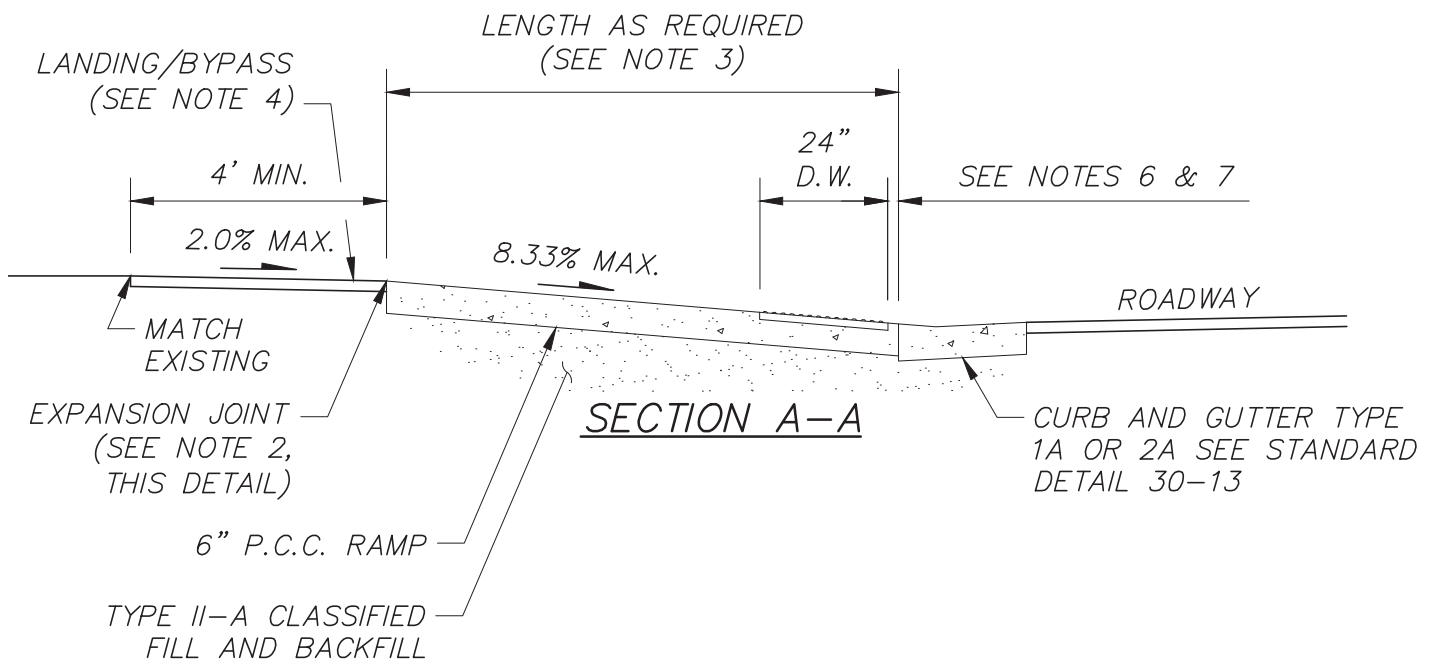
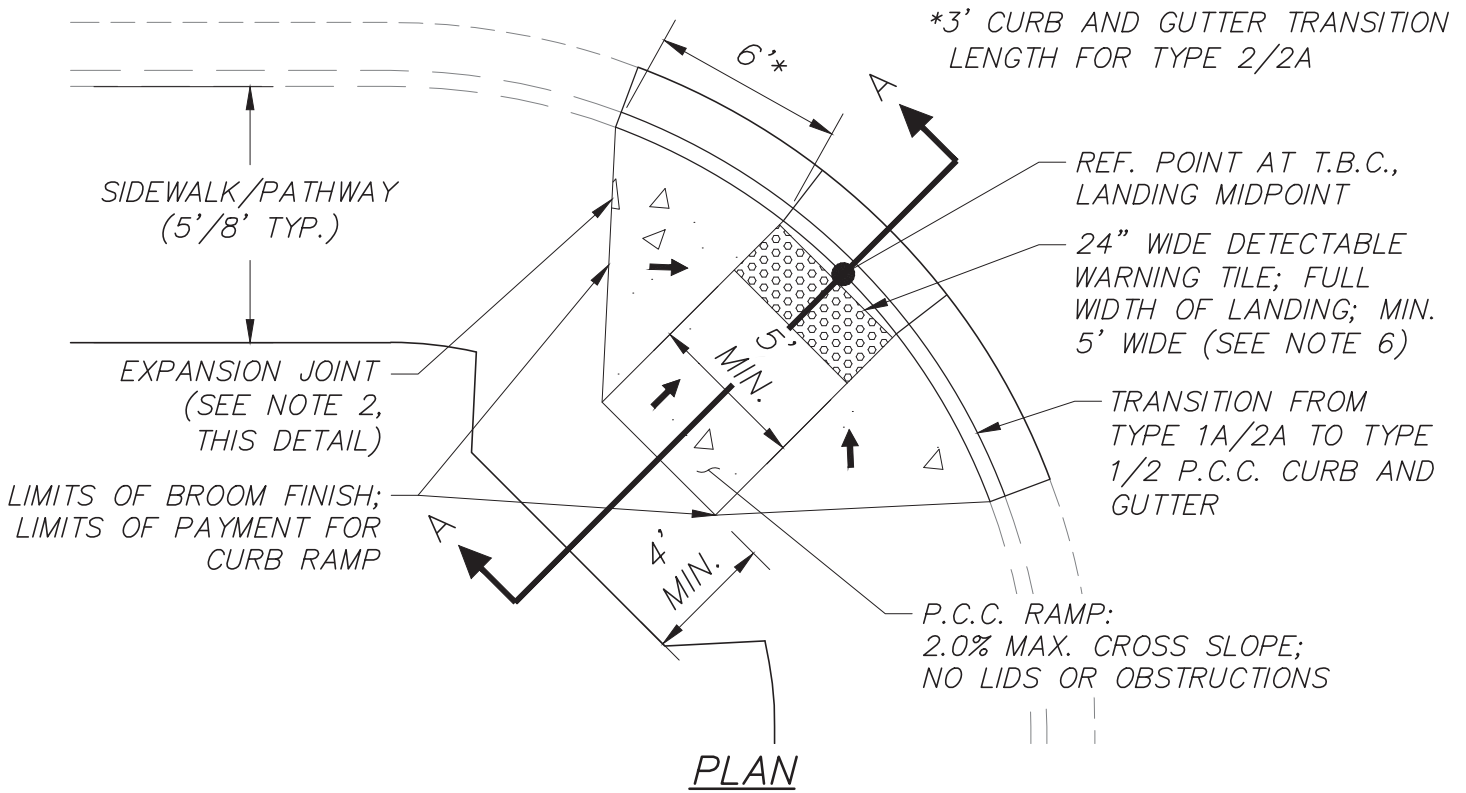
APPROVED:

REVISED:  
2/24

## CURB RAMP NOTES

SECTION #  
30.04

DETAIL #  
30-8



**NOTES:**

1. CURB RAMP NOTES ARE PROVIDED IN STANDARD DETAIL 30-8.
2. EXPANSION JOINTS LOCATED BETWEEN THE CURB RAMP AND THE ASPHALT PATHWAY ARE NOT REQUIRED.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY

OF ANCHORAGE

SCALE:  
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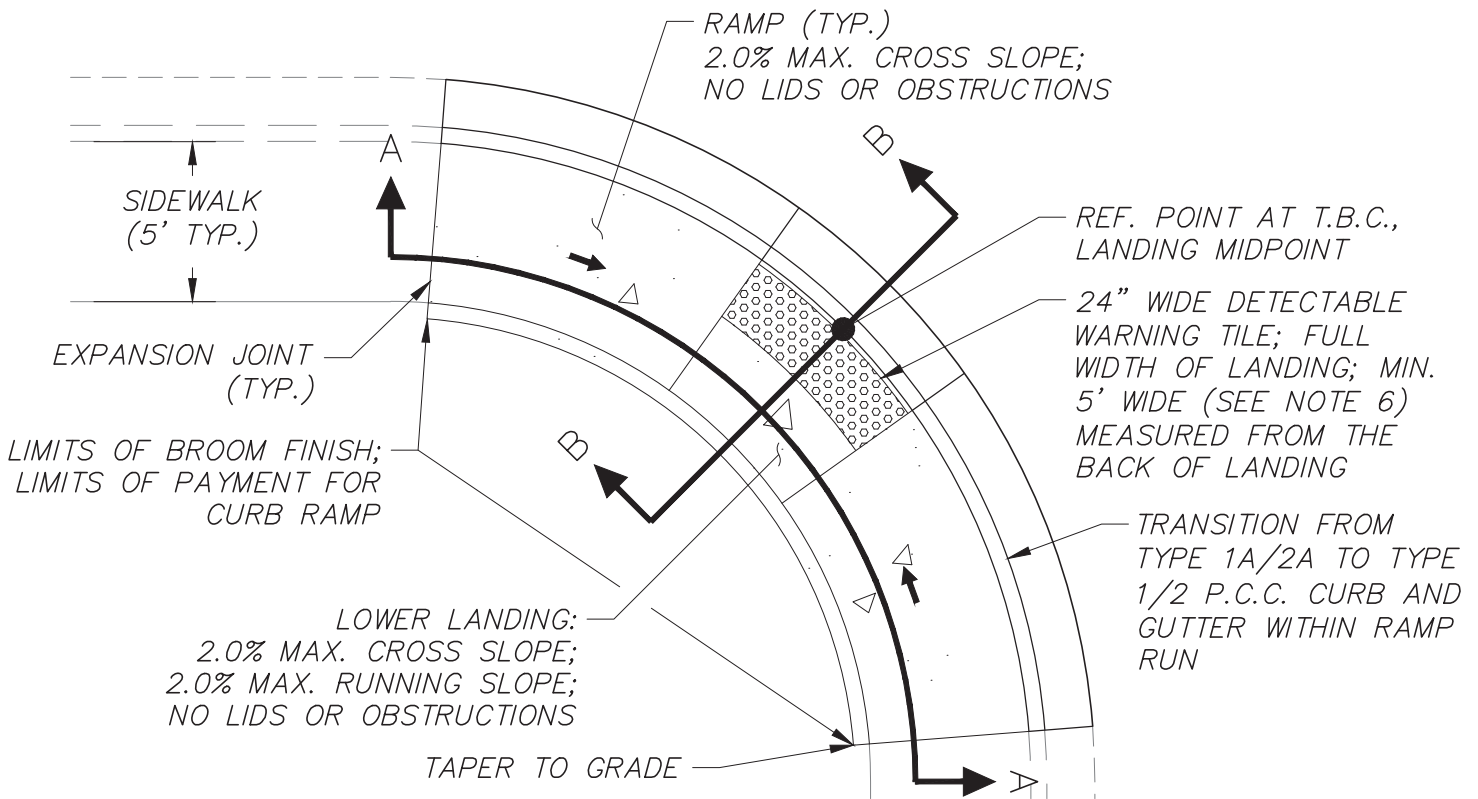
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2/24

**PERPENDICULAR CURB RAMP**

SECTION #  
30.04

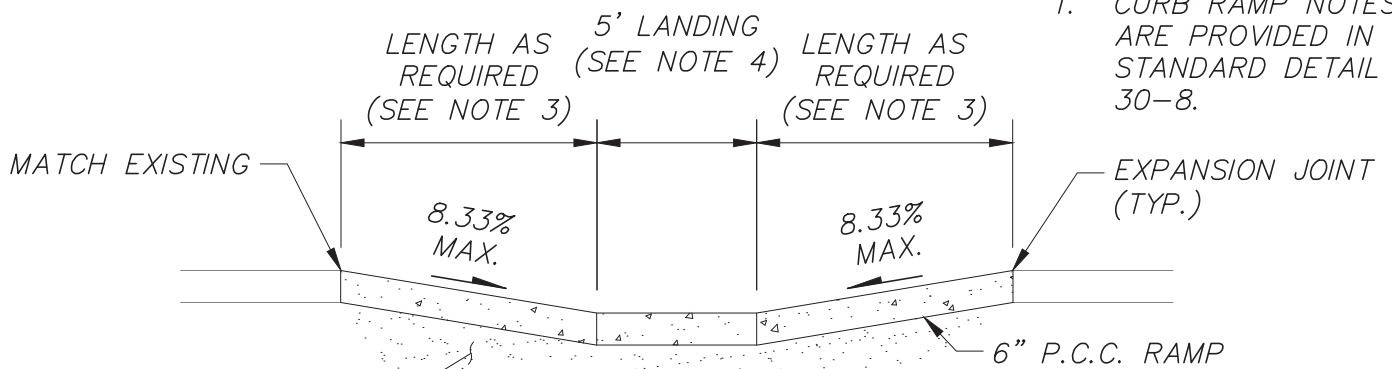
DETAIL #  
30-9



**PLAN**

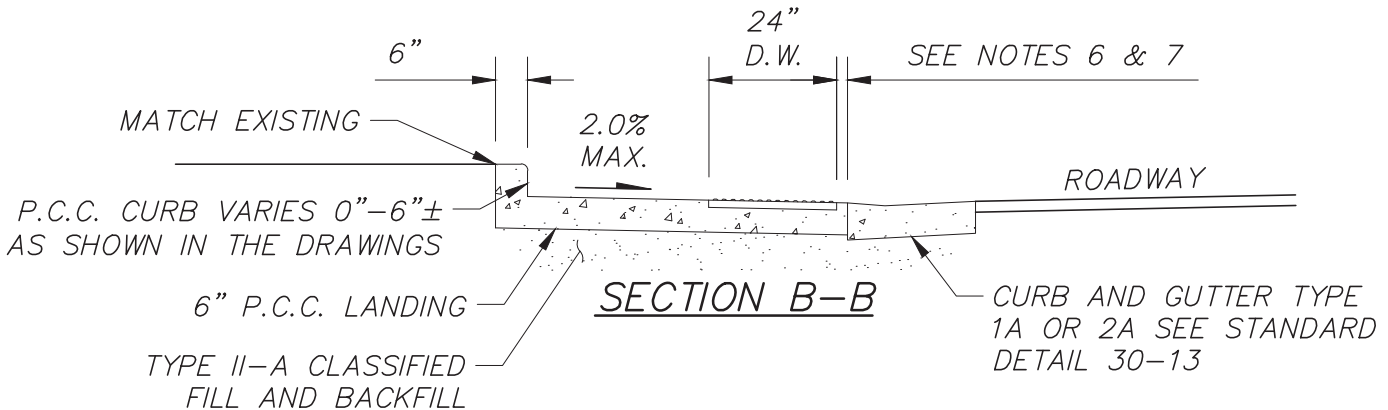
**NOTE:**

1. CURB RAMP NOTES ARE PROVIDED IN STANDARD DETAIL 30-8.



**SECTION A-A**

(FROM BACK OF SIDEWALK)



**SECTION B-B**

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
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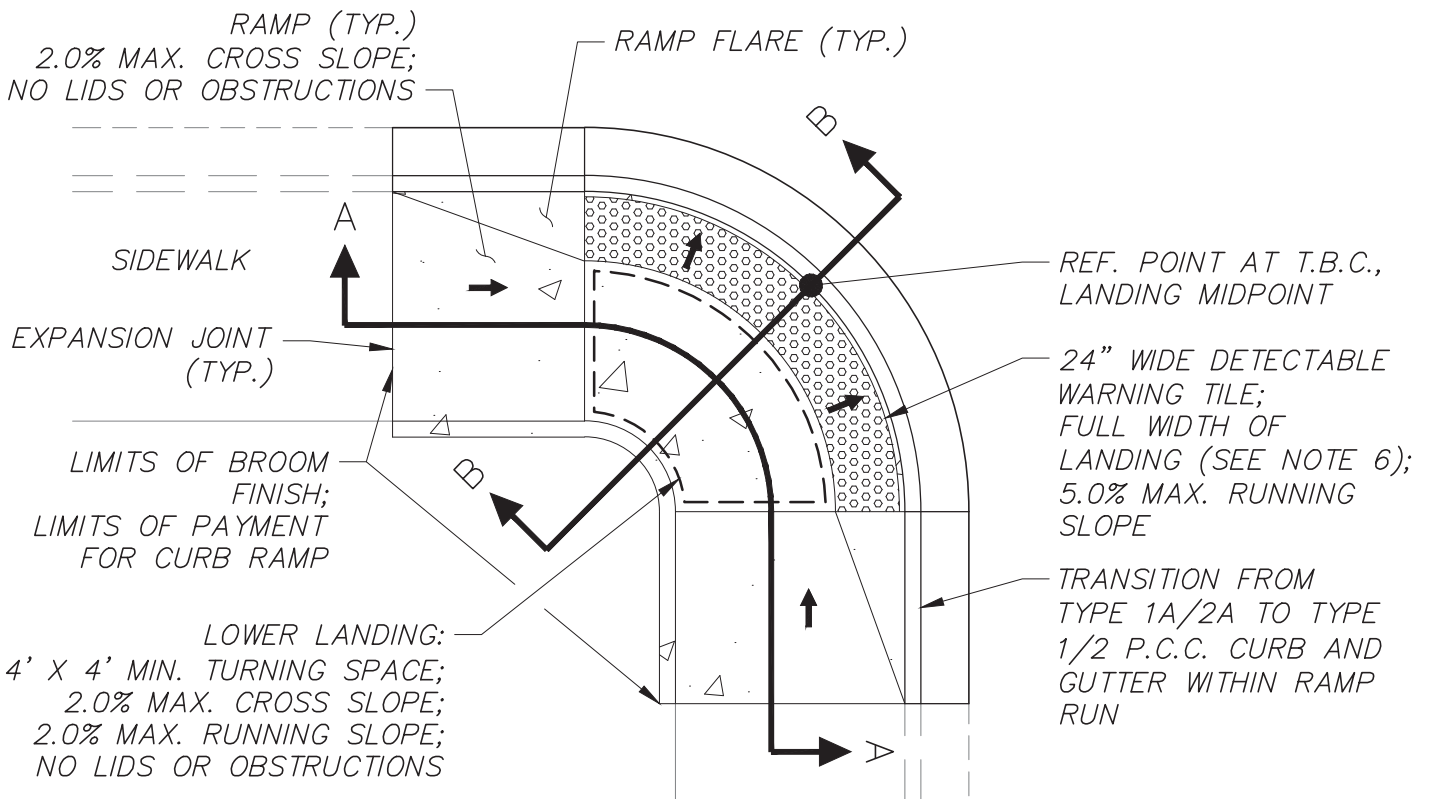
APPROVED:

REVISED:  
2/24

**PARALLEL CURB RAMP**

SECTION #  
30.04

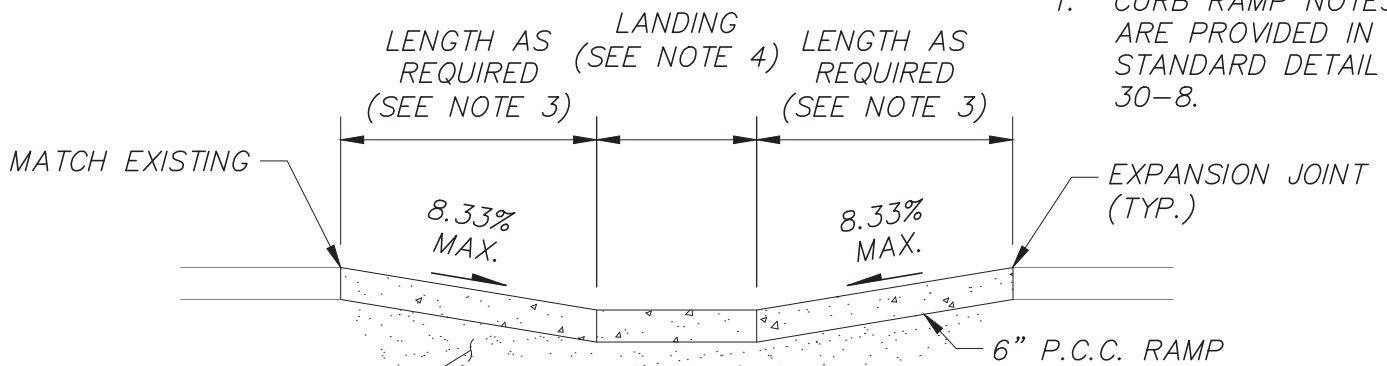
DETAIL #  
30-10



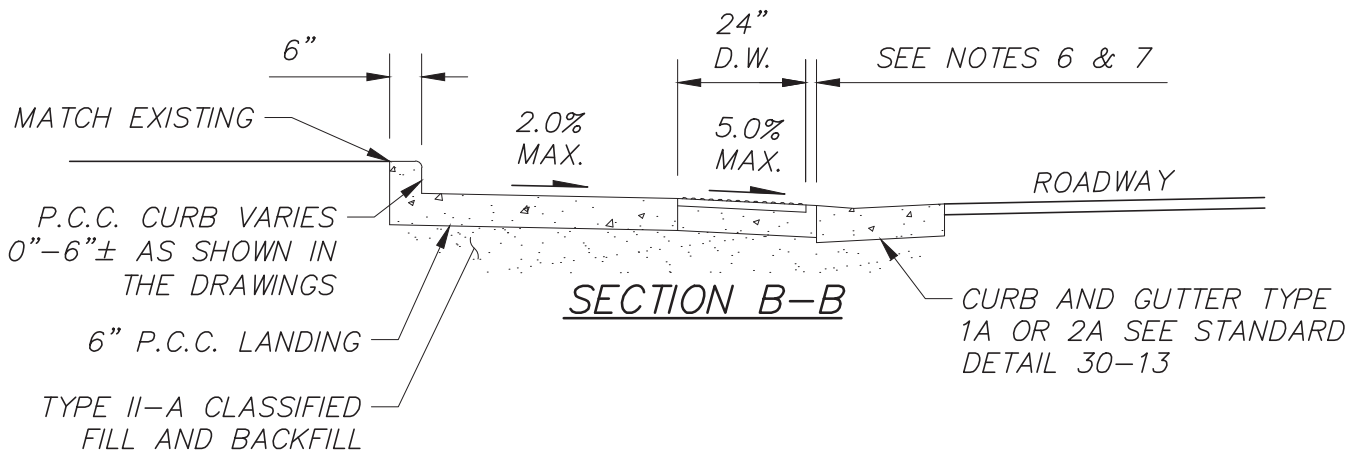
**PLAN**

**NOTE:**

1. CURB RAMP NOTES ARE PROVIDED IN STANDARD DETAIL 30-8.



**SECTION A-A**



**SECTION B-B**

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

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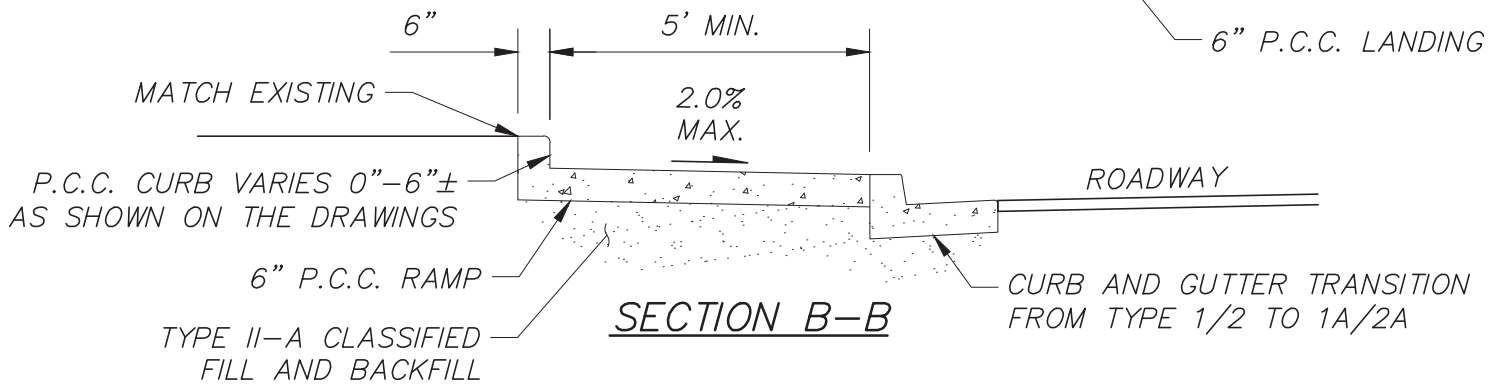
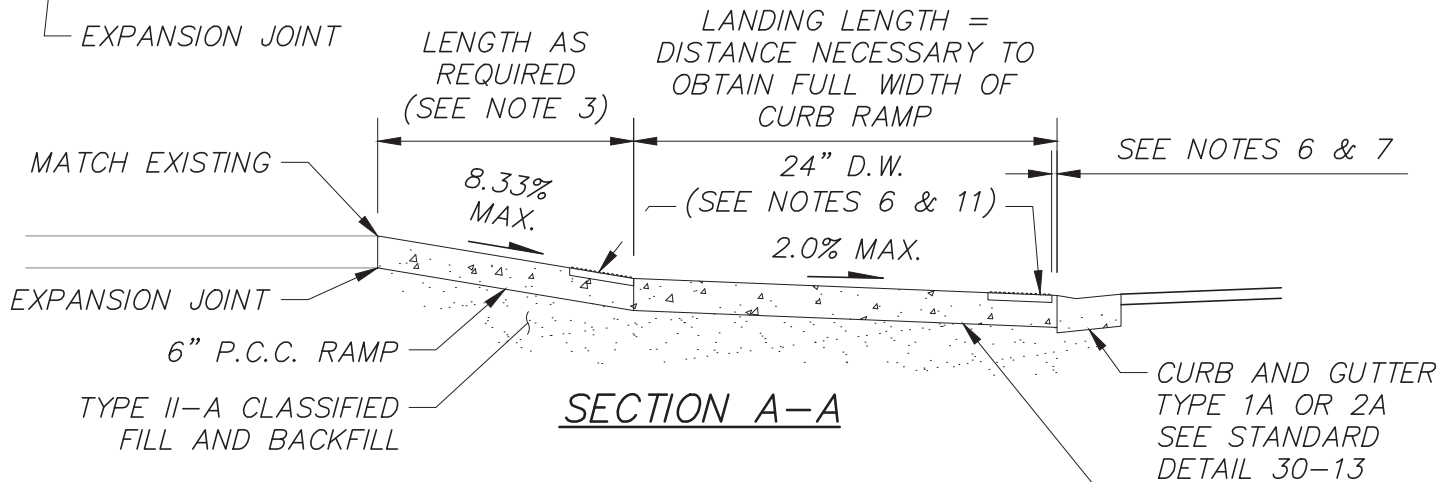
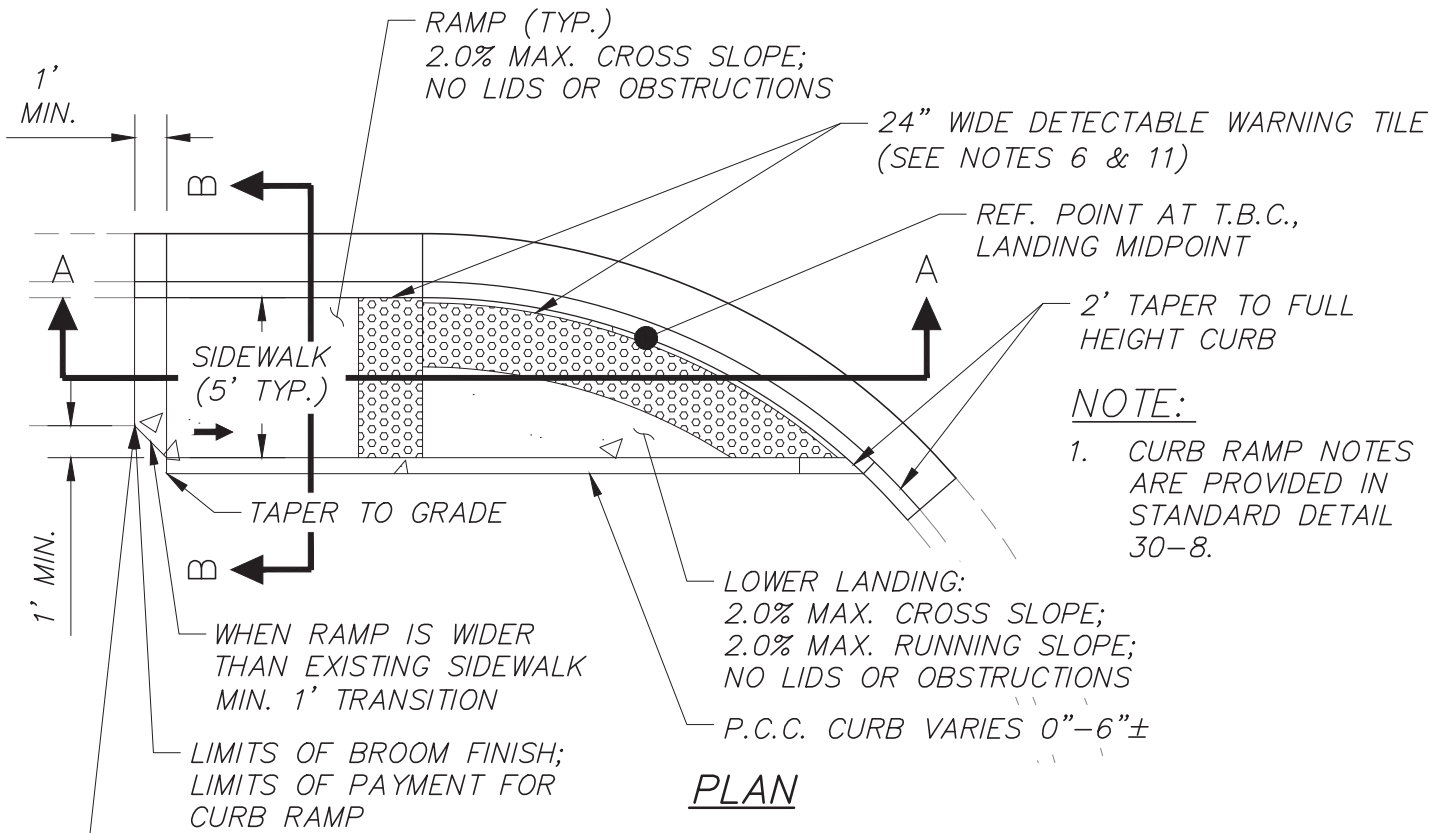
APPROVED:

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**BLENDED TRANSITION  
CURB RAMP**

SECTION #  
30.04

DETAIL #  
30-11



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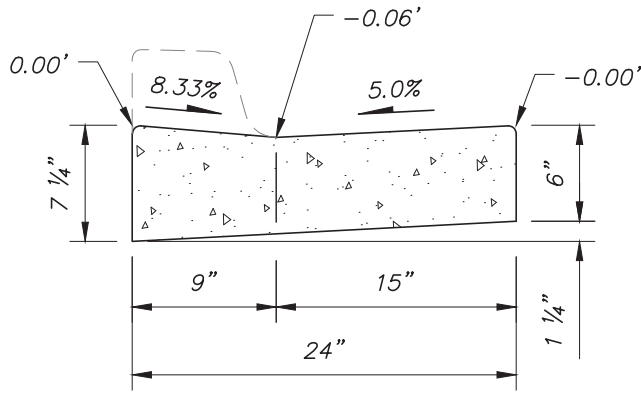
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2/24

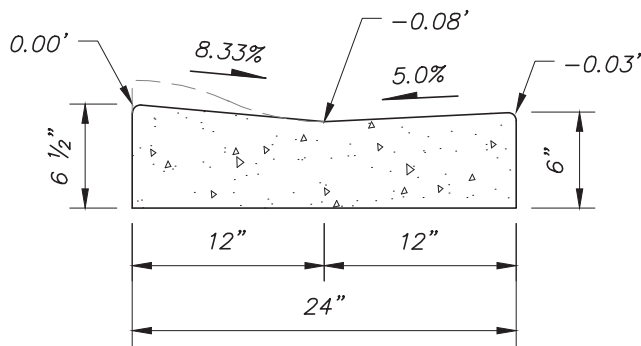
# UNIDIRECTIONAL CURB RAMP

SECTION #  
30.04

DETAIL #  
30-12



P.C.C. CURB AND GUTTER  
TYPE 1A  
 (FOR USE IN CURB RAMPS)



P.C.C. CURB AND GUTTER  
TYPE 2A  
 (FOR USE IN CURB RAMPS)

NOTE:

1. TRANSITION CURBS TO MAINTAIN CONSTANT FLOWLINE ACROSS CURB RAMP AND AROUND CURB RETURN PER THE DRAWINGS.

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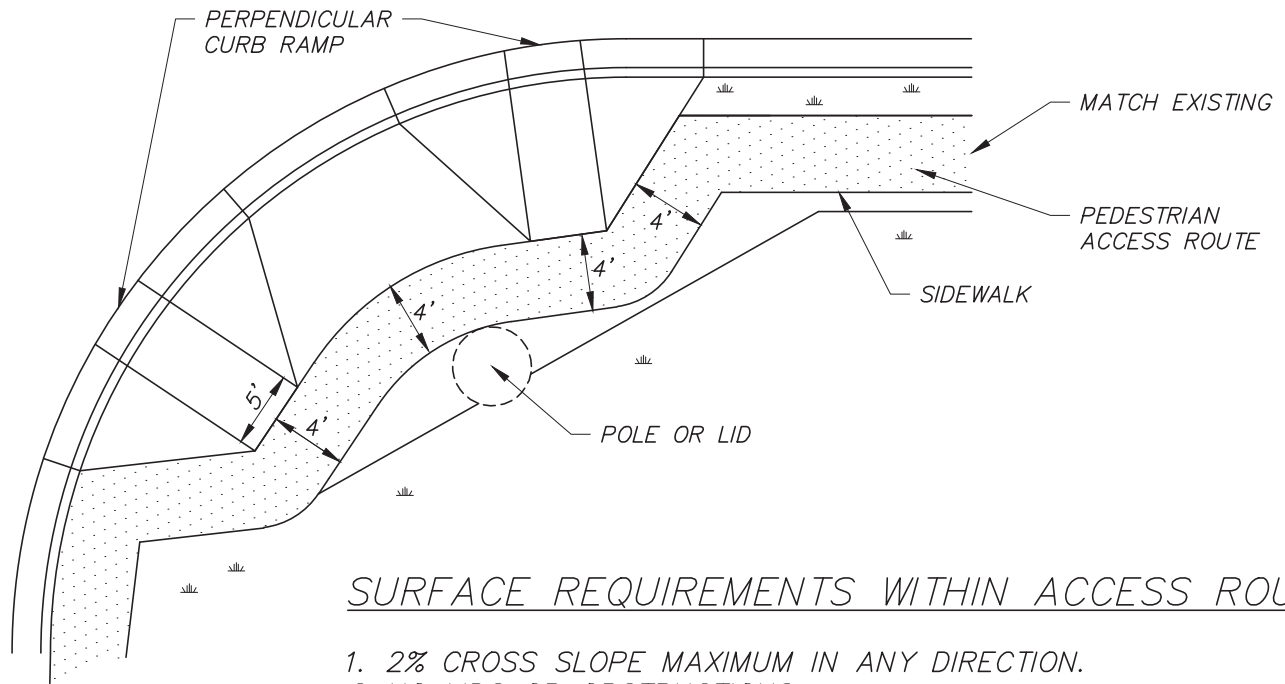


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**ACCESSIBLE CURB AND  
 GUTTER CROSS SECTIONS**

SECTION #  
 30.04

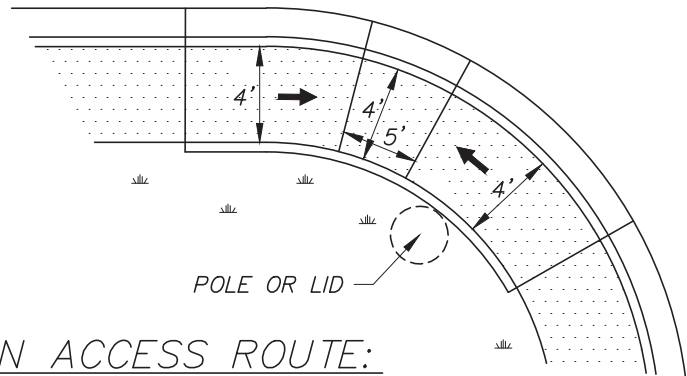
DETAIL #  
 30-13



SURFACE REQUIREMENTS WITHIN ACCESS ROUTE:

1. 2% CROSS SLOPE MAXIMUM IN ANY DIRECTION.
2. NO LIDS OR OBSTRUCTIONS.
3. CONNECTED ACCESS TO PED SIGNAL BUTTON I.A.W. STANDARD DETAIL 30-12.

MINIMUM PEDESTRIAN ACCESS ROUTE  
AROUND PERPENDICULAR CURB RAMPS



SURFACE REQUIREMENTS WITHIN ACCESS ROUTE:

1. 2% CROSS SLOPE MAXIMUM IN ANY DIRECTION.
2. NO LIDS OR OBSTRUCTIONS.
3. CONNECTED ACCESS TO PED SIGNAL BUTTON I.A.W. STANDARD DETAIL 30-12.

MINIMUM PEDESTRIAN ACCESS ROUTE  
THROUGH PARALLEL RAMPS

REVISION: 2024 M.A.S.S. UPDATE

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OF ANCHORAGE

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APPROVED:

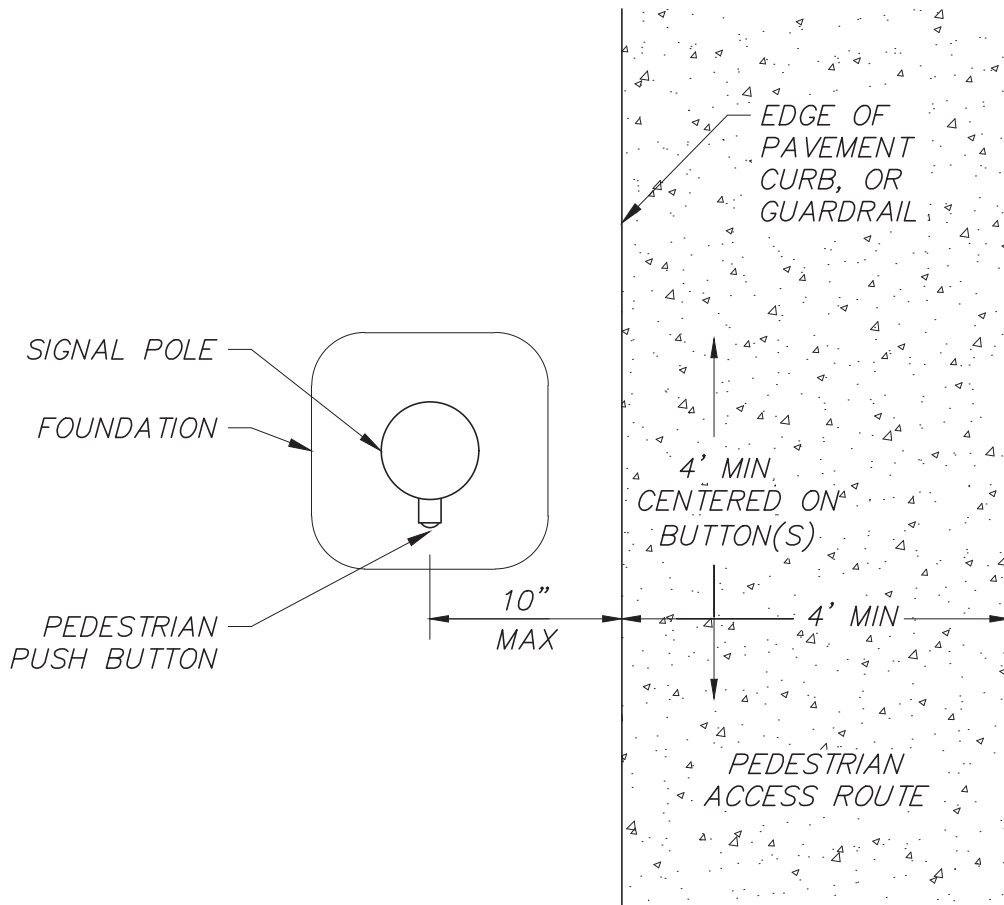
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**CURB RAMP CLEARANCES**

SECTION #  
30.04

DETAIL #  
30-14



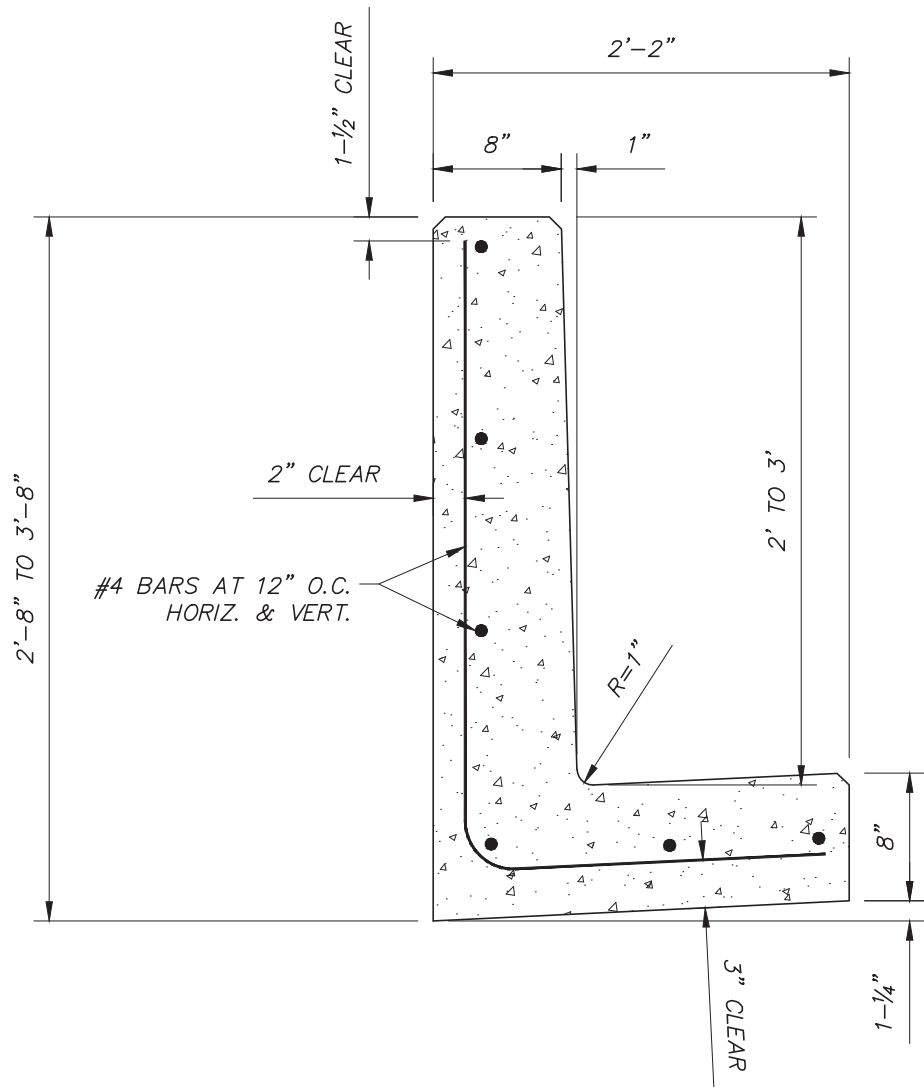


## ACCESSIBLE PEDESTRIAN PUSH BUTTON APPROACH

### NOTES:

1. PEDESTRIAN PUSH BUTTONS SHALL HAVE AN ACCESSIBLE APPROACH AS SHOWN.
2. APPROACH AREA SHALL JOIN OR OVERLAP THE MAIN SIDEWALK/PATHWAY, AND SHALL BE SURFACED WITH THE SAME MATERIAL.
3. APPROACH SHALL NOT EXCEED 2% SLOPE IN ANY DIRECTION.
4. APPROACH SHALL BE FREE FROM LIDS, OBSTRUCTIONS, AND LIPS.



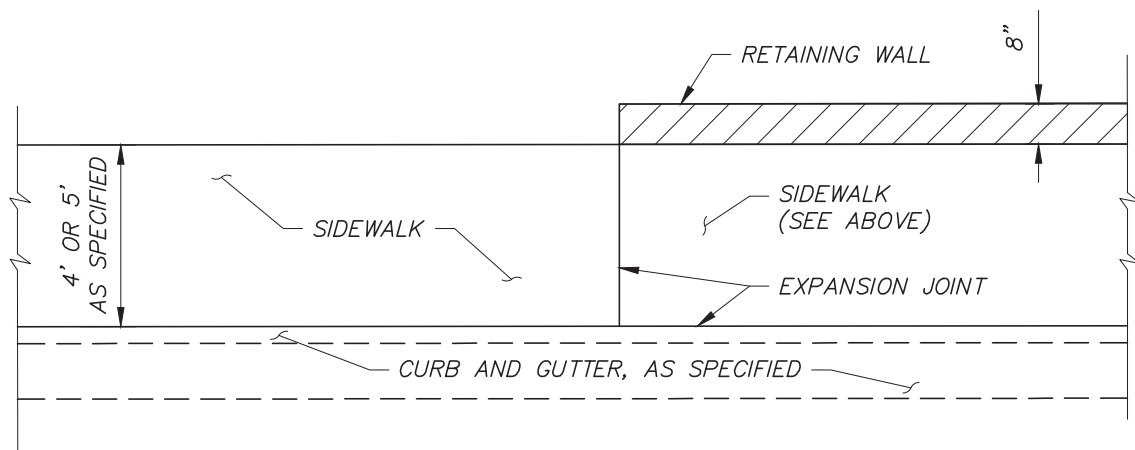
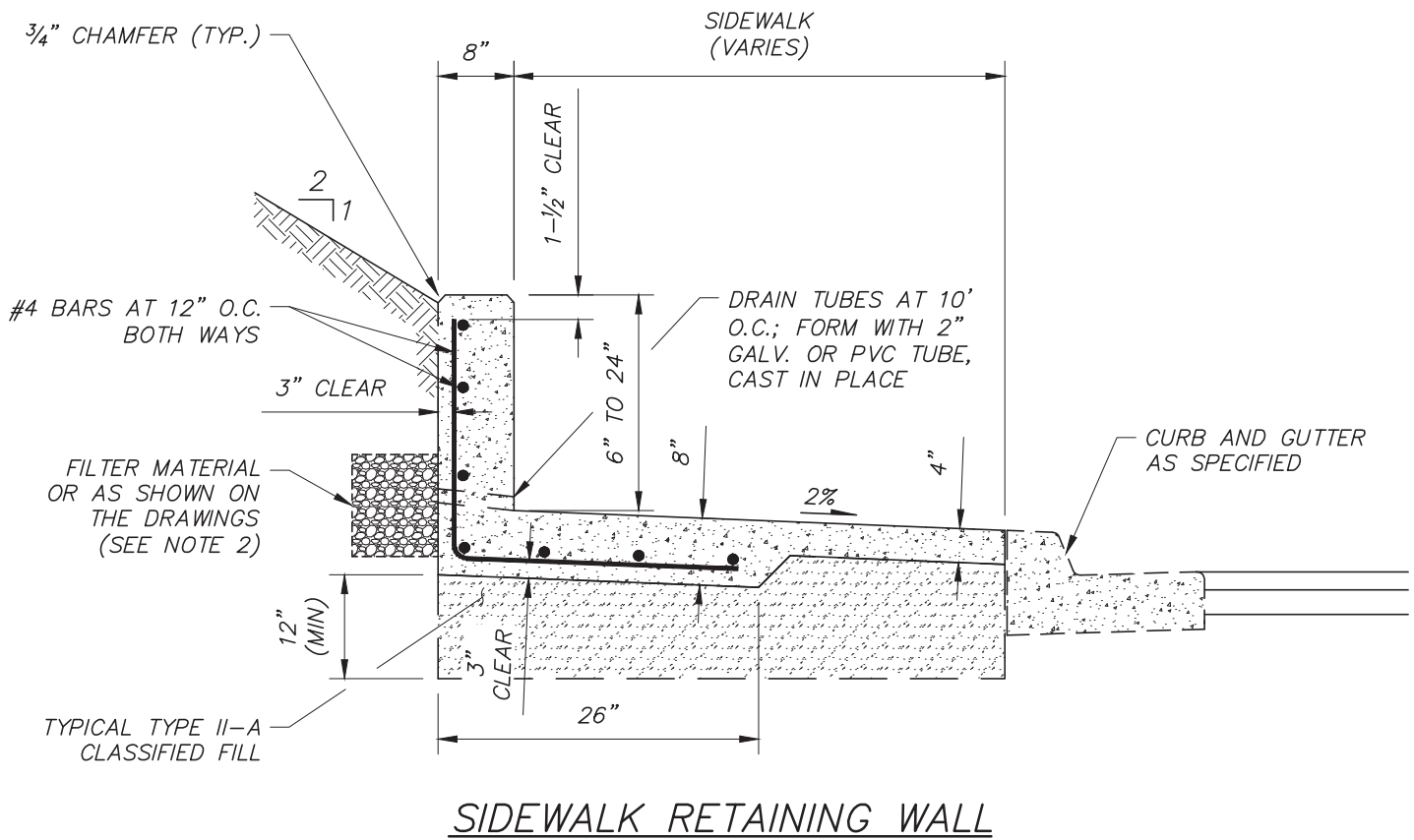


NOTES:

1. PROVIDE  $\frac{3}{4}$ " X  $\frac{3}{4}$ " CHAMFERED CORNERS AT ALL OUTSIDE EDGES.
2. NO VEHICLE TRAFFIC WITHIN 3' OF TOP OF WALL.

REVISION: 2024 M.A.S.S. UPDATE

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>CURB TYPE RETAINING WALL</b></p> <p><b>2' TO 3'</b></p>	<p>SECTION # 30.05</p> <p>DETAIL # 30-16</p>
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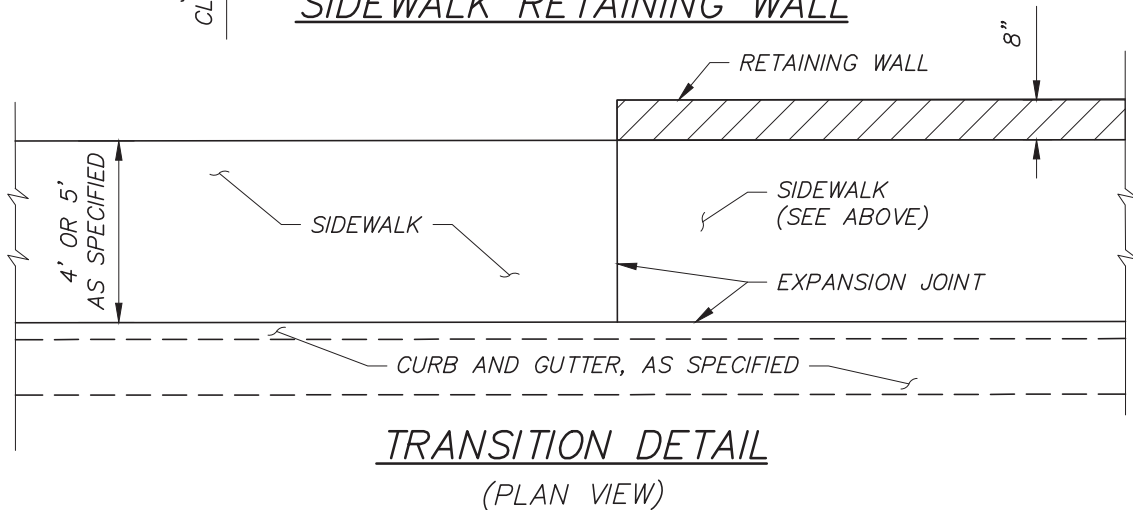
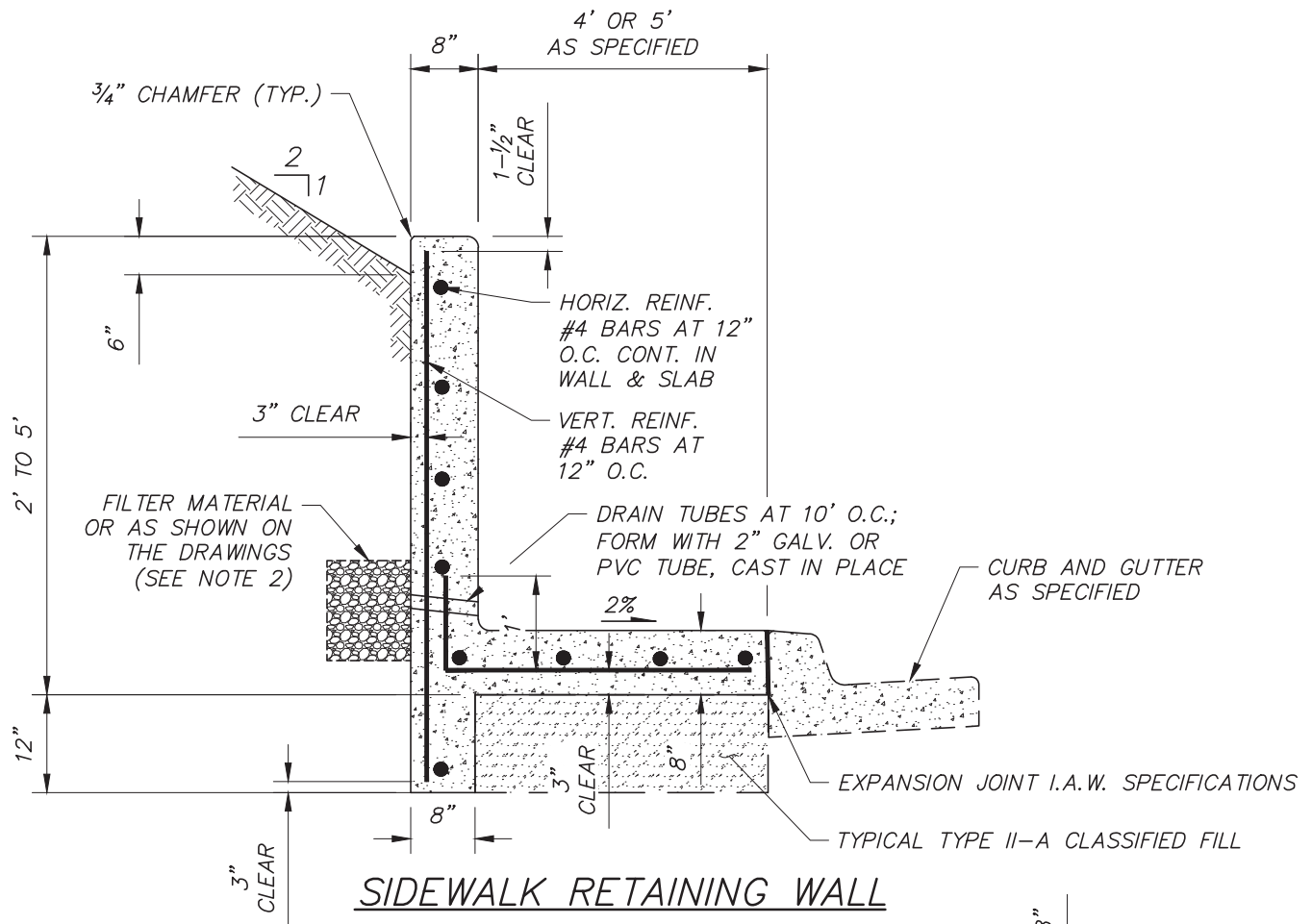


**NOTES:**

1. STANDARD CURB AND GUTTER SECTION NOT INCLUDED IN UNIT BID PRICE FOR RETAINING WALL.
2. PLACE ONE CUBIC FOOT OF FILTER MATERIAL AROUND WEEP HOLE AS SHOWN.
3. PROVIDE 3/4" X 3/4" CHAMFERED CORNERS AT ALL OUTSIDE EDGES.
4. NO VEHICLE LOADS WITHIN 2' OF TOP OF WALL.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h1 style="margin: 0;">SIDEWALK RETAINING WALL</h1> <h2 style="margin: 0;">6" TO 24"</h2>	SECTION # 30.05  DETAIL # 30-17
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**NOTES:**

1. STANDARD CURB AND GUTTER SECTION NOT INCLUDED IN UNIT BID PRICE FOR RETAINING WALL.
2. PLACE ONE CUBIC FOOT OF FILTER MATERIAL AROUND WEEP HOLE AS SHOWN.
3. PROVIDE 3/4" X 3/4" CHAMFERED CORNERS AT ALL OUTSIDE EDGES.
4. NO VEHICLE LOADS WITHIN 5' OF TOP OF WALL.

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MUNICIPALITY



OF ANCHORAGE

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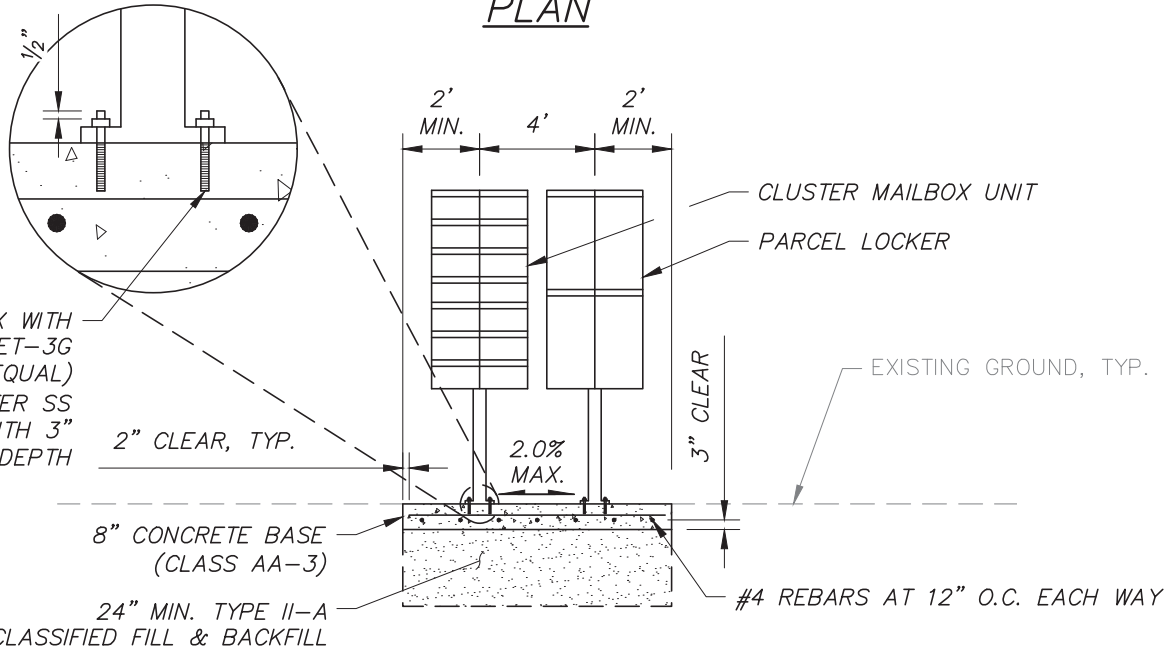
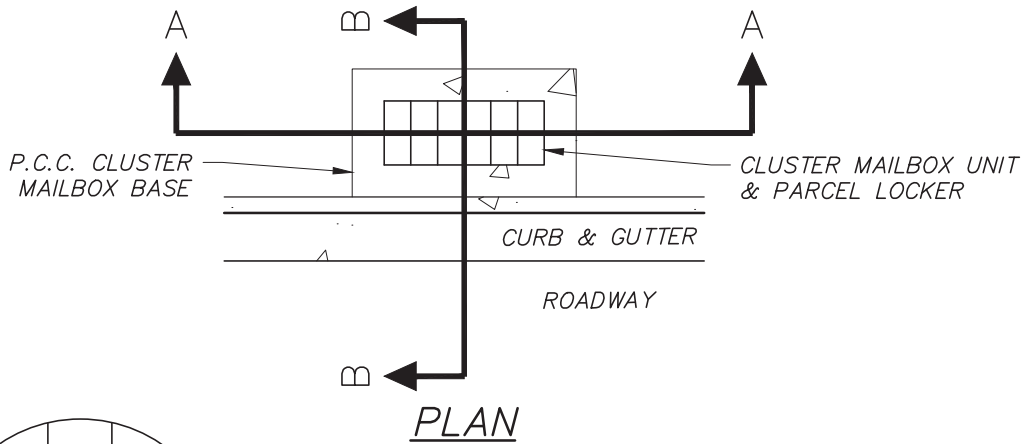
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2/24

**SIDEWALK RETAINING WALL**  
**2' TO 5'**

SECTION #  
30.05

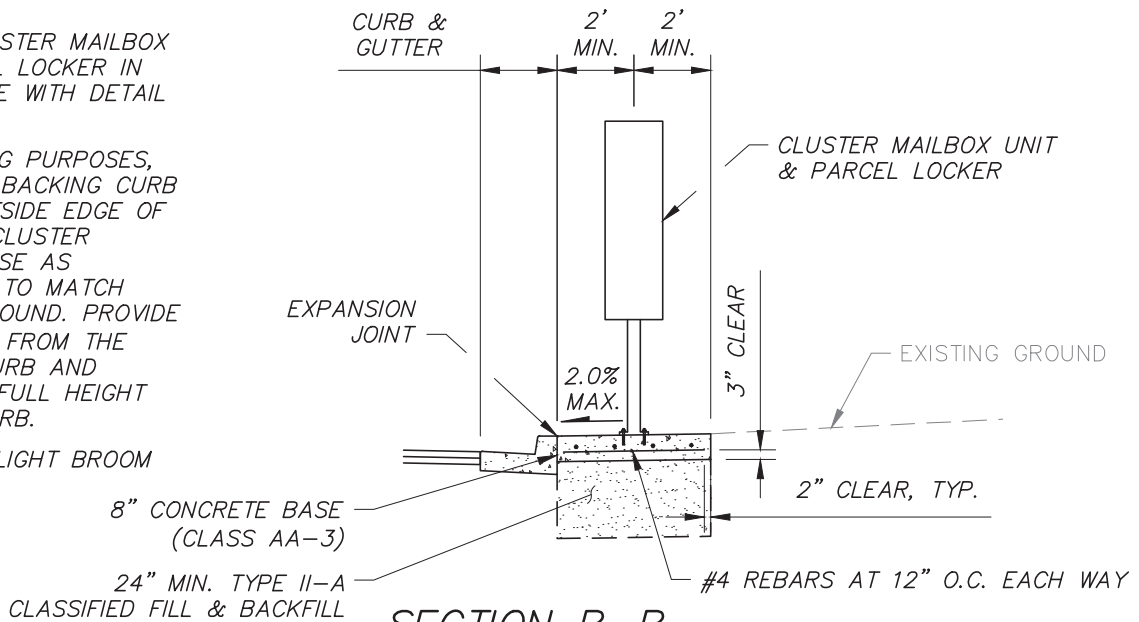
DETAIL #  
30-18



**SECTION A-A**

**NOTES:**

1. LOCATE CLUSTER MAILBOX AND PARCEL LOCKER IN ACCORDANCE WITH DETAIL 85-33.
2. FOR GRADING PURPOSES, CONSTRUCT BACKING CURB AT THE OUTSIDE EDGE OF THE P.C.C. CLUSTER MAILBOX BASE AS NECESSARY TO MATCH EXISTING GROUND. PROVIDE A 2' TAPER FROM THE BACK OF CURB AND GUTTER TO FULL HEIGHT BACKING CURB.
3. PROVIDE A LIGHT BROOM FINISH.



**SECTION B-B**

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

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2/24

**P.C.C. CLUSTER MAILBOX  
BASE**

SECTION #  
30.08

DETAIL #  
30-19



**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 40  
ASPHALT SURFACING**





**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR ASPHALT SURFACING  
DIVISION 40  
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**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR ASPHALT SURFACING  
DIVISION 40**

**SECTION 40.01 GENERAL**

**Article 1.1 Scope of Work**

The Work covered by these Specifications consists of providing all plant, labor, equipment supplies, material, transportation, handling, and storage, and performing all operations necessary to complete the construction of hot mix asphalt concrete pavement consisting of one or more courses on a previously prepared base, seal coat of asphalt cement and cover aggregate, and bituminous surface treatment in single or multiple courses.

**Article 1.2 Applicable Standards**

The latest revision of the following publications: Annual Book of ASTM Standards by ASTM International (ASTM), Standard Specifications for Transportation Materials and Methods of Sampling and Testing by the American Association of State Highway and Transportation Officials (AASHTO), and Alaska Test Methods Manual (ATMM) by the State of Alaska Department of Transportation and Public Facilities (DOT&PF), are hereby made a part of these Specifications. Additionally, the Western Alliance for Quality Transportation Construction (WAQTC) Test Methods and Procedures are hereby incorporated into these Specifications. The test designations listed below are those that are currently specified for use in this Division.

ATM 312	Nordic Abrasion Value of Coarse Aggregate
ATM 414	Anti-Strip Requirements of Asphalt Mixtures
ASTM C29	Test for Unit Weight of Aggregate
ASTM C88	Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Test for Materials Finer than No. 200 Sieve in Mineral Aggregates
ASTM C127	Test for Specific Gravity and Absorption of Coarse Aggregate
ASTM C128	Test for Specific Gravity and Absorption of Fine Aggregate
ASTM C131	Test for Resistance to Abrasion of Small Size Coarse Aggregate by Use of Los Angeles Abrasion Machine Test for Sieve or Screen Analysis of Fine and Coarse Aggregate
ASTM C183	Sampling Hydraulic Cement
ASTM D75	Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials
ASTM D140	Sampling Bituminous Materials
ASTM D242	Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D4125	Standard Test Method for Asphalt Content of Bituminous Mixtures by Nuclear Method
ASTM D4791	Flat and Elongated Particles
ASTM D5821	Percent Fracture
AASHTO M 29	Fine Aggregate for Bituminous Paving Mix
AASHTO M 43	Sizes of Aggregate for Road & Bridge Construction
AASHTO M 156	Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
AASHTO M 208	Specification for Cationic Emulsified Asphalt

AASHTO M 226	Viscosity Graded Asphalt Cement - Table Three (3)
AASHTO M 320	Standard Specifications for Performance-Graded Asphalt Binder
AASHTO T 30	Test for Mechanical Analysis of Extracted Aggregate
AASHTO T 228	Specific Gravity of Semi-solid Asphalt Materials
AASHTO T 85	Specific Gravity and Absorption of Coarse Aggregate
AASHTO T 180	Test for Moisture-Density Relations of Soils
AASHTO T 182	Coating and Stripping of Bitumen Aggregate Mixtures
AASHTO T 102	Spot Test of Asphaltic Materials
AASHTO T 164	Test for Quantitative Extraction of Bitumen*
AASHTO T 195	Test for Coated Particles for Bituminous Mixtures
AASHTO R 97	Sampling Asphalt Mixtures
AASHTO T 304	Uncompacted Void Content of Fine Aggregate (Fine Aggregate Angularity)
AASHTO T 308	Determining the Asphalt Content of Hot Mix Asphalt (HMA) by Ignition Method
AASHTO T 209	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
AASHTO T 166	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface Dry Specimens
AASHTO T 275	Bulk Specific Gravity of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens

\* In lieu of the specified methods, the Engineer may permit the use of a nuclear asphalt gauge.

The following standards of The Asphalt Institute are also a part of these Specifications:

- SS-1 Specifications and Construction Methods for Asphalt Concrete and Other Plant-Mix Types
- MS-2 Asphalt Mix Design Methods 7<sup>th</sup> Edition.

The number of blows of the Compaction hammer used in the Marshall Mix Design will be fifty (50) blows per side of specimen.

### **Article 1.3 Subsurface Investigation**

Information pertaining to subsurface exploration, boring, test pit locations, and other preliminary investigation may appear in the Contract Documents or be available at selected locations for review by the Bidder. While such data will have been collected with reasonable care, there is no expressed or implied guarantee that conditions so indicated are exact or entirely representative of those actually existing. The Bidder shall make their own interpretation of results of such investigations and satisfy themselves as to the conditions to be encountered.

### **Article 1.4 Materials and Inspection**

Representative samples of all materials proposed for use under these Specifications shall be submitted to the Engineer for testing. The Contractor shall submit these materials at their own expense. Material shall not be used until it has been approved by the Engineer.

For verification of weights and measures, character of materials, and determination of temperatures used in the preparation of the paving mixes, the Engineer or their authorized representative shall always have access to all portions of the paving plant, aggregate

plant, storage yards, and other facilities for producing and processing the material construction.

### **Article 1.5 Stripping Test for Aggregates**

The use and proportions of antistrip agents shall be determined by ATM 414 and be included in job mix design. At least seventy percent (70%) of the aggregate shall remain coated when tested in accordance with ATM 414.

### **Article 1.6 Payment – General**

Payment for all Work included in this Division shall be paid for in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described.

### **Article 1.7 Asphalt Price Adjustment**

This provision provides a price adjustment for asphalt cement material by:

1. an increase to the contract amount, or
2. a deduction from the contract amount.

The provision shall apply to asphalt concrete pavement which:

- is a major bid item as defined in M.A.S.S. Division 10, Section 10.04, Article 4.5 – Increased Quantities;
- is placed in the second or later year of the contract;
- conforms to M.A.S.S. Division 40, Section 40.06 – Asphalt Concrete Pavement; and
- is paid pursuant to M.A.S.S. Division 40, Section 40.06 – Asphalt Concrete Pavement.

This provision shall only apply to cost changes in the asphalt cement material that occur between the date of bid opening and the date the asphalt material is incorporated into the project.

The asphalt price adjustment shall only apply when there is more than a seven and one-half percent (7.5%) increase or decrease in the Alaska Asphalt Material Price Index from the date of the bid opening to the date the asphalt material is incorporated into the project.

As used in this Article, the Alaska Asphalt Material Price Index is calculated bi-monthly on the first and third Friday of each month and will remain in effect from the day of calculation until the next bi-monthly calculation. The Alaska Asphalt Material Price Index is posted on the DOT&PF's Statewide Materials website and is calculated according to the formula posted therein.

The Asphalt Price Adjustment (APA) payment is cumulative and is calculated with each progress payment. Asphalt material price index in effect on the last day of the pay period is used to calculate the price adjustment for asphalt cement material incorporated into the project during that pay period. The Municipality will increase or decrease payment under this contract by the amount determined with the following asphalt cement material price adjustment formula:

$$\text{APA \{price}^{\text{increase/decrease}}\} * = [(\pm \text{IPP} \mp \text{IB}) - (0.075 * \text{IB})] * \text{Q} * \% \text{AC}$$

Where:

- Q** = quantity of asphalt concrete pavement incorporated into the project during the pay period, in tons, and documented by weight tickets.
- IB** = Index at bid: the bi-monthly Alaska asphalt material price index in effect on date of bid, in dollars per ton.
- IPP** = Index at Pay Periods: the bi-monthly Alaska asphalt material price index in effect on the last day of the pay period, in dollars per ton; and
- %AC** = percentage asphalt cement content in the asphalt concrete pavement, as determined by the average asphalt cement content in project's asphalt concrete quality control testing.

\* Note: a negative price adjustment (APA) results in a price reduction to the Contract.

Method of measurement for determining quantity, Q, is the weight of asphalt concrete pavement material that conforms to M.A.S.S. Division 40, Section 40.06 – Asphalt Concrete Pavement and is incorporated into the project.

No asphalt price adjustment will be paid based on estimated quantities.

Contingent Sum payment shall be made on the following basis:

The final asphalt price adjustment on a project is the aggregate of the price adjustments paid on a project's respective progress pay estimates, i.e.,

$$\mathbf{APA = APA1 + APA2 + \dots + APAn}$$

Where: n = partial payment estimate number.



## **SECTION 40.02 SEAL COAT (CHIP SEAL)**

### **Article 2.1 Description**

The Work under this Section consists of the performance of all Work required for the construction of a seal coat of asphalt cement and cover aggregate on RAP, strip-paved, and gravel surfaces.

### **Article 2.2 Asphalt**

The Contractor shall submit a certified analysis of the proposed asphalt from the refinery laboratory to the Engineer for review and approval. A copy of the certified analysis shall accompany each shipment of asphalt to the Project. The Engineer shall reserve the right to make check tests of the asphalt received on the Project site, and if the asphalt is not in accordance with the certified analysis, the Engineer may reject the material.

The asphalt required by these Specifications shall conform to AASHTO M 208 or ASTM D2397 for the type and grade shown below:

Asphalt for Seal Coating CRS-2 or CRS-2P

### **Article 2.3 Cover Aggregate**

#### **A. General**

Cover aggregate shall consist of crushed gravel and shall be sound, durable, free of adherent coatings of clay, dirt, or any other objectionable matter, and shall have a percentage of wear not to exceed forty (40) after five hundred (500) revolutions, as determined by ASTM C131. Fractured Face Count shall conform to Section 40.06, Article 6.2 – Material and Testing. The cover aggregate shall have the following gradation:

<u>Sieve Size</u>	<u>Percentage Passing Sieve</u>
1/2"	100
3/8"	90 – 100
#4	10 – 30
#8	0 – 8
#200	0 – 1

#### **B. Stripping Test for Aggregates**

Cover aggregate shall show no detrimental amount of stripping when tested as described in Section 40.01, Article 1.5 – Stripping Tests for Aggregates.

Regardless of the test results, a "non-stripping" additive shall be added to the asphalt in the amount of one-half percent (0.5%) by weight of the asphalt. Such additive material shall be of quality and grade acceptable to the Engineer.

### **Article 2.4 Equipment**

#### **A. General**

All equipment used on this Work shall be of sufficient size and in such mechanical condition as to meet the requirements and to produce the Work to the specified quality.

#### **B. Pressure Distributor**

The bitumen distributor shall be pneumatic-tired, self-propelled, and shall have a capacity of not less than eight hundred (800) gallons. It shall be equipped with an

independently-operated bitumen pump, tachometer, pressure gauges, volume metering devices, a thermometer for reading the tank temperature, and a hose attachment suitable for applying the bituminous material to spots unavoidably missed by the distributor. The independently-operated bitumen pump shall be equipped with a tachometer calibrated in revolutions per minute. The distributor shall also be equipped to agitate and circulate the bituminous material during the heating process. Spray bars shall be the circulating type with extensions, available for distributing width from eight to twenty-one feet (8' to 21') by one-foot (1') increments.

The nozzle shall give uniform distribution and the shutoff shall be quick and positive to prevent dripping. The distributor shall be designed and equipped to distribute the bituminous material uniformly at consistent surface speeds, at uniform temperatures with various surface widths, at known and maintained rates of five hundredth (0.05) to two (2.0) gallons per square yard within a tolerance of five percent (5%), and through pressure ranges from twenty-five to seventy-five pounds per square inch (25 to 75 psi). Air pressure type equipment may be used only upon written approval from the Engineer.

C. Cover Aggregate Spreader

The spreader shall be self-propelled and capable of spreading the cover material uniformly for widths of eight to sixteen feet (8' to 16') in one-foot (1') increments, and adjustable to spread uniform layers of ten (10) to thirty (30) pounds per square yard. Revolving plate type chip spreaders will not be approved.

D. Rollers

Rollers shall be self-propelled, pneumatic-tired, weighing not less than five (5) tons and not more than eight (8) tons. Rolling shall follow closely on spreading of aggregate.

E. Hauling Equipment

The cover aggregate shall be transported from the plant to the site in trucks having tight, clean, and smooth beds.

F. Miscellaneous Equipment

A power broom and all necessary hand tools, thermometers, etc. shall be provided by the Contractor.

**Article 2.5 Construction**

A. Surface Preparation

The existing surface shall be swept clean of all dust, dirt, and other loose material with hand brooms or with approved mechanical sweepers. Where existing dust and dirt cannot be satisfactorily removed by brooming, it may be necessary to flush the asphalt surface with water. If flushing is necessary, the Contractor shall furnish the necessary equipment for flushing.

B. Weather Limitations

Bituminous material shall not be placed during rainy or threatening weather, or when the moisture on the surface to be treated would prevent satisfactory bond, or when the air temperature is less than fifty degrees Fahrenheit (50°F), except by approval of the Engineer.

C. Heating and Application of Bituminous Material

The bituminous material shall be heated in such a manner as to ensure even always heating of the entire mass with an efficient and positive control. It shall be applied at a temperature between one hundred thirty and one hundred eighty degrees Fahrenheit (130 to 180°F). Necessary thermometers shall be supplied so that the temperature may always be observed.

The bituminous material for the surface coat shall be uniformly applied by means of a pressure distributor at the ratio of four-tenths (0.40) to fifty-five hundredths (0.55) gallons per square yard with forty-five hundredths (0.45) gallons per square yard desired. The quantity of material as measured by the volume measuring device of the distributor shall not vary from the true quantity, as herein specified, by more than five percent (5%). A strip of building paper or other suitable covering shall be used at the beginning and/or end of the spread to provide a positive cutoff at the desired limits.

Existing improvements such as curb and gutter, steps and buildings shall be protected to prevent contact with bituminous material.

D. Preparation and Application of Cover Aggregate

Cover material shall be sufficiently dried when it encounters bituminous material that a satisfactory bond or coating is obtained. The moisture content shall not exceed two percent (2%) by weight.

Immediately following the application of the bituminous material, the aggregate cover material shall be uniformly spread over the surface with an approved mechanical spreader at a rate of twenty-two (22) to thirty (30) pounds per square yard. The cover material shall be applied continuously and without delay until the asphalt application is covered.

Whenever possible, successive strips shall be applied before the previous strip has cooled. Cover material shall not be spread on the six inches (6") adjacent to an unprotected edge until the next strip of bituminous material has been applied. Rolling shall immediately follow the application of the cover material. The roller shall be pneumatic-tired and of such a weight that it does not crush the cover material.

Rolling shall continue only long enough to "set" the cover material in the bituminous material. Under no circumstances will the rolling continue until the cover material is crushed or pulverized. If the cover material is distributed or thrown off the surface by traffic, it shall be broomed back into place. Areas with a deficiency or excess of cover material shall be corrected.

E. Maintenance of Surface

After application of the cover material, the surface shall be maintained by the Contractor for two (2) to five (5) days, depending on the weather. During this period the Contractor shall, at least once daily, redistribute the cover material that has become displaced by traffic, by means of brooms, a drag or other method satisfactory to the Engineer. When all possible material has been imbedded in the bituminous material to the satisfaction of the Engineer, the Contractor shall sweep the pavement surface of all excess material and remove it to the storage yard as designated, unless otherwise directed by the Engineer.

**Article 2.6 Measurement**

Bituminous material and cover aggregate shall be measured by weight in tons (2,000 lbs.). Legible weight tickets shall be submitted to the Engineer for all bituminous material and cover aggregate delivered to the Project site for use in the Work. All weight tickets shall contain, at a minimum, the following information:

1. Weight ticket serial number;
2. Vehicle identification number;
3. The date and time the load was weighed;
4. The tare weight of the vehicle;
5. The gross weight of the loaded vehicle, as registered on the scale; and
6. The legal gross weight of the vehicle, as permitted by Anchorage Municipal Code Sections 9.46.090 or 9.46.100.

The Owner shall not pay for that portion of any load more than the legal gross weight for the vehicle.

**Article 2.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Asphalt for Seal Coat	Ton
Cover Aggregate	Ton

## **SECTION 40.03 PRIME COAT**

### **Article 3.1 Description**

This Work under this Section consists of the performance of all Work required for preparing and treating the base course with bituminous material, and blotter material, in conformity with the required lines.

### **Article 3.2 Materials**

The prime coat shall be MC-30 (ASTM D2027) or approved equal. The aggregate for blotter material shall conform to the gradation requirements of AASHTO M 43, Size No. 10. The aggregate shall be free from organic or other deleterious material.

### **Article 3.3 Construction**

Weather Limitations: Bituminous material shall not be applied on a wet or frozen surface, or when the air temperature is below forty-five degrees Fahrenheit (45°F), or when weather conditions would prevent the proper construction of the prime coat.

### **Article 3.4 Application of Bituminous Material**

The distributor shall be so designed, equipped, maintained, and operated that bituminous material at even heat may be applied uniformly on variable widths of surface up to fifteen feet (15') at readily determined and controlled rates from five hundredths (0.05) to two (2.0) gallons per square yard, with uniform pressure and with an allowable variation from any specified rate not to exceed two hundredths (0.02) gallon per square yard. Distributor equipment shall include a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and a thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a power unit for the pump, and full circulation spray bars adjustable laterally and vertically.

Traveling or stationary mixing plants, or other equipment of proven performance, may be used by the Contractor in lieu of the specified equipment if approved.

Bituminous material shall be applied to the width of the section to be primed by means of a pressure distributor in a uniform, continuous spread. When traffic is maintained, not more than half (1/2) of the width of the section shall be treated in one application. Care shall be taken that the application of bituminous material deficiencies shall be corrected. Building paper shall be placed over the end of the previous applications and the joining application shall start on the building paper. Building paper used shall be removed and satisfactorily disposed of.

When traffic is maintained, one-way traffic shall be permitted on the untreated portion of the roadbed. As soon as the bituminous material has been absorbed by the surface and will not pick up, traffic shall be transferred to the treated portion and the remaining width of the section shall be primed.

The quantities, rate of application, temperatures, and areas to be treated shall be approved before application of the prime coat.

### **Article 3.5 Application of Blotter Material**

If, after the application of the prime coat, the bituminous material fails to penetrate within the time specified and the roadway must be used by traffic, blotter material shall be spread in the amounts required to absorb any excess bituminous material. Blotter material will be used only at the direction of the Engineer.

**Article 3.6 Measurement**

Bituminous material will be measured by the ton and blotter material will be considered incidental to the asphalt used as prime coat.

**Article 3.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Asphalt Prime Coat	Ton

## **SECTION 40.04 TACK COAT**

### **Article 4.1 Description**

The Work under this Section shall consist of performing all Work required for the application of bituminous material to an existing asphalt base or bituminous binder to provide bond for a superimposed asphalt wearing surface.

### **Article 4.2 Material**

The Contractor shall submit a certified analysis from the refinery laboratory to the Engineer for review and approval. A copy of the certified analysis shall accompany each shipment of the asphalt received on the Project site, and if the asphalt is not in accordance with the certified analysis, the Engineer may reject the material. The asphalt required by these Specifications shall conform to the latest Asphalt Institute Specifications for the type and grade shown below:

Asphalt for Tack Coat

STE-1 {Snap-Tack}  
or approved equal

### **Article 4.3 Equipment**

#### **A. General**

All equipment used on this Work shall be of sufficient size and in such mechanical condition as to meet the requirements and to produce the Work to the specified quality.

#### **B. Pressure Distributor**

The bitumen distributor shall have pneumatic tires of such width and number that the load produced on the binder course shall not exceed six hundred fifty (650) pounds per inch of tire width, and shall be so designed, equipped, maintained and operated that bituminous material at even heat may be applied uniformly on variable widths of surface at readily determined and controlled rates per square yards, with a pressure range of from twenty-five (25) to seventy-five (75) pounds per square inch, and with an allowable variation from the specified rate not to exceed five percent (5%). Distributor equipment shall include a tachometer, pressure gauges, volume measuring devices, and a thermometer for reading temperatures of tank contents.

Contractor shall be required to lay a test strip of not less than fifteen feet (15') in length to demonstrate that the equipment is working. Location of the test strip will be on-site, as approved by the Engineer. Street closures required for testing of equipment will be the responsibility of the Contractor prior to testing.

Notification of testing will be made to the Engineer not less than twenty-four (24) hours prior to making the test strip to allow the inspector and materials analysis personnel to be present. Engineer may require reasonable adjustments to the distribution rate to meet the required or desired cured thickness.

All equipment shall meet federal and State of Alaska safety standards. The Engineer and Contractor will inspect equipment jointly. Contractor shall immediately repair or replace defective or non-working pumps, gauges, or spray bar parts.

Contractor shall re-test test strips that fail due to equipment failure or inexperienced personnel operating the equipment will be re-tested. Engineer may require additional tests that the Engineer believes are needed to verify that the equipment meets the

requirements of these specifications, and the Contractor has qualified personnel and supervision to complete this Work.

Supplying the application of tack coat test strips is incidental to the bid item "Tack Coat" and no separate payment shall be made.

C. Miscellaneous Equipment

A power broom equipped with blower and all necessary hand tools, thermometers, etc., shall be provided by the Contractor.

**Article 4.4 Construction**

A. Surface Preparations

Immediately before applying the tack coat, if the surface is sufficiently bonded, the full width of surface to be treated shall be swept with a power broom equipped with a blower, supplemented by hand brooms, washed down with water, or otherwise cleaned to remove all loose dirt, clay, or other loose and objectionable material.

After the operation of removing dust has been completed and prior to the application of the tack coat, the Engineer shall inspect the existing pavement to determine its fitness to receive the bituminous material.

B. Weather Limitations

Tack coat shall not be applied during cold weather, after sunset, or to a wet surface. The tack coat shall be applied only when the temperature of the atmosphere is above sixty degrees Fahrenheit (60°F).

C. Heating and Application of Bituminous Material

The application of the bituminous tack material shall be made by means of a pressure distributor of approved type and shall be in the following amounts. Contractor shall distribute undiluted amounts of bituminous material (STE-1 {Snap-Tack} or approved equal) so that the mixture will cure back to five hundredths (0.05) to one tenth (0.10) gallon per square yard. The quality of material as measured by the volume measuring device of the distributor shall not vary from the true quantity, as herein specified, by more than five percent (5%). The bituminous material shall be applied at a temperature between seventy-five and one hundred thirty degrees Fahrenheit (75°F and 130°F). Necessary thermometers shall be supplied so that the temperature may always be observed.

Existing improvements such as keyboxes, manholes, cleanouts, monuments, curb and gutter, steps, and buildings shall be protected to prevent contact with bituminous material to the satisfaction of the Engineer. The surface shall be allowed to dry until it is a proper condition of tackiness to receive the AC surface course placement as is necessary to obtain this proper condition of tackiness. Until the wearing surface course is placed, the Contractor shall protect the tack coat from damage.

**Article 4.5 Measurement**

Bituminous material will be measured by weight in tons (2000 lbs.).

**Article 4.6 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.



Payment shall be made under the following units:

ITEM	UNIT
Asphalt Tack Coat	Ton

## **SECTION 40.05 CRACK AND JOINT SEALANT**

### **Article 5.1 General**

The Work under this Section shall consist of the performance of all plant, labor and supervision, equipment, and material for performing all operations required for the preparation and application of a hot bituminous emulsion and three-eighths inch (3/8") chip applied as a crack and joint sealant. The Work under this Section shall be performed after the asphalt pavement has been rotomilled or as directed by the Engineer.

### **Article 5.2 Materials**

Asphalt materials shall be approved by the Engineer prior to use (a certified analysis by the refinery laboratory with each shipment of asphalt to the project may be acceptable). The Engineer shall reserve the right to make check tests of the asphalt received on the job and if the certified analysis proves to be unsatisfactory individual check tests will be required.

The asphalt required by these specifications shall conform to the requirements of the Asphalt Institute for the type and grade shown below:

Asphalt for Bituminous Emulsion Crack Sealant	STE-1 {Snap-Tack} or approved equal
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The aggregate shall consist of crushed gravel (three-eighths inch [3/8"] minus and sand) evenly mixed and shall be sound, durable, and free of adherent coatings of clay, dirt, or any other objectionable matter. Not less than sixty percent (60%) by weight of crushed gravel shall consist of pieces having two or more faces being freshly fractured.

The aggregate shall have the following gradation:

<u>Sieve Size</u>	<u>Percentage by Weight Passing</u>
3/8"	100
#4	85 – 100
#8	0 – 25
#200	0 – 2

All aggregate equipment shall meet federal and State of Alaska safety standards and shall be sufficient in size and mechanical condition to meet the requirements and to produce the Work. The equipment will be inspected jointly by the Municipality and the Contractor and shall be approved by the Engineer before any Work is started. Any units found defective shall be immediately repaired or replaced before starting Work on this project. The Contractor shall notify the Engineer twenty-four (24) hours in advance for equipment inspection.

The bitumen distributor shall have pneumatic-tires and be self-propelled and shall have a capacity of not less than four hundred (400) gallons. It shall be equipped to agitate and circulate the bituminous material during heating, with an independently operated bitumen pump, tachometer, pressure gauges, volume metering devices, tank thermometer, and a handheld pressurized spray bar with a single nozzle equipped with a quick and positive shut-off to prevent dripping or over-spraying.

Rollers shall be self-propelled, have pneumatic tires, and weigh not less than five (5) tons or more than eight (8) tons.

The Contractor shall provide a power broom and all necessary hand tools, thermometers, etc., at no additional cost to the Municipality.

### **Article 5.3 Construction**

Crack and joint sealant shall be applied to cracks or joints that have dimensions between three-eighths inch (3/8") and three-quarter inch (3/4") in width as directed by the Engineer. The sealant shall be applied in conformance with the manufacturer's instructions and to full depth of the crack. Cracks less than three-eighths inch (3/8") in width will be filled with sealant (STE-1).

The cracks shall be cleaned, and all loose material shall be blown out to the full depth of the crack. The interior of the crack shall be completely dried and existing asphalt surfaces shall be exposed to enable bonding of the sealant.

All cracks shall have a minimum depth of one inch (1"). If the crack does not have a minimum depth of one inch (1"), the crack shall be deepened to a minimum of one inch (1") using a router or similar device approved by the Engineer. The area covered with the emulsion/aggregate treatment shall be a minimum of six inches (6") on either side of the crack.

Crack and joint sealant shall be prepared and applied in conformance with the manufacturer's instructions. All extruded sealant shall be removed and feathered to transition to the existing pavement surface.

Crack sealant shall not be applied during cold weather, after sunset, or when the surface and crack are wet. The crack sealant shall be applied only when the temperature of the atmosphere is above sixty degrees Fahrenheit (60°F).

The application of the bituminous material shall be made by means of a pressure distributor of approved type. Undiluted amounts of bituminous material (STE-1) shall be distributed at the rate of two-tenths to thirty-five hundredths (0.20 to 0.35) gallons per square yard. The quality of material as measured by the volume-measuring device shall not vary from the true quantity, as herein specified, by more than five percent (5%). The bituminous material shall be applied at a temperature between one hundred and twenty-five and one hundred and eighty-five degrees Fahrenheit (125°F to 185°F).

The hot bituminous emulsion shall be applied with a handheld spray bar, with a nozzle pressure range from twenty pounds per square inch (20 psi) to forty-five pounds per square inch (45 psi), to distribute the bituminous material uniformly to the full depth of the crack without filling it.

Aggregate distribution shall follow the emulsion applications closely as possible. It shall be placed prior to the emulsion breaking to ensure the greatest adherence.

The loose aggregate shall be removed, and all crack repairs shall be broomed and cleaned before the asphalt overlay is installed.

For wide cracks or other openings in the existing asphalt surface, which in the opinion of the Engineer are too large for crack sealing, the Engineer shall direct the Contractor to remove and replace pavement in accordance with Section 40.11 – Remove and Replace Asphalt Surfacing or place an A.C. wedge course in accordance with Section 40.06 – Asphalt Concrete Pavement.

The crack and joint sealant must be in place a minimum of twenty-four (24) hours and approved by the Engineer prior to an application of the tack coat or overlay will be allowed.

**Article 5.4 Measurement**

The application of crack and joint sealant shall be measured per linear foot of sealant applied as directed. Application of aggregate shall be incidental to bid item “Crack and Joint Sealant” and no separate payment shall be made.

**Article 5.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Crack and Joint Sealant	Linear Foot

## SECTION 40.06 ASPHALT CONCRETE PAVEMENT

### Article 6.1 Description

The Work under this Section consists of the performance of all Work required for the construction of asphalt concrete pavement on a prepared base.

### Article 6.2 Material and Testing

#### A. Asphalt Cement or binder:

The Contractor shall submit a certified analysis of the asphalt from the refinery laboratory to the Engineer for review and approval. A copy of the certified analysis shall accompany each shipment of asphalt to the asphalt mixing plant. The Engineer may make check acceptance tests of the asphalt binder, and, if the asphalt binder is not in accordance with the certified analysis, it shall be rejected.

1. For Class A asphalt concrete, the asphalt cement or binder required by this specification shall conform to the following AASHTO designations.

Meets AASHTO M 320 and the following:

Performance Grade of Asphalt binder	PG 64-28
Softening Point, minimum (AASHTO T 53)	125°F
Toughness, minimum (ASTM D5801)	110 in-lbs.
Tenacity, minimum (ASTM D5801)	75 in-lbs.

2. For other classes of asphalt concrete, the asphalt cement or binder required by these Specifications shall conform to the requirements of AASHTO M 320 and Certified Performance Grade Asphalt Binder PG 52-28.

#### B. Aggregates

1. Class A asphalt concrete

Coarse aggregate is all mineral retained on the No. 4 sieve.

The aggregate retained on the No. 4 sieve shall contain at least ninety percent (90%) by weight of particles having a minimum of two (2) mechanically fractured surfaces.

Coarse Aggregate: Particles retained on the No. 4 sieve. Remove all natural fines passing the No. 4 sieve before crushing coarse aggregates for the asphalt concrete grading. The grain-size distribution for the asphalt concrete shall consist entirely of aggregate produced from an aggregate crushing process. Crush only aggregate that is free from clay conglomerates, vegetative matter, or other deleterious material. Crush only aggregate which consists of sound, tough, durable rock of uniform quality and is not coated with silt or clay. Aggregates shall meet the following requirements:

Property	Test Method	Requirement
Percent Sodium Sulfate Loss (5 cycles)	ASTM C88	9% maximum
Percent Fracture (Two Surfaces)	ASTM D5821	90% minimum
Flat & Elongated Particles	ASTM D4791	
3 to 1	----	15% maximum
5 to 1	----	5% maximum
Nordic Abrasion	ATM 312	12% maximum
Absorption	AASHTO T 85	2% maximum

Fine Aggregate: Particles passing the No. 4 sieve. Remove all natural fines retained on the No. 4 sieve before crushing fine aggregate for the asphalt concrete grading. Crush only aggregate that is free from clay conglomerates, vegetative matter, or other deleterious material and that consists of sound, tough, durable rock of uniform quality not coated with silt or clay.

The grain-size distribution for the asphalt concrete shall consist entirely of aggregate produced from an aggregate crushing process and be non-plastic as determined in accordance with AASHTO T 90 (Determining the Plastic Limit and Plasticity Index of Soils). Meet the quality requirements of AASHTO M 29, including S1.1, Sulfate Soundness, and the following:

Property	Test Method	Requirement
Uncompacted Void Content of Fine Aggregate (Fine Aggregate Angularity)	AASHTO T 304	45% minimum

2. Class D and E asphalt concrete

Coarse aggregate for Class D and E asphalt concrete is all mineral retained on the No. 4 sieve. The aggregate retained on a No. 4 sieve shall contain at least eighty percent (80%) by weight of crushed pieces having two or more mechanically fractured surfaces.

All coarse aggregate shall be free from coatings of clay, silt, or other objectionable matter and shall not contain clay balls or other aggregation of fine material. Coarse aggregate shall be tested for soundness in accordance with the requirements of ASTM C88 or will have proven sound through adequate record of service.

When aggregate grading is such that the material will tend to segregate in stockpile or handling, it shall be supplied in two (2) or more sizes. Each size of aggregate required to produce the combined gradation specified shall be placed in individual stockpile at the plant site and separated by bulkheads or other means. When it is necessary to blend two (2) or more aggregate sizes, the blending shall be done through separate bins at the cold elevator feeders, and not in the stockpile.

Fine aggregate is composed of all mineral matter passing the No. 4 sieve. It shall consist of natural and/or manufactured material derived by crushing gravel.

The aggregate particles shall be clean, tough, durable, moderately sharp, and free from coating of clay, silt, or other objectionable matter and shall not contain clay balls or other aggregations of fine material. Fine aggregate shall be tested for soundness in accordance with the requirements of ASTM C88 or shall have a satisfactory soundness record. When tested for soundness, the number of cycles shall be five (5), the solution shall be sodium sulphate; the maximum loss shall be nine percent (9%) by weight. Fine aggregates shall be maintained in individual stockpiles, suitably separated to prevent intermingling.

C. Mineral Filler

Mineral Filler shall conform to the requirements of ASTM D242.

## Article 6.3 Composition of Mixes

### A. General Requirements

Paving mixtures prepared under these Specifications shall be composed of aggregate and paving asphalt within the limits set forth in the following table:

Asphalt paving mixtures prepared under these Specifications shall be composed of aggregate and asphalt cement within the limits set forth in the following table:

Percentages by Weight Passing Sieves - Wearing Course			
Sieve Size	Class A	Class D	Class E
1"	----	----	----
3/4"	100	----	100
1/2"	68 – 82	100	78 – 96
3/8"	52 – 64	75 – 92	66 – 86
#4	36 – 46	50 – 68	46 – 66
#8	26 – 36	32 – 50	34 – 52
#16	16 – 28	20 – 38	24 – 42
#30	10 – 20	14 – 30	16 – 32
#50	6 – 16	10 – 24	10 – 24
#100	4 – 12	7 – 16	7 – 16
#200	3 – 8	3 – 9	3 – 9
Asphalt Cement *	5.0 – 7.0	5.0 – 7.0	5.0 – 7.0

\*By weight of total mix

Target values for the gradation of the Job Mix Design shall be within the Broad Band Limits depicted in the table above.

### B. Additive Materials

A "non-stripping" additive shall be added to the asphalt in the amount determined by ATM 414 or one-fourth percent (0.25%) by weight of the asphalt, if approved by the Engineer. Such additive material shall be of quality and grade acceptable to the Engineer.

### C. Job Mix

The Contractor, at their expense, shall submit to the Engineer for approval, a job mix formula within the limits specified above, for each class of mix designated by the Contract. Within each mix design the Contractor shall provide correction factor ignition points generated in accordance with AASHTO T 308. The aggregate gradation of the job-mix formula, when plotted upon an aggregate grading chart, shall closely approximate the shape of average gradations for the limits specified. For that portion of the aggregate passing No. 4 sieve, gradings which range from at or near the maximum of one (1) sieve to at or near the minimum of the next sieve will not be permitted. The Engineer may require increased asphalt content up to one-half percent (0.5%) above that indicated by Marshall Design Criteria. Upon requiring increased asphalt content, the lower limit of percent voids and the upper limit of percent voids filled shall be waived.

### D. Maximum Permissible Variations

Tolerances to the approved Job Mix Formula shall not exceed the permissible variations presented in the following table. The Job Mix Formula band shall mean

the approved Job Mix Formula plus-or-minus ( $\pm$ ) the numeric values for the maximum permissible variations.

Maximum Permissible Variation (Percent by Weight of Total Aggregate)		
Sieve Size	Class A Asphalt	Class D & E Asphalt
3/8" & larger	$\pm 6.0$	$\pm 5.0$
#4	$\pm 5.0$	$\pm 5.0$
#8	$\pm 5.0$	$\pm 4.0$
#16, #30, & #50	$\pm 4.0$	$\pm 4.0$
#100	$\pm 3.0$	$\pm 3.0$
#200	$\pm 2.0$	$\pm 2.0$
Asphalt	$\pm 0.4$	$\pm 0.4$

When these permissible variations are applied to the "Class A Asphalt Concrete" Job Mix formula, the broad band limits in Subsection A, above, may be exceeded only as follows:

1. The three-quarter inch (3/4") and No. 200 sieves shall not exceed the broad band limits in SubArticle 6.3.A – General Requirements;
2. All other sieves may exceed the broadband limits in SubArticle 6.3.A – General Requirements for the respective sieve sizes in the above table provided that the Job Mix Formula band is not exceeded.

When these permissible variations are applied to the "Class D or Class E Asphalt Concrete" Job Mix formulas, the individual sieve shall not exceed the Broad Band limits in SubArticle 6.3.A – General Requirements, above.

Maximum temperature shall not vary more than twenty-five degrees Fahrenheit (25°F) from the approved Job Mix Formula design.

#### E. Test Methods

The job mix shall be determined according to the Marshall Method, as set forth in The Asphalt Institute Manual MS-2 Asphalt Mix Design Methods, 7<sup>th</sup> Edition.

Upon compaction and testing of the job mix specimens, the mixture shall conform to the aforementioned specifications within the following limits:

	Class A Asphalt	Class D/E Asphalt
Stability (Marshall) Pounds Minimum	1200	1200
Flow (Marshall) Maximum	8 to 16	8 to 16
Percent Voids	2½ to 4½	3 to 5
Percent Voids Filled with Asphalt	70 to 80	75 to 85

### Article 6.4 Equipment

#### A. General

All equipment furnished by the Contractor shall be maintained in a sound mechanical condition. Equipment shall be serviced and lubricated away from the paving site; units that drip fuel, oil and/or grease shall be removed from the Project until such leakage is corrected to the satisfaction of the Engineer.



## B. Asphalt Mixing Plant

All plants used by the Contractor shall be designed, coordinated, and operated to produce a mix uniformly within the job- mix tolerances as listed herein and in accordance with AASHTO M 156. The plant may be either a weight batch type or a volumetric proportioning, continuous/drum mixing type, provided the equipment has demonstrated that it is suitable for producing finished mixtures complying with the job-mix formula specified herein.

The plant shall be equipped with the necessary equipment for storing, handling, drying, heating, and mixing the aggregate and asphalt. Satisfactory means shall be provided for aggregate and asphalt control as to quantity and temperature. Adequate safety measures shall be provided on stairs, gears, pulley, chains, sprockets, and all other dangerous moving parts.

Contractor shall calibrate the asphalt plant not more than thirty (30) days in advance of production and furnish copies of the data to the Engineer at least one day prior to asphalt concrete production. Aggregate and asphalt cement sampling locations meetings OSHA safety requirements shall be provided. Proportioning (batch) scales shall not be used for weighing material for payment. Weight scales used in conjunction with a storage silo may be used to weigh the final product for payment, provided the scales are certified by the State of Alaska. The asphalt plant shall maintain a current Air Quality Permit issued by the State of Alaska.

## C. Pavers

Asphalt pavers shall be self-propelled units provided with a heated vibratory screed. Grade and cross slope shall be controlled using automatic grade and slope control devices. The paver screed control system shall be automatically actuated using an erected string-line or a mobile string-line (ski) at least thirty feet (30') in length on the high side of the paver. Grade control shall be used on either (a) both the high and low sides, or (b) grade control on the high side and slope control on the low side.

The Contractor may request a waiver for the screed control system (string-line or ski) if the Contractor believes the paving grade poses an unreasonable obstacle in the form of extreme horizontal or vertical curves or unusual cul-de-sac and/or street configuration.

For trails, pavers shall be capable of placing the required thickness in one lift with a minimum paving width of five feet (5'), truck-towed spreader-type equipment will be permitted, providing the width and depth requirement can be met.

The paver shall be equipped with a receiving hopper having sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the asphalt concrete mixture uniformly in front of the screed without segregation and/or tearing.

The term "screed" includes any strike-off device operated by cutting, crowding, or other action, which is effective on mixes at workable temperatures, without tearing, shoving, or gouging, and which produces a finished surface of an even and uniform texture. The screed shall be adjustable as to level and section and shall have provisions for vibration and heat.

The screed assembly shall produce a finished surface of the required smoothness, thickness, and texture without tearing, shoving, displacing, or segregating the asphalt

concrete mixture. Screed extensions used for paving a constant width shall be heated and vibrated. Auger extensions shall be within one and one-half feet (1.5') of the screed extension on both sides.

The paver shall be capable of placing courses in thicknesses of from one-half inch (1/2") to at least three inches (3"), and, in width, be adjustable in increments of six inches (6") and one foot (1').

The use of a pick-up machine to transfer the asphalt concrete mixture from a windrow to the paver hopper will be permitted, provided the pick-up machine is capable of collection of the windrowed material without damage to the underlying course. The Engineer will not allow the continued use of the pick-up machine if segregation, excessive temperature loss, or any detrimental effects are observed.

Paver shall be equipped with a means of preventing the segregation of the coarse aggregate particles from the remainder of the bituminous concrete mixture while being carried from the paver hopper over the slat-conveyor to the auger chamber. The mechanism to accomplish this must be approved in writing by the paver manufacturer and may consist of chain curtains, deflector plates, or other devices and may be any combination of these.

The following specific requirements apply to the following identified bituminous pavers:

1. Blaw-Knox bituminous paver shall be equipped with the Blaw-Knox Materials Management Kit (MMK).
2. Cedarapids bituminous paver must have been manufactured in 1989 or later.
3. Caterpillar bituminous pavers shall be equipped with the following deflector plate models: 6630, 6631, or 6640.

Contractor shall provide a Certificate of Compliance that verifies the required mechanism has been installed to prevent bituminous paver segregation.

The Engineer shall approve all mechanisms proposed by Contractor for preventing paver segregation of coarse aggregate prior to the bituminous paver's use on the project.

#### D. Rollers

Rollers shall be self-propelled, reversible, and equipped to maintain clean and straight contact surfaces. Heat shall be maintained on pneumatic tires by skirting or other approved devices.

The number, weight, and type of rollers furnished shall be sufficient to obtain the required density and surface requirements while the mix is in a workable condition. One pneumatic and a minimum of one vibratory roller shall be furnished and operated in a workmanlike manner by the Contractor. There shall be at least one operator for each roller.

Pneumatic Tired Rollers:

Pneumatic tired roller shall ride on not less than seven (7) uniformly sized and uniformly inflated smooth tires mounted on wheel rims of twenty inch (20") minimum diameter. The rear group of tires shall align behind and cover the spaces between the forward group of tires. Tires shall be inflated, and the roller ballasted, to provide a uniform (plus or minus five [5] pounds per square inch) minimum ground contact

weight of seventy (70) pounds per square inch, unless a lower weight is requested in writing by the Engineer. If a pneumatic roller experiences a pick-up problem, the Contractor shall be required to add an effect release agent to the tire watering tank.

Steel-Drum Rollers: Steel-wheel roller may be of two (2) types:

Two-axle static drum rollers, eight (8) to twenty-two (22) tons in weight.

Two-axle vibratory drum rollers, eight (8) to twenty-two (22) tons in weight.

All rollers shall be equipped with power units of not less than four (4) cylinders and under working conditions shall develop a compression in the rear wheels of two hundred fifty (250) to three hundred fifty (350) pounds per inch of roller width. Rollers shall be in good working condition and be free from backlash, faulty steering mechanism, or worn parts. Rollers shall be equipped with adjustable scrapers to keep the drums clean and with efficient means of keeping the drums/wheels wet to prevent mixes from sticking to the drums. Rollers/Drums shall be free of flat areas, openings or projections which will mar the surface of the pavement.

#### E. Haul Trucks

Vehicles used for the transportation of hot-mix asphalt from the plant to the Project shall have tight metal bottoms and shall be free from dust, screenings, petroleum oils, volatiles, and other mineral spirits which may affect the mix being hauled. The truck beds shall be cleaned as often as required, but at least once a day. After this operation the truck bed shall be elevated and thoroughly drained; no excess solution shall be permitted.

When requested by the Engineer, trucks shall be equipped with covers of canvas, insulated boxes, or other suitable material, and be of sufficient size and weight to protect the load from adverse weather conditions and to maintain the required mix temperatures.

#### F. Truck Scales

Hot mix asphalt shall be weighed on platform scales furnished by the Contractor or on public scales at the Contractor's expense. The scales shall be satisfactory to the Engineer and shall comply with all State Laws governing the use of scales. The scales shall be tested and sealed by an authorized public official, at the expense of the Contractor, as often as the Engineer may deem necessary to ensure their accuracy. Batch plant proportioning scales may be used in lieu of truck scales only with the written approval of the Engineer.

#### G. Hand Tools

Only lutes or asphalt rakes shall be used during the spreading operation and when finishing by hand.

Tamping irons shall weigh not less than twenty-five (25) pounds and shall have a bearing area not exceeding forty-eight (48) square inches. Mechanical compaction equipment, satisfactory to the Engineer, may be used instead of tamping irons.

#### H. Straightedges

Straightedges ten (10') and sixteen feet (16') in length, to test the finished surface, shall be provided by the Contractor. The sixteen-foot (16') straightedge shall be used on straight sections and the ten-foot (10') straightedge on vertical curves or crown.

## **Article 6.5 Construction**

### **A. Weather Limitations**

Asphalt concrete mixture shall not be placed when it is raining or when rain is imminent, on a saturated surface, on an unstable/yielding roadbed, when the base material is frozen, or when weather conditions prevent proper handling or finishing of the mixture. Asphalt concrete mixture shall not be placed unless the surface temperature is forty-five degrees Fahrenheit (45°F) or warmer and the ambient air is at least thirty-two degrees Fahrenheit (32°F) and not descending. Air temperature shall be measured in the shade away from heat sources at the paving site.

### **B. Preparation of Area to be Paved**

The area to be paved shall be true to line and grade, having a smooth dry, compacted surface prior to the start of paving operations. The area to be paved shall be free from all loose asphalt and foreign material.

Contractor shall notify the Engineer, a minimum of twenty-four (24) hours prior to paving, that the newly constructed, rotomill-planed, or existing surface, has been prepared in conformance with the Drawings and Specifications and is ready to be paved. Engineer or their representative shall inspect the grade through the use of string line, straightedge, levels, or any other means necessary. Upon determining the grade that has been proposed for paving is in conformance with the Drawings and Specifications, Engineer will provide written authorization for the Contractor to proceed with the paving. The Contractor shall not initiate paving prior to receiving written authorization to proceed.

The surface of the Leveling Course, when finished, shall not demonstrate any deviation more than three-eighths inch in ten feet (3/8" in 10') parallel with, and at right angles to, the centerline, or more than five-eighths inch (5/8") total from centerline to face of curb of the area to be paved. Any deviation more than this amount shall be corrected by loosening, adding, or removing material and reshaping and compacting to satisfy the above requirement.

Existing paved surfaces shall be cleaned of loose material by sweeping with a power broom, supplemented by hand sweeping, if determined necessary by the Engineer.

After rotomilling of a section of the roadway has been completed, that section shall be inspected by the Engineer for areas of distress or failure. Areas requiring repair shall have the remaining pavement removed, and the distressed area shall be excavated to the depth and limits directed by the Engineer. The excavated area shall be backfilled, as directed by the Engineer, with crushed aggregate Leveling Course material and/or Asphalt Concrete leveling course in conformance with the Drawings and Specifications. Pavement surface irregularities, remaining from the rotomilling effort, that extend more than three-quarters inch (3/4") below the milling indentations shall be pre-leveled and brought into conformance with the tolerances established in Article 6.6 – Density and Surface Requirements. Pre-leveling shall be completed with an approved Class D asphalt concrete in accordance with this Section and include the furnishing, hauling, placing, and compaction of the asphalt concrete.

Contact surfaces of curbing, gutters, manholes, and other structures shall be painted with a thin, uniform coating of asphaltic cement or approved equal material prior to

the mixture being placed against them. Butt joints on previously placed cooled pavement shall be saw cut and tack coated prior to continuing the paving operation.

Contractor shall not pave against newly placed concrete until the concrete has cured until lab testing of field-cured specimens has attained at least eighty percent (80%) of the Specified Compressive Strength, in accordance with Division 30, Article 1.10 – Protection of Work.

C. Preparation of Paving Asphalt

The asphalt shall be heated at the paving plant to a temperature at which it can be properly handled through the pumping system, but at no time shall the temperature of the asphalts exceed that recommended by the asphalt supplier or manufacturer or be greater than three hundred twenty-five degrees Fahrenheit (325°F) or less than two hundred fifty degrees Fahrenheit (250°F).

D. Preparation and Handling of Aggregates

The aggregate for the asphalt concrete mixture shall be heated and dried to a temperature compatible with the mix requirements specified. The burner on the dryer shall be properly adjusted to avoid damage to the aggregate and to avoid the presence of unburned fuel on the aggregate. Any asphalt concrete mixture in which soot or fuel is present shall be wasted and no payment made.

Drying operations shall reduce the aggregate moisture content so that the moisture content of the asphalt concrete mixture, sampled at the point of acceptance for asphalt cement content, shall be no more than one-half percent (0.5%) (by total weight of mix), as determined by AASHTO T 329. Adequate dry storage shall be provided for the mineral filler.

Aggregates shall be stored at the plant in such a manner that the separate sizes will not become intermixed. Cold aggregate shall be carefully fed to the plant in such proportions that surplus and shortages in the hot bins will not cause breaks in the continuous operations.

Stockpiles and bins shall be sampled for gradation analysis, dust coating, and for other purposes, at the option of the Engineer.

When requested by the Engineer, the Contractor shall provide representative samples from each of the hot bins. Samples shall be used to determine compliance with these Specifications.

1. Drying:

The aggregate shall be thoroughly dried and heated to provide a paving mix within a tolerance specified herein. The moisture content of the heated and dried aggregate shall not exceed one-half percent (0.5%).

Dust collected during the drying operation may be fed uniformly back into the hot aggregate prior to screening, provided a position mechanical feed is used which will control the feed back to the quantity specified by the Engineer.

2. Screening:

Aggregates shall be screened into sizes that may be recombined into a gradation meeting the requirements of the job-mix formula. Screens shall have

normal capacities slightly more than the production capacity of the mixer and rated capacity of the dryer.

3. Hot Aggregate Storage:

Hot screened aggregate shall be stored in such a manner as to minimize segregation and loss of temperature.

E. Mixing Plants and Controls

All plants shall be equipped with a positive means to govern the time of mixing. Mixing time shall not be altered unless requested by the Engineer.

Frequent gradation analysis of the hot aggregates of the completed mix shall be made to be certain that the materials being used and produced are within the tolerances of the job-mix formula and the specifications of the mix being used. If the mix is found to be outside the hot-mix formula tolerances or outside the specification limits, corrections shall be made in quantities measured from the hot bins and suitable changes made at the cold bin feeders. It shall be the responsibility of the Contractor to furnish a finished product in accordance with the Contract Documents. Tests conducted by the Engineer are for quality acceptance purposes only and are not authorized for use in plant calibration. Plant metering systems and scales shall be calibrated to the accuracy specified in AASHTO M 156.

Batch Type Plant: When the mix is produced in a batch type plant, the aggregate shall be accurately weighed in the proper proportions to provide the batch weight.

The asphalt shall be heated to provide a material sufficiently fluid to produce a uniform coating on every particle of aggregate within the specified mixing time. The temperature of the aggregates and asphalt immediately prior to mixing shall be approximately that of the completed batch. In no case shall the temperature of the asphalt and aggregate vary more than twenty-five degrees Fahrenheit (25°F) when placed in the mixing chamber.

A dry mixing period of not less than ten (10) seconds shall precede the addition of the asphalt to the mix. Excess wet mixing shall be avoided. Wet mixing shall continue as long as necessary to obtain a thoroughly blended mix. The minimum percent of coated particles used to establish the mixing time interval shall be ninety-five percent (95%) as determined by AASHTO T 195.

Continuous Type Plant: Continuous mix and drum plants shall in general be controlled in the same manner as batch plants.

The determination of mixing time shall be by weight method under the following formula unless otherwise approved:

$$\text{Mixing time in seconds} = \frac{\text{Pugmill Dead Capacity in Pounds}}{\text{Pugmill Output in Pounds Per Second}}$$

The weights used for computing mixing time shall be determined for the job, from tests made by the Contractor and shall conform to the recommendations of the manufacturer. Mixing temperature shall not exceed that recommended by the asphalt cement manufacturer without the written approval of the Engineer. To aid in determining the proper temperature of the completed batch, current viscosity data shall be always available at the plant.

F. Transportation of Mix

The dispatching of the hauling vehicles shall be so scheduled that all material delivered may be placed and rolled in daylight. When variations in size of loads, speed of trucks, length of haul, and conditions of trucks interfere with orderly continuous operations, the Engineer may order suitable corrections to be made.

G. Mechanical Spreading

Contractor shall submit a Paving Plan for the Engineer's review a minimum of five (5) working days prior to initiating paving operations. The plan shall consist of at least the following items:

1. Paving schedule to include sequence of operations.
2. Operational details to include:
  - a. Plant operating capacity and target production rate. Process control testing frequency for gradation, moisture, asphalt cement content, and compaction.
  - b. Number and capacity of trucks, cycle time, and delivery rate.
  - c. The manufacturer and model of the paver and pick-up machine to include information on grade followers, sensors, operating speed, and production rate of the pavers.
  - d. Number, type, weight, and operating speed of rollers, including replacement roller.
  - e. Location and method of constructing longitudinal and transverse joints.
  - f. Construction plan for paving intersections and driveways.
3. The asphalt concrete shall be placed on the road surface at a temperature not less than two hundred fifty degrees Fahrenheit (250°F) or greater than three hundred degrees Fahrenheit (300°F). Additionally, the maximum temperature to which the asphalt concrete is heated shall not exceed the supplier's recommendation. The asphalt concrete temperature shall be measured directly behind the paver screed at the time of placement.  
The asphalt concrete mixture shall be laid upon a surface approved in writing by the Engineer, spread and struck-off and compacted to the thickness specified in the Drawings and specifications. Asphalt pavers shall be used to distribute the asphalt concrete mixture in lanes of such widths as to hold to a practical minimum the number of longitudinal joints required.

Longitudinal joints and edges shall be constructed to true line markings. Lines shall be established parallel to the center line for the paver to follow in placing individual lanes. The paver shall be operated and positioned to closely follow the established line. When backing trucks to the finisher, care shall be taken not to jar the paver.

The texture of the unrolled surface shall be checked to determine its uniformity. The adjustment of the screed, tamping, feed screws, hopper feed, etc., shall be checked frequently to assure uniform spreading of the mix. Segregation of the material shall not be permitted. If segregation occurs, the spreading operation shall be immediately suspended until the cause is determined and corrected.

Any irregularities left by the paver shall be corrected by trimming directly behind the machine by use of lutes or covered rakes. Immediately after trimming, the edges of the course shall be thoroughly compacted by tamping. Distortion of the pavement during this operation shall be avoided.

Edges against which additional pavement is to be placed shall be vertically formed to true line. A lute or covered rake shall be used immediately behind the finisher, when required to obtain a true line and vertical edge. Any irregularities in the surface of the pavement course shall be corrected directly behind the paver. Excess material forming high spots shall be removed by a shovel or lute. Indented areas shall be filled with hot-mix and smoothed with the back of a shovel pulled over the surface. Fanning of material over such areas shall not be permitted.

On longitudinal joints, the paver shall be positioned so that in spreading, the material overlaps the edge of the lane previously placed by one or two inches (1" or 2") and is sufficiently high to allow for compaction. The coarse aggregate in the material overlapping the joint shall all be raked out into the cold lane as soon as possible behind the paver and broomed up and wasted. In no case shall scattered rocks be rolled into the surface of either lane.

Asphalt concrete mixture which is contaminated or segregated will be rejected.

When multiple lifts are specified in the Contract, the final lift shall not be placed until all lower lifts throughout that section, as defined by the Paving Plan, have been placed and accepted. Paving shall not begin until all adjacent curb has been poured for at least seven (7) days when Type I/II cement is used or three (3) days when Type III cement is used.

#### H. Hand Spreading

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the asphalt concrete mixture shall be spread, raked, and luted by hand tools. For such areas, the asphalt concrete mixture shall be placed to the required compacted thickness and density.

#### I. Compaction

Immediately after the asphalt mixture has been spread, struck off and surface irregularities adjusted, it shall be thoroughly and uniformly compacted by rolling.

The surface shall be rolled when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, or shoving.

Initial rolling shall be done with a steel-drum roller with the drive roll operating toward the paver, and/or a suitable pneumatic tired roller. Initial rolling shall be completed while the bituminous mat temperature is above two hundred twenty-five degrees Fahrenheit (225°F).

Following the initial rolling at least three coverages of the pavement shall be completed with a pneumatic tired roller, while the mat temperature is above one hundred seventy-five degrees Fahrenheit (175°F).

Final rolling shall be completed with a steel-drum roller and shall continue until roller marks and further compression are not evident in the pavement and specified density has been achieved.

Unless otherwise directed, rolling shall begin at the sides and proceed longitudinally parallel to the road center line, each trip overlapping one-half the roller width, gradually progressing to the crown of the road. When paving in echelon or abutting a previously placed lane, the longitudinal joint should be rolled first followed by the regular rolling procedure. On superelevated curves the rolling shall begin at the low



side and progress to the high side by overlapping of longitudinal trips parallel to the centerline.

Any displacement occurring as result of the reversing of the direction of a roller, or from other causes, shall be corrected at once using rakes and addition of fresh mixture when required. Care shall be exercised in rolling not to displace the line and grade of the edges of the asphalt mixture.

To prevent adhesion of the mixture to the rollers, the wheels shall be kept properly moistened with water or water mixed with very small quantities of detergent or other approved material. Excess liquid will not be permitted.

Along forms, curbs, headers, walls, and other places not accessible to the rollers, the mixture shall be thoroughly compacted with hot hand tampers, smoothing irons, or with mechanical tampers. On depressed areas, a trench roller may be used or cleated compression strips may be used under the roller to transmit compression to the depressed area.

Rollers or other vehicles shall not be parked or left standing on pavement that has not cooled sufficiently to prevent indentation by wheels.

#### J. Joints

The Contractor shall not construct longitudinal joints in the driving wheel paths. The Contractor shall align the joints of the top layer of pavement to either the centerline of the road or to lane lines. The Contractor shall offset the longitudinal joint in the top layer of pavement not more than six inches (6") from centerline of edge of stripe. Joints shall be constructed to ensure a continuous bond between old and new sections of the course. All joints shall present the same texture and smoothness as other sections of the course. The Contractor shall offset the longitudinal joints in the top layer from the joint in the layer immediately below by at least four inches (4").

When joining existing pavement and new pavement, the old pavement shall be cut in a neat line with a power-driven saw.

Improperly formed joints resulting in surface irregularities shall be removed full depth, replaced with fresh asphalt concrete mixture, and thoroughly compacted. Rolling of joints after the material has cooled below one hundred seventy degrees (170°) Fahrenheit shall not be allowed. All pavement removal shall be precut to a neat line with a power-driven saw.

A tack coat of asphalt cement or asphalt emulsion shall be applied on all cold joints and allowed to break prior to placing fresh asphalt concrete mixture against the joint. This Work shall be completed by Contractor just prior to paving.

Transverse joints shall be formed by saw cutting back on the previous run to expose the full depth of the course or by using a removable bulkhead. Transverse joints shall not be perpendicular to centerline but shall be skewed between fifteen and twenty-five degrees (15° to 25°).

#### K. Repair and Replacement

Asphalt concrete mixture that becomes contaminated with foreign material or is in any way defective as determined by the Engineer shall be removed. Skin patching will not be permitted. Defective materials shall be removed for the full thickness of the course. The pavement shall be cut so that all edges are vertical, the sides are

parallel to the direction of traffic, and the ends are skewed between fifteen and twenty-five degrees (15° to 25°). Edges shall be coated with a thin tack coat of material. Fresh asphalt concrete mixture shall be placed in sufficient quantity so that the finished surface will conform to grade and smoothness requirements. The asphalt concrete mixture shall be compacted to the density specified. Any area determined to have an excess or deficiency of asphalt concrete shall be corrected by full depth removal and replacement. No payment shall be made for material replacing defective material. All costs associated with the patching of defective areas shall be borne by Contractor.

L. Vehicular Traffic

Contractor shall not allow vehicular traffic on the asphalt mat surface until the mat surface has cooled to below one hundred twenty degrees Fahrenheit (120°F). Any portion of the asphalt concrete mixture that becomes loose and broken, rutted, or damaged in any way due to vehicular traffic on the asphalt mat surface prior to it cooling to below one hundred twenty degrees Fahrenheit (120°F), shall be removed, and replaced with fresh hot asphalt concrete, which shall be compacted to conform with the surrounding area at the specified density.

**Article 6.6 Density and Surface Requirements**

The complete pavement shall have a density equal to or greater than ninety-six (96) percent of Maximum Density (Marshall Method), except for trail pavement which shall have a density equal to or greater than ninety percent (90%). Maximum Density shall be determined in accordance with the test procedures specified in Section 40.01, Article 1.2 – Applicable Standards. The compacted specimens on which the Maximum Density is determined shall be produced from a laboratory specimen made from the same days mix, and as close to the lay down temperature as practicable.

When requested by the Engineer, the Contractor shall, without charge, provide the Engineer with test samples of asphalt concrete cored from the completed pavement. All cores shall be at least four inches (4”) in diameter and the core holes will be patched by the Contractor within seventy-two (72) hours.

The final surface shall be of a uniform texture conforming to true grade, and cross sections in accordance with the Contract Documents. The thickness of the course shall be in accordance with the Drawings and Specifications. Where curb and gutter is present the compacted pavement surface shall be one-eighth inch plus or minus one-eighth inch (1/8” ±1/8”) above the top front edge of curb. The specified position of the pavement surface shall be achieved through proper grading of the subgrade, in order not to exceed the design thickness of the pavement.

Prior to the delivery of the first load of asphalt to the Project, the Contractor shall furnish straightedges to the Inspector for checking surface uniformity. Irregularities in the finished pavement surface shall not exceed three-sixteenths of an inch in ten feet (3/16” in 10’), or five-sixteenths of an inch in sixteen feet (5/16” in 16’). Non-conforming surfaces shall be subject to rejection by the Engineer. Irregularities which develop before the completion of rolling shall be remedied by loosening the surface mix, removing, or adding material as may be required, and rerolling.

For trails, a ten-foot (10’) straightedge, supplied by the Contractor, shall be used to check the paving surface. Surface irregularities shall not exceed one inch in ten feet (1” in 10’). Non-conforming surfaces shall be subject to rejection by the Engineer. Irregularities which

develop before completion of rolling shall be remedied by loosening the surface mix, removing or adding material as may be required, and rerolling.

### **Article 6.7 Measurement**

Asphaltic concrete will be paid for by one of the methods as defined in the paragraph below and as designated in the Bid Schedule.

#### **A. Measurement by the Ton**

Measurement of hot-mix asphaltic paving materials, unless otherwise provided, shall be weighed on truck scales in accordance with Article 6.4, SubArticle F – Truck Scales. Asphalt concrete pavement shall be measured per ton (2,000 lbs.) based on the amount of hot mix asphaltic material used in the completed and accepted work modified as follows: the quantity paid for shall not exceed one hundred and five percent (105%) of tonnage determined based on the average core density, the specified neat line thickness, and the completed area of asphaltic concrete pavement. In addition, the Owner will not pay for that portion of any load more than the legal gross weight for the vehicle delivering the load.

#### **B. Measurement by the Square Yard**

Measurement of hot-mix asphaltic paving materials, unless otherwise provided, shall be measured by the completed and accepted work. The area measured will be that which is shown on the Drawings plus any additional areas as authorized by the Engineer in writing.

The tolerance for thickness of asphaltic concrete under square yard measurement shall be plus or minus one-fourth inch (1/4") from design mat thickness, as shown on the typical section. This one-fourth inch (1/4") variance shall be the exception only with the average variance for the job being plus or minus one-eighth inch ( $\pm 1/8$ ") from the design mat thickness. All asphaltic concrete placed outside the variables allowed will be corrected by the Contractor at their expense.

#### **C. Measurement by the Linear Foot**

Measurement of hot-mix asphaltic paving materials for bike trails, unless otherwise provided, shall be per linear foot along the centerline of the constructed trail. The thickness of asphalt shall not be less than the thickness shown in the typical section as noted on the Drawings.

### **Article 6.8 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
A.C. Pavement (Class)	Ton
A.C. Pavement (Class, Thickness)	Square Yard
A.C. Pavement (Class, Thickness)	Linear Foot

**SECTION 40.07 THIS SECTION INTENTIONALLY LEFT BLANK**

## SECTION 40.08 RECYCLED ASPHALT PAVING (RAP)

### Article 8.1 General

The work under this Section consists of furnishing all materials and performing all operations necessary to complete placement and construction of a recycled asphalt paving (RAP) surface on an existing prepared subbase.

### Article 8.2 Material

The RAP shall consist of crushed gravel, rock, sand, or other approved material. The aggregate shall be derived from recovered AC pavement and be free from lumps, balls of clay, or other objectionable matter, and shall be durable and sound. The portion of the material retained on a No. 4 sieve shall be known as coarse aggregate. Maximum RAP conglomerate (prior to extraction) shall pass the one-inch (1") sieve.

RAP is to be delivered to the jobsite in an unheated condition. Delivery of heated material to the jobsite will be rejected unless previously approved by the Engineer.

#### A. Coarse Aggregate

The coarse aggregate material conforming to the requirement specified above shall have a percentage of wear not to exceed fifty (50) after five hundred (500) revolutions, as determined by the current requirements of ASTM C131. It shall consist of angular fragments, reasonably uniform in density and quality, and reasonably free from thin elongated pieces, dirt, and other objectionable material. At least fifty percent (50%) of the coarse aggregate particles shall have at least two (2) mechanically fractured faces. Asphalt extraction and sieve analysis shall be performed in accordance with ASTM D2172 Method A or B, AASHTO T 164 Method A or B, and AASHTO T 30.

#### B. Fine Aggregate

The fine aggregate shall consist of material free of organic or other objectionable matter. The fine aggregate, either naturally combined with the coarse aggregate or separately obtained and mixed therewith, shall be of such character that the composite material will conform to the gradation and other requirements specified.

#### C. Gradation

The composite mixture of coarse aggregate and fine aggregate, processed as hereinafter specified, shall conform to the following gradation limits:

Sieve Size	Percentage Passing by Weight
1"	100
3/4"	70 – 100
3/8"	50 – 85
#4	35 – 65
#10	25 – 50
#40	10 – 30
#80	5 – 20
#200	2 – 10

Asphalt Content: 2.7% - 4.7%    Moisture Content: 3.5% Max

The asphalt content of RAP delivered to the project shall be determined on the individual extraction test results and not an average of extractions conducted.

### **Article 8.3 Construction**

The RAP shall be placed to the lines, grades, and thicknesses shown on the Drawings and shall consist of the materials specified. The RAP shall provide a smooth stabilized paved surface on which vehicular traffic can drive.

#### **A. Preparation of Subbase**

Subbase preparation shall be completed by others in accordance with Division 20, Section 20.11 – Grading Existing Surfaces with the compaction density modified to ninety-five percent (95%).

#### **B. Placing**

The approved RAP material shall be deposited and spread uniformly on the prepared subbase in one uniform layer to the required contour and grades and to such loose depth that when compacted to the density required will achieve the specified thickness. Portions of the layer which become segregated in spreading shall be remixed to the required gradation.

#### **C. Compacting**

The RAP shall be compacted to at least ninety-five percent (95%) of maximum density as per AASHTO T 180 Method D. In all places not accessible to the rolling equipment, the mixture shall be compacted with tamping equipment capable of attaining the specified density. Blading, rolling, and tamping shall continue until the surface is smooth and free from waves and inequalities. If at any time the mixture is determined to be above or below optimum moisture, it shall be aerated by means of blade graders, harrows or other approved equipment or moisture added until the moisture content is such that the surface can be recompacted and finished as above. In place compaction shall be accomplished with a double-drum vibratory asphalt compactor with a minimum of fifteen thousand (15,000) pounds of dynamic force per drum. All requests for equipment substitution shall require a current certification test, identifying the capability of the equipment to meet the required specifications.

#### **D. Smoothness Test**

The surface of the RAP, when finished, shall not show any deviation more than three-eighths inch (3/8") when tested with a ten-foot (10') straightedge applied parallel with and at right angles to the centerline of the area to be paved. Any deviation more than this amount shall be corrected by loosening, adding, or removing material and reshaping and compacting to satisfy the above requirement.

The Contractor shall furnish a ten foot (10') long straightedge and shall, in the presence of the Engineer, straightedge test the entire surface.

#### **E. Seal Coat**

The surface of the RAP shall be seal coated in accordance with the provisions in Section 40.02 – Seal Coat. The sealant shall be considered incidental to the cost of RAP construction.

### **Article 8.4 Measurement**

The RAP shall be measured in tons of materials delivered and placed in accordance with these Specifications and adjusted for excess moisture as provided. Said measurement may include moisture up to a maximum of three and one-half percent (3.5%) of dry weight of the material.

When tests by the Engineer indicate that moisture contents of more than three and one-half percent (3.5%) may be occurring consistently, the frequency of testing will be increased as necessary, and the results averaged over a period of one week. When this average is greater than three and one-half percent (3.5%), the tonnage as measured over the above period shall be reduced by the difference. No credit will be due the Contractor when moisture content is less than three and one-half percent (3.5%). Testing will be done in accordance with AASHTO T 255.

**Article 8.5 Basis of Payment**

Payment for this work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish & Install RAP	Ton

## SECTION 40.09 BITUMINOUS SURFACE TREATMENT

### Article 9.1 Description

The Work under this Section consists of the performance of Work required for the construction of a seal coat of asphalt cement and cover aggregate on an asphalt street surface.

### Article 9.2 Asphalt

The Contractor shall submit a certified analysis from the refinery laboratory to the Engineer for review and approval. A copy of the certified analysis shall accompany each shipment of asphalt to the Project. The Engineer shall reserve the right to make check tests of the asphalt received on the Project site, and if the asphalt is not in accordance with the certified analysis, the Engineer may reject the material.

The asphalt required by these Specifications shall conform to the requirements of The Asphalt Institute for the type and grade shown below:

Asphalt for Bituminous Surface Treatment

CRS-2

### Article 9.3 Aggregates

Aggregate shall consist of crushed gravel and shall be sound, durable, free of adherent coatings of clay, dirt, dust, or any other objectionable matter, and shall have a percentage of wear not to exceed forty (40) after five hundred (500) revolutions, as determined by the ASTM C131. Not less than sixty percent (60%) by weight of crushed gravel shall consist of crushed pieces having two (2) or more faces having freshly fractured face.

Aggregate material shall have the following gradation:

#### A. Cover - 1st Course

Sieve Size	Percentage by Weight Passing
3/4"	100
1/2"	90 – 100
3/8"	40 – 75
#4	0 – 15
#8	0 – 5
#200	0 – 1

#### B. Cover Aggregate - 2nd Course

Sieve Size	Percentage by Weight Passing
3/8"	100
#4	85 – 100
#8	0 – 25
#200	0 – 2

### Article 9.4 Equipment

#### A. General

All equipment used on this Work shall be of sufficient size and in such mechanical condition as to meet the requirements and to produce the Work to the specified quality.



B. Pressure Distributor

The bitumen distributor shall be pneumatic-tired self-propelled and shall have a capacity of not less than eight hundred (800) gallons. It shall be equipped with an independently-operated bitumen pump, tachometer, pressure gauges, volume metering devices, a thermometer for reading the tank temperature and a hose attachment suitable for applying the bituminous material to spots unavoidably missed by the distributor. The independently-operated bitumen pump shall be equipped with a tachometer calibrated in revolutions per minute. The distributor shall also be equipped to agitate and circulate the bituminous material during the heating process.

Spray bars shall be the circulating type with extensions, available for distributing width from eight to twenty-one feet (8' to 21') by one-foot (1') increments. The nozzles shall give uniform distribution and shutoff shall be quick and positive to prevent dripping. The distributor shall be designed and equipped to distribute the bituminous material uniformly at consistent surface speeds, at uniform temperatures with various surface widths, at known and maintained rates of five-hundredths (0.05) to two (2.0) gallons per square yard within a tolerance of five percent (5%), and through a pressure range from twenty-five (25) to seventy-five (75) pounds per square inch. Air pressure type equipment may be used only upon written approval from the Engineer.

C. Cover Aggregate Spreader

The spreader shall be self-propelled and capable of spreading the cover material uniformly for widths of eight to sixteen feet (8' to 16') in one-foot (1') increments, and adjustable to spread uniform layers of ten (10) to fifty (50) pounds per square yard. Revolving plate type chip spreaders will not be approved.

D. Rollers

Rollers shall be self-propelled, pneumatic-tire, weighing not less than five (5) tons or more than eight (8) tons. Rolling shall follow closely on spreading of aggregate.

E. Hauling Equipment

The cover aggregate shall be transported from the plant to the site in trucks having tight, clean smooth beds.

F. Miscellaneous Equipment

A power broom and all necessary hand tools, thermometers, etc., shall be provided by the Contractor.

**Article 9.5 Construction**

A. Surface Preparation

The existing road surface shall be graded smooth to the satisfaction of the Engineer. There shall be no visible ruts, holes, or large rocks protruding from the surface to be treated. Existing soft spots in the road base shall be compacted or excavated and backfilled with suitable base course material. The area to be treated in any one operation shall be as indicated in the Drawings.

B. Weather Limitations

Bituminous material shall not be placed during rainy or threatening weather, or when the moisture on the surface to be treated would prevent satisfactory bond. The

surface coats shall not be applied when the air temperature is below fifty degrees Fahrenheit (50°F), unless otherwise approved by the Engineer.

C. Heating and Application of Bituminous Material

Bituminous material shall be heated in such a manner as to always ensure heating of the entire mass with efficient and positive control. A curing period of twenty-four (24) hours may be required between the application of the prime coat and the next application of bituminous material, during which time the surface shall be kept in repair. The asphalt for the surface treatment shall be applied at a temperature between one hundred thirty and one hundred eighty degrees Fahrenheit (130°F to 180°F) and at a rate of three-tenths (0.30) to forty-five hundredths (0.45) gallon per square yard for the first coat and twenty-five hundredths (0.25) to four tenths (0.40) gallon per square yard for the second coat. Thermometers shall be provided by the Contractor so that temperatures can always be observed.

Bituminous material shall be uniformly applied by means of a pressure distributor in the amount per square yard specified. The quantity of material as measured by the volume measuring device of the distributor shall not vary from the true quantity as herein specified by more than five percent (5%). Bituminous material shall not be applied until sufficient cover aggregate is on hand to cover the area to be applied at a particular application. If the aggregate spreader is delayed by breakdown or operational difficulties, application of bituminous material shall cease until the Engineer is satisfied that delays will not recur.

D. Preparation and Application of Cover Aggregate

Cover material shall be sufficiently dried when it encounters bituminous material so that a satisfactory bond or coating is obtained.

When the prime coat has sufficiently cured, the asphalt for the surface coat shall be applied to the surface. Immediately following this application of bituminous material, the first coat of cover aggregate shall be uniformly spread over the surface with an approved mechanical spreader at a rate of thirty (30) to forty (40) pounds per square yard. A minimum curing period of twelve (12) hours will be required before the second coat of asphalt and cover aggregate is applied. The rate of application of the second coat of cover aggregate shall be twenty (20) to thirty (30) pounds per square yard. Cover material shall be applied continuously and without delay until the application is covered. Whenever possible successive strips shall be applied before the previous strip has cooled. Cover material shall not be spread on the six inches (6") adjacent to an unprotected edge until the next strip of bituminous material has been applied. Rolling shall immediately follow the application of each coat of cover aggregate and shall continue until the surface is accepted as determined by the Engineer.

E. Maintenance of Surface

After application of the second coat of cover material, the surface shall be maintained by the Contractor, at their expense, for a period of three (3) days. During this period the Contractor shall, at least once daily, redistribute the cover material that has become displaced by traffic, by means of brooms, a drag, or other method satisfactory to the Engineer.

When all possible aggregate has been imbedded in the bituminous material on each course to the satisfaction of the Engineer, the Contractor shall sweep each course surface of all excess material and remove it to a designated area, unless otherwise directed by the Engineer.

**Article 9.6 Measurement**

Bituminous material and cover aggregate course will be measured by weight in tons (2,000 lbs.).

Legible weight tickets shall be submitted to the Engineer for all bituminous material and cover aggregate delivered to the Project site for use in the Work. All weight tickets shall contain, at a minimum, the following information:

1. Weight ticket serial number;
2. Vehicle identification number;
3. The date and time the load was weighed;
4. The tare weight of the vehicle;
5. The gross weight of the loaded vehicle, as registered on the scale; and
6. The legal gross weight of the vehicle, as permitted by Anchorage Municipal Code Sections 9.46.090 or 9.46.100.

The Owner shall not pay for that portion of any load more than the legal gross weight for the vehicle.

**Article 9.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
B.S.T. Asphalt for Prime Coat (Type & Grade)	Ton
B.S.T. Asphalt (Type & Grade)	Ton
B.S.T. Cover Aggregate (1st Coat)	Ton
B.S.T. Cover Aggregate (2nd Coat)	Ton

## **SECTION 40.10 PAVEMENT ROTOMILLING**

### **Article 10.1 General**

The Work under this Section consists of furnishing all plant, labor, supervision, equipment, and material for performing all operations necessary for the removal and disposal of pavement to a depth designated on the Drawings with a power-operated profile machine designed for this specific purpose.

### **Article 10.2 Construction**

Pavement shall be removed by rotomilling, planning, or grinding to a final surface smooth enough for temporary traffic and repaving with no additional preparation other than sweeping and application of a tack coat. Additional rotomilling, grinding, or milling by the power-operated profile machine may be necessary around manhole covers, valve boxes, survey monument cases, etc. The depth of asphalt removal under this Section may vary.

Contractor shall dispose of this material in accordance with Division 10, Section 10.04, Article 4.9 – Disposal Sites.

### **Article 10.3 Measurement**

Pavement removed by rotomilling, planning or grinding shall be measured by the square yard of pavement designated for and actually removed. No additional payment will be made regardless of depth or additional rotomilling around utility appurtenances.

### **Article 10.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Pavement Rotomilling	Square Yard

## **SECTION 40.11 REMOVE AND REPLACE ASPHALT SURFACING**

### **Article 11.1 Description**

The Work under this Section consists of the performance of all Work required for removing, disposing of, and replacing existing asphaltic surfacing or cold mix asphalt, including leveling course and existing traffic markings, as indicated on the Drawings.

### **Article 11.2 Materials**

All materials used shall conform to the requirements of these Specifications and other agencies (if any) having jurisdiction over the pavement being replaced.

Cold mix asphalt material shall be that located at the Kloep Maintenance Station, 5701 Northwood Drive.

### **Article 11.3 Construction**

All construction practices, tests and other controls shall conform to the Division 20 — Earthwork, and this Division.

Contractor shall remove existing asphalt surfacing and leveling course, regardless of thickness. Replacement asphalt surfacing and leveling course thickness shall be shown on the Drawings.

Contractor shall neatly and cleanly saw cut existing asphalt surfacing to be removed prior to removal. Saw cuts shall be a minimum of two inches (2") deep and shall be straight and parallel. If any portion of the remaining asphalt surfacing is undercut by trenching operations, the Contractor shall saw cut, remove, and replace the affected area at their own expense.

Contractor shall apply tack coat to all contact surfaces including curbing, gutters, manholes, and other structures with a thin, uniform coating prior to placing asphalt. Butt joints on previously placed cooled pavement shall be tack coated prior to continuing the paving operation.

Asphaltic concrete paving replacement will be performed by utilizing a mechanical spreader and will be compacted by a mechanical roller weighing not less than ten (10) tons, except that where the area of the asphalt replacement patch is less than one hundred (100) square feet, a mechanical spreader need not be employed.

Small areas inaccessible to roller shall be tamped to produce a compression and surface texture equivalent to that produced by the specified rolling. Hand tampers shall have a maximum tamping face of fifty (50) square inches and a minimum weight of twenty-five (25) pounds.

The Contractor shall replace traffic markings, in kind, in accordance with Division 85, Section 85.03 – Traffic Markings.

Prior to winter shutdown, Contractor shall haul, place, and compact cold mix asphalt on areas where asphalt has been removed. Rejuvenated hot mix asphalt will be supplied by the Municipality of Anchorage at a rate of approximately two (2) tons per hour. The rejuvenated hot mix will be located at the Kloep Maintenance Station, 5701 Northwood Drive. Contractor shall coordinate with Maintenance & Operations Department, Street Maintenance Division, at 343-8277, when the patch can be obtained. Contractor shall haul from the Kloep Maintenance Station to the project site.

Contractor shall dispose of all removed asphalt surfacing in accordance with Division 10, Section 10.04, Article 4.9 – Disposal Sites.

**Article 11.4 Measurement**

Removing, disposing of, and replacing existing asphalt surfacing and cold mix asphalt, including leveling course, is measured per square yard, complete in place.

**Article 11.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Remove & Replace Asphalt Surfacing (Class)	Square Yard

## **SECTION 40.12 IN-PLACE FULL DEPTH RECLAMATION OF ASPHALT CONCRETE PAVEMENT AND LEVELING COURSE**

### **Article 12.1 General**

The Work under this Section consists of furnishing all plant, labor, supervision, equipment, and material for performing all operations necessary to complete pulverizing of asphalt concrete pavement, mixing with portions of the underlying granular subbase material, and shaping and compacting the processed materials as a granular base course.

### **Article 12.2 Material**

The operation of full depth reclamation shall ensure that one hundred percent (100%) of the processed material passes the one-inch (1") sieve and not more than seventy-five percent (75%) passes the No. 4 sieve.

### **Article 12.3 Construction**

Asphalt concrete pavement and a portion of the underlying granular material shall be pulverized/reclaimed, mixed, shaped, and compacted to a final surface smooth enough for temporary traffic and paving. The processed material shall be shaped to the lines and thickness shown on the Drawings.

Additional pulverizing of asphalt concrete pavement and mixing with the underlying granular material may be necessary around manhole covers, valve boxes, survey monument cases, etc. The processed materials shall provide a smooth stabilized surface on which to place the new asphalt concrete pavement and shall conform to the compaction and smoothness requirements of this Article.

The Contractor shall dispose of excess processed material in accordance with Division 10, Section 10.04, Article 4.9 – Disposal Sites.

If the Engineer determines that there is insufficient reclaimed material to construct an adequate roadway crown, the Contractor shall obtain Owner-furnished RAP material at the Kloep Maintenance Station, 5701 Northwood Drive. The Contractor shall coordinate the pick-up with Street Maintenance.

#### **A. Placing**

The approved material shall be deposited and spread uniformly in one uniform layer to the required contour and grades and to such loose depth that when compacted to the density required will achieve the specified thickness. Portions of the layer which become segregated in spreading shall be remixed to the required gradation.

#### **B. Compacting**

The processed material shall be compacted to at least ninety-five percent (95%) of maximum density as per AASHTO T 180 Method D. In all places not accessible to the rolling equipment, the mixture shall be compacted with tamping equipment capable of attaining the specified density. Blading, rolling, and tamping shall continue until the surface is smooth and free from waves and inequalities. If at any time the mixture is determined to be above or below optimum moisture, it shall be aerated by means of blade graders, harrows or other approved equipment or moisture added until the moisture content is such that the surface can be re-compacted and finished as above. The finished stabilized surface shall be maintained by the Contractor in the above condition until the pavement is applied.

C. Smoothness Test

The surface of the granular base, when finished, shall not show any deviation more than three-eighths inch (3/8") when tested with a ten-foot (10') straightedge applied parallel with, and at right angles to, the centerline of the area to be paved. Any deviation more than this amount shall be corrected by loosening, adding, or removing material and reshaping and compacting to satisfy the above requirement.

**Article 12.4 Measurement**

Pulverizing of asphalt concrete pavement and mixing with a portion of the underlying granular material, then shaping and compacting the processed materials as a granular base, is measured per square yard, complete in place.

If the Contractor obtains Owner-furnished RAP material from Street Maintenance, payment shall include loading, transportation, placement, and incorporation of the material into the reclaimed surface.

Disposal of surplus material is incidental to the bid item Pavement Reclamation and no additional payment shall be made.

**Article 12.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Pavement Reclamation	Square Yard
RAP (Owner Furnished)	Ton



## **SECTION 40.13 PAVEMENT SEAM REPAIR - INFRARED METHOD**

### **Article 13.1 General**

The Work described in this Section shall consist of furnishing materials and repairing existing asphalt pavement cuts or seams.

### **Article 13.2 Materials**

If seam repair is shown on the Drawings and/or the Engineer determines that it is necessary, the Contractor shall apply a one-component emulsified maltenes recycling agent (rejuvenator) in a ratio of 1:1 with water. The Contractor shall disperse the solution with a commercial grade sprayer at a rate of eight (8) ounces per square yard of heated area. The rejuvenator application area shall include both the area under repair as well as the area heated but left undisturbed around the perimeter of the repair. The application shall take place after the area has been scarified and just prior to the addition of new asphalt. The rejuvenator replaces the light oil component of asphalt which has oxidized out over time.

### **Article 13.3 Equipment**

- A. Infrared Heater: the heating chamber used shall consume no more than twelve thousand and five hundred British Thermal Units (12,500 BTU) per square foot of heated area. This rate of consumption shall translate into the ability of the heater to soften asphalt to a depth of one and one-half to two and one-half inches (1½" to 2½") in eight (8) to ten (10) minutes without burning the surface.
- B. Asphalt Storage Unit: a thermostatically controlled storage unit will be utilized to ensure that sufficient hot virgin asphalt is on hand. This unit must ensure that the temperature of the asphalt is never more than three hundred and twenty-five degrees Fahrenheit (325°F).
- C. Compactor/Roller: the compaction equipment used will generate at least one ton (2000 lbs.) of applied force per square inch.
- D. Steel Rake: a steel rake shall be used to delineate the repair area along the chalk line and to scarify the heated area of the patch inside the chalk line to a depth of at least two (2) inches.
- E. Asphalt Lute: a thirty-six-inch (36") -wide lute shall be used to evenly distribute the added asphalt and to establish the proper grade.

### **Article 13.4 Construction**

- A. Heating the Repair Area:

Contractor shall sweep area clean of dirt, loose aggregate, or standing water.

Contractor shall lower the infrared chamber over the repair allowing at least twelve to eighteen inches (12" to 18") of heated area beyond the perimeter of the original opening.

The Contractor shall check the surface temperature of the asphalt at seven minutes and every minute thereafter using an infrared thermometer to ensure the proper heating time. The surface temperature shall not exceed three hundred and fifty degrees Fahrenheit (350°F). Heating time is influenced by ambient temperature, color of the pavement, size of the aggregate, and moisture content.

After the appropriate heating time (typically eight to ten (8-10) minutes), the asphalt surface will be softened to a depth of two to two and a half inches (2" to 2½").

The Contractor shall then remove the infrared chamber from the heated area.

**B. Raking the Heated Area:**

The Contractor shall use the backside of a steel rake to neatly square off the repair, cutting six inches to twelve inches (6" to 12") back from the damage along the chalk line.

The Contractor shall then deeply scarify the area inside the repair, taking special care to eliminate the original seam between the repair and the road.

If needed, the Contractor shall apply the Maltenes rejuvenator to the repair and the surrounding heated asphalt surface.

**C. Adding Plant Mix Asphalt:**

If required, the Contractor shall add Class D asphalt concrete to the area to bring it up to proper grade.

The Contractor shall spread a light coating of stone dust over the repair to remove the tackiness. The road can then be opened to traffic.

Note: the total time for a typical single heat restoration should be no more than twenty to twenty-five (20 to 25) minutes. This timeframe shall be strictly adhered to so as to ensure that both the heated pavement and added asphalt have not been allowed to cool significantly. This provides the proper fusion between the repair and the existing road surface.

**Article 13.5 Measurement**

The Pavement Seam Repair shall be measured per seam or cut identified, complete and accepted. There shall be no separate measurement or payment for asphalt, tack coat, or materials required to seam repair as they are considered incidental to this Work.

**Article 13.6 Basis of Payment**

Payment for this Work shall be in accordance with M.A.S.S. Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

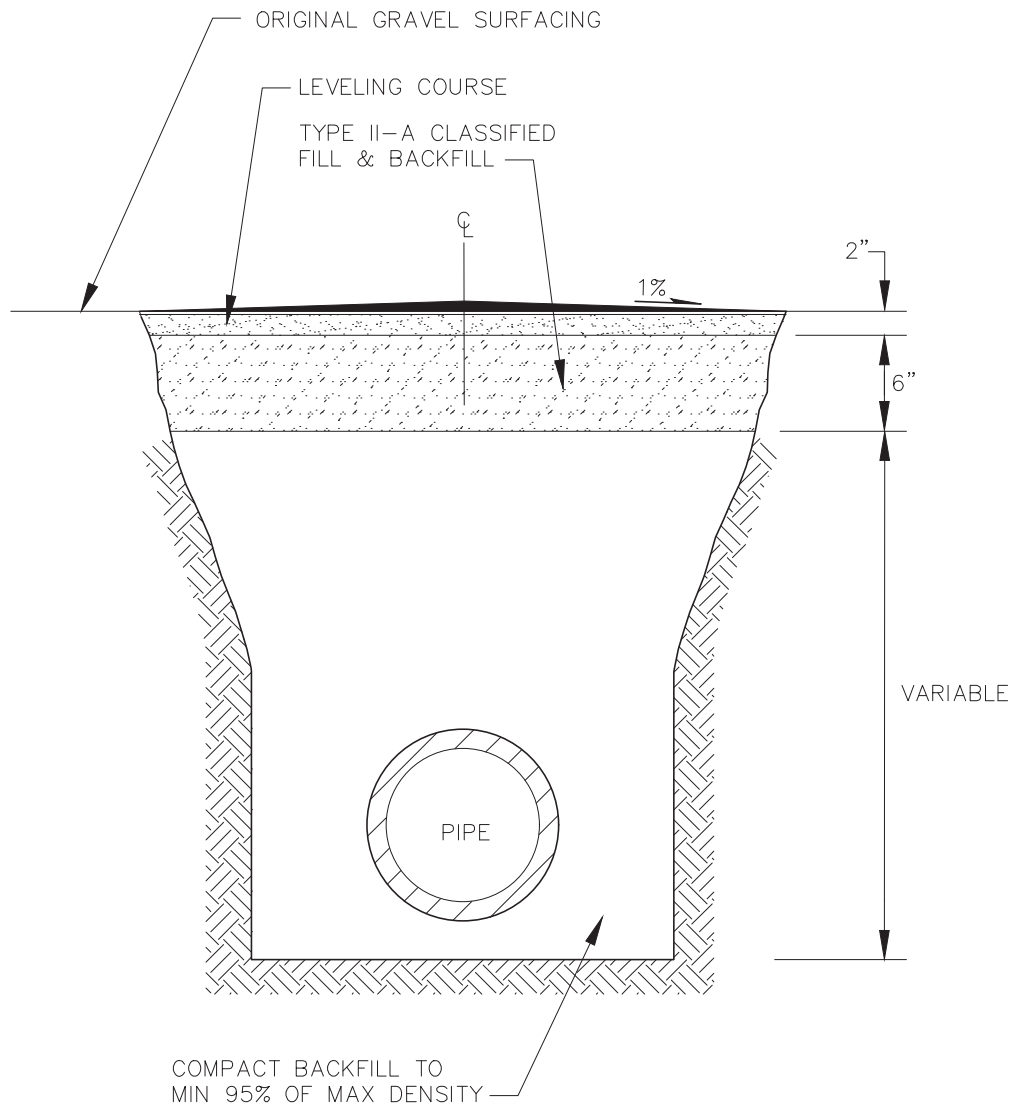
ITEM	UNIT
Pavement Seam Repair	Each

**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 40  
ASPHALT SURFACING  
STANDARD DETAILS**

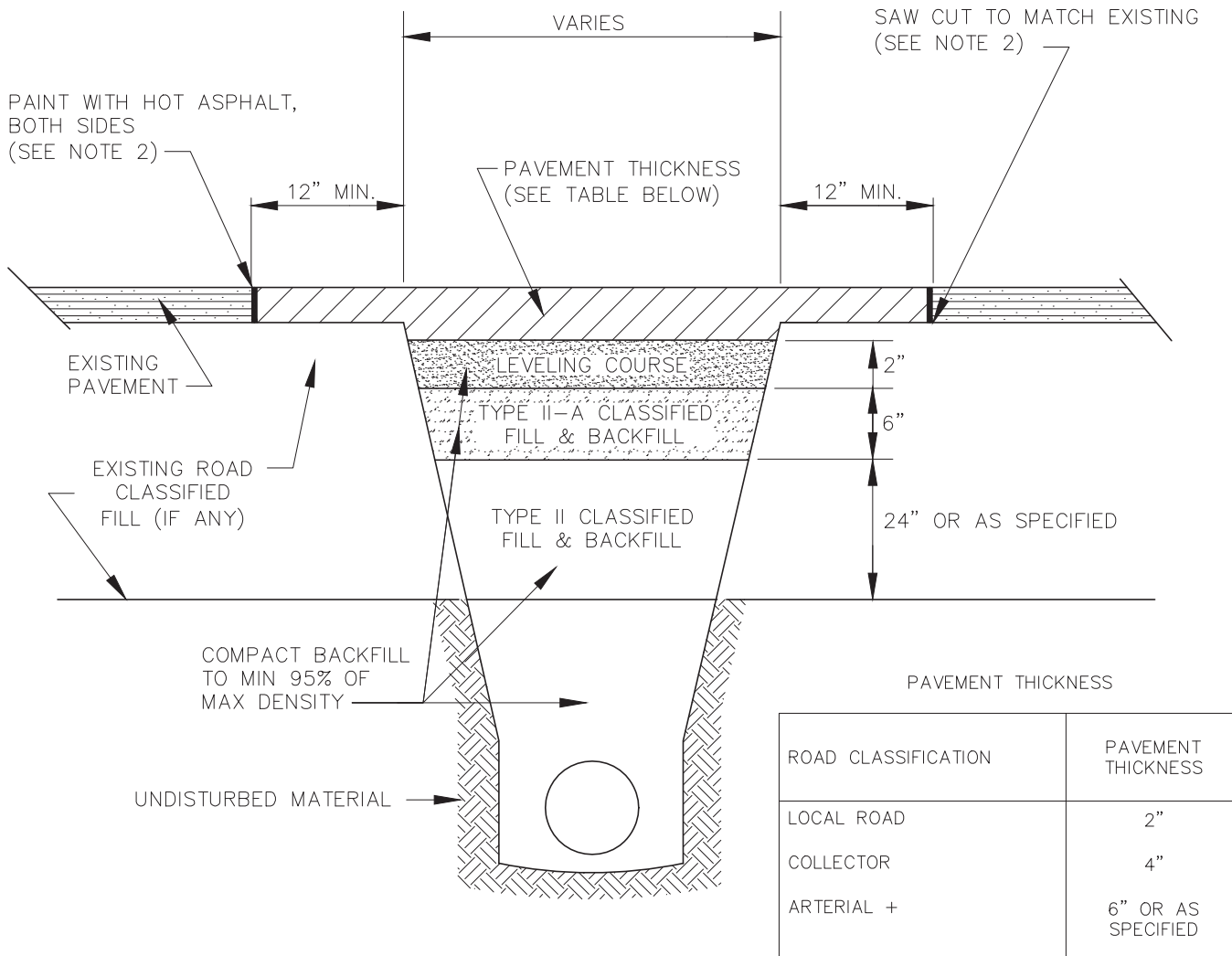
**STANDARD CONSTRUCTION SPECIFICATIONS  
DIVISION 40  
INDEX OF STANDARD DETAILS**

- 40-1 Typical Resurfacing Detail – Gravel Surfaces
- 40-2 Typical Resurfacing Detail - Non-Gravel Surfaces



**NOTE:**

1. CONTRACTOR SHALL CONSTRUCT A 1% CROWN WITH THE PEAK CENTERED OVER THE CENTERLINE OF THE EXCAVATION.



**NOTE:**

- ENGINEER OR PERMITTING AGENCY MAY DIRECT ADDITIONAL AMOUNTS OF SURFACE REPLACEMENT MATERIALS AND/OR TYPE II CLASSIFIED FILL & BACKFILL, BASED UPON FIELD CONDITIONS.
- AFTER TRENCH BACKFILL HAS BEEN COMPACTED, CONTRACTOR SHALL SAW CUT (REF. SECTION 40.06.5.J) AND REMOVE AN ADDITIONAL 12" FROM EACH EDGE OF THE ORIGINAL CUT. ENGINEER MAY REQUIRE ADDITIONAL REMOVAL IF THE EXISTING SURFACING HAS BEEN LIFTED IN THE REMOVAL PROCESS OR IF THE JOINT DOES NOT OCCUR ON UNDISTURBED MATERIAL. TRIM AND SQUARE THE EDGES OF EXISTING SURFACING, AND REMOVE LOOSE MATERIALS BEFORE PLACING PAVEMENT. CONTRACTOR SHALL PAINT SURFACES AND EDGES OF EXISTING PAVEMENT WITH HOT ASPHALT CEMENT AS SPECIFIED IN THE CONTRACT DOCUMENTS OR AS APPROVED BY THE ENGINEER.
- MAXIMUM PAVEMENT LIFT THICKNESS IS 2" UNLESS OTHERWISE SPECIFIED IN THE DRAWINGS OR APPROVED BY THE ENGINEER.
- THIS DETAIL APPLIES TO ALL NON-GRAVEL SURFACES INCLUDING, BUT NOT LIMITED TO, PAVEMENT, RECYCLED ASPHALT PAVEMENT (RAP), AND BITUMINOUS SURFACE TREATMENT, ALSO KNOWN AS CHIP SEAL.

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>TYPICAL RESURFACING DETAIL NON-GRAVEL SURFACES</b></p>	<p>SECTION # 40.11</p> <p>DETAIL # 40-2</p>
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**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 50  
SANITARY SEWERS**





**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR SANITARY SEWERS  
DIVISION 50  
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**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR SANITARY SEWERS  
DIVISION 50**

**SECTION 50.01 GENERAL**

This Section is to be applied and used for all Sections in Division 50.

**Article 1.1 Scope of Work**

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, material, transportation, handling and storage, and performing all operations necessary to complete the construction for pipe laying, jointing, and testing of sanitary sewers.

Construction is to be completed according to the Standard Details, Drawings, these specifications, and special provisions.

Requirements for earthwork including, but not limited to trench excavating and backfill are specified in Division 20 - Earthwork.

The Contractor is to locate and treat utilities as described in Division 10, Section 10.04, Article 4.17 – Utilities.

The Contractor, by providing a Bid Proposal and entering into a Contract with the Owner has found that the access, easements, rights-of-way, and other work areas designated in the Drawings are adequate to perform the work and/or the Contractor has secured additional work areas at their own expense that is included in the Bid Proposal to complete the work.

Additional areas secured by the Contractor from parties not associated with the Contract are to be memorialized in the form of a right of entry agreement between the Contractor and party having authority to enter an agreement for the work area. A copy of the right of entry agreement is to be provided to the Owner. The right of entry agreement is to extend the indemnification requirements found in the Contract to Contractor obtained work areas.

The Contractor is to restore the area of Work to preconstruction conditions or better except where shown different on the Drawings or required by the Contract Documents. Where preconstruction conditions cannot be obtained such as items that require growth to obtain height, thickness and other prized attributes then they are to be replaced with standard nursery stock plant material of the same species and type that will grow back to preconstruction conditions and maintained in accordance with the Contract. The Contractor is to secure written approval by the Engineer for replacement material that does not match preconstruction conditions.

Where the requirements in this division call for an Engineer and there is not anyone assigned the duties of the Engineer, then the Utility Company is to be consulted for direction.

## Article 1.2 Applicable Standards

The most recent revision of the following standards are made a part of these Specifications:

AASHTO M45	Standard Specification for Aggregate for Masonry Mortar
AASHTO M306	Standard Specification for Drainage, Sewer, Utility, and Related Castings
ASTM A48	Specifications for Gray Iron Castings
ASTM A74	Standard Specification for Cast Iron Soil Pipe & Fittings
ASTM 438	Traverse Testing of Gray Cast Iron
ASTM A746	Specification for Ductile Iron Gravity Sewer
ASTM C14 or ASTM C14M [Metric]	Specification for Concrete Sewer, Storm Drain and Culvert Pipe
ASTM C76 or ASTM C76M [Metric]	Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe
ASTM C150	Specification for Portland Cement
ASTM C206	Specification for Finishing Hydrated Lime
ASTM C443 or ASTM C443M [Metric]	Specification for Joints for Circular Concrete Sewer & Culvert Pipe, Using Rubber Gaskets
ASTM C478 or ASTM C478M [Metric]	Specification for Precast Reinforced Concrete Manhole Sections
ASTM C564	Standard Specifications for Rubber Gaskets for Cast Iron Soil Pipe & Fittings
ASTM C923	Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes & Laterals
ASTM D256	Test Methods for D-C Resistance of Plastics and Electrical Insulating Materials
ASTM D2321	Recommended Practice for Underground Installation of Thermoplastic Sewer Pipe
ASTM D3034	Specification for Type of PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3035	Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
ASTM D3350	Specification for Polyethylene Plastic Pipe and Fittings Materials
AASHTO M45	Sand for Cement Mortar

AWWA C104/ ANSI A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105/ ANSI A21.5	Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
AWWA C110/ ANSI A21.10	Ductile-Iron and Gray-Iron Fittings, 3 inch through 48 inch, for Water and Other Liquids
AWWA C111/ ANSI A21.11	Rubber Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C151/ ANSI A21.51	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
AWWA C600	AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C901	Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 inch through 3 inch, for Water Service
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inch through 12 inch for Water Transmission and Distribution
AWWA C905	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inch through 48 inch for Water Transmission and Distribution
UPC	Uniform Plumbing Code, latest edition adopted by the Municipality, and current local amendments

### **Article 1.3 Surveys**

Survey must be performed by the Contractor per Division 65 - Construction Survey. Survey is to be incidental to items under construction unless a pay item for Construction Survey Measurement is provided. The Contractor is to as-built and record at a minimum the following items based on the design survey horizontal and vertical control:

- Each pipe invert and length of pipe segment
- Manholes, inverts, cleanouts, service stubs
- Other buried utility conduits, vaults, utilidors, wires, manholes, catch basins
- Other utility surface features such as pedestals, junction boxes, power poles, light poles

Before working in developed areas, the Contractor is to take photographs and video documenting existing conditions. Photographs are to include major construction areas and their boundaries as well as a zone fifty feet (50') outside the furthest anticipated impact. Photo and video documentation is incidental to the Work.

### **Article 1.4 Definitions**

The definitions provided within this Article are supplemental to definitions provided in Division 10 and are to govern in the interpretation of all disputes. Industry standard definitions are to apply if a definition is not provided. Where a term, word or phrase has varying meanings, the Engineer will have final say on the interpretation.

Sewer Connection – sewer pipe and associated apparatuses from the point of connection to a collector, trunk or interceptor to the terminus of the Utility Company maintenance responsibility, usually the property or Utility Company easement.

Sewer Extension – sewer pipe and associated apparatuses from the terminus of the Sewer Connection to a point five feet outside the building foundation

Building Sewer – Sewer piping inside the building to five feet outside of the building foundation

Service – connection, extension and/or building sewer from the Utility Company sewer collection system to private property and typically to one structure

Collection system – series of pipes and structures to collect and convey sewer to a treatment facility

Collector – Typically 8” and larger sewer pipe where the majority of sewage is from individual services.

Trunk – Typically 12” and larger sewer pipe where the majority of sewage is from collectors.

Interceptor – Typically 24” and larger sewer pipe where the majority of sewage is from trunks and collectors to a point of treatment.

#### **Article 1.5 Concrete and Mortar**

##### **A. Miscellaneous Concrete**

All concrete used in the construction of sanitary sewer systems with the exception of precast manholes, manhole risers, cones, and reinforced concrete pipe is to be Class AA-3. Concrete Work is to conform to Division 30 - Portland Cement Concrete.

##### **B. Mortar**

Cement for mortar used in the construction of sanitary sewer systems is to conform with the requirements of ASTM C-150, Type II. Sand is to conform with the requirements of AASHTO M-45. The mortar is to be composed of one (1) part cement and three (3) parts sand. The addition of lime is not permitted. The use of five (5) minute or fast-cure mortar requires prior approval of the Utility Company prior to use.

#### **Article 1.6 Payment - General**

Payment for all Work included in this Division is to be paid for in accordance with Division 10, Section 10.07 - Measurement and Payment and includes full payment for all Work described.

## **SECTION 50.02 FURNISH AND INSTALL PIPE**

### **Article 2.1 General**

The Work under this Section consists of the performance of all operations pertaining to furnishing and installing pipe for sanitary sewer systems.

The Work under this Section consists of performing all Work required for furnishing and installing an operational piping system in a workman like manner meeting applicable standards. The Contractor is to install piping systems in accordance with these Specifications, manufacturer's recommendations, the Utility Company Design and Construction and Practice Manual and in conformity with the lines and grades as shown on the Drawings. Where the previously stated requirements are in conflict the more stringent requirement is to govern.

### **Article 2.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. The Contractor is to clearly demarcate items to be incorporated into the Work. Submittals for pipe and fittings should include, but is not limited to the following information:

- Manufacturer pipe submittal cut sheets
- Manufacturer fitting submittal cut sheets
- Detectable underground warning tape and trace wire
- HDPE welder certificates (pressure sewer pipe only)
- Trace wire (pressure sewer pipe only)
- Anodes, anode connection systems, other corrosion protection components

### **Article 2.3 Materials**

#### **A. General**

All piping is to be in accordance with the Contract Documents conforming to the size and class shown and specified. Changes in class are to be made within one-half of a pipe length of the station indicated on the Drawings. The use of pipe containing asbestos materials is prohibited.

Detectable underground warning tape is required for installation of all pipe types. Warning tape must not be less than five (5) mil, foil backed, six inches (6") wide vinyl tape, colored green, with "Caution Buried Sewer Line Below" continuously printed in black along the tape length.

#### **B. Ductile Iron Pipe**

Ductile iron pipe is to conform to ASTM A 746 (AWWA C 151) with a cement mortar lining conforming to AWWA C-104. Cast and ductile iron fittings and pipe bells are to conform to AWWA C110 or AWWA C-153. Rubber gasket joints for ductile iron pipe fittings are to conform to AWWA C-111.

C. Cast Iron Pipe

All cast iron pipe and fittings are to be hub and spigot service weight soil pipe conforming to the requirements of ASTM A74. Gaskets are to conform to the requirements of ASTM C564.

D. Concrete Pipe and Fittings

Reinforced concrete pipe and fittings must conform to the requirements of ASTM C 76. Non-reinforced concrete sanitary sewer pipe is to conform to ASTM C 14.

E. Concrete Pipe Joints

Joints for concrete pipe are to conform to ASTM C-14 and ASTM C-443. Joints are to be of the "O" Ring type and be subject to the approval of the Engineer as to configuration. All repair clamps are to be approved stainless steel clamps.

F. High Density Polyethylene Pipe (HDPE)

High Density Polyethylene Pipe (HDPE) and fittings are to be manufactured in accordance with AWWA C906. In addition to the requirements of AWWA C906, HDPE is to be manufactured from PE4710 polyethylene compounds that meet or exceed ASTM D3350 Cell Classification 445574. All HDPE pipe and fittings must be certified by the NSF for potable water service. HDPE pipe and fitting material compound are to contain color and ultraviolet (UV) stabilizer meeting or exceeding the requirements of Code C per ASTM D3350. Electrofusion fittings are not allowed. All fittings will have pressure class ratings not less than the pressure class rating of the pipe to which they are joined.

The pipe is to be homogeneous throughout and free of visible cracks, holes, foreign inclusions or other injurious defects. It is to be uniform in color, opacity, density and other physical properties.

Butt fusion of the pipe and fittings is to be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. The fusion operation is to be performed by an individual who has demonstrated the ability to fuse polyethylene pipe in the manner recommended by the pipe supplier.

G. Polyvinyl Chloride Pipe (PVC)

Four inch (4") through twelve inch (12") Polyvinyl Chloride Pipe must conform to the requirements of AWWA C900 and as otherwise required by the Contract Documents. DR 18 pipe must be used for C900 PVC pipe, unless otherwise specified.

Fourteen inch (14") through sixteen inch (16") Polyvinyl Chloride Pipe must conform to the requirements of AWWA C900 and as otherwise required by the Contract Documents. DR 21 must be used for C900 PVC pipe, unless otherwise specified. Pipe greater than sixteen inches (16") in diameter will not be allowed unless approved by the Utility Company's Engineering Director.

H. Cleanouts

Building sewer cleanouts are to be restrained at the wye to the surface. Horizontal gravity piping systems do not need to be restrained.



I. Polyethylene Encasement

Polyethylene encasement material for pipe is to be eight (8) mils thick and conform to AWWA C105. Polyethylene encasement is to include a VBio film system incorporating corrosion control additives and MIC control additives as provided by US Pipe or approved equal.

J. Trace Wire

Tracer wire for sewer lines is to be #10 AWG high-strength copper clad steel with a 30-mil HDPE insulation jacket (color blue) and have a 600-pound average tensile break load. Tracer wire is to be manufactured by Copperhead Industries or an approved equal.

Grounding rods are to a minimum of twenty four inches (24") long and copper clad.

The direct burial grounding clamps are to be EK17 as manufactured by Erico or approved equal.

All splice connections are to be constructed using 3M DBR watertight connectors, or approved equal.

DryConn Waterproof Direct Bury Lugs as manufactured by King Innovation, or approved equal, are to be used to splice into the main line tracer wire.

K. Material Limitations

Cast iron pipe may be used for repairs that are less than ten feet (10') long for sewer extensions.

Repair clamps or pipe couplers are to be constructed of stainless steel components with at least three inches (3") bearing on each side of the coupled pipe joint. Couplers may be, but not limited to, the ROMAC LSS1, 2, & 3's, Powerseal's 3121CS series and Ford FS1 series. The coupler limitation is being required to prevent pipe joint offsets inside of the fittings.

Couplers such as solid sleeve, alpha, macro hp and others that allow for pipe offsets within the coupler require pre-approval and more intensive inspection requirements by the Utility Company and the Engineer.

## **Article 2.4 Construction**

A. Excavation and Backfill

Excavation and backfill for furnishing and installing of sanitary sewer pipe is to be in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill.

The Contractor must remove and dispose of all sewage-saturated soils encountered within the trench area. All sewage-saturated soils are to be considered unsuitable material, not to be used as fill material anywhere within the Municipality and must be disposed of at the Municipal Landfill. There is to be no separate payment and is considered incidental to the pay item under construction for removal and disposal of sewage-saturated soils.

B. Pipe Grade and Alignment

Piping is to be laid at the grade and alignment shown on the Drawings. For projects that do not require Drawings, the Contractor must ensure a functioning sanitary sewer system meeting the minimum separation, slope and burial requirements.

Minimum slopes for gravity sewers are as follow:

<u>Pipe Diameter</u>	<u>Slope</u>	
4"	2.08%	.0208 feet per foot
6"	1.00%	.0100 feet per foot
8"	0.40%	.0040 feet per foot
10"	0.28%	.0028 feet per foot

The minimum standard depth of bury for gravity sewer is eight feet (8'). Where this cannot be achieved, the sewer pipe is to be laid at the minimum slope to achieve the greatest depth of bury possible. Where the depth of bury is reduced to five and one-half feet (5 ½'), but greater than four and one-half feet (4 ½') the sewer pipe is to be insulated in compliance with the Utility Company's standards. Pressure sewer is to have a minimum cover of ten feet (10') with no reduction allowance for insulation.

Pipe installation with less than minimum separation, slope, or bury will be cause for rejection.

Allowable variances for individual pipe sections from established line and grade must not be greater than those listed in the table below, provided that such variance does not result in a level or reverse sloping pipe.

<u>Diameters (Inches)</u>	<u>Allowance Tolerance (Feet)</u>
8-12	0.03
14-16	0.04
18+	0.05

During the progress of the Work, the Contractor shall provide instruments such as transits, levels, laser devices, and other facilities for transferring grades from offset hubs or for setting of batter boards or other construction guides from the control points and bench marks. The Contractor is to provide qualified personnel to use such instruments and who have the duty and responsibility for placing and maintaining such construction guides.

Backfill over a section of pipe to provide a platform for transit, level alignment and grade observations is subject to the approval of the Engineer. If intermittent backfilling is allowed, backfilling is to be accomplished in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill.

### C. Pipe Laying

In all cases pipe installation is to proceed from lower to higher elevations with the spigot ends of the pipe at the lower end of each pipe segment. Each pipe is to be laid true to line and grade. Joints may not deflect or be offset. The alignment of the installed pipe is to appear visually straight so that a full circle of light can be seen between manholes.

Each section of pipe is to be handled carefully, placed accurately; and joined in accordance with the pipe manufacturer's recommended standards. Each section of pipe is to be properly supported to ensure true alignment and an invert which is smooth and free from roughness or irregularity.

The Contractor is to stagger the joints for sanitary sewer pipe such that no sewer pipeline joint is closer than nine feet (9') measured horizontally (outside of pipe to outside of pipe) from its intersection with water mains encountered in the Work.

The Contractor shall take every precaution to preclude foreign debris from entering the sanitary sewer system. Temporary screening techniques of the downstream manholes proposed for use by the Contractor must first be reviewed and approved by the Engineer prior to their use in the Work. The Contractor is responsible for removing and cleaning any foreign debris that enters the sanitary sewer system. All costs associated with the removal of foreign debris from the sanitary sewer system resulting from the Contractor's activities is considered incidental to the Contract.

At all times, when Work is not in progress, open ends of pipe and fittings are to be securely and satisfactorily closed so that no undesirable substance will enter the pipe or fittings.

The pipe is to be laid in trenches when the trench bottom and sides to one foot (1') above the pipe are in a thawed state. The trench is to be immediately backfilled with completely thawed material. The trench is to be backfilled at the end of the work shift during freezing and near freezing temperatures to prevent the pipe zone from freezing.

Tracer wire must be installed on all non-metallic pressure sewer pipes. Tracer wire must be brought to the surface near sewer structures.

The warning tape must be continuously laid with the pipe and be at least twenty four inches (24") and no more than thirty six inches (36") above the pipe.

### D. Polyethylene Encasement

The polyethylene encasement is to be installed in strict conformance with Method A described in the most current editions of AWWA C105/ANSI A21.5 and the Ductile Iron Pipe Research Association's "A Guide for the Installation of Ductile Iron Pipe."

Bedding and backfill material around pipelines with polyethylene encasement is to be placed using protective measures such as shields, guards, coating systems, and/or other methods as needed to protect the polyethylene encasement from becoming torn, punctured or otherwise damaged during the Work. Damage to the integrity of the polyethylene encasement must be either repaired or the pipeline

removed and the polyethylene encasement replaced as directed by the Engineer. Costs for repair and/or replacement of damaged polyethylene encasement is to be considered incidental to the installation of the polyethylene encasement and/or the installation of the pipeline protected by the encasement.

E. Bedding of Sanitary Sewer Pipe

All pipe is to be bedded with Class E bedding, unless another material is authorized in writing by the Utility Company. Bedding is to be laid the full width of the ditch and compacted to a minimum of ninety-five percent (95%) of the maximum density.

Sanitary sewer pipe bedding is to extend six (6) inches below and above the pipe and constructed in accordance with Standard Detail 20-8.

F. Laying Instructions for Concrete Pipe with "O" Ring Bell End Joint

To allow a watertight joint and to ensure an installation which will allow the pipe to perform as designed, the following recommendations of the pipe manufacturer are to be observed:

1. Spigot groove and bell surface is to be clean and free of foreign material.
2. Apply joint lubricant freely to the bell including the tapered surface and completely coat the rubber gasket.
3. After placing gasket in groove, run a small tool completely around between gasket and groove to equalize gasket stretch.
4. Exercise care at first contact of the pipe. Avoid bumping which may damage spigot. Stop any swaying motion before contact is made.
5. To couple pipe, insert spigot slowly and carefully straight into bell, to allow the gasket to cushion the initial contact and center the spigot as it enters the tapered portion of the bell.
6. Completed joints should have spigot inserted into the bell in conformance with the pipe manufacturer's recommendations. Sewer collectors are to be laid in a straight run with no deflections or alignment changes except at manholes. Sewer services alignment changes are to happen through fittings.
7. Check all around pipe for rolled or "fish mouthed" gaskets after coupling.
8. Do not pick up and drop coupled pipe to adjust grade.
9. Ensure that the pipe is not supported only at the bell nor is the pipe barrel resting on a high spot. The bottom quarter of the pipe is to be uniformly supported through its length in order for the pipe to resist the design loads.

G. Laying Instructions for Other Pipe

All other pipe is to be laid in accordance with the manufacturer's published recommendations and as directed by the Engineer.

## **Article 2.5 Testing**

### **A. General**

The Contractor is to provide all materials, equipment and labor related to testing that is acceptable to the Engineer and Utility Company. Testing, retesting, and any required repairs to pass testing of the installed sewer pipe is an obligation of the Contractor to perform and is incidental to the bid item under construction. After testing, if repairs are needed then the previous testing will be considered void and the segment of pipe in which the repair took place is to be retested.

The Contractor may test any portion of the installed sewer pipe at any time for their convenience, but acceptance testing is to be performed in the presence of the Engineer or Inspector and a Utility Company representative. The Engineer will provide the Contractor written confirmation that acceptance testing is satisfactory.

All sanitary sewer pipe installed is subject to either an infiltration test or an exfiltration test and lamping or CCTV inspection.

The Contractor is to clean and flush all sanitary sewer pipe installed prior to testing and substantial completion inspection. Testing for the purpose of acceptance will be done after trenches are backfilled, planned surrounding utilities have been installed and the road structural section is in place. It is recommended to complete testing prior to installation of curb and gutter and pavement.

Pneumatic exfiltration testing is the standard method of testing. Exfiltration and infiltration testing using water may occur when requested by the Contractor and if the Engineer and the Utility Company finds that the groundwater and soil conditions are satisfactory to complete an infiltration test.

All wyes, tees, and pipe ends are to be plugged or capped and secured to withstand the test pressures. Plugs or caps are to be readily removable and their removal is to provide a bell suitable for extending the sanitary sewer extension.

The Contractor shall take precautions to prevent sewage from entering the new sanitary sewer pipeline until it has been inspected, tested and accepted for operation by the Engineer. The Contractor may request inspection, testing and acceptance of incremental segments of the Work. An incremental segment is considered buried sewer pipe between two completed manholes.

Before the Contractor requests the Inspector to perform conformance testing on any portion of the Work, the Contractor is to complete tests and observations to assuage themselves that the Work is ready for inspection. At the discretion of the Engineer, the Contractor will be required to pay for all Owner related costs associated with conformance testing when the inspection fails more than once.

### **B. Hydrostatic Exfiltration Test**

Upon completion of a section of sanitary sewer between manholes the Contractor is to plug all ends of the pipe, including service piping prior to commencing testing.

A minimum head of six feet (6') of water above the crown at the upper end of the test section is to be maintained for a period of four (4) hours during which time it

will be presumed that full absorption of the pipe body has taken place and thereafter for a further period of one (1) hour for the actual test of leakage. During this one-hour period, the measured loss must not exceed the rate of fifty (50) gallons per inch diameter per mile per twenty-four (24) hours.

The above listed leakage rate is also to be applied to infiltration from ground water and infiltration or exfiltration in greater amounts will be cause for rejection of the sanitary sewer.

The maximum length of sanitary sewer for the above allowable leakage test is one thousand feet (1,000'). If it is not apparent that leakage test results between any two (2) manholes is satisfactory, then the Engineer may require subsequent tests to establish the more exact location of the leakage areas. Any section of sanitary sewer between any two (2) manholes that does not meet the above requirements will be rejected.

### C. Low Pressure Pneumatic Exfiltration Test

Safety braces are required to hold plugs in place and to prevent a sudden release of compressed air. Due to the large forces that could be exerted by an escaping plug during the testing of the pipe, workmen must not be allowed in the manholes in which plugs have been placed while internal pipe pressure is above atmospheric pressure. Such as while testing is in progress. The Contractor's testing equipment is to be arranged in such a manner that a pressure relief device will prohibit the pressure in the pipeline from exceeding ten pounds per square inch (10 PSI).

All air used to pressure up the line being tested is to pass through a single above ground control panel. The above ground air control equipment is to include a shut-off valve, pressure relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from 0 to at least 10 PSI and no more than 20 PSI. The continuous monitoring gauge is to be no less than three inches (3") in diameter with a minimum division of 0.50 PSI and an accuracy of plus or minus three percent ( $\pm 3\%$ ) (Miljoco Part # P3508L-02 or equal). Two separate hoses connected to their own dedicated plug connection are to be used to:

- connect the control panel to the sealed line for introducing low-pressure air, and
- a separate hose connection for constant monitoring of air pressure build-up in the line.

Air is to be slowly supplied to the test section until the internal air pressure reaches four (4.0) pounds per square inch. Where the groundwater table is above the sewer test section, then the air test pressure is increased by the head of ground water above the lowest invert of the test section to a maximum test pressure of 9 PSI. A conversion of 0.43 PSI/ft of head is to be used to convert head pressure to PSI. At least two (2) minutes will be allowed for temperature stabilization before proceeding further.

To obtain the groundwater table height above the lowest invert of the pipe; the Contractor is to install a temporary slotted 3/4" PVC pipe at the exterior of all manholes. The ground water level will be measured after a minimum of forty-eight

hours (48hrs) have passed from the installation to allow the ground water to reach equilibrium. The Contractor, as witnessed by the Inspector, is to measure the ground water level. After completion of the testing, the PVC pipe is to be cut off 1' below grade and buried.

When temperatures have been equalized and the pressure stabilized at 4.0 PSI plus the groundwater pressure increase, the air hose from the control panel to the air supply is to be disconnected. The pressure is to be decreased through bleeding to the test pressure of 3.5 PSI plus the groundwater pressure increase. Upon reaching the test pressure the Inspector is to begin timing with a stopwatch.

If the pressure drops 1.0 PSI before time expires as found in the table below, then the section undergoing testing has failed and must be repaired and/or retested.

Table 1

Nominal Pipe Diameter (Inches)	Minimum test time by length (Minutes: Seconds)							
	100ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
16	14:10	19:13	25:38	32:03	38:27	44:52	51:16	57:41
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
20	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

If a pipe diameter is not list in Table 1, then the Contractor is to request, receive and follow the direction provided by the Engineer.

Pipes that are thirty-six inches (36") in diameter or larger at the option of the Contractor, may reduce the testing requirements to joints only.

D. Infiltration Test

Infiltration testing may be allowed at the Engineer's option when the natural ground water table is six feet (6') above the crown of the higher end of the test section. The maximum allowable limit for infiltration is not to exceed the rate of fifty (50) gallons per inch diameter per mile per twenty-four (24) hours.

The Engineer may require the Contractor to repair obvious leaks even though the total leakage of the test section falls within the maximum allowable leakage for the test used.

## E. Check Line and Grade

After backfilling and cleaning, but before final acceptance, all sections of installed line are to be checked for line and grade. At the request of the Contractor, the Utility Company inspector will lamp the sewer line to check line and grade after the Contractor makes the lines accessible and safe. A full circle of light must be seen, and no pipe misplaced in line or grade. A physical inspection of the interior of all sanitary sewer lines thirty inches (30") in diameter and above will be made before acceptance. Any excess deviation in line and grade must be corrected by the Contractor prior to Final Acceptance of the Project.

All size sanitary sewer pipes thirty inches (30") and smaller in diameter may be checked for line and grade by closed circuit television per the corresponding requirements in the Contract Documents.

Sewer Services lines of all sizes that do not have manholes at both ends of a pipe segment cannot be checked for line and grade by lamping. In such cases, the line and grade may be checked by the Contractor utilizing CCTV.

### **Article 2.6 Measurement**

Measurement for furnishing and installing sewer pipe is to be per linear foot of horizontal distance of the various sizes as set forth in the Bid Schedule. Measurement will be from center to center of manholes or from center of manhole to center of cleanout, bend or fitting. Polyethylene encasement will not be measured for payment.

### **Article 2.7 Basis of Payment**

Payment for this Work is to be as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Testing and any required repairs to pass testing of the installed sewer pipe is an obligation of the Contractor to perform and is incidental to the bid item under construction.

Unless specifically identified for payment under a separate bid item, the unit price bid for Furnish and Install Pipe (size, shape, type material, class, and/or gauge) includes all labor, equipment, and materials to furnish and install a functional sanitary sewer system including but not limited to the following incidental items:

- polyethylene encasement;
- asphalt surfacing removal and/or replacement;
- concrete sidewalk removal and/or replacement;
- curb, and/or gutter removal and replacement;
- clearing and grubbing;
- trench excavation, backfill and compaction;
- excavation dewatering;
- trench support system;
- furnishing and installing Class E pipe bedding;
- installation of pipe, fittings, adapters, or other necessary appurtenances;
- surveying;
- testing;



- disposal of unusable or surplus material;
- protection, bracing and/or shoring of existing utilities;
- restoration of existing drainage patterns;
- removal and replacement of existing culverts, fences, landscaping, and other public or private improvements or natural features impacted by the Work;
- finish grading;
- cleanup

Unit cost payment is to be made on the following basis:

ITEM	UNIT
Furnish and Install Pipe (Nominal Size, Material)	Linear Foot

## **SECTION 50.03 SANITARY SEWER CONCRETE STRUCTURES**

### **Article 3.1 General**

The Work under this Section consists of the performance of all operations pertaining to the construction and installation of sanitary sewer manholes, vaults, dry wells, wet wells and discharge structures, complete with frames and covers.

### **Article 3.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. The Contractor is to clearly demarcate items to be incorporated into the Work. Submittals for concrete structures and components are to include at a minimum the following information:

#### **A. Structure Shop Drawing:**

1. Manhole or structure identification that matches plan labeling
2. Elevation, size and location of penetrations. Elevations may be from a common reference point that can be translated back to the construction Drawings.
3. Number, height, width of grade rings
4. Number and height of risers
5. Type and height of cone
6. Ability to calculate the elevation of the manhole from the bottom of the manhole base to rim of casting
7. Reinforcing type and placement for all concrete components
8. Ladder rung type, size and placement
9. Exterior and interior diameter or dimensions

#### **B. Components**

1. Cast in place resilient connectors between reinforced concrete manhole structures and pipe (boot connectors)
2. Casting, size, type, lettering, load ratings, certifications and locking mechanism (if specified)
3. Concrete mix design and compression testing (ASTM C497) of concrete cylinder samples that are representative of the mix design used in the construction of the manhole components that have been completed within thirty (30) days of casting the manhole
4. Access port(s) size, type, load rating, and certification

#### **C. Coatings and Waterproofing**

1. External coatings
2. Internal and external joint sealer
3. Internal coatings when required

4. Concrete admixture

D. Cast in place sewer structures

Submittal of formwork and shoring plan that is prepared by a qualified designer

**Article 3.3 Material**

A. Sewer structures, manhole cones, risers, bases and grade rings

Materials used in the construction of manholes is to conform to the requirements of ASTM C-478 (AASHTO-199), these specifications and the Standard Details.

Concrete is to be of a suitable mixture of aggregates, cement, and water to achieve a 28-day break strength of 4,000 psi per ASTM C39. Maximum aggregate size is to be no greater than one and one-half inch (1-1/2"), one fifth (1/5) the wall thickness and 1/2 of the minimum space between reinforcement to other reinforcement or forms.

Mortar is to be composed of one (1) part cement and three (3) parts sand. Sand must conform to AASHTO Specification M-45. Only enough water is to be added to provide plasticity in placing the mortar.

Cement is to conform to ASTM C150 Type II or Type III. The water to cement ratio is not to exceed 0.53 by weight.

Concrete for manhole flow channel forming is to be Class A-3 concrete per Division 30.

Reinforcement steel must conform to the requirements of ASTM A-1064, ASTM A-615, Grade 40 or 60 steel, or ASTM A706, Grade 60 steel, and the Standard Details. Reinforcement steel is to be installed through the transition from the base to the vertical walls of the manhole.

Cones are to be eccentric, unless otherwise approved.

The base is to be integrally cast with the first section for all manholes and structures, except for horseshoe and type C manholes.

Grade rings are to be a minimum of three inches (3") thick and provide a clear opening that is at least as large as what the casting provides.

B. Castings

Frames and covers are to conform to the Standard Details, meet the requirements of ASTM A-48, and be rated Heavy Duty (H-20 loading minimum). Gray cast iron is to have a minimum tensile strength of 30,000 pounds per square inch (PSI).

Castings placed within airport properties and other heavy load areas are to be specified in the special provisions to resist loading forces associated with those areas.

Gray iron castings are to have appropriate certifications and be individually marked in accordance with the requirements of AASHTO M-306. Castings which do not possess appropriate AASHTO M-306 certifications and markings must be replaced by the Contractor at no expense to the Owner.

C. Access portals

Access portals are concrete structure opening covers other than frames and covers and typically cover large rectangular aluminum hatches into wet and dry wells. Access portals are to be as specified in the special provision.

D. Coatings and Waterproofing

External cold joint sealant is to be WrapidSeal (18" wide), manufactured by CCI Pipeline Systems, Viscotaq ViscoWrap (12" wide) or approved equal for external joint sealing.

GMX Ultra-Shield WB, or approved equal for exterior buried concrete structure coatings.

Clear or opaque 8-mil polyethylene tube or sheeting for encasement.

Cold joint gaskets are to be Ram-Nek preformed concrete joint sealant by Henry Company, Inc., Viscotaq ViscoPaste (1/2"x1" profile) or equal

Internal coatings are to be resistant to low PH (1.5), bond well to concrete, and withstand submersion in industrial sewerage, such as but not limited to a 150 mil thick Carboline "Semstone 140" 100% solids, high performance epoxy liner system with primer.

E. Pipe Connections to new manholes (boots)

Material and manufacture of waterstops is to conform to applicable provision of the ASTM Standard Specifications for Resilient Connectors between Reinforced Concrete Manhole Structure and Pipes, ASTM C923. Pipe connectors' metallic components are to be stainless steel.

Z Lok Connector by A•Lok® Products Inc. or equal is to be cast integral with the concrete structure.

G3 Boot by A•Lok® Products Inc., Kor-N-Seal I and II, Wedge Style Pipe to Manhole connector or equal are to be used for core drilled penetrations.

F. Accessory components

Ladder rungs are to meet the requirements of ASTM C-478 and AASHTO M-199 constructed with Grade 60 rebar with copolymer polypropylene molded cover with footing grip pegs, contoured back side for fingers and reflective surface on each side of the rung visible from above, such as, but not limited to the polypropylene steps by Lane International Corporation.

G. Internal Drop Connect

Internal drop connect is to be a Reliner internal drop connect or equal. The drop connects are to be constructed of a fiberglass or plastic drop bowl, PVC pipe, PVC fittings, clamps, anchors, and restraints. The bowl material is to be resistant to damage from typical sewer discharge chemical and physical properties. Clamps, bolts and wedge anchors are to be made of stainless steel. The bowl to drop pipe connect is to be a flexible external pipe coupler (Fernco or equal). The bowl is to be sized based on the inlet pipe.

## Article 3.4 Construction

### A. General

The precast concrete structure manufacturer is to provide timely notice (at least two working days in advance) to allow time for the Engineer to arrange for necessary inspections. Installation, of manhole sections will not be allowed without prior review by the Engineer. This approval does not relieve the Contractor of the responsibility for protection against damage during storage, handling and installation.

Precast manholes are to comply with ASTM C478 for acceptability, including but not limited to; cracks, dimension tolerances, acceptance testing submittals and surface defects caused by pour placement and vibrating of concrete into formwork, transportation and handling. Damaged joints may be accepted by the Engineer for incorporation into the work by written order. Additional damage to the joints will not be covered by a previous order of acceptance.

The exterior surfaces of newly installed structures are to have an exterior coating field or shop applied. The coating installation is to meet the coating manufacturer's recommendations.

Precast structures are to be lifted with rigging, hoists, and machinery appropriate for the application and must not damage the structure or exterior coatings. Lifting lugs, devices, and eyes are to be rated for anticipated applied loads. Lifting devices are to be removed and holes filled with mortar prior to backfill around the structure.

Structures are to be installed at the locations and elevations shown on the Drawings. The base section is to be set on a prepared firm and stable surface. The base section and remaining precast components are to be set true and plumb. The rim elevation is to be per the standard details. Each manhole must have a minimum of one (1) six inch (6") grade ring.

Ladder rungs for manholes must align on a bench and be located on an unobstructed side of the manhole. The last rung is to be within twelve inches (12") of the landing pad, the top rung is to be within eight inches (8") of the top of the cone and the spacing is to be twelve inches (12") on center.

Preformed gasket joint sealer is to be applied per the manufacturer's recommendation between each cold joint except for grade ring joints. Gaskets are to be trimmed on the inside of the manhole to prevent the excess gasket material from entering the sanitary sewer lines. Grade rings are to be bed in mortar. Smearing mortar to cover the joint on the inside of the grade ring will be cause for rejection. Heat shrink external joint sealer is to be applied per the manufacturer's recommendation over the casting, grade rings and over the eccentric cone joint.

Manholes and other unheated underground structures are to have a minimum of three (3) layers of 8-mil polyethylene encasement on the outside. The polyethylene encasement may be applied one layer at a time with three individual tubes, continuously wrapping, or three separate tape secured layers of polyethylene. Polyethylene joints are to overlap a minimum of twelve inches and be secured with tape.

The boot pipe connector is to be installed so that leakage between the pipe and structure is eliminated. Pipe-to-structure boot connections are to fit snugly over a pipe and be cast integrally with the structure. The boot is to be held firmly against the pipe surface by means of a stainless-steel mechanical take-up device which, when tightened, will compress the boot to provide a water tight fit. The mechanical take-up device is to remain accessible from the interior of the manhole. Pipes are to be stabbed into the structure through the boots such that at least two inches (2") but no more than three (3") of pipe extend past the inside face of the manhole.

When directed by the Engineer, the Contractor may core in new penetration(s) when in the opinion of the Engineer a pre-cast pipe penetration is not feasible. Boots for cored in pipe connectors are to be secured in place with stainless steel mechanical devices that will seal the rubber boot against the concrete structure. Mortar is not to be placed on the boot inside the structure.

Excavation and backfill for furnishing and installing sanitary sewer manholes is to be as specified in Division 20, Section 20.13 - Trench Excavation and Backfill. Type IIA or Class 'E' Bedding material is to be placed a minimum of three feet (3') outside the manhole and compacted to a minimum of 95% of the modified proctor.

In the case of poured-in-place manhole construction, if the Contractor elects to accomplish the manhole construction utilizing more than one continuous concrete pour, a keyed construction joint must be used. Pre-cast bases may not be used in conjunction with poured-in-place manhole sections.

#### B. Sanitary Sewer Manhole Flow Channel Construction

Sewer flow channels must be smooth and semicircular in shape providing a smooth flow path from inlet pipe(s) to the outlet pipe. Changes in directions of flow are to be made by forming a smooth radius that is sized to allow adequate access for a closed circuit camera (CCTV) and/or maintenance equipment into the served sanitary sewer pipe. Manhole benches at the top of the flow channels are to be smooth and slope towards the channels at a grade of one inch (1"/ft) per foot.

Channels may be formed during the manhole casting process or constructed after installation by trowelling the channels in place.

Where manholes are not being used to change alignment or grade the Contractor may lay a full stick of pipe through and centered in the manhole, place concrete around the pipe and then cleanly and carefully remove the top half of the pipe after the surrounding concrete has sufficiently set.

Horseshoe manhole channels are to be constructed by placing concrete around the existing pipe and troweling in channels for new pipe penetrations. When the concrete has sufficiently set, the existing pipe is to be cleanly and carefully removed to create a semicircular channel.

Where pipe is to be removed, the Contractor is to capture and remove all pipe fragments.

The use of Transite or Asbestos Cement (AC) pipe to form manhole inverts is prohibited.

C. Beaver Slide Invert Construction

Beaver slides are to be constructed to provide a smooth continuous channel directed into and with the flow of the receiving sanitary sewer as shown in the Standard Details.

Beaver slides are required where the invert of the connecting sanitary sewer is above the crown of the receiving sewer and the drop in the manhole does not exceed the maximum height of twenty-four inches (24”).

D. External Drop Connect

Installation of an external drop connect is to be as shown in the Standard Details, Drawings and as specified.

Pipe and fittings are to be restrained and metallic which meet the requirements of Section 50.02 Furnish and Install Pipe. Over-excavation under a drop connection requires compaction of not less than ninety-five percent (95%) of the maximum density prior to installation of the pipe and fittings, or the concrete cradle. The lower invert of the exterior drop connect must be bedded in set concrete before backfill of the manhole is completed.

E. Internal Drop Connect

Installation of an internal drop connect is to be as provided in the manufacturer’s instructions, in these specifications, and as shown in the Standard Details and Drawings.

The drop bowl and pipe are to be anchored into the manhole wall with clamps attached with wedge anchors. The clamps are not to be spaced more than three feet (3’) and at each end. All metallic components of the internal drop connect are to be stainless steel.

One internal drop connect per manhole is allowed by the Utility Company.

F. Additional Depth for Manholes

This item is for construction of manholes deeper than twelve feet (12’). Additional depth to manholes is to be constructed per the Standard Details and Drawings.

**Article 3.5 Measurement**

Concrete structures are to be measured as units complete in place, including all component parts such as, but not limited to, pre-cast concrete sections, lids, frames, water proofing, coatings, joint sealants, ladders and flow channels.

Where the use of watertight frames and covers are specified on the Drawings they are to be measured separately.

When inverts of entering pipes are greater than one pipe diameter (nominal) higher than the existing pipe, invert beaver slides and external drop connects are to be measured separate from the concrete structure. Beaver Slides and External Drop Connects are to be measured as units, complete in place.

Depth of manholes will be based upon a measurement to the nearest foot, for payment purposes, from top of casting to the top of the base slab. All depths over the specified standard depth will be paid under "Additional Depth to Manholes."

**Article 3.6 Basis of Payment**

Payment for this Work will be as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Related component parts to the bid items under construction (including steps, etc.) as shown in the Standard Details and Drawings are incidental to that bid item.

Payment for watertight frames and covers represents the additional cost for the equipment and labor to provide a water tight frame and cover over the standard frame and cover included in the base bid for Construct Sanitary Sewer Manhole (type).

Unless specifically identified for payment under a separate bid item, the unit bid price includes all labor, equipment, and materials to furnish and install a functional sanitary sewer structure including but not limited to the following incidental items:

- asphalt surfacing removal and replacement;
- concrete sidewalk, curb, and/or gutter removal and replacement;
- clearing and grubbing;
- trench excavation and backfill;
- excavation dewatering; trench support system;
- furnishing and installing Class E pipe bedding; compaction;
- installation of pipe, fittings, adapters, or other necessary appurtenances;
- polyethylene encasement;
- surveying;
- testing; disposal of unusable or surplus material;
- protection, bracing and/or shoring of existing utilities;
- restoration of existing drainage patterns;
- removal and replacement of existing culverts, fences, landscaping, and other public or private improvements or natural features impacted by the Work;
- finish grading;
- cleanup

Payment is to be made on the following basis:

ITEM	UNIT
Construct Sanitary Sewer Manhole (Type)	Each
Additional Depth to Manhole (Type)	Vertical Foot
Concrete Sewer Structure (LxWxH – Wall Thickness)	Each
Construct Beaver Slide	Each
Construct External Drop Connect	Each
Construct Internal Drop Connect	Each
Watertight Manhole Frame and Cover	Each
Access Port (Material, Size)	Each



## **SECTION 50.04 SANITARY SEWER PIPE CONNECTIONS AND EXTENSIONS**

### **Article 4.1 General**

The Work under this Section consists of the construction of sewer sanitary sewer pipe to pipe connections, Sewer Connections and Sewer Extensions. Generally the following conditions are covered by this Section:

- Sewer service extension to service extension
- Sewer service extension to buried building sewer
- Sewer service connection to sewer service extension
- Sewer service connection to sewer collector
- Sewer service connection to sewer trunk
- Sewer service connection to sewer interceptor
- Sewer lateral to sewer interceptor

The Contractor shall take all necessary measures to ensure that connection to the existing sewer main does not damage the existing main. The connection is to be as shown on the Drawings except where existing pipe joints or other obstacles require location adjustments. Care shall be taken not to damage or move the existing sewer main while excavating to expose the existing pipe and determine the best connection location for the new pipe being connected.

The exact location, type, and size of existing Service Connections are to be considered unknown. All information provided in the Contract Documents and provided by the Utility Company is from maintenance records, record drawings, field surveys and represents the Utility Company's best indication of location and size. The Utility Company cannot be held liable for accuracy of the information. The Contractor shall locate and confirm that the service extension will function prior to beginning the work.

### **Article 4.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. Submittals, at a minimum, are to include applicable items identified below:

- A. Contractor obtained sewer service permits
- B. Construction schedules
- C. By-pass plan, where required to by-pass sewer flow. See other MASS Sections for plan requirements
- D. Material, such as but not limited to;
  - 1. Grout
  - 2. Fittings, bolts, anchors and gaskets
  - 3. Cleanout
  - 4. Pipe
  - 5. Bedding

6. Backfill
7. Surface material (asphalt pavement, concrete, topsoil and seed, turf)
8. Insulation

#### **Article 4.3 Material**

Pipe and fitting materials are to comply with Section 50.02 – Furnish and Install Pipe, Article 2.2 – Materials. The Contractor is to supply all necessary fittings, adapters and other appurtenances to make a complete working system.

The minimum diameter of a gravity sewer collector is eight inches (8”), a gravity sewer service is four inches (4”) and a pressure sewer service is two inches (2”).

Connections of four and six inch (4” & 6”) sewer pipe to non-concrete collectors, trunks and interceptors are to be accomplished with an epoxy coated ROMAC CB saddle or equal.

Connection to concrete pipe is to be accomplished with an Inserta Tee™, Romac SST, modified Romac SST or equal. To modify a Romac SST is to remove bolts and receiver lugs so that the tee, half clamshell and partial gasket remain. The clamshell gasket and tee are to be connected to the concrete sewer pipe with stainless steel concrete wedge anchors at each corner and fastened tightly to the concrete sewer pipe.

A connection of eight inch (8”) and larger sewer pipe to larger pipe is to be accomplished with a manhole, Inserta Tee™, Romac SST, modified Romac SST or equal.

A Romac SST or equal is to be used for deep service riser connects.

When connecting sanitary sewer pipe ends through the use of couplers, the couplers may be, but not limited to, the ROMAC LSS1, 2, & 3's, Powerseal's 3121CS series and Ford FS1 series. The coupler limitation is required to prevent pipe joint offsets inside of the fittings. These fittings do not allow for deflections. In cases where a deflection is needed, the Contractor is to use a bend fitting.

Pressure sewer pipe connections are to utilize ROMAC 305, 306 stainless steel service saddles or equal.

Cement containing products are to comply with Section 50.01 – General, Article 1.5 Concrete and Mortar.

#### **Article 4.4 Construction**

##### **A. GENERAL**

Pipe and associated fittings construction are to comply with Section 50.02 – Furnish and Install Pipe, Article 2.4 – Construction with the following additional requirements.

The Contractor is to provide general cleanup, flush and test the system; protect/restore existing utilities, driveways, trees, utility markers, survey monuments, fences, retaining walls, buildings, walkways, gardens, landscaping, and other improvements damaged by the Contractor. The Contractor must use appropriately sized construction equipment to minimize the impact to on-lot improvements and vegetation.

The Utility Company will not approve any installation that is not in accordance with the Uniform Plumbing Code, these Specifications, and the AWWU Design and Construction Manual. The Contractor may not start the excavation for Work until all permits are obtained. Sewer Utility Company permits are to be posted at the job prior to earth disturbing activities.

The Contractor is to notify the Engineer and property owners seventy-two (72) hours in advance of any interruption to sanitary sewer service. The Contractor must provide temporary service during the period of interruption in accordance with their approved bypass plan.

A Utility Company representative is to perform the field inspection at the initial connection, extension and building sewer either concurrently or consecutively. The Contractor is to leave the work uncovered until it passes the Utility Company inspection. Work completed under a Utility Company mainline extension agreement is to be inspected as specified in the agreement.

The Contractor is to record and transmit to the Engineer the location of points in the Work such as but not limited to service connection at the main, connection of the service extension, service length, service invert elevations at the main and property line and distance to nearest property corner, building corner or other permanently fixed objects. The fixed point cannot be living, movable (e.g. boulders, rocks, fence posts), or changing attributes of something larger (e.g. sidewalk cracks, building paint schemes).

## B. SANITARY SEWER CONNECTIONS

Multiple connections are not to be made any closer together than three feet (3') to another connection or joint. Taps completed with saddles are to be made with a mechanical hole cutter or equal. Taps not using a saddle are to be pre-approved in writing and listed on the permit by the Utility Company prior to installation.

Saddles for gravity sewer connections are to be centered over a circular hole sawed one-eighth inch (1/8") larger than the inside diameter of the saddle. The hole is to be made above the spring line of the main being tapped. The strap(s) are to be tightened in accordance with the manufacturer's instructions.

Where leakage testing of the service connection is required, the connection is to have a removable plug installed at the terminus that is capable of passing the leakage test. The terminus of the Sanitary Sewer Connection is to end in a bell if it is not immediately continued by construction of the complete Sanitary Sewer Extension.

Services stubbed to the property line or beyond for future use is to terminate with a pipe bell. The bell is to be plugged and marked at the end of the service with a 2" X 4" marker protruding three feet (3') above final grade, painted green, and stenciled with the word "SEWER" in white two inch (2") high letters.

No portion of the sanitary sewer connection is to be closer than five feet (5') to a side lot line or manhole.

Connections with deep service risers can be installed where the service to collector connection is in excess of twelve feet (12') deep and eight feet (8') of

cover can be maintained over the entire service. Deep service risers must be fully restrained pipe and fittings to the edge of right-of-way or easement. No more than two sanitary sewer service connections are to be installed on a single deep service riser.

Connections utilizing a steep sewer riser maybe installed where the sewer main is more than 10' below final grade and the service connection and extension will have greater than minimum slope and 8' of cover in their entirety.

#### C. SANITARY SEWER EXTENSION AND BURIED BUILDING SEWER

The exact location, type, and size of existing Service Connections are to be considered unknown. All information provided in the Contract Documents and provided by the Utility Company is from maintenance records, record drawings, field surveys and represents the Utility Company's best indication of location and size. The Utility Company cannot be held liable for accuracy of this information. The Contractor must locate and confirm that the service extension will function prior to beginning the work.

Upon exposing an existing sanitary sewer service connection and/or extension the Contractor must ensure that the line has proper slope, bearing, and is free and clear of obstructions prior to continuing the Work. If the service line is found to be either plugged or if a gravity sewer service is found to have reverse grade, the Contractor is required to notify the Utility Company immediately or be liable for correcting the misalignment or unplugging the line at the Contractors' expense.

Extensions are to utilize existing pipe bells, except where no bell exists or the pipe diameter changes such that the bell does not allow a bell to spigot connection. Connection other than through a bell to spigot marriage is to be completed with a pipe coupler.

Pressure sewer service extensions are to be constructed with dual two inch (2") HDPE pipes and connect to the sanitary sewer connection per the Standard Detail.

Cleanouts are required on service lines (connection and extension) greater than one hundred feet (100') long installed without a manhole, at a single bend greater than forty five degrees (45°), and where a combination of bends adding up to more than forty five degrees (45°) in alignment change taking place within ten linear feet (10'). The cleanout assembly is to be restrained in the vertical direction from and including the wye to the surface. The horizontal piping does not need to be restrained to the wye.

The Contractor may be required to adjust more than one type of cleanout under this Contract. All adjustments will be accomplished as directed by the Engineer. Any damage to cleanouts resulting from construction under this Contract is to be repaired or the damaged portion replaced at the Contractor's expense. All vertical cleanout joints and fittings must be restrained. All vertical components of cleanouts are to be encapsulated with three layers of eight mil polyethylene.

#### D. ELEVATION CONFLICTS

The Contractor is to notify the Engineer where a conflict in grade occurs between a gravity sewer and another utility. Except when otherwise directed by the Engineer,

the Contractor is required to excavate gravity utilities from the point of interception for a sufficient distance to gather elevation information such that the Engineer can provide direction to raise or lower one or both of the utilities such that the grade conflict will be eliminated.

The Contractor may not lower or raise the conflicting utilities without first providing the elevations of the conflicting utilities to the Engineer in writing and allowing the Engineer five (5) days to analyze the information and provide the Contractor direction.

Where a conflict in grade occurs between a gravity sewer and a non-gravity utility, the non-gravity utility is to be relocated unless the Engineer provides direction to raise or lower the sewer service.

#### E. EIGHT INCH (8") AND LARGER DIAMETER PIPE TO PIPE CONNECTIONS

Connections are to be water tight, have smooth flow surfaces, protrude less than one-half inch past the inside wall of the existing pipe and be completed in the top quadrant of the pipe.

Holes are to be completed through drill coring a neat round penetration. Breaking into the pipes by use of a chipping gun, jackhammer, saw or other similar method will not be allowed.

### **Article 4.5 Measurement**

Sanitary Sewer Service Connections are to be measured per linear foot.

Sanitary Sewer Service Extensions including any buried building sewer is to be measured per linear foot.

Deep service riser connections are to be measured as complete units in place regardless of the number of services connected to the riser.

Steep service riser connections will not be measured separately from the service connection.

Cleanouts will be measured as complete units in place adjusted to final grade.

Cleanout adjustments will be measured per unit where an existing cleanout is adjusted to grade.

Large diameter pipe to pipe connections will be paid for as a complete units in place which includes all pipe and fittings from the manhole to the existing pipe to pipe connection

Raising or lowering sewer services will be measured per linear foot of horizontal distance of pipe exposure and includes all fittings necessary to restore and make functioning the utilities impacted.

The item under construction as listed in the Bid Proposal will include all materials, excavation, import materials, installation, compaction, and backfill..

Unless specifically identified for payment under a separate bid item, the unit price bid for includes all labor, equipment and materials to furnish and install a functional unit including but not limited to the following incidental items:

- Location and verification of customers' existing service location, size, and elevation
- disconnection and reconnection of existing services where the Work includes replacement of existing service pipe
- Sewer main and service flow control regardless of size
- clearing and grubbing;
- trench excavation and backfill;
- excavation dewatering;
- trench support system;
- furnishing and installing Type II-A Classified Fill and Backfill;
- bedding; compaction;
- installation of pipe, fittings, adapters, or other necessary appurtenances;
- sanitary sewer service insulation;
- polyethylene encasement; when applicable,
- Permits, permit fees, taxes;
- disposal of unusable or surplus material;
- protection of existing utilities, removal, restoration, replacement of disturbed private or public property, drainage patterns, existing utilities, existing culverts, fences, landscaping, grass, asphalt, curb, gutter and sidewalk, retaining walls, and any other public or private improvements;
- finish grading; and
- cleanup.

Where the Work includes disconnecting existing sanitary sewer services from an existing sewer main and reconnecting them to a new sewer main, the disconnection and reconnection of those existing sewer services will be considered incidental to the installation of the new sewer pipe.

Any conflicts with a property owner concerning the Work and restoration of the property after construction are to be resolved by the Contractor at no additional cost to the Owner.

**Article 4.6 Basis of Payment**

Payment for this Work will be as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Payment will be made on the following basis:

ITEM	UNIT
Sanitary Sewer Connection (Size)	LF
Sanitary Sewer Extension and Buried Building Sewer (Size)	LF
Deep Service Riser (Size)	Each
Cleanout (Size)	Each
Adjust Cleanout to Finish Grade	Each
Eight Inch (8") and Larger Diameter	

Pipe to Pipe Connection  
Raise or Lower Sewer

Each  
Linear Foot

## **SECTION 50.05 SANITARY SEWER FLOW CONTROL**

### **Article 5.1 General**

The Work under this Section consists of providing all labor, equipment, materials, planning, coordination, operations, permits, and facilities to control sewer flow for inspection, maintenance, repair or replacement of sewer assets.

Definitions:

Bypass – a diversionary flow path for sewer that will utilize pipes, pumps, tanks and other equipment to maintain an area suitable for maintenance, repair, rehabilitation, installation and/or CCTV inspection.

Property Owner – The authorized agent that can legally obligate debt and risk to real property from which sewer is being collected

Resident – person(s) occupying a property from which sewer is being collected who may or may not be the Property Owner.

Sewer Flow Control Supervisor – A Contractor personnel who has authority to make changes to the by-pass system, buy replacement parts, and assign other personnel to monitor the system.

Sewer flow control is to be completed such that it will not damage public or private property. Repair and reparations for property damage associated with the Work is the sole responsibility of the Contractor to fix, repair clean and make whole. This includes payment of all fines and penalties levied by other agencies such as the Environmental Protection Agency, Alaska Department of Environmental Conservation, or other governing bodies for unauthorized discharges of sewer.

### **Article 5.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data.

The Contractor is to prepare, submit and receive acceptance of a detailed sewer flow control plan that describes the measures to be used to control flows prior to implementation of such plans.

The plan, at a minimum, is to contain the following items:

- Plug types and sizes
- Pump types, sizes, and power source
- Conduit types, sizes, connections, valves and fittings
- Name and telephone number of the Sewer Flow Control Supervisor, who is responsible for Flow Control.
- Key personnel being used for 24 hour operations
- Copy of noise permit application and approved permit when it is received
- Diagram(s) indicating pump, pipes, catch points, portable restrooms and discharge point showing applicable elevations



- Identification of structures with basements
- Diagram and state location of provisions being made for vehicular and pedestrian traffic. Provide details of ramps, trenches, temporary surfaces etc...
- Calculations used to size system
- Copy of property access agreement between the Contractor and the Property Owner (may be a delayed submittal, but must be obtained and provided prior to flow control implementation)
- Provisions for repair and re-instatement of the sanitary sewer flow control system, including but not limited to back up pumps, repair clamps, extra hosing/piping and alternate power sources.

### **Article 5.3 Materials**

Bypass systems are to have sufficient equipment and materials on site to ensure immediate repair or modification of any part of the system.

#### **A. Conduit and pipes**

Provide water tight hoses, piping and fittings of sufficient capacity and pressure rating to accomplish the sewer bypass. The Contractor is to have replacement conduit and fittings on-site to make multiple repairs to the conduit.

Where hoses are provided, the Contractor is to have on hand two sections of replacement hose that are capable of covering the longest single hose in the flow control system.

The conduit, pipe, repair and transition materials are to be of a common size and material that purveyors of such materials will have a ready supply as a backup to the on-site replacement conduit.

#### **B. Pumping and suction equipment**

Pumps are to be adequately sized, well maintained and of an appropriate type for sewer. They are to be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system and are to allow dry run for longer periods of time to accommodate the cyclical nature of sewer flow.

Pumps with engines or associated combustion power generation units must be in compliance with the MOA noise ordinance. The Contractor is to apply for and receive a noise permit when required by the MOA noise ordinance.

All pumps used to bypass mainlines and services six inches (6") and larger are to have a reliable standby pump of equal capacity to the primary bypass pump. These backup pumps are to be on-line and isolated from the primary system through the use of valves.

All bypass pumps for services smaller than six inches (6") in size are to have a primary pump and a backup for each lot of five operationally identical primary pumps.

Backup pumps are to be on-site and ready for replacement and incorporation into the by-pass system.

C. Plugs

All sewer line plugs are to be permanently marked with a Contractor identification marker. Secure plugs with a tag line. The tag line is to extend and be secured to a point outside of the manhole or wet well in which it is being used. Airlines are not considered tag lines.

Temporary plugs must be removed and the flow restored after planned interruptions. If the sewer flow control work has not been completed prior to the end of the planned interruption, the Contractor is then required to restore sewer flow by providing, operating and maintaining a sewer bypass until sewer flow is restored to normal.

D. Portable Toilets

Portable toilets are to be provided for buildings with temporarily blocked services. One portable toilet is to be provided per each two residential units or eight employees. Each business complex with a plugged sewer service is to be supplied at least one handicap accessible portable toilet with a wash station. Businesses with more than twenty four (24) employees are not eligible for portable toilet service and must have the sewer service bypass the work. Residential units housing disabled sewer customers must agree in advance and in writing to portable toilets or must have their sewer services bypass the work.

E. Holding Tanks

Tanks are to be metal or plastic, free of leaks, designed to contain fluids and closed to the atmosphere except to allow for venting. Vents are to be smaller than the feed lines and installed at the highest point of the system. The tank size is to be no less than double the anticipated daily flow. Filling and discharging of tanks is to take place through securable ports.

**Article 5.4 Construction**

A. General

Unless the anticipated flow is provided in the special provisions, the Contractor is to assume that the sewer flow is to be equivalent to the capacity of the sewer system being bypassed based on the as-built information. When flows are bypassed, the discharge must be to a sanitary sewer collection system.

The Contractor is to provide notice to affected parties who may be impacted by planned sewer flow control. Interruptions are not to exceed six hours.

The Contractor, at a minimum, is to provide periodic monitoring and observations of any active sewer flow control. The maximum period between observations is limited to two hours and is to be recorded in a logbook that is available to the Engineer.

In addition to having the bypass system monitored, the Contractor is to provide to the Engineer and on all notices for temporary service the name and 24-hour contact number for the person(s) responsible for continuous operation of the bypass system. This person is to be known as the Sewer Flow Control Supervisor. After approval of the sewer flow control plan, any substitutions of the Sewer Flow

Control Supervisor are to be approved by the Engineer and new notices are to be sent out to sewer customers previously notified.

The Contractor is to provide a sewer flow control plan showing all components of the sewer flow control equipment, materials, location personnel and schedule.

#### B. Conduits

Conduits are to be constructed leak and repair band free. Repair bands may be used after the flow control system has been accepted for operation. Insertion of the conduit into the sewer collection system is to be done such that the system is not damaged. New penetrations for bypass conduits into the piping of the sewer collection system is not allowed except where the connection is to be made into pipes being removed by the project.

Sewage will not be allowed to free flow in gutters, streets, streams or over sidewalks, etc., nor is any sewage allowed to flow into storm inlets or stormwater piping.

Where conduits pass over traveled ways, the conduit is to be protected from vehicular and pedestrian traffic and vice versa.

#### C. Notifications

Notification is to be given to the sewer utility, Property Owner(s), business manager(s), and Resident(s) whose sewer service is being plugged, bypassed, or affected by the planned sewer flow control. Notices are to be provided a minimum of a minimum of seventy two (72) hours to a maximum of one hundred forty-four (144) hours prior to commencement of the flow control. Notices at a minimum will require a written statement of when utility interruption will begin and end, form and/or amount of compensation for impacts, twenty four hour (24hr) emergency contacts, indemnification of the MOA and AWWU, signatures of both the Contractor and Property Owner.

Where signatures cannot be obtained from the Property Owner after a minimum of three days of well documented attempts during the hours of 7am-8am, 12pm-1pm, and 6pm-7pm each day, the Contractor may complete the flow control Work within permitted Rights-of-Ways and easements. Work on private property may not commence without permission from the Property Owner.

#### D. Plugs

When plugs are inserted to control the flow, the Contractor is to monitor upstream components of the services and sewer collection system.

After the Work has been completed and restricting the flow is no longer needed for the work, then the flow is to be restored to normal. Flow is to be restored by removing the plugs in an order that permits flow to slowly return to normal without surcharging or causing other major disturbances downstream.

#### E. Service Disconnection

Services are to be disconnected preferably at the property line or intercepted with a vacuum at the exterior structure cleanout for all rehabilitation work. All work on property requires the Contractor to obtain written permission from the Property

Owner. Disconnected and intercepted sewer service flows are to be captured, collected and transferred to the sewer collection system downstream of the work. The Contractor is to restore all disconnected services unless it is in the Contract to abandon the sewer service.

Alternatively, the Contractor may request permission from Businesses, Property Owner(s) and Primary Resident(s) of single family and duplex structures for permission to block the service during the work or find alternative accommodations for residences.

**Article 5.5 Measurement**

Sewer flow control is to be measured on a lump sum basis regardless of the method used by the Contractor.

**Article 5.6 Basis of Payment**

Payment for this Work will be as specified in Division 10, Section 10.07 - Measurement and Payment.

All work including but not limited to disconnection, interception, plugging, bypassing, pumping around, public coordination, permitting, and repairing damage caused by sewer flow control is included in the lump sum price.

Payment will be made under the following units:

ITEM	UNIT
Sewer Main (8"Ø-16 Ø") Flow Control	Lump Sum
Sewer Main (16" Ø +) Flow Control	Lump Sum
Sewer Service (4" Ø) Flow Control	Lump Sum
Sewer Service (4" Ø +) Flow Control	Lump Sum

## **SECTION 50.06 EXISTING MANHOLE MODIFICATIONS**

### **Article 6.1 General**

The Work under this Section consists of rehabilitation of existing manholes, adjusting their grade, or providing new penetrations. The Contractor is to provide all labor, materials, and supervision required to furnish and install new manhole components needed to rehabilitate existing manholes.

Rehabilitation of existing manholes can include, but are not limited to the following items of Work:

- Removal and replacement of manhole covers and frames.
- Removal and replacement of grade rings.
- Removal and replacement of manhole ladder rungs.
- Removal and replacement of cone section.
- Removal and replacement of barrel ring/riser section.
- Removal and replacement of base section.
- Removal and replacement of entire manhole assembly.
- Remove entire manhole
- Furnish and install new pipe penetration

### **Article 6.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data.

The Contractor will prepare and submit a Work Plan to the Engineer that identifies how the manhole rehabilitation effort will proceed without interruption of existing sanitary sewer service. Where interruption is anticipated, the work plan is to contain Sewer Flow Control as required by other Sections in this Division. The plan will also address maintenance of vehicular traffic and pedestrian traffic. Manhole rehabilitation efforts may not proceed without the Engineer's acceptance.

See Section 50.03 - SANITARY SEWER CONCRETE STRUCTURES for submittal requirements for new material.

### **Article 6.3 Material**

The replacement component materials of construction to be deployed in the Work are to comply with the requirements of this Division, the Standard Details and Drawings. The Contractor must furnish new, unused materials for those manhole components identified in the Drawings to be replaced.

### **Article 6.4 Construction**

A. Re-use of components

The Contractor is to reuse those manhole components that are not to be replaced in assembly of the rehabilitated manhole. Where a component is to be re-used, the bid item will call out re-use or resetting of the component.

The Contractor must take due care not to destroy or damage existing component parts of manholes that are to remain or be reset in place. Damage by the Contractor that renders a component unusable is to be replaced by the Contractor with new material at no additional cost to the Owner or Utility Company.

The Engineer is to be notified when the Contractor finds that an existing component identified for re-use cannot be moved, adjusted, repaired or worked on without damaging the component. The Engineer is to investigate and respond to the Contractor with a final determination of the component's fitness to be re-used.

**B. Sewer Flow Control**

The Contractor is required to maintain sanitary sewer flows during the execution of the Work. Any Sewer Flow Control required to complete the Work will be considered incidental to the manhole rehabilitation effort and will not be paid for separately.

**C. Earthwork**

The Contractor is to excavate the manhole as needed to access the Work. All excavation, shoring, dewatering, backfill and compaction efforts required to access the Work is to be per Division 20 – Earthwork.

**D. Restoration**

Upon completion of the manhole assembly effort, the Contractor is to restore the existing grades and surrounding area to preconstruction conditions including but not limited to pavement, sidewalk, curb and gutter, landscaping, and other improvements or natural features disturbed and/or damaged by the manhole rehabilitation effort.

**E. Manhole Rehabilitation**

The Contractor is to remove and replace those manhole components identified in the Drawings. The rehabilitated manhole is to be re-constructed as required in the Contract Documents. Where the existing manhole does not meet current requirements, the manhole is to be improved to meet the current requirements. E.g. where a manhole scheduled to be rehabilitated and that manhole does not have polyethylene wrapping, then all new and re-used components are to be wrapped with polyethylene. Existing components not accessible are exempted from the upgrade requirements.

Where the Work requires disassembly and reuse of components that are assembled with grout and/or mastic/sealant/gasket materials, the Contractor must completely remove these materials from the components and replace them with new materials approved by the Utility Company for manhole construction in the reassembly of the rehabilitated manhole.

Where the Work requires the removal and replacement of existing ladder rungs, all ladder rungs within the existing manhole must be removed and replaced. The

Contractor must cut off existing rungs and grind smooth against the interior wall of manhole. New ladder rungs are to be installed per the Standard Details.

The Contractor is to dispose of manhole components not used in the manhole rehabilitation effort and all other unsuitable or waste materials created in the execution of the Work.

F. Component Part Replacements

The manhole components to be removed and replaced for a specific manhole are identified in the Drawings.

The Contractor must furnish and install barrel sections and grade rings to adjust the top of sanitary sewer manholes to grade as required in this Division and per the Drawings.

Installation of new sections is to be constructed to produce a smooth, regular, watertight surface.

G. Removal of Existing Manhole and Component Parts

Upon removal of manhole component parts, the Contractor is to clean and prepare existing component parts prior to installation of replacement parts. This will include, but not be limited to, removing existing grout and Ramnek-type sealant from remaining and connecting component parts.

Damage caused to component parts to remain by the removal of component parts is to be repaired by means acceptable to the Engineer.

Materials that can be reused (manhole covers, frames, etc.) are to be salvaged and removed in a workmanlike manner and delivered to the Utility Company's Operation and Maintenance Yard. Prior to removal, salvaging, and delivery the Contractor is to confirm salvageable parts are desired. The Contractor is to provide a disposal site for non-salvageable and rejected salvageable materials.

H. Connect to Existing Sanitary Sewer Manhole

Prior to connecting to the existing manhole, the Contractor is to excavate the existing manhole to clean and prepare the exterior surface. The downstream pipe in manholes must be screened to prevent entry of mortar or other debris from entering the system. Upstream pipe inverts entering the manhole are to be cleaned prior to the removal of the downstream screen. At no additional cost to the Owner, the Contractor may elect to install a sewer by-pass system.

Connections to existing manholes are to be made by core drilling the new penetration into the manhole, modifying the existing flow channel and installing a pipe to manhole connector to produce a water tight seal for each penetration at the invert elevations shown in the Drawings. The use of impact tools to form new penetrations is prohibited and will be cause for replacement of all damaged components of the manhole at no additional cost to the Owner.

Modification of the existing flow channel includes all work to modify and remove the existing flow channel concrete and forming new flow channels.

Pipes are to be stabbed into the manhole through the boots such that at least two inches (2") but no more than three (3") of pipe extend past the inside face of the manhole.

Connections to existing sanitary sewer manholes will be allowed only after all portions of the Contractor's Work tributary to the connection point has been cleaned and flushed, inspected and tested. Under certain conditions, connections prior to the completion of the system may be permitted subject to the Engineer's prior written approval and the provision of suitable and adequate debris and sand traps and sumps upstream from the connection.

If the connection to existing manhole occurs near the existing ladder rungs of the existing manhole, the Contractor must remove the existing ladder rungs and install new ladder rungs so that the ladder rungs are not above a pipe penetration. (The Contractor may rotate the barrel sections and cone section of the manhole rather than removing old ladder rungs and installing new ladder rungs.)

## **Article 6.5 Measurement**

Rehabilitated manholes and manhole components are to be measured as units complete in place with the components identified in the Drawings.

Unless specifically identified for payment under a separate bid item, the unit price bid to complete the Work includes all labor, equipment and materials to modify an existing manhole including but not limited to the following incidental items:

- Development of a Work Plan acceptable to the Engineer;
- temporary bypass piping;
- temporary sanitary sewer service;
- excavation;
- shoring;
- dewatering;
- backfilling;
- integrity testing;
- restoration of Work area to existing preconstruction conditions;
- import;
- export and disposal;
- disposal fees;
- backfill;
- compaction;
- grade adjustment;
- repair of damage to components to remain caused by the removal of components;
- and/or other items of Work needed to complete the manhole rehabilitation effort is to be considered incidental to the completion of the Work and will not be paid separately.

Component parts of existing or new manholes is to be included in the unit price for the bid item being constructed, reset, or replaced, and be paid for by a cumulative total of each unit constructed.



No measurement for Sewer Flow Control will be made. Sewer Flow Control is incidental to the bid item under construction.

Restoration of existing conditions is to be considered incidental to the manhole rehabilitation effort and will not be paid for separately.

**Article 6.6 Basis of Payment**

Payment for this Work is as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Payment will be made on the following basis:

ITEM	UNIT
Remove and Replace Manhole Cover and Frame (Manhole #)	Each
Remove and Reset Manhole Cover and Frame to Grade (Manhole #)	Each
Remove and Replace Manhole Grade Rings	Each
Remove and Replace Manhole Ladder Rungs	Each
Remove and Replace Manhole Cone Section (Manhole #, Height)	Each
Remove and Replace Manhole Barrel Ring/Riser Section (Manhole #, Type, Number of Rings Replaced, Depth Below Grade measured to bottom of lowest ring to be replaced)	Each
Remove and Replace Manhole Base Section (Manhole #, Type, Depth of Base Section Below Grade measured to the bottom of base section)	Each
Remove Existing Sanitary Sewer Manhole	Each
Connect to Existing Sanitary Sewer Manhole (Size)	Each

## **SECTION 50.07 SEWER CLOSED CIRCUIT TELEVISION INSPECTIONS**

### **Article 7.1 General**

The Work under this Section consists of providing all operations associated with video inspection and recording of sewer assets.

Sewer mainline Closed Circuit Television (CCTV) work is to be completed by a currently certified National Association of Sewer Service Companies (NASSCO) camera operator in the specialty of Pipeline Assessment and Certification Program (PACP). The sewer mainline CCTV video inspection is to code observations and defects as specified in the PACP reference manual (version 6.0.1).

Video inspections for other sewer assets (non-mainline) do not require NASSCO certification.

This Work may be required multiple times and at different phases of construction. Sewer line cleaning, flow control and atmospheric conditioning will be required to obtain access, ease camera travel, remove visual impediments and remove debris. Traffic control may be required to access sanitary sewer manholes, cleanouts, pipes and other sewer assets. The MOA makes no warranty as to the condition of the pipe, manholes or access points.

### **Article 7.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. Submittals, at a minimum, are to include applicable items identified below:

- Video
- PACP data
- Sewer flow control, when required
- CCTV Equipment, when requested

### **Article 7.3 Material**

CCTV equipment includes vehicles, computers, software programs, viewing devices, cameras, cables, portable power sources, lights, blowers, winches and all related equipment needed to satisfactorily complete a CCTV inspection.

The camera is to process video in color with a lens having a focal distance between one inch (1”) and infinity ( $\infty$ ), be capable of autofocus, manual focus and have an adjustable iris. The in-pipe target is to be viewable with the camera at a perpendicular angle to the target and the camera at zero zoom. For cameras with zoom lens capability, calibration and in-pipe measurements are to be taken at zero zoom. Analog Video output and capture is to be a minimum of 400 lines per inch.

The camera is to be transporter mounted for six inch diameter (6”Ø) and larger pipe line inspections, have built in lighting with pan and tilt capabilities of 360° rotation and 270° tilt. Illumination is to be adjustable and capable of providing a clear and well lit picture. Lighting is to be planned and executed based upon the size and type of pipe being inspected.

Push cameras may be used to video sewer services which are typically less than eight inches (8") in diameter. Push cameras are to have built in lighting, be self-leveling, be flexible for navigating around bends, and have a sonde device. Push cameras may be used from the ground surface or transporter mounted for use from within the mainline pipe for lateral inspection. Push cameras are not to be used as the primary image source for pipes six inch diameter (6"Ø) and larger.

CCTV performed using digital high-resolution camera(s) equipped with wide angled lenses(s) that provide three hundred and sixty degree (360°) spherical and side scanning capabilities that provide "unfolded" views of the pipe, and propelled by a transporter that travels faster than 30 feet per minute, may be used as an alternative to a pan and tilt camera / transporter. This alternative will only be used if the Contractor can comply with all other requirements of this specification section.

Pole mounted cameras may be used to video manholes and pipe connections.

All in pipe equipment is to be certified to operate in conditions found in wet/submerged sewer pipes and manholes without adverse effects to the equipment or the sewer system. Typically this will require, but not limit, the camera to operate in grease, sludge, mud, gravel, one hundred percent (100%) humidity, and other adverse environments.

#### **Article 7.4 Construction**

Where required, the Contractor is to complete a CCTV inspection at the following points of construction;

- Condition Assessment – The primary goal of this inspection is to document the condition of an existing sewer asset through the use of PACP codes, video and photographic documentation. This information will assist engineers and planners to plan and prioritize any needed repairs.
- Pre-rehabilitation – This inspection takes place prior to the rehabilitation of a sewer asset to look for places that may interfere with the planned rehabilitation. This inspection does not require PACP coding. The video and photographic documentation is to be provided to the Engineer for review prior to beginning rehabilitation.
- Prior to Acceptance of New Pipe – Prior to acceptance of newly installed pipe a CCTV inspection is to look for deficiencies in the work. If no deficiencies are found the CCTV of sewer pipe is to set baseline condition of the newly installed pipe from which future CCTV inspections will used to document changes in the condition of the pipe. PACP coding is required.
- Post rehabilitation – This inspection takes place after rehabilitation of the pipe has been accomplished and will be used to determine Substantial Completion. PACP coding is required.
- Rehabilitation acceptance – This inspection will take place approximately one month prior to the end of the Warranty Period. It is the responsibility of the Contractor to request CCTV the rehabilitated sewer asset. The Warranty will be automatically extended to 30 days past the Rehabilitation Acceptance CCTV or Warranty expiration date, whichever is later. PACP coding is required.

The Engineer or their designee is to be provided unobstructed access to CCTV facilities from set up to tear down of the CCTV equipment. During the CCTV inspection the Engineer or their designee may require the Contractor to backup, adjust the camera and investigate with the CCTV equipment any points they may deem of interest.

The Engineer will review the CCTV video and PACP observations and defect codes to determine conformance with the specification. The Contractor is to correct deficiencies where the video and coding do not meet the standards stated herein at no additional cost to the Owner.

#### A. Sewer Main CCTV Inspection

The camera is to be centered in the pipe and move in a downstream direction at a uniform rate stopping and recording all joints and points of coding. At no time is the rate to exceed a rate of thirty feet per minute (30 ft/min). When the camera is not able to complete the inspection, after several attempts and cleaning of the sewer pipe, then the inspection of the current segment is to be abandoned and started from a reverse setup going against the sewer flow.

The camera lens is to be kept clear of condensation, oils, grease and debris during the CCTV inspection. Lighting intensity is to be adjusted to minimize glare. Picture quality must be adjusted to provide a clear in-focus picture of the entire periphery of the pipeline.

The Contractor is to record and code the sewer mainline inspection using PACP codes in a NASSCO certified software. The Engineer will provide the sewer main names to the Contractor. The Contractor is to request a list of the NASSCO PACP non-mandatory fields that are required to successfully complete the CCTV inspection from the Engineer. If an unknown/new access point is found or created to CCTV the sewer pipe, then the Contractor is to obtain the name from the Engineer.

The Contractor is to complete a thorough examination of stopping points prior to continuing the inspection. The following partial list of required stopping points are provided below and a more complete list is provided in the NASSCO PACP requirements.

- Manholes – Pipe penetrations, flow channel, bench, and barrel sections are to be videoed.
- Joints – camera shall rotate 360° to provide a potential view of all portions of the joint. The rotation is to occur at a metered rate over no less than twenty seconds.
- Cracks and fractures – provide a close up view of the point of interested (POI) and a perspective view indicating the extent and/or length of the POI and how close the nearest pipe joint is.
- Holes, breaks, lining failures and/or deformations – provide a close up and perspective view of the POI. Adjust the view to make apparent any voids behind the POI.

- Service connects – inspect the hole cut into the pipe and associated repairs at all service connections.
- Changes in alignment, sags or crests – The view should be long enough and lit such that the change can be estimated.

Video and photographs are to be captured but not coded for sewer assets that are not sewer mainlines.

## B. Sewer Cleaning

The Contractor is to clean the sewer lines for sewer CCTV by removing grit, loose solids, grease, and any debris that is present. All debris is to be trapped at the end of the CCTV inspection run and properly hauled off and disposed.

Sewer line cleaning is to be accomplished using a high velocity jet or mechanically powered equipment. Selection of the equipment used is to be based on the condition of the sewer line at the time the work commences.

The Contractor is to take due care to avoid damaging the pipe or impact connected sewer customers.

Cleaning is to be completed by the Contractor within 144 hours and no less than one hour prior to inspection.

## 3. Flow Control

CCTV video will not be accepted when the water depth is greater than twenty percent (20%) of the pipe diameter for pipes twelve inch in diameter (12"Ø) and smaller. Larger pipes will have an additional five percent (5%) allowance.

Flow control is required for the successful completion of the CCTV inspection. The Contractor is to work with property owners, schedule inspections at low usage times, assist with a high velocity hydraulic jet, provide sewer flow control or any combination of the above to meet the water depth requirement.

## 4. Distance Measurement

The distance is to be measured between the exit of the start manhole and the entrance of the finish manhole for a true measurement of the length of the pipe segment, as required by PACP. It shall be recorded in standard units and the video display readout shall display units to one-tenth of a foot. The camera cable shall be retracted to remove slack to ensure an accurate footage reading. The cable footage counter is to be accurate to the nearest third of a foot (1/3') except where a higher accuracy is required to reinstate services. Accuracy to reinstate services is to be to the nearest inch.

## 5. Deliverables

A minimum of two digital photos are to be taken of each defect, one showing a perspective view and one showing a close up view. The photo is to have on-screen information such as the distance into the inspection, the starting asset number and the ending asset number.

The Contractor is to submit to the Engineer within five days of completing the CCTV inspection video files, photographs, and the sewer main inspection

database. The database will be in an unmodified NASSCO-PACP Certified database with a MS Access format. Photographs, video, folders, and other data will be properly referenced within the Contractor's database. This integration will provide a seamlessly export from the Contractor's NASSCO-certified PACP software and then import into the AWWU's NASSCO-certified PACP software. CCTV inspection data from the Contractor that cannot be seamlessly imported will be cause for rejection.

This may be provided on CD's, DVD's USB Thumb Drives, or portable hard drive.

Recorded images showing steam, inadequate lighting, or poor image quality will be cause for rejection.

If the Engineer determines that corrections are needed, the documentation is to be resubmitted after corrective action has taken place.

### **Article 7.5 Measurement**

CCTV measurement is not to overlap and is to occur once per bid item under which it is being paid for regardless of the number of times the CCTV camera views any one piece of pipe during that pay item. Measurement of footage is to be based on footage counter shown in the video.

### **Article 7.6 Payment**

Payment for this Work is to be as specified in Division 10, Section 10.07 - Measurement and Payment, and include full payment for all Work described in this Section. Payment includes all labor, tools, equipment, apparatus and incidentals required to complete the Work. At a minimum, no additional payment will be granted for setups, reverse setups, tear downs, relocation, overlapping video footage per bid item, lost or damaged equipment, property owner coordination, and jetting during CCTV activities. Sewer flow control is considered incidental, unless provided for as a bid item.

Payment will be made under the following units:

ITEM	UNIT
Sewer line cleaning for CCTV	Linear Foot
Condition Assessment CCTV	Linear Foot
Acceptance of New Pipe CCTV	Linear Foot
Pre-rehabilitation CCTV	Linear Foot
Post Rehabilitation CCTV	Linear Foot
Rehabilitation Acceptance CCTV	Linear Foot

## **SECTION 50.08 REMOVE AND DISPOSE OF EXISTING CESSPOOLS OR SEPTIC TANKS**

### **Article 8.1 General**

The Work under this Section consists of providing all operations for removing and disposing of existing cesspools or septic tanks.

Disposal of Unusable or Surplus Material, import of Classified Fill and Backfill, providing Sanitary Sewer Flow Control, construction of the Sewer Service Connection and Construction of the Sewer Service Extension are to be constructed and paid for under the appropriate bid item.

### **Article 8.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. Submittals for this Work will include a plan for removal and disposal of the septic tank and is to include at a minimum disposal locations and approvals.

### **Article 8.3 Construction**

The following procedures apply for removing cesspools or septic tanks:

1. The liquid and sludge from the existing structure is to be pumped into a watertight container and transported to and disposed of at an approved sanitary sewer dump station. Care is to be exercised in transporting cesspool liquid and sludge so that no spillage occurs during transport and disposal.
2. Remove and dispose of any remaining sludge, septic tank, cesspool or privy pit, logs or cribbing, and saturated gravel remaining in the trench area. Disposal of this material must be at a Contractor provided disposal area approved by the Municipality of Anchorage Department of Health and Human Services and the Engineer.
3. Fill the void created by removal of the cesspool with Type III material as specified in Division 20, Section 20.21 – Classified Fill and Backfill.
4. As soon as the downstream portion of the new sanitary sewer has been tested and accepted, the Contractor is to furnish and install a sewer service connection and extension to the existing service line that drained into the cesspool or septic tank.
5. Schedule inspection of the abandoned systems with AWWU Field Service office. The abandoned disposal system must be shown on the record drawings.

### **Article 8.4 Measurement**

Removal of existing cesspool or septic tank with the associated drainfield is to be measured per each unit.

Disposal of logs, cribbing, tanks and saturated gravel will be measured as unsuitable material.

**Article 8.5 Basis of Payment**

Payment for this Work will be as specified in Division 10, Section 10.07, -Measurement and Payment, and includes full payment for all Work described in this Section.

Payment will be made on the following basis:

ITEM	UNIT
Remove Cesspool or Septic Tank and Drain Field	Each



**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

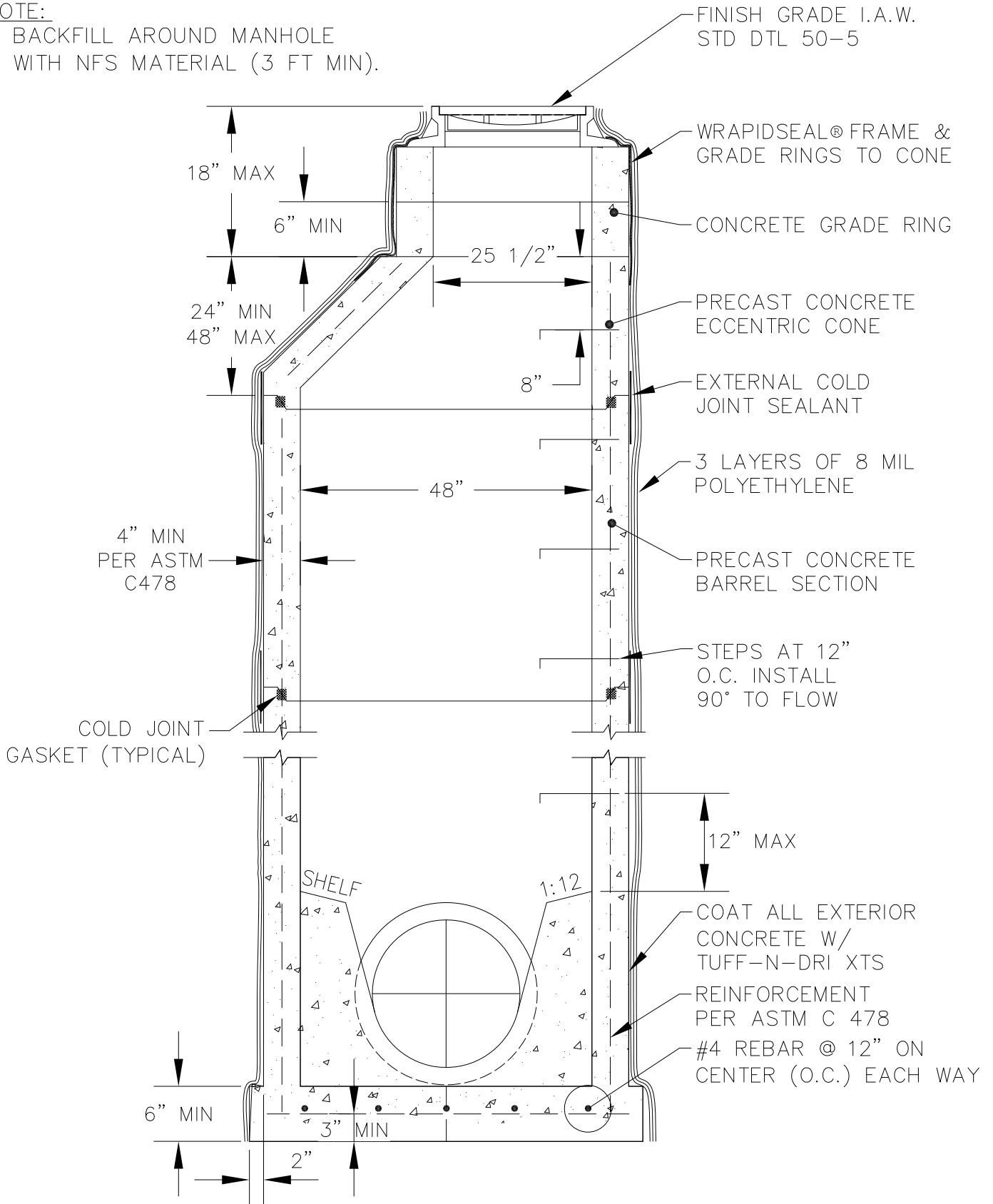
**DIVISION 50  
SANITARY SEWERS  
STANDARD DETAILS**

**STANDARD CONSTRUCTION SPECIFICATIONS  
DIVISION 50  
INDEX OF STANDARD DETAILS**

50-1	Sanitary Manhole - Type A - Pipe 8" to 24"
50-2	Sanitary Manhole - Type B - Pipe Dia 30" to 36"
50-3	Sanitary Manhole - Type C - Pipe Dia 40" to 48"
50-4	Type A and B Manhole Base Plan
50-5	Manhole Heights
50-6	Copolymer Polypropylene Manhole Step
50-7	Sewer Service Connect for On-Site Lift Station 1-1/2" and 2"
50-8	Manhole Cover
50-9	Manhole Frame
50-10	Watertight Manhole Ring
50-11	External Drop Connection
50-12	Internal Drop Connect
50-13	Typical Beaver Slide Manhole
50-14	Sanitary Sewer Service (Complete)
50-15	Large Diameter Lateral Connection to Concrete Pipe
50-16	New Construction of Sewer Lines Service Riser/Top Entry for Deep Sewer – Ductile Iron
50-17	Sanitary Sewer Service Connection (R.O.W. Only)
50-18	Sanitary Sewer Cleanout Cover
50-19	Sanitary Cleanout
50-20	Special Manhole and Cleanout Detail (inside protective well radius)
50-21	Special Manhole and Cleanout Detail (inside protective well radius)
50-22	Special Manhole and Cleanout Detail (inside protective well radius)
50-23	Horse Shoe Sanitary Sewer Manhole Detail
50-24	Contractor Field Installation Notes Sanitary Example
50-25	Manhole Cone Adjustment
50-26	Manhole Ring Adjustment
50-27	Steep Sewer Riser

**NOTE:**

1. BACKFILL AROUND MANHOLE WITH NFS MATERIAL (3 FT MIN).



SCALE:  
NTS

APPROVED:

REVISED:  
01/2015

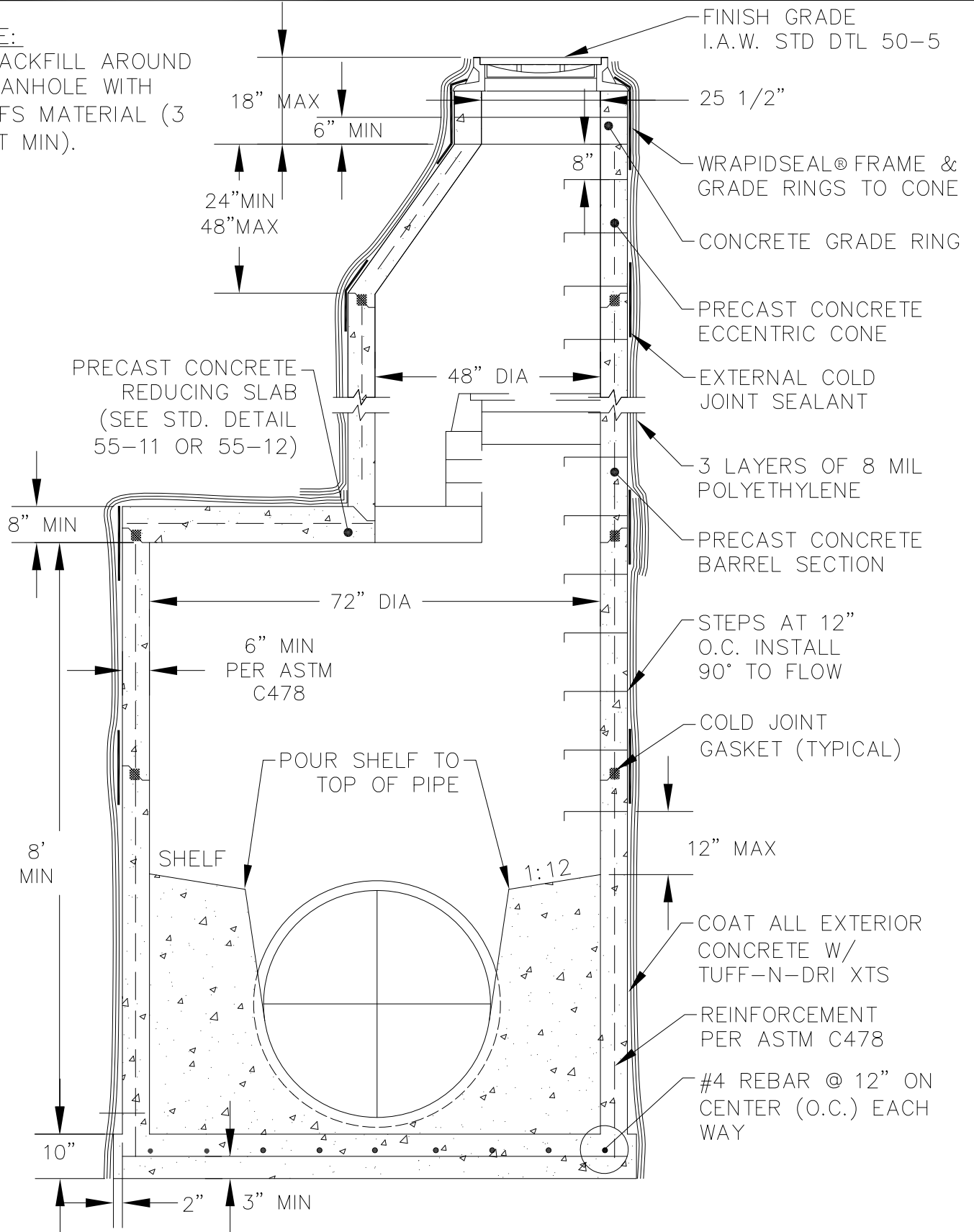
**SANITARY MANHOLE  
TYPE 'A'  
PIPE 8" TO 24"**

SECTION #  
50.03

DETAIL #  
50-01

**NOTE:**

- BACKFILL AROUND MANHOLE WITH NFS MATERIAL (3 FT MIN).



SCALE:  
NTS

APPROVED:

REVISED:  
01/2015

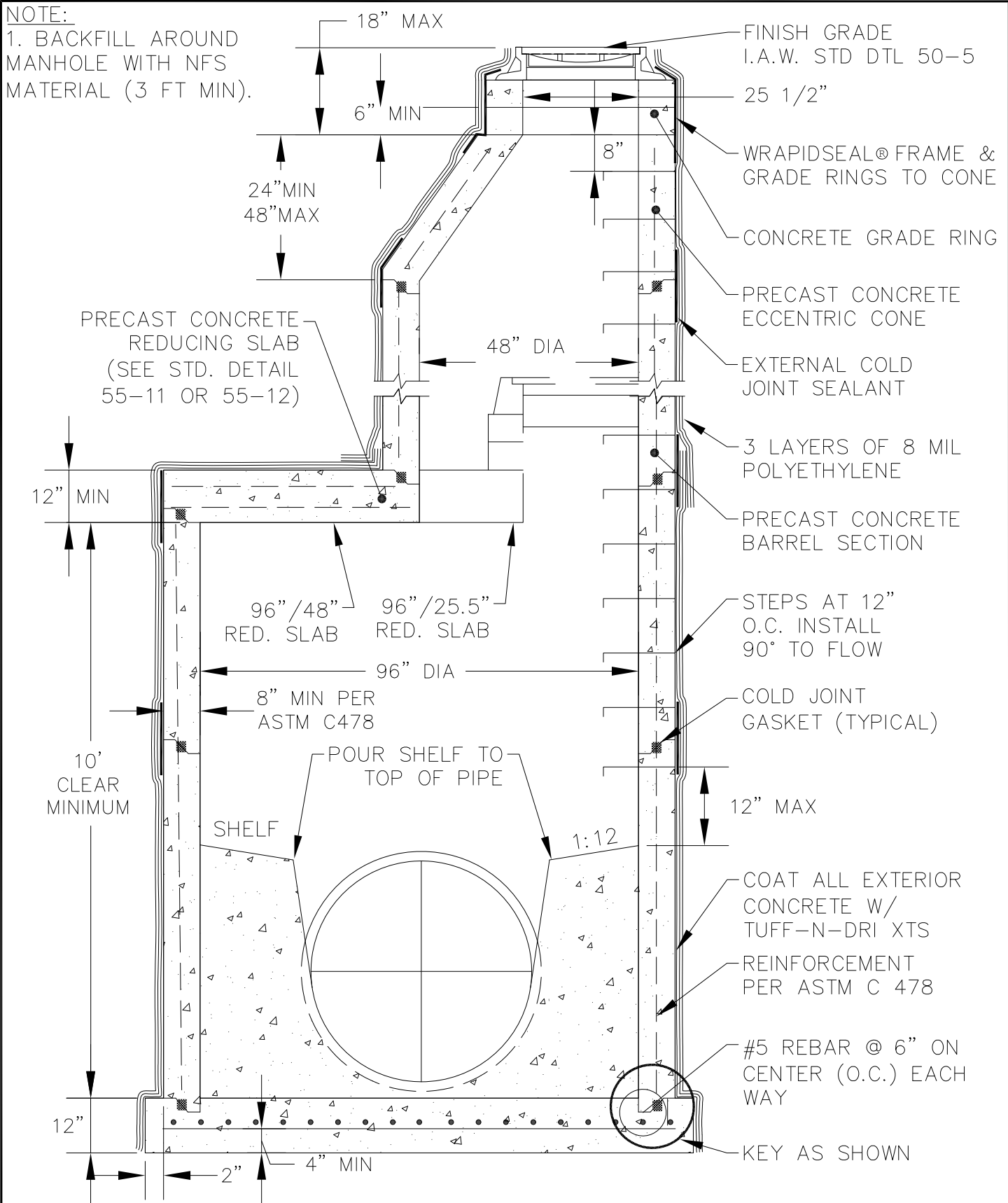
**SANITARY MANHOLE  
TYPE B  
PIPE DIA. 30" TO 36"**

SECTION #  
50.03

DETAIL #  
50-02

**NOTE:**

1. BACKFILL AROUND MANHOLE WITH NFS MATERIAL (3 FT MIN).



SCALE:  
NTS

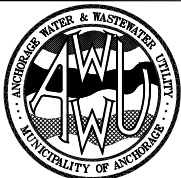
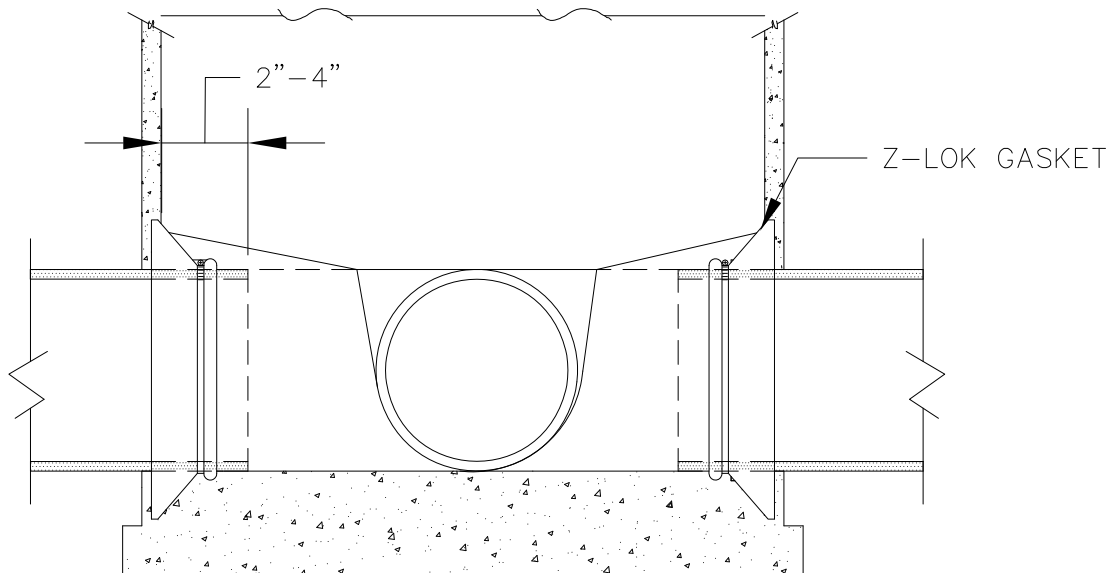
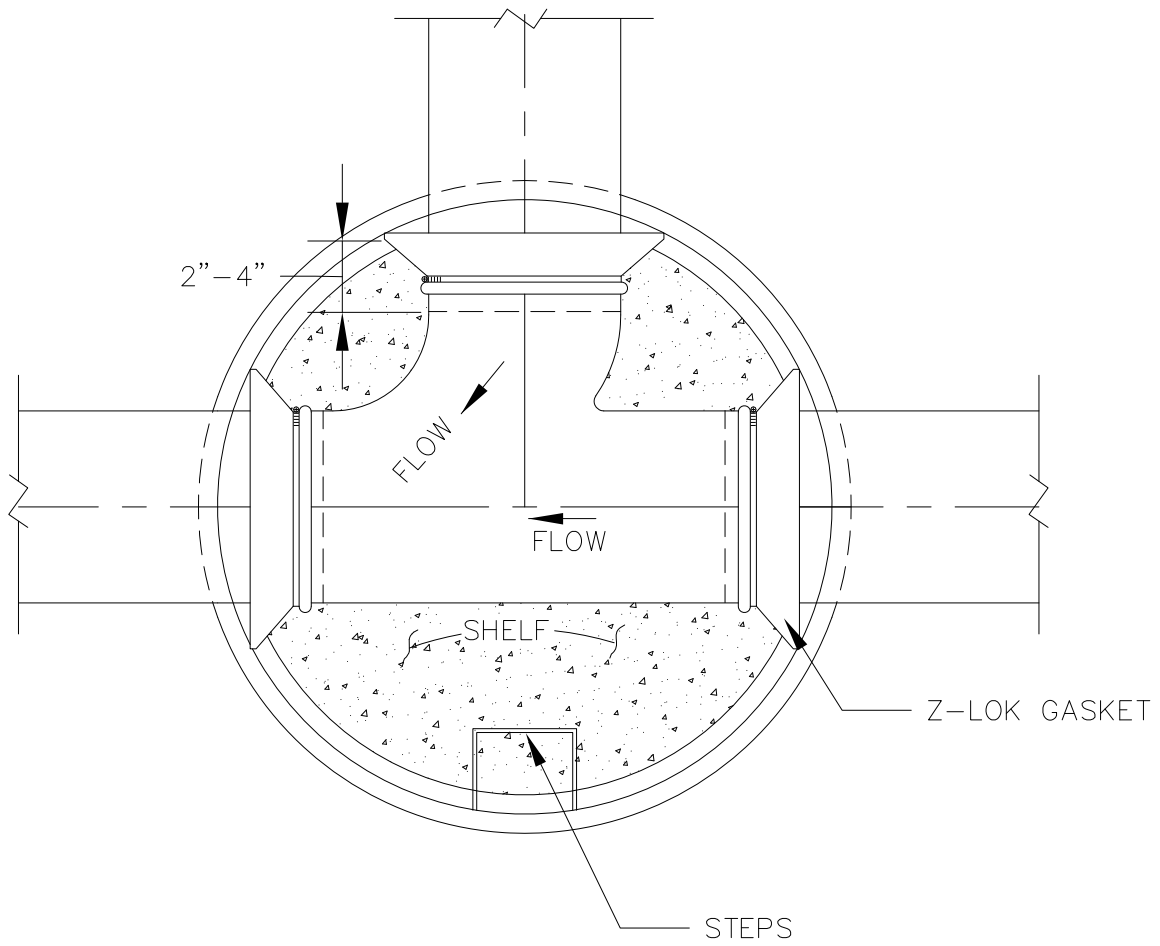
APPROVED:

REVISED:  
01/2015

**SANITARY MANHOLE  
TYPE C  
PIPE DIA. 40" TO 48"**

SECTION #  
50.03

DETAIL #  
50-03



SCALE:  
NTS

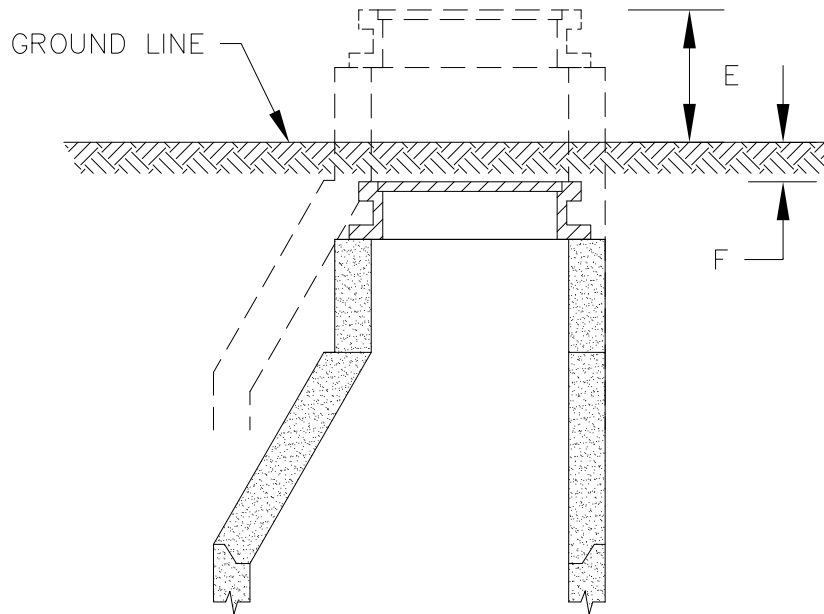
APPROVED:

REVISED:  
01/2015

## TYPE A AND B MANHOLE BASE PLAN

SECTION #  
50.03

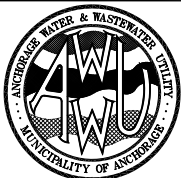
DETAIL #  
50-04



LOCATION	E-MIN	E-MAX	F-MIN	F-MAX
LANDSCAPED AREAS, GRAVEL STREETS, AND ALLEY AREAS WHERE TRAVELED.			0"	2"
UNDEVELOPED AND SWAMPY AREAS. <sup>1</sup>	24"	36"		
ASPHALT PAVED VEHICLE SURFACES. (FEATHER PAVEMENT AT EDGE TO SMOOTH TRANSITION)			1/2"	1"
ASPHALT PAVED PEDESTRIAN SURFACES. <sup>2</sup>			0"	1/2"
CONCRETE PAVED PEDESTRIAN SURFACES.			0"	1/4"

NOTES:

1. MANHOLES WITHIN THE CLEAR ZONE SHALL MEET CLEAR ZONE REQUIREMENTS.
2. PAVEMENT AROUND MANHOLES INSTALLED MORE THAT 1/4" BELOW GRADE SHALL BE BEVELED WITH A SLOPE NOT STEEPER THAN 50 PERCENT.



SCALE:  
NTS

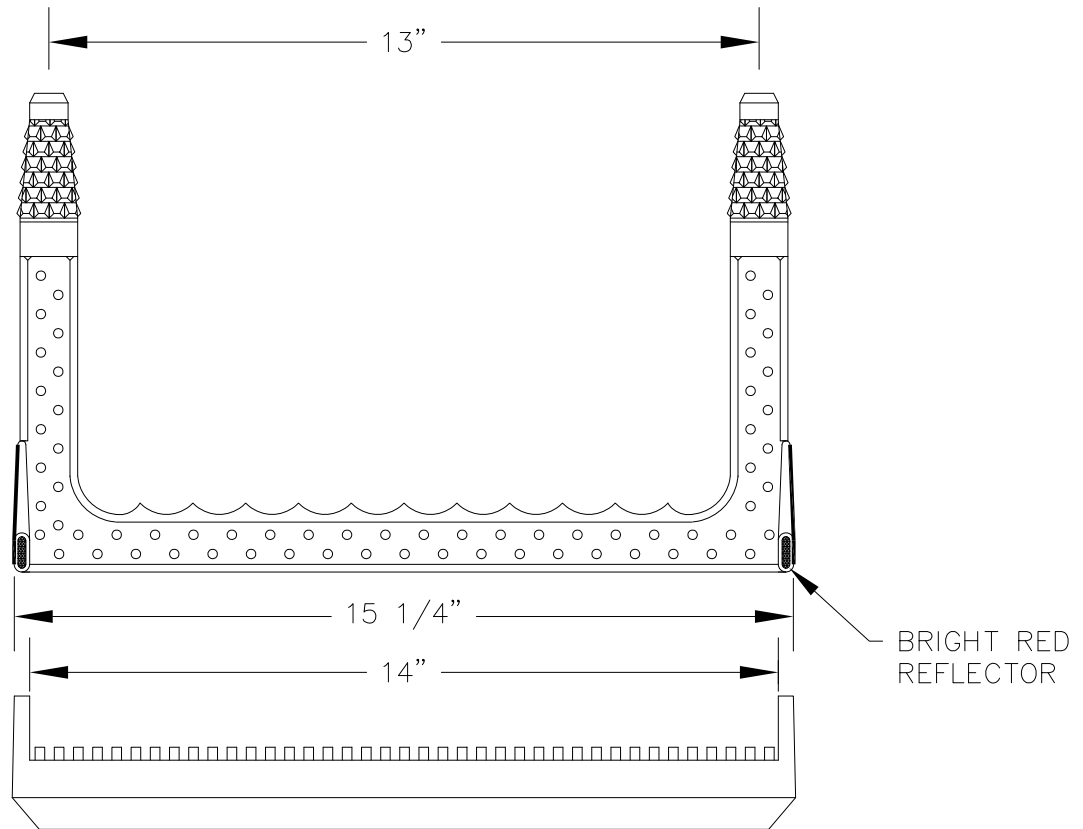
APPROVED:

REVISED:  
2/2024

## MANHOLE HEIGHTS

SECTION #  
50.03

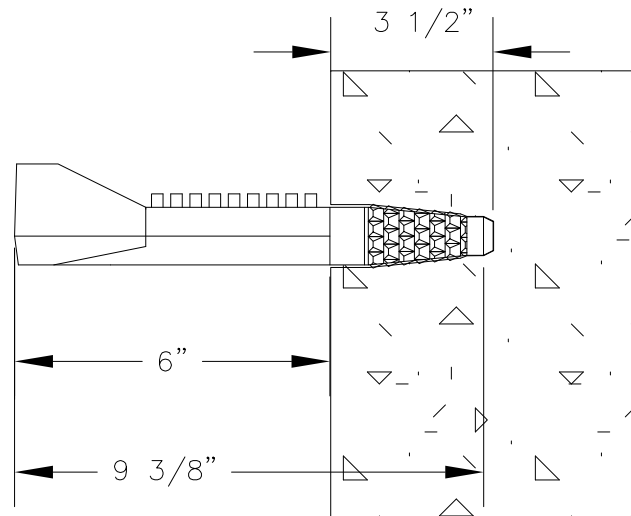
DETAIL #  
50-05



INJECTION MOLDED  
COPOLYMER  
POLYPROPYLENE

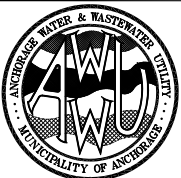
1/2"

#4 DEFORMED  
STEEL BAR



NOTE:

1. DRIVE RUNG INTO PREFORMED OR DRILLED HOLES WITH A 6 TO 10 LB. SLEDGE HAMMER, AFTER CONCRETE IS CURED TO 3000 PSI MIN.
2. THE INSTALLED STEP SHALL RESIST A PULLOUT FORCE OF 1500 LBS.



SCALE:  
NTS

APPROVED:

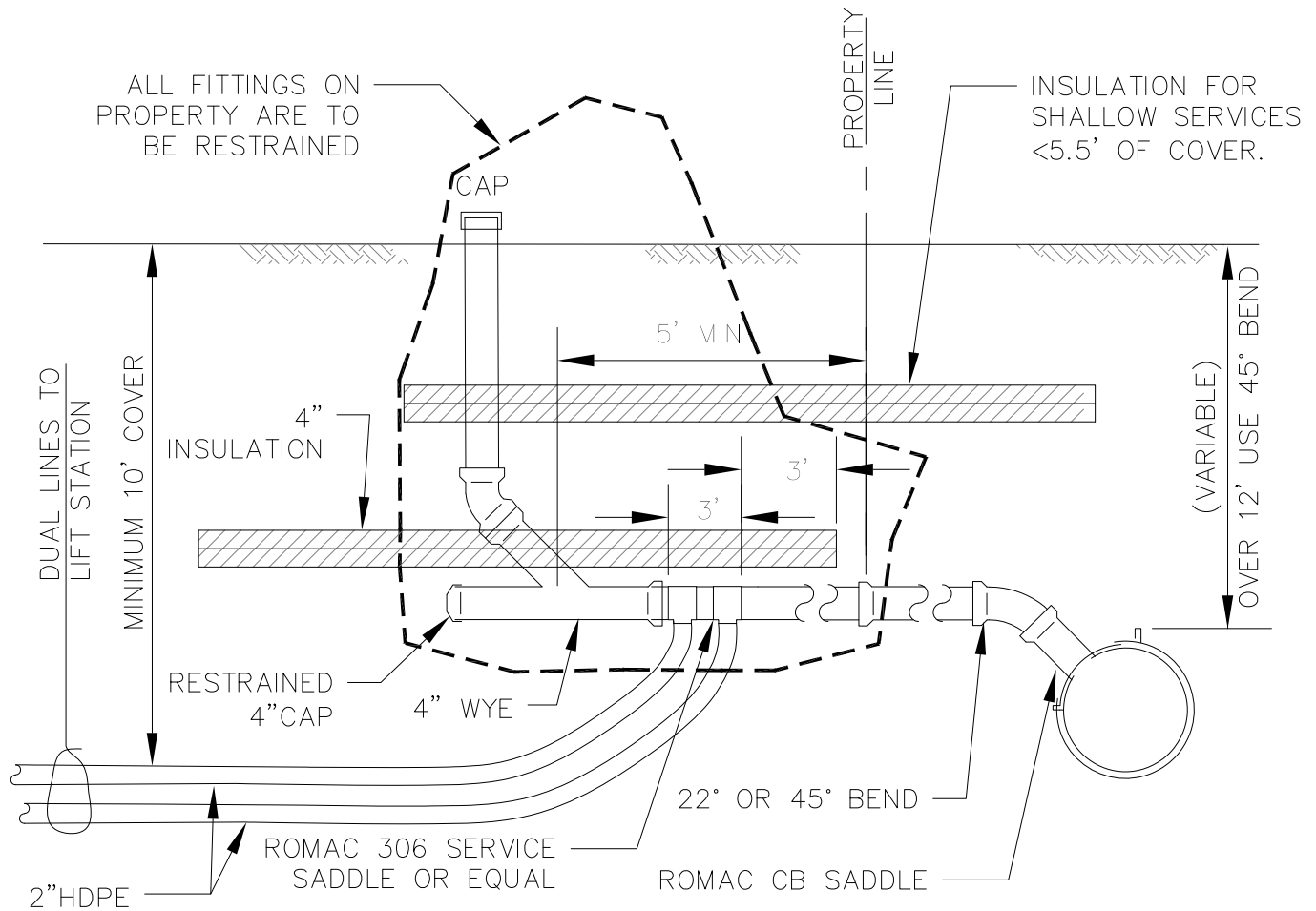
REVISED:  
01/2015

## COPOLYMER POLYPROPYLENE MANHOLE STEP

SECTION #  
50.03

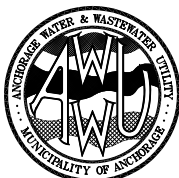
DETAIL #  
50-06





NOTES:

1. THE USE OF HDPE ARCTIC PIPE WITH ELECTRIC HEAT TRACE SHALL ONLY BE USED WITH PRIOR WRITTEN APPROVAL BY AWWU ENGINEERING. ENDS OF HEAT TRACE CHANNEL SHALL BE SEALED WATER TIGHT.



SCALE:  
NTS

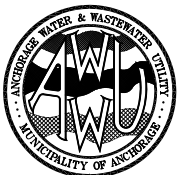
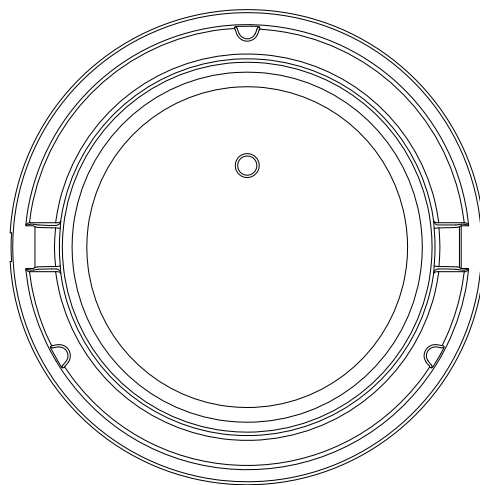
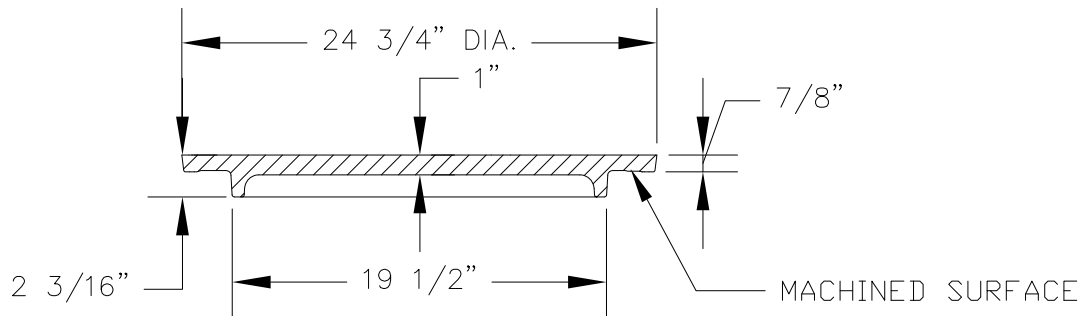
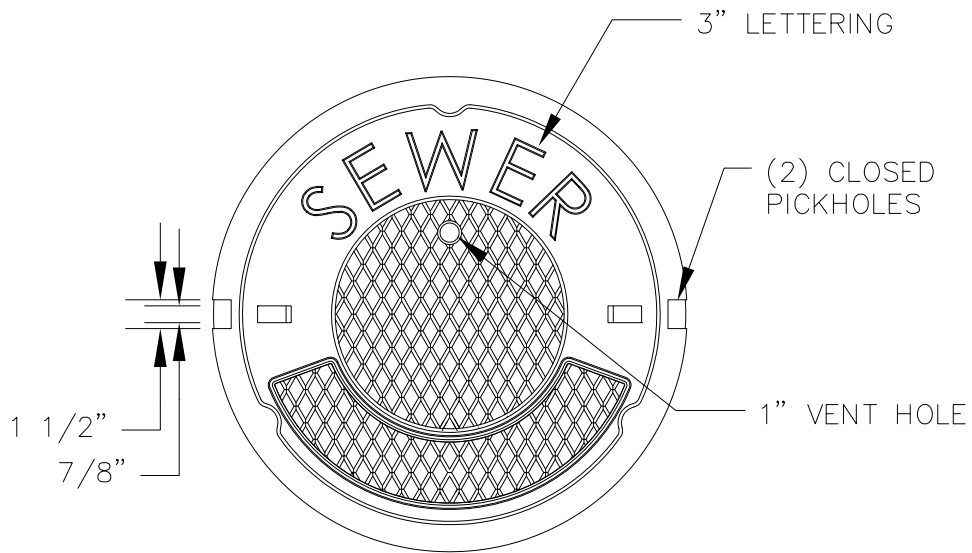
APPROVED:

REVISED:  
3/2024

## SEWER SERVICE CONNECT FOR ON-SITE LIFT STATION 1-1/2" AND 2"

SECTION #  
50.03

DETAIL #  
50-07



SCALE:  
NTS

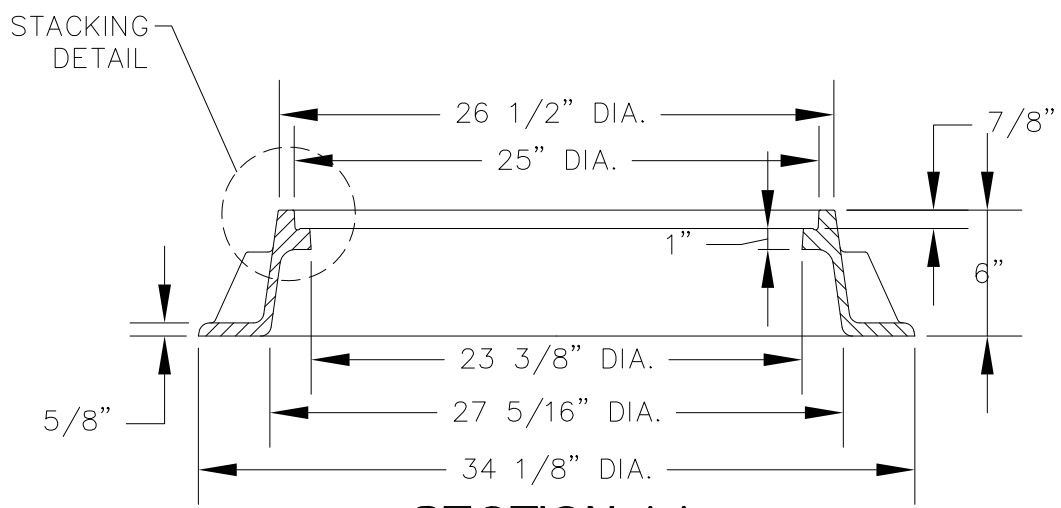
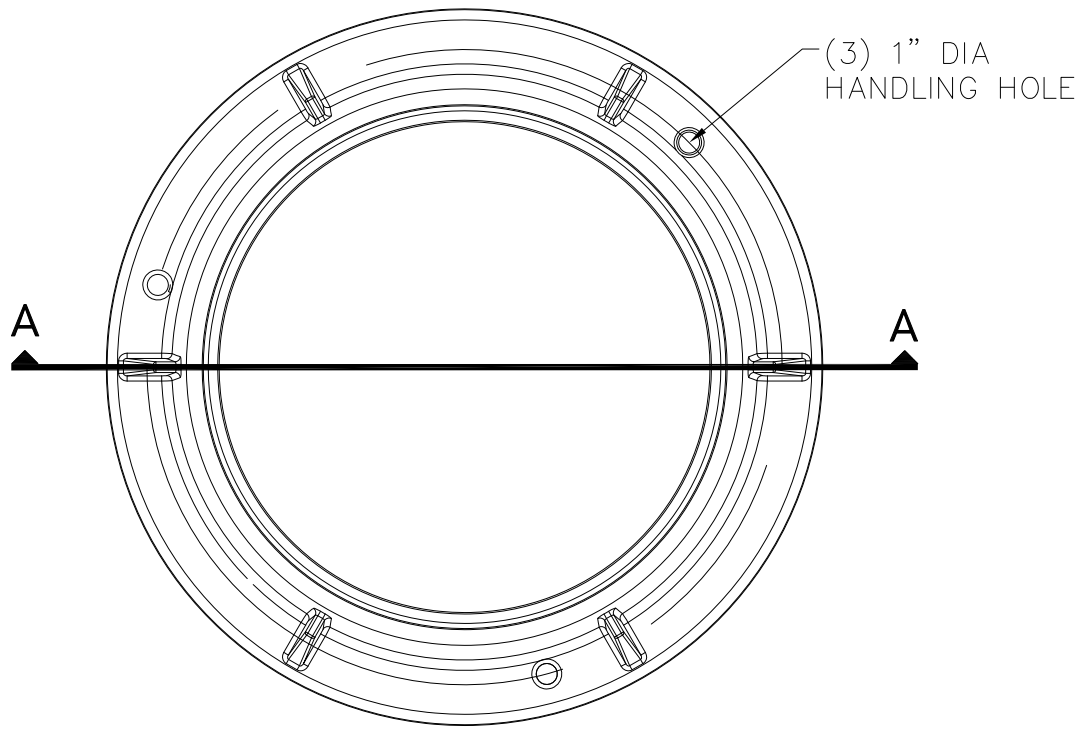
APPROVED:

REVISED:  
01/2015

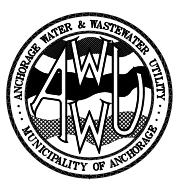
## SEWER MANHOLE COVER

SECTION #  
50.03

DETAIL #  
50-08



**SECTION AA**



SCALE:  
NTS

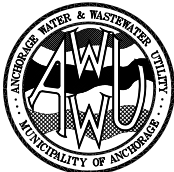
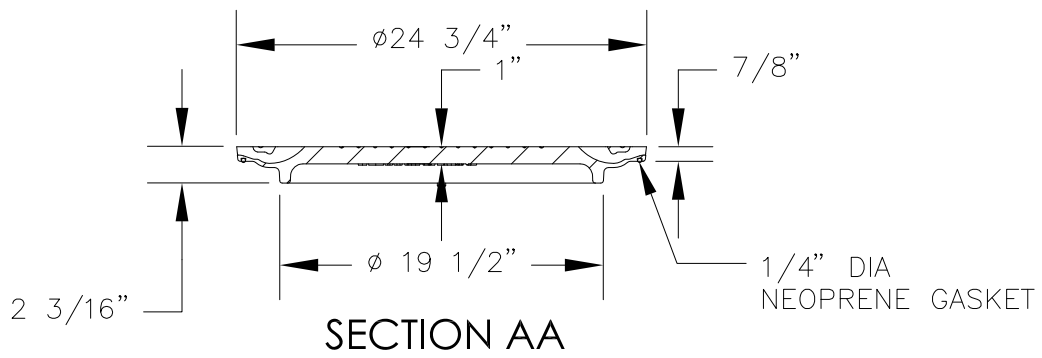
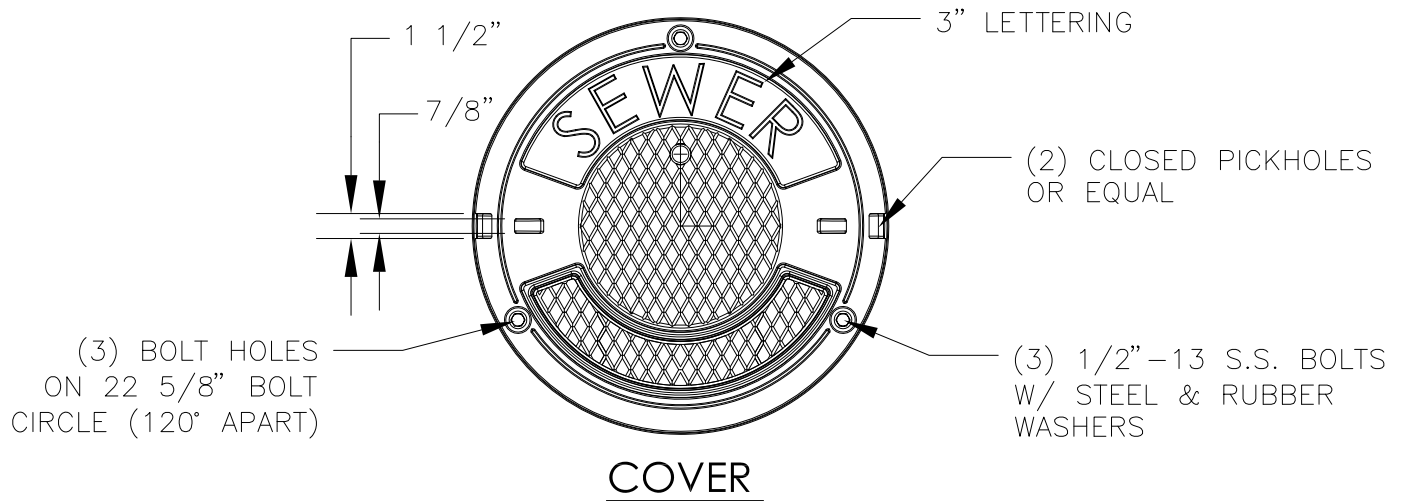
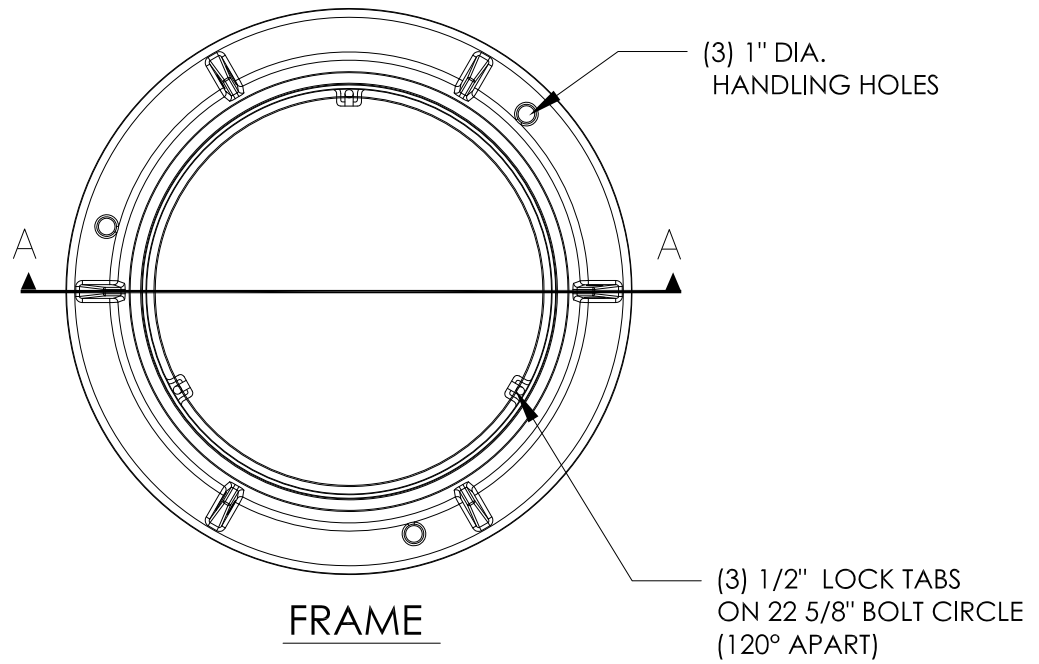
APPROVED:

REVISED:  
01/2015

**MANHOLE FRAME**

SECTION #  
50.03

DETAIL #  
50-09



SCALE:  
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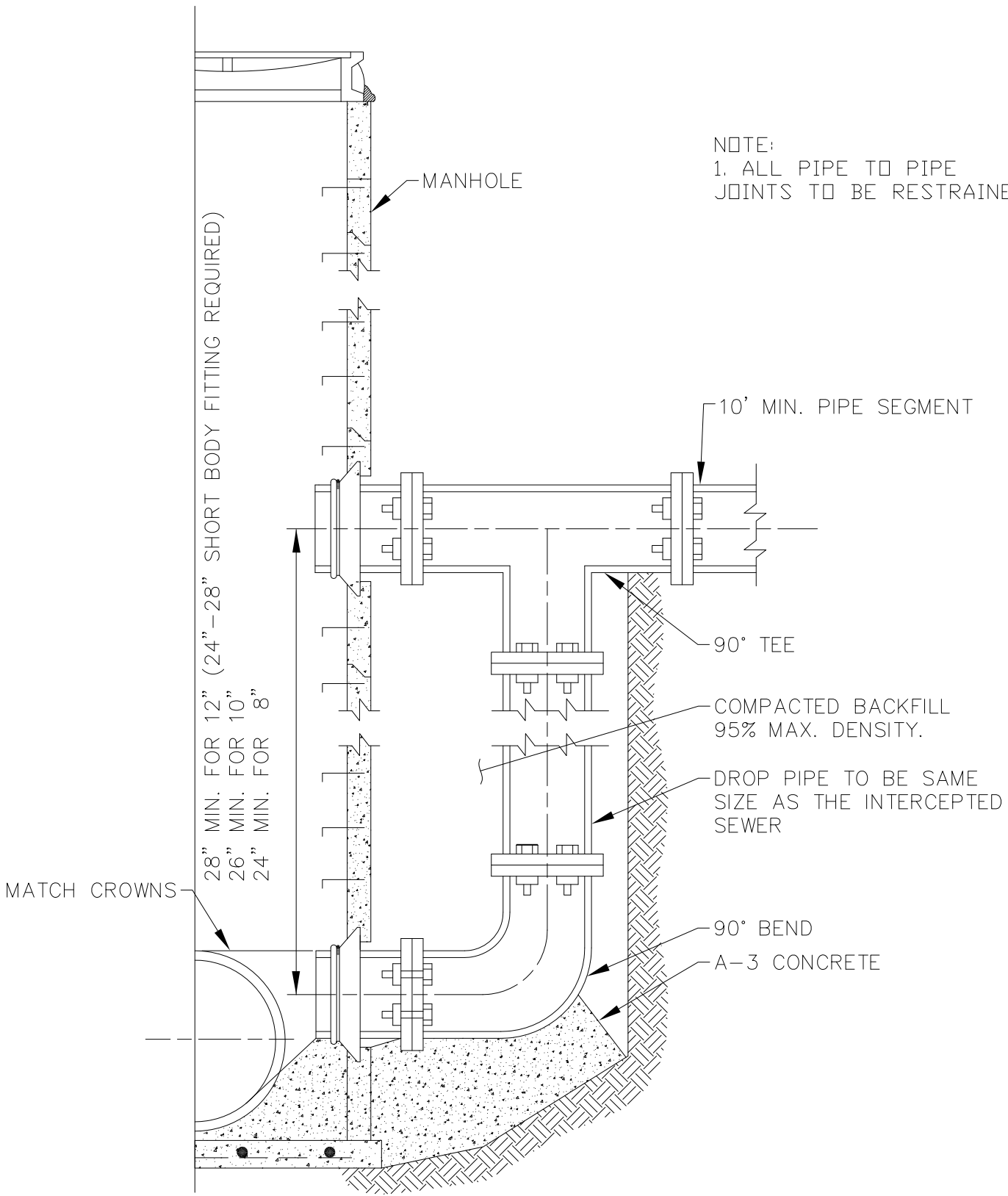
APPROVED:

REVISED:  
1/2015

# WATERTIGHT MANHOLE RING

SECTION #  
50.03

DETAIL #  
50-10



NOTE:  
 1. ALL PIPE TO PIPE JOINTS TO BE RESTRAINED

28" MIN. FOR 12" - 28" SHORT BODY FITTING REQUIRED  
 26" MIN. FOR 10"  
 24" MIN. FOR 8"

MATCH CROWNS

10' MIN. PIPE SEGMENT

90° TEE

COMPACTED BACKFILL  
 95% MAX. DENSITY.

DROP PIPE TO BE SAME  
 SIZE AS THE INTERCEPTED  
 SEWER

90° BEND

A-3 CONCRETE



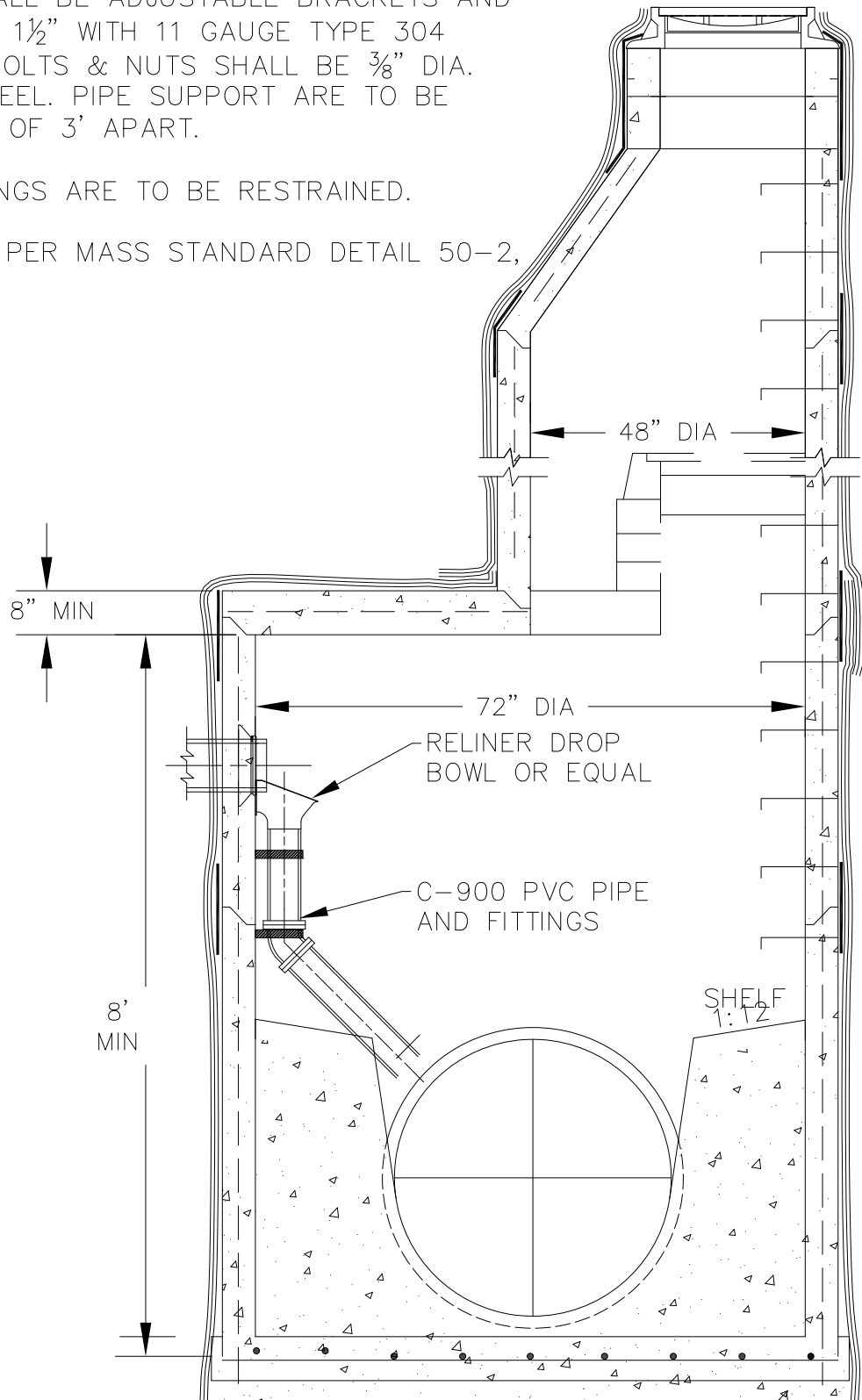
SCALE:  
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 APPROVED:  
 REVISED:  
 01/2015

# EXTERNAL DROP CONNECTION

SECTION #  
 50.03  
 DETAIL #  
 50-11

NOTE:

1. PIPE SUPPORTS SHALL BE ADJUSTABLE BRACKETS AND SHALL BE MADE OF 1½" WITH 11 GAUGE TYPE 304 STAINLESS STEEL. BOLTS & NUTS SHALL BE ¾" DIA. 18-8 STAINLESS STEEL. PIPE SUPPORT ARE TO BE SPACED A MINIMUM OF 3' APART.
2. ALL PIPE AND FITTINGS ARE TO BE RESTRAINED.
3. MANHOLE IS TO BE PER MASS STANDARD DETAIL 50-2, TYPE "B".



SCALE:  
NTS

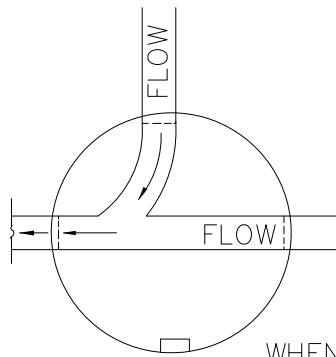
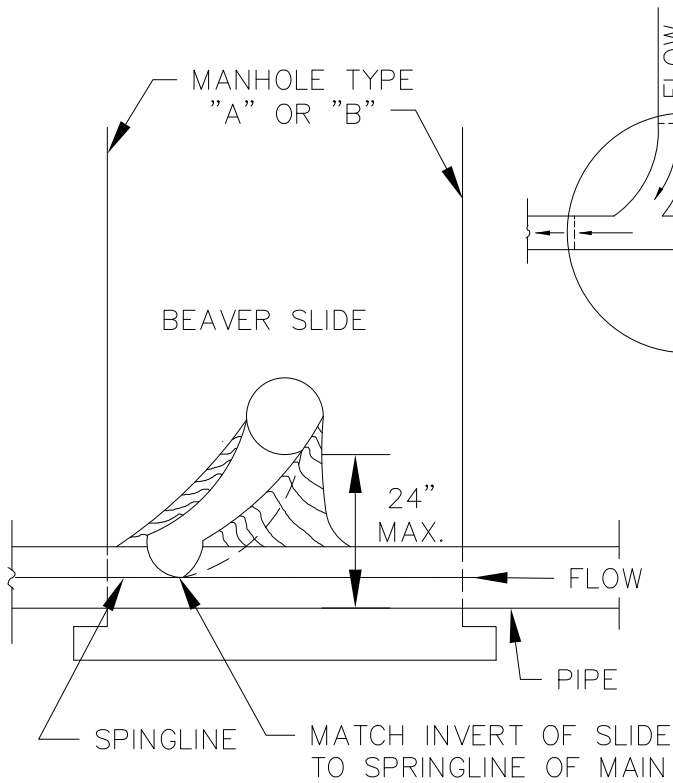
APPROVED:

REVISED:  
1/2015

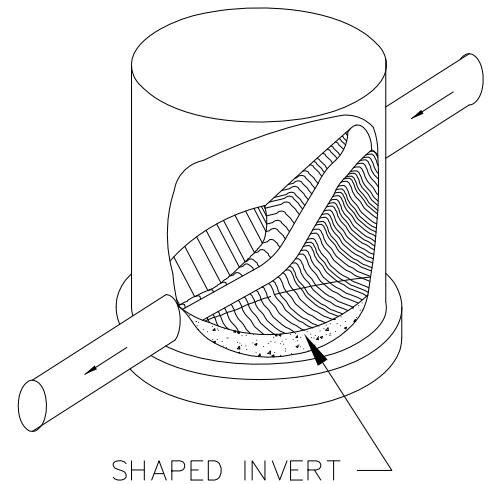
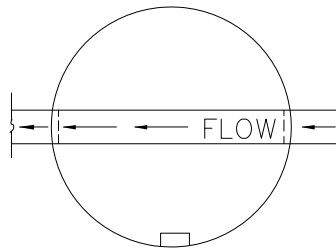
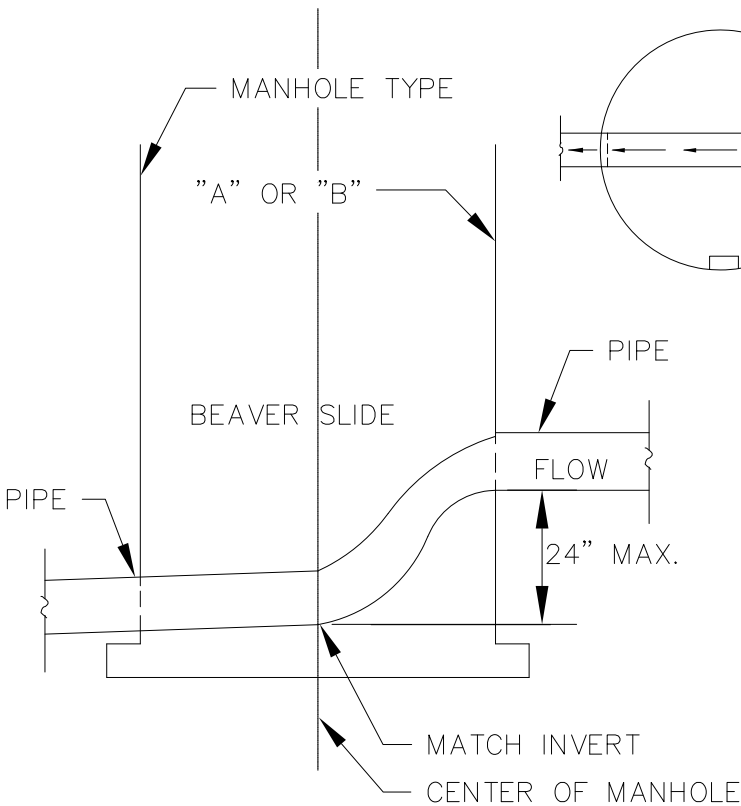
## INTERNAL DROP CONNECT

SECTION #  
50.03

DETAIL #  
50-12

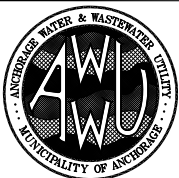


WHEN INSTALLING A BEAVER SLIDE THAT INTERCEPTS AN EXISTING SEWER AT A RIGHT ANGLE, THE CONNECTING INVERT OF THE BEAVER SLIDE IS TO INTERCEPT THE EXISTING SEWER SLIGHTLY ABOVE THE SPRINGLINE AS SHOWN. DISTANCE MEASURED FROM INVERT TO INVERT.



WHEN INSTALLING A BEAVER SLIDE WHERE THE FLOW IS STRAIGHT THROUGH THE MANHOLE, THE BEAVER SLIDE IS TO MATCH THE INVERT OF THE EXISTING LINE AND NOT TO EXTEND MORE THAN HALF-WAY THROUGH THE MANHOLE. DISTANCE MEASURED FROM INVERT TO INVERT.

PREMIX MORTAR PROHIBITED

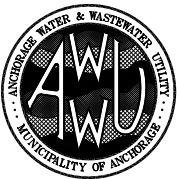
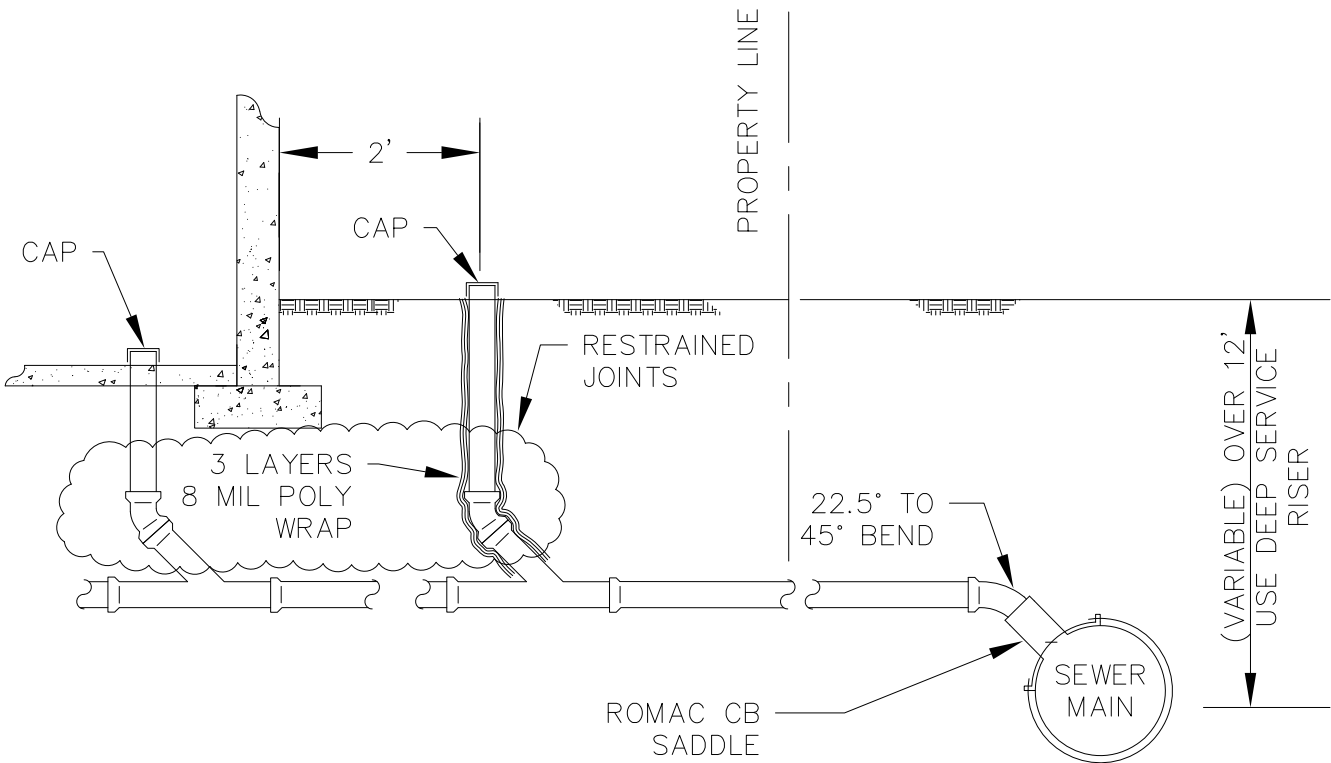
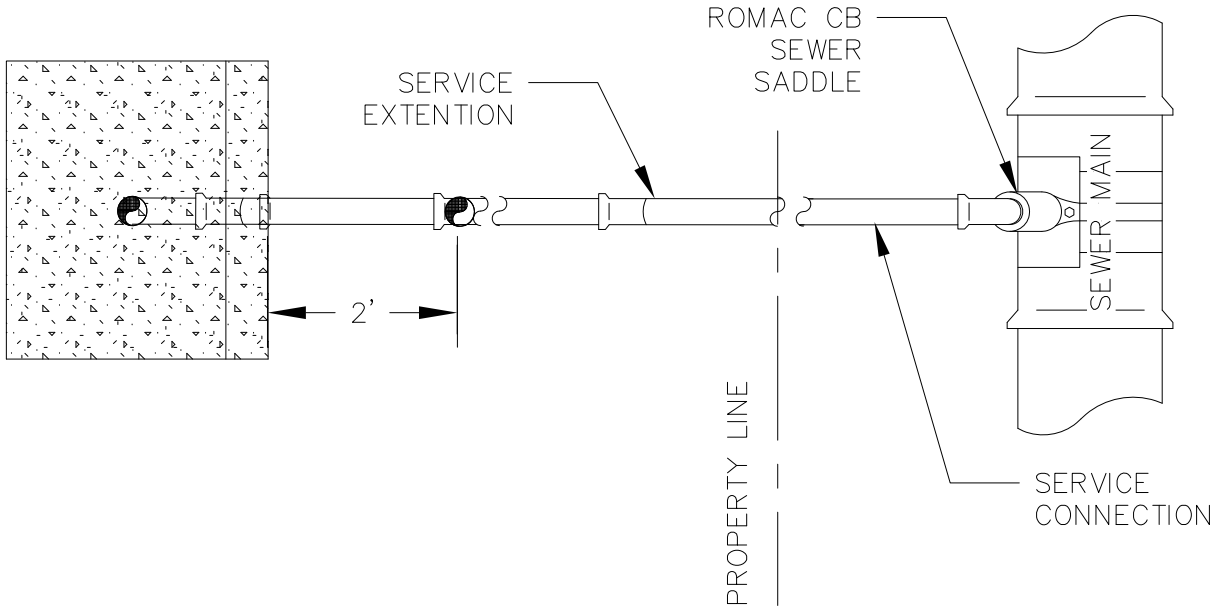


SCALE:  
NTS  
APPROVED:  
REVISED:  
1/2015

## TYPICAL BEAVER SLIDE MANHOLE

SECTION #  
50.03

DETAIL #  
50-13



SCALE:  
NTS

APPROVED:

REVISED:  
1/2015

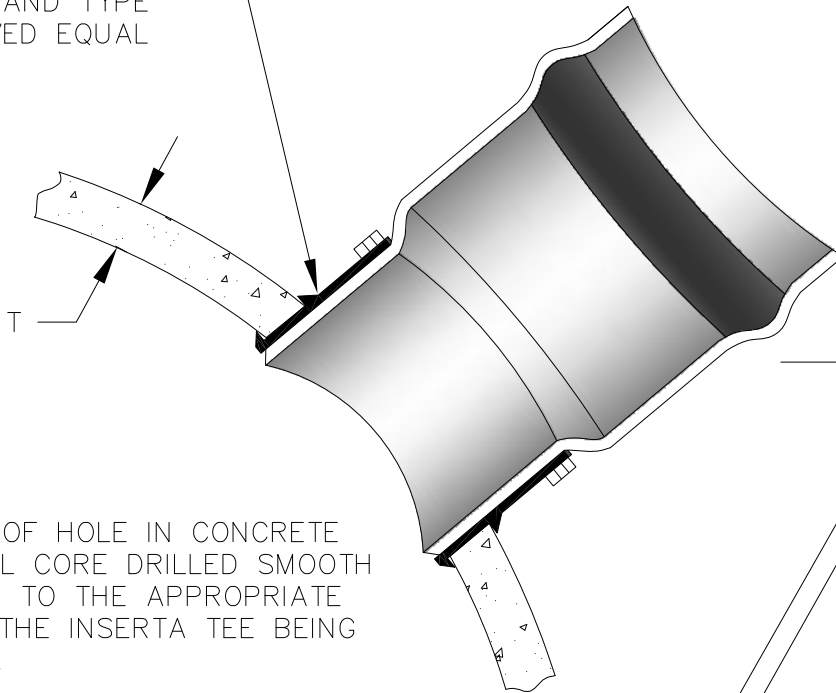
## SANITARY SEWER SERVICE (COMPLETE)

SECTION #  
50.03

DETAIL #  
50-14



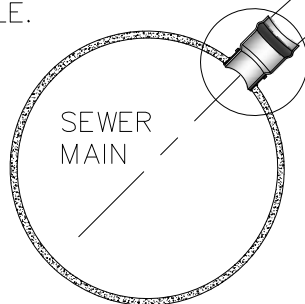
INSTALL AN INSERTA TEE OF APPROPRIATE PIPE SIZE AND TYPE OR APPROVED EQUAL



DIAMETER OF HOLE IN CONCRETE PIPE SHALL CORE DRILLED SMOOTH AND SIZED TO THE APPROPRIATE SIZE FOR THE INSERTA TEE BEING INSTALLED.

D.I.P. PIPE SHALL BE USED BETWEEN M.H. & TRUNKLINE. USE 22 1/2° OR 11 1/2° BENDS.

THE EXISTING GROUND AROUND THE CONC. TRUNK SHALL BE DISTURBED AS LITTLE AS POSSIBLE.



COMPACT EXISTING GROUND TO MIN. OF 95% MAX. DENSITY

8" TYPE II-A COMPACTED TO MIN. 95% MAX. DENSITY.

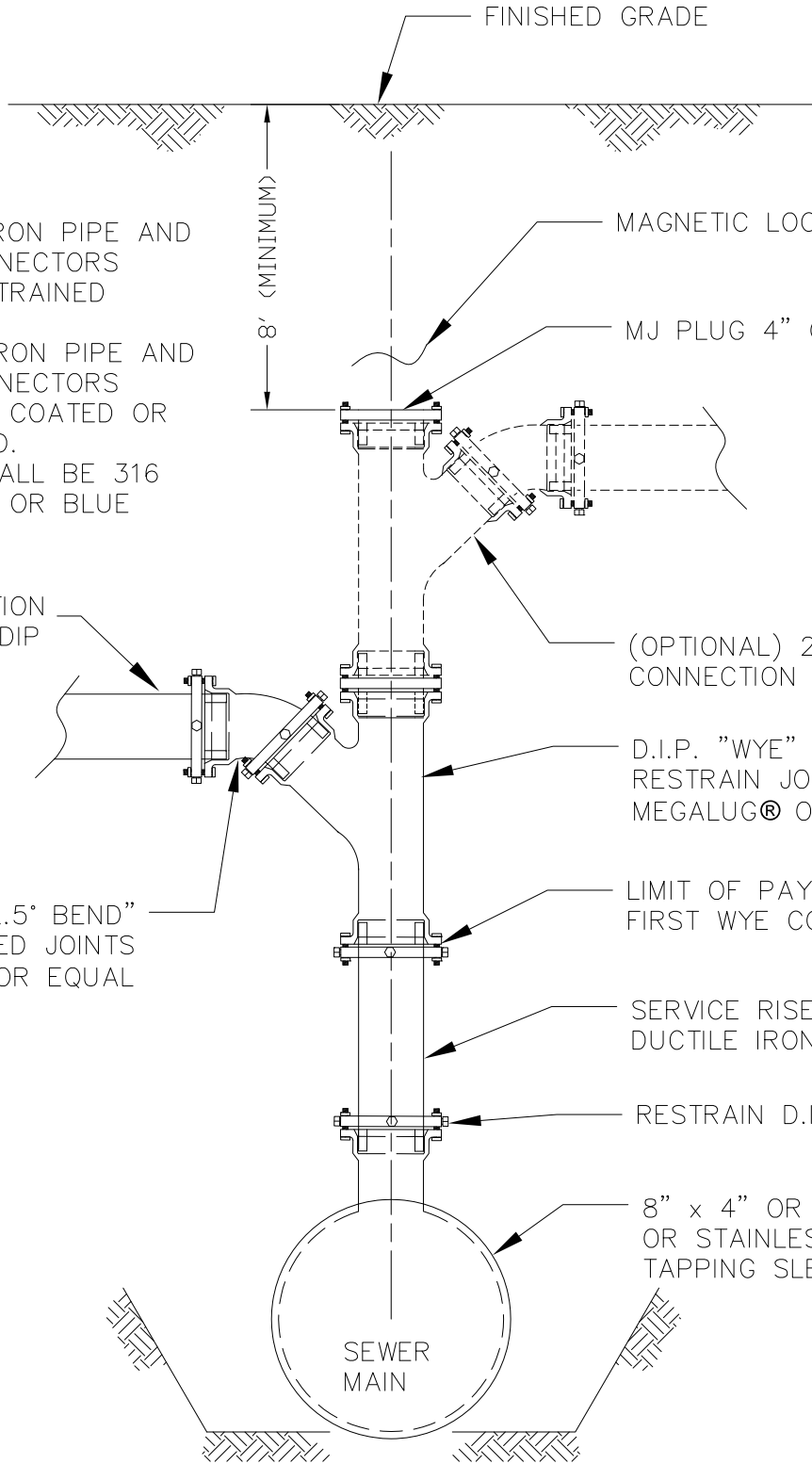


SCALE:  
NTS  
APPROVED:  
REVISED:  
1/2015

# LARGE DIAMETER LATERAL CONNECTION TO CONCRETE PIPE

SECTION #  
50.04

DETAIL #  
50-15



**NOTE:**

1. ALL DUCTILE IRON PIPE AND MECHANICAL CONNECTORS SHALL HAVE RESTRAINED JOINTS.
2. ALL DUCTILE IRON PIPE AND MECHANICAL CONNECTORS SHALL BE EPOXY COATED OR BE DENSYL TAPED.
3. ALL BOLTS SHALL BE 316 STAINLESS STEEL OR BLUE BOLTS

SERVICE CONNECTION  
4" OR 6" DIP

D.I.P. "45° OR 22.5° BEND"  
TYPICAL, RESTRAINED JOINTS  
MEGALUG® OR EQUAL

MAGNETIC LOCATOR TAPE

MJ PLUG 4" OR 6"

(OPTIONAL) 2 SERVICE  
CONNECTION MAXIMUM

D.I.P. "WYE" TYPICAL  
RESTRAIN JOINTS  
MEGALUG® OR EQUAL

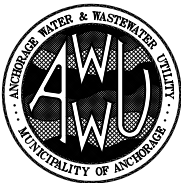
LIMIT OF PAYMENT AT  
FIRST WYE CONNECTION

SERVICE RISER 4" OR 6"  
DUCTILE IRON PIPE

RESTRAIN D.I.P. TO MJ TEE

8" x 4" OR 8" x 6" TEE  
OR STAINLESS STEEL  
TAPPING SLEEVE

SEWER  
MAIN

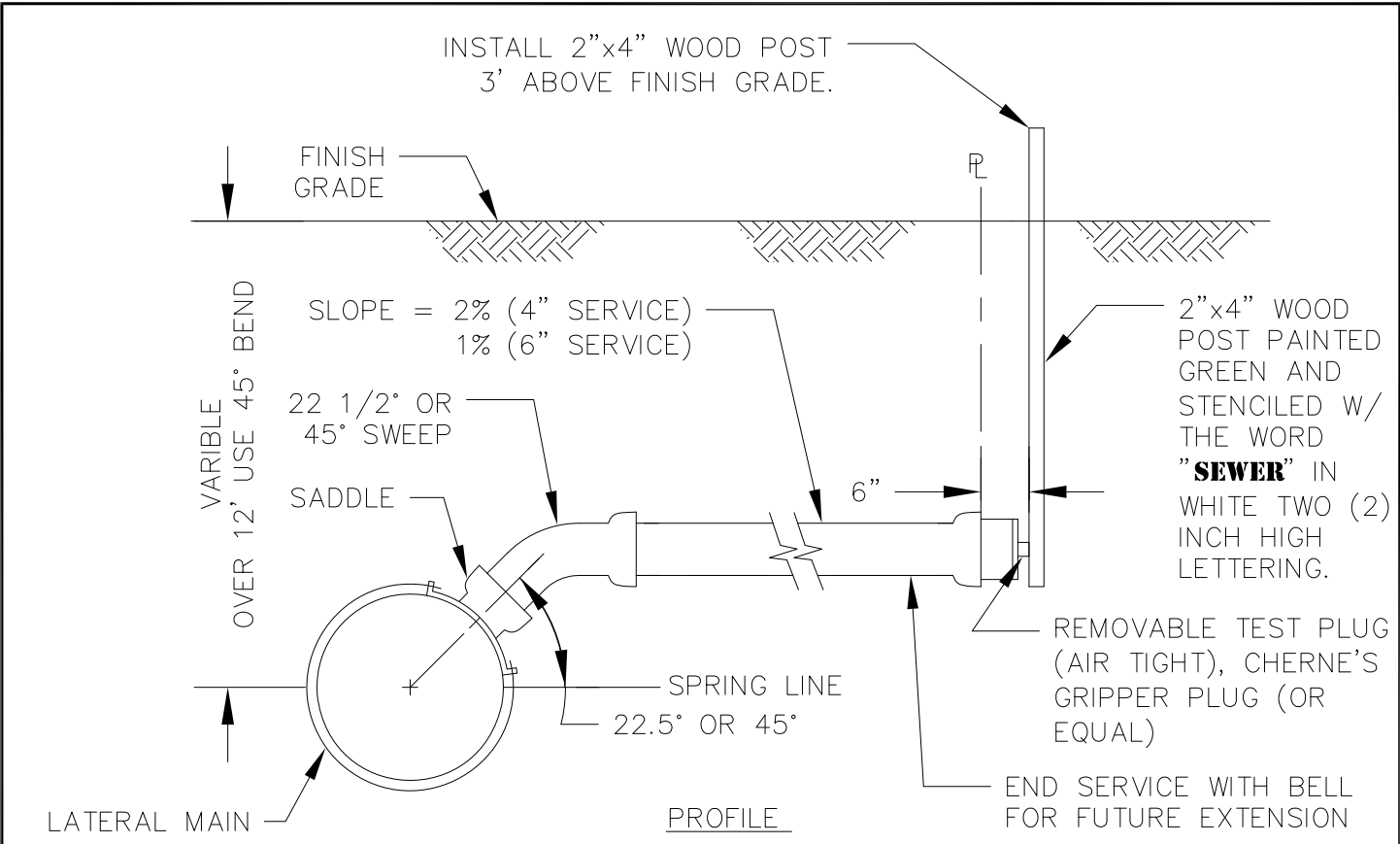


SCALE:  
NTS  
APPROVED:  
REVISED:  
1/2015

**NEW CONSTRUCTION OF SEWER LINES  
SERVICE RISER/TOP ENTRY  
FOR DEEP SEWER - DUCTILE IRON**

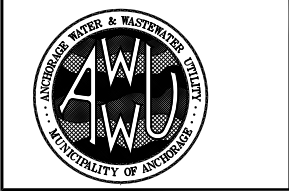
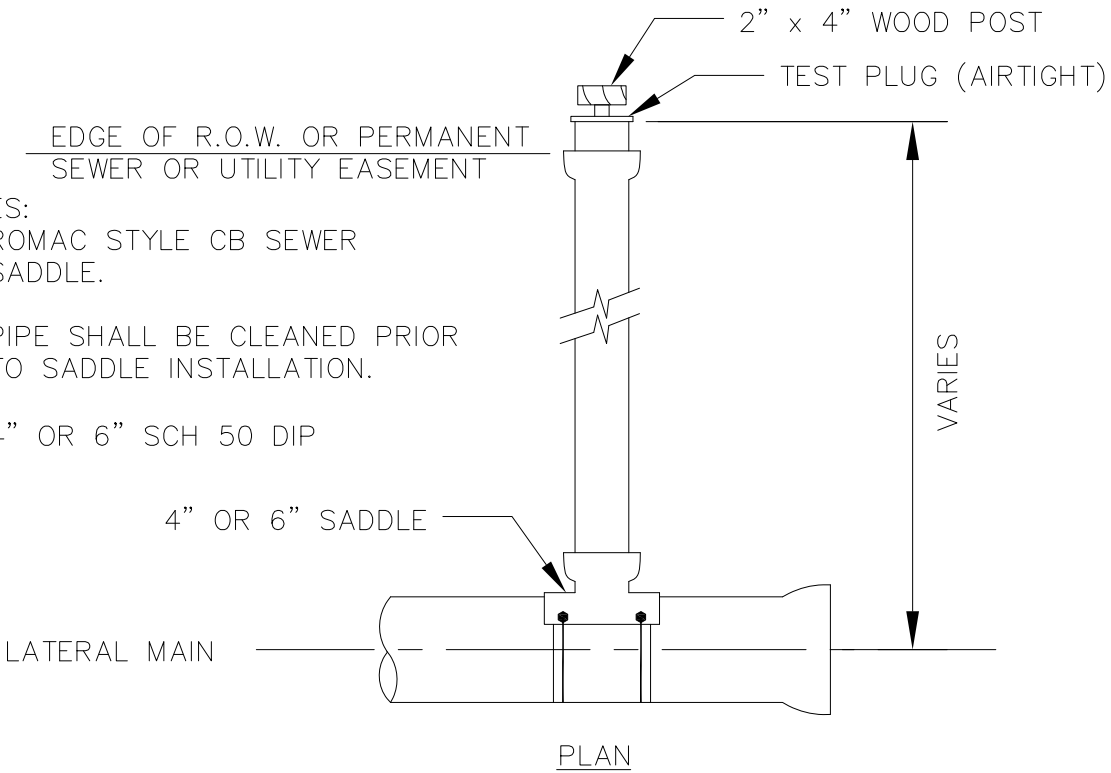
SECTION #  
50.04

DETAIL #  
50-16



NOTES:

1. ROMAC STYLE CB SEWER SADDLE.
2. PIPE SHALL BE CLEANED PRIOR TO SADDLE INSTALLATION.
3. 4" OR 6" SCH 50 DIP



SCALE:  
NTS

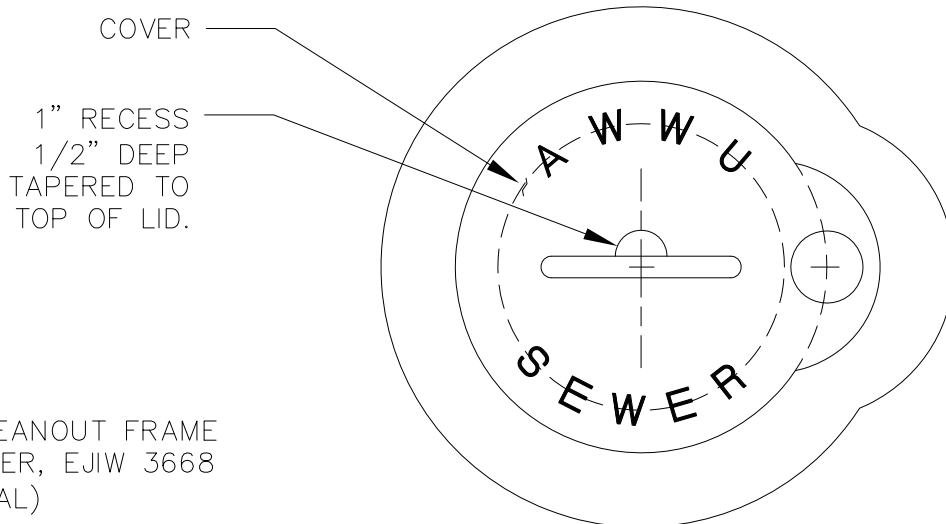
APPROVED:

REVISED:  
1/2015

# SANITARY SEWER SERVICE CONNECTION (R.O.W. ONLY)

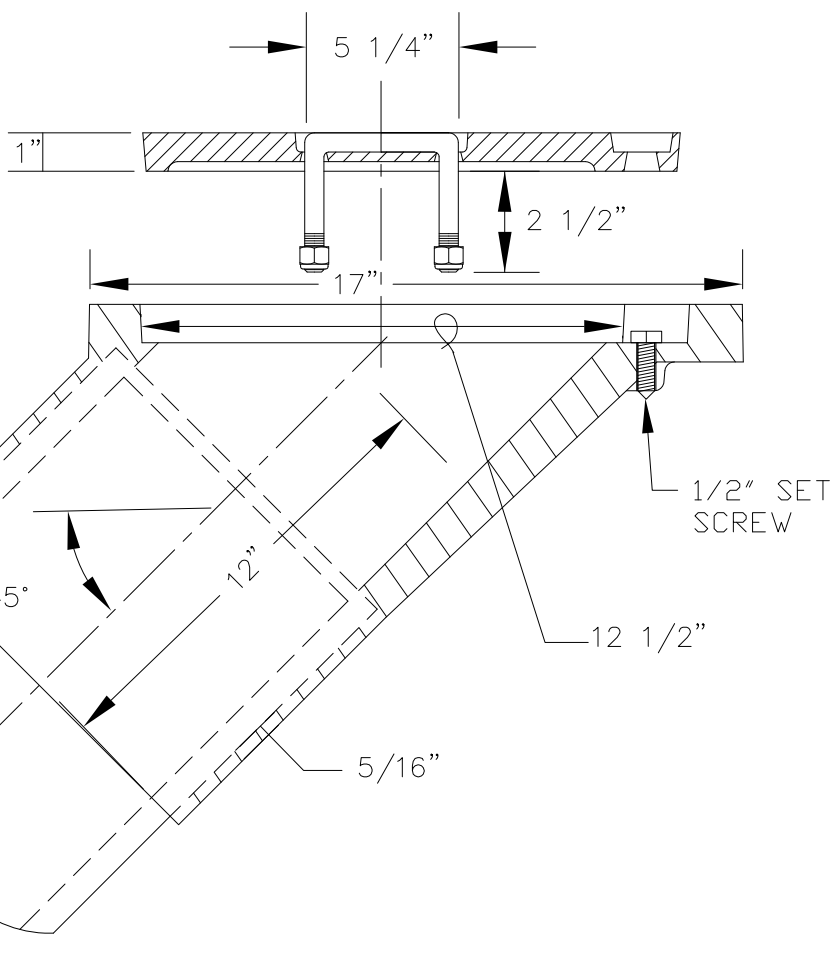
SECTION #  
50.04

DETAIL #  
50-17



NOTES:

1. CAST CLEANOUT FRAME AND COVER, EJIW 3668 (OR EQUAL)
2. CASTING THICKNESS SUBJECT TO FOUNDRY REQUIREMENTS.
3. CASTING MUST BE SIZED TO FIT 8-INCH, D.I.P. CLASS 50 ONLY.
4. COVER SHALL BE 1/2" BELOW TOP OF PAVEMENT OR 6" BURY BELOW GRAVEL, DIRT OR R.A.P ROAD.



1/2" SET SCREW  
3 REQUIRED @  
120°

1/2" SET SCREW

8" D.I.P.

5/16"

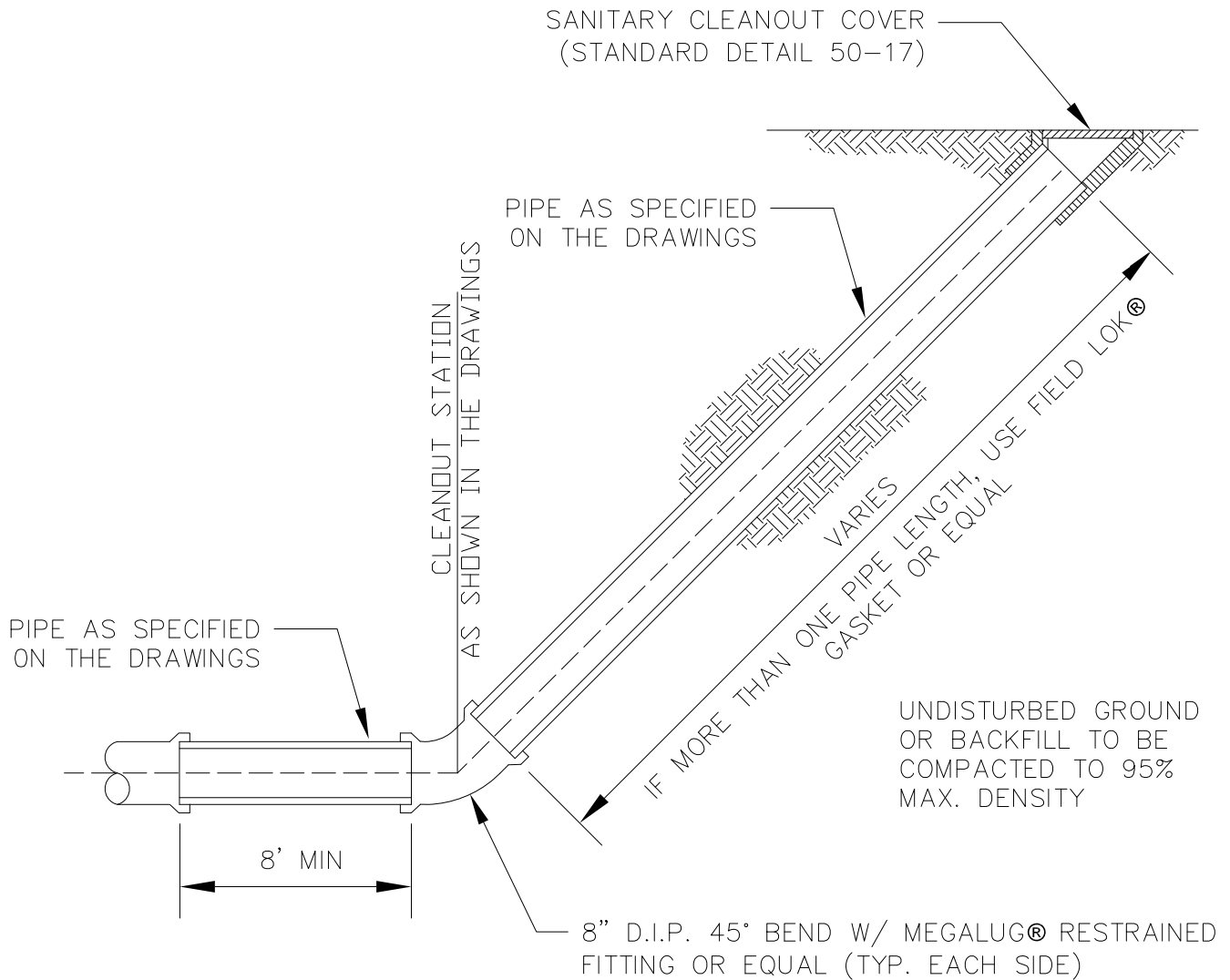


SCALE:  
NTS  
APPROVED:  
REVISED:  
1/2015

## SANITARY SEWER CLEANOUT COVER

SECTION #  
50.04

DETAIL #  
50-18



NOTES:

1. CLEANOUTS ARE NOT USED IN NEW CONSTRUCTION. CONSULT THE ENGINEER FOR ANY NEW INSTALLATIONS.

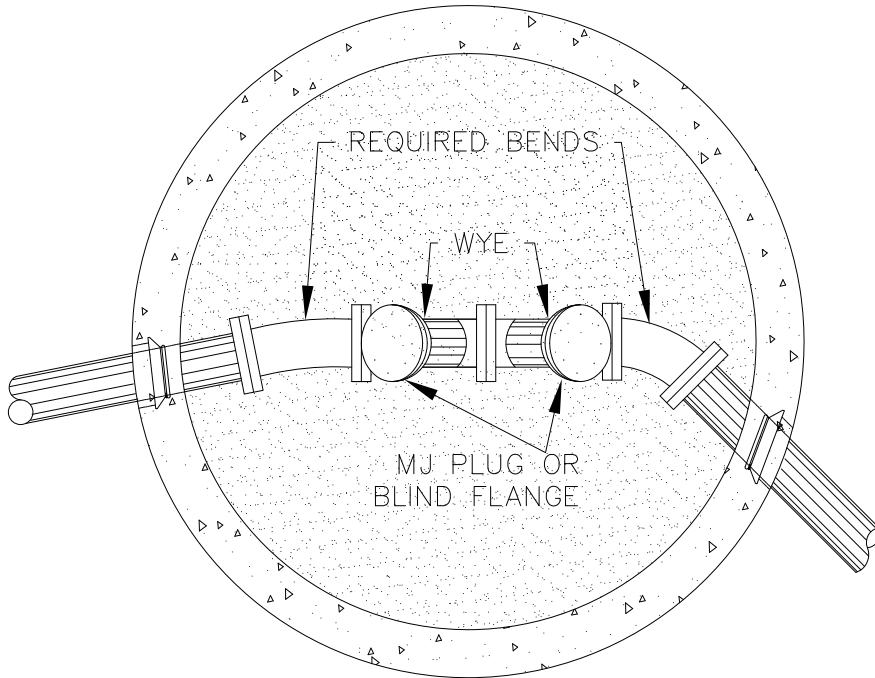
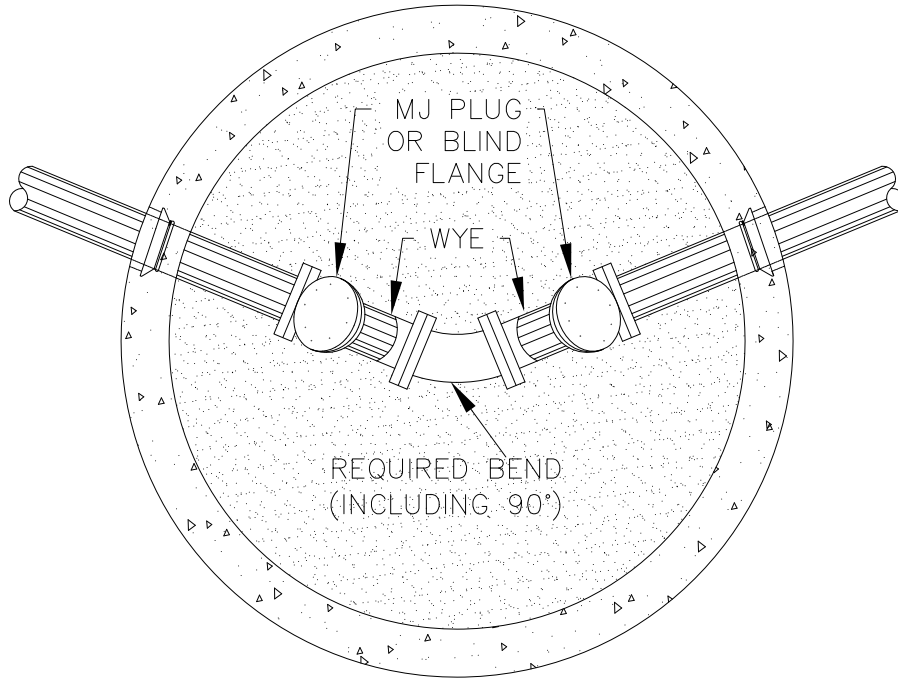


SCALE:  
NTS  
APPROVED:  
REVISED:  
1/2015

# SANITARY CLEANOUT

SECTION #  
50.04

DETAIL #  
50-19



NOTES:

1. TYPE "B" MANHOLE (MINIMUM)
2. FITTINGS SHALL BE "SHORT BODY" AND RESTRAINED W/ MEGALUG® OR EQUAL.
3. INSTALL MASON SAND TO SPRING LINE (SEE DETAIL 50-21 OR 50-22).
4. MANHOLE LID & FRAME SHALL BE WATERTIGHT IN ACCORDANCE WITH DETAIL 50-10.



SCALE:  
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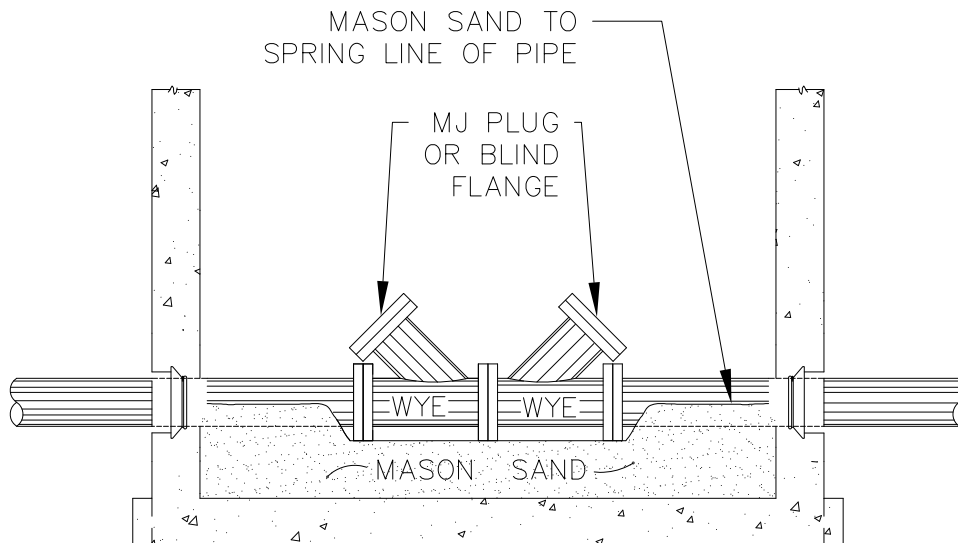
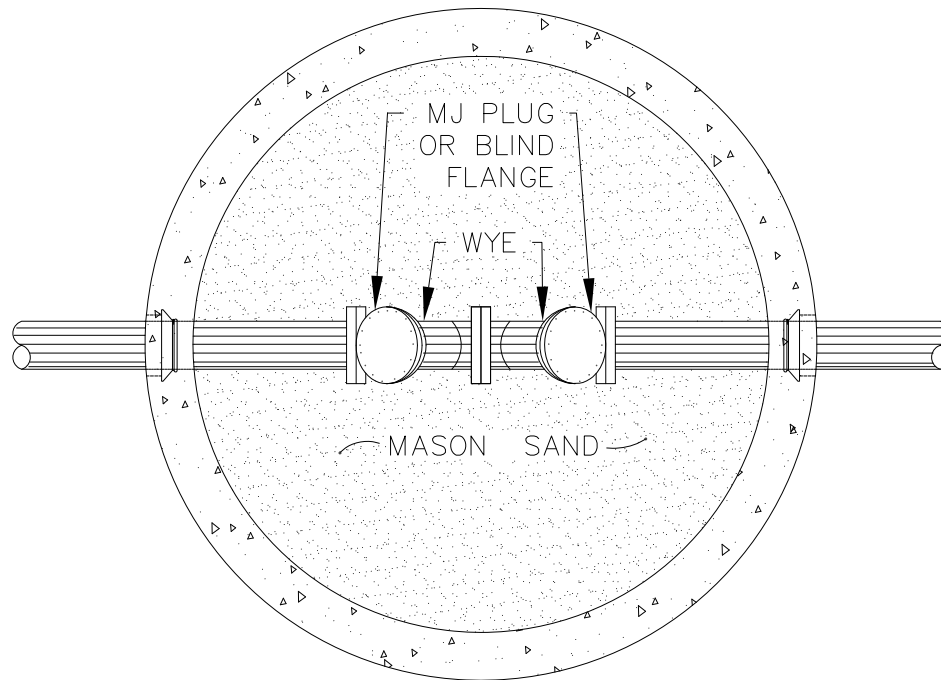
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REVISED:  
1/2015

**SPECIAL MANHOLE AND  
CLEANOUT DETAIL**  
(INSIDE PROTECTIVE WELL RADIUS)

SECTION #  
DIV 50.03

DETAIL #  
50-20



NOTES:

1. TYPE "B" MANHOLE (MINIMUM).
2. FITTINGS SHALL BE "SHORT BODY" AND RESTRAINED W/ MEGALUG® OR EQUAL.
3. INSTALL MASON SAND TO SPRING LINE OF PIPE.
4. MANHOLE LID & FRAME SHALL BE WATERTIGHT IN ACCORDANCE WITH DETAIL 50-10.



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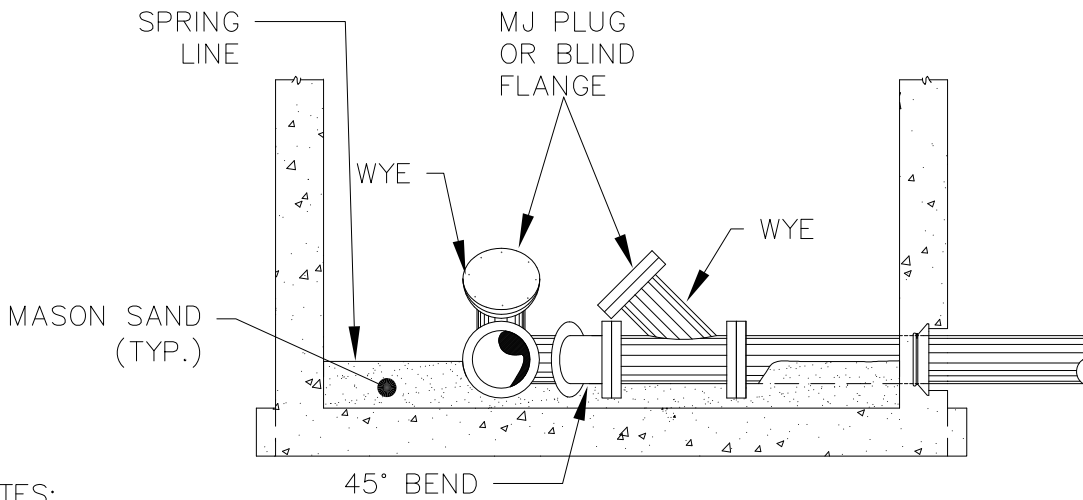
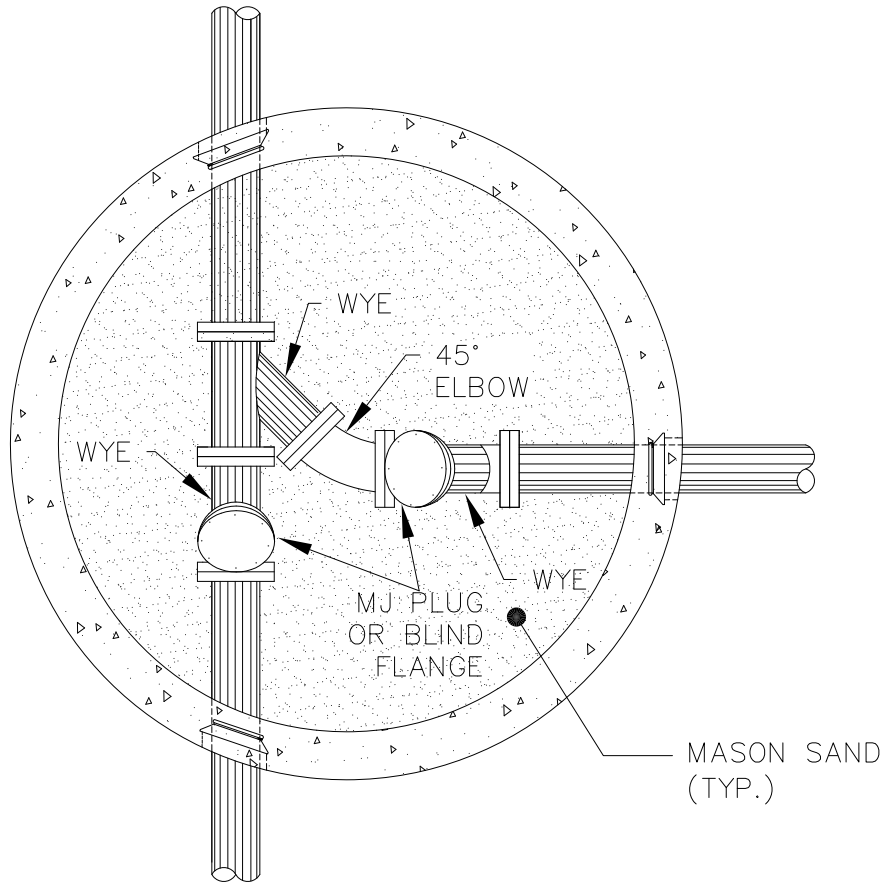
APPROVED:

REVISED:  
1/2015

**SPECIAL MANHOLE AND  
CLEANOUT DETAIL**  
(INSIDE PROTECTIVE WELL RADIUS)

SECTION #  
DIV 50.03

DETAIL #  
50-21



NOTES:

1. TYPE "B" MANHOLE (MINIMUM).
2. FITTINGS SHALL BE "SHORT BODY" AND RESTRAINED W/ MEGALUG® OR EQUAL.
3. INSTALL MASON SAND TO SPRING LINE OF PIPE.
4. MANHOLE LID AND FRAME SHALL BE WATERTIGHT IN ACCORDANCE WITH DETAIL 50-10.

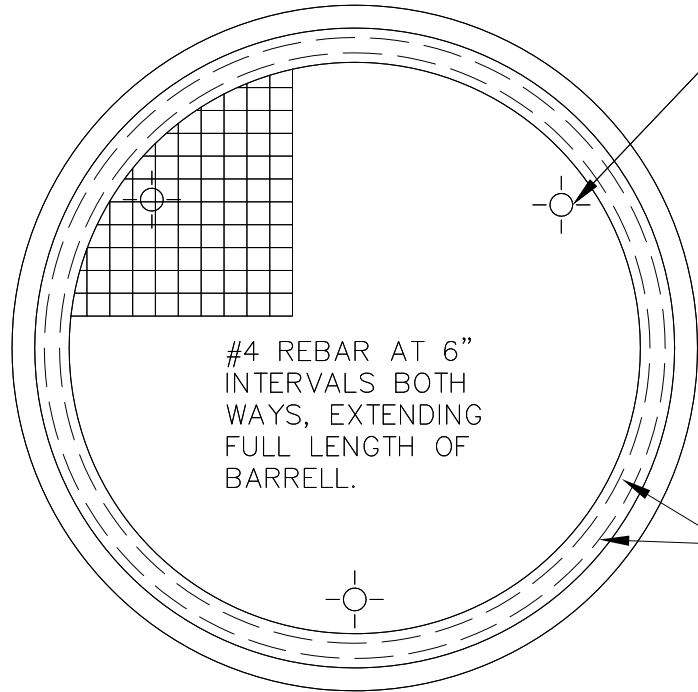


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1/2015

**SPECIAL MANHOLE AND  
CLEANOUT DETAIL**  
(INSIDE PROTECTIVE WELL RADIUS)

SECTION #  
DIV 50.03  
DETAIL #  
50-22

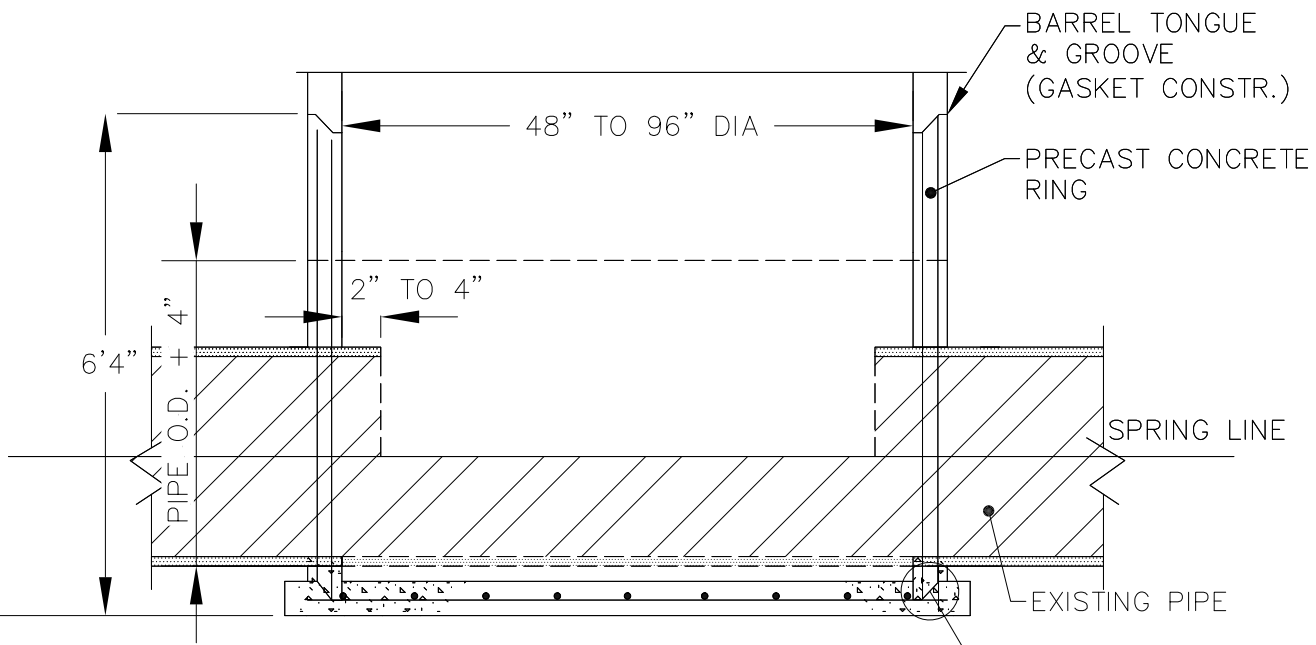




#4 REBAR AT 6" INTERVALS BOTH WAYS, EXTENDING FULL LENGTH OF BARRELL.

INSTALL 3 EQUALLY SPACED (120° APART) LIFTING RINGS.

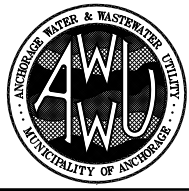
2 - #4 REBAR SPACED 2" APART ALL AROUND 2" & 4" FROM TOP.



NOTES:

1. NO REBAR TO EXTEND INTO PIPE OPENING.
2. MORTAR PENETRATIONS
3. REFER TO DETAIL 50-01, 50-02, & 50-03 FOR PROPER DIMENSIONS, SEALING, LADDER AND OTHER COMPONENTS

STD. TONGUE & GROOVE W/COLD JOINT SEALANT



SCALE:  
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APPROVED:  
REVISED:  
1/2015

# HORSE SHOE SANITARY SEWER MANHOLE DETAIL

SECTION #  
50.03  
DETAIL #  
50-23

(DIRECTION ON STREET) S. ON ARCTIC PROJECT NAME SIZE "DI CL-50 SEWER"					
STA	+	H.I.	-	T.B.M. EL.	INV. EL.
(23+36.98)	5.64	74.70		69.06	
24+52.18	SSMH Q #4				
24+53.88	N. INV.=	65.20			65.17
24+71.99	RT (24+58.2)	4" S/S L-9, B-2	8.80 65.90		65.24
24+90.13	LT (24+84)	4" S/S L-4, B-1	8.70 66.00		65.32
25+08.19	RT (24+87)	4" S/S L-8, B-2	8.70 66.00		65.39
25+25.90	RT (25+16.2)	4" S/S L-7, B-2	8.60 66.10		65.46
25+44.00	RT (25+40.2)	4" S/S L-6, B-2	8.50 66.20		65.53
25+62.10	RT (25+66.1)	4" S/S L-5, B-2	8.40 66.30		65.60
25+70.75	S. INV.=	65.67			65.64
24+72.45	SSMH Q #5				
(23+36.98)	5.38	74.44		69.06	
24+72.45	SSMH Q #5				
25+74.15	NW. INV.=	65.77			65.74
25+92.28	RT (25+78.4)	4" S/S L-4, B-2	7.99 66.45		65.81
26+10.38	RT (26+07)	4" S/S L-3, B-2	7.89 66.55		65.89
26+28.48	LT (26+14)	4" S/S L-3, B-1	7.84 66.60		65.96
26+46.58	RT (26+43.5)	4" S/S L-2, B-2	7.74 66.70		66.03
26+64.71	LT (26+49.6)	4" S/S L-2, B-1	7.69 66.75		66.10
26+77.85	8" 45 Q C.O.	INV.= 66.18			66.16
	RT (26+71.5)	4" S/S L-1, B-2	7.64 66.80		

CONTRACTOR NAME		PAGE#		①	
LINE & GRADE NAME	PERSON	DAY	& DATE		
ROD INV.	ROD T.O.P.	FOOTAGE	TIME/SET	SLOPE/DESCR.	
(15) SSMH#3					
		0.00			
9.53	8.78	1.70		S = +0.004/FT.	
9.46	8.71	18.11 19.81	8:00	+0.07/JNT	
9.38	8.63	18.14 37.95	8:20		
9.31	8.56	18.06 56.01	8:35	SERVICE TAP STA & DIR, SIZE, LOT, BLOCK MAY GO HERE OR AT THE LEFT	
9.24	8.49	17.71 73.72	8:55		
9.17	8.42	18.10 91.82	9:10		
9.10	8.35	18.10 109.92	9:20		
9.06	8.31	8.65 118.57	9:30		
		1.70 120.27	10:00		
(15) SSMH#3					
		0.00			
8.70	7.95	1.70		S = +0.004/FT.	
8.63	7.88	18.13 19.83	10:30	0.07/JNT	
8.55	7.80	18.10 37.93	10:45		
8.48	7.73	18.10 56.03	11:00		
8.41	7.66	18.10 74.13	11:15		
8.34	7.59	18.13 92.26	11:30		
8.28	7.53	13.14 105.40	12:00		
		105.40			

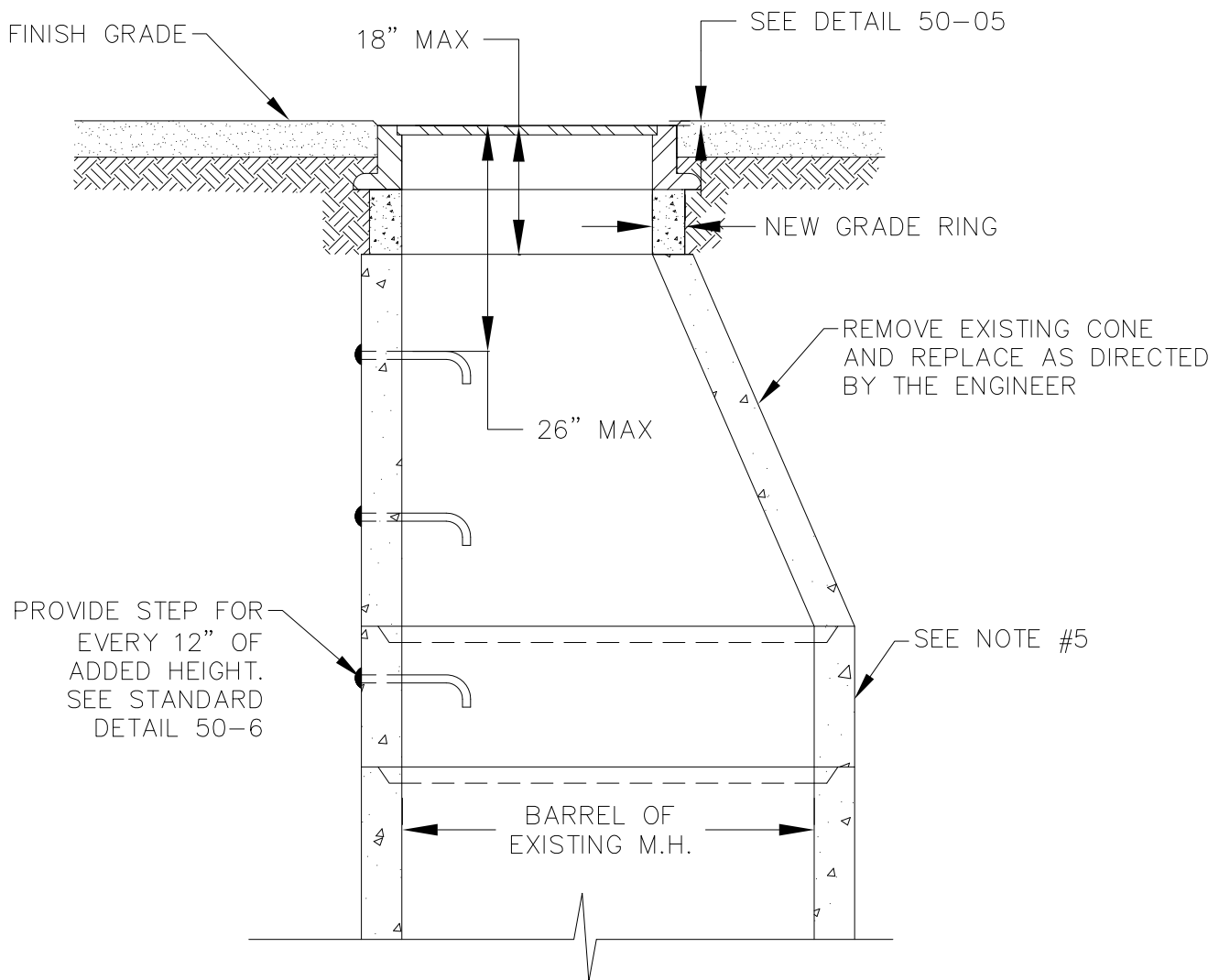
USE INVERT ELEVATIONS (INV) FOR SEWER  
USE BOTTOM OF PIPE ELEVATIONS (BOP) FOR WATER



SCALE:  
NTS  
APPROVED:  
REVISED:  
1/2015

# CONTRACTOR FIELD INSTALLATION NOTES SANITARY EXAMPLE

SECTION #  
DIV 50  
DETAIL #  
50-24



NOTES:

1. RESET CONE WITH COLD JOINT GASKET AND SEAL EXTERIOR JOINT WITH COLD JOINT SEALANT.
2. ADJUST FRAME TO PROPER DEPTH BELOW SURFACE OF PAVEMENT. FEATHER EDGE OF PAVEMENT TO SMOOTH TRANSITION, PER DETAIL (50-05).
3. SEAL FRAME, AND GRADE RINGS TO CONE WITH WRAPIDSEAL® OR APPROVED EQUAL.
4. WRAP CONES & BARREL SECTIONS WITH THREE (3) LAYERS OF 8-MIL THICK POLYETHYLENE ENCASEMENT MATERIAL AFTER INSTALLING THE WRAPIDSEAL® (SEE DETAIL 50-1)
5. ADD OR REMOVE PRECAST RISER SECTIONS OR RADIAL CONCRETE MANHOLE BLOCKS AS DIRECTED BY THE ENGINEER

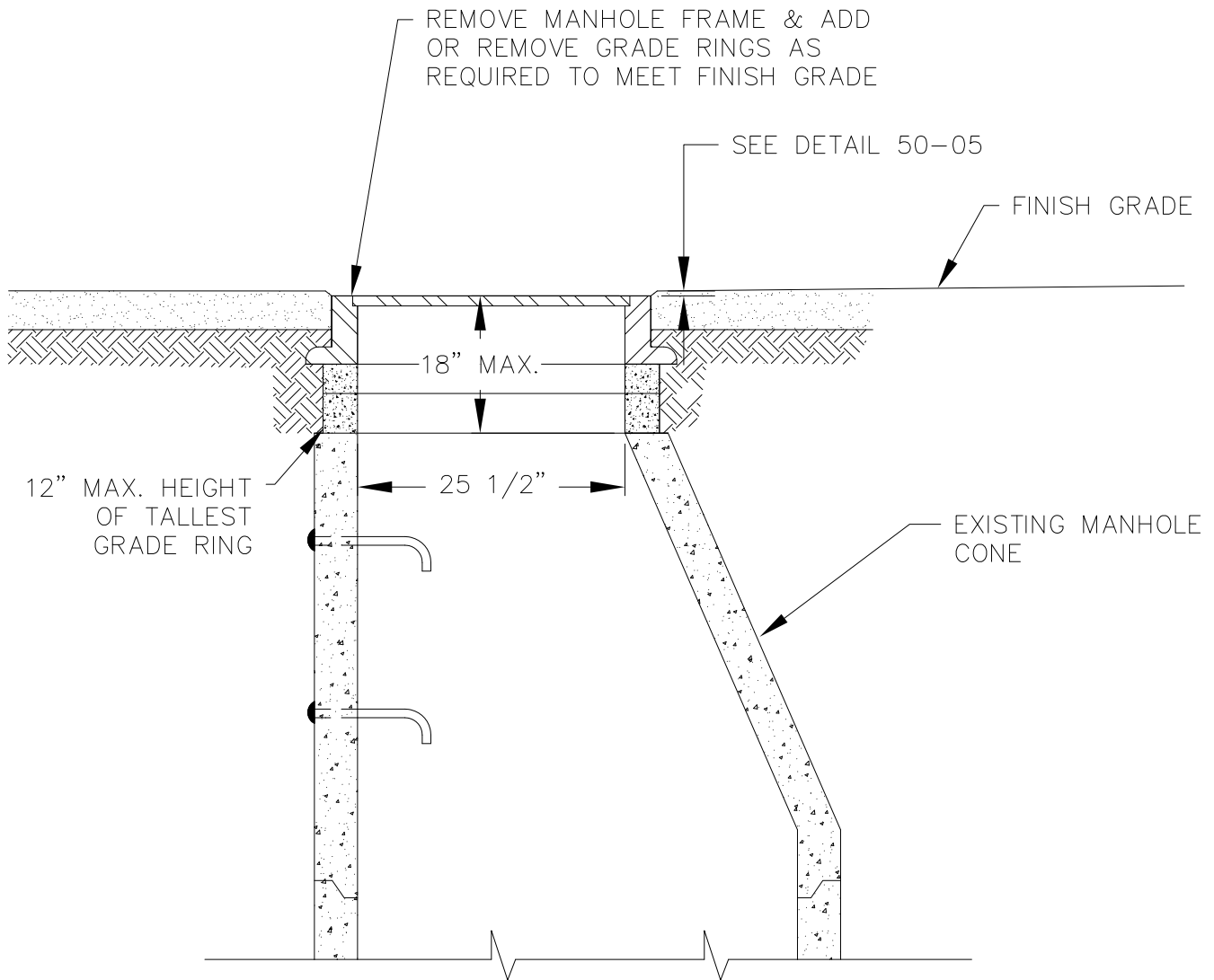


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APPROVED:  
REVISED:  
1/2015

## MANHOLE CONE ADJUSTMENT

SECTION #  
50.03

DETAIL #  
50-25



NOTES:

1. WHEN AN ADJUSTMENT OF GREATER THAN 12" IN GRADE RINGS IS REQUIRED, ADJUST CONE PER STANDARD DETAIL 50-25 RATHER THAN GRADE RINGS.
2. SEAL FRAME AND GRADE RING TO CONE WITH WRAPID SEAL® OR APPROVED EQUAL



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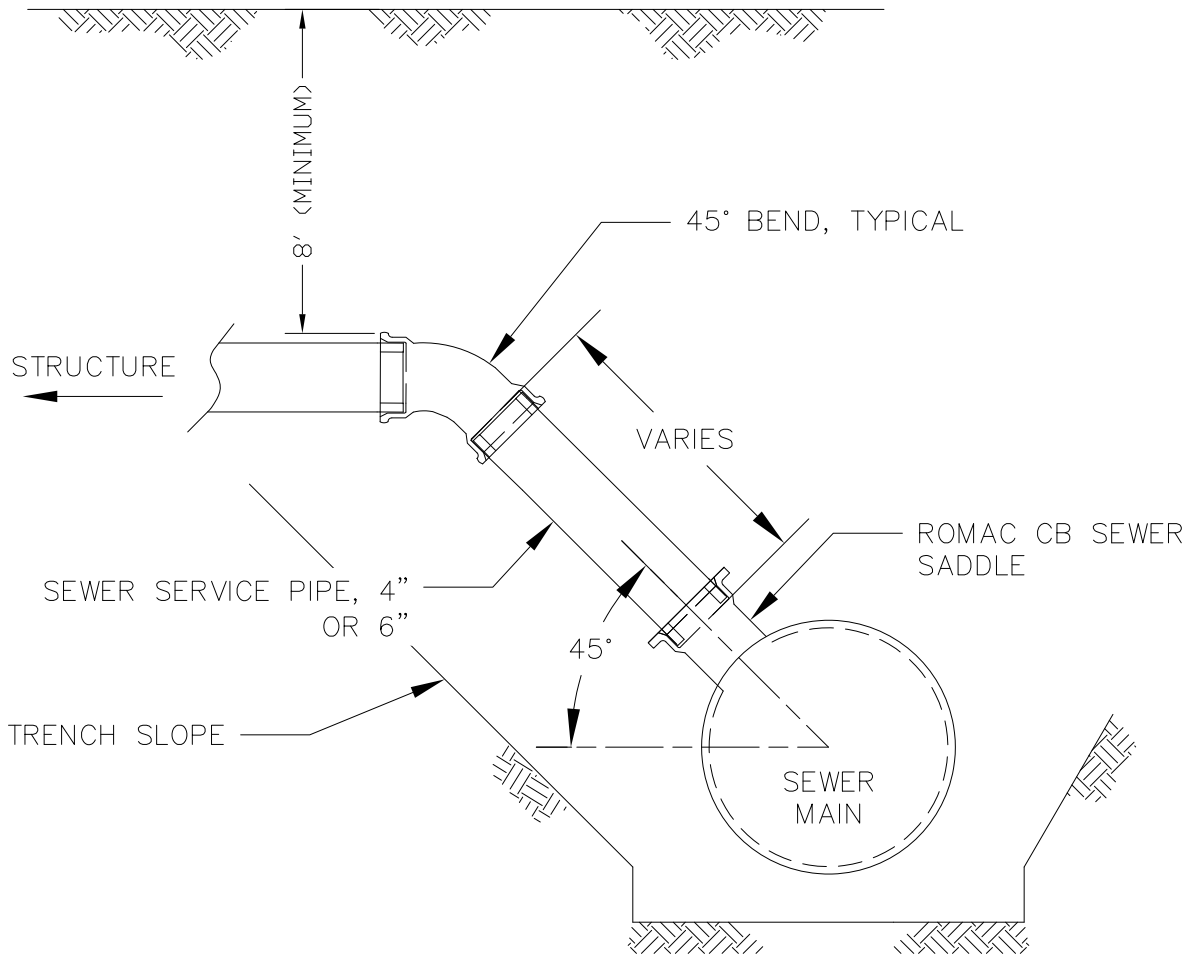
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## MANHOLE RING ADJUSTMENT

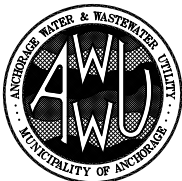
SECTION #  
50.03

DETAIL #  
50-26



NOTES:

1. CONNECTIONS UTILIZING A STEEP SEWER RISER MAYBE INSTALLED WHERE THE SEWER MAIN IS IN EXCESS OF 10' AND THE SERVICE CONNECTION AND EXTENSION WILL HAVE A MINIMUM OF 8' OF COVER IN THEIR ENTIRETY.
2. BACKFILL MUST BE PLACED AND COMPACTED IN UNIFORM HORIZONTAL LIFTS THE WIDTH OF THE TRENCH. COMPACTION IS CRITICAL BENEATH THE SEWER MAIN, FITTINGS, AND LATERAL TO MINIMIZE AND ELIMINATE SETTLEMENT.



SCALE:  
NTS  
APPROVED:  
REVISED:  
1/2024

**STEEP SEWER RISER**

SECTION #  
50.04

DETAIL #  
50-27



**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 55  
STORM DRAIN SYSTEMS**





**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR STORM DRAIN SYSTEMS  
DIVISION 55  
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**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR STORM DRAIN SYSTEMS  
DIVISION 55**

**SECTION 55.01 GENERAL**

**Article 1.1 Scope of Work**

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, transportation, handling, storage, and performance of all operations necessary to complete the construction for the pipe laying, jointing, and testing of storm drain systems and culverts.

Requirements for earthwork including trench excavation and backfill are specified in Division 20 - Earthwork.

**Article 1.2 Applicable Standards**

The latest revision of the following standards of the American Society for Testing and Materials (ASTM), the American Association of State Highway and Transportation Officials (AASHTO), and the American Water Works Association (AWWA) are hereby made part of this Specification.

ASTM A48 (AASHTO M-105)	Standard Specifications for Gray Iron Castings
ASTM C76	Specification for Reinforced Concrete
ASTM C150	Specification for Portland Cement
ASTM C478 (AASHTO M-199)	Specification for Precast Reinforced Concrete Manhole Sections
ASTM C990	Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM D1248	Polyethylene Plastics Molding and Extrusion Materials, Type III, High Density
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe
ASTM D3035	Polyethylene Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
ASTM D3350	Polyethylene Plastics and Fittings Materials
ASTM F2648	2 to 60 inch Corrugated Polyethylene Pipe & Fittings
AASHTO M-36	Corrugated Steel Pipe & Fittings
AASHTO M-45	Sand for Cement Mortar
AASHTO M-190	Bituminous Coating of CMP
AASHTO M-196	Corrugated Aluminum Pipe & Fittings

AASHTO M-245	Precoated Galvanized Steel Culverts and Underdrains
AASHTO M-246	Precoated Galvanized Steel Sheets for Culverts and Underdrains
AASHTO M-274	Corrugated Aluminized Pipe and Fittings
AASHTO M-252	Corrugated Polyethylene Pipe 3"-10" diameter
AASHTO M-294	Corrugated Polyethylene Pipe, 12" diameter and larger
AASHTO M-306	Drainage, Sewer, Utility, and Related Castings

### **Article 1.3 Surveys**

The Contractor shall layout in the field the alignment and grade of Work to be done under the Contract. The Contractor shall be responsible for the preservation of all line stakes, grade stakes, and hubs. In the event of their loss or destruction, the Contractor shall be responsible for their proper replacement. The line and grade for pipes shall be given from reference hubs offset from each manhole or cleanout. The Contractor shall be responsible for the transfer of the control points from the reference hubs to such hubs or batter boards as needed for the prosecution of the Work.

All survey work shall adhere to Division 65 – Construction Survey.

### **Article 1.4 Concrete and Mortar**

#### **A. Miscellaneous Concrete**

All concrete used in the construction of storm drain systems with the exception of precast manholes, manhole risers, cones, and catch basin barrels shall be Class A-3, as defined in Division 30, Section 30.01, Article 1.6 - Mix Requirements for Classes of Concrete. Concrete Work shall conform to Division 30 – Portland Cement Concrete.

#### **B. Mortar**

Cement for mortar used in the construction of storm drain systems shall conform with the requirements of ASTM C-150, Type II. Sand shall conform with the requirements of AASHTO M-45. The mortar shall be composed of one (1) part cement and three (3) parts sand. The addition of lime is not permitted.

### **Article 1.5 Payment - General**

Payment for all Work included in this Division shall be in accordance with Division 10, Section 10.07 - Measurement and Payment and shall include full payment for all Work described.

## **SECTION 55.02 FURNISH AND INSTALL PIPE**

### **Article 2.1 General**

The Work under this Section consists of the performance of all operations pertaining to furnishing and installing pipe for storm drain systems.

In the case of Owner-furnished pipe, the Owner shall allot to the Project pipe to accomplish the Work in amounts exactly matching the Contractor's pay quantities for pipe. Any surplus pipe left over from this allotment at the end of the Project shall be returned from the Contractor's job sites to the Owner's designated pipe yard. If the Contractor withdraws from the Owner's pipe yard more than the amount required to match the payment quantities, the Contractor shall pay the Owner on the basis of the Owner's invoice price for pipe (including freight), plus ten percent (10%) overhead to reimburse the Owner for handling, warehousing, inspection, and administration.

### **Article 2.2 Material**

#### **A. General**

All piping shall be in accordance with the Contract Documents conforming to the size and class or model shown and specified.

#### **B. Corrugated Metal Pipe (CMP)**

Corrugated metal pipe shall only be used in culvert crossings and similar applications. CMP use in a piped storm drain system is prohibited without approval from Street Maintenance and the Municipal Engineer. Corrugated metal pipe is intended to refer to both steel and aluminum. The pipe shall conform to the following specifications:

1. Steel: Corrugated steel pipe shall meet the requirements of AASHTO M-36.
2. Aluminum: Corrugated aluminum pipe shall conform to the requirements of AASHTO M-196.
3. Aluminum Coated (Aluminized): Corrugated aluminized pipe shall conform to the requirements of AASHTO M-36 and AASHTO M-274.

All CMP fittings shall be fabricated in a workmanlike manner, develop the full strength of the material being joined, and finished to conform to the appropriate requirements of AASHTO M-36, AASHTO M-196 and AASHTO M-274.

Corrugated steel and aluminum pipe shall be jointed by using coupling bands applied as recommended by the manufacturer and approved by the Engineer.

Dissimilar metals may only be used in extending in place metal CMP and reattachment of dissimilar metal end sections provided an electrical insulating material, at least one-sixteenth inch (1/16") in thickness, is used to separate the dissimilar materials.

All angles, bolts, and nuts shall be as recommended by the manufacturer for the type of pipe used and as approved by the Engineer.

The metal gauge for pipe to be used shall be in accordance with the Contract Documents.

If bituminous coating of CMP is required by the Contract Documents, the bituminous coating shall conform to the requirements of AASHTO M-190.

All welding performed by the Contractor on aluminum pipe shall incorporate the use of 4043 or 5356 alloy for welding wire. The welding shall be accomplished by either the "TIG" (tungsten, inert gas shielded) or "MIG" (metal arc welding, inert gas shielded) process.

End Section for Corrugated Metal Pipe - Galvanized steel and aluminum end sections shall be flared, beveled, shop-assembled units to serve as structural, hydraulic and esthetic treatment to corrugated metal pipe culverts. They may be attached to culverts by threaded bolts, by riveting or bolting in accordance with the manufacturer's standard procedure. End sections shall have a turned-down lip or toe plate at the wide end to act as a cutoff. Materials for steel end sections shall be galvanized steel conforming to the requirements of AASHTO M-36. The gauge shall be as follows:

- 16 Ga. Through 24" in diameter or 29" X 18" pipe-arch
- 14 Ga. 30" in diameter and 36" X 22" pipe-arch  
36" in diameter and 43" X 27" pipe-arch
- 12 Ga. Over 36" in diameter and 43" X 27" pipe-arch  
(except that the center panels of 60" in diameter and larger  
and 72" x 44" pipe-arch and larger, shall be 10 Ga.)

Galvanized stiffener angles shall supplement the usual reinforced side edges for sixty inches (60") in diameter and larger, seventy-nine by forty-nine inch (79" x 49") pipe-arch and larger.

If the end section is shop attached to a stub of pipe, the pipe stub shall not be lighter in gauge than the end section.

Materials for aluminum end sections shall comply with the provisions of AASHTO M-196 and fabrication shall comply with the requirements above.

C. Precoated Corrugated Metal Pipe (PCMP)

All precoated corrugated metal pipe and connecting bands shall be coated to meet the AASHTO DESIGNATION: M-245 and M-246 and the coating shall be 10 mils minimum thickness each side. All exposed edges including any perforated hole edges shall be coated with a liquid coating supplied by the supplier of the precoated corrugated pipe. All metal utilized for the precoated metal pipe shall conform to SubArticle 2.2.B - Corrugated Metal Pipe. All metal pipe utilized shall have a nominal wall thickness of 16 gauge for pipes twenty-one inches (21") and larger and 18 gauge for pipes eighteen inches (18") and smaller, unless otherwise noted.

D. Corrugated Polyethylene Pipe (CPEP)

Corrugated polyethylene pipe shall conform to the following specifications:

1. Three inch through ten inch (3" through 10") diameters: AASHTO M-252 or ASTM F2648.
2. Twelve inch (12") and larger diameters: AASHTO M-294 or ASTM F2648.



The corrugated polyethylene pipe covered by these specifications is classified as follows:

Type C - This pipe shall have a full circular cross-section with a corrugated surface both inside and outside. Corrugations may be either annular or helical.

Type S - This pipe shall have a full circular cross-section, with an outer corrugated pipe wall and a smooth inner liner. Corrugations may be either annular or helical.

Type CP - This pipe shall be Type C with Class 2 perforations.

Type SP - This pipe shall be Type S with Class 2 perforations.

All CPEP fittings shall be rotational or blow molded and shall conform to the fitting requirements of AASHTO M-252 or M-294.

Contractor shall join CPEP segments per the manufacturer's recommendations. When a bell and spigot joint is utilized, the Contractor shall ensure that the rubber gasket is correctly inserted into the joint and that the bell is on the upstream end of the pipe.

For connections not using manufactured couplings, the Contractor shall join three inch to ten inch (3" - 10") CPEP with couplings corrugated to match the pipe corrugations or with push-on couplings with locking devices. Contractor shall join twelve inch (12") and larger CPEP with couplings, corrugated to match the index in the pipe corrugations and in a width not less than three-quarters (3/4) of the nominal pipe diameter. All couplings shall be manufactured to lap equally to a distance on each jointed pipe and shall provide a positive means of closure.

All flared end sections and saddles shall be constructed of the same material as the pipe and shall be factory assembled units to serve as structural, hydraulic, and/or aesthetic end treatment to CPEP culverts. CPEP connections shall be as recommended by the manufacturer. The cost of the end section and saddles shall be incidental to the pipe.

CPEP may be connected to CMP or may be used between or connected to dissimilar metals. When CPEP is used as a connection, the Contractor shall construct the connection utilizing a joint specifically manufactured for that type of connection or shall construct the connection in accordance with Standard Detail 55-1.

Contractor shall not insert any portion of the bell of CPEP pipe into any manhole, catch basin, or catch basin manhole unless that portion will be completely removed when the pipe is trimmed to two inches (2") inside the manhole in accordance with Article 5.3, SubArticle B – Storm Drain Manholes and Catch Basin Manholes.

E. High Density Polyethylene Pipe (HDPEP)

High density polyethylene pipe shall conform to the following specifications:

The polyethylene resin shall be classified by ASTM D-1248 as Type III, Class C, Category 5, Grade P34, and have a minimum ASTM D-3350 cell classification of 335434C and a designation of PE 3408 by the Plastic Pipe Institute.

The polyethylene compound shall be suitably protected against ultraviolet light degradation by means of a two percent (2%) concentration of carbon black, well dispersed by pre-compounding in with the resin (by the resin manufacturer).

The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material supplier. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects, and shall be identical in color, density, melt index, and other physical properties.

The pipe shall be designed according to the ISO modified formula in ASTM D-3035. The design pressure rating shall be expressed in terms of the static working pressure in psi for water at 73.4°F according to ASTM D-2837. The minimum allowable pressure rating for gravity pipe shall be 52 psi.

Join pipe lengths to one another using thermal butt fusion. Butt fusion of pipes shall be performed in accordance with the pipe manufacturer's recommendations for equipment and technique, using the correct size equipment and technique. Butt fusion will be performed only by personnel certified as competent by the polyethylene material supplier.

The Contractor shall provide butt fusion equipment compatible with the piping system being used as necessary to complete all joints on the project. All costs in connection with this equipment shall be included in the price bid for pipe installation.

Provide wall pipes or wall fitting as recommended by the pipe manufacturer to connect storm drain and catch basin drain pipes to manholes and catch basins.

Installation of all components shall be accomplished using the manufacturer's recommendations. Unless the Contractor's personnel are certified in the installation of polyethylene pipe, the pipe suppliers shall provide pipe personnel to instruct the Contractor in the handling, installation, and testing of their products. The Contractor shall provide one supplier's representative at the start of construction for on-site services. Additional technical representative services, if necessary, shall also be at the Contractor's expense.

Random tests of field joints will be made by the Engineer, as necessary, as a quality control measure. The Contractor shall be responsible for removal or repair of unsatisfactory butt fusion joints.

F. Polypropylene Pipe (PP)

Polypropylene pipe shall conform to the following specifications:

The pipe shall meet AASHTO M-330. All pipe and fitting joints shall be watertight per ASTM-D3212.

G. Detectable Warning Tape

Detectable underground warning tape is required for installation of all pipe types. Warning tape must not be less than five (5) mil, foil backed, six inches (6") wide vinyl tape, colored green, with "Caution Buried Storm Drain Line Below" continuously printed in black along the tape length.

**Article 2.3 Construction**

A. Excavation and Backfill

Excavation and backfill for furnishing and installing pipe shall be in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill.

B. Pipe Grade and Alignment

Variance of individual pipe sections from established line and grade shall not be greater than those listed in the table below, providing that such variance does not result in a level or reverse sloping invert.

Allowance Diameter (Inches)	Tolerance (Feet)
8	0.03
10	0.03
12	0.03
14	0.04
16	0.04
18 and greater	0.05

During the progress of the Work, the Contractor shall provide instruments such as transits, levels, laser devices, and other facilities for transferring grades from offset hubs or for setting of batter boards or other construction guides from the control points and bench marks provided by the Contractor. The Contractor shall provide qualified personnel to use such instruments and who shall have the duty and responsibility for placing and maintaining such construction guides. The Contractor shall notify the Engineer forty-eight (48) hours prior to taking measurements on newly installed section of line and/or appurtenances for Record Documents.

If the method of transferring grades from the offset hubs to the pipe require batter-boards, they shall be at least one by six inches (1" x 6") supported on two by four inch (2" x 4") stakes or approved metal rods and shall be placed every twenty-five feet (25'). At least three boards must be in place at any given time to facilitate checking of line and grade. Both line and grade shall be checked for each piece of pipe laid, except at tunnels where methods acceptable to the Engineer shall be used to carry forward line and grade.

The practice of pushing in uncompacted backfill over a section of pipe to provide a platform for transit and level alignment and grade observations shall be subject to the approval of the Engineer. If intermittent backfilling is allowed, backfilling shall be accomplished in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill.

Due to the flexibility of the CPEP, the Contractor shall exert due care while placing bedding and/or filter material and compacting adjacent to and over the pipe. All

placement bedding and/or filter material and compaction shall be per the manufacturer's recommendations.

#### C. Pipe Laying

CMP and PCMP pipe shall be laid in Class C Bedding and CPEP and HDPEP pipe shall be laid in Class D Bedding unless otherwise required by the Contract Documents or directed by the Engineer.

The Contractor shall exert due care in handling the precoated corrugated metal pipe or while placing bedding and/or filter material around the pipe so as not to damage the coating. The Contractor shall obtain a liquid coating supplied by the precoated corrugated metal supplier which will be painted over scratched or cut sections of the pipe.

Pipe laying shall in all cases proceed upgrade. Each pipe shall be laid true to line and grade and in such a manner as to form a close concentric joint with the adjoining pipe. The alignment of the installed pipe shall appear straight to visual observations and shall be such that a full circle of light can be seen between manholes, etc., when sighting along all points of the pipe circumference. Each section of pipe shall be handled carefully and placed accurately. Each section of pipe shall be properly supported to ensure true alignment and an invert which is smooth and free from roughness or irregularity. On helical pipe, the laps shall not impede the flow and all seams shall be aligned uniformly for the length of the run. At all times, when Work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no undesirable substances shall enter the pipe or fittings. All pipe shall be laid in accordance with the respective manufacturer's recommendations. Pipe shall not be laid when the bottom of the ditch or the sides to one foot (1') above the pipe are frozen. Backfill containing frozen material shall not be placed, nor shall the trench be left open during freezing weather so that the temperature of the material near the pipe goes below freezing.

At connections to manholes or catch basins, a minimum eight foot (8') length of pipe shall be provided from the outside edge of the structure to the first pipe joint.

Detectable warning tape shall be continuously laid with the pipe and be at least twenty-four inches (24") and no more than thirty-six inches (36") above the pipe.

#### D. Low Pressure Air Test

Where watertight pipe is specified on the Drawings, the Contractor must perform a low pressure air test on specified plastic pipes in accordance with ASTM F1417.

#### E. Televising Storm Drains.

New storm drains twelve inch (12") and greater in diameter shall be inspected by closed circuit television (CCTV) after completion of trench backfill and finished grading but prior to the placement of pavement or permanent trench resurfacing, to determine the existence and extent of any obstructions, structural deficiencies, or sags.

CCTV of storm drains shall be performed in accordance with Section 55.25 – Storm Drain Closed Circuit Television Inspections. CCTV for new pipe and subdrain installations is incidental to the respective bid items.

**Article 2.4 Measurement**

Measurement for all sizes of pipe shall be based on the horizontal distances and shall be from center to center of manholes, from the center of manholes to center of catch basins, from center of manholes to center of cleanout wye, and from center of manhole to end of pipe including flared end sections. Televising storm drains is considered incidental to the pay item and no separate payment shall be made.

**Article 2.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units.

ITEM	UNIT
Furnish, Install, and Televising Pipe (Nominal Size, Material)	Linear Foot

## **SECTION 55.03 SUBDRAINS AND PERFORATED STORM MAINS**

### **Article 3.1 General**

The Work under this Section consists of the performance of all operations pertaining to furnishing and installing subdrains and perforated storm drain mainlines.

### **Article 3.2 Material**

- A. All piping shall be in accordance with the Contract Documents and shall be the sizes shown and specified.
- B. The Contractor shall use perforated steel, perforated aluminum or perforated aluminized coated corrugated metal pipe as noted. Corrugated metal pipe shall conform to the provisions of Section 55.02 - Furnish and Install Pipe. Perforations shall be located and sized in accordance with the requirements of AASHTO M-36.
- C. Corrugated Polyethylene Pipe (CPEP) shall conform to the provisions of Section 55.02 - Furnish and Install Pipe. Size and locate perforations in accordance with the requirements of AASHTO M-252 for pipe diameters three to ten inches (3" to 10") and AASHTO M-294 for pipe diameters twelve to sixty inches (12" to 60"). Perforations shall be Class 2. Perforations shall be cleanly cut so that water inflow is not restricted and shall be uniformly spaced along the length of the pipe.

Unless shown otherwise on drawings, Type D Filter Material shall be used on all CPEP pipe diameters three to ten inches (3" to 10") and Type C Filter Material shall be used on all CPEP pipe diameters from twelve to sixty inches (12" to 60").

- D. Geotextile fabric shall conform to Division 20, Section 20.25 – Geotextile Fabric, and shall be non-woven, pervious drainage material.

### **Article 3.3 Construction**

Unless shown otherwise on drawings, refer to Standard Detail 55-3 for construction of subdrains and perforated storm drain mainlines. Each phase of construction shall be accomplished in accordance with the applicable sections of these Specifications. Excavation and backfill for furnishing and installing of subdrains and perforated storm drain mainlines shall be in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill. Furnish and install subdrains and perforated storm drain mainlines in accordance with Section 55.02 - Furnish and Install Pipe. Furnish filter material in accordance with Division 20, Section 20.17 - Furnish Filter Material.

### **Article 3.4 Measurement**

Measurement for all sizes of pipe shall be based on the horizontal distances and shall be from center to center of manholes, from the center of manholes to center of catch basins, from center of manholes to center of cleanout wye, and from center of manhole to end of pipe including flared end sections. Measurement includes furnishing, installing, and televising pipe; furnishing and placing filter material; and, when required by the Contract Documents, furnishing and installing geotextile fabric.

### Article 3.5 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Furnish, Install & Televisive Subdrain (Nominal Size, Material, and Type of Filter Material)	Linear Foot
Furnish, Install & Televisive Subdrain with Geotextile (Nominal Size, Material, Type of Filter Material, and Type of Geotextile Fabric)	Linear Foot
Furnish, Install & Televisive Perforated Storm Mains (Nominal Size, Material, and Type of Filter Material)	Linear Foot
Furnish, Install & Televisive Perforated Storm Mains with Geotextile (Nominal Size, Material, Type of Filter Material, and Type of Geotextile Fabric)	Linear Foot

## **SECTION 55.04    MODIFICATIONS TO EXISTING MANHOLES OR CATCH BASINS**

### **Article 4.1    General**

The Work under this Section consists of rehabilitating and providing new connections to existing manholes or catch basins. The Contractor shall provide all labor and materials required to furnish and install new manhole and catch basin components needed.

Modifications to existing manholes or catch basins can include, but are not limited to, furnishing and installing new pipe penetrations, as well as removal and replacement of manhole covers and frames, grade rings, cone section, barrel ring/riser section, base section, and ladder rungs.

### **Article 4.2    Materials**

The materials for replacement components to be used in the Work are to comply with the requirements of this Division, the Standard Details, and the Drawings. The Contractor shall furnish new, unused materials for those components identified to be replaced.

### **Article 4.3    Construction**

The Contractor shall reuse components that are not identified to be replaced. Damage by the Contractor that renders any such component unusable is to be replaced by the Contractor with new material at no additional cost to the Owner. If the Contractor finds that a component that is not identified to be replaced cannot be moved, adjusted, repaired, or worked on without damaging the component, the Engineer shall be notified in order to assess the component's ability to be re-used.

Excavation, shoring, dewatering, backfill, and compaction efforts required for modifications to existing manholes or catch basins shall be in accordance with Division 20 - Earthwork.

The Contractor shall remove and replace manhole and catch basin components as identified in the Drawings. Upon removal of manhole components, the Contractor shall clean and prepare remaining and connecting component parts prior to installation of replacement parts; this includes removal of existing grout and sealants. Installation of new sections is to be constructed to produce a smooth, regular, watertight surface.

Salvaged components shall be removed in a workman-like manner and delivered to a site as directed by the Engineer. Non-salvageable materials shall be removed to a Contractor-provided disposal site.

Connections to existing manholes or catch basins shall be made in a workmanlike manner. The invert shall be brought into the existing manhole at the elevation shown on the Drawings. The downstream pipe in manholes shall be screened to prevent entry of mortar or other debris from entering the system.

After connection is made to a storm drain manhole and the mortar holding the pipe in place has set, cut the pipe off evenly so that no more than two inches (2") of pipe protrudes into the manhole and remove any screening.



Upon completion of manhole or catch basin modifications, the Contractor shall restore the existing grade and surrounding area to preconstruction conditions.

**Article 4.4 Measurement**

Modifications to existing manholes and connections to manholes shall be measured as complete units in place. Unless specifically identified for payment under a separate bid item, all excavation, shoring, dewatering, backfill, compaction, restoration of existing preconstruction conditions, and disposal of unusable material necessary to complete the Work is incidental.

**Article 4.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made on the following basis:

ITEM	UNIT
Remove and Replace Manhole Cover and Frame	Each
Remove and Replace Grade Ring	Each
Remove and Replace Manhole Cone Section	Each
Remove and Replace Manhole Barrel Ring/Riser Section	Each
Remove and Replace Manhole Base Section	Each
Remove and Replace Ladder Rung	Each
Connect to Existing Storm Drain Manhole	Each
Connect to Existing Storm Drain Catch Basin	Each

## **SECTION 55.05 MANHOLES AND CATCH BASIN MANHOLES**

### **Article 5.1 General**

The Work under this Section consists of the performance of all Work required for the construction of storm drain manholes and catch basin manholes complete with frames and covers.

### **Article 5.2 Material**

#### **A. Frames and Covers**

Manhole and catch basin manhole frames and covers shall conform to the Standard Details, meet the requirements of ASTM A-48/AASHTO M-306, and be rated Heavy Duty (H-20 loading minimum). Gray cast iron shall have a minimum tensile strength of 35,000 pounds per square inch (PSI). Inlet grates shall conform to the Standard Details and the requirements of ASTM A536. Manhole frames, covers, and grates shall be furnished with machined horizontal bearing surfaces. The cover or grate shall not rock when rotated to any position in the frame.

Gray iron castings shall have appropriate certifications and be individually marked in accordance with the requirements of AASHTO M-306.

#### **B. Reinforced Concrete Manholes**

Material used in the construction of reinforced concrete manholes shall conform to the requirements of ASTM C-478 and the Standard Details. Cones shall be eccentric unless otherwise approved. Forty-eight inch (48") reinforced concrete pipe may be used for manhole riser sections as an alternate. This pipe shall conform to the requirements of ASTM C-76 with a minimum thickness of five inches (5").

Each precast concrete barrel section and eccentric cone shall be set and sealed by use of a pre-molded plastic gasket pipe joint sealer as manufactured by Henry Co, Ram-Nek Sealant Division or equal and installed to the manufacturer's specification and meets ASTM C990. Each concrete adjusting ring and manhole cover/frame that falls outside of a paved road section shall be set and sealed by a pre-molded plastic gasket sealer. Each concrete adjusting ring and manhole cover/frame that falls in a paved road section/sidewalk shall be set in a full bed of mortar. Mortar shall conform to Division 55, Section 55.01, Article 1.4B. The joints shall be constructed so as to produce a smooth, regular, watertight surface. Water shall be added in minimum amounts to provide plasticity in placing the mortar.

Refer to Division 30, Section 30.01, Article 1.6 - Mix Requirements for Classes of Concrete, for Specifications pertaining to Class A-3 concrete as required in forming manhole inverts.

Reinforcement steel shall conform to the requirements of ASTM A-185, ASTM A-615, Grade 60 steel, or better, and the Standard Details.

## Article 5.3 Construction

### A. General

Excavation and backfill for the construction of storm drain manholes and catch basin manholes shall be in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill.

All portions of the manholes must be approved by the Engineer prior to installation in the storm drain system. The Contractor shall provide timely notice (at least two Working days in advance of casting) to allow time for the Engineer to arrange for necessary inspections. Installation of manhole sections without the Engineer's written approval shall not be allowed. This approval does not relieve the Contractor of the responsibility for protection of manholes against damage during handling and installation.

The manhole frames and covers shall be brought to grade in accordance with Standard Details unless otherwise shown on the Drawings or approved by the Engineer. Manhole rings shall be set in a full bed of mortar and made secure. Grade adjustment rings must be set centered over the manhole and catch basin cone or lid opening with no lateral offset. No more than a one-quarter inch (1/4") lateral offset is permitted between grade adjustment rings. Total cumulative offset between grade adjustment rings shall not exceed one-half inch (1/2"). Manhole rings and catch basin frames shall be set centered on the opening with a maximum lateral offset of one-half inch (1/2") permitted.

Manholes shall be installed at the location shown on the Drawings and primary leads shall enter radially at the invert elevations specified. The base section shall be set plumb on a prepared surface. Prepared surface shall be compacted to a minimum of ninety-five percent (95%) of maximum density.

In the case of precast manhole barrel sections where holes need to be bored to provide for the storm drain pipe, the diameter of the bore shall not exceed the outside diameter of the storm drain pipe plus one and one-half inches (1.5").

Where indicated on the Drawings, a stub shall be provided for future connections to the manhole. The stub shall be sized and positioned as indicated. The end of the stub shall be stopped with a wooden plug, concrete biscuit, or other adequate methods to prevent water, earth, or other substances from entering the pipe. Manholes up to twelve feet (12') in depth shall have ten foot (10') stubouts; over twelve feet (12') in depth shall have twenty foot (20') stubouts.

In the case of poured-in-place manhole construction, if the Contractor elects to accomplish the manhole construction utilizing more than one continuous concrete pour, a keyed construction joint shall be used. These manholes shall have poured-in-place bases. Precast concrete barrel sections shall be set and sealed with premolded plastic gasket. Premolded plastic gaskets for sealing pre-cast concrete barrel sections for manholes shall meet ASTM C-990 and shall be installed in accordance with the manufacturer's recommendations. Gaskets shall be trimmed on the inside of the manhole to prevent the excess gasket material from entering the storm drain lines.

**B. Storm Drain Manholes and Catch Basin Manholes**

Contractor shall construct storm drain manholes in accordance with the Drawings and Standard Details. In the invert of manholes, Contractor shall construct a catch of eighteen inches (18”) minimum depth, unless otherwise specified.

After connecting the storm drain pipe to reinforced concrete manhole or catch basin, seal annular space around pipe penetrations with cement mortar, or an approved equal. Mortar used in the sealing of joints and connections shall conform to Division 55, Section 55.01, Article 1.4B. After the mortar has firmly set, Contractor shall cut the pipe evenly so that no more than two inches (2”) of the pipe protrudes into the manhole.

**Article 5.4 Measurement**

Manholes and catch basin manholes shall be measured as units complete in place. Depth of manholes and catch basin manholes shall be based upon a measurement to the nearest foot from top of casting to the top of the base slab. Standard depths for manholes and catch basin manholes shall be constructed in accordance with the Standard Details and designated as to type.

TYPE	STANDARD DEPTH
Type I, II, III	twelve feet (12')

All depths over the specified standard depth shall be paid for under the bid item "Additional Depth to Manhole" as defined below:

**Additional Depth for Manholes:**

This item consists of the construction of additional depth to manholes over and above the twelve foot (12') depth specified below. Additional depth to manholes and catch basin manholes shall be complete in place.

**Article 5.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made on the following basis:

ITEM	UNIT
Construct (Type, Diameter*) Manhole	Each
Construct (Type) Catch Basin Manhole	Each
Additional Depth to (Type) Manhole	Linear Foot

\* For Type III manholes, include the diameter in the descriptor for the appropriate pay item.

## **SECTION 55.06 WATERTIGHT MANHOLE FRAMES AND COVER**

### **Article 6.1 General**

The Work under this Section consists of the performance of all Work required for the construction of watertight manhole frames and covers.

### **Article 6.2 Material**

Watertight frames and covers for manholes and similar appurtenances shall conform to the Standard Details, meet the requirements of ASTM A-48/AASHTO M-306, and be rated Heavy Duty (H-20 loading minimum). Gray cast iron shall have a minimum tensile strength of 35,000 PSI. Contact surfaces between frames and covers shall be machined to provide a uniform contact surface. Manhole covers shall have identification letters as shown on the Standard Details.

### **Article 6.3 Construction**

Provide watertight manhole frames and covers as indicated on the Drawings and in accordance with the Standard Details.

### **Article 6.4 Measurement**

Watertight manhole frames and covers shall be measured as complete units in place.

### **Article 6.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment is to be made only for the additional cost of furnishing and installing the watertight frame and cover which exceeds the cost of the standard frame and cover included in the completed manhole unit price.

Payment shall be made under the following unit:

ITEM	UNIT
Additional Cost of Watertight Manhole Frame and Cover	Each

## **SECTION 55.07    ADJUST MANHOLE CONE, MANHOLE RING, OR CATCH BASIN TO FINISH GRADE**

### **Article 7.1    General**

The Work under this Section consists of providing all operations pertaining to the adjustment of existing manholes or catch basins to finish grade. All broken and/or missing manhole or catch basin components are to be replaced with new materials furnished and installed by the Contractor in accordance with these Specifications.

### **Article 7.2    Material**

All materials used in the adjustment of manhole cones and rings including mortar, steps, barrel sections, premolded plastic gaskets, etc., shall conform to the requirements for manholes as outlined in Section 55.05 - Manholes and Catch Basin Manholes.

All materials used in the adjustment of catch basins shall conform to the requirements for catch basins as outlined in Section 55.09 - Construct Catch Basin.

Radial concrete manhole blocks may be used for upward adjustments in certain cases if approved by the Engineer.

The Contractor may utilize Neenah R-1979 Series Manhole Adjusting Rings, or an approved equal, for adjusting the manhole to finished grade.

### **Article 7.3    Construction**

The Contractor shall make adjustments to existing manholes and catch basins in accordance with the applicable Standard Details. Each precast concrete barrel, cone section, or adjusting ring shall be set upon and sealed with a premolded plastic gasket which shall meet ASTM C990. The casting can be set in a bed of mortar with steel adjusting shims in the event the grade will not allow the premolded plastic gasket material. The steel shims shall be placed in four locations as a minimum and must be approved by the Engineer.

Grade adjustment rings must be set centered over the manhole and catch basin lid opening or cone with no lateral offset. No more than a one-quarter inch (1/4") lateral offset is permitted between grade adjustment rings. Total cumulative offset between grade adjustment rings shall not exceed one-half inch (1/2"). Manhole rings and catch basin frames shall be set centered on the opening with a maximum lateral offset of one-half inch (1/2") permitted.

Rotational as well as vertical displacement of the catch basin top and casting might occur. All adjustments will be accomplished as directed by the Engineer.

A horizontal milling process whereby the casting is milled to lower the top to meet the finish grade of the street is an approved method of lowering the manhole grade. This method must be submitted to the Engineer for approval.

Contractor shall remove and replace pavement around the manhole in such a way to minimize impact to the travel path of the roadway. Contractor shall either use infrared treatment to fuse old and new pavement or shall make the pavement cut in such a way to prevent a straight-line patch from occurring perpendicular to the direction of travel. Pavement cuts shall be made in a diamond shape in relation to the travel path rather

than a square shape. Contractor shall adjust the manhole or catch basin to finish grade prior to placement of asphalt pavement. Contractor shall have an inventory of extra grade rings, comprised of a few of each adjustment height (2" through 6"), available on site during paving. New asphalt shall not be cut for adjustments.

Any damage to manholes or catch basins resulting from construction under this Contract shall be repaired or the damaged portion replaced at the Contractor's expense. All inverts, benchwalls, and catch areas shall be left clean and free from any foreign materials.

**Article 7.4 Measurement**

Manhole cone, manhole ring, and catch basin adjustments shall be measured as units, complete in place.

**Article 7.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for manhole cone or ring adjustments shall include full compensation for changes in height per the applicable Standard Details, unless otherwise directed by the Engineer. In no case will payment for both ring and cone adjustments be made for the same manhole. Any adjustments requiring cutting of new asphalt shall not be paid and shall be deducted from the plan quantity.

Payment shall be made under the following unit:

ITEM	UNIT
Adjust Storm Drain Manhole Cone	Each
Adjust Storm Drain Manhole Ring	Each
Adjust Catch Basin to Finish Grade	Each

**SECTION 55.08 THIS SECTION INTENTIONALLY LEFT BLANK**



## **SECTION 55.09 CONSTRUCT CATCH BASIN**

### **Article 9.1 General**

The Work under this Section consists of the performance of all operations pertaining to the construction and installation of catch basins.

### **Article 9.2 Material**

Materials used in the construction of catch basins shall conform to the requirements of ASTM C-478 and the Standard Details.

For concrete used in the formation of catch basin base slabs, refer to Division 55, Section 55.01, Article 1.4A.

Mortar used in the construction of catch basins, including sealing of joints and connections, shall conform to Division 55, Section 55.01, Article 1.4B.

### **Article 9.3 Construction**

Excavation and backfill for furnishing and installing of catch basin shall be in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill.

Reducing slab shall be set and sealed by a pre-molded plastic gasket joint sealer as manufactured by Henry Co., Ram-Nek Sealant Division or equal and installed to the manufacturer's specification. Plastic gasket joint sealers shall meet ASTM C-990.

Contractor shall bring catch basin rings and covers to the grades shown on the Drawings. Grade stakes defining the elevation of the casting, and hub stakes with tacks to define the line for the curb face shall be set by the Contractor. The Contractor may accomplish final setting of the casting by wedging it up with masonry material as approved by the Engineer. The casting shall then be set in a full bed of mortar and made secure.

All joints and connections are to be mortared. The joints shall be made so as to produce a smooth, regular, watertight surface. Water shall be added in minimum amounts to provide plasticity in placing the mortar.

After connecting the storm drain pipe to catch basin, seal annular space around pipe penetration with cement mortar, or an approved equal. After the mortar has set firmly, the pipe is to be cut off evenly so that no more than two inches (2") of the pipe protrudes into the catch basin.

### **Article 9.4 Measurement**

Catch Basins shall be measured as units complete in place.

### **Article 9.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Catch Basin	Each

## **SECTION 55.10 RELOCATE CATCH BASIN OR CATCH BASIN MANHOLE**

### **Article 10.1 General**

The Work under this Section consists of providing all operations pertaining to relocating of existing catch basin or catch basin manholes.

### **Article 10.2 Material**

All materials used in relocation of catch basins or catch basin manholes shall conform to the requirements for catch basins as outlined in Section 55.05 - Manholes and Catch Basin Manholes and Section 55.09 - Construct Catch Basin.

### **Article 10.3 Construction**

The Contractor shall note the fact that the relocation of more than one type of catch basin or catch basin manhole may be required under this Contract. All excavation, trenching and backfill necessary for the removal and relocation shall be considered incidental to this item. The Contractor shall backfill the excavation with suitable, non-frost-susceptible material and compact it to not less than ninety-five percent (95%) of maximum density as directed by the Engineer. If additional material is required for backfill it will be paid for under the item "Furnish Trench Backfill." Existing leads may require relocation up to a maximum length of fifteen feet (15') to provide proper alignment. Such relocation shall be considered incidental to this Item. Pipe used shall be the same size and type as the existing leads. The relocated catch basin or catch basin manholes shall be adjusted to finish grade as directed by the Engineer.

### **Article 10.4 Measurement**

Relocation of catch basins or catch basin manholes will be measured on a basis of units complete in place at the new location and accepted by the Engineer.

### **Article 10.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Relocate Catch Basin	Each
Relocate Catch Basin Manhole	Each

## **SECTION 55.11 REMOVE MANHOLE OR CATCH BASIN**

### **Article 11.1 General**

The Work under this Section consists of providing all operations pertaining to the removal and disposal or salvage of existing manholes or catch basins.

### **Article 11.2 Construction**

Salvaged materials shall be removed in a workman-like manner and delivered to a site as directed by the Engineer. Non-salvageable materials shall be removed to a Contractor-provided disposal site.

Any excavation required in the removal shall be considered incidental to this item. The Contractor shall backfill the excavation with a suitable, non-frost susceptible material and compact it to not less than ninety-five percent (95%) of maximum density as directed by the Engineer. If additional material is required for backfill, it will be paid for under the Item "Furnish Trench Backfill." Existing pipes shall be suitably plugged and abandoned unless otherwise noted.

### **Article 11.3 Measurement**

Removal of existing manholes or catch basins will be measured as units.

### **Article 11.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Remove Manhole	Each
Remove Catch Basin	Each

**SECTION 55.12 THIS SECTION INTENTIONALLY LEFT BLANK**

## **SECTION 55.13 ABANDON CATCH BASIN LEAD**

### **Article 13.1 General**

The Work under this Section consists of performing all operations pertaining to the abandonment of catch basin leads. Catch basin leads to be abandoned may be crushed in place, filled with sand slurry, or removed, at Contractor's option and approval by the Engineer.

### **Article 13.2 Materials**

Sand slurry shall consist of a mixture of water and sand with an approximate ratio of seven gallons of water per cubic foot of sand. Native materials that contain no lumps, frozen material, organic matter, or other deleterious material are acceptable for use in the slurry mixture.

### **Article 13.3 Construction**

Contractor shall abandon catch basin leads as shown on the Drawings. The opening in the storm drain manhole where the catch basin lead enters shall be plugged with concrete grout and abandoned per Contractor's option and approval by the Engineer.

Where catch basin leads lie within trench excavation, as called for in the Drawings and Specifications, the leads shall be removed.

### **Article 13.4 Measurement**

Abandonment of each catch basin lead shall be measured as a complete unit. This item will include materials, excavations, placement of materials, disposal of unusable materials, backfill, and incidental operations.

### **Article 13.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Abandon Catch Basin Lead	Each

## **SECTION 55.14 CONSTRUCT STORM DRAIN CLEANOUT**

### **Article 14.1 General**

The Work under this Section consists of the performance of all Work required for the construction and installation of storm drain cleanouts.

### **Article 14.2 Material**

Materials used in the construction of storm drain cleanouts shall conform to the Standard Details.

### **Article 14.3 Measurement**

Storm drain cleanouts shall be measured as units, complete in place.

### **Article 14.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Storm Drain Cleanout	Each

## **SECTION 55.15 ADJUST STORM DRAIN CLEANOUT TO FINISH GRADE**

### **Article 15.1 General**

The Work under this Section consists of providing all operations pertaining to adjustment of existing cleanouts to finish grade. All broken and/or missing cleanout components are to be replaced with new materials furnished and installed by the Contractor in accordance with these Specifications.

### **Article 15.2 Material**

All materials used in the adjustment of cleanouts shall conform to the requirements for cleanouts as outlined in Section 55.14 - Construct Storm Drain Cleanout.

### **Article 15.3 Construction**

The Contractor may be required to adjust more than one type of cleanout under this Contract. All adjustments will be accomplished as directed by the Engineer. Any damage to cleanouts resulting from construction under this Contract shall be repaired or the damaged portion replaced at the Contractor's expense.

### **Article 15.4 Measurement**

Cleanout adjustments will be measured per unit, complete in place.

### **Article 15.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Adjust Storm Drain Cleanout to Finish Grade	Each

## **SECTION 55.16 CONSTRUCT DROP CONNECTION**

### **Article 16.1 General**

The Work under this Section consists of the performance of all Work required for the construction and installation of storm drain drop connections to manholes.

### **Article 16.2 Material**

Pipe and fittings used in the construction of drop connections for storm drain shall conform to the requirements of Section 55.02 - Furnish and Install Pipe and the Standard Details.

For materials used in the construction of the concrete cradle, refer to Division 55, Section 55.01, Article 1.4A.

### **Article 16.3 Construction**

Excavation and backfill for the construction of drop connection to manhole shall be in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill.

Over-excavation under drop connection shall require compaction of not less than ninety-five percent (95%) of the maximum density prior to installation of the pipe and fittings, or the concrete cradle.

### **Article 16.4 Measurement**

Storm drain drop connections shall be measured as units, complete in place.

### **Article 16.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Storm Drain Drop Connection	Each



## **SECTION 55.17 FLUME DOWNDRAIN**

### **Article 17.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing and installing flume downdrain(s) with anchor assemblies at locations shown on the Drawings.

### **Article 17.2 Materials**

All material utilized in the fabrication of the galvanized metal flume downdrain(s) shall conform to Section 55.02 - Furnish and Install Pipe with a minimum sheet thickness of six-hundredths inches (0.060").

### **Article 17.3 Construction**

The flume downdrain(s) shall be fabricated in accordance with the details and dimensions shown on the Drawings. No dissimilar metal shall be allowed at any installation. Anchor assemblies shown on the Drawings may be used with an aluminum installation provided the anchor assemblies are electrically insulated. All flume sections shall be connected together and to the existing pipe by means of galvanized bolts as indicated on the Drawings.

### **Article 17.4 Measurement**

Measurement shall be based on the horizontal length of flume downdrain measured from the top end of the flume downdrain to end of flared or half-round metal pipe modified end section complete in place with anchors properly placed in the ground and bolted to the flume downdrain pipe.

### **Article 17.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish and Install Flume Downdrain (Size)	Linear Foot

## **SECTION 55.18 FOOTING DRAIN SERVICES**

### **Article 18.1 General**

The Work under this section includes all material, labor, and equipment necessary for construction, connection, and/or disconnection/reconnection of footing drain services to the storm drain system.

### **Article 18.2 Material**

For new footing drain service construction, Contractor shall provide CPEP (Type S) pipe bedded in Filter Material (Type B), or as specified on the Drawings. Connect footing drain services to the storm drain with a saddle of a type recommended by the pipe manufacturer.

For reconnection of footing drain services, Contractor shall reconnect the existing footing drain service to the storm drain with a saddle of appropriate size and of a type recommended by the pipe manufacturer.

### **Article 18.3 Construction**

Excavation and backfill for the construction of footing drain services shall be in accordance with Division 20, Section 20.14 - Trench Excavation, Backfill and Compaction for Service Connections and is incidental to the service connection bid item. The number and approximate location of footing drain services are shown on the Drawings.

Contractor shall follow the footing drain saddle manufacturer's recommendations for installation, including ensuring that the connection is the correct size and shape and that the cut edges are smooth.

### **Article 18.4 Measurement**

Footing drain services is measured as units, complete in place.

The Work under this Section includes all materials, equipment, and Work required to construct, connect, disconnect, and/or reconnect the footing drain services as indicated on the Drawings and in accordance with this Division and Division 20 – Earthwork. Such materials, equipment, and Work are incidental and no additional payment is made for the following:

Trench Excavation and Backfill, Unusable or Surplus Excavation, Disposal of Unusable or Surplus Material, Usable Excavation, Type B Filter Material, Furnish and Install Pipe, Mechanical Compaction, Type II Trench Backfill, Shoring, Sheeting, Bracing, and Canousa Wrap.

### **Article 18.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

ITEM	UNIT
Disconnect/Reconnect Footing Drain Service	Each
Construct Footing Drain Service (Size)	Each

## **SECTION 55.19 CONSTRUCT OPEN DITCH**

### **Article 19.1 General**

The Work under this Section consists of the performance of all Work required for the excavation, embankment and spreading of material necessary to construct an open ditch.

### **Article 19.2 Construction**

#### **A. Excavation**

Excavation shall be to the grade and ditch cross section shown on the Drawings. The final ditch shall have no projections of roots, stumps, rock, or similar matter. Material hauled from the job site for disposal shall be paid for under Division 20, Section 20.10, Article 10.7 – Disposal of Unusable Material.

#### **B. Embankment**

Embankment shall be to the shape and at the location shown on the Drawing. The type of material utilized to construct ditch banks and dikes shall be as noted on the Drawing, or as approved by the Engineer. If additional material is required for embankment, it will be paid for under Division 20 - Earthwork.

#### **C. Cleanup**

The Contractor shall maintain the ditch and keep it open and free from all debris, as directed by the Engineer until final acceptance.

### **Article 19.3 Measurement**

Measurement for open ditch construction shall be per linear foot along the slope of the ditch.

### **Article 19.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made on the following basis:

ITEM	UNIT
Construct Open Ditch	Linear Foot

## **SECTION 55.20 CULVERT**

### **Article 20.1 General**

The Work under this Section consists of the performance of all materials and operations required to furnish and install culverts.

### **Article 20.2 Material**

All material utilized in the fabrication of culverts shall conform to Section 55.02 - Furnish and Install Pipe.

### **Article 20.3 Construction**

Excavation and backfill for furnishing and installing of culverts shall be in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill.

The Contractor shall furnish and install culverts as shown on the Drawings. The pipe shall be installed to the alignment and grades as required by the Drawings. The pipe shall be installed so that there is a minimum of twelve inches (12") of cover over the pipe before the placement of surfacing materials. Excavation, backfilling, compaction, and grading or ditching necessary to direct water into or out of the culvert, are incidental items and no separate payment shall be made.

Where additional backfill material is required, it shall be classified fill or backfill in accordance with Division 20, Section 20.21 – Classified Fill and Backfill and as directed by the Engineer. Disposal of unusable material shall be paid under "Disposal of Unusable Material" as designated in the Bid Proposal.

### **Article 20.4 Measurement**

Measurement of culverts shall be per linear foot along the slope of the pipe from end to end.

### **Article 20.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made on the following basis:

ITEM	UNIT
Culvert (Pipe Size, Material, Gauge, Shape)	Linear Foot

## **SECTION 55.21 FIN DRAIN**

### **Article 21.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing and installing an impervious subsurface fin drain system as shown on the Drawings or as directed by the Engineer.

### **Article 21.2 Materials**

The fin drain system shall consist of a flexible, impervious, vertical core made of a deeply dimpled, high-strength styrene sheet and a perforated storm pipe enveloped in a non-woven polypropylene filter fabric.

The subsurface fin drain system shall be Miradrain 6200 XL, or an approved equal.

#### **A. Fin Core**

The fin core shall consist of a deeply dimpled, high-strength, non-biodegradable styrene sheet. Provide fin core which is dimpled on both sides of the shaft. Dimple pattern shall create open channels between the dimples 0.40 to 0.80 cm wide and not less than 0.80 cm deep, which allows water flow along the face of the fin core on both sides in all directions.

#### **B. Filter Fabric**

The filter fabric shall conform to the requirements of Division 20, Section 20.25 - Geotextile Fabric for subsurface drainage and riprap lining (Type C Geotextile) or an approved equal.

#### **C. Pipe**

The perforated encased pipe shall conform to the requirements of Section 55.02 - Furnish and Install Pipe. Compaction adjacent to the pipe shall conform to Division 20, Section 20.13 - Trench Excavation and Backfill and the manufacturer's recommendations. The perforations in the pipe shall conform to Section 55.03 - Subdrains and Perforated Storm Mains.

### **Article 21.3 Construction**

Contractor shall install the fin drain in accordance with the manufacturer's recommendations and the applicable provisions of Division 20, Section 20.17 - Furnish Filter Material; Section 20.01, Article 1.5 - Compaction Standards; Section 20.25 - Geotextile Fabric; Section 55.02 - Furnish and Install Pipe; Section 55.03 - Subdrains and Perforated Storm Mains; and this Section. The Work under this Section shall include mechanical compaction, non-woven geotextile fabric, pipe, fin core, installing the fin drain system, filter material (Type C), Trench Excavation and Backfill, and Disposal of Unusable Material.

### **Article 21.4 Measurement**

The method of measurement for furnishing and installing the fin drain shall be per linear foot based on the horizontal distance measured from center of manhole to center of manhole and center of manhole to center of cleanout riser.

**Article 21.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish and Install Fin Drain (Size, Type)	Linear Foot

## **SECTION 55.22 OIL AND GRIT SEPARATOR**

### **Article 22.1 General**

The Work under this section consists of performing all operations pertaining to constructing a storm drain oil and grit separator, complete with manhole structure, frames, covers, and diversion apparatus as shown on the Drawings, or as the Engineer directs.

### **Article 22.2 Materials**

Contractor shall furnish and install a Stormceptor oil and grit separator manufactured by:

Rinker Materials/Stormceptor 800 NE Tenney Road, Suite 413 Vancouver, WA 98685 Phone: 503-572-9894 FAX: 503-296-2023	Local Contacts: D & S Concrete, Inc. 2140 E 84th Ct Anchorage, AK 99507 Phone: 907-349-6031 FAX 907-349-4597 or an approved equal.	Local Contacts: CONTECH Vortechinics OGS Systems 111 E. 100th Avenue Anchorage, Alaska 99515 Phone: 907-344-1144 Fax: 907-344-1174. or an approved equal.
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Contractor shall backfill the excavation with Type II Classified Fill and Backfill material. If foundation material is required, provide "Foundation Backfill (Type II)."

The storm drain manhole shall conform to the requirements of Section 55.05 - Manholes and Catch Basin Manholes and the Drawings. The diversion apparatus shall conform to the requirements of the oil and grit separator manufacturer's specifications and Standard Detail 55-29B.

Contractor shall provide access to the structure through two (2) manhole frames and covers. The smaller cover shall conform to Standard Detail 55-4. The manufacturer of the oil and grit separator shall provide the larger cover clearly marked "oil/grit separator" and the larger cover shall support HS-20 loadings.

### **Article 22.3 Construction**

Contractor shall install the separator in accordance with Section 55.05 - Manholes and Catch Basin Manholes and the separator unit manufacturer's specifications.

Contractor shall backfill around the manhole with a minimum of three feet (3') Type II Classified Fill and Backfill to the full depth of the manhole, compacted in accordance with Division 20, Section 20.21 - Classified Fill and Backfill. Classified Fill and Backfill is incidental to this pay item, and no separate payment shall be made.

### **Article 22.4 Measurement**

Oil and grit separator is measured as a complete unit in place and shall include the concrete manhole, diversion apparatus, frames, covers, and classified backfill. All clearing and grubbing, excavation, backfill, compaction, and disposal of unusable material necessary to construct the oil and grit separator, is incidental to this Work item. Foundation backfill, if required, will be paid pursuant to Division 20, Section 20.19 - Furnish Foundation Backfill.

**Article 22.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment will be made under the following unit:

ITEM	UNIT
Oil and Grit Separator (Model #)	Each



## **SECTION 55.23 UNDERGROUND DETENTION AND INFILTRATION SYSTEMS**

### **Article 23.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing and installing an underground detention and infiltration chamber system as required by the Drawings and these Specifications.

Contractor shall furnish all labor, materials, equipment, and incidentals necessary to install the system, appurtenances, and incidentals in accordance with the Drawings, these Specifications, and the Manufacturer's requirements.

### **Article 23.2 Related Standards**

ASTM F2418 – Standard Specification for Polypropylene Corrugated Wall Stormwater Collection Chambers.

ASTM F2787 – Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers.

### **Article 23.3 Materials**

Contractor shall furnish and install a Contech ChamberMaxx underground detention and infiltration chamber system, or an approved equal.

Contech Engineered Solutions  
9025 Centre Pointe Drive  
West Chester, OH 45069  
Phone: 1-800-338-1122

Local Contact:  
Contech Engineered Solutions  
111 W. 100th Avenue  
Anchorage, Alaska 99515  
Phone: 907-344-1144  
Fax: 907-344-1174.

The chambers shall be constructed of injection molded polypropylene copolymer formulated for high impact and stress cracking resistance and sustained structural performance during high temperatures. The chamber shall be designed and manufactured in accordance with ASTM F2418 and F2787.

The chambers shall be designed to AASHTO LRFD Bridge Design Specifications (Section 12), as applied to material and performance requirements for buried thermoplastic pipes. Design live load shall be the AASHTO HS-20 and HS-25 truck, including multiple lane presence factors, over a minimum cover of 18 inches and chamber row spacing of 5 inches or greater.

### **Article 23.4 Construction**

The Contractor shall participate in an on-site preconstruction meeting with the supplier prior to the scheduled delivery date of the system.

The system shall be installed per the manufacturer/supplier installation instructions, the Drawings, and these Specifications. The Contractor shall carry out the installation in strict accordance with OSHA and manufacturer's safety requirements.

Underground detention and infiltration systems shall be inspected by closed circuit television (CCTV) after completion of backfill and finished grading but prior to the

placement of pavement or other permanent resurfacing, to determine the existence and extent of any obstructions, structural deficiencies, or sags. CCTV shall be performed in accordance with Section 55.25 – Storm Drain Closed Circuit Television Inspections and is incidental to this bid items.

**Article 23.5 Measurement**

An underground detention and infiltration system is measured as a complete unit in place and shall include the containment row(s), diversion manhole, manifold piping, inspection port, geotextile, scour protection, and classified backfill. All clearing and grubbing, excavation, backfill, compaction, and disposal of unusable material necessary to construct the underground chamber system, is incidental to this Work item.

**Article 23.6 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Underground Chamber System	Each

**SECTION 55.24 THIS SECTION INTENTIONALLY LEFT BLANK**

## **SECTION 55.25 STORM DRAIN CLOSED CIRCUIT TELEVISION INSPECTIONS**

### **Article 25.1 General**

The Work under this Section consists of providing all operations associated with video inspection and recording of storm drain assets.

This Work may be required multiple times and at different phases of construction.

New and replaced storm drains twelve inch (12") and greater in diameter shall be inspected by closed circuit television (CCTV) after completion of trench backfill and finished grading but prior to the placement of pavement or permanent trench resurfacing, to determine the existence and extent of any obstructions, structural deficiencies, or sags.

Storm drain pipe being rehabilitated using cured in place pipe lining shall be inspected by CCTV during and after pipe preparation and after lining is completed.

Traffic control may be required to access storm drain manholes, catch basins, catch basin manholes, and other assets. The MOA makes no warranty as to the condition of the pipe, manholes, catch basins, or access points.

### **Article 25.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. Submittals, at a minimum, are to include applicable items identified below:

1. Video
2. CCTV Equipment product data, when requested

### **Article 25.3 Material**

CCTV equipment includes vehicles, computers, software programs, viewing devices, cameras, cables, portable power sources, lights, blowers, winches and all related equipment needed to satisfactorily complete a CCTV inspection.

The camera is to process video in color with a lens having a focal distance between one inch (1") and infinity ( $\infty$ ), be capable of autofocus, manual focus and have an adjustable iris. The in-pipe target is to be viewable with the camera at a perpendicular angle to the target and the camera at zero zoom. For cameras with zoom lens capability, calibration and in-pipe measurements are to be taken at zero zoom. Analog Video output and capture is to be a minimum of 400 lines per inch.

The camera is to be transporter mounted for six inch (6") diameter and larger pipe line inspections, have built in lighting with pan and tilt capabilities of 360° rotation and 270° tilt. Illumination is to be adjustable and capable of providing a clear and well lit picture. Lighting is to be planned and executed based upon the size and type of pipe being inspected.

CCTV performed using digital high-resolution camera(s) equipped with wide angled lens(es) that provide 360 degree spherical and side scanning capabilities that provide "unfolded" views of the pipe, and propelled by a transporter that travels faster than 30 feet per minute, may be used as an alternative to a pan and tilt camera / transporter.

This alternative will only be used if the contractor can comply with all other requirements of this specification section.

Pole mounted cameras may be used to video storm structures and pipe connections.

All in-pipe equipment is to be certified to operate in conditions found in wet/submerged storm drain pipes and manholes without adverse effects to the equipment or the storm drain system. Typically this will require, but not limit, the camera to operate in grease, sludge, mud, gravel, one hundred percent (100%) humidity, and other adverse environments.

#### **Article 25.4 Construction**

Where required, the Contractor is to complete a CCTV inspection at the following points of construction;

- Condition Assessment – The primary goal of this inspection is to document the condition of an existing storm drain asset through the use of video and photographic documentation. This information will assist engineers and planners to plan and prioritize any needed repairs.
- Pre-rehabilitation – This inspection takes place during or after pipe preparation and prior to the rehabilitation of a storm drain asset. The video is used to ensure that the pipe is ready for rehabilitation and to look for places that may interfere with the planned rehabilitation. The video and photographic documentation is to be provided to the Engineer for review prior to beginning rehabilitation.
- Prior to Acceptance of New Pipe – Prior to acceptance of newly installed pipe, a CCTV inspection is performed to look for deficiencies in the work. If no deficiencies are found, the CCTV of storm drain pipe is to set baseline condition of the newly installed pipe from which future CCTV inspections will be used to document changes in the condition of the pipe.
- Post rehabilitation – This inspection takes place after rehabilitation of the pipe has been accomplished and will be used to determine Substantial Completion.
- Rehabilitation acceptance – This inspection will take place approximately one month prior to the end of the Warranty Period. It is the responsibility of the Contractor to request CCTV of the rehabilitated storm drain asset. The Warranty will be automatically extended to 30 days past the Rehabilitation Acceptance CCTV or Warranty expiration date, whichever is later.

The Contractor shall notify the Engineer two (2) working days in advance of the anticipated date of the televising. The Engineer or their designee is to be provided unobstructed access to CCTV facilities from set up to tear down of the CCTV equipment. During the CCTV inspection the Engineer or their designee may require the Contractor to backup, adjust the camera and investigate with the CCTV equipment any points they may deem of interest.

The Engineer will review the CCTV video to determine conformance with the specification. The Contractor is to correct deficiencies where the video does not meet the standards stated herein at no additional cost to the Owner.

#### A. Storm Drain Main CCTV Inspection

The camera is to be centered in the pipe and move in a downstream direction at a uniform rate stopping and recording all joints and points of coding. At no time is the rate to exceed a rate of thirty feet per minute (30 ft/min), unless using the digital high-resolution camera identified as an alternative in Article 25.3. When the camera is not able to complete the inspection, after several attempts and cleaning of the storm drain pipe, then the inspection of the current segment is to be abandoned and started from a reverse setup going against the storm drain flow.

The camera lens is to be kept clear of condensation, oils, grease and debris during the CCTV inspection. Lighting intensity is to be adjusted to minimize glare. Picture quality shall be adjusted to provide a clear in-focus picture of the entire periphery of the pipeline.

The Contractor is to complete a thorough examination of stopping points prior to continuing the inspection. The following partial list of required stopping points are provided below:

- Manholes - Pipe penetrations and barrel sections are to be videoed.
- Joints – camera shall rotate 360° to provide a potential view of all portions of the joint. The rotation is to occur at a metered rate over no less than twenty seconds.
- Cracks and fractures – provide a close up view of the point of interested (POI) and a perspective view indicating the extent and/or length of the POI and how close the nearest pipe joint is.
- Holes, breaks, lining failures and/or deformations – provide a close up and perspective view of the POI. Adjust the view to make apparent any voids behind the POI.
- Lateral connections – inspect the hole cut into the pipe and associated repairs at all lateral connections.
- Changes in alignment, sags or crests – The view should be long enough and lit such that the change can be estimated.

#### B. Storm Drain Cleaning

When the storm drain line to be inspected by CCTV is slated to be rehabilitated, the pipe cleaning process identified in Section 55.26 shall be followed.

In all other circumstances, the Contractor is to clean the storm drain lines by removing grit, loose solids, grease, and any debris that is present. Debris is to be trapped at the end of the CCTV inspection run and properly hauled off and disposed.

Storm drain line cleaning is to be accomplished using a high velocity jet or mechanically powered equipment. Selection of the equipment used is to be based on the condition of the storm drain line at the time the work commences.

The Contractor is to take due care to avoid damaging the pipe or impact lateral connections.

Cleaning is to be completed by the Contractor within 144 hours and no less than one hour prior to inspection.

C. Flow Control

CCTV video will not be accepted when the water depth is greater than twenty-five percent (25%) of the pipe diameter.

Flow control is required for the successful completion of the CCTV inspection. The Contractor is to schedule inspections at low flow times, assist with a high velocity hydraulic jet, provide storm drain flow control or any combination of the above to meet the water depth requirement.

D. Distance Measurement

The distance shall be measured between the exit of the start structure and the entrance of the finish structure for a true measurement of the length of the pipe segment. It shall be recorded in standard units and the video display readout shall display units to one-tenth of a foot. The camera cable shall be retracted to remove slack to ensure an accurate footage reading. The cable footage counter is to be accurate to the nearest third of a foot (1/3').

E. Deliverables

A minimum of two digital photos are to be taken of each defect, one showing a perspective view and one showing a close-up view. The photo is to have on-screen information such as the distance into the inspection, the starting asset number and the ending asset number.

The Contractor is to submit to the Engineer within five days of completing the CCTV inspection video files, photographs, and the storm drain inspection database. Photographs, video, folders, and other data will be properly referenced within the contractor's database.

The data may be provided on CD's, DVD's, USB Thumb Drives, or portable hard drive. The data shall include the following:

	Data View	Audio	Written
Report No.	X		X
Date of CCTV inspection	X	X	X
Current weather conditions	X		X
MOA Storm Drain Grid page number	X		X
Upstream and downstream manhole structure numbers, storm drain access point or station numbers.	X	X	X
GPS coordinate locations for upstream and downstream manholes and/or any other storm drain access points. GPS receivers shall provide sub-meter accuracy	X		X
Location, size, type, and length of pipe.	X	X	X

	Data View	Audio	Written
Direction of flow and measurement ("From" manhole/storm drain access point/station number "To" manhole/storm drain access point/station number)			X
Tape Counter Footage (current distance along reach)	X		Beginning & End
Sketch showing the street and cross streets where the TV inspection was made			X
Description and location of each defect		X	X
Description and location of each connection		X	X

Recorded images showing steam, inadequate lighting, or poor image quality will be cause for rejection. Rejected recordings will be rerecorded by the Contractor at no additional cost to the Owner.

If the Engineer determines that corrections are needed, the documentation is to be resubmitted after corrective action has taken place.

### Article 25.5 Measurement

CCTV measurement is not to overlap and is to occur once per bid item under which it is being paid for regardless of the number of times the CCTV camera views any one piece of pipe during that pay item. Measurement of footage is to be based on footage counter shown in the video.

### Article 25.6 Basis of Payment

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment includes all labor, tools, equipment, apparatus and incidentals required to complete the Work. At a minimum, no additional payment will be granted for setups, reverse setups, tear downs, relocation, overlapping video footage per bid item, lost or damaged equipment, property owner coordination, and jetting during CCTV activities. Pipe cleaning in preparation for CCTV is incidental unless required for the Prepare Pipe for Lining bid item, in which case the Work is paid under that bid item. Storm drain flow control is considered incidental, unless provided for as a bid item.

Acceptance of new pipe CCTV is incidental to the bid item Furnish & Install Pipe or Furnish & Install Subdrain.

Payment shall be made under the following units:

ITEM	UNIT
Condition Assessment CCTV	Linear Foot
Pre-rehabilitation CCTV	Linear Foot
Post Rehabilitation CCTV	Linear Foot
Rehabilitation Acceptance CCTV	Linear Foot



## **SECTION 55.26 CURED IN PLACE PIPE (CIPP) LINING**

### **Article 26.1 Description**

The Work under this Section consists of the performance of all operations pertaining to preparing the storm drain pipe for the installation of the lining system, furnishing and installing a cured in place pipe (CIPP) lining system for storm drain pipe rehabilitation, and the subsequent Warranty Close-out Inspection, all in accordance with the pipe lining system manufacturer's recommendations and industry standards.

The Work shall include the performance of a closed-circuit television inspection, including DVD recording of the pre-lining pipe condition, providing all operations pertaining to pipe cleaning, the removal of all intruding pipe ends, intruding pipe material, and other obstructions and deleterious material, within the pipe cross-section and throughout the full length of the pipe, which may interfere with the installation or service performance of the lining system, and any other preparatory Work recommended by the lining system manufacturer and industry standards.

The Contractor shall furnish all labor, materials, and equipment for doing the Work including storm drain line cleaning, storm drain flow control and pipe lining installation. The CIPP shall meet the requirements of ASTM F1216 or ASTM F1743 or ASTM F2019. The CIPP shall extend the full length of the host pipe being rehabilitated and shall provide a structurally sound, impermeable, jointless, close-fitting pipe that when cured is mechanically fixed inside the host pipe. If applicable, removal and replacement of the existing host pipe in those areas shown on the drawings shall be accomplished before the liner is inserted.

Polyvinyl Chloride (PVC) fold and form pipe liner installed per ASTM F1504, ASTM F1867, or ASTM F1871 will not be acceptable.

### **Article 26.2 Submittals**

Submit the following for review and approval by the Engineer:

1. Product information for the lining system materials, methods of repair and SDS's for all materials used.
2. Calculations showing that the lining thickness and strength has been designed to meet the requirements of this specification.
3. Verification of the pipe diameters in the Drawings
4. Material sample test results including soil cell testing, chemical resistance, SDR, creep and long-term structural loading tests.
5. Sampling and testing plan for the CIPP.
6. Installers proof of manufacturer's certification.
7. Information confirming that the pipe conforms to the requirements of the Materials Section of this Specification.
8. Submit documented evidence of the ability and capacity of the CIPP installer to perform this work. Submit the name and qualifications of the senior installation supervisor who will be on the project whenever lining materials are

being handled, impregnated with resin, or installed. The senior installation supervisor shall have installed a minimum of 3,000 feet of similar CIPP liner of the same CIPP system in storm drains. If the Contractor does not have a senior installation supervisor that meets these requirements, the Contractor shall provide a manufacturer's representative who is qualified in the CIPP lining work at the project site for the first seven (7) days of CIPP installation while the first two sections of liner is being installed in the host pipe. Contractor shall submit evidence of the manufacturer representative's experience and qualifications for approval by the Engineer prior to the site visit.

### **Article 26.3 Materials**

The hydraulic capacity of the lined pipes shall equal or exceed 100% of the original unlined pipe.

#### **A. Felt or Fiberglass Tube**

The tube shall consist of one or more layers of flexible, needled felt or an equivalent woven and/or non-woven material capable of carrying resin, withstanding installation pressures and curing temperatures and compatible with the resin system used. The felt tube shall meet the requirements of ASTM D5813.

Fiberglass tubing shall consist of at least two separate tubes made of corrosion resistant (E-CR) glass fibers in accordance with ASTM D578. The fiberglass tube shall meet the requirements of ASTM F2019.

#### **B. Resin/Catalyst**

The contractor shall furnish an ultraviolet (UV) or thermosetting polyester or vinylester resin compatible with the approved liner and a compatible catalyst system as specified by the resin manufacturer. The resin manufacturer shall provide the Contractor with their recommended curing cycle and shall submit the same to the Engineer for approval.

#### **C. Structural Requirements**

Design Criteria: The cured in place pipe thickness shall be calculated per ASTM F1216, Appendix X.1 The cured-in-place-pipe thickness shall be calculated and designed based upon the following physical condition of the existing pipe to be rehabilitated.

1. Pipes shall be considered partially or fully deteriorated, as indicated on the drawings or special provisions.
2. All pipes shall be considered to have a depth of bury as provided in the Contract Documents. If not provided, use no less than five feet (5').
3. All pipes shall be subject to a water table as provided in the Contract Documents. If not provided, use not less than two feet (2') above the invert of the pipe.
4. All pipes shall have a minimum of 5% ovality reduction factor in the circumference.
5. A factor of safety of not less than 2.0 shall be applied.

6. The enhancement factor K shall not be higher than 7.
7. The CIPP shall have a wall thickness that is no less than 10 percent (10%) larger than the minimum calculated design thickness.

D. Mechanical Properties

The CIPP when cured shall have the following minimum values when tested in accordance with ASTM F1216 by an independent testing laboratory:

1. Flexural Strength (tested in accordance with ASTM D790) 4,500 psi
2. Flexural Modulus (tested in accordance with ASTM D790) 250,000 psi
3. Chemical Resistance Meet Minimum Requirements of ASTM F1216, Table X2.1

**Article 26.4 Construction**

A. General

The Contractor shall carry out this operation in strict accordance with all OSHA and manufacturer's safety requirements. Particular attention is drawn to those safety requirements involving working with scaffolding, entering confined spaces and operations with hot media.

The Contractor shall take all necessary precautions and actions to prevent debris from entering the pipe. Contractor shall remove any debris that enters the system due to construction, including the downstream system.

B. Storm Drain Pipe and Structure Cleaning

The designated storm pipe sections from storm structure to storm structure shall be cleaned using high velocity jet, or mechanically powered equipment. Selection of the equipment used shall be based on the condition of the storm pipes and structures at the time the Work commences. The equipment shall be capable of removing dirt, grease, rocks, sand, pipe coating debris and other materials and obstructions from the storm pipes and structures. If cleaning of an entire section cannot be successfully performed from one structure, the equipment shall be set up on the other structure and cleaning again attempted.

During cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment. Care shall be exercised to avoid damage to the pipes and structures during cleaning. If the bottom of the pipe is corroded or missing, the cleaning process shall be limited to getting the bottom smooth enough to allow the pre-lining CCTV and to support the lining operation. Extra caution shall be used to ensure that the Contractor does not wash away material that is outside the diameter of the existing pipe section. If the Contractor operation results in a significant wash-out, the Contractor shall import classified material to fix the wash-out. Repair of the wash-out, including placement and the cost of the imported material, is incidental to the Work and no separate payment is made.

The Contractor shall be responsible for and repair, at no cost to the Owner, any damage to a structurally sound (no cracks, breaks or loss of pipe wall thickness) storm pipe caused by use of the cleaning equipment. Further, the Contractor shall

be responsible for any damage to properties connected to the storm drain which result from the pipe cleaning operation.

Cleaning shall be performed to a level required so that television inspection and storm drain pipe rehabilitation can be properly accomplished. Contractor may use CCTV to monitor work during the cleaning of the storm drain pipe to determine whether the pipe is sufficiently cleaned, at which point the Contractor shall CCTV the pipe in accordance with Section 55.25 – Storm Drain Closed Circuit Television Inspections and provide a copy to the Engineer for final acceptance of the storm drain pipe cleaning. If television inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the storm drain line by television inspection until the cleaning is shown to be satisfactory, at no additional cost to the Owner.

If the Contractor wishes to use AWWU water for this work, the Contractor shall obtain a hydrant permit from AWWU prior to obtaining water from any hydrant. Any damage to the hydrant or water system resulting from misuse or work not in compliance with the fire hydrant permit by the Contractor shall be repaired by the Contractor at no cost to the Owner.

C. Material Removal and Disposal

All sludge, dirt, sand, rocks, grease, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream structure of the section being cleaned. Passing material from structure to structure will not be permitted. Collected material shall be disposed of by the Contractor in accordance with Division 10, Section 10.04, Article 4.9 – Disposal Sites. Disposal of the collected material is incidental to the Work and no separate payment is made.

D. Pre-Lining Inspection

The Contractor shall inspect the storm drain pipe immediately before the insertion of the impregnated tube to assure that the pipe is clean and existing pipe conditions are acceptable for lining.

Inspection of pipes shall be performed by experienced personnel trained in locating breaks, obstacles, and lateral connections by closed-circuit television, completed in accordance with Section 55.25 – Storm Drain Closed Circuit Television Inspections. The interior of the pipe shall be carefully inspected to determine the location of any conditions which may prevent proper installation of the pipe lining, and it shall be noted so that these conditions can be corrected. Immediately after the inspection is complete, the Contractor shall provide the Engineer with an inspection recording and suitable log for later reference.

If the pre-insertion video inspection reveals an obstruction in the existing pipe (heavy solids, dropped joint, collapsed pipe, etc.) that cannot be removed with conventional pipe cleaning equipment, then the Contractor shall contact Engineer immediately to determine how to deal with the obstruction.

E. Bypass Storm Flows

Contractor shall bypass storm drain flows in accordance with Article 26.5, SubArticle A – Bypass Storm Flows.

#### F. Resin Impregnation

The Contractor shall designate a location where the felt tube will be impregnated with resin, using distribution rollers and vacuum, to thoroughly saturate the felt tube prior to its dispatch for installation. A catalyst system or additive(s) compatible with the resin and tube may be used per the manufacturer's recommendation. However, they shall not impair or reduce the resin's ability to withstand the minimum chemical resistance or load bearing criteria. The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall.

#### G. Installation

If an additional sleeve or tube is required for liner protection, the Contractor shall install it per the manufacturer's recommendations prior to pipe lining.

The wetted out tube shall be transported and protected until it is inserted through an existing structure. The insertion area, equipment platform, etc., shall be securely protected, and all damaged structures shall be repaired by the Contractor.

The CIPP shall be installed in accordance with ASTM F1216 or ASTM F1743. Care shall be taken not to overstress the felt or fiberglass tube at the elevated curing temperatures, which may cause damage or failure prior to cure.

#### H. Curing

After completion of the insertion, the Contractor shall follow manufacturer's recommended curing method. The Contractor shall use a hot water recirculation, steam system, or ultraviolet light (depending on the requirements described below), capable of delivering a consistent cure of the resin.

The Contractor shall be responsible for moving or conveying water to the work area. The curing temperature shall be as recommended by the resin manufacturer.

For water or steam cure, the heat source shall be fitted with suitable monitors to gauge the temperature of the outgoing and incoming curing water or steam. Another such gauge shall be placed between the impregnated tube and the invert to the original pipe at all manholes along the length of the liner (including intermediate manholes) to determine the temperatures during the resin curing process. Initial cure may be considered completed when the exposed portions of the felt tube pipe appear to be hard, and the remote sensing device indicates the temperatures to be adequate, as recommended by the resin/catalyst system manufacturer. Curing temperatures and duration shall comply with previously submitted data and information.

For heat cured CIPP, cool the hardened cured-in-place-pipe to a temperature below one hundred degrees Fahrenheit (100° F) before relieving the internal pressure. Cool down shall be accomplished with water. Careful attention shall be taken not to cool too quickly to eliminate the possibility of thermoshock. Care shall be taken in the release of the internal pressure so that a vacuum will not be

developed that could damage the newly installed liner. Cool down process may vary depending on the installation technique of the manufacturer/Contractor.

For UV cure the Contractor shall provide equipment capable of delivering desired UV light intensity, pressure, and temperature uniformly throughout the liner. The UV light intensity, pressure, and temperature shall be continuously monitored by both computer and video as recommended by the liner manufacturer.

Samples shall be obtained for testing as stated below.

I. Fit/Finish

The finished pipe shall be continuous over the entire length of the storm drain section. The finished liner shall tightly conform to the walls of the existing host pipe. No gap or annular space between the finished liner and the host pipe shall be allowed or be visible at the structure, lateral connection, or other exposed points within the finished liner section. The finished liner shall be homogenous throughout and free of any protrusions, holes, cracks, etc., which in the opinion of the Engineer will affect the liner's structural integrity, hydraulic performance, future maintenance access, and overall line performance.

At liner termination points in manholes, provide a smooth transition from the liner to the existing pipe end. If necessary, grind the exposed liner edge smooth to eliminate rough or abrupt edges that may collect debris or hamper CCTV equipment operation.

J. Reinstatement of Lateral Connections

Reinstate lateral connections, if necessary, using trenchless techniques in accordance with the liner manufacturer's requirements. The Work shall be accomplished from within the storm drain line. Excavation to reinstate lateral connections will not be allowed. Re-opening of the lateral entrances shall be performed in a manner to prevent blockage of flows at the opening. The reinstated connection opening shall be no less than 95 percent and no more than 100 percent of the size of the original connection opening. The reinstated connection shall be smooth and uniform with no rough edges or protrusions along the trimmed edge of the liner that could cause debris to collect at the connection opening. Each reinstated connection shall be thoroughly inspected with the camera during the post rehabilitation CCTV inspection to confirm that the final fit and finish is acceptable. The CCTV inspection will include stopping at each reinstated connection, pausing for 10 seconds and view the entire circumference of the reinstated connection.

If the Contractor cuts through the liner outside of the lateral connection to be reinstated, the Contractor shall repair the damaged liner at no additional cost to the Owner.

K. Clean Up

After the installation Work has been completed and all testing accepted, the Contractor shall clean up the entire project area. The Contractor shall dispose of all excess material and debris not incorporated into the permanent installation.

#### L. Sampling and Testing

Sampling and testing shall meet the requirements of ASTM F-1216 or ASTM F-1743. Deviations from sampling methods described in the appropriate ASTM shall be reviewed and approved or denied in advance of the start of construction. Sampling and testing shall include the following:

1. Prepare a minimum of three CIPP samples from each diameter of liner installed.
2. Samples shall be large enough to provide a minimum of five specimens.
3. Test for initial tangent flexural modulus of elasticity and flexural stress in accordance with ASTM D790 and meet the requirements of Article 26.3, SubArticle D. Mechanical Properties within this specification.
4. Verify that the liner thickness of the sample meets the requirements of this specification.
5. Submit test results to the Engineer for review and approval.

#### M. Post-Rehabilitation Television Inspection

After the liner is inserted and lateral connections have been reinstated, the Contractor shall complete a television inspection of the CIPP and submit the video and log to the Engineer for review. The final television inspection shall conform to Section 55.25 – Storm Drain Closed Circuit Television Inspections and to the requirements of this Specification. The entire circumference of the liner and each reinstated lateral connection shall be observed during the television inspection. The Contractor shall by-pass or temporarily block the storm drain flow in accordance with Article 26.5, SubArticle A – Bypass Storm Flows, if necessary to achieve this condition. The entire circumference of the liner shall be readily visible with the television camera.

#### N. Final Acceptance

The final acceptance for the liner will be based on visual observation results of the post-rehabilitation television inspection and satisfactory sampling and testing results. During the post-rehabilitation television inspection, the Engineer will examine the pipe wall for deformation or damage. The Contractor shall correct deformations and reinspect as required by the Engineer.

### **Article 26.5 Work Incidental to CIPP**

#### A. Bypass Storm Flows

The Contractor shall bypass the storm flows around those sections of pipe designated for rehabilitation on an as-required basis.

Prior to construction, the Contractor shall submit to the Engineer a plan detailing the scheduled deployment of pumps, hoses, and other equipment necessary to maintain storm flows during construction. The Contractor shall ensure that pumping systems shall be of sufficient capacity to handle existing flow plus additional flow that may occur during a rainstorm for the duration of all operations requiring such bypass. A minimum of 500 gpm capacity will be required for bypass pumping but flows can be expected as large as 2700 gpm during storm events.

The Contractor shall provide a primary bypass pump in good working order and reliable or provide a standby pump of the same or equal capacity that is connected into the bypass piping system and immediately ready for operation. The pumping system shall be such that the hydraulic gradient both upstream and downstream of the piping being bypassed will not reach elevations that will cause damage to the properties being served. This will require close attention to the elevation of the upstream head needed to actuate the pumping cycle and the rate of discharge flow from the pumps. Under no circumstances shall the Contractor allow the discharge of storm water on the ground.

If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum and the Contractor shall provide full-time, 24-hour monitoring and observation of the bypass pump when bypass pumping is occurring.

The Contractor is reminded that after-hours pumping may require a permit to exceed the allowable noise levels. Should such a permit not be available for certain locations, such lack of availability shall not be cause for a claim for additional compensation or time extension.

The Contractor shall be liable for all damages which result from storm drainage flows not properly maintained during the progress of the Work, including damages to private property which occur as a direct or indirect result of inadequate control of the storm drainage flows while the storm drainage bypass operation is ongoing.

All Work as described in this SubArticle, including bypass pumping of existing storm flows and all dewatering operations/efforts associated with rehabilitation of existing storm drain pipe, shall be incidental to the project and no separate payment shall be made.

#### B. Disposal of Water Generated by Lining Operations

Contractor is responsible for obtaining all necessary permits for disposal of water generated during lining operations. Contractor shall collect and dispose of all water generated during lining operations around those section(s) of pipe designated for rehabilitation on an as-required basis.

Prior to construction, Contractor shall submit to the Engineer a plan detailing the necessary permits acquired and the method of collecting and disposing of water generated during lining operations.

Contractor's methods for collection and disposal of water generated from pipe preparation and lining operations shall comply with the current Municipality of Anchorage MS4 Permit (Permit No. AKS-052558) and the current ADEC Standards including, but not limited to, the Alaska Water Quality Standards (18 AAC 70) and Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances. For more information refer to the following website:

<https://dec.alaska.gov/water/water-quality/standards>

All Work as described in this SubArticle, including collection and disposal of all water generated during lining operations and obtaining all necessary permits, shall be incidental to this project and no separate payment shall be made.



**Article 26.6 Measurement**

Measurement for preparing pipe for lining shall be based on actual length of pipe on a linear foot basis without respect to pipe diameter. Closed-circuit television inspection of the pipe including delivery of the DVD to the Engineer is incidental to this pay item and no additional payment shall be made.

Measurement for all sizes of lining pipe shall be based on the horizontal distances and will be for actual linear footage for liner installed in the field and shall be measured between the pipe ends along the length of the pipe.

Measurement for reinstatement of lateral connections shall be per each.

**Article 26.7 Basis of Payment**

Payment for this Work shall be in accordance with M.A.S.S. Section 10.07 Measurement and Payment as amended in these specifications and shall include full payment for all Work as described in this Section.

Payment for furnishing and installing CIPP liner includes furnishing all materials and performing the Work specified in this Section, including liner, resin, storm drain line cleaning and preparation, sampling and testing, and sealing the liner in the manholes.

Payment for reinstating lateral connections shall constitute full payment for furnishing labor and equipment required to reinstate lateral connections shown in the drawings.

Unit cost payment shall be made on the following basis:

ITEM	UNIT
Prepare Pipe for Lining	Linear Foot
Furnish and Install CIPP Liner (Diameter)	Linear Foot
Reinstate Lateral Connection	Each

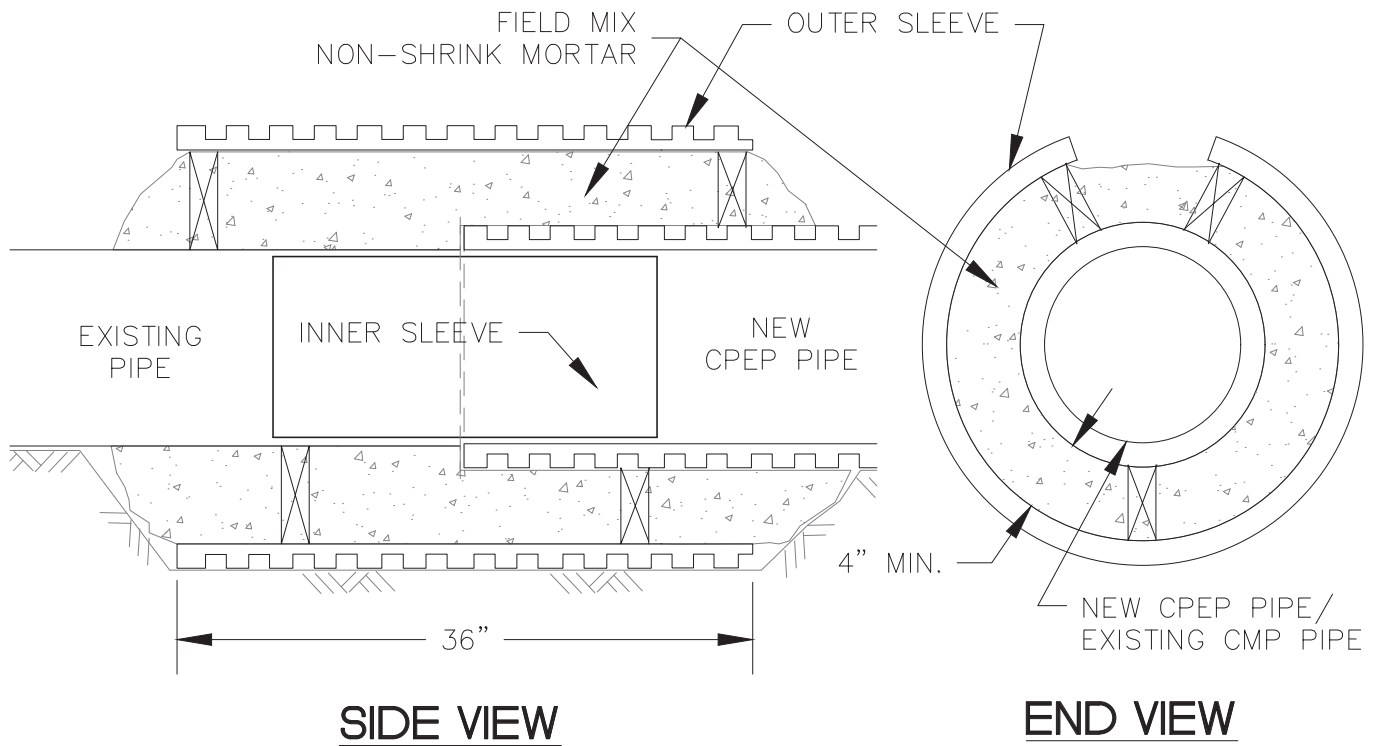


**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 55  
STORM DRAIN SYSTEMS  
STANDARD DETAILS**

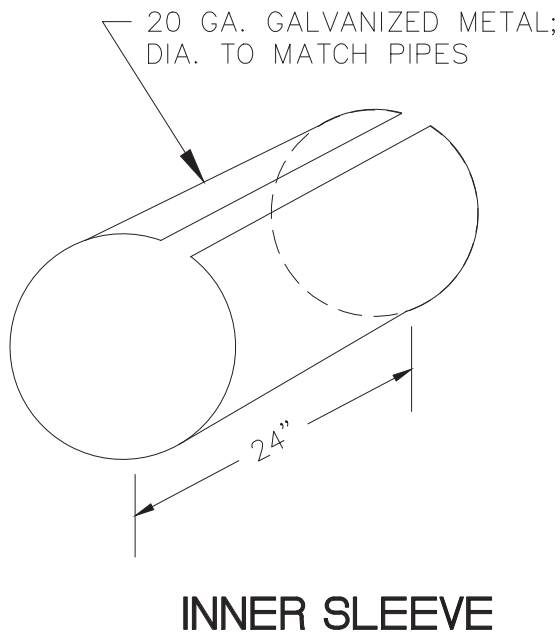
**STANDARD CONSTRUCTION SPECIFICATIONS  
DIVISION 55  
INDEX OF STANDARD DETAILS**

- 55-1 CPEP Storm Pipe Connection
- 55-2 Corrugated Metal Pipe Band
- 55-3 Subdrain / Perforated Storm Mains
- 55-4 Storm Drain Manhole Type I - Pipe  $\leq$  24"
- 55-5 Storm Drain Manhole Type II - 24" to 36"
- 55-6 Storm Drain Manhole Type III
- 55-7 Storm Drain Manhole Cover
- 55-8 Storm Drain Top Intake Cover
- 55-9 Storm Drain Beehive Intake Cover
- 55-10 Manhole Heights
- 55-11 Precast Concrete Reducing Slab (72" or 48" to 26")
- 55-12 Precast Concrete Reducing Slab (72" to 48")
- 55-13 Precast Concrete Two Hole Reducing Slab (72" to two 25 1/2")
- 55-14 Precast Concrete Reducing Slab (112" to 72")
- 55-15 Precast Concrete Reducing Slab (140" to 72")
- 55-16 Precast Concrete Reducing Slab (168" to 72")
- 55-17 Manhole Cone Adjustment
- 55-18 Manhole Ring Adjustment
- 55-19 Curb Inlet Frame and Hood for Type 1 Curb and Gutter
- 55-20 Curb Inlet Grates for Type 1 Curb and Gutter
- 55-21 Curb Inlet for Type 2 Curb and Gutter
- 55-22 Precast Catch Basin
- 55-23 Storm Drain Cleanout
- 55-24 Storm Drain Drop Connection (2' Min Drop)
- 55-25 Storm Drain Drop Connection (4' Min Drop)
- 55-26 Footing Drain Service
- 55-27 Driveway Culvert Details
- 55-28 Dual Entry Manhole
- 55-29A Oil and Grit Separator Bypass
- 55-29B Oil and Grit Separator Bypass Manhole



**SIDE VIEW**

**END VIEW**

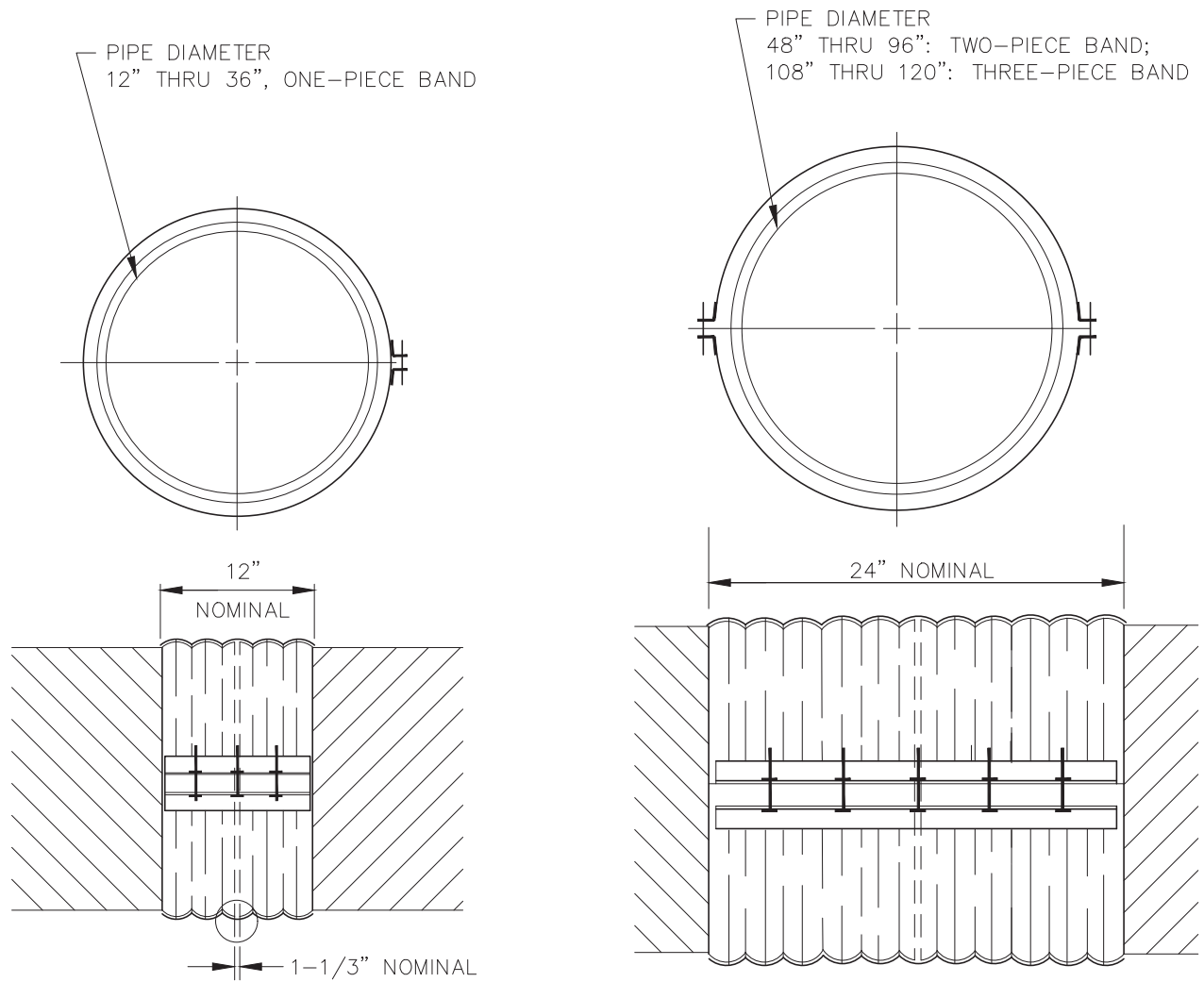


**INNER SLEEVE**

**NOTE:**

1. MATCH INVERTS OF EXISTING PIPE AND NEW CPEP PIPE. INNER SLEEVE SHALL FORM A SMOOTH TRANSITION, WITHOUT AN ABRUPT EDGE WITH NEW CPEP PIPE AND EXISTING CMP PIPE.
2. INSTALL 24" LONG INNER SLEEVE.
3. INSTALL A 36" LONG OUTER SLEEVE, CENTER ON JOINT, AS A CONCRETE FORM.
4. FILL OUTER SLEEVE WITH NON-SHRINK MORTAR.
5. USE POTABLE WATER IN MINIMUM AMOUNTS TO PROVIDE PLASTICITY IN PLACING THE MORTAR.
6. BACKFILL AND COMPACT TRENCH.

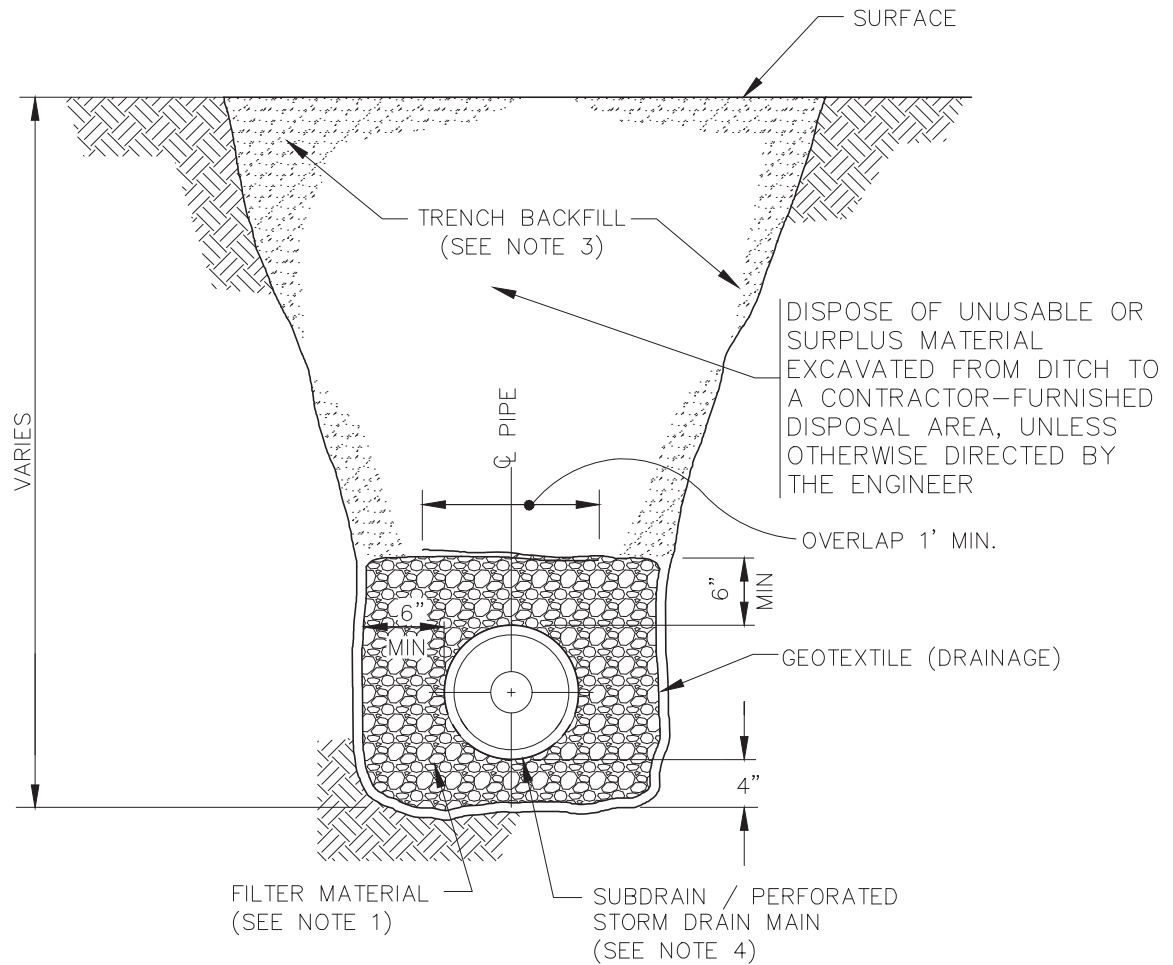
 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>CPEP STORM PIPE CONNECTION</b></p>	<p>SECTION # 55.02</p> <p>DETAIL # 55-1</p>
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**NOTE:**

1. 12" THRU 36" PIPE ENDS RE-CORRUGATED TO ANNULAR (2 VALLEYS MIN. PER END).
2. 48" THRU 120" PIPE ENDS RE-CORRUGATED TO ANNULAR (4 VALLEYS MIN. PER END).
3. BAND ANGLES TO BE 2"x2"x12" GA. MIN.
4. BAND MATERIAL AND FABRICATION SHALL CONFORM TO AASHTO M-36 AND AASHTO M-218; PROVIDE 16 GAUGE BANDS FOR 12" THRU 120" DIAMETER PIPES.
5. DIMPLED TYPE CONNECTING BANDS ARE ALLOWABLE ONLY WHERE FITTINGS ARE USED IN NEW OR EXISTING CONSTRUCTION, FOR REPAIRS TO DAMAGED CMP, AND FOR EXTENSIONS TO CMP WITHOUT ANNULAR ENDS. SIZE BANDS IN ACCORDANCE WITH ABOVE SCHEDULE (MIN. 12").
6. BOLT SIZE SHOULD BE 1/2" DIAMETER BY 8" LONG. NUTS SHALL BE PROVIDED WITH A WASHER.

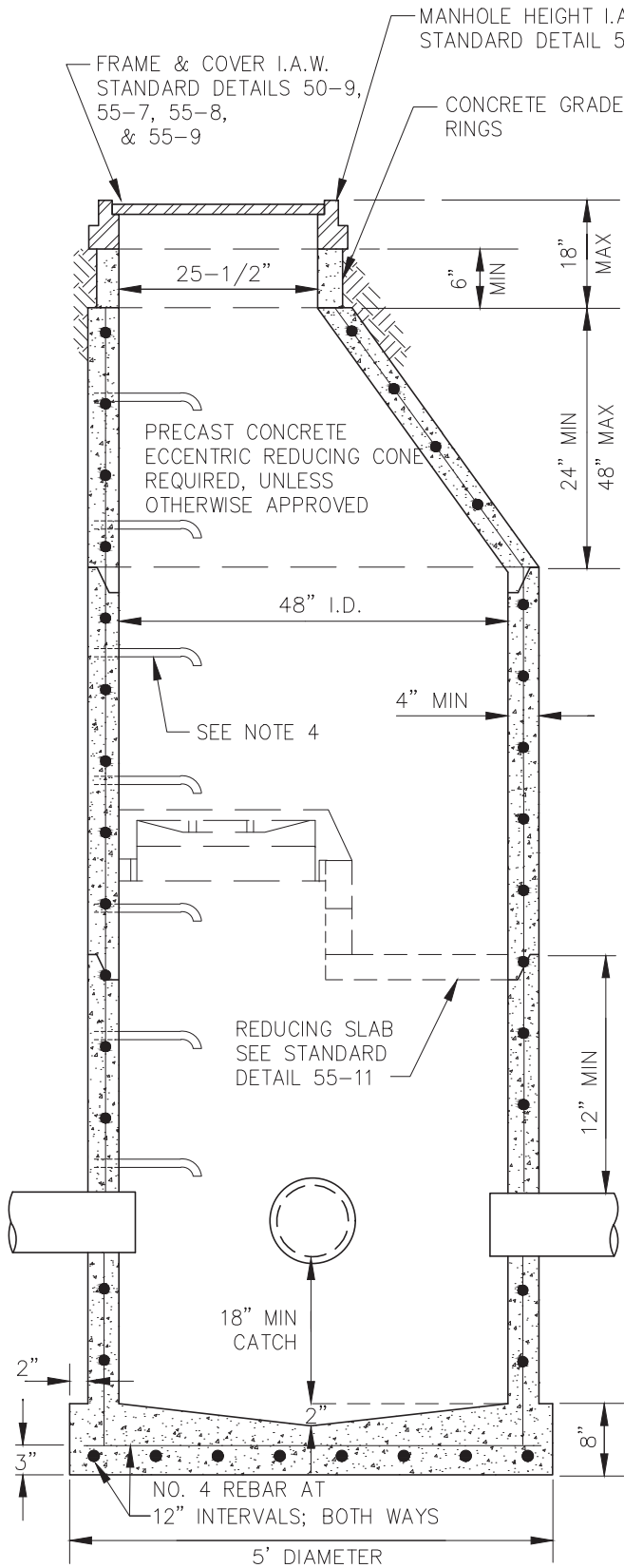
 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>CORRUGATED METAL PIPE BAND</b></p>	<p>SECTION # 55.02</p> <p>DETAIL # 55-2</p>
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**NOTE:**

1. PROVIDE FILTER MATERIAL TYPE AS SPECIFIED IN THE CONTRACT DOCUMENTS.
2. COMPACT BACKFILL UNDER THE EXISTING OR PROPOSED ROAD PRISM TO A MINIMUM OF 95% OF MAXIMUM DENSITY.
3. TRENCH BACKFILL SHALL BE CLASSIFIED BACKFILL AS SPECIFIED IN THE DRAWINGS.
4. PERFORATION PATTERN AS SHOWN ON THE DRAWINGS. IF NO PERFORATION PATTERN PROVIDED ON DRAWINGS, USE CLASS 2 PATTERN, EITHER 45° OR 60°, AS SPECIFIED IN THE APPROPRIATE AASHTO STANDARD.

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>SUBDRAIN / PERFORATED STORM MAIN</b></p>	<p>SECTION # 55.03</p> <p>DETAIL # 55-3</p>
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**NOTE:**

1. MANHOLE SECTIONS SHALL CONFORM TO A.S.T.M. C-478.
2. EXTEND PIPE 2" INTO MANHOLE. SEAL PIPE PENETRATIONS WITH NON-SHRINKABLE GROUT MIXED WITH POTABLE WATER I.A.W. MANUFACTURERS RECOMMENDATIONS.
3. BLOCKOUTS SHALL BE FORMED.
4. PLACE RUNGS 12" ON-CENTER ON UNOBSTRUCTED SIDE OF MANHOLE 18" MAX. FROM BOTTOM OF MANHOLE & 8" MAX. FROM TOP OF CONE. IF UNOBSTRUCTED SIDE NOT AVAILABLE, BOTTOM RUNG TO BE PLACED 6" OVER SMALLEST PIPE. WHEN USING REDUCING CONE, MAXIMUM DEPTH TO FIRST LADDER RUNG IS 26". WHEN USING FLAT SINGLE ACCESS LIDS, THE MAXIMUM DEPTH TO THE FIRST LADDER RUNG IS 30". SEE MANHOLE STEP STANDARD DETAIL 50-6.
5. MANHOLE SHALL HAVE MINIMUM OF ONE 6" GRADE RING.
6. BACKFILL AROUND MANHOLE WITH A MINIMUM OF 3' TYPE II CLASSIFIED FILL & BACKFILL. BACKFILL SHALL BE INCIDENTAL TO COST OF MANHOLE INSTALLATION.
7. CATCH BASIN LEADS SHALL ENTER THE MANHOLE AT LEAST ONE PRIMARY LEAD DIAMETER ABOVE THE TOP OF THE PRIMARY LEAD UNLESS MINIMUM PIPE SLOPES CANNOT BE ACHIEVED.
8. STEEL REQ'D FOR BARREL SHALL CONFORM TO A.S.T.M. C-478. EMBED STEEL IN BASE SO THAT FIRST BARREL SECTION IS CONNECTED WITH BASE.
9. "RAM-NEK" OR EQUAL AND PRIME BARREL JOINTS. HEAT "RAM-NEK" AND SEAL SURFACES BEFORE FINAL ASSEMBLY.
10. PRIMARY LEADS NOT TO EXCEED 24" CPEP OR HDPEP WITH INCLUDED ANGLE BETWEEN LEADS GREATER THAN OR EQUAL TO 135°, OR PRIMARY LEADS NOT TO EXCEED 18" CPEP OR HDPEP WITH INCLUDED ANGLE LESS THAN 135°.
11. A TYPE I MANHOLE SHALL NOT BE USED WHEN BOTH CATCH BASIN AND ACCESS FUNCTIONS ARE REQUIRED.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

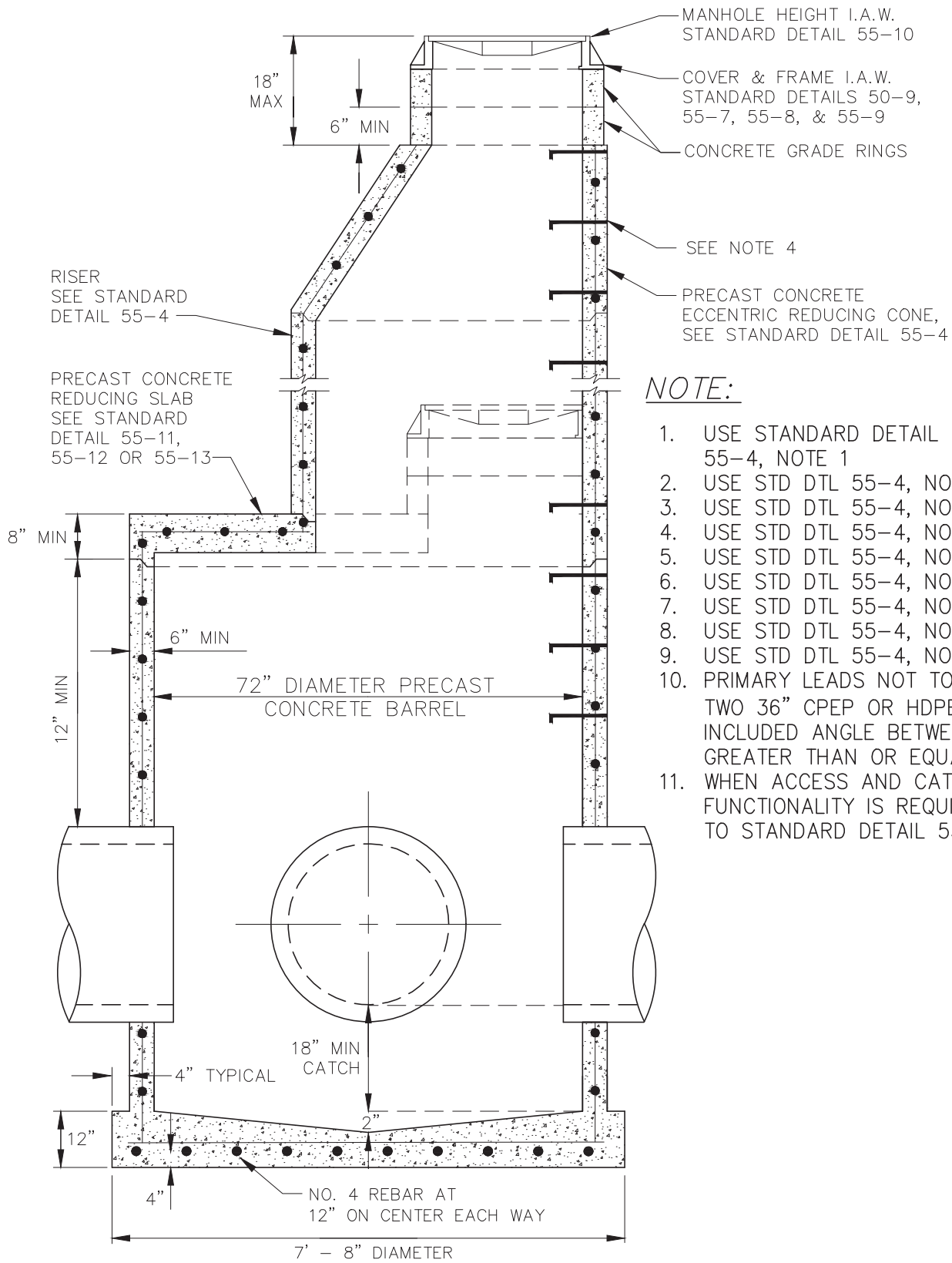
REVISED:  
2/24

**STORM DRAIN MANHOLE  
TYPE I  
PIPE ≤ 24"**

SECTION #  
55.05

DETAIL #  
55-4





**NOTE:**

1. USE STANDARD DETAIL (STD DTL) 55-4, NOTE 1
2. USE STD DTL 55-4, NOTE 2
3. USE STD DTL 55-4, NOTE 3
4. USE STD DTL 55-4, NOTE 4
5. USE STD DTL 55-4, NOTE 5
6. USE STD DTL 55-4, NOTE 6
7. USE STD DTL 55-4, NOTE 7
8. USE STD DTL 55-4, NOTE 8
9. USE STD DTL 55-4, NOTE 9
10. PRIMARY LEADS NOT TO EXCEED TWO 36" CPEP OR HDPEP WITH INCLUDED ANGLE BETWEEN LEADS GREATER THAN OR EQUAL TO 135°.
11. WHEN ACCESS AND CATCH BASIN FUNCTIONALITY IS REQUIRED, REFER TO STANDARD DETAIL 55-28.



SCALE:  
N.T.S.

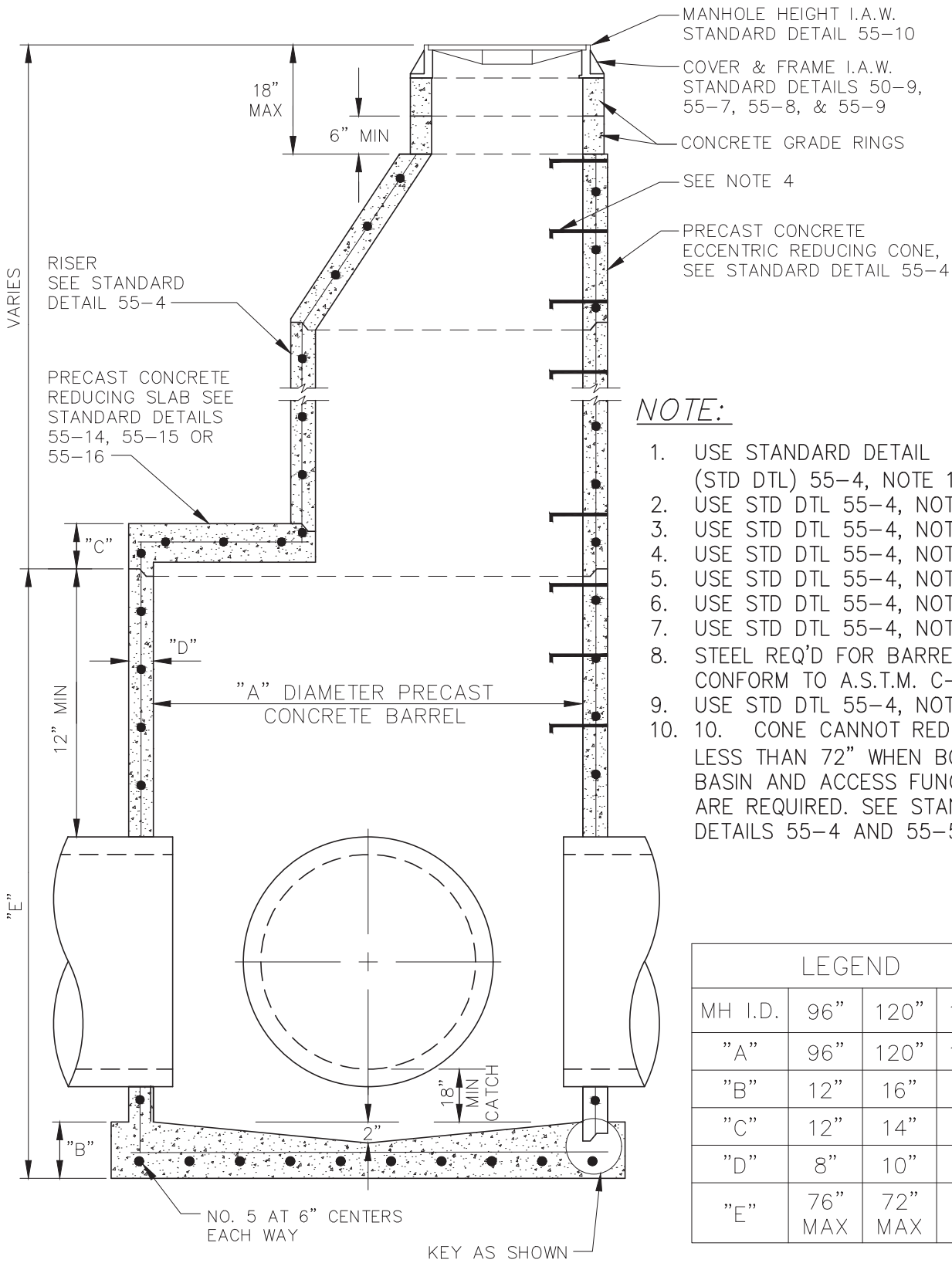
APPROVED:

REVISED:  
2/24

**STORM DRAIN MANHOLE  
TYPE II  
24" TO 36"**

SECTION #  
55.05

DETAIL #  
55-5



**NOTE:**

1. USE STANDARD DETAIL (STD DTL) 55-4, NOTE 1
2. USE STD DTL 55-4, NOTE 2
3. USE STD DTL 55-4, NOTE 3
4. USE STD DTL 55-4, NOTE 4
5. USE STD DTL 55-4, NOTE 5
6. USE STD DTL 55-4, NOTE 6
7. USE STD DTL 55-4, NOTE 7
8. STEEL REQ'D FOR BARREL SHALL CONFORM TO A.S.T.M. C-478.
9. USE STD DTL 55-4, NOTE 9
10. 10. CONE CANNOT REDUCE TO LESS THAN 72" WHEN BOTH CATCH BASIN AND ACCESS FUNCTIONS ARE REQUIRED. SEE STANDARD DETAILS 55-4 AND 55-5.

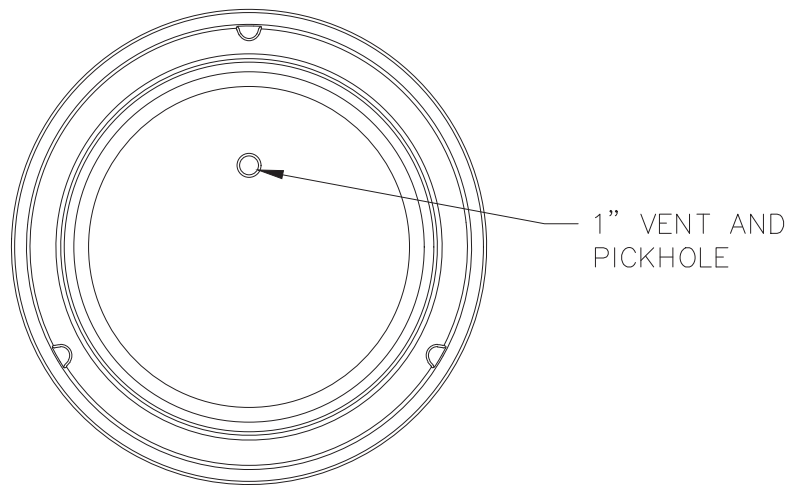
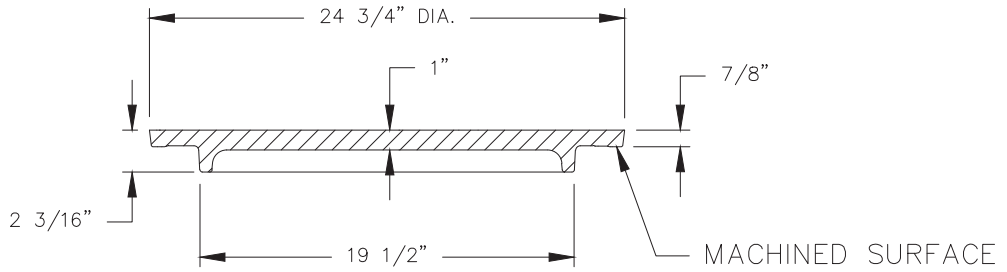
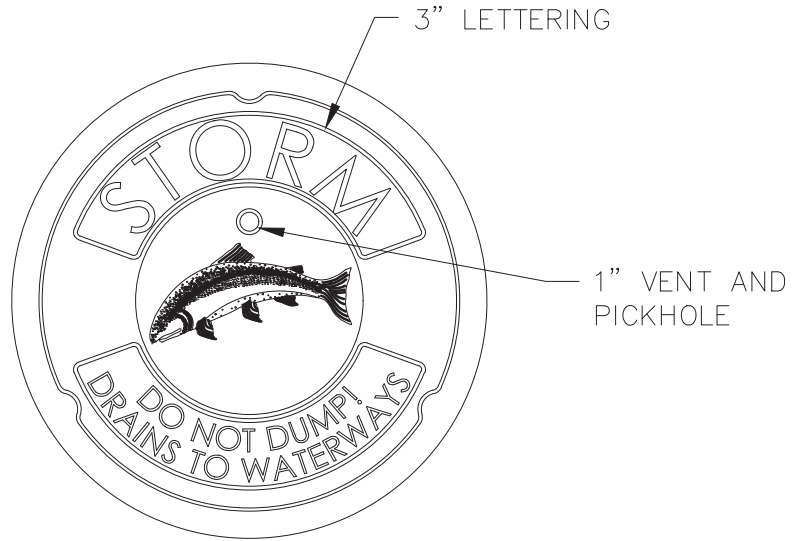
LEGEND			
MH I.D.	96"	120"	144"
"A"	96"	120"	144"
"B"	12"	16"	16"
"C"	12"	14"	16"
"D"	8"	10"	12"
"E"	76" MAX	72" MAX	56" MAX

MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
N.T.S.  
 APPROVED:  
 REVISED:  
2/24

# STORM DRAIN MANHOLE TYPE III

SECTION #  
55.05  
 DETAIL #  
55-6



SCALE:  
N.T.S.

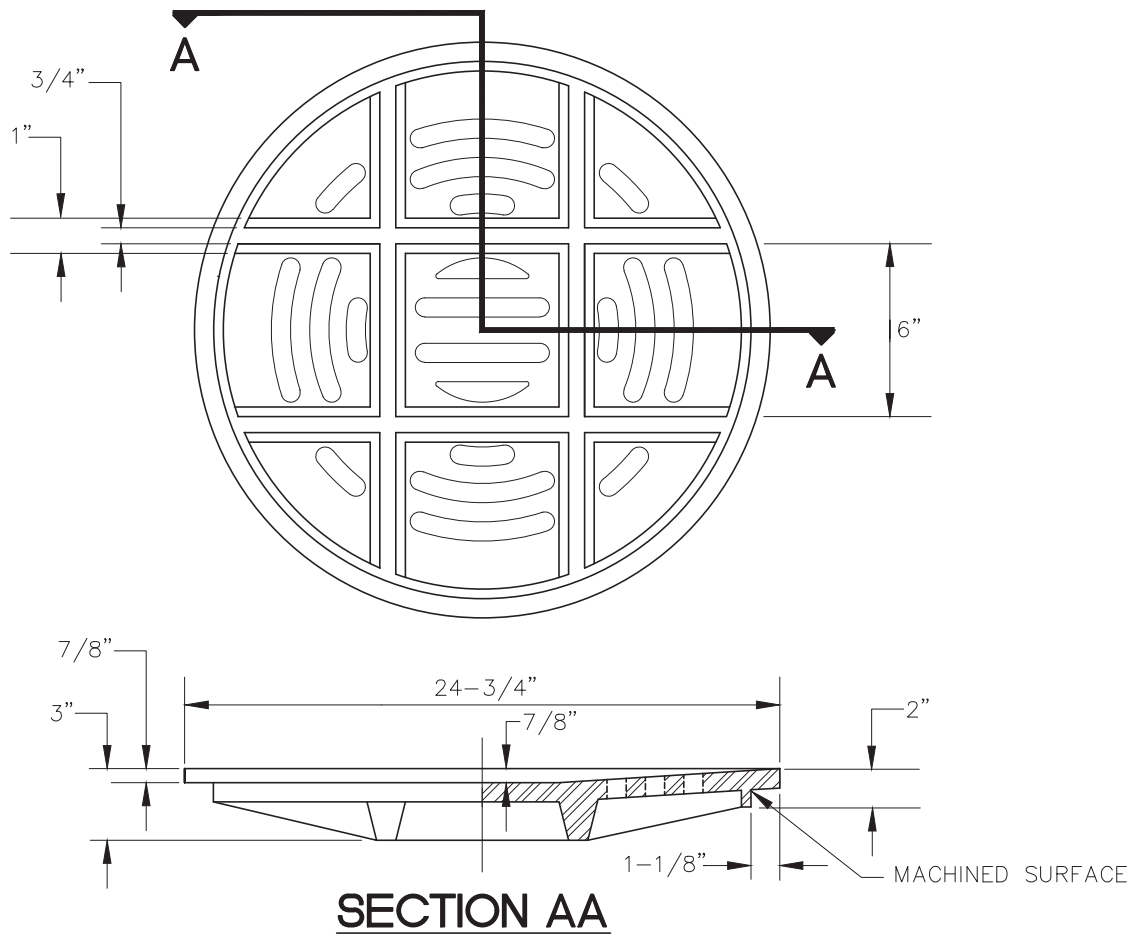
APPROVED:

REVISED:  
2/24

# STORM DRAIN MANHOLE COVER

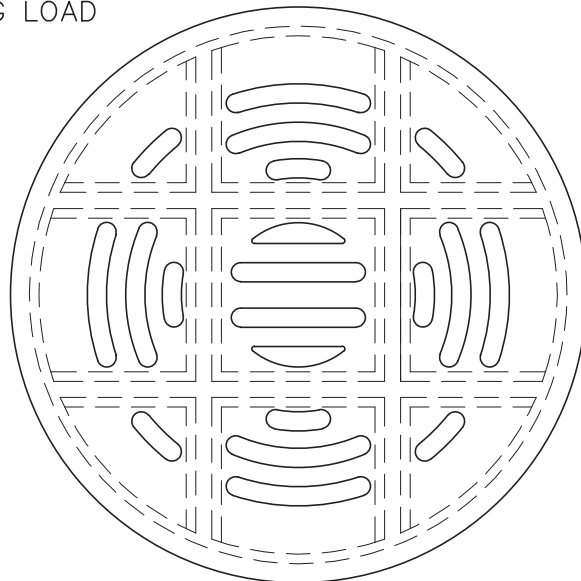
SECTION #  
55.05

DETAIL #  
55-7

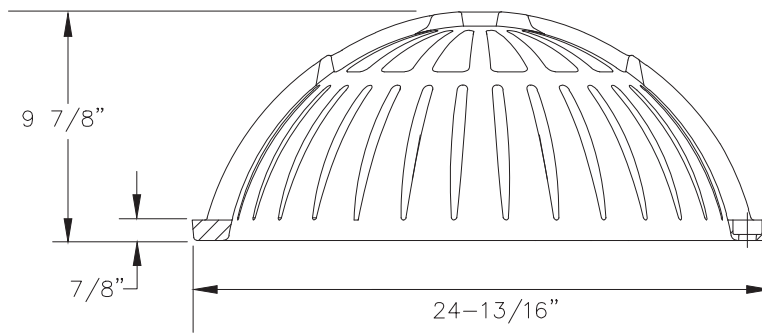
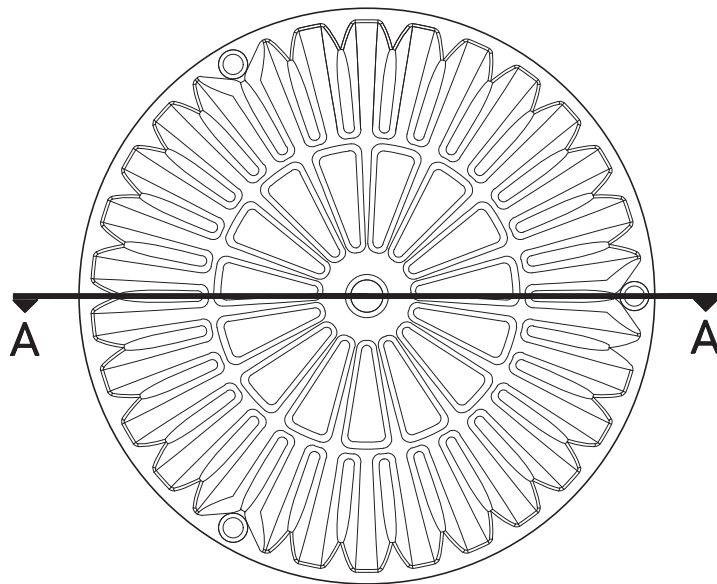


**SECTION AA**

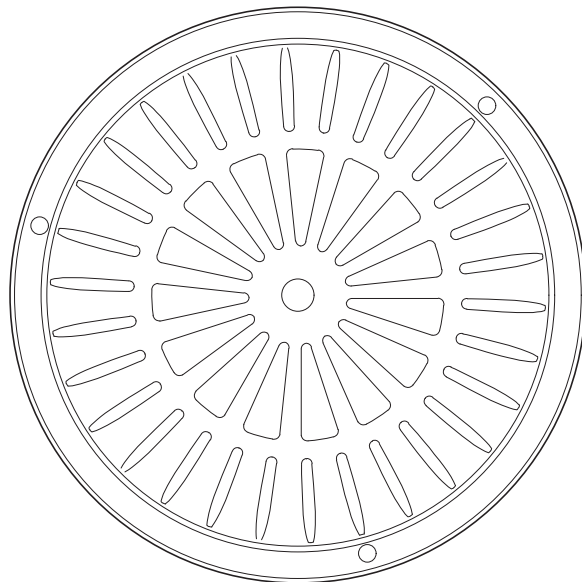
2000 P.S.I. STRENGTH REQUIREMENT  
 FOR TRANSVERSE BREAKING LOAD  
 PER A.S.T.M. A-438



 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>STORM DRAIN TOP INTAKE COVER</b></p>	<p>SECTION # 55.05</p> <p>DETAIL # 55-8</p>
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**SECTION AA**



MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

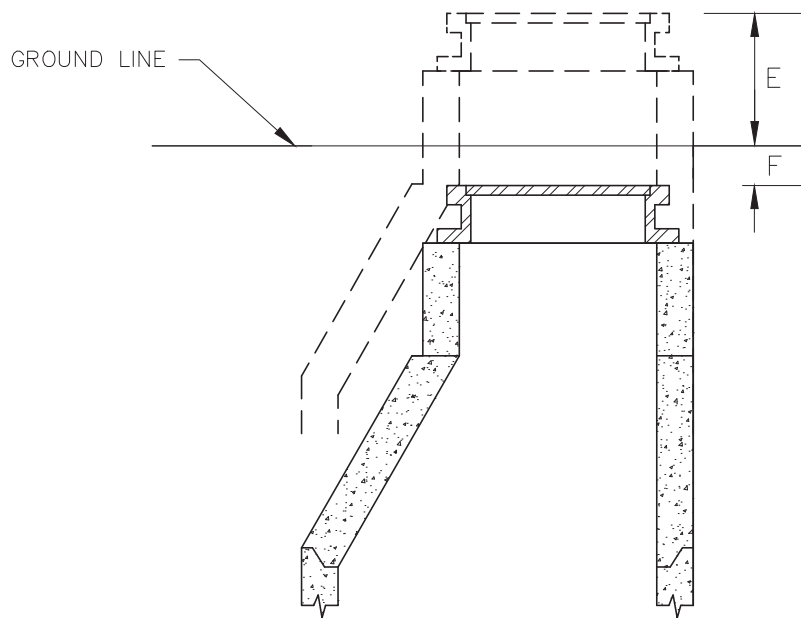
APPROVED:

REVISED:  
2/24

**STORM DRAIN  
BEEHIVE INTAKE COVER**

SECTION #  
55.05

DETAIL #  
55-9



LOCATION	E	F
LANDSCAPED AREAS, GRAVEL STREETS, AND ALLEY AREAS WHERE TRAVELED		0" TO 2"
UNDEVELOPED AND CLASSIFIED WETLAND AREAS <sup>1</sup>	24" TO 36"	
ASPHALT PAVED VEHICLE SURFACES (FEATHER PAVEMENT AT EDGE TO SMOOTH TRANSITION)		1/2" TO 1"
ASPHALT PAVED PEDESTRIAN SURFACES <sup>2</sup>		0" TO 1/2"
CONCRETE PAVED SURFACES		0" TO 1/4"

NOTES:

1. MANHOLES WITHIN THE CLEAR ZONE SHALL MEET CLEAR ZONE REQUIREMENTS.
2. PAVEMENT AROUND MANHOLES INSTALLED MORE THAN 1/4" BELOW GRADE SHALL BE BEVELED WITH A SLOPE NOT STEEPER THAN 50 PERCENT.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

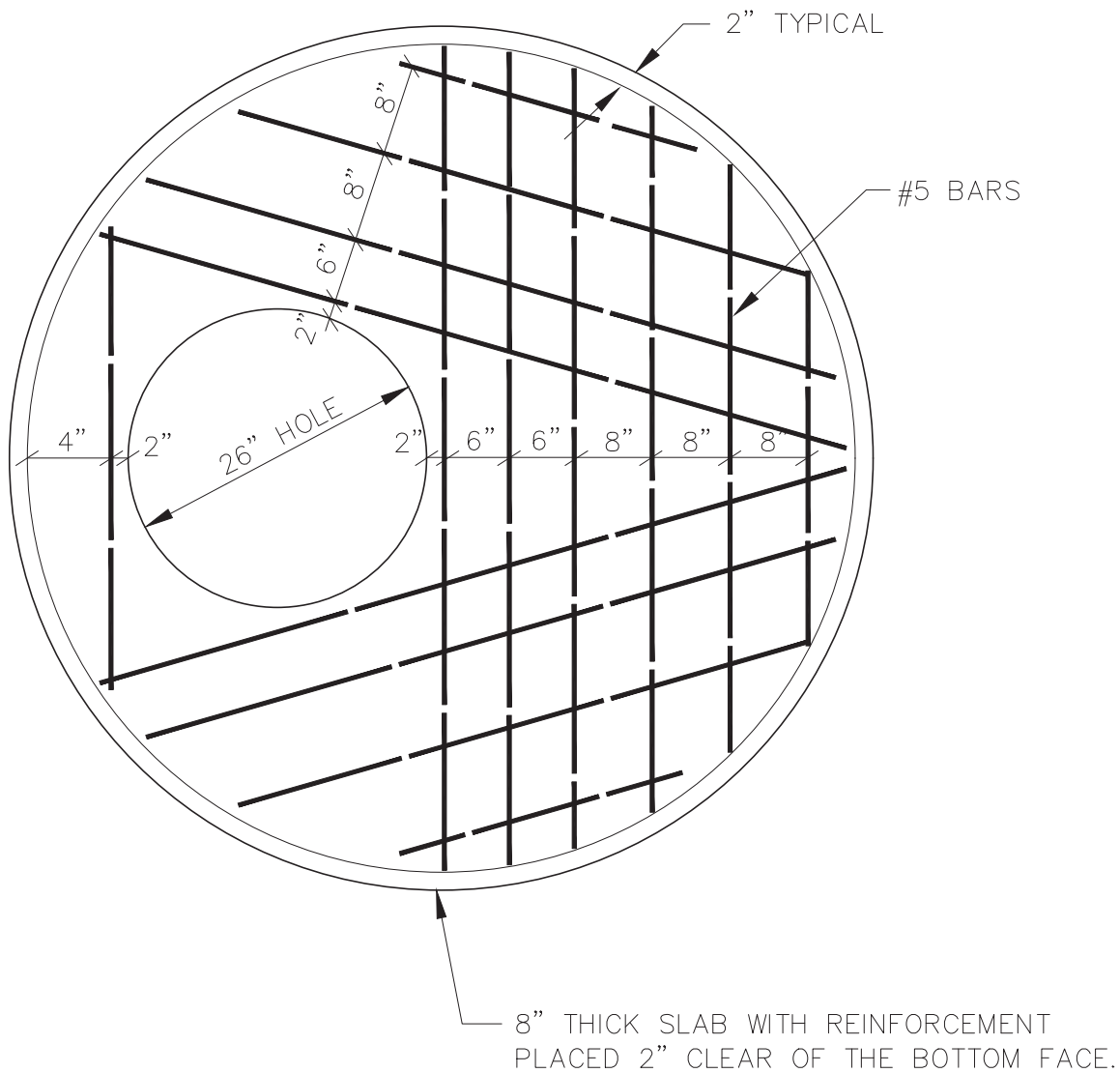
APPROVED:

REVISED:  
2/24

## MANHOLE HEIGHTS

SECTION #  
55.05

DETAIL #  
55-10



MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

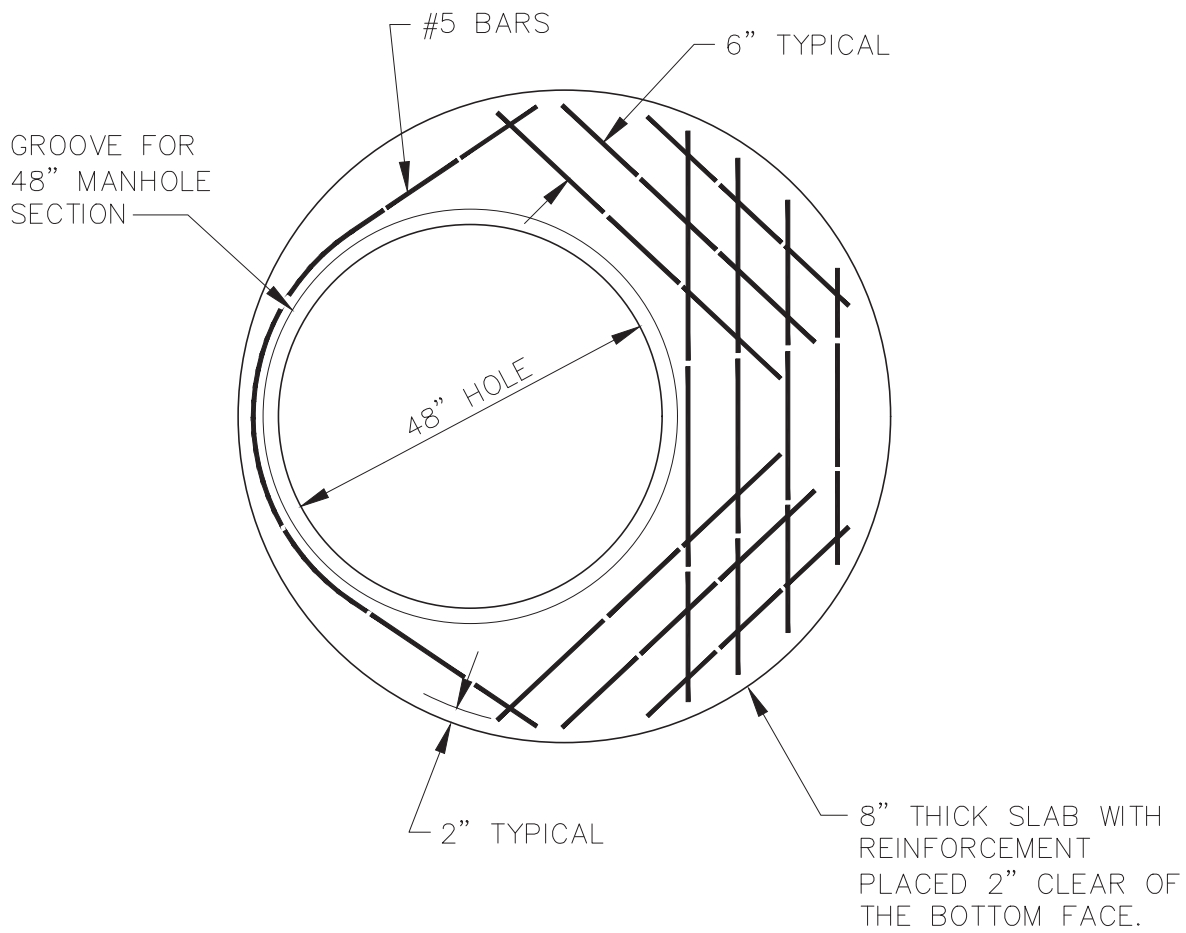
APPROVED:

REVISED:  
2/24

**PRECAST  
CONCRETE REDUCING SLAB  
(72" OR 48" TO 26")**

SECTION #  
55.05

DETAIL #  
55-11



MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

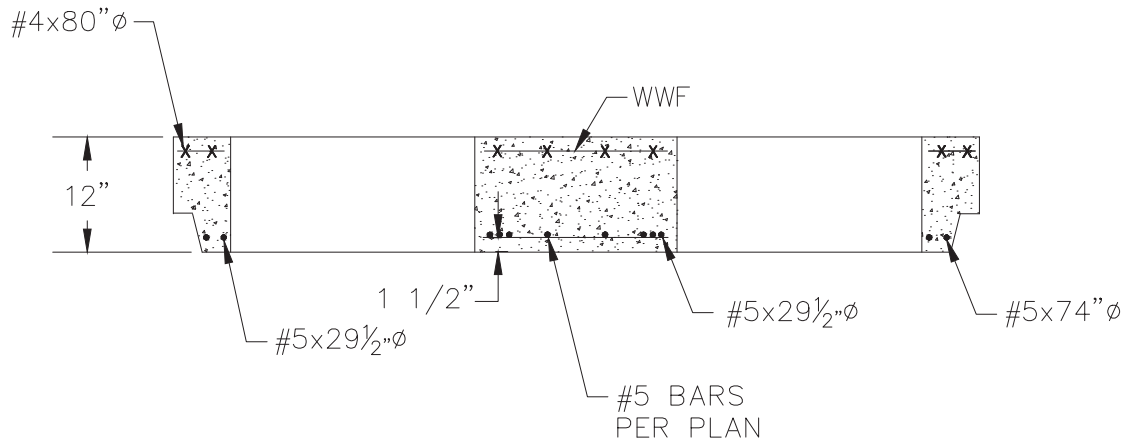
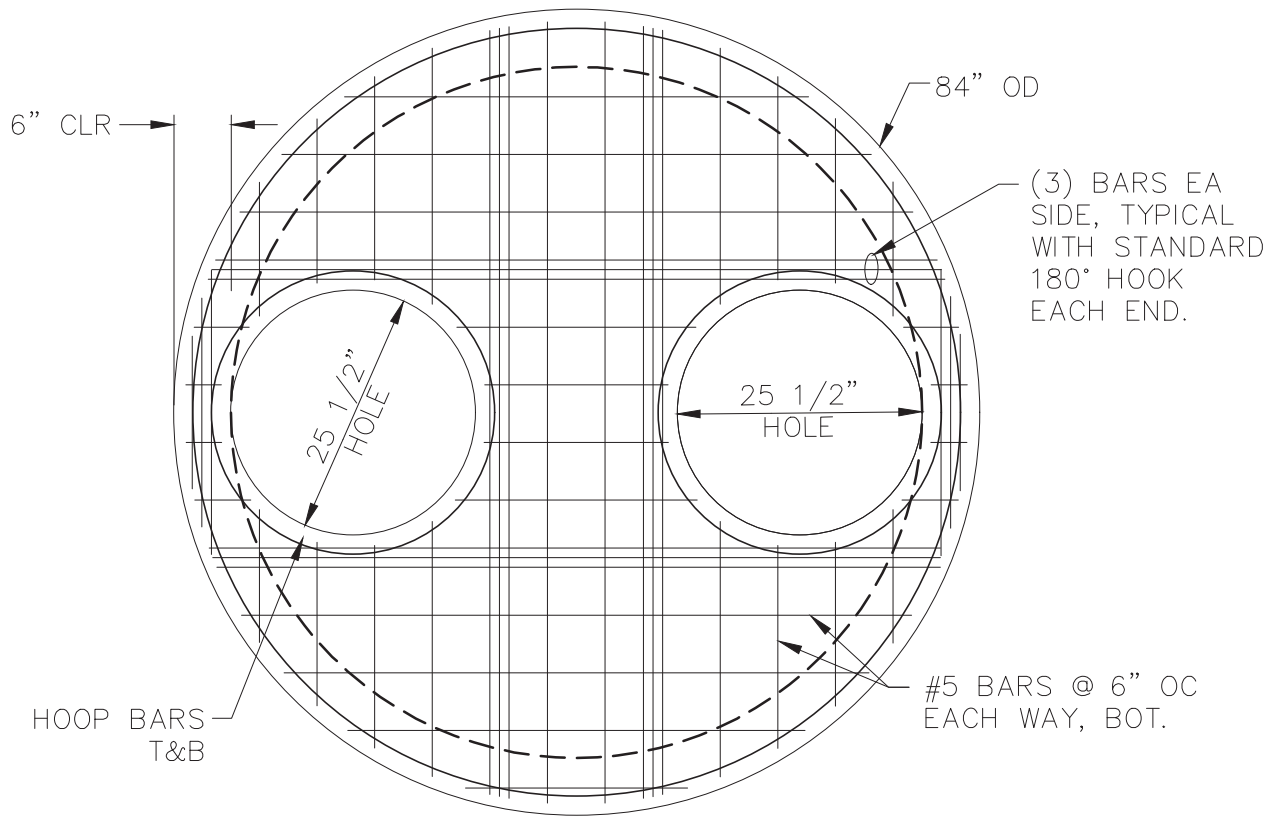
REVISED:  
2/24

**PRECAST  
CONCRETE REDUCING SLAB  
(72" TO 48")**

SECTION #  
55.05

DETAIL #  
55-12





MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

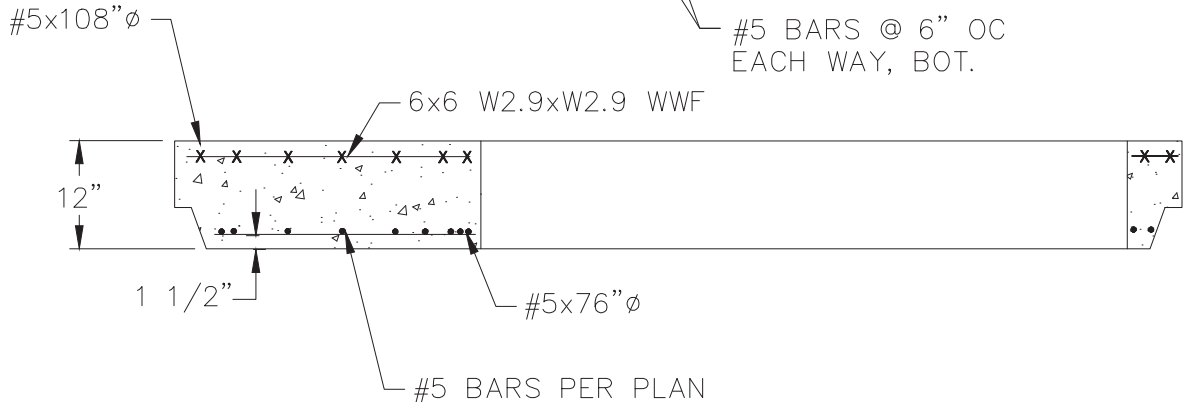
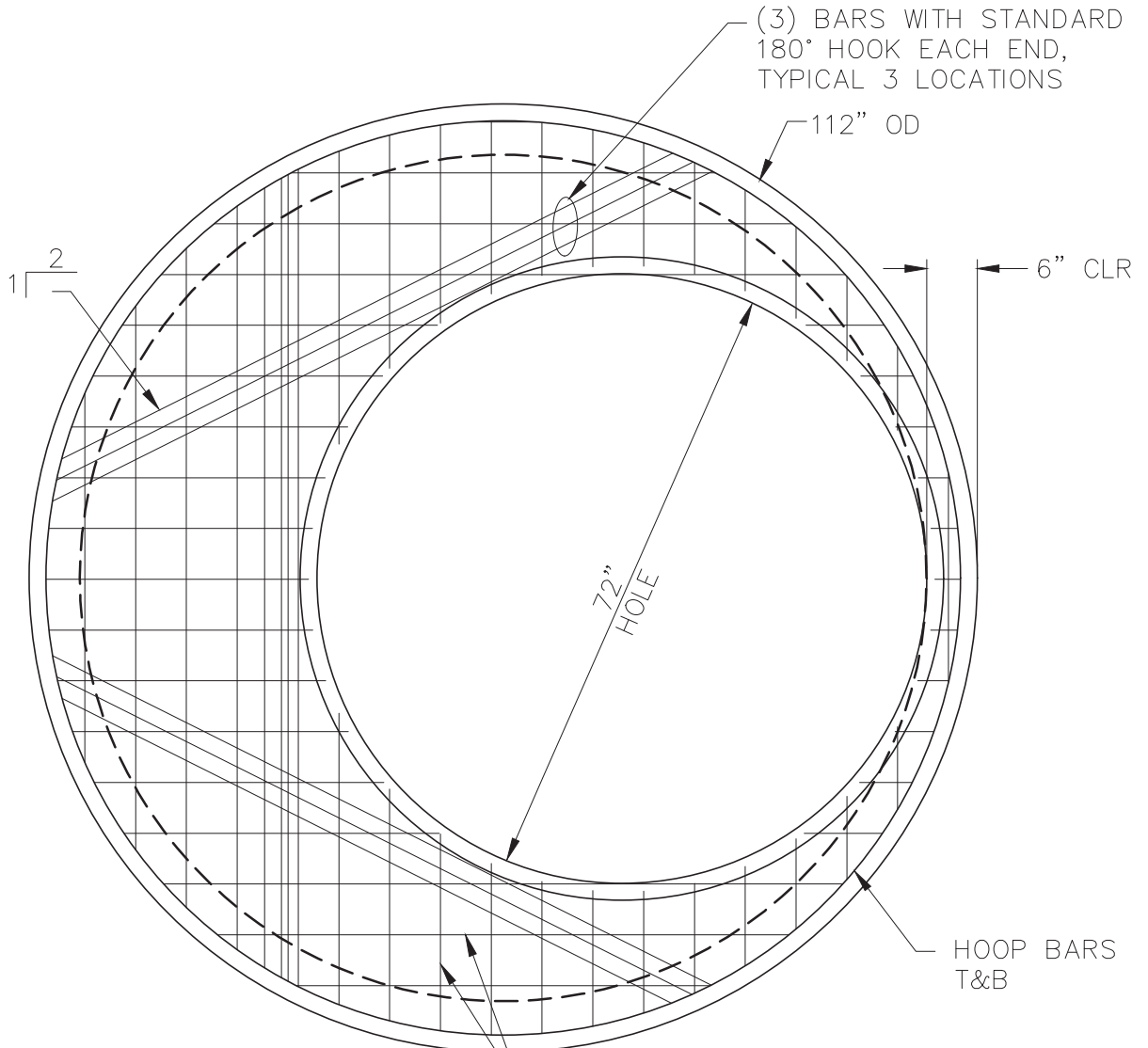
APPROVED:

REVISED:  
2/24

# PRECAST CONCRETE TWO HOLE REDUCING SLAB (72" TO TWO 25 1/2")

SECTION #  
55.05

DETAIL #  
55-13



SCALE:  
N.T.S.

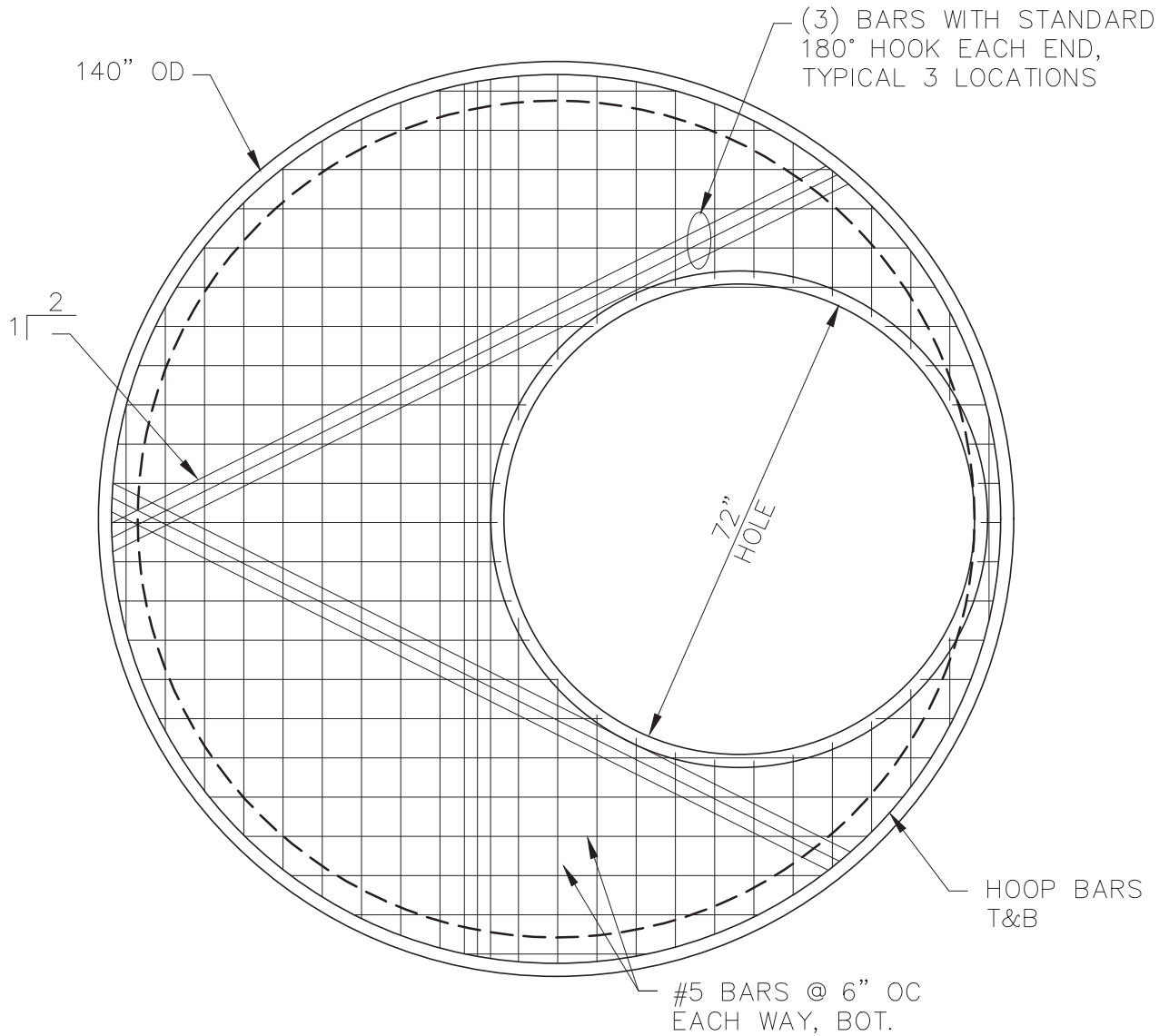
APPROVED:

REVISED:  
2/24

# PRECAST CONCRETE REDUCING SLAB (112" TO 72")

SECTION #  
55.05

DETAIL #  
55-14



MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

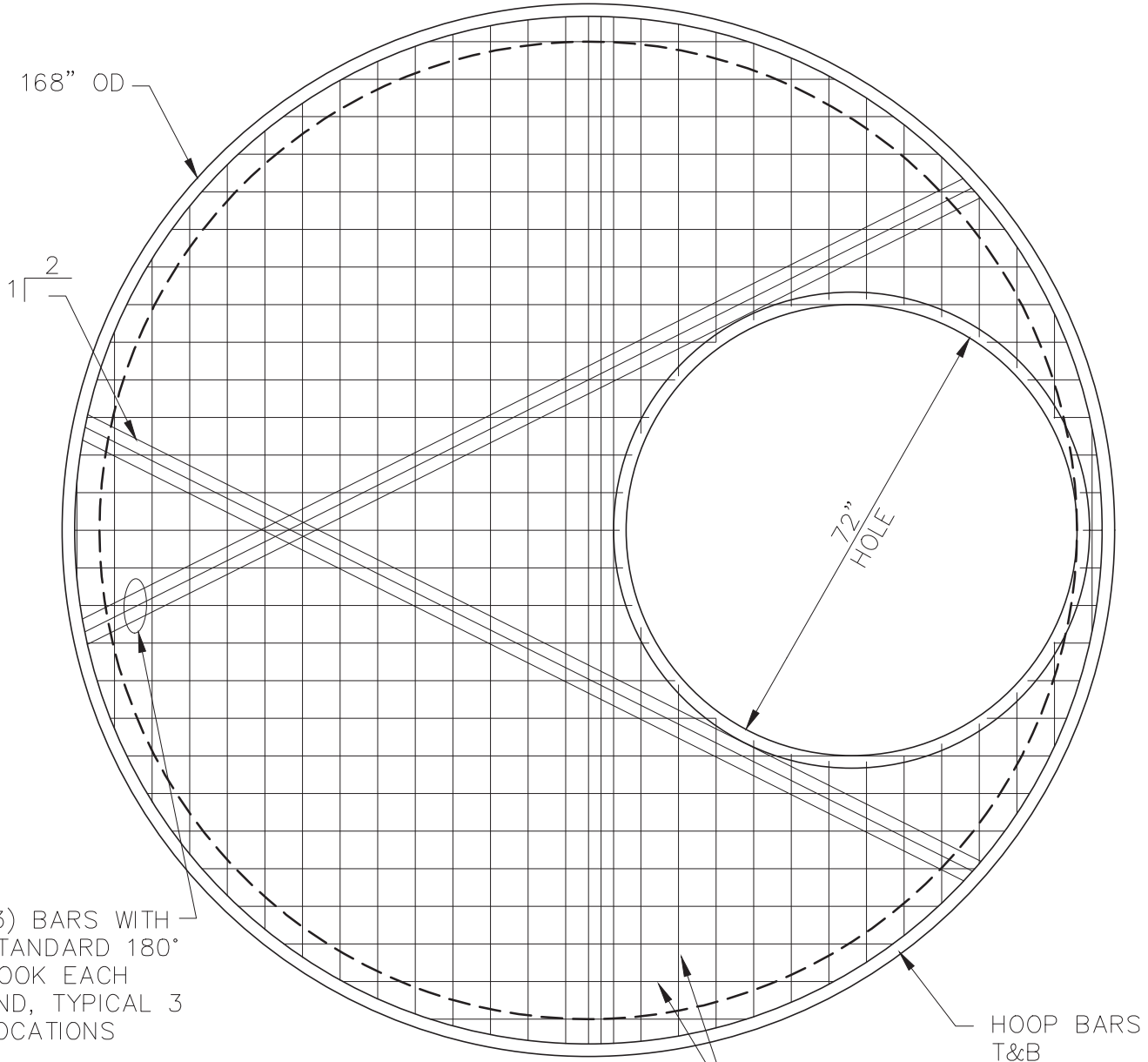
APPROVED:

REVISED:  
2/24

**PRECAST  
CONCRETE REDUCING SLAB  
(140" TO 72")**

SECTION #  
55.05

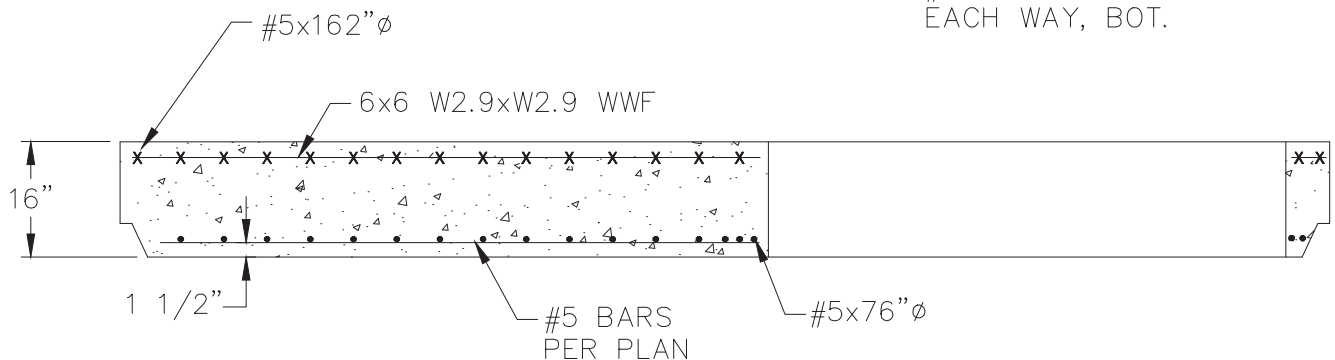
DETAIL #  
55-15



(3) BARS WITH STANDARD 180° HOOK EACH END, TYPICAL 3 LOCATIONS

HOOP BARS T&B

#5 BARS @ 6" OC EACH WAY, BOT.



#5x162"  $\phi$

6x6 W2.9xW2.9 WWF

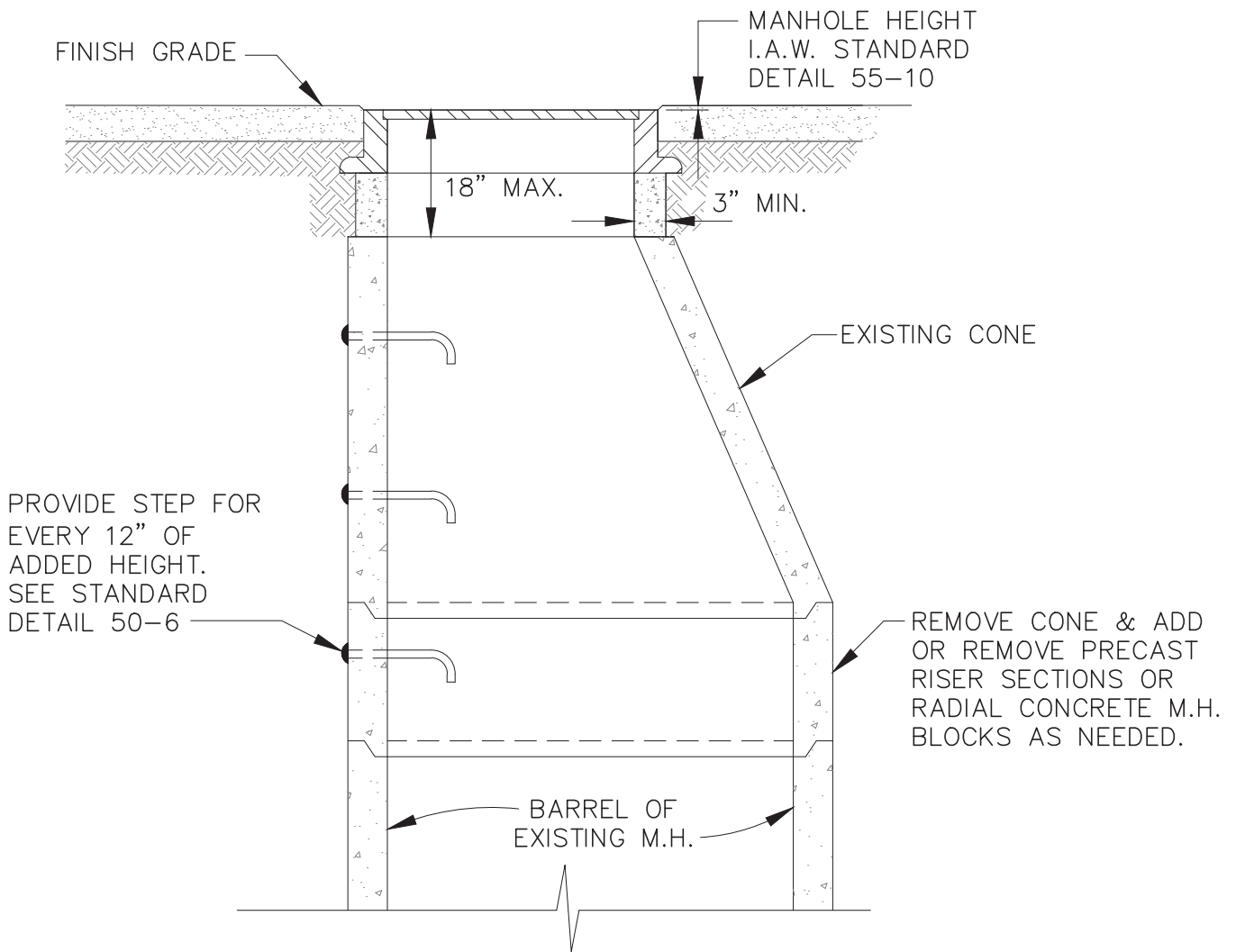
16"

1 1/2"

#5 BARS PER PLAN

#5x76"  $\phi$

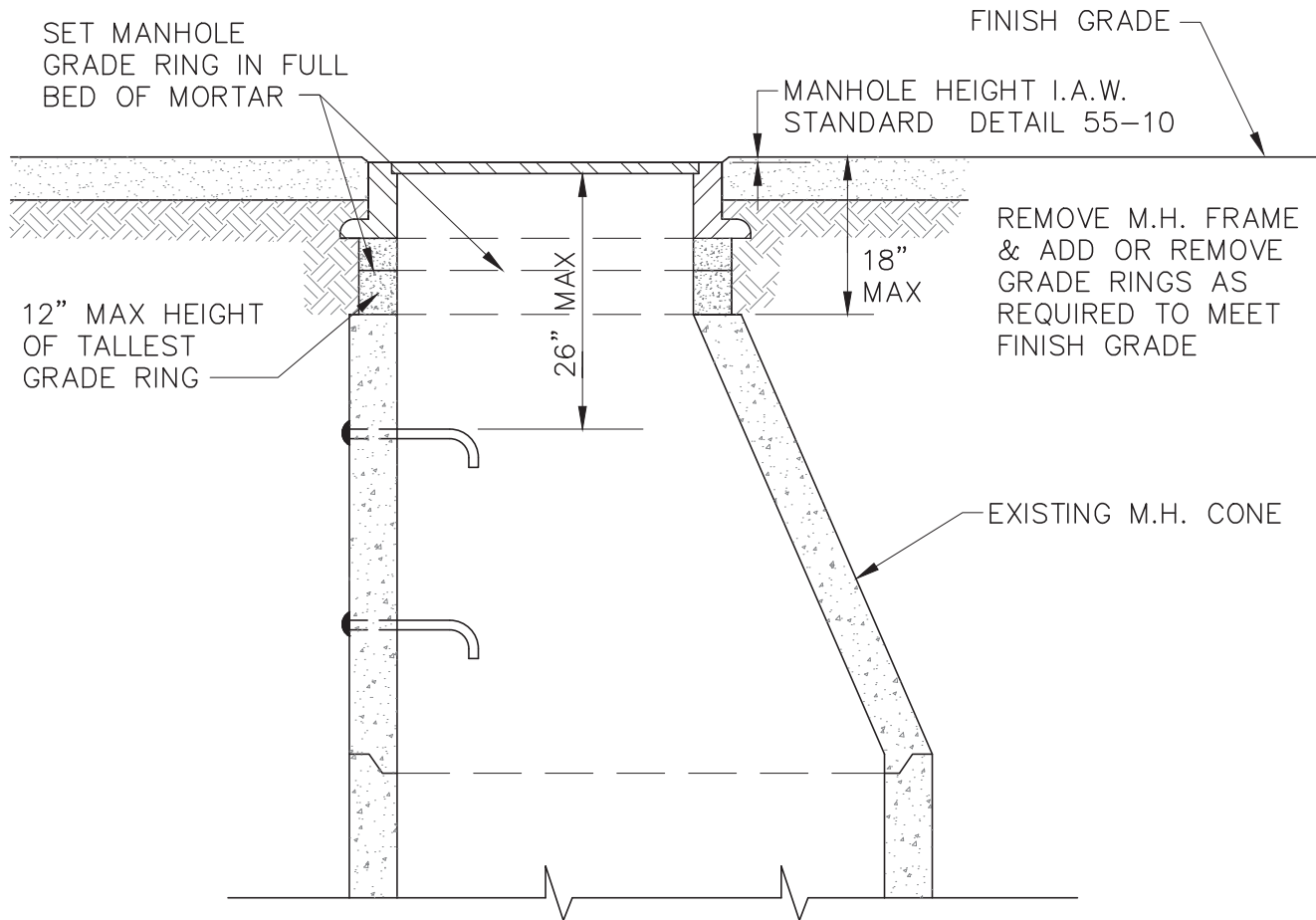
 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>PRECAST CONCRETE REDUCING SLAB (168" TO 72")</b></p>	<p>SECTION # 55.05</p> <p>DETAIL # 55-16</p>
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NOTE:

1. RESET CONCRETE GRADE RING IN BEDDING MATERIAL AS SPECIFIED IN SECTION 55.05, ARTICLE 5.2.B – REINFORCED CONCRETE MANHOLES.
2. REFER TO ASTM DESIGNATION C-478 FOR DESIGN AND STRENGTH REQUIREMENTS.
3. RESET CONE IN RAM-NEK OR EQUAL.

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>MANHOLE CONE ADJUSTMENT</b></p>	<p>SECTION # 55.07</p> <p>DETAIL # 55-17</p>
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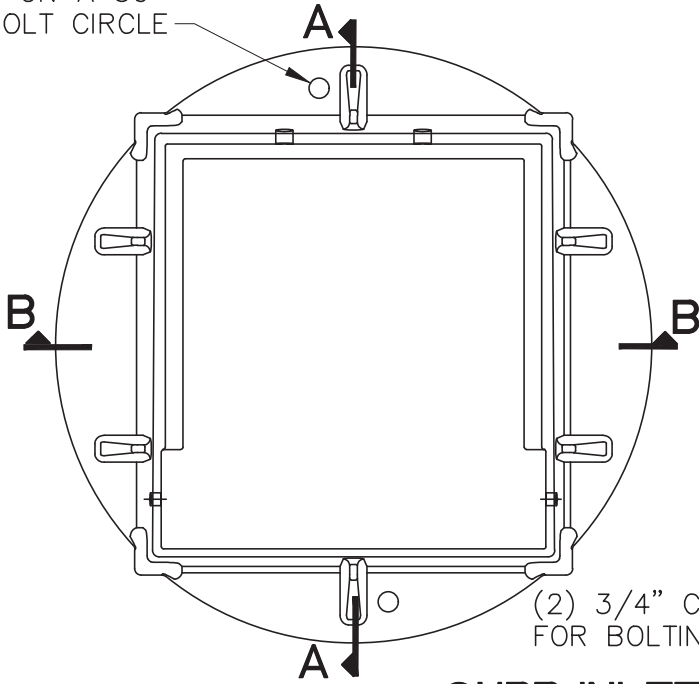


NOTE:

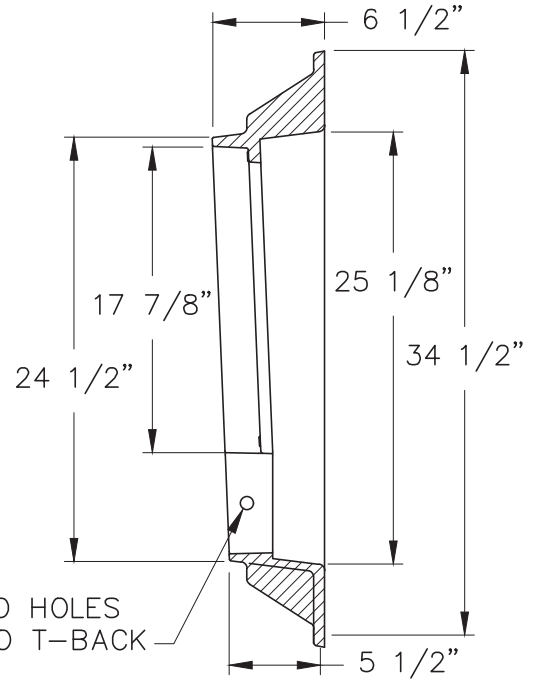
1. REFER TO ASTM DESIGNATION C-478 FOR DESIGN AND STRENGTH REQUIREMENTS.
2. WHEN AN ADJUSTMENT OF GREATER THAN 12" IN GRADE RINGS IS REQUIRED, ADJUST CONE I.A.W. STANDARD DETAIL 55-17 RATHER THAN GRADE RINGS.
3. IF NECESSARY, SHIM MANHOLE FRAME WITH STUD WASHERS, TO ADJUST FRAME TO THE DEPTH IN ACCORDANCE WITH STANDARD DETAIL 55-10. WHEN SHIMS ARE USED, SET MANHOLE FRAME IN A FULL BED OF MORTAR WITH SHIMS.

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<h1>MANHOLE RING ADJUSTMENT</h1>	<p>SECTION # 55.07</p> <p>DETAIL # 55-18</p>
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(2) 1" HANDLING HOLES ON A 30" DIA. BOLT CIRCLE



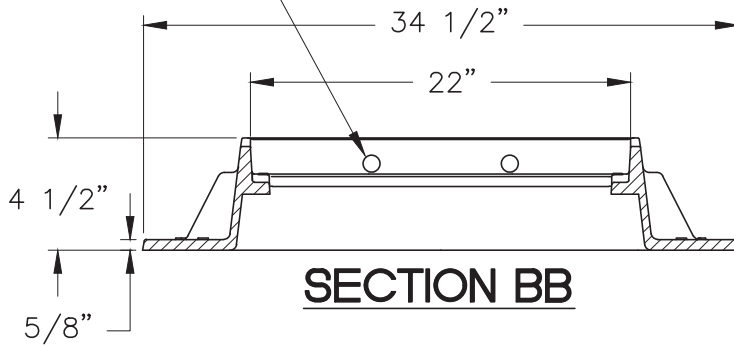
(2) 3/4" CORED HOLES FOR BOLTING TO T-BACK



**CURB INLET FRAME**

**SECTION AA**

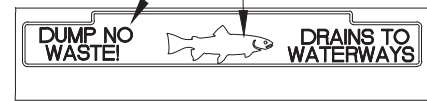
(2) 1" CORED WEEP HOLES



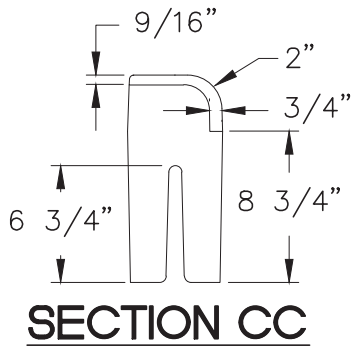
**SECTION BB**

3/4" RAISED LETTERS (RECESSED FLUSH)

RAISED FISH (RECESSED FLUSH)

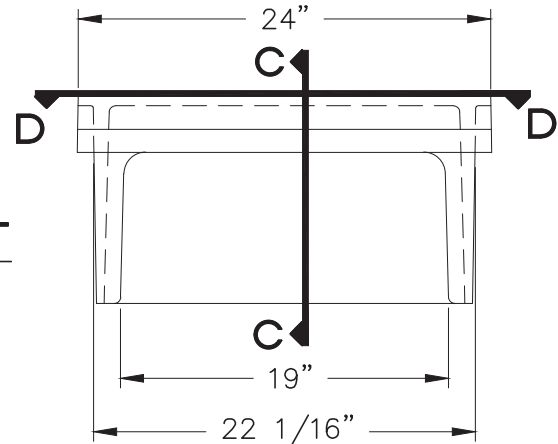


**SECTION DD**



**SECTION CC**

**CURB INLET HOOD**



**NOTE:**

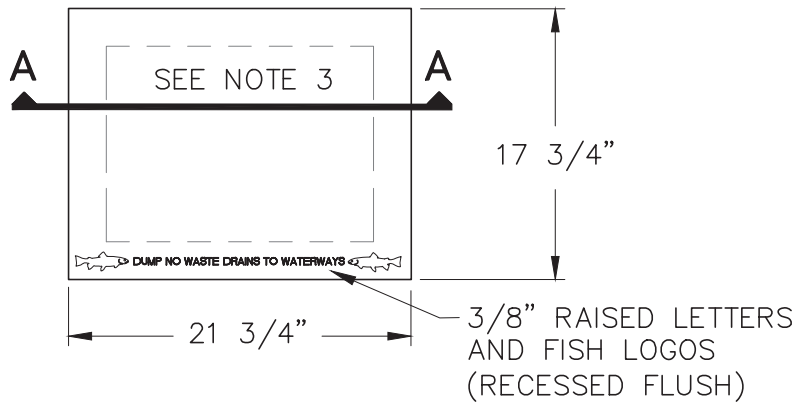
1. MINIMUM CASTING WEIGHT SHALL BE 400 LBS. FOR CURB INLET FRAME, HOOD & GRATE.
2. CURB INLET HOOD & GRATE SHALL CONFORM TO ASTM A536.



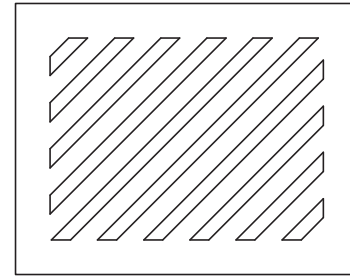
SCALE:  
N.T.S.  
APPROVED:  
REVISED:  
2/24

**CURB INLET  
FRAME AND HOOD  
FOR TYPE 1 CURB and GUTTER**

SECTION #  
55.05&09  
DETAIL #  
55-19

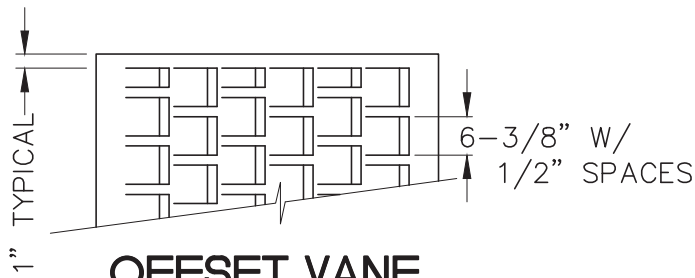


**CURB INLET GRATE**

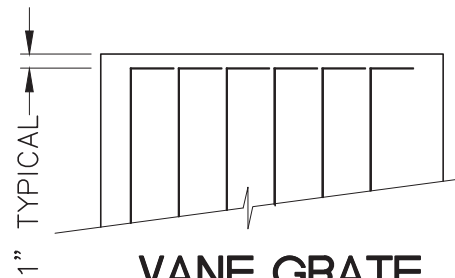


1" DIAGONAL BARS  
WITH 1-1/2" OPENINGS

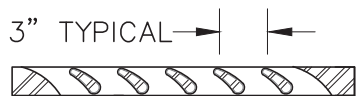
**DIAGONAL GRATE**



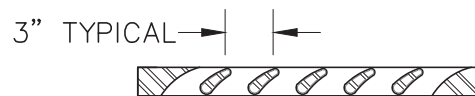
**OFFSET VANE GRATE**



**VANE GRATE**



**SECTION AA**



**SECTION AA**

**NOTE:**

1. MINIMUM CASTING WEIGHT SHALL BE 400 LBS. FOR CURB INLET FRAME, HOOD & GRATE.
2. CURB INLET HOOD & GRATE SHALL CONFORM TO ASTM A536.
3. GRATE SHALL BE AS SHOWN ON THE DRAWINGS OR SPECIFIED BY THE ENGINEER.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

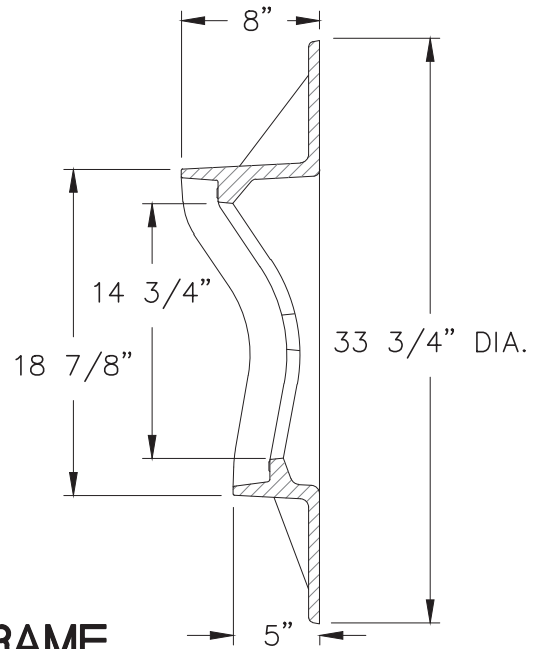
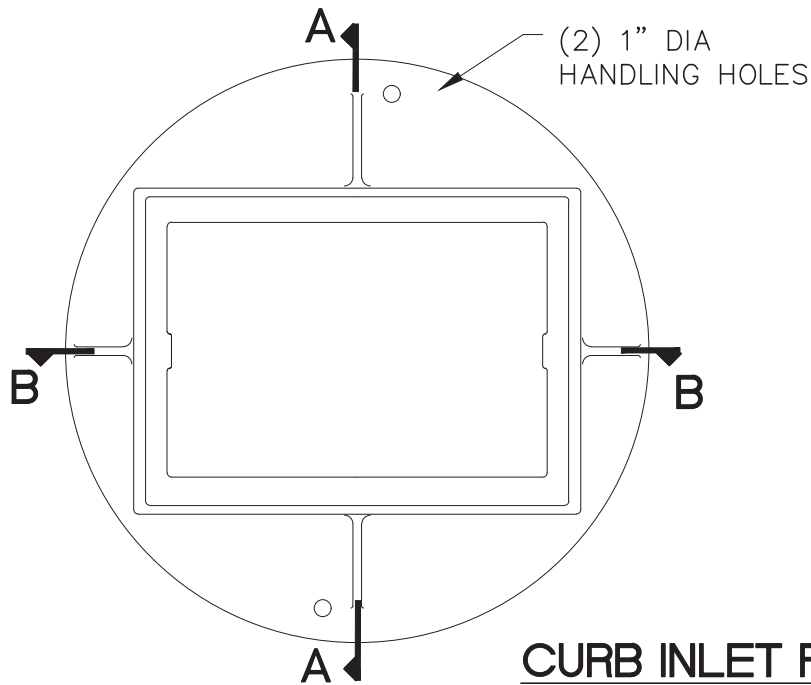
REVISED:  
2/24

**CURB INLET GRATES  
FOR TYPE 1 CURB and GUTTER**

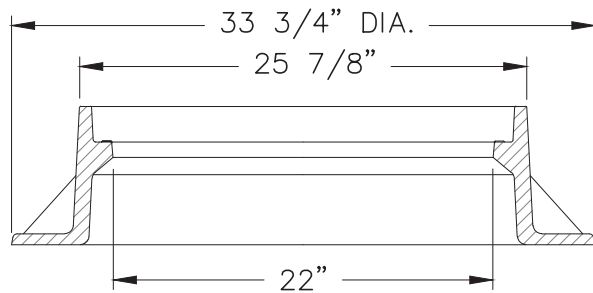
SECTION #  
55.05&09

DETAIL #  
55-20





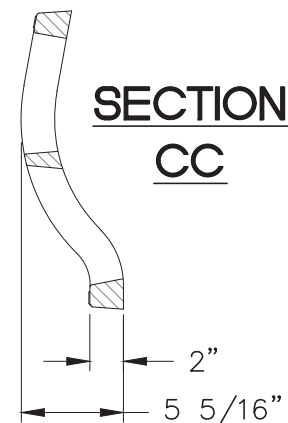
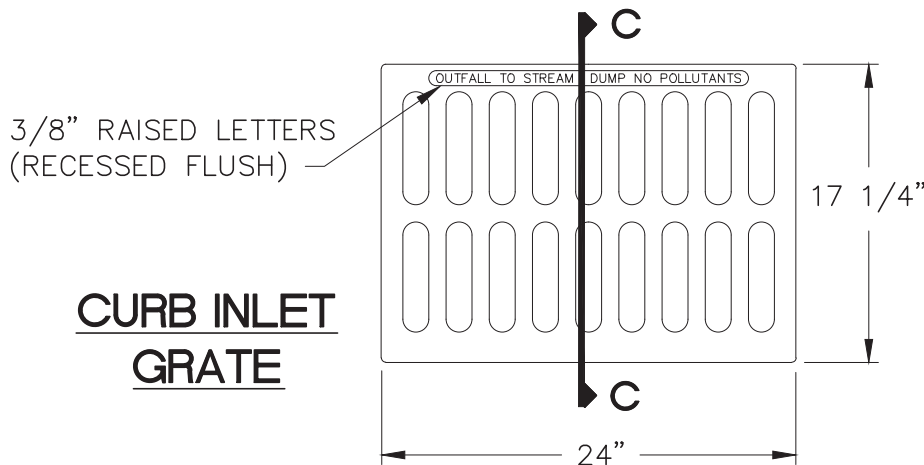
**SECTION AA**



**SECTION BB**

**NOTE:**

1. MINIMUM CASTING WEIGHT SHALL BE 400 LBS. FOR CURB INLET FRAME & GRATE.
2. CURB INLET GRATE SHALL CONFORM TO ASTM A536.
3. GRATE SHALL BE AS SHOWN ON THE DRAWINGS OR SPECIFIED BY THE ENGINEER.



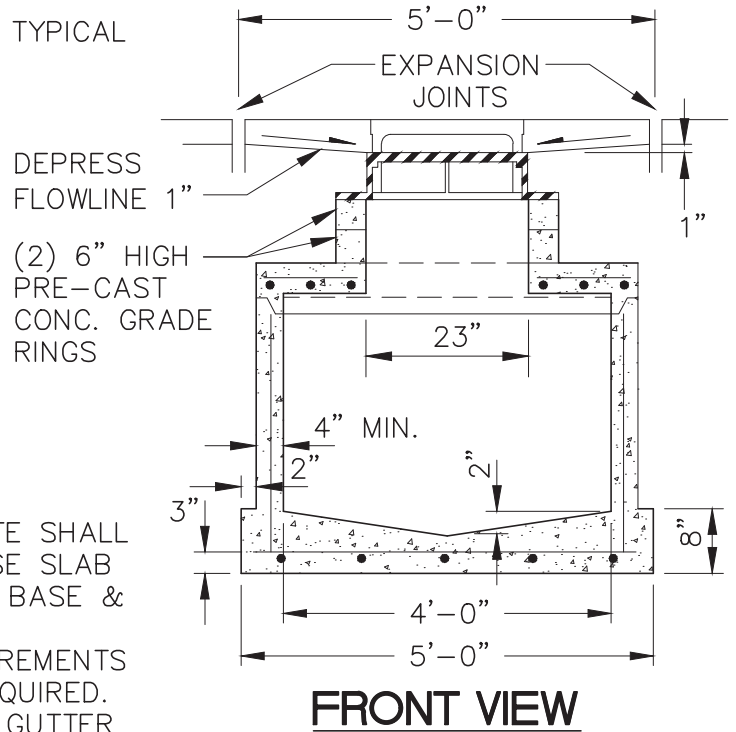
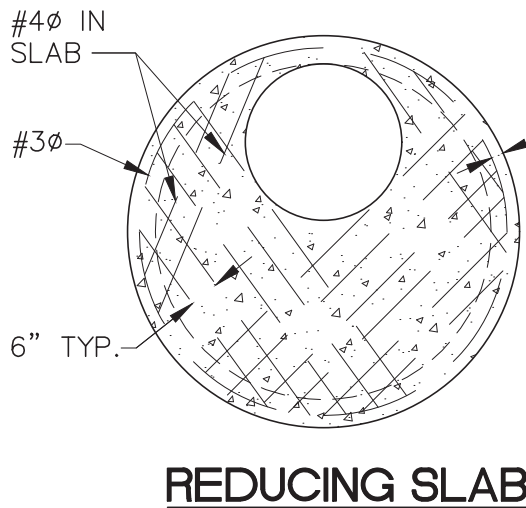
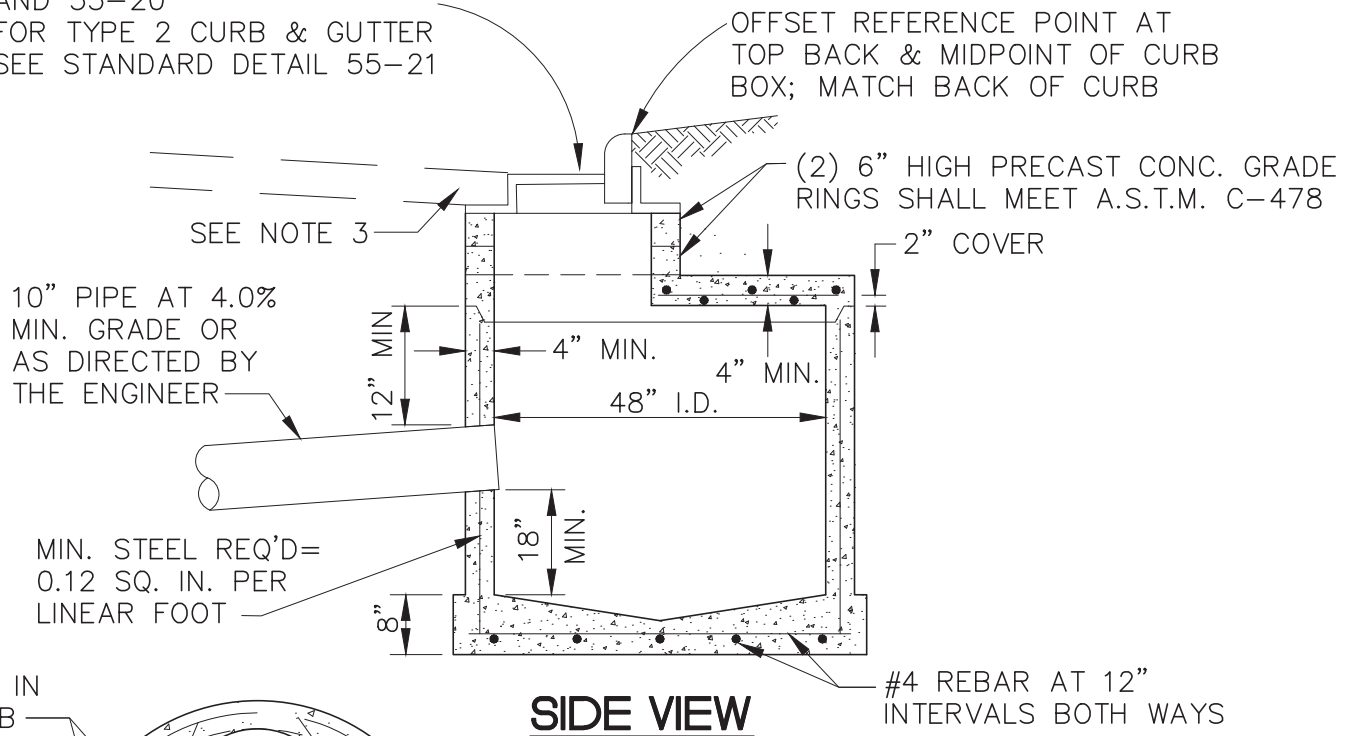
SCALE:  
N.T.S.  
APPROVED:  
REVISED:  
2/24

**CURB INLET  
FOR TYPE 2 CURB and GUTTER**

SECTION #  
55.09  
DETAIL #  
55-21

**CATCH BASIN INLET**

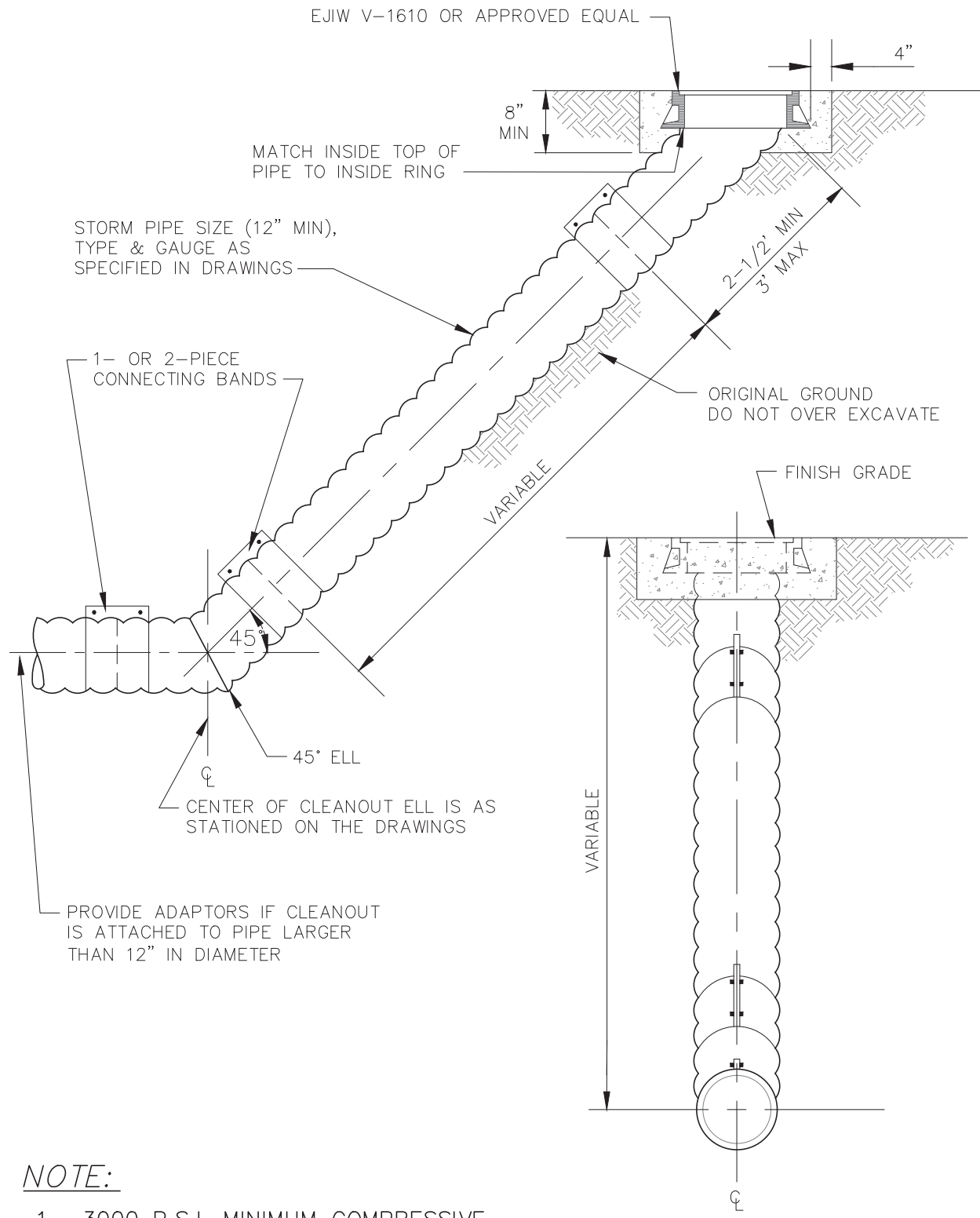
- FOR TYPE 1 CURB & GUTTER  
SEE STANDARD DETAILS 55-19  
AND 55-20
- FOR TYPE 2 CURB & GUTTER  
SEE STANDARD DETAIL 55-21



**NOTE:**

1. COMPRESSIVE STRENGTH OF CONCRETE SHALL BE MINIMUM 4000 P.S.I., EXCEPT BASE SLAB WHICH MAY BE 3000 P.S.I. CONNECT BASE & BARREL WITH CONTINUOUS STEEL.
2. SEE ASTM C-478 FOR DESIGN REQUIREMENTS AND MINIMUM REINFORCING STEEL REQUIRED.
3. AT CATCH BASIN, DELETE CONCRETE GUTTER PAN. FOR TYPE 1 CURB & GUTTER PAVE TO FACE OF CATCH BASIN INLET. FOR TYPE 2 CURB & GUTTER PROVIDE 5" CONCRETE GUTTER PAN BETWEEN CASTING AND EDGE OF ASPHALT.

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>PRECAST CATCH BASIN</b></p>	<p>SECTION # 55.09</p> <p>DETAIL # 55-22</p>
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**NOTE:**

1. 3000 P.S.I. MINIMUM COMPRESSIVE STRENGTH CONCRETE.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

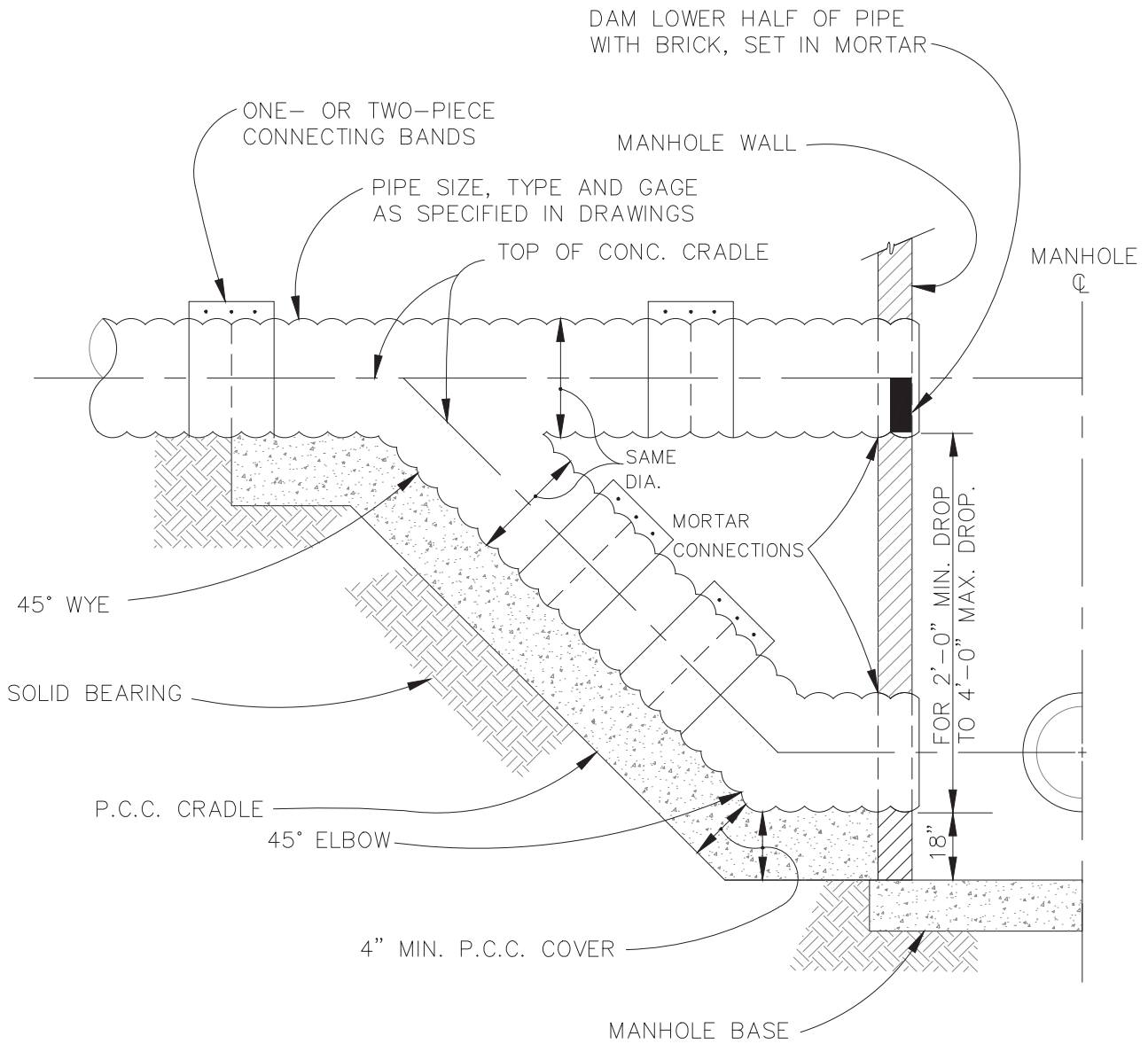
APPROVED:

REVISED:  
2/24

# STORM DRAIN CLEANOUT

SECTION #  
55.14

DETAIL #  
55-23



**NOTE:**

1. 3000 P.S.I. MIN. COMPRESSIVE STRENGTH CONCRETE FOR CRADLE.
2. PIPE SHALL PROTRUDE 2" INTO MANHOLE.

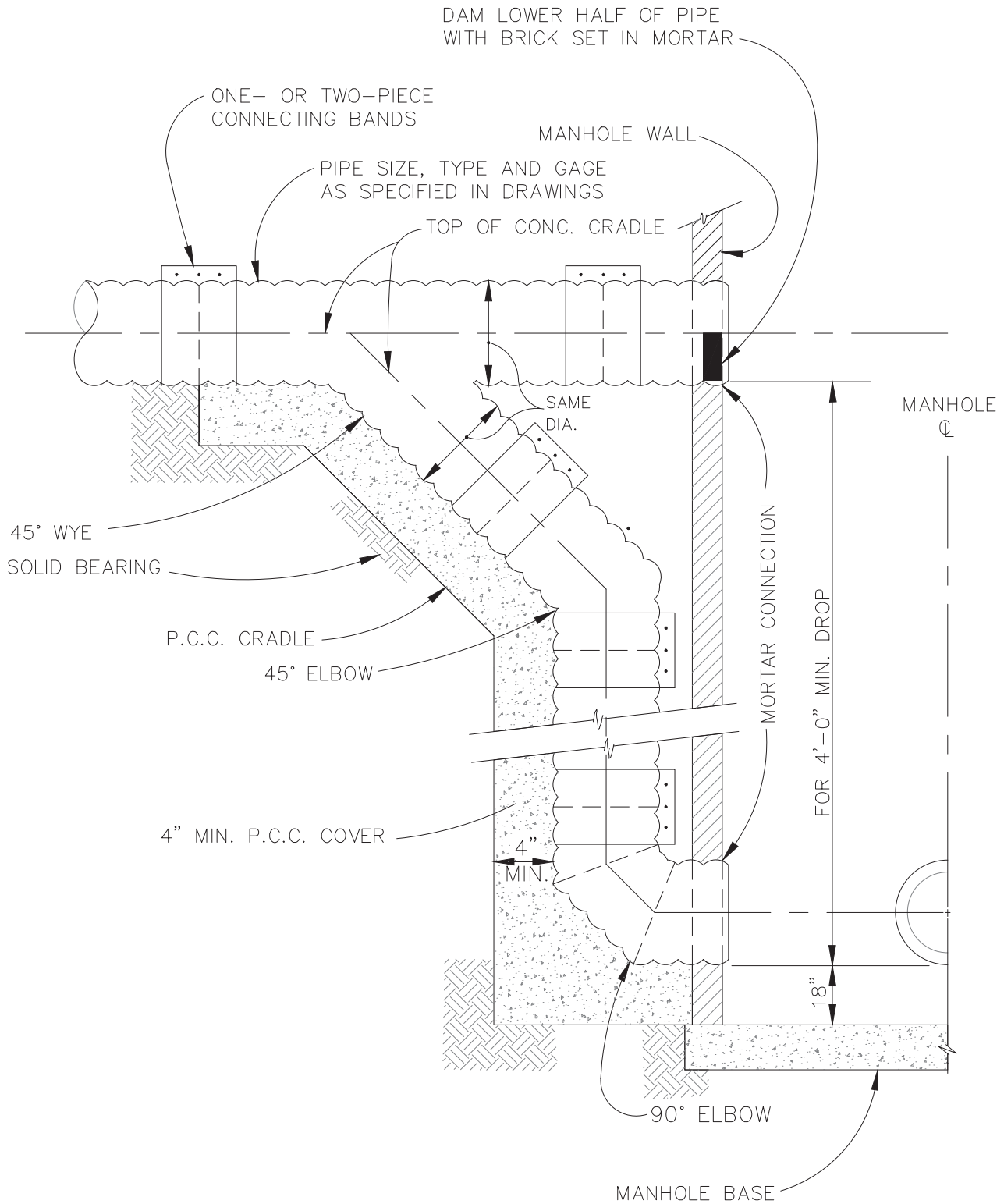


SCALE:  
N.T.S.  
APPROVED:  
REVISED:  
2/24

## STORM DRAIN DROP CONNECTION (2' MIN. DROP)

SECTION #  
55.16

DETAIL #  
55-24



**NOTE:**

1. 3000 P.S.I. MIN. COMPRESSIVE STRENGTH CONCRETE FOR CRADLE
2. PIPE SHALL PROTRUDE 2" INTO MANHOLE.

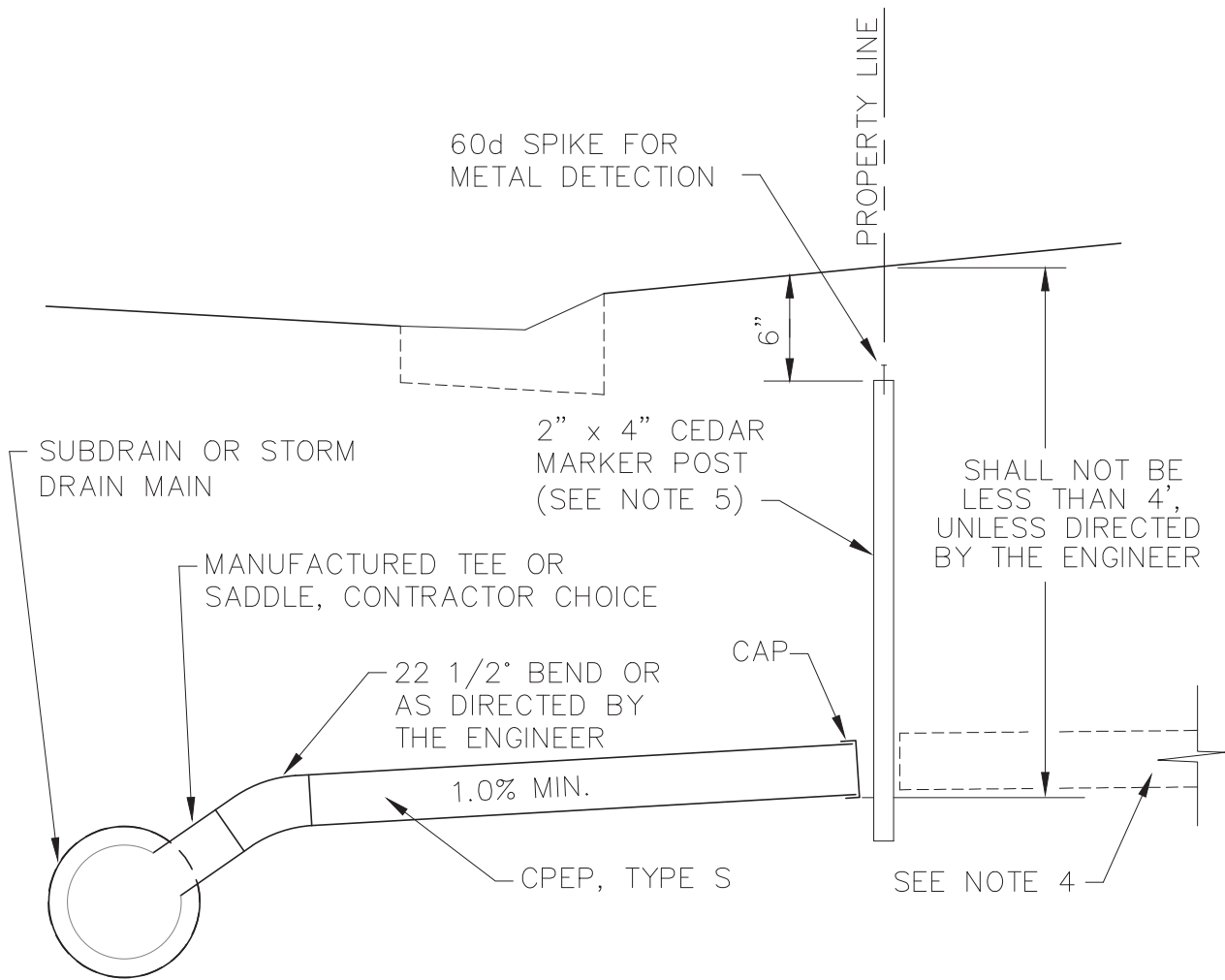


SCALE:  
N.T.S.  
APPROVED:  
REVISED:  
2/24

## STORM DRAIN DROP CONNECTION (4' MIN. DROP)

SECTION #  
55.16

DETAIL #  
55-25



NOTE:

1. FINAL LOCATION OF THE FOOTING DRAIN SERVICE MAY BE ADJUSTED BY THE ENGINEER.
2. BACKFILL WITH TYPE II CLASSIFIED FILL AND BACKFILL WITHIN ROAD PRISM. BACKFILL WITH NATIVE MATERIAL BEHIND CURB.
3. WHEN FOOTING DRAIN CONNECTS DIRECTLY TO A MANHOLE, OMIT THE 22 1/2° BEND AND CONSTRUCT THE INVERT A MINIMUM OF 1' ABOVE THE DOWNSTREAM INVERT.
4. CONNECT TO ON-PROPERTY FOOTING DRAIN, WHEN PRESENT, AT PROPERTY LINE, AND OMIT MARKER POST. CONTRACTOR SHALL ADAPT AND PROVIDE BELL-REDUCER OR COUPLING CONNECTION TO EXISTING FOOTING DRAIN OF WHATEVER PIPE SIZE AND TYPE AND RESOLVE CONNECTION DETAILS WITH PROPERTY OWNER AND THE ENGINEER. CONNECTION TO EXISTING FOOTING DRAIN SHALL BE INCIDENTAL TO THIS PAY ITEM, AND NO ADDITIONAL PAYMENT SHALL BE MADE.
5. THE MARKER POST FOR A FOOTING DRAIN SERVICE TO AN UNDEVELOPED LOT SHALL EXTEND 3 FEET ABOVE GRADE. THE WORD "STORM" SHALL BE STENCILED ON THE SECTION OF POST PROTRUDING FROM THE GROUND.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

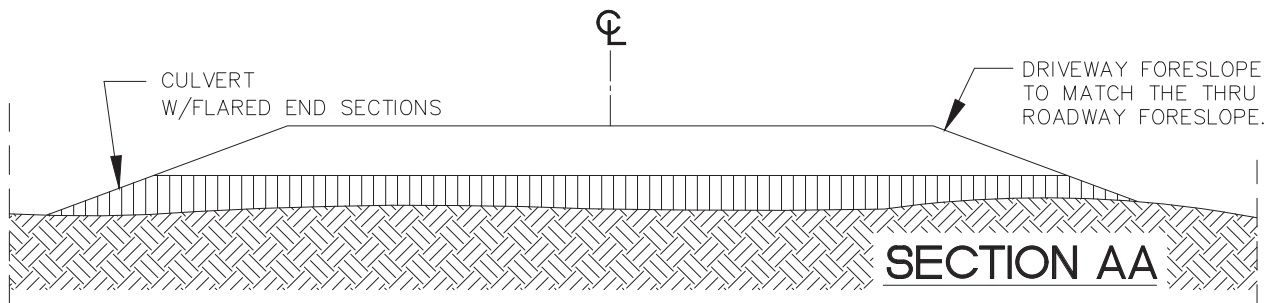
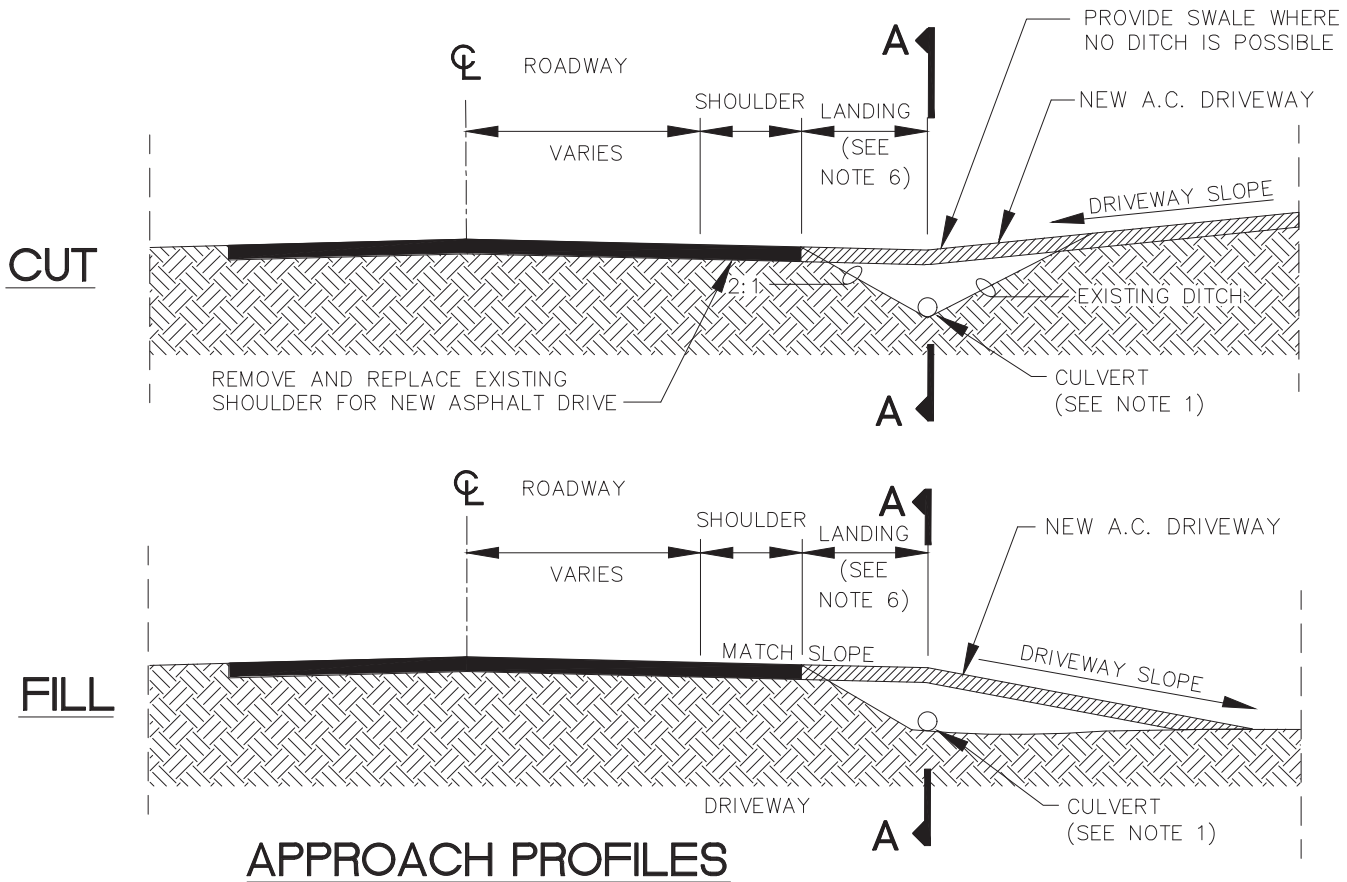
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2/24

## FOOTING DRAIN SERVICE

SECTION #  
55.18

DETAIL #  
55-26



**NOTE:**

1. CULVERT DIAMETER IS MINIMUM 18" OR AS SPECIFIED IN THE DRAWINGS.
2. CULVERT INVERTS SHALL MATCH BOTTOM OF DITCH PROFILE. CONTRACTOR SHALL GRADE DITCH ON BOTH ENDS OF CULVERT PRIOR TO INSTALLATION TO ENSURE POSITIVE DRAINAGE.
3. DRIVEWAY CULVERTS SHALL HAVE A MINIMUM 12" COVER FROM BOTTOM OF A.C. PAVEMENT TO TOP OF PIPE.
4. CULVERT SHALL BE BEDDED IN MINIMUM 6" CLASS "C" BEDDING MATERIAL. BACKFILL SHALL BE TYPE II-A CLASSIFIED FILL & BACKFILL COMPACTED TO 95% OF MAXIMUM DENSITY. BACKFILL AND BEDDING ARE INCIDENTAL TO COST OF CULVERT INSTALLATION.
5. CULVERT END SECTIONS SHALL BE FLARED AND ARE INCIDENTAL TO CULVERT INSTALLATION.
6. LANDING AREA MAXIMUM SLOPE  $\pm 2\%$ . RESIDENTIAL DRIVEWAY, 12' MINIMUM. COMMERCIAL/INDUSTRIAL DRIVEWAY, 20' MINIMUM.

MUNICIPALITY



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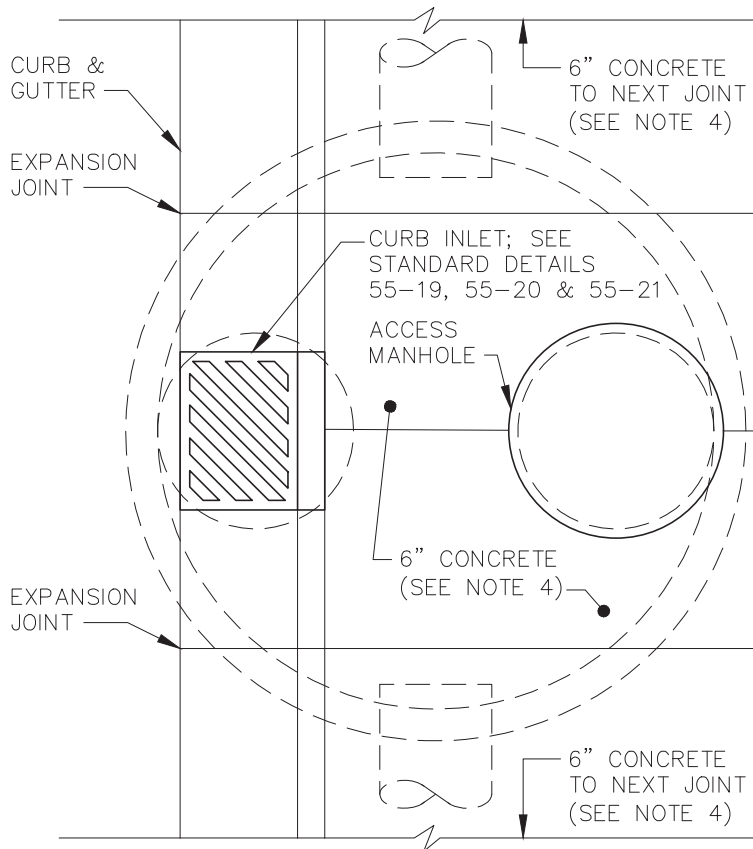
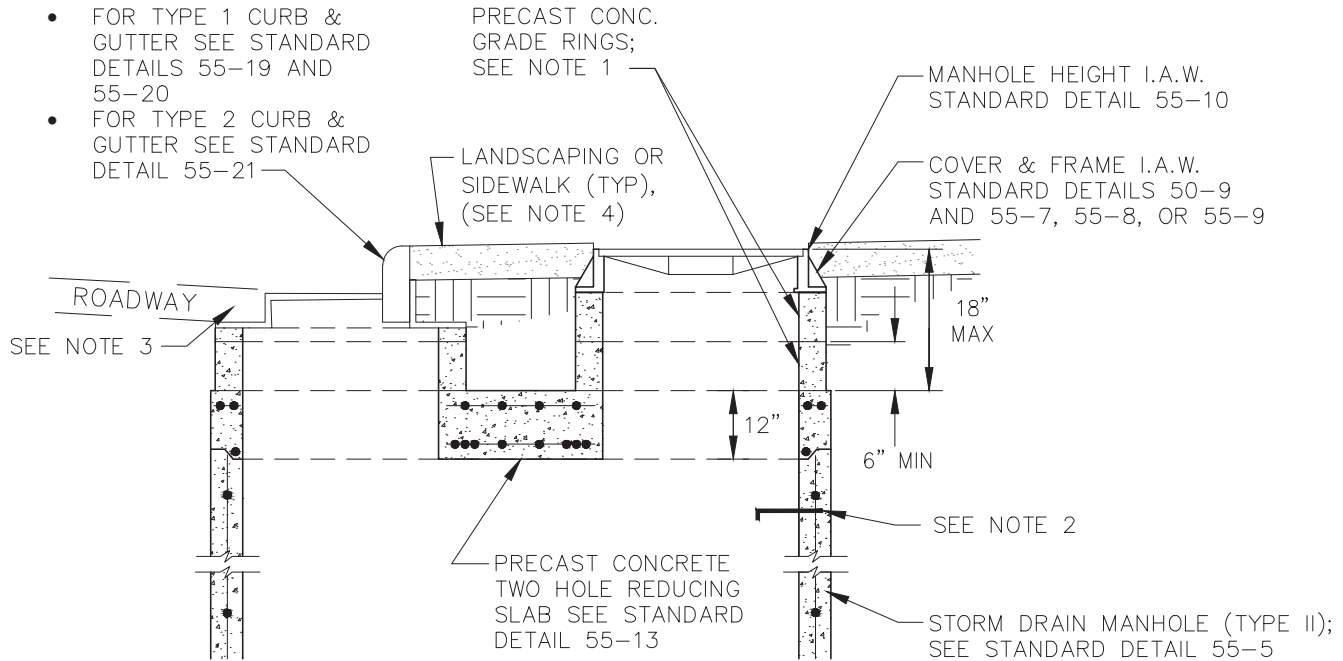
**DRIVEWAY CULVERT DETAILS**

SECTION #  
55.21

DETAIL #  
55-27

CATCH BASIN INLET

- FOR TYPE 1 CURB & GUTTER SEE STANDARD DETAILS 55-19 AND 55-20
- FOR TYPE 2 CURB & GUTTER SEE STANDARD DETAIL 55-21



NOTE:

1. MANHOLE SHALL HAVE MINIMUM OF ONE 6" GRADE RING. A 3" GRADE RING UNDER THE CATCH BASIN IS SUFFICIENT FOR THE TWO-HOLE CONFIGURATION.
2. CONTRACTOR SHALL ALIGN THE MANHOLE SO THAT THE LADDER RUNGS ARE IN LINE WITH THE MANHOLE ACCESS LID. THE MAXIMUM DISTANCE TO FIRST LADDER RUNG IS 34".
3. AT CATCH BASIN, DELETE CONCRETE GUTTER PAN. FOR TYPE 1 CURB & GUTTER PAVE TO FACE OF CATCH BASIN INLET. FOR TYPE 2 CURB & GUTTER PROVIDE 5" CONCRETE GUTTER PAN BETWEEN CASTING AND EDGE OF ASPHALT.
4. WHEN ACCESS MANHOLE IS LOCATED IN A CONCRETE SIDEWALK, INCREASE CONCRETE THICKNESS TO 6-INCHES.

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**DUAL ENTRY MANHOLE**

SECTION #  
55.05

DETAIL #  
55-28



BYPASS MANHOLE  
(TYPE II); SEE  
STANDARD DETAIL 55-5.

SEE STANDARD  
DETAIL 55-29B

LADDER RUNGS (TYP)

INLET PIPE

A

A

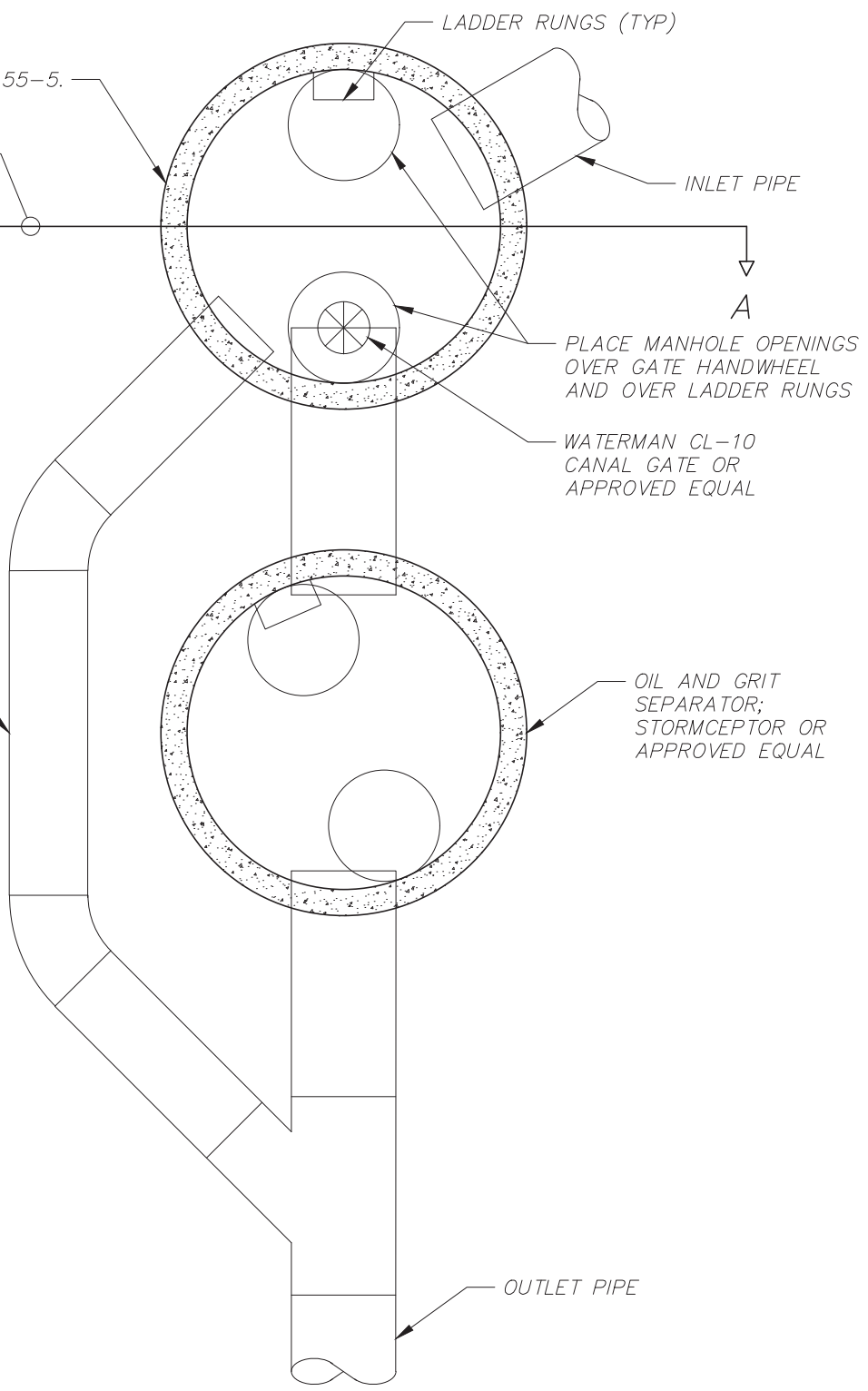
PLACE MANHOLE OPENINGS  
OVER GATE HANDWHEEL  
AND OVER LADDER RUNGS

WATERMAN CL-10  
CANAL GATE OR  
APPROVED EQUAL

10" CPEP  
BYPASS PIPE

OIL AND GRIT  
SEPARATOR;  
STORMCEPTOR OR  
APPROVED EQUAL

OUTLET PIPE



MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

# OIL AND GRIT SEPARATOR BYPASS

SECTION #  
55.22

DETAIL #  
55-29A

MANHOLE HEIGHT I.A.W.  
STANDARD DETAIL 55-10

COVER & FRAME I.A.W.  
STANDARD DETAILS  
50-9 & 55-7

EXTEND NO-RISE HANDWHEEL  
12-INCHES (MAX) FROM TOP  
OF CASTING

10" CPEP  
BYPASS PIPE

18" MAX

6" MIN

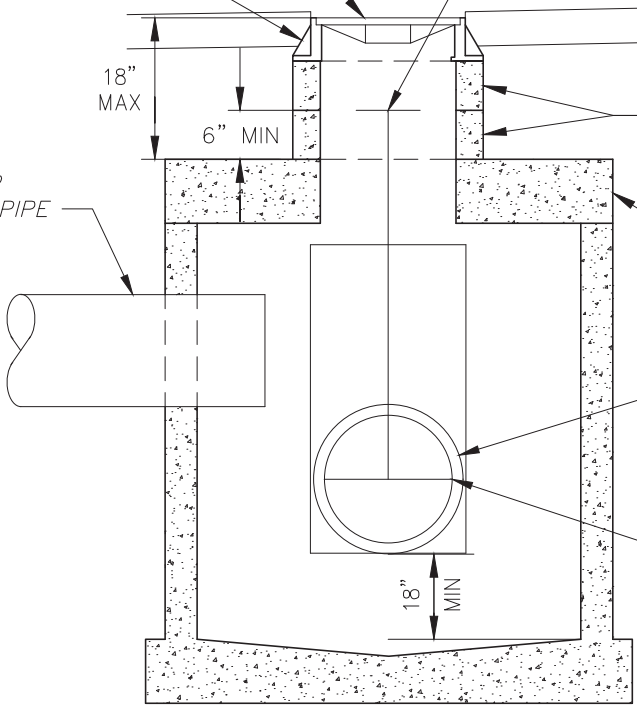
CONC. GRADE  
RINGS (TYP)

PRECAST CONCRETE TWO  
HOLE REDUCING SLAB SEE  
STANDARD DETAIL 55-13

OUTLET PIPE

WATERMAN CL-10  
CANAL GATE OR  
APPROVED EQUAL,  
MOUNTED ON  
OUTLET PIPE

18" MIN



SECTION A-A

MUNICIPALITY



OF ANCHORAGE

SCALE:  
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2/24

# OIL AND GRIT SEPARATOR BYPASS MANHOLE

SECTION #  
55.22

DETAIL #  
55-29B

**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 60  
WATER SYSTEMS**



**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR WATER SYSTEMS  
DIVISION 60  
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**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR WATER SYSTEMS  
DIVISION 60**

**SECTION 60.01 GENERAL**

This section is to be applied and used for all Sections in Division 60.

**Article 1.1 Scope of Work**

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, material, permitting, transportation, handling and storage, and performing all operations necessary to complete the construction of all water facilities that will be distributing water by the Utility Company having jurisdiction.

Requirements for earthwork, concrete, landscaping and other associated work items are found in other Divisions and are complimentary to this Division.

The Contractor is to locate and treat utilities in compliance with Division 10, Section 10.04, Article 4.17 – Utilities.

The Contractor, by providing a Bid Proposal and entering into a Contract with the Owner has found that the access, easements, rights-of-way, and other work areas designated in the Drawings are adequate to perform the Work and/or the Contractor has or will secure additional work areas to complete the Work. Furthermore, all costs associated with the Contractor secured work areas is to be included in the Bid Proposal.

Additional areas secured by the Contractor from parties not associated with the Contract are to be memorialized in the form of a right of entry agreement between the Contractor and party having authority to enter an agreement for the work area. A copy of the right of entry agreement is to be provided to the Owner. The right of entry agreement is to extend the indemnification requirements found in the Contract to Contractor obtained work areas.

The Contractor is to restore the area of Work to preconstruction conditions or better except where shown different in the Contract Documents. Where preconstruction conditions cannot be obtained such as items that require growth to obtain height, thickness and other prized attributes then they are to be replaced with standard nursery stock plant material of the same species and type that will grow back to preconstruction conditions and maintained in accordance with the Contract Documents. The Contractor is to secure written approval by the Engineer for replacement material differs from the Contract requirements.

Where the requirements in this division call out for an Engineer and there is no one assigned the duties of the Engineer, then the Utility Company is to be consulted for direction for items that require an Engineer or Inspector.

**Article 1.2 Applicable Standards**

The most recent revisions of the following standards are made a part of these Specifications:

AASHTO M306 Standard Specification for Drainage, Sewer, Utility, and Related Castings, Single User Digital Publication

ASTM A126	Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings
ASTM B88	Specification for Seamless Copper Water Tubing
ASTM D256	Test Methods for D-C Resistance of Plastics and Electrical Insulating Materials
ASTM D3035	Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
ASTM D3261	Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D3350	Specification for Polyethylene Plastic Pipe and Fittings Materials
ASTM F1674	Standard Test Method for Joint Restraint Products for Use with PVC Pipe.
ASTM F4777	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
AASHTO M45	Sand for Cement Mortar
AWWA A100	Water Wells
AWWA C104/ ANSI A21.4	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
AWWA C105/ ANSI A21.5	Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
AWWA C110/ ANSI A21.10	Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids
AWWA C111/ ANSI A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
AWWA C115/ ANSI A21.15	Flanged Ductile-Iron Pipe with Threaded Flanges
AWWA C116/ ANSI A21.16	Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service
AWWA C150/ ANSI A21.50	Thickness Design of Ductile-Iron Pipe
AWWA C151/ ANSI A21.51	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
AWWA C153/ ANSI A21.53- 84:	Ductile-Iron Compact Fittings
AWWA C213	Fusion-Bonded Epoxy Coating for the Interior and Exterior of Steel Water Pipelines



AWWA C303	Reinforced Concrete Pressure Pipe, Steel Cylinder Type, Pre-Tensioned, for Water and Other Liquids
AWWA C500	Gate Valves for Water and Sewerage Systems
ANSI/ AWWA C502	Dry-Barrel Fire Hydrants
ANSI/ AWWA C504	Rubber-Seated Butterfly Valves
AWWA C509	Resilient-Seated Gate Valves for Water Supply Service
AWWA C515	Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
ANSI/ AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
ANSI/ AWWA-C605	Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for water.
AWWA C651	Disinfecting Water Mains
ANSI/ AWWA C652	Disinfection of Water Storage Facilities
ANSI/ AWWA C800	Underground Service Line Valves and Fittings
AWWA C901	Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 in. through 3 in., for Water Service
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 inch through 12 inch for Water Transmission and Distribution
AWWA C905	Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 inch through 48 inch for Water Transmission and Distribution
ANSI/ AWWA D100	Welded Steel Tanks for Water Storage
ANSI/ AWWA D102	Coating Steel Water-Storage Tanks
SSPC-SP	Steel Structures Painting Council Surface Preparation Specifications
SSPC-PA	Steel Structures Painting Council Paint Application Specifications
NSF (Standard 61)	Drinking Water System Components – Health Effects
UBC	Uniform Building Code, latest edition adopted by MOA and current local amendments
IBC	International Building Code, latest edition adopted by MOA and current local amendments

UFC	Uniform Fire Code, latest edition adopted by MOA and current local amendments
IFC	International Fire Code, latest edition adopted by MOA and current local amendments
ISO 8179-1	Ductile Iron Pipes-External Zinc-Based Coating – Part1: Metallic Zinc with Finishing Layer
UMC	Uniform Mechanical Code, latest edition adopted by MOA and current local amendments
IMC	International Mechanical Code, latest edition adopted by MOA and current local amendments
UPC	Uniform Plumbing Code, latest edition adopted by MOA and current local amendments
NEC	National Electrical Code, latest edition adopted by MOA and current local amendments
NFPA	Other National Fire Protection Association Standards, latest edition adopted by MOA and current local amendments
AWG	America Wire Gauge
HMWPE	High Molecular Weight Polyethylene
NACE	National Association of Corrosion Engineers

### **Article 1.3 Survey**

Survey must be performed by the Contractor per Division 65 - Construction Survey. Survey is to be incidental to items under construction unless a pay item for Construction Survey Measurement is provided. The Contractor is to as-built and record at a minimum the following items based on the design survey horizontal and vertical control when provided or else the use local horizontal and vertical control when not provided by a design survey:

- Each pipe bottom and length of pipe segment
- Manholes, inverts, cleanouts
- Fire hydrants, valves, keyboxes, tees, fittings, restraint, pipe to pipe connections specialized fittings
- Other buried utility conduits, vaults, utilitdors, wires, manholes, catch basins
- Other utility surface features such as pedestals, junction boxes, power poles, light poles

Before working in developed areas, the Contractor is to take photographs and video documenting existing conditions. Photographs and video are to include major construction areas and their boundaries as well as a zone fifty feet (50') outside the furthest anticipated impact. Photo and video documentation is incidental to the Work.

## **Article 1.4 Definitions**

The definitions provided within this Article are supplemental to definitions provided in Division 10 and are to govern in the interpretation of all disputes. Industry standard definitions are to apply if a definition is not provided. Where a term, word or phrase has varying meanings, the Engineer will have final say on the interpretation.

Water Service Connection – water pipe and associated apparatuses from the point of connection to a water main to the terminus of the Utility Company maintenance responsibility, usually the property line or Utility Company easement. The terminus of the water service connection is usually defined by a valve.

Water Service Extension – typically it is water pipe and associated apparatuses on a parcel of land that begins where the Water Service Connection ends.

Service – connection, extension, and/or building piping from the Utility Company water distribution system.

Main Line – Water pipe servicing multiple customers within an easement owned by the Utility Company or within a public right of way.

Water Distribution System – Anything that is used to distribute potable water.

Fire Line – A portion of the water service with no additional branches that has the primary purpose of providing fire protection inside of a building. Typically a service that originates at a mainline or at a valve downstream of a fire hydrant tee continuing directly into a building with a sprinkler fire suppression system. Water extensions that are four inches (4”) and larger will be considered a fire line for the purpose of pressure testing.

Sewer – Non-domestic and domestic wastewater as defined in 18 AAC 72.990.

## **Article 1.5 Payment - General**

No separate payment will be made to the Contractor for Contractor obtained work areas or the restoration thereof.

Restoration Work not covered by bid items is to be considered incidental and no separate payment will be made. Restoration completed in Contractor secured areas is incidental to the contract.

Payment for all Work included in this Division will be paid for in accordance with Division 10, Section 10.07 - Measurement and Payment, and will include full payment for all Work described.

## **SECTION 60.02 FURNISH AND INSTALL PIPE**

### **Article 2.1 General**

The Work under this Section consists of performing all Work required for furnishing and installing an operational piping system in a workman like manner meeting applicable standards. The Contractor shall install piping systems as specified within these Contract Documents, the manufacturer's recommendations, the American Water Works Association (AWWA) standards, the Utility Company's most current Design and Construction Practices Manual (DCPM), per the Engineer's written directives and in conformity with the lines and grades as shown on the Drawings. Where the previously stated requirements are in conflict the more stringent requirement is to govern.

### **Article 2.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. The Contractor is to clearly demarcate items to be incorporated into the Work. Submittals for pipe and fittings should at least the following items:

- Pipe
- Fittings
- Detectable underground warning tape
- Trace and continuity wire
- Contractor thrust restraint calculations
- Polyethylene baggies and sheeting
- Coatings
  - Pipe layout plan
  - Storage Temperature
  - Surface preparation requirements
  - Coating repair plan
  - Applicator resumes
  - Application equipment
  - mixing and application time of coating
  - Curing time
- Flushing and testing plan
- Survey Personnel qualifications

### **Article 2.3 Material**

#### **A. Ductile Iron Pipe**

Ductile iron pipe is to be cement mortar lined, conforms to the requirements of AWWA C151, and has a minimum pipe wall thickness meeting Class 52 requirements. The cement mortar lining is to conform to the requirements of AWWA C104/ANSI A24.1. At least 10% of the pipe delivered is to be gauged full length of the pipe and marked as such.

B. Zinc Coated Ductile Iron Pipe (qualifies as tightly bonded)

Zinc Coated Ductile Iron Pipe is to be ductile iron pipe meeting item A of this Article with a metallic zinc coat and a bituminous finish layer in accordance with ISO 8179-1, with the minimum mass of zinc being 150 grams per square meter and a mean mas of 200 grams per square meter of 99.99% pure metallic zinc.

C. Polyurethane Coated Ductile Iron Pipe (qualifies as tightly bonded)

Polyurethane Coated Ductile Iron Pipe is to be ductile iron pipe meeting item A of this Article that has been prepared to receive a solventless elastomeric aromatic polyurethane, chemical cure, ASTM Type V coating that is compatible with in-situ soil conditions. Surface preparation is to be in accordance with the coating manufacturer's instructions.

The polyurethane coating is to have balanced viscosities in their liquid state that does not require agitation during use.

Coating material is to be Lifelast Durashield 310 or as approved by the Engineer and Utility Company.

All coating material is to remain in manufacturer's unopened containers and stored per the manufacturer's recommendations until required for use. Each container is to have the following items plainly visible: name of manufacturer, product, date of manufacture, shelf life, and batch number.

Coating material that has exceeded manufacturer's recommended shelf life or pot life, has been frozen or over heated, is stored in damaged containers, has broken or leaking seals or has jelled or otherwise deteriorated during storage must not be used.

Shelf life, temperature, and humidity limitations for each of the coating system components shall be maintained in strict accordance with coating manufacturer's recommendations during shipping, storage and application.

Thinning shall not exceed limitations established by manufacturer. Type of thinner shall comply with manufacturer's instructions.

D. Epoxy Coated Ductile Iron Pipe (qualifies as tightly bonded)

Epoxy Coated Ductile Iron Pipe is to be ductile iron pipe meeting item A of this article with a high build and high solids epoxy coating system.

Inspect, clean and blast surfaces in accordance with SSPC SP-1 or NAPF 500-03-01 and NAPF 500-03-04. Solvent clean as necessary to remove any deposits of asphalt paint, oil, grease, soil, drawing and cutting compounds and other soluble contaminants prior to abrasive blasting.

The following coating system, or Engineer approved equal, shall be used:

<u>Coating Materials</u>	<u>Coating Thickness (DFT)</u>	
	<u>Minimum (mils)</u>	<u>Maximum (mils)</u>
Sherwin Williams Fast Clad ER Epoxy 1st Coat	18	20

<u>Coating Materials</u>	<u>Coating Thickness (DFT)</u>	
	<u>Minimum (mils)</u>	<u>Maximum (mils)</u>
Sherwin Williams Fast Clad ER Epoxy 2nd Coat	18	20
Sherwin Williams Fast Clad ER Epoxy 3rd Coat	18	20
Total Dry Film Thickness (DFT)	54	60

All Manufacturer's instructions and safety precautions shall be followed.

Deliver all coating materials to the job site in their original, unopened containers. Clearly mark packaging with the coating Manufacturer's name, product name, manufacture date, shelf life, batch number and color.

Apply all coatings in accordance with SSPC PA-1, this procedure and the coating Manufacturer's recommendations. If a conflict exists, contact the Engineer for the determination of which is applicable.

Coats must not be applied whenever the relative humidity exceeds eighty-five percent (85%), or whenever the surface temperature is less than five degrees (5°) Fahrenheit above the dew point of the ambient air. The temperature of the surface shall not be less than sixty degrees (60°) Fahrenheit during application. Ambient and pipe temperatures shall be within the range recommended by the coating Manufacturer.

Coatings shall be applied to dust free surfaces. Test the surfaces by applying a strip of clear adhesive tape to the surface and rub onto the surface with a finger. When removed, the tape should show little or no dust, blast abrasive, or other contaminants. If found contaminated, clean by compressed air or vacuum cleaning and retest.

E. Polyvinyl Chloride (PVC) Pipe

Four inch (4") through twelve inch (12") Polyvinyl Chloride Pipe is to conform to the requirements of AWWA C900, have a dimensional ratio (DR) of 18.

Fourteen inch (14") through sixteen inch (16") Polyvinyl Chloride Pipe must conform to the requirements of AWWA C905, have a DR of 18. PVC pipe larger than sixteen inches (16") in diameter requires approval from the Utility Company's Engineering Director for use.

All PVC pipe is to be blue in color. PVC water main and service piping must be installed with an over insertion prevention device equal to EBAA Iron Mega Stop or the Cert-Lok bi-directionally restraint system.

F. High Density Polyethylene Pipe

High Density Polyethylene Pipe (HDPE) and fittings are to be manufactured in accordance with AWWA C906 with the additional stipulation that the HDPE is to be manufactured from PE4710 polyethylene compounds that meet or exceed ASTM D3350 Cell Classification 445574. HDPE pipe and fitting material compound is to

contain color and ultraviolet (UV) stabilizer meeting or exceeding the requirements of Code C per ASTM D3350. Electrofusion fittings will not be allowed. All fittings are to have pressure class ratings not less than the pressure class rating of the pipe to which they are joined.

#### G. Coated Copper Pipe

Coated copper pipe must be soft-drawn Type K, seamless, annealed copper pipe suitable for use as underground service water connections for general plumbing purposes and ASTM B88 compliant with an approved coating system.

Approved coatings include factory applied minimum twenty-six (26) mil thick polyethylene or a field applied coating.

#### H. Field Applied Coatings

Where a coating is required, field applied coatings may be used for repair of, in conjunction with or substitution for other coatings. Field applied coatings are to be denso wrap system, trenton wax tape system or viscotag viscowrap system. The term "system" requires the use of more than one product from the specified manufacturer to be used in concert to seal the pipe from corrosive and/or potentially contaminated environments and water. At a minimum, the system is to fully encapsulate the piping and fittings, fill voids/gaps and adhere to the pipe. The coating system must not interfere with the operation of moving parts.

#### I. Fittings and Gaskets

Iron fittings are to have exterior and interior surfaces coated with fusion bonded epoxy in accordance with AWWA C116/A21.13-09, with the only exception being for PVC overstab bell protection devices which do not need to be coated.

Romac 501 couplers are not allowed on water lines.

Unless otherwise indicated on the Drawings, rubber gaskets for iron pipe is to conform to AWWA C111 and rubber gaskets for PVC pipe joints are to conform to ASTM F477.

Ductile and cast iron fittings are to be a minimum of two hundred fifty pound (250#) pressure rating, flange, mechanical joint or bell, lined or unlined. Fittings must conform to the requirements of AWWA C110/ANSI A21.10 or C153 A21.53-06.

Fittings with nut and bolts are to utilize carbon steel or stainless steel nuts and bolts. Fittings with carbon steel bolts and nuts must conform to the dimensional and material standards as outlined in AWWA C111 and C115 and be factory-coated with a blue fluoropolymer coating system. Fittings with stainless steel bolts and nuts must conform to the dimensional standards as outlined in AWWA C111 and C115 and the material standards in ASTM F593 and F594 with a minimum tensile strength of 75,000psi. Bolts and nuts must have imprinted markings indicating the material and grade of the metal used in fabrication. Where bolts and nuts for fittings cannot be covered by the above references then the Contractor must submit a deviation request to the Engineer and Utility Company.

Fittings used with copper pipe are to be rated high pressure (150 psi) per AWWA C800. Brass components in contact with potable water are to comply with Public

Law 111-380 (No Lead Rule). Fittings are to accept flared copper pipe or have NPT threads for threading into other fittings. Buried Brass fittings are to be field coated in the same manner as coated copper pipe.

#### J. Thrust Restraint System

All thrust restraint system components are to be FM Global approved for the intended use or be UL listed. The surfaces of ferrous components are to have a fusion bonded epoxy coating in accordance with AWWA C116/A21.13-09.

Thrust restraint systems are required where specified on the Drawings and at fittings, valves and piping deflection points. The length of required restraint is dependent upon the system characteristics (i.e. soils, depth of cover, pipe size, etc...) in which it is installed. The Contractor must submit restraint length computations to the Engineer. Where the Contractor provided computations and the length shown in the computations do not match the Drawings, then the greater restraint length takes precedent. When the Drawings do not show restraint length at fittings, valves and piping deflection points and the Contractor does not provide calculations; then the entire length of pipe is to be restrained.

Where the Contractor proposes to use non-certified (i.e. FM Global, Underwriter Laboratories, ASTM, AWWA) thrust restrain systems they are to field demonstrate to the Engineer and the Utility Company the installation and/or construction of each new restrained joint or restraining system. Field demonstration must show the performance and sustainability of the restraint system to such a degree as to be equal to FM Global or applicable ASTM requirements. The Engineer and the Utility Company will make the final determination of the acceptability of Contractor proposed non-certified thrust restraint. Each approval will be project specific and re-testing is required for each subsequent project proposed use. All costs for approval or rejection of non-certified thrust restraint and restraint systems are to be borne by the Contractor.

##### 1. Additional Requirements for Ductile Iron Pipe (with or without coatings)

Tie back rods and/or tie back rod and shackle assemblies, along with thrust blocks will not be acceptable thrust restraining system.

Metallic fittings when not bonded and made amalgams to the pipe cathodic protection system requires a separate corrosion protection system.

##### 2. Additional Requirements for Polyvinyl Chloride Pipe

Thrust restrain systems are to meet the standards of ASTM F1674.

Chemical bonding will not be allowed. Metallic fittings require a separate corrosion protection system.

##### 3. Additional Requirements for High Density Polyethylene Pipe

Thrust restraint systems may be heat fusion bonding, flange fittings fusion bonded with metallic backer rings, alpha romac coupler or equal and other couplers with pipe stiffeners.

Metallic fittings require a separate corrosion protection system. Electro-fusion couplings are not allowed on Utility Company maintained pipe.



#### 4. Additional Requirements for Copper Pipe

Copper pipe thrust restraint systems are the use of flared fittings and silver solder brazed joints.

#### K. Pipe Material Limitations

Copper is the only pipe material allowed on small diameter (less than 4") water service connections. Copper pipe for direct bury is limited in size from 1" to 2" in nominal diameter. Copper pipe is to be coated type K seamless copper tubing. Factory coating is to be a minimum 26 Mil thick blue color polyethylene jacket. Field coating may be applied to areas of factory coating damage or pipe that does not have an option to come coated from a factory.

Four inch (4") and larger pipe are to have standard jointing consisting of bell to spigot with a gasket appropriate for the service environment. Where joints in copper pipe are needed, they are to be sealed with silver brazing.

#### L. Trace Wire

Trace wire for water lines is to be #10 AWG high-strength copper clad steel with a 30-mil HDPE insulation jacket (color blue) and have a 600-pound average tensile break load. Tracer wire is to be manufactured by Copperhead Industries or an approved equal.

Grounding rods are to be a minimum of twenty four inches (24") in length and copper clad.

The direct burial grounding clamps are to be EK17 as manufactured by Erico or approved equal.

All splice connections are to be constructed using 3M DBR watertight connectors, or approved equal.

DryConn Waterproof Direct Bury Lugs as manufactured by King Innovation, or approved equal, is to be used to splice into the main line tracer wire.

#### M. Thaw and Continuity Strap Wire

The wire shall be insulated No. 2 AWG stranded copper conductor rated for 600V. Insulation shall be HMWPE or approved for use in buried low temperature service. Split bolts or mechanical bolt connection of the wires will not be allowed.

#### N. Detectable Warning Tape

Detectable warning tape must not be less than five (5) mil, foil backed, six inches (6") wide vinyl tape, colored blue, with "Caution Buried Water Line Below" continuously printed in black along the tape length.

#### O. Polyethylene Encasement

Polyethylene encasement material for pipe is to be eight (8) mils thick and conform to AWWA C105. Polyethylene encasement is to include a VBio film system incorporating corrosion control additives and MIC control additives as provided by US Pipe or approved equal.

## **Article 2.4 Construction**

### **A Water Flow Interruptions**

All planned interruptions require the Contractor to notify the Utility Company, Engineer, the Municipality of Anchorage Fire Department (AFD), property owners, property managers and residents a minimum of seventy-two (72) hours and a maximum of one-hundred forty-four (144) hours in advance of the interruption.

Properties with fire sprinklers require a minimum of three non-holiday and non-weekend days of notice to allow property managers time to mitigate impacts to fire suppression systems.

Each interruption requires a separate notification. Interruptions not started within the planned interruption period require a new notice and notifying period. Along with notice requirements, planned interruptions may not affect any portion of a previous interruption until a minimum of forty eight (48) hours has passed the previous interruption.

The water service outage area is water system infrastructure and project dependent. Upon notifying the Utility Company of a planned interruption, the Contractor will allow the Utility Company up to fourteen (14) working days to clean and operate valves, operate hydrants and complete test shutdowns to establish the limits of the shutdown area. Once the shutdown area has been defined, the Utility Company will provide the Contractor a map or list of properties indicating the anticipated shutdown area.

Shutdown does not implicitly mean shut off and the Contractor is to plan for up to two hundred gallons per minute (200 gpm) of water from the water system to enter the work area after the pipes have been depressurized. The Contractor is to mitigate impacts to the system and implement energy control measures.

The Contractor is to notify the Municipality of Anchorage Department of Health and Human Services where an interruption impacts or has the potential to impact a business establishment that provides food or health care services. Critical health care services as shown on the Drawings or called out in the special provisions are to be provided temporary water at all times.

It shall be the Contractor's responsibility to coordinate "turn-off" and "turn-on" with the Engineer and the Utility Company. The Contractor cannot operate the Utility Company's water system to achieve a water interruption.

Where and when the Work is reasonably anticipated to interrupted water service to any one customer for more than six (6) hours, the Contractor shall furnish and install a temporary water system. If the water service is disrupted in excess of six (6) hours or without notice, the Contractor is to pay the Utility Company fifty dollars (\$50) for each impacted residential or business unit for each hour beyond the initial six-hour period or the start of an interruption without notice.

If the interruption surpasses twenty four (24) hours without reestablishing water service, then the Utility Company at its discretion will take action to make repairs to reinstate water service, back charge the Contractor and other responsible parties to reinstate water service. The Utility Company may take further action by limiting

the Contractor from working on Utility Company piping and Utility Company controlled services in the future. In addition, the Engineer may consider the Contractor to have substantially violated the terms of the Contract and begin to terminate the Contract as provided for in Division 10, Section 10.05, Article 5.28.

B. Excavation and Backfill

The Contractor is to provide all excavation, backfill, and compaction necessary to install the pipe. Trench excavation and backfill is to be completed in accordance with Division 20, Section 20.13 - Trench Excavation and Backfill. In addition, trenching and excavation is to meet the requirements of 29 CFR 1926.651 and 1926.652 (OSHA Trench and Excavation).

All pipes are to be bedded with Class E bedding unless another material is authorized in writing by the Utility Company. Bedding is to be laid the full width of the ditch and compacted to a minimum of ninety-five percent (95%) of the maximum density.

Water pipe bedding is to extend six (6) inches below and above the pipe and constructed in accordance with Standard Detail 20-8

C. Materials Delivery

Pipe and appurtenances are to be handled in such a manner to ensure delivery to the trench in a sound, undamaged condition. Particular care is to be taken not to damage the pipe, pipe coating, or lining. Before, after and during installation the engineer is to be provided an opportunity to examine the pipe and appurtenances for damage and defects. Damaged or defective pipe may be rejected. Rejected pipe must be removed from the project and replaced with acceptable material at no additional cost.

The pipe is not to be strung out along the shoulders of the road for long distances if it causes inconvenience to the public. The amount of pipe strung at the job site is at the discretion of the Engineer.

Rubber gaskets are to be protected from extended exposure to direct sunlight. Gaskets are to be installed into the piping when the gasket and pipe are above freezing temperature and the gasket is pliable.

D. Connection to existing water lines

The Utility Company issues permits for, witnesses, records live tap locations and sometimes completes taps on a cost reimbursable basis.

Mainline taps two (2") inches and smaller are to be done by the Contractor. The mainline tap must be accomplished with a drilling machine approved for use on the pipe material being tapped, capable of drilling through the tapping saddle and corporation stop and pipe wall.

Tapping saddles are to be used for all taps with the exception that one (1") inch taps into eight inch (8") and larger ductile iron pipe can be directly tapped into the pipe.

Taps are to be made at sufficient distances from each other, tees, bells, joints and other critical areas to prevent compromising the structural integrity of the pipe being tapped. Taps are not to be made any closer than three feet (3') to each other or to a bell.

The Contractor is to schedule Utility Company crews for taps larger than two inches (2") with the Utility Company's department of Customer Service, Field Services section a minimum of three working days in advance of the anticipated need. Reimbursements arrangements are to be made prior to the start of the three working days' notice. Live taps proposed on mains larger than twelve inches (12") or constructed of HDPE may require additional time for ordering and receiving of parts.

The Contractor shall provide all trench excavation, shoring, bracing, backfill and compaction necessary to complete a successful live tap connection. The trench shall be long enough and of sufficient width at the bottom to allow installation of the valve for the live tap connection. The Utility Company will provide the staff, tapping machine, tapping saddle and connection valve. The Contractor shall provide all necessary equipment and manpower to assist Utility Company personnel in moving piping, valves, tapping machines and miscellaneous items into and out of the trench during the entire time Utility Company personnel are working to complete the installation of the water line tap.

For the safety of Utility Company personnel, trenching and excavation is to be completed such that it meets the more stringent requirements of OSHA and the Utility Company's safety program.

Contractor shall excavate for live tap connections in such a manner that the excavation is ninety degrees (90°) to the main water line, whenever possible.

The Contractor shall bear the expenses incurred, if a water main within and directly adjacent to the project site should be damaged during construction. The Utility Company, at its option, will allow the Contractor to make repairs, or the Utility Company will make repairs; however, Contractor shall bear the cost of all material, labor, and other expenses associated with the repair.

Where the Drawings require the connection to an existing valve, the Contractor may choose to use the valve at their risk or replace it at their expense.

#### E. Installation

Installation is to follow the requirements of AWWA C600, C605, M23, M41 and M55, these specifications, special provisions, and the Utility Company's construction manual and published guidance documents. The Utility Company will have final say when deciding on which requirement the Contractor is to meet where these documents conflict at no additional cost to the Owner.

Deflection at pipe to pipe joints is to be limited to 80% of the maximum deflection angle recommend by the pipe manufacturer for ductile iron pipe

Deflection at pipe to pipe joints is to be limited to 0% of the maximum deflection angle recommend by the pipe manufacturer for polyvinyl chloride pipe

If the alignment requires deflection in excess of the above limitations, the Contractor shall furnish fittings to provide angular deflections within the limits allowable. Short radius curves and closures are to be formed by shorter lengths of pipe, bevels, factory fittings or fabricated fittings.

Where a fitting is provided to change direction, the Contractor is to install a pipe angle marker per the standard details. The marker must be centered over of the fitting.

The interior of the pipe and accessories are to be thoroughly cleaned of foreign matter before being lowered into the trench. The pipe is to be kept clean during laying operation by plugging.

Pipe and appurtenances are to be carefully lowered into the trench by means of derrick, ropes, belt slings, or other suitable equipment. Under no circumstances are any of the pipes or appurtenances to be dropped or dumped into the trench. Care is to be taken to avoid abrasion of the pipe coating. Poles used as levers or skids are to be of wood and have broad flat faces to prevent damage to the pipe and coating. Where any part of the coating or lining is damaged, a repair is to be made by the Contractor at their expense and in a manner satisfactory to the Engineer.

Damage to a factory applied coating on copper pipe is to be repaired with a field applied coating system.

The trench bottom is to be graded to provide uniform support for the pipe barrel. Water is to be kept out of the trench by pumping, if necessary, until the jointing is completed. When Work is not in progress, open ends of the pipe, fittings, and valves are to be securely plugged so that no trench water, earth or other substances will enter the pipes or fittings.

At a distance of not less than forty feet (40') from a known obstacle or tie-in to an existing pipe, the Contractor is to expose and verify the exact location of the obstacle or pipe so that proper alignment and/or grade may be determined before the pipe sections are laid in the trench and backfilled.

Pipe ends left for future connections are to be capped and restrained or as directed by the Engineer. The Contractor is to install vertically an eight foot (8') long wood post, directly over the end of pipe.

Cutting of pipe is to be done in a neat and workmanlike manner without damage to the pipe.

The Contractor is required to use mechanically restrained joints and fittings on all hydrant leads. The Engineer has the option of checking any or all mechanical joints to assure proper torque as specified by the manufacturer.

All ductile iron pipes with affixed fittings are to be encased in one layer of polyethylene encasement. Fittings affixed to non-metallic piping do not need polyethylene encasement. All valve boxes and hydrant barrels are to be encased in three layers of polyethylene encasement.

Water mains and services are to be constructed to meet all separation requirements of 18 AAC 80.020. Variance from the separation requirements

requires a waiver from the Alaska Department of Environmental Conservation and prior approval from the Utility Company.

The Contractor is to stagger the joints for the water pipe such that no joint is closer than nine feet (9') from the centerline crossing of water to sewer. In addition, where water and sewer mains and services intersect, the vertical separation between the water and sewer pipe is to be a minimum of eighteen inches (18") between exterior pipe surfaces.

F. Alignment and Grade

All adjustments to line and grade are to be done by scraping away or filling the earth under the body of the pipe and not by blocking or wedging up.

The Contractor shall continually survey line, grade and location of the pipe and appurtenances with the use of transits and levels during pipe laying operations. Survey is to be completed by qualified personnel to transfer line, grade and record required information. The Engineer will determine qualifications based on submittal of work examples and notes being made in the field when compared to note taking requirements as outlined in Division 65. The Contractor is to replace any personnel the Engineer deems to be less than qualified based on work examples provided or work being performed.

Each piece of pipe is to be laid to within three-one hundredths (0.03) of a foot horizontally and vertically from the design elevation and alignment. Regardless of the limits applied to individual pieces of pipe the accumulated variance of pipe alignment and grade must not be greater than two-tenths foot (2/10' or 0.2'). The Contractor must re-lay the water line when alignment and grade requirements are not met.

Elevations and locations for each piece of pipe and appurtenances are to be recorded in a field book. The Contractor will furnish to the Engineer a copy of the surveyor's notes and redlined drawings for transfer to record drawings. The Contractor is to make any clarifications, corrections or fill in missing data in the survey notes and redlines when requested.

The practice of placing backfill over a section of pipe to provide a platform for instruments is to be subject to the approval of the Engineer and be accomplished in accordance with the trench excavation and backfill requirements

G. Jointing of Ferrous Metal Pipe

The Contractor has the option of using either mechanical or push-on joints. All joints are to conform to the requirements of ANSI/AWWA C600.

Metallic pipe is to have two (2) electrical continuity straps installed on each side of every joint for all pipe diameters. Straps are to be welded to a clean, dry surface. Each exothermic wire weld connection is to be protected with one (1) field applied Royston Handy Cap IP or equal. Uncoated surfaces are to be coated with coal tar pitch to the satisfaction of the Engineer.

#### H. Jointing of High Density Polyethylene

All HDPE water main piping and fittings are to be butt-fused in accordance with ASTM D2657. Where the Engineer finds that joint fusion is not feasible the Contractor may connect with metallic fittings. The individual who performs the joint fusion is to have written certification from an HDPE pipe manufacturer or supplier stating he/she has successfully completed an 8-hour (minimum) certification class on joint fusion techniques and procedures. In addition, this individual is to have fused a combined total of more than 5,000 feet of HDPE piping in diameters 4-inches and larger.

The Contractor shall ensure that each joint is fused at the temperature and pressure recommended by the pipe manufacturer in order to achieve the maximum pressure rating for that joint. All fused joints for HDPE piping and fabricated fittings are to be documented by a computer data logger that records pressure and temperature applied at each fused joint, along with the date and time the joint was fused. Computer printouts, electronic data, and the project station for each field fused joint is to be submitted to the Utility Company through the Engineer.

The use of electro-fusion couplings to join HDPE piping is not allowed.

#### I. Jointing of PVC pipe

The Contractor has the option of using mechanical joints or push-on joints. All joints are to conform to the requirements of AWWA C605.

The Contractor is to ensure that the spigot end of the pipe is not inserted into the adjoining pipe bell past the pipe manufacturer's recommended insertion limits.

#### J. Jointing of Copper pipe

Copper pipe may be joined with the use of silver brazing copper couplers, flared fittings and by swedging and silver brazing. Solder must be lead free silver solder. All joints are to be outside of the rights-of-ways and/or Utility Company easements, unless given prior approval by the Utility Company.

#### K. Detectable Warning Tape

Detectable underground warning tape is required for installation of all pipe types. The warning tape must be continuously laid with the pipe and be at least twenty four inches (24") and no more than thirty six inches (36") above the pipe.

#### L. Tracer Wire for Non-metallic Pipe

Tracer wire is to be grounded at all dead ends, except fire hydrant legs. The trace wire is to be connected to the grounding rod with grounding clamps.

Tracer wire is to be securely affixed to the top exterior surface of the pipe using PVC pipe tape at 5-foot intervals or less. Tracer wire is to be looped around valves, saddles, curb stops, and other appurtenances in such a manner that there is no interference with the operation of the appurtenances. Tracer wire must be continuous and without splices, breaks, or cuts except for spliced-in connections as approved by the Engineer. All spliced connections must be inspected by the Engineer before being buried.

Tracer wire must be brought to the surface at all junctions and terminals, including at all valve boxes and fire hydrant legs by splicing into the main line tracer wire. The main line tracer wire must not be broken or cut. Tracer wire is to be spiral-wrapped around the exterior of the valve box riser pipe and brought into the valve box top section. Provide three feet (3') minimum of additional wire neatly coiled within each valve box.

#### M. Polyethylene Encasement

The Contractor is to install polyethylene encasement as outlined below.

1. Cut a section of polyethylene tube approximately two (2) feet longer than the pipe section. Remove all lumps of clay, mud, cinders, or other material that might have accumulated on the pipe surface during storage. Slip the polyethylene tube around the pipe, starting at the spigot end. Bunch the tube accordion fashion on the end of the pipe. Pull back the overhanging end of the tube until it clears the pipe end.
2. Dig shallow bell hole in the trench bottom at the joint location to facilitate installation of the polyethylene tube. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe.
3. Move the cable to the bell end of the pipe and lift the pipe slightly to provide clearance to easily slide the tube. Spread the tube over the entire barrel of the pipe. Note: Make sure that no dirt or other bedding material becomes trapped between the wrap and the pipe.
4. Make the overlap of the polyethylene tube by pulling back the bunched polyethylene from the preceding length of pipe and securing it in place. Note: The polyethylene may be secured in place by using tape or plastic tie straps.
5. Overlap the secured tube end with the tube end of the new pipe section. Secure the new tube end in place.
6. Take up the slack in the tube along the barrel of the pipe to make a snug, but not tight, fit. Fold excess polyethylene back over the top of the pipe.
7. Secure the fold at several locations along the pipe barrel (approximately every three (3) feet).
8. Repair all small rips, tears, or other tube damage with adhesive tape. If the polyethylene is badly damaged, repair the damaged area with a sheet of polyethylene and seal the edges of the repair with adhesive tape.
9. Carefully backfill the trench in according to procedures in AWWA C600 Standard. To prevent damage during backfilling, allow adequate slack in the tube at the joint. Backfill should be free of cinders, rocks, boulders, nails, sticks, or other materials that might damage the polyethylene. Avoid damaging the polyethylene when using tamping devices.

Damaged polyethylene encasement is to be repaired or the pipeline removed and the polyethylene encasement replaced at no additional cost.



The requirements of Method A of ANSI/AWWA A21.5/C105 is to be used to make any clarifications to the installation process as outlined above.

#### N. Fire Lines

No connections, other than those for additional fire protection, will be allowed on the fire line outside the building. Domestic water obtained from a fire line will be connected and metered inside the building.

The fire line riser from the service piping is to be composed of metallic pipe extending vertically from a ninety-degree (90°) fitting through the plane of the building floor. The fire sprinkler riser must be constructed of material in compliance with the NFPA. All below grade metallic piping must be cathodically protected.

#### O. Relocate Water Main

Where a water main line or service crosses the location of a sewer, the water main is to be raised or lowered sufficiently to permit a minimum (outside diameter) vertical distance of eighteen inches (18") from the sewer line.

The Contractor may employ either of the following methods for raising or lowering a water main.

Raise or lower lengths of the water main as necessary on either side of an obstacle to allow the main to pass under or over the obstacle, providing the deflection at any pipe joint does not exceed the requirements of this Section, or

The water main may be raised or lowered using four (4) pipe bends. The bends are not to exceed forty-five degrees (45°). Where the configuration of lowering the water piping differs from the details provided in this Division, the Contractor is to receive prior approval of the Engineer and Utility Company.

### **Article 2.5 Flushing and Testing**

Flushing and testing is to be completed as specified in the requirements of the referenced AWWA standards unless hereinafter modified. A Utility Company representative, the Engineer, and the Contractor must be present for all flushing and testing.

Flushing and testing is to be completed separately and sequentially starting with pre-disinfecting, flushing, hydrostatic testing, disinfection, and continuity. The Contractor is to provide, install and remove fittings, pipes, pumps, hoses, gauges and other items necessary to perform the flushing and testing.

All water piping, including but not limited to main line, services, fire lines, and fire hydrant legs must be flushed and tested before the piping system can be put into service.

The only exceptions to the chlorination and pressure testing requirements are for non-fire lines constructed of one inch to two inch (1"-2") coated copper pipe that are:

- water service extensions connected to an existing water connection or,
- water service connections that are connected to an existing main that are constructed in conjunction with a water service extension.

Pipe, gaskets, mechanical joints, fittings, valves, hydrants and other water distribution components found to be cracked or defective through flushing and testing are to be removed and replaced with sound material at the Contractor's expense. When repairs are needed to make corrections pass flushing and testing requirements, the flushing and testing procedures are to be restarted for all test sections impacted by the repair.

Each request to supply water for flushing, testing, and disinfecting is to be scheduled in writing with the Engineer and the Utility Company at least forty-eight (48) hours prior to obtaining Utility Company supplied water. Scheduling of flushing, testing, and disinfecting will be subject to water availability. At no additional cost, the Contractor is to modify their schedule to match water availability which may require work on non-working days or outside of normal work shifts.

If the Contractor is not prepared for flushing or testing, they are to provide a cancellation notice to the Engineer and Utility Company at least two (2) hours prior to the scheduled event or the Contractor is to reimburse the Utility Company and Engineer for all expenses incurred by said entities. Expenses will include, but not be limited to, salaries, transportation and administrative costs.

Earthwork for roadways and sidewalks as well as installation of other utilities that share the same frontage as the water distribution system being tested is to be Substantially Complete prior to flushing and testing.

The Contractor is not authorized to operate the Utility Company water distribution system. Only the Utility Company personnel are authorized to manipulate the existing pipe system to supply water for flushing and testing.

The Contractor shall submit, in writing, for the Engineer to review and approve, a schedule and procedure for the testing and flushing of all newly installed pipe. The plan is to include flush and de/chlorinated water handling and discharge procedures. Water discharge locations must receive approval from the governing authority of the discharge location.

When, in the opinion of the Engineer, the testing and flushing schedule and procedure are deficient, inadequate, improper, or conditions are such that the impact to existing water service areas are adversely affected by service interruptions, the Contractor will be notified in writing by the Engineer. Such notification is to be accompanied by a statement of the corrective action to be taken. Contractor shall adhere to the testing and flushing schedule and comply with such instruction as directed by the Engineer.

#### A. Flushing

All newly installed water pipes are to be open-bore flushed through un-restricted outlets. Flush water is to achieve a minimum velocity of three feet per second (3 ft/sec) and the minimum water quantity flushed at the minimum velocity is to equal three times the quantity of water in the piping being flushed.

The Contractor is to configure the flushing operation, where possible, from higher to lower elevation, utilizing higher pressure mains first, allowing the Utility Company to manipulate the water distribution system to achieve higher than normal pressures and flows to the newly constructed main or other appropriate measures to increase flushing velocities.

Flush piping on service water connections is to be connected to the service water extension side of the key box, extended a minimum of two feet (2') above finish grade and remain in place until the Final Acceptance Date.

Flush water must not be directly connected to the sanitary sewer system. When specifically permitted by the Utility Company, flush water discharged to the sanitary sewer system must be de-chlorinated, have flow regulation with metering, and be limited to the sewer system capacity. The sewer system capacity may exclude discharging to sewer regardless of the flow conditions at the proposed discharge point. The sewer capacity is to be provided in the Special Provisions or the Contractor must obtain the sewer capacity from the Utility Company. The flow provided is based on computer modeling. The actual conditions of the sewer piping may require the Contractor to reduce flow so that the added flow will not cause damage to property.

#### B. Hydrostatic Testing

All hydrostatic testing will be performed through a test copper. The test station is to be placed at the highest end of the pipe being tested when there is an elevation change in the pipe greater than ten feet (10'). The test pressure is not to exceed the maximum allowable operating pressure of the pipe, fittings, valves, thrust restraints, or other appurtenances of the test section. Use of fire hydrants for testing will not be allowed. The specified test pressure shall be applied by means of an approved pumping assembly connected to the pipe in a manner satisfactory to the Engineer.

When the pressure decreases below the required test pressure during the test period, the pipe being tested will be declared void and will require re-testing.

The Contractor is to incorporate a Utility Company provided test pressure gauge for measuring and determining results of the hydrostatic test. The gauge is to be returned to the Utility Company at the completion of the hydrostatic testing.

The Contractor shall suitably valve-off or plug the outlet to the existing or previously-tested water main at the Contractor's expense prior to making the required hydrostatic test. Prior to testing, all air is to be expelled from the pipe.

If permanent air vents are not located at all high points and dead ends, the Contractor must install and abandon corporation stops at such points so the air can be expelled as the line is slowly filled with water.

All intermediate valves within the section being tested will be closed and reopened during the test. Only static pressure will be allowed on the opposite side of the end valves of the section being tested.

Hydrostatic testing of water lines containing a chlorine mixture above 2 ppm will not be allowed.

The minimum hydrostatic test pressure is to be one hundred fifty pounds per square inch (150 psi) for a minimum duration of thirty (30) minutes for non-fire lines. Fire lines are to be tested at two hundred pounds per square inch (200 psi) for a minimum duration of two hours.

Pumping will be terminated and disconnected upon starting the test. The test pressure at the start of the test is to be maintained for the duration of the test period. Any loss of pressure will be considered a failed pressure test for all pipe types except HDPE.

Newly installed HDPE water main is to be hydrostatically tested to the rated operating pressure of the pipe and appurtenances in two phases. The rated operating pressure of PE4710 HDPE SDR11 piping is two hundred pounds per square inch (200 psi).

#### Phase 1 – Initial Expansion (4 hours)

Pressurize the test section to the test pressure and maintain for four (4) hours. The contractor is to pump in additional test water into the pipe to maintain test pressure as the pipe expands slightly. It is not necessary to monitor the amount of water added during this phase.

#### Phase 2 – Pressure Testing (minimum 1 hour)

Immediately following the initial expansion phase the Contractor is to stop adding testing fluid and then reduce pressure by 10 psi. The reduced pressure then becomes the test pressure and is to be held within five percent (5%) for one hour and show no visible leaks to be deemed as having passed the test.

The maximum test duration is eight (8) hours. If the test is not completed in the maximum duration period, then the Contractor is to depressurize the test section completely and allow it to relax for at least eight (8) hours before pressurizing the test section again.

### C. Disinfection and Confirmation Testing

The Contractor is to use the Continuous Feed Method to disinfect newly installed water distribution system. AWWA C651 provides various methods for disinfection. The Utility company has found that the tablet, slug and spray methods method are impractical.

The chlorinating agent must be applied at a point of not more than ten feet (10') from the beginning of the project. Under no conditions is the chlorinating agent to be introduced through a fire hydrant.

Water is to be fed slowly into the new water line with chlorine applied in amounts to produce an initial water and chlorine mixture in the pipe of not having less than twenty-five parts per million (25 ppm) of free chlorine. During the chlorination process, all intermediate valves and accessories are to be operated by the Contractor.

The Contractor is to discharge water from the end of all main lines, branches, service connections and extensions until the Engineer verifies that all portions of the newly constructed water distribution system has the initial minimum free chlorine level of the water source supply.

The chlorinated water is to be retained in the piping for a minimum of twenty-four hours (24hrs) and have a minimum residual level of free chlorine of ten parts per

million (10 ppm). At the completion of the twenty-four hour (24hr) period the Engineer is to sample the water. If the free chlorine drops below ten parts per million (10 ppm) the Contractor is to restart the flushing and testing.

The Contractor shall provide a plan for concurrence by the Engineer for disposal of chlorinated waters from the disinfection process. The plan must include a method to dechlorinate and hold the discharge prior to leaving the Contractor's control. Under no circumstances is the solution to be discharged to the sanitary sewer system without prior approval of the sewer Utility Company and the Engineer. Discharges of the spent chlorine solution is to be approved by the authorities have jurisdiction of the receiving facility/site.

After dechlorination is complete, the Contractor shall provide access and accommodate in its schedule for coliform testing. The Engineer with Contractor support is to collect two sets of acceptable samples, taken 16 hours apart, of water from the disinfected piping at the location(s) required by AWWA C651. The samples are to be tested as specified in AWWA C651 Standard Methods for the Examination of Water and Wastewater, and show the absence of coliform organisms. Samples are to be collected by a qualified person and processed in a certified lab.

All preparation and coordination required for disinfection testing and re-testing shall be the responsibility of the Contractor. Additional compensation or contract time extensions for re-testing due to inadequate disinfection will not be granted.

#### CHLORINATION

<u>Pipe Diameter (ID)</u>	<u>Dosage (oz.) per 100 feet</u>
4"	.34
6"	.76
8"	1.34
10"	2.10
12	3.02
14 and larger	$D^2 \times 3.02$

Where D is the inside pipe diameter (ft)

One Heaping Tablespoon  $\cong$  ½ oz.

This table is to be used as a guide for chlorinating water mains by the calcium hypochlorite and water mixture method. This dosage takes into account that contractors most frequently use granular HTH, which is sixty-five percent (65%) pure. If another chlorinating agent is used, the dosage must be adjusted. Caution should be exercised against producing too high a concentration of chlorine in the line.

Disinfection will not be allowed until all open-bore flush pipes are removed and the water system is sealed.

The Contractor may submit a deviation request to the Engineer for review and approval for alternate disinfection plans that meet the requirements of ANSI/AWWA C-651.

#### D. Continuity Tests

The Contractor shall perform electrical conductivity tests on all ductile iron mains, service connections and service extensions in the presence the Engineer and a representative of the Utility Company.

The Contractor shall maintain a circuit of six hundred (600) amperes DC current for fifteen (15) minutes. To pass the continuity test, the input current may not exceed ten percent (10%) of the return circuit. All equipment necessary to maintain the circuit will be supplied by the Contractor.

The Contractor will perform line tracing on plastic pipe installed with trace wire.

All continuity and tracing tests will be through wires connected to the main and brought to the surface. The use of water service thaw wires, fire hydrants and valves as substitutes for wires will not be accepted. All wires brought to the surface to complete the continuity test are to be placed in a valve box adjustment sleeve.

Where continuity or tracing is not continuous the Contractor, at no additional cost to the Owner, must make necessary repairs/corrections.

Continuity and tracing tests must not be performed until all excavations have been completed and backfilled.

#### E. Test and Air Vent Copper Pipe Removal

The Contractor is to remove all test and air vent copper pipes upon successful completion of the flushing and testing requirements and install a copper disc in the corporation stop in the presence of the Engineer.

### **Article 2.6 Measurement**

Measurement for furnishing and installing water main line and fire line is per linear foot of horizontal distance of the various sizes as set forth in the Bid Schedule. Measurement will be from station to station as staked in the field and as shown on the Drawings, except where the grade exceeds twenty-five percent (25%), in which case measurement will be by actual pipe length.

Where a water connection, also known as a “live tap”, is completed by the Utility Company on an existing pressurized Utility Company water pipe, these connections are measured as a complete unit in place. All other water connections are incidental to the work taking place.

Raising or lowering of existing water line is measured as a complete unit in place that includes but not limited to piping, fittings, locator tape, disinfection, continuity wire, trace wire polyethylene encasement and the like to make a functioning water system.

## Article 2.7 Basis of Payment

Payment for this Work will be in as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

All requirements for flushing and testing are incidental to the Work.

Variations from the depth of the connection point indicated in the Drawings will not be grounds for additional compensation.

Unless specifically identified for payment under a separate pay item, the unit price bid to includes all labor, equipment and materials to complete the Work including, but not limited to, the following incidental items:

- delivery of non-serviceable portions of removed pipe, valves, and fittings at a Contractor-furnished disposal site;
- delivery of serviceable portions of removed pipe, valves, and fittings to the Utility Company,
- installation of all pipe, tees, crosses, bends, caps, plugs, adapters, reducers, thrust restraint systems, and other fittings;
- installation of pipe angle markers
- installation of thrust blocks;
- adjustment to finish grade;
- protection and/or restoration of all existing utilities;
- maintenance of existing water distribution system flows;
- Trench excavation and backfill;
- Compaction,
- Import classified material and disposal of unusable material
- shoring
- protection of existing light and utility poles;
- maintenance and restoration of existing drainage patterns;
- restoration of existing private or public improvement such as but not limited to:
  - driveways;
  - signage, mail boxes, newspaper boxes,
  - trees and shrubs located on private property;
- landscaping, utility markers, survey monumentation;
- cleanup, and miscellaneous items required to complete the Work as shown on the Drawings.
- Temporary water system for water interruptions lasting longer than 6 hours

Where the Work includes disconnecting existing water services from an existing water line and reconnecting them to a new water line, the disconnection and reconnection of those existing water services will be considered incidental to the price bid for installation of the new water line.

Payment will be made on the following unit bid items:

ITEM	UNIT
Furnish and Install (Size,Type) Pipe	Linear Foot
Furnish and Install (Size,Type) Fire Line	Linear Foot

Connect to Existing Water Line (Connection Size)  
Raise or Lower Water Line (Size)

Each  
Each



## **SECTION 60.03 FURNISH AND INSTALL VALVES**

### **Article 3.1 General**

The Work under this Section consists of the performance of all Work required for furnishing and installing valves, including valve boxes and marker posts.

### **Article 3.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. The Contractor is to clearly demarcate items to be incorporated into the Work. Submittals for pipe and fittings should include, but is not limited to the following information:

- Manufacturer valve submittal cut sheets
- Valve box
  - Lid
  - Top Section
  - Dust Pan
  - Riser
  - Bottom Section
  - Rubber centering sleeve
- Geotextile

### **Article 3.3 Material**

Tie back rods and/or tie back rod and shackle assemblies are not acceptable as restrained joints or restraining system for valves and valve/pipe joint interface.

Unless otherwise detailed on the Drawings, valve and valve/pipe interface are to be push-on rubber gasket type or mechanical-joints conforming to AWWA C111 and be restrained per Section 60.02.

#### **A. Gate Valves**

Gate valves shall be iron body, fully bronze mounted, double disc, parallel or resilient seat valves as specified in AWWA C509 “Resilient-Seated Gate Valves for Water Supply Service” or AWWA C515 “Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service”.

Gate valve bonnet bolts shall be Type 316 stainless steel with a minimum tensile strength of 75,000 PSI and shall conform to ASTM F593 and F594. All bolts shall be stamped with the grade marking on the head of the bolt, and shall be “T-316”, “316”, or “F593”.

#### **B. Butterfly Valves**

Butterfly valves shall be of the rubber-seated tight-closing type. They shall meet or exceed the performance requirements of AWWA C504 for operational pressures of 150 psi working pressure and 300 psi hydrostatic pressure.

Mechanical joint valve ends shall be per AWWA C110/ANSI 21.10 and AWWA C111/ANSI 21.11 of the latest revision, and "Short-Body" in accordance

with the requirements of Table 2 of ANSI/AWWA C504. Accessories (bolts, glands, and gaskets) shall be supplied by the valve manufacturer.

Butterfly valve actuator bolts that are exposed shall be Type 316 stainless steel with a minimum tensile strength of 75,000 PSI and shall conform to ASTM F593 and F594. All bolts shall be stamped with the grade marking on the head of the bolt, and shall be "T-316", "316", or "F593".

Valves must use full ANSI/AWWA C504 Class 150 B valve shaft diameter and full Class 150 B underground service operator torque rating throughout entire travel to provide capability for operation in emergency service.

Valve body shall be high-strength cast iron ASTM A126 Class B. For valves with the rubber seat mounted on the disc, the mating surface in the body shall be 304 or 316 steel. For valves containing the rubber seat in the body, the method of seat retention shall be in accordance with the requirements of ANSI/AWWA C504, except that no retaining fasteners or other hardware shall be permitted in the flow stream.

Valve operators, unless otherwise required by the Contract Documents, shall be of the traveling nut type, sealed, gasketed, and lubricated for underground service and capable of withstanding on overload input torque of four hundred fifty (450) foot-pounds at full open or closed position without damage to the valve or valve operator. The number of turns to operate the valve shall be a minimum of two (2) turns per inch of valve diameter for ninety degrees (90°) of closure travel at a maximum pull of eighty (80) pounds. All valves shall open counterclockwise and be equipped with two inch (2") square AWWA operating nut.

For butterfly valves twenty inches (20") and less, the valve shaft shall be one piece extending full size through valve bearings, disc and shaft seal. In the event that the shaft is turned down to fit connections to the operator, the limits of ANSI/AWWA C504, Section 3.3.2 shall be strictly observed. Carbon steel shafts, if used, shall have 304 or 316 stainless steel journals with static seals to isolate the interior of the disc and the shaft from the water.

For butterfly valves over twenty inches (20"), the valve shaft shall be of two-piece stub shaft type, made of 18-8 Type 304 stainless steel. Valve bearings and shaft seals for valves of all sizes shall meet the requirements of ANSI/AWWA C504 Section 3.6 and 3.7 respectively, with the following additional requirements:

1. Sleeve bearings shall have a maximum coefficient of friction of 0.1.
2. For underground service, packing shall be pressure-energized chevron or "O" ring type, not requiring adjustment and suitable for permanent duty.

#### C. Pressure Reducing Valves

Pressure reducing valves are to be supplied as directed in the Special Provisions.

#### D. Valve Boxes

Valve boxes are to be constructed of the following individual parts:

Lid – cast or ductile iron with lifting ears that conforms with and fits closely with the top section and is rated heavy duty

Top section - cast or ductile iron, rated heavy duty, 18" minimum height, minimum 6" inner diameter, recessed to receive the lid

Dust pan – cast or ductile iron, 3" minimum height, ¼" minimum thick material, lift handle/bar and fits into and rests on the riser

Riser – cast or ductile iron pipe that fits inside the top section and over the bottom section, 10' long delivered to the Work site

Bottom section – cast or ductile iron, rated heavy duty, 24" minimum height, with round or oval bottom hood sections to fit over the top of the valve

Geotextile – woven, class 2 in conformance with MASS Section covering geotextile fabric

Polyethylene film – 8 mil in conformance with this Division.

Rubber centering ring –a rubber compound sleeve placed on a valve to align the valve box bottom section with the valve top, such as the Valve Box Adaptor II or equal. The centering ring must conform to the shape of the valve and valve box to seal out soil.

Tape – minimum 2" wide, 20 mil thick, UPC approved PVC Tape

Heavy duty rated items are to meet AASHTO M306 criteria. Internal diameter of the smallest section shall not be less than five inches (5"). Minimum thickness of the metal shall not be less than five-sixteenth inch (5/16"). Castings shall be smooth and the workmanship shall be acceptable to the Engineer.

#### E. Markers

A two and one-half inch (2.5") O.D. galvanized steel pipe, painted "navy blue", seven feet (7') in length, with three feet (3') buried in the ground is to be placed at the nearest property line to mark the location of all valve boxes outside of paved areas. Unless otherwise directed by the Engineer, the marker is to be placed no more than fifty feet (50') away from the valve being marked. The marker is to have two inch (2") "caterpillar yellow" lettering stenciled near the top of the above ground portion of the marker indicating what the marker is for, swing distance to the valve and general direction from the marker to the valve. The notation is to be presented as "VB (feet) (direction)" with "VB" being within two inches (2") of the top of the marker.

### **Article 3.4 Construction**

Valve interiors are to be cleaned of all foreign matter before installation. If the valve is at the end of the line, it is to be plugged prior to backfilling. The valve shall be inspected by the Contractor in the open and closed positions prior to installation to ensure that all parts are in working condition.

Place the rubber centering ring inside the bottom section over the valve bonnet. After placement of the bottom section the Contractor is to wrap three (3) layers of woven geotextile fabric around the outside of the valve and bottom section of the valve box. The geotextile is to be secured in place with PVC pipe tape to the bottom section and pipes. Encase the valve box assembly with three layers of eight-mil (8 mil) polyethylene, encasement, taped securely in place.

Valve box components are to be plumb and centered over the operating nut.

The butterfly valve operators are to be placed on the side of the water main away from the centerline of the street or easement.

Regardless of what is shown on the Drawings, a valve is to be installed outside the building so that all fire hydrants will remain in service in the event water service to the building must be shut off.

After final inspection of valves located in unpaved areas the Contractor is to place Class 'E' bedding directly over the valve box lid to final grade elevations. The Contractor must expose and rebury all valve boxes for pre-final and final inspections in unpaved areas. Valve box lids in paved areas are to be exposed and accessible.

Locations where replacing a valve box assembly is required it is to be removed by excavating to fully expose the valve and connecting pipes then reconstructed to the requirements of this section and the standard details.

Locations where replacing a valve box riser is required it is to be removed by excavating to the top of the valve box bottom section and reconstructed to the requirements of this section and the Standard Details.

To adjust an existing valve box top section to finish grade, the valve box top section, lid and dust pan are to be removed by excavating and reconstructed to the requirements of this section and the Standard Details.

Valve box components removed are to be replaced with materials meeting this section and not re-used in any portion of the Work.

### **Article 3.5 Measurement**

Furnishing and installing valves will be measured as a whole unit designated by type and size inclusive of all parts required to provide a functioning valve including but not limited to valve, valve connection components, bottom section, riser, top section, dust pan, lid, markers, elevation adjustments, and corrosion/intrusion/frost protection per these specifications, special provisions, standard details and Drawings.

Replacement of valve boxes will be measured as complete units in place including but not limited to the bottom section, riser, top section, dust pan, lid, markers and corrosion/intrusion/frost protection.

Replacement of valve box risers will be measured as complete units in place including but not limited to the riser, top section, dust pan, lid, markers and corrosion/intrusion/frost protection.

Adjustment of valve box top sections to finish grade will be measured as complete units in place at the Engineer approved elevation that includes the removal and replacement of the valve box top section, dust pan, lid and provides for polyethylene encasement.

When the bid item includes the removal and replacement of valve box components, then those same components will not be measured for payment under any other bid item.

Disposal of removed parts will not be measured for payment and is considered incidental to the item being constructed.

Unless specifically identified for payment under a separate pay item, the unit price bid to complete the Work includes all costs, labor, equipment and materials to complete the Work including, but not limited to, the following incidental items:

- Excavation;
- Backfill and compaction;
- Import of classified material
- Markers,
- Disposal of unusable material;
- Removal and replacement of ground surface features
- adjustment to finish grade;
- protection and/or restoration of all existing utilities;
- maintenance of existing water distribution system flows;
- shoring excavations
- protection of existing light and utility poles;
- restoration of existing private or public improvement such as but not limited to:
  - driveways;
  - signage, mail boxes, newspaper boxes,
  - trees and shrubs located on private property;
- landscaping, utility markers, survey monumentation;
- cleanup, and miscellaneous items required to complete the Work as shown on the Drawings

**Article 3.6 Basis of Payment**

Payment for this Work is to be as specified in Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made on the following unit:

ITEM	UNIT
Furnish and Install (Size) Gate Valve	Each
Furnish and Install (Size) Butterfly Valve	Each
Remove and Replace Valve Box	Each
Remove and Replace Valve Box Riser	Each
Remove and Replace Valve Box Top Section	Each
Remove and Replace Valve Box Lid	Each
Remove and Replace Valve Box Dust Pan	Each

## **SECTION 60.04 FURNISH AND INSTALL FIRE HYDRANTS**

### **Article 4.1 General**

The Work under this Section consists of the performance of all Work required for the furnishing and installation of "L-Base" Fire Hydrant Assemblies, including the fire hydrant leg pipe, auxiliary gate valve, anode(s), valve box, joint restraint, guard rails and/or posts, coatings, wrappings and fire hydrants.

### **Article 4.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. The Contractor is to clearly demarcate items to be incorporated into the Work. Submittals for fire hydrants should include, but is not limited to the following information:

- Manufacturer fire hydrant submittal cut sheets with the selected ordering options clearly marked.
- Valve and valve box riser components
- Thrust restraint system
- Corrosion protection items

### **Article 4.3 Materials**

#### **A. Fire Hydrants**

Fire hydrants are to conform to the requirements of ANSI/AWWA C502 for Dry Barrel Fire Hydrants. Fire hydrants are to be Mueller Super Centurion, American Darling 5-1/4 B62B with 20" nozzle section or equal.

1. The operating nut of the hydrants is to be a minimum of twenty eight (28") above the traffic breakaway flange. The traffic breakaway flange is to be between three inches (3") to nine inches (9") above adjacent grades.
2. All single pumper hydrants are to be furnished with a six inch (6") ANSI Class 125 standard mechanical-joint end. All double pumper hydrants must be furnished with an eight inch (8") ANSI Class 125 standard mechanical-joint.
3. All connections are to be mechanical-joint unless otherwise indicated in the Contract Documents.
4. Single pumper hydrants must be furnished with two (2) two and one-half inch (2.5") hose connections and one (1) four and one-half inch (4.5") pumper connection. Double pumper hydrants are to be furnished with one (1) two and one-half inch (2.5") hose connection and two (2) four and one-half inch (4.5") pumper connections.
5. Unless otherwise required by the Contract Documents, all hydrants are to be furnished with a barrel length that will allow a minimum of ten feet (10') of bury. The lower barrel must be one piece to achieve a ten foot burial depth.
6. The main valves are to be of the compression type, where water pressure holds the main valve closed permitting easy maintenance or repair of the entire barrel assembly from above the ground without the need of a water shutoff.

7. All fire hydrants must be furnished with a breakaway flange which allows both barrel and stem to break clean upon impact from any angle. Traffic flange design must be such that repair and replacement can be accomplished above ground.
  8. Painting and coating are to be shop coated in accordance with cited AWWA Specifications. The paint is to be federal standard color 595B, Code 13538.
  9. Operating and nozzle nuts are to be pentagon shaped with one and one-half inch (1.5") point to flat measurements.
  10. Hose nozzle threading must be in conformance with NFPA #194 for National (America) Standard Fire Hose Coupling Screw Threads.
  11. All working parts are to be bronze or noncorrosive metal in accordance with the requirements of ANSI/AWWA C502.
  12. All hydrants are to be right hand opening (clockwise).
  13. All hydrants must not drain. Drain plugs are to be securely installed.
  14. All fire hydrants are to be supplied with a five and one-fourth inch (5.25") main valve opening.
  15. Brass components in contact with potable water are to comply with Public Law 111-380 (No Lead Rule).
- B. Auxiliary Gate Valves  
All gate valves and valve boxes are to be furnished and installed as specified in Section 60.03 - Furnish and Install Valves.
- C. Thrust-Restraint System  
Fire hydrants are to be fully restrained back to and include the connection to the main line. Thrust restraint is to be furnished and installed as specified in Section 60.02 – Furnish and Install Pipe.
- D. Guard Posts  
The Contractor shall install guard posts for each hydrant installation as shown with the Standard Details. If, in the opinion of the Engineer, the guard posts are not to be installed, they are to be delivered to the Utility Company storage yard.

#### **Article 4.4 Construction**

The Contractor is to complete all trench excavation, backfill and compaction necessary to install the fire hydrant assembly.

An eight foot (8') wide clear, slightly sloping (max 5% in any direction) access path that extends four feet (4') beyond the fire hydrant must be provided. Where a ditch is encroached upon by the access path, the ditch is to be relocated or filled and a twenty four inch (24") diameter culvert installed to pass run off by the hydrant.

The Contractor shall field coat the barrel section, shoe, MJ restraint, and all buried bolted connections with a coating that meets the requirements of Section 60.02 – Furnish and Install Pipe, Article 2.3 - Material, item H – Field Applied Coating. In addition to the field applied coating, the Contractor shall wrap the hydrant barrel section with three layers of 8-mil thick polyethylene encasement, up to the finish ground surface.

The fire hydrant auxiliary valve is to be closed during installation and remain closed during all main line open bore flushing operations. The Contractor is to open the auxiliary gate valve for hydrostatic pressure testing, disinfection and for hydrant raising. The hydrant leg must have hydrostatic pressure for the hydrant to be raised. The Utility Company will raise hydrants on a cost reimbursable basis to the heights provided by the Contractor. All fire hydrant legs are to be installed level. The fire hydrant barrel is to be installed plumb. The Contractor will provide the Utility Company with a minimum of seventy-two (72) hours advance notice, excluding weekends and holidays, to coordinate fire hydrant adjustment. The Contractor is responsible for access to the hydrant location and all trench excavation, dewatering and backfill operations prior to, during, and after the fire hydrants are adjusted by Utility Company personnel. The cost for coordinating and raising the fire hydrant is incidental to the fire hydrant installation.

All fire hydrants that have yet to be approved for use must be covered and identified as being "not in service". The cover is to be firmly secured to the hydrant. Not in service bags are to be at least 27" wide x 42" tall x 4 mil thick polypropylene material, brightly colored (e.g. orange, yellow, green) and in bold black print clearly show in large, easy-to-read lettering the words "NOT IN SERVICE".

The Contractor must paint in two inch (2") black lettered stenciling, the direction and distances to the nearest one-tenth foot (1/10' or 0.1') of the fire hydrant auxiliary valve box. The lettering is to be placed on the face of the fire hydrant directly below the bonnet flange.

#### **Article 4.5 Measurement**

The method of measurement to furnish and install fire hydrants is to be as follows:

A. Single Pumper Fire Hydrants

Single Pumper Fire Hydrants are to be measured as complete assemblies furnished, constructed, installed, and accepted in place for each installation, including, but not limited to, fire hydrants six inch (6") leg to main, six inch (6") auxiliary gate valve and valve box, guard post installation, coatings, coverings, and thrust-restraint system. The price must include full compensation for furnishing and installing single pumper hydrants as shown in the Standard Details, required by these specifications and shown in the Drawings.

B. Double Pumper Fire Hydrants

Double Pumper Fire Hydrants are to be measured as complete assemblies furnished, constructed, installed, and accepted in place for each installation, including, but not limited to, fire hydrants eight inch (8") leg to main, eight inch (8") auxiliary gate valve and valve box, guard post installation, coatings, coverings and thrust-restraint system. The price is to include full compensation for furnishing and installing double pumper hydrants as shown in the Standard Details, required by these specifications and shown in the Drawings.

#### **Article 4.6 Basis of Payment**

Payment for this Work is to be as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Payment is to be made under the following units:

ITEM

UNIT



Furnish and Install Fire Hydrant Assembly (Single Pumper)	Each
Furnish and Install Fire Hydrant Assembly (Double Pumper)	Each

## **SECTION 60.05 WATER SERVICE LINES**

### **Article 5.1 General**

The Work under this Section consists of the performance of Work required for furnishing and installing water service lines including but not limited to tapping, connecting, piping, fittings, key boxes, and valve boxes at the location and depth required by the Contract Documents.

The exact location, type, and size of existing Water Service Connections are to be considered unknown. All information provided in the Contract Documents and provided by the Utility Company is from maintenance records, record drawings, field surveys and represents the Utility Company's best indication of location and size. The Utility Company cannot be held liable for accuracy of the information. The Contractor shall locate and confirm that the service extension will function prior to beginning the work.

A permit must be purchased from the Utility Company permit section prior to any water service construction (either on or off property in the Utility Company service area). The permit is to be displayed at the job site. The Utility Company permit does not relieve the Contractor from obtaining all other necessary permits.

The Contractor is to notify the Utility Company a minimum of twenty-four (24) hour in advance of any required or needed inspection.

Before an on-property service line permit for a new subdivision can be released for construction, all property corners must be established and identified.

### **Article 5.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. The Contractor is to clearly demarcate items to be incorporated into the Work. Submittals for water service lines should include, but is not limited to the following information:

- Piping – See Section 60.02
- Corporation stop
- Curb stop
- Key box
- Key box rod
- Flare nuts
- Valve and valve box riser components
- Thrust restraint system
- Corrosion protection items
- Continuity and trace wire

### **Article 5.3 Material**

#### **A. Pipe**

Pipe material must comply with Section 60.02 – Furnish and Install Pipe

B. Key Box, Curb Stop, Corporation stop, valve and Valve boxes

Keyboxes are to be telescoping, furnished with a lid, have an arch pattern base and is to be constructed of cast or ductile iron. The operating rod and connection pin are to be constructed of stainless steel alloy type 304 or 316. The connection pin is to be a minimum of 3/16" by two inches (2") long and inserted completely through cast connection head that is welded to the operating rod. Bent plate connection heads will not be allowed.

Curb stops (key box valves) are to conform to AWWA C800, be rated for 150 psi working water pressure, have a waste port, be NSF 61 certified, accept copper flare nuts on both ends and conform to the "no lead" standard for parts in contact with potable water. For one inch (1") services, the flare nut on the Utility side of the curb stop is to come with an integral wire connector for an anode connection. For services greater than one inch (>1"), a bronze direct burial compression pipe clamp is to be used in conjunction with a flare nut.

Corporation stops/valves shall be PTFE coated brass ball valves, rated for 300 psi water pressure, conform to AWWA C800, be NSF 61 certified, and conform to the "no lead" standard. Inlet end shall have the AWWA/CC taper and outlet end shall have copper flare straight connection. The corp shall come with a flare with an integral wire connector (up to one-inch) and a bronze direct burial compression pipe clamp thaw nut for sizes greater than 1-inch. Corp shall be Mueller B25000-07 corp and thaw nut, AY MacDonald 74701BA 1 NL corp stop with anode connection, or equal.

All valves and valve boxes must be as specified in Section 60.03 - Furnish and Install Valves.

C. Continuity and Trace Wire

Continuity and Trace wire are to meet the requirements of Section 60.02 – Furnish and Install Pipe.

**Article 5.4 Construction**

Water service piping and valves are to be constructed as outlined in Section 60.01, Section 60.02 and Section 60.03 with the following special considerations.

The Contractor is to familiarize themselves as to the depth of the water main for the project through Contract Documents, gathering field data and record data. The Contractor must excavate whatever substances that are encountered to the depth required for the connections. The Contractor is to expose the main to be tapped for a minimum distance of two feet (2' on either side of the proposed tap location and below the pipe for proper clearance of the tapping saddle.

The Contractor is responsible for all costs for damaging Utility Company controlled piping included by not limited to damage during excavation, tapping or backfilling. The Utility Company will make repairs, then issue back charges and penalties to the Contractor for the repairs. If approved by the Utility Company, the Contractor may repair the damaged main.

Except where shown on Utility Company approved Drawings, The Contractor shall lay water connections at ninety degrees (90°) to the street line. Water service piping is to have a minimum of ten foot 10' of bury from the point of connection to a point five feet (5') inside the building footing. Where the main line has less than ten foot of bury, the service must be immediately lowered to achieve the required bury depth and insulated where there is less than ten foot of bury. Water services are not to be within a horizontal distance of ten feet (10') or have less than eighteen inches (18") of vertical separation at crossings to a sewer or footing drain. Services must not cross property lines.

Trenches are to be OSHA compliant and have a minimum of two and one-half feet (2.5') wide bottom for a single copper water service. The service is to be centered in the ditch and the thaw wire laid at the edge. Where multiple copper services are laid in the same trench, the services must have a minimum separation of two feet (2') and the key boxes must not be separated more than twelve feet (12'). Non-copper services cannot share the same excavation.

Key boxes shall be of an acceptable construction as shown in the Standard Details and the requirements of the Specifications. Key boxes are to be installed at the furthest point of Utility Company maintenance, which is typically at the property or utility easement line, whichever is a greater distance from the water mainline. The key box must not be installed horizontally closer than:

- ten feet (10') to a known or proposed structure, street light, utility pole transformer pad, electrical/telephone/cable box, and other utility pedestals, sewer piping
- five feet (5') to a property line,
- fifteen feet (15') to a fire hydrant or hydrant leg

The Contractor will relocate any service not meeting the separation requirements at their own expense. Valve box adjustment sleeves as defined in Section 60.03 – Furnish and Install Valves are to be used for key boxes located in pavement or concrete.

Key and valve boxes are to be installed plumb, be centered over the water line valve, have an unobstructed access way, and be wrapped with eight mils (8-mils) thick polyethylene encasement. Key and valve boxes must not be in contact with other utility lines, such as but not limited to gas, electric, telephone or cable.

Where key box and valve box locations are not shown on a plan they shall be installed in the standard location as shown in the Standard Details or as found in the Utility Company's Design and Construction practices manual.

Keyboxes located within pavement or concrete are to be adjusted to finish grade and installed in a valve box adjustment sleeve. Adjustment of keyboxes is to be accomplished by removing the keybox lid, installing a black iron pipe coupling, installing a section of black iron pipe, and replacing the keybox lid at the finish grade.

Services stubbed to the property line or beyond for future use must have a bleeder pipe brought above grade, be marked at the end of the service with a 2" X 4" X 8' marker, protruding three (3') feet above grade, painted blue, and stenciled with the word "WATER" in white two (2") inch high letters near the top.

Existing key boxes identified on the Drawings for adjustment are to be adjusted to be flush with the final ground surface when in non-paved areas. If excavation is required to adjust the existing key box, the ground surface will be restored to its original condition unless otherwise indicated in the Drawings. The Contractor shall be responsible for ensuring that the key box is vertical, clean, to the proper grade, and readily accessible for operation of the curb stop.

Existing key boxes to be lowered will include adjustment of the telescoping riser, cutting excessive length of key box, threading, and installing threaded unions to complete adjustments. Only threaded joints will be allowed. "Quick-connect" style connections assembled with set screws will not be accepted.

Any damage to a key box resulting from construction under this Contract will be repaired or replaced at the Contractor's expense.

The Contractor is to record the as-built vertical and horizontal locations of the water service, service length, bottom of pipe elevations at the main and property line, key box, and valves based on the survey control provided in the Drawings. When survey control is not provided to the contractor, the recording of the as-built information is to be relative to two permanent fixed points such as, but not limited to, manholes, valve boxes, building structures and property corners. The fixed point cannot be living, movable (e.g. boulders, rocks, fence posts), or changing attributes of something larger (e.g. sidewalk cracks, building paint schemes). The record information must be turned into the Utility Company prior to the Utility Company allowing the water service to be turned on.

At such time as the Engineer may direct, but only after the service lines and appurtenances have been properly completed and inspected, the trenches and appurtenant structures may be backfilled in accordance with the construction requirements found in Division 20, Section 20.13 – Trench Excavation and Backfill.

The Contractor shall exercise due care in backfilling to keep the service box and continuity wire vertical and in place. In the event the service box or continuity wire is displaced, the Contractor will be required to excavate and restore the service box and continuity wire to the proper position. Any work necessary to restore the service box and continuity wire to the proper position will be performed at the Contractor's expense.

A continuity wire is to be attached to the corporation stop on one inch (1") connections with a flare tube nut with integral wire connector. The continuity wire is to be attached to the saddle on the main for one and one-half (1 1/2") and two inch (2") connections.

Hydrostatic testing must comply with Section 60.02 – Furnish and Install Pipe. A bleeder will be installed at each service line key box and extended a minimum of two foot (2') above the existing ground. The Contractor is to cap all bleeders after testing is complete. The bleeder may not be used for the on-property system and must be disconnected at the time of the on-property extension.

No unions will be allowed in the right-of-way on newly constructed service lines.

All on-property installations are to be constructed to the same standard as off-property installations.

Repair of water services typically involves the replacement of piping. When the piping is constructed of copper pipe the new pipe is to meet current standards and be connected

to the existing pipe through the use of silver brazing with copper couplers, swaging the copper line or use of Flare x Flare three-part unions. Flare x Flare unions will not be allowed for use within the rights-of-ways and easements. Furnish and install a reducer if the existing water service extension piping differs in size to new piping. Furnish and install dielectric union if existing water service line piping is of dissimilar metal from new piping.

#### **Article 5.5 Measurement**

Measurement for Furnishing and Installing Water service Lines shall be per linear foot of horizontal distance of the various sizes set forth in the Bid Schedule. Measurement will be from station to station as staked in the field and as shown on the Drawings, except where the grade exceeds twenty five percent (25%), in which case measurement will be actual pipe length.

Measurement for connection to new on-property service line or existing service line are considered incidental to the Contract, and no separate payment will be made for this Work.

Adjusting existing key boxes will be measured per unit, complete in place. Adjustment of key boxes installed with a service line will not be measured.

#### **Article 5.6 Basis of Payment**

Payment for this Work will be as specified Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Adjusting of all key boxes installed with a service will not be paid for separately from the service.

Unless specifically identified for payment under a separate pay item, the unit price bid to Furnish and Install (size) Water Service Lines includes all costs, labor, equipment and materials to furnish and install a functional potable water service including, but not limited to, the following incidental items:

- verify location of existing water services;
- disconnection and reconnection of customer's existing services where the Work includes replacement of existing services;
- clearing and grubbing;
- trench excavation and backfill;
- excess excavation and backfill;
- excavation dewatering;
- trench support system;
- furnishing and installing Class E pipe bedding;
- compaction of fill;
- installation of pipe,
- fittings, adapters, or other necessary appurtenances;
- polyethylene encasement;
- hydrostatic testing, flushing, and disinfection;
- water service insulation;
- disposal of unusable or surplus material;
- seeding; protection of existing utilities;

- restoration of existing drainage patterns;
- removal and replacement of existing culverts, guardrail, fences, landscaping, and other public or private improvements; finish grading;
- cleanup

Where the Work includes disconnecting existing water services from an existing water line and reconnecting them to a new water line, the disconnection and reconnection of those existing water services will be considered incidental to the costs bid for installation of the new water line.

Fittings and appurtenances as shown on the Drawings or not specifically identified for payment under a separate pay item but required for normal completion of water service line installation, will be considered incidental and will be included in the linear foot cost of the water service lines.

Payment is to be made under the following unit:

ITEM	UNIT
Furnish and Install (Size) Water Service Line	Linear Foot
Remove and Replace Key Box	Each
Adjust Key Box	Each
Adjust Key Box (Concrete Slab or Asphalt Paving)	Each

## **SECTION 60.06 FURNISH AND INSTALL GALVANIC ANODES**

### **Article 6.1 General**

The Work under this Section consists of the performance of all Work required for furnishing and installing galvanic anodes for added protection of water pipe from corrosion. The Contractor shall install galvanic anodes in accordance with these specifications and in conformity with the Standard Details or as shown on the Drawings.

### **Article 6.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. The Contractor is to clearly demarcate items to be incorporated into the Work. Submittals for anodes should include, but is not limited to the following information:

- Anodes
- Lead wire
- Thermite Welding
- Anode connectors

### **Article 6.3 Materials**

#### **A. Anodes**

Anodes utilized for typical galvanic anode system installation are prepackaged magnesium style anodes weighing twenty (20) pounds. Anode composition is to be in accordance with ASTM B843-2003 Table 1, Grade HP, M1C.

Anodes are to be packaged in a low resistive backfill consisting of seventy-five percent (75%) gypsum, twenty percent (20%) bentonite, and five percent (5%) sodium sulfate.

Anodes shall be provided with #10 AWG stranded copper, single-conductor cable with HMWPE insulation. Lead wire cable shall be rated for six hundred (600) volts and designed for direct burial applications.

#### **B. Pipe Connection Lead Wire**

Lead wires must be of sufficient length for splice-free routing between the anode and the pipe and is to be #10 AWG stranded copper, single-conductor cable with HMWPE insulation. Lead wire cable must be rated for six hundred (600) volts and designed for direct burial applications.

#### **C. Thermite Welding Equipment and Materials**

Equipment and materials used to bond the #10 AWG HMWPE to the pipeline is of the “CADWELD” type as manufactured by ERICO Products, Inc. of Cleveland, Ohio, or approved equal. Thermite weld caps, designed to protect the CADWELD bonds from corrosion, is to be Royston “Handy Cap 2” or approved equal.

### **Article 6.4 Construction**

The following is a list of general procedures utilized for typical installation of galvanic anodes:



1. Anode Placement

Anodes are to be installed eighteen to thirty-six inches (18" to 36") from the side wall of the pipe, to a centerline depth in line with the approximate horizontal plane of the pipe's bottom dead center. Anodes are to be placed on alternating sides of the pipeline and a frequency of no less than one anode per every pipe section (joint) that is greater than nine feet in length. One anode may not protect more than twenty seven feet (27') of pipe segments. One anode on all fittings within a twenty foot (20') radius as long as all fittings are electrically connected to the anode.

2. Lead wire connection from anode to pipe, anode to fitting, fitting to fitting

The #10 AWG HMWPE lead wires must be attached to the top dead center of the pipe. Lead wire connections to the pipe are to utilize exothermic weld connection methodology and follow the manufacturer's instructions for use.

Lead wire connections to fittings are to be done with a stainless steel metal plate with two holes through the plate. One hole is to be placed and sized 1/8" larger than the fitting bolt to allow the fitting bolt to pass through the hole. The second hole is to be 5/16" in diameter to allow connection of the anode lead wire with a 1/4" diameter by 1" long stainless steel bolt with a nut and locking washer. The anode lead wire is to be fitted with a 5/16" diameter wire ring terminal. Were a connector plate is used, the Contractor must ensure a metal to metal connection is made to all metallic parts being protected by the anode.

3. Backfilling

Extreme care shall be taken not to damage the anodes or direct buried lead wires during backfill procedures.

**Article 6.5 Measurement**

Measurement for furnishing and installing anodes will be per each anode installed. The price includes full compensation for furnishing and installing anodes as described herein and as shown on the Drawings.

Unless specifically identified for payment under a separate pay item, the unit price bid to complete the anode installation includes all costs, labor, equipment and materials to complete the Work including, but not limited to, the following incidental items:

- Connection of anode to pipe or fitting
- Excavation;
- Lead wire, jumper wires, connectors, bolts, nuts, washers
- Backfill and compaction;
- Import of classified material
- Disposal of unusable material;
- Removal and replacement of ground surface features
- adjustment to finish grade;
- protection and/or restoration of all existing utilities;
- maintenance of existing water distribution system flows;

- shoring excavations
- protection of existing light and utility poles;
- restoration of existing private or public improvement such as but not limited to:
  - driveways;
  - signage, mail boxes, newspaper boxes,
  - trees and shrubs located on private property;
- landscaping, utility markers, survey monumentation;
- cleanup, and miscellaneous items required to complete the Work as shown on the Drawings

**Article 6.6 Basis of Payment**

Payment for this Work is as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Payment is to be made under the following unit:

ITEM	UNIT
Furnish and Install Anode	Each

## **SECTION 60.07    TEMPORARY WATER SYSTEMS**

### **Article 7.1    General**

The Work under this Section consists of the performance of all operations pertaining to the construction, installation, maintenance and removal of temporary water service. It is the intent of this Section that the Contractor maintains water service during the entire period of construction activities to all current customers that would be impacted by an extended water service interruption (longer than six hours (6 hrs))

The Contractor will not be allowed to gain access to interior plumbing, residences, commercial space or other portions of the project outside of the right of way to assess the amount of work required to install a temporary plumbing system prior to a notice to proceed.

The Contractor is to assume that exterior plumbing connection points (e.g. hose bibs) are at the furthest distance from the main feeder line for the temporary water system. Exterior plumbing connections are to be hydrostatically tested for leaks at a test pressure equivalent to ten feet of head prior to connecting to the exterior plumbing. When a leak is detected by witnessing a loss of pressure during the test, the Contractor is to discontinue testing immediately and find the next available exterior connection point and repeat the testing procedure. Where the Contractor cannot find a suitable exterior connection point and the Contract Documents do not provide for an interior connection point, then the Contractor shall immediately notify the Engineer.

Where modifying of interior plumbing is required, the Contractor should plan for making and documenting multiple contact attempts, working outside of usual hours, and moving and replacing objects of substantial size such as but not limited to dressers, couches, washers, dryers, plants, storage boxes, etc... to gain access to interior plumbing. In addition where the Contractor is to modify the building to gain access to the plumbing, they are to assume the removal and replacement of at most five square feet of sheet rock in addition to the plumbing. Removal and replacement shall match the existing building material to the satisfaction of the owner of the building. The Contractor is to practice "lead safe" requirements for building modifications that disturb lead-based paint in pre-1978 homes, child care facilities, and schools where the Work must be performed by an EPA Certified Renovator working for an EPA Certified Firm and specific work practices must be implemented to prevent lead contamination. The Contractor is to use the Municipality of Anchorage Geographical Information Systems or by other means to determine the year of construction prior to bidding and make this information available to their workers during the execution of the Work.

### **Article 7.2    Submittal**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. Submittals for temporary water systems should include, but is not limited to the following information:

- Temporary Water Plan

Where an ADEC approved temporary water plan is not provided in the Drawings, the Contractor shall create and submit a plan for any temporary water systems to the State of Alaska, Department of Environmental

Conservation (ADEC) for review and approval prior to installing the system. The plan must identify the type of system, the method of construction and the maintenance and operation procedures to be used. The plan must identify service to each existing customer except those who agree in writing to have their service temporarily disconnected. The Contractor shall obtain such agreement at their own expense. To be submitted with the plan are any agreements between the Contractor and property owner regarding access and use of private property. The methods to be employed in maintaining water service are left to the Contractor. Surface piping, trailer mounted supply systems, and so forth may all be considered as long as they comply with current health standards and requirements. A copy of the ADEC approved plan is to be provided to the Engineer and Utility Company, along with copies of any agreements with property owners referred to above.

The Contractor shall also submit the name and phone number of a contact person and at least one alternate who shall be available on a twenty-four (24) hour basis for repair and/or maintenance of the temporary water system to the Engineer and to the Utility Company.

- Temporary Water Individual Components

See the Section on furnish and install pipe for requirements relating to pipe and fitting submittals. At a minimum the following items are to be included in the submittal:

- Pipe
  - Fittings
  - Backflow preventer
  - meters
  - Fire Hydrant
  - Pipe routing schematic
- For Contractor created temporary water plans, the plan is to provide calculations showing capacity of the temporary water system meeting the water demands for typical use and fire protection.
  - Lead Based Painting certification

### **Article 7.3 Material**

The Contractor shall use only those materials and equipment listed in this Section to supply temporary water service. Temporary water service is to be supplied under the service criteria outlined in this Section. All equipment used must be specifically designed and properly disinfected for the storage, handling, and delivery of potable water.

Materials used for temporary water service is to conform to the requirements of this Division. Where Work is performed for a temporary basis of less than three (3) months the requirements for stainless steel and epoxy coating will not be required.

The primary water feeder pipe is to be a minimum of three inches (3") in diameter for residential temporary water systems that serve less than 25 single family residents. For

all other cases the Contractor is to provide the pipe sizes supported by engineered calculations signed and sealed by an Alaskan Registered Professional Engineer.

#### **Article 7.4 Construction**

The following minimum criteria are to be used for service to each structure:

- Forty (40) psi minimum, one hundred (100) psi maximum delivery pressure measured at the connection to the structure.
- Five (5) gallons per minute flow at the above delivery pressure measured at the connection to the single family residential structure. Multi-family residential, Commercial and other business structures may require higher water flows.
- Potable water system and water quality is to conform to 18AAC 80 Alaska Drinking Water Standards.
- All services to structures are to have a valve and backflow preventer installed to allow individual control of service to each structure.

All temporary water service equipment is to be flushed and disinfected per MASS Section 60.02 - Article 2.5 Flushing and Testing, ANSI/AWWA C652, Disinfection of Water Storage Facilities and ANSI/AWWA C651, Disinfection of Water Mains. All bacteriological samples required under these Specifications are to be done by a testing laboratory certified by the State of Alaska. Any visible leaks in the temporary water system are to be repaired.

All temporary service equipment is to be disinfected prior to connecting to a residence or business and be disinfected each and every time the equipment is moved or connected to another residence or business.

The Engineer is to be notified twenty-four (24) hours prior to the installation of any temporary water system. The Engineer and Utility Company shall be present to inspect the disinfection process of any temporary water service system.

No residence presently service by the Utility Company system is to be without water for a period greater than six (6) hours in any twenty-four (24) hours period. Each residence or business owner is to be notified seventy-two (72) hours before they are transferred on or off the temporary water system and before any other service interruption. Prior to constructing temporary water services on private property, the Contractor shall secure a written "Right of Entry" from the property owner.

All Right of Entry agreements are to provide indemnification in accordance with Division 10, Section 10.06, Article 6.10 – Indemnification. The Contractor is to provide a copy of each "Right of Entry" agreement to the Engineer.

Where it is necessary to prevent the back-feeding of temporary water through the service connects to complete the Work, the Contractor shall install a functional shut-off valve on the dwelling plumbing system. The new shut-off valve is to be used to isolate the building plumbing system from the water main during the work. The Contractor will be responsible for entering the private property building and installing a new shut-off valve.

Installation of a new shut off valve that requires any work that modifies the building, including but not limited demolition, removal, replacement or reconstruction of walls, flooring, concrete slabs or other parts of the structure and/or plumbing is to be

completed to the satisfaction of the property owner and Engineer. The Contractor is to match to the greatest extent possible the existing conditions of the building. The Contractor is to obtain and provide a copy of a written verification that the property owner has accepted any reconstruction.

Modification to the building plumbing system to install a functional shut-off valve is to be accomplished by a plumber who is a licensed by the State of Alaska and the Municipality.

The Contractor is to obtain and comply with required permits from the Municipality's Department of Community Development, Development Services, Building Safety or their successor for all work associated with the installation of the shut-off valve.

Where in the opinion of the Engineer the Contractor has done due diligence to obtain a right of entry and complete the installation of the shutoff valve but has been refused access by the property owner and/or resident of the structure then the Utility Company is to be brought in to enforce Tariff for Water Service provisions that require access to premises.

The Contractor will be required to obtain a hydrant permit from the Utility Company and will be required to meet all permit conditions (winter use of a hydrant requires special permission from the Utility Company).

The Contractor shall provide a gate valve assembly and backflow prevention device at the connection point of the temporary water piping to the Utility Company piping/hydrants. The Contractor is responsible for repairing any damage caused by the connection of the temporary water system to the Utility Company's water system at no additional cost.

In the event that the Contractor fails to repair and/or maintain the temporary system and the Utility Company or Owner is required to perform repairs and/or maintenance, all costs associated with said repairs and/or maintenance may be deducted from the Contract amount.

### **Article 7.5 Measurement**

Providing temporary water service for the project is measured as lump sum and includes installation, removal and restoration activities associated with providing a disinfected and functioning temporary water system meeting the requirements of this section.

Modification of building plumbing is paid separately from the temporary water system. Modification of building plumbing will include all costs associated with modifying the building plumbing, including but not limited to, permitting, structure demolition and reconstruction, valves, right of access agreements, and public relations.

### **Article 7.6 Basis of Payment**

Payment for this Work is to be as specified in Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Payment is to be made under the following unit:

ITEM	Unit
Temporary Water System	Lump Sum

Modify Building Plumbing (Size, Type) without Structure Demolition and Reconstruction	Each
Modify Building Plumbing (Size, Type) with Structure Demolition and Reconstruction	Each

## **SECTION 60.08 DECOMMISSION WATER SYSTEM AND COMPONENTS**

### **Article 8.1 General**

The Work under this Section includes all operations pertaining to decommissioning water system pipe lines, wells, fire hydrants and other applicable components. Where shown on the Drawings, required for platting actions, building removal, land use changes or otherwise directed by the Engineer or Utility Company, the Contractor is to decommission and salvage identified components of the water system.

### **Article 8.2 Submittals**

Submittals are to be provided to the Engineer for review and acceptance as stated in Division 10, Section 10.05, Article 5.6 – Product Data. Submittals for decommissioning water systems should include, but is not limited to the following information:

- Concrete, Grout, sand slurry, bentonite mixtures and placement plan
- Temporary water and shutdown plan
- See Section 60.02 - Furnish and Install Pipe, for fittings required to separate the abandoned system from the active system.

### **Article 8.3 Material**

Sand slurry consists of a mixture of water and sand with an approximate ratio of seven (7) gallons of water per cubic foot of sand. Sand may consist of native material with a particle size distribution such that one hundred percent (100%) of the material passes the No. 4 U.S. Standard Sieve and contains no lumps, frozen material, organic matter, or other deleterious material.

Grout is to consist of a Portland cement, water, lime and sand. Portland cement is to be Type II, Sand is to meet the requirements of sand slurry.

Concrete is to be class C-6 in accordance with MASS Division 30.

Solid copper retainer disc (Mueller Co. Catalog No H-15535) or equal.

### **Article 8.4 Construction**

#### **A. General**

Decommissioning will require the Contractor to excavate, expose and remove different parts, pieces and assemblies of the water system as well as salvage identified components. Salvaged pieces are to be delivered to the Utility Company. The ends of the water lines four inch and greater that are remain in service (pressurized) are to be capped, restrained, and backed up with a thrust block. A Utility Company representative must witness all decommissioning. Water lines to remain in service after abandonment of adjacent pieces are to be disinfected in accordance with AWWA C651.

The Contractor is to restore the area of Work to preconstruction conditions. The Contractor is to provide written notice to the Engineer forty-eight (48) hours prior beginning decommissioning Work.



## B. Water Main

The decommission in place method of water mains requires emptying the line, placing of a one foot (1') thick concrete plug with vent tube at the higher end of the line, filling the pipe with a quantity of sand slurry or grout mixture equal to the total calculated volume from the newly installed plug to the point of injection then finally placing a one foot concrete plug at the injection end of the pipe. The concrete plugs the pipe and the slurry fills the pipe. Work is typically started on the downhill end of the pipe.

In the event the pipeline to be abandoned is cracked or crushed, the Contractor shall excavate to the next joint of pipe and install the plug. Crushed pipe sections or portions thereof are to be removed and disposed of by the Contractor.

Where the main is being decommissioned by removal, the Contractor is to excavate down to and remove the water pipe.

## C. Water Service

Water service decommissioning requires a disconnect permit from the Utility Company. To obtain the Utility Company disconnect permit the Contractor is to provide to the Utility Company and Engineer a schedule, disconnect location (lot, block, subdivision name, address), and record of who will perform the service disconnect. The Contractor is to post the Utility Company permit and the Right-of-Way permit at the job site.

The abandonment method for disconnection of a copper water service at the main line will include turning off the corporation stop at the main, cutting or disconnecting the copper at the corporation stop and thaw wire, placement of a solid copper retainer disc in the corporation stop, removal of the key box with operating rod, and providing a record of the service connection location via swing ties to permanent structures.

Abandonment of larger services requires that the service line must be capped and or blind flanged at or cut out of the main. This may include, but not be limited to, removal and replacement of water main pipe, blind flanging tapping sleeves, capping tees. In most cases this work will require a water turnoff.

## D. Fire Hydrant

The hydrant assembly is all pipes, fittings, valves and other parts from the tee at the main and/or service to and including the fire hydrant.

Upon inspection of the exposed hydrant assembly components, the Engineer will determine which components are to be salvaged. Non-salvageable parts are to be transported by the Contractor to a disposal site approved for disposal of construction debris.

The hydrant assembly components to be removed and salvaged at each hydrant location where the hydrant is to be salvaged include:

- Hydrant assembly (head, barrel, and shoe)
- Hydrant gate valve
- Hydrant gate valve box

- Hydrant leg

The Contractor shall install a plug in the branch connection on the tee in the water main where the hydrant assembly is removed. If the water main is to be returned to an active state then the plug is to be visually checked for leakage by the Engineer and Utility Company Inspector. At no additional cost, the Contractor will be required to expose the cap if it is buried and the Engineer has not completed the visual check for leakage. In most cases this work will require a water turnoff.

#### E. Well

The Contractor shall use the following procedure when abandoning wells:

1. Remove the existing well pump and appurtenances. The well pump and appurtenances are to be carefully removed to avoid damage and delivered to the property owner after removal.
2. Backfill the well casing to ten feet (10') above the screen with disinfected sand or gravel. Sand is to be used as backfill adjacent to water bearing strata consisting of sand. Gravel is to be used as backfill adjacent to water bearing strata consisting of gravel. Disinfected sand or gravel is defined as sand or gravel washed in a one part per million chlorine/water solution prior to the backfilling operation. The Contractor is to provide proof to the Engineer that any imported sand or gravel has been disinfected prior to backfilling the casing.
3. If the aquifer is pressurized, place a seal over the top of the disinfected sand or gravel to seal the aquifer. The seal may consist of bentonite chips or other suitable means, as approved by the Engineer.
4. Backfill the next section of well casing for a minimum distance of ten feet (10') with concrete or cement grout. If necessary, the depth of the concrete or cement grout may have to exceed ten feet (10') to ensure the lower aquifer is thoroughly sealed. The concrete or cement grout is to be placed from the bottom upward through a pipe or tremie tube in such a way as to avoid segregation or dilution of the material. The concrete or cement grout is to be cured for a minimum of thirty-six (36) hours prior to proceeding with the next step.
5. Backfill the next section of well casing to fifteen feet (15') below the ground surface with gravel. Disinfected gravel is not required in this zone.
6. Excavate the area adjacent to the top of the well to a depth of five feet (5') and cut the casing at this level. Then backfill the remaining ten feet (10') of well casing with bentonite, concrete, or cement grout. Weld a metal cap on top of the well casing to ensure the well is sealed. Mark the cap stating that the well is abandoned with the date of abandonment.
7. Backfill the area within a two foot (2') minimum radius from the center of the well casing to a level which is two inches (2") above the top of the sealed well casing with concrete or cement grout to preclude the downward migration of water along the outside of the casing. Then backfill the remainder of the excavated hole with native soils and restore the Work site.

8. As part of this bid item, the Contractor shall be responsible for topsoil and reseeding all lawn areas damaged by the Contractor during the well abandonment operation. In addition, the Contractor shall be responsible for the repair and/or replacement of all existing utilities, driveways, trees, utility markers, survey monuments, fences, retaining walls, buildings, sidewalks, gardens, landscaping, and other private improvements damaged by the Contractor as a result of the well abandonment operation.
9. The Contractor shall provide a log of the well abandonment to the Engineer prior to receiving final payment for this Work. The log is to describe the materials used in the abandonment and the depths below existing grade each type of material was used, in addition to any other pertinent information regarding the abandonment.
10. The Contractor is to obtain well information through investigation if the well logs are not provided herein.

The Contractor may employ, at his/her option, an alternate method of abandoning the wells that conforms to the requirements of ANSI/AWWA Standard A 100. In the event the Contractor elects to obtain approval to employ an alternate method, he/she shall first secure the approval of the ADEC and then submit a Substitution Request form to the Engineer for approval. The substitution request is to clearly identify the method the Contractor wishes to employ; clearly reference applicable sections of ANSI/AWWA Standard A 100 which allow the Contractor's proposed method of abandonment; and, include written approval from the ADEC specific for these particular wells.

### **Article 8.5 Measurement**

Salvage and disposal costs are to be included in the bid item and will not be measured separately.

Quantity measurement for pipeline to be decommissioned in place is per linear foot for each nominal pipeline size regardless of type of pipe. For pipe to be decommissioned in place no separate measurement will be made for pipe removed due to damaged ends.

Quantity measurement for pipeline to be decommissioned by removal will be made based on the Engineers measurement and observations.

Quantity measurements for decommissioning water services are on per each basis regardless of the effort required to locate the connection point to the main.

Quantity measurements for decommissioning wells are on a per each basis which includes but not limited to verifying the well construction and removal of internal and external components.

Quantity measurement for removal of fire hydrants are per each and includes costs of salvaging and delivering parts and pieces as described above.

Unless specifically identified for payment under a separate pay item, the unit price bid to complete the Work includes all costs, labor, equipment and materials to complete the Work including, but not limited to, the following incidental items:

- Excavation;
- Backfill and compaction;
- Import of classified material
- Disposal of unusable material;
- Removal and replacement of ground surface features
- adjustment to finish grade;
- protection and/or restoration of all existing utilities;
- maintenance of existing water distribution system flows;
- shoring excavations
- protection of existing light and utility poles;
- restoration of existing private or public improvement such as but not limited to:
  - driveways;
  - signage, mail boxes, newspaper boxes,
  - trees and shrubs located on private property;
- landscaping, utility markers, survey monumentation;
- cleanup, and miscellaneous items required to complete the Work as shown on the Drawings
- maintenance of vehicular traffic and/or pedestrian access

Costs incurred for completion of these incidental Work items are considered including in the bid unit cost.

**Article 8.6 Basis of Payment**

Payment for this Work is to be in accordance with Division 10, Section 10.07 - Measurement and Payment, and includes full payment for all Work described in this Section.

Payment is to be made under the following unit:

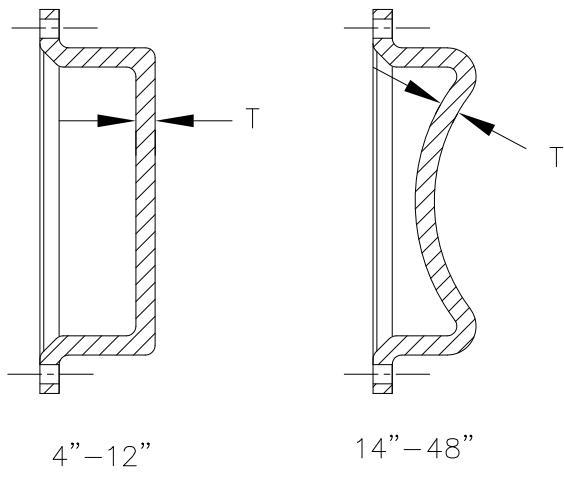
ITEM	UNIT
Decommission Pipeline in Place (Pipeline Nominal Size)	Linear Foot
Decommission Pipeline by Removal (Pipeline Nominal Size)	Linear Foot
Decommission Water Service 3/4" to 2" copper pipe	Each
Decommission Water Service (Pipeline Nominal Size) (Type of Pipe)	Each
Decommission Well (Size, Depth)	Each
Decommission Fire Hydrant Assembly (Type)	Each

**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

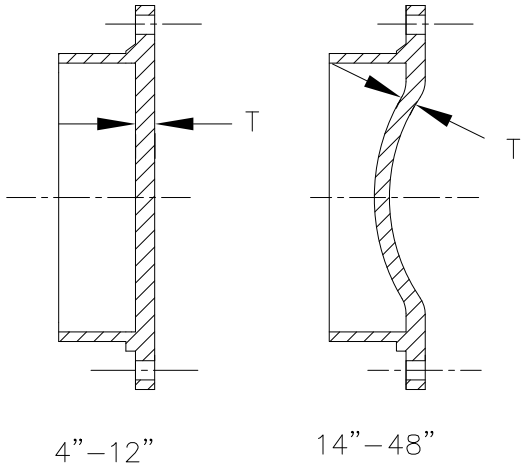
**DIVISION 60  
WATER SYSTEMS  
STANDARD DETAILS**

**STANDARD CONSTRUCTION SPECIFICATIONS  
DIVISION 60  
INDEX OF STANDARD DETAILS**

60-1	MJ Cap and Plug
60-2	Relocate Water Main (Sewer/Storm Drain)
60-3	Tracer Wire
60-4	Joint Bonding
60-5	Typical Pipe Angle Marker
60-6	Thrust Block
60-7	Mid-Span Thrust Block
60-8	Typical Valve Box (VB)
60-9	Dust Pan with Thaw Wires
60-10	Single Pumper "L" Base Fire Hydrant Assembly
60-11	Double Pumper "L" Base Fire Hydrant Assembly
60-12	Fire Hydrant Guard Posts
60-13	1" Water Service Connect
60-14	Water Service Connect - 1-1/2" and 2"
60-15	Irrigation System
60-16	Adjust Service Key Box
60-17	Small Diameter Water Service Under Foundation
60-18	Large Diameter Water Service Under Foundation
60-19	Water Service Extension Stub
60-20	Anode Detail
60-21	Anode Wire Connection

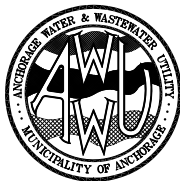


MJ  
CAP



MJ  
PLUG

- NOTES:
1. MECHANICAL JOINT RESTRAINT EBAA IRON MEGALUG OR EQUAL.
  2. COST OF THIS FITTING TO BE INCLUDED IN BID PRICE OF PIPE.
  3. T = THICKNESS PER AWWA C110 OR C153 STANDARDS.



SCALE:  
NTS

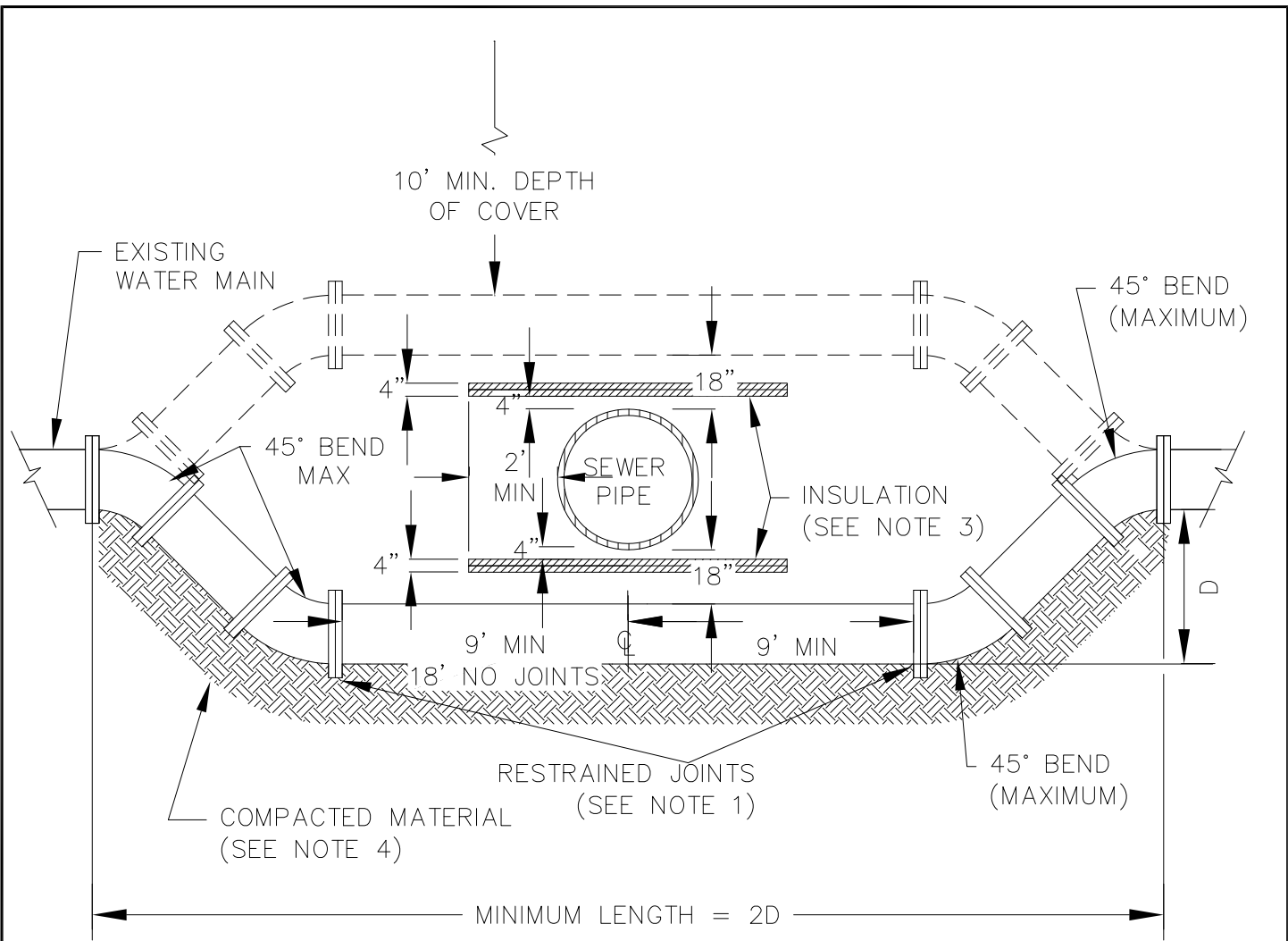
APPROVED:

REVISED:  
1/2015

## MJ CAP AND PLUG

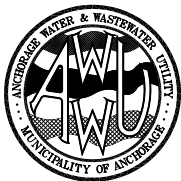
SECTION #  
60.02

DETAIL #  
60-01



NOTES:

1. ALL PIPE AND FITTINGS SHALL BE RESTRAINED BY USE OF MEGALUG® AND/OR FIELD LOK® GASKETS OR EQUAL.
2. RELOCATED WATER MAIN SHALL HAVE A MINIMUM SEPARATION OF THIRTY-SIX INCHES (36") BETWEEN STORM AND WATER. IF LESS THAN THIRTY-SIX INCHES (36") OF SEPARATION CANNOT BE OBTAINED THEN FOUR INCHES (4") OF INSULATION IS REQUIRED. IF EIGHTEEN INCHES (18") OF SEPARATION CANNOT BE MAINTAINED BETWEEN WATER AND SEWER OR STORM AN ADEC WAIVER IS REQUIRED.
3. RIGID BOARD INSULATION MUST BE HIGH DENSITY POLYSTYRENE, MIN. 60 P.S.I., EQUIVALENT TO R-20 PER FOUR INCH (4") THICKNESS. INSULATION SHALL BE BE POSITIONED NO LESS THAN OR EQUAL TO FOUR INCHES (4") FROM SEWER PIPE.
4. ALL MATERIALS USED TO RELOCATE WATER LINE SHALL BE APPROVED BY THE ENGINEER.



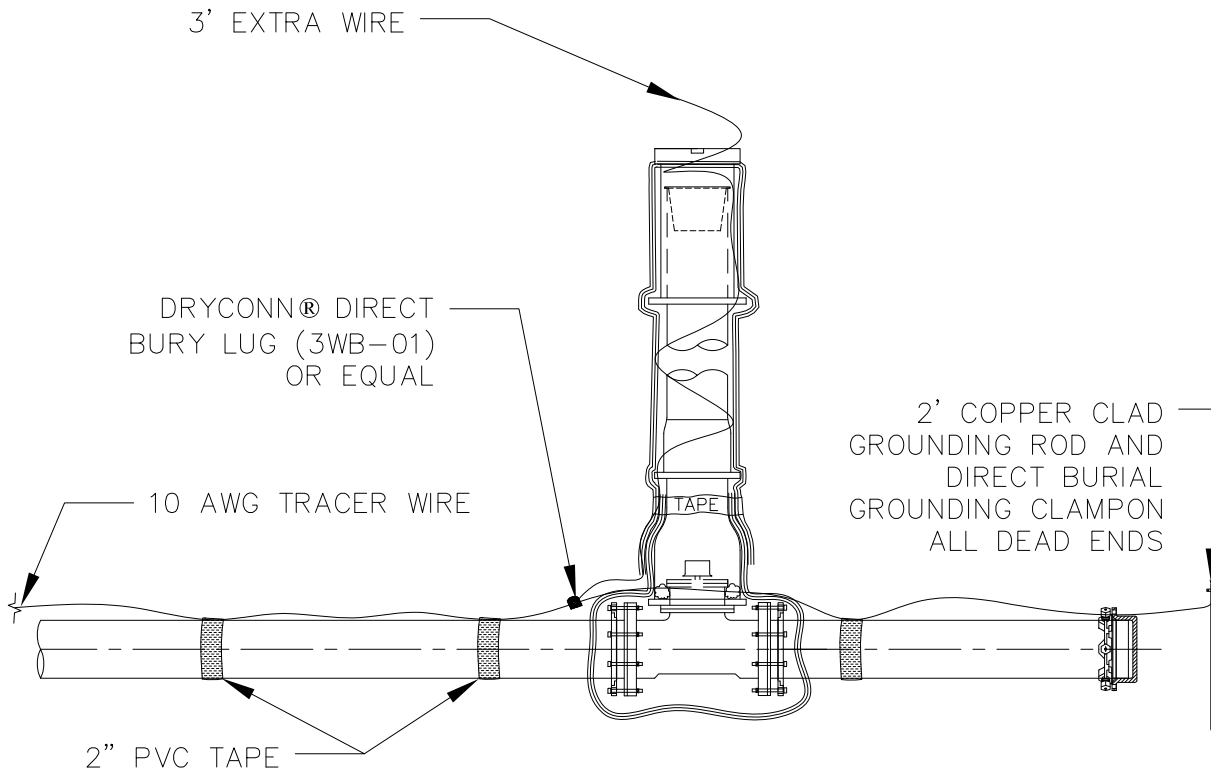
SCALE:  
NTS  
APPROVED:  
REVISED:  
1/2015

## RELOCATE WATER MAIN (SEWER/STORM DRAIN)

SECTION #  
60.02

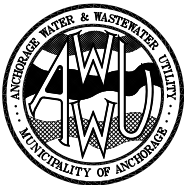
DETAIL #  
60-02





NOTE:

1. RUN A DIRECT BURIAL #10 AWG SOLID (.1019" DIAMETER), STEEL CORE SOFT DRAWN HIGH STRENGTH TRACER WIRE, 600# AVERAGE TENSILE BREAK LOAD, 30 MIL HIGH MOLECULAR WEIGHT-HIGH DENSITY BLUE POLYETHYLENE JACKET COMPLYING WITH ASTM-D-1248, 30 VOLT RATING TRACER LINE CONTINUOUSLY ALONG THE PVC MAIN LINE, TAPING IT TO THE PIPE EVERY 5' WITH 2" WIDE 10 MIL. PVC PIPE TAPE.
2. SPLICE A WIRE ON AT EVERY VALVE RISER AND BRING LOCATE WIRE UP INTO THE VALVE CAN WITH 3' OF EXTRA WIRE USING A DRYCONN® DIRECT BURIAL LUG (3WB-01) OR EQUAL, FOLLOWING MANUFACTURES RECOMENDATIONS.
3. INSTALL GROUNDING RODS ON BOTH ENDS AND AS REQUIRED.

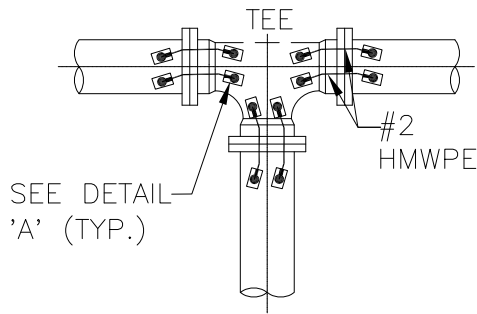


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NTS  
APPROVED:  
REVISID:  
1/2015

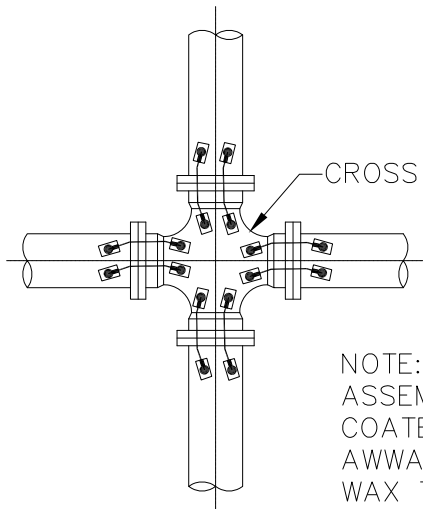
## TRACER WIRE

SECTION #  
60.02

DETAIL #  
60-03

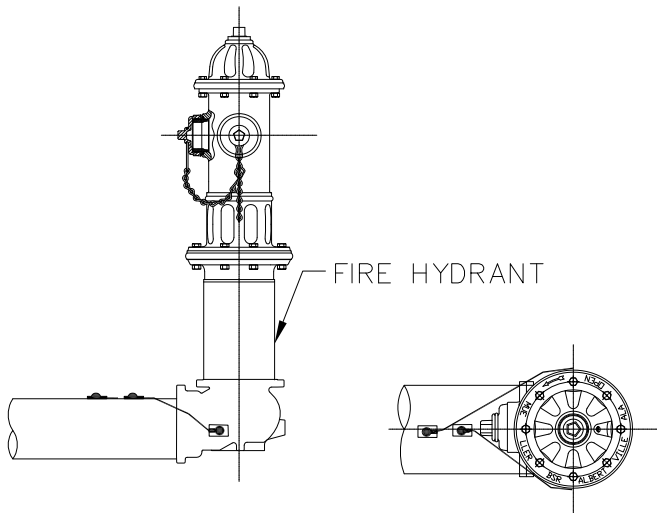


JOINT BONDING OF A TEE



JOINT BONDING OF A CROSS

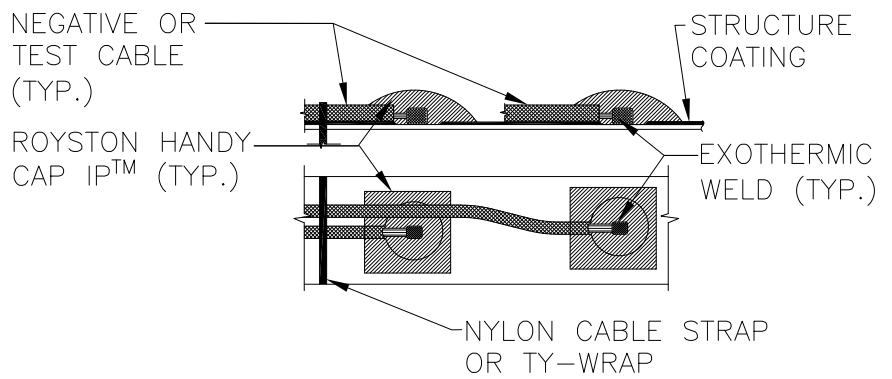
NOTE: ENTIRE CROSS ASSEMBLY TO BE FIELD COATED WITH 4-PART AWWA C217 WAX TAPE SYSTEM.



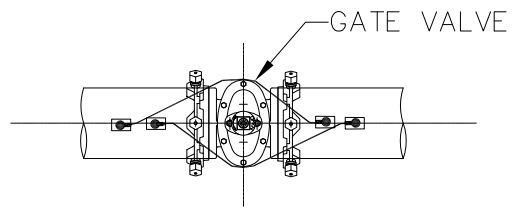
SIDE VIEW

TOP VIEW

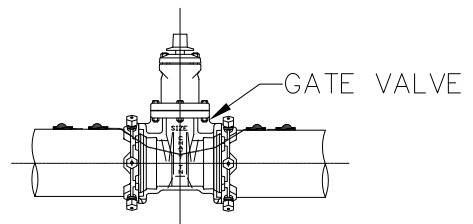
JOINT BONDING OF A HYDRANT



DETAIL 'A'



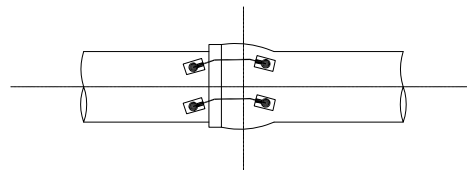
TOP VIEW



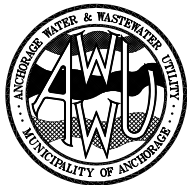
SIDE VIEW

JOINT BONDING ACROSS VALVE

NOTE: ENTIRE VALVE ASSEMBLY TO BE FIELD COATED WITH 4-PART AWWA C217 WAX TAPE SYSTEM.



JOINT BONDING BELL/SPIGOT PIPE

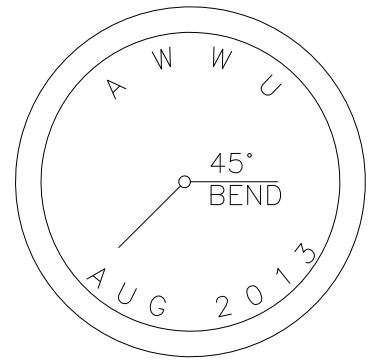
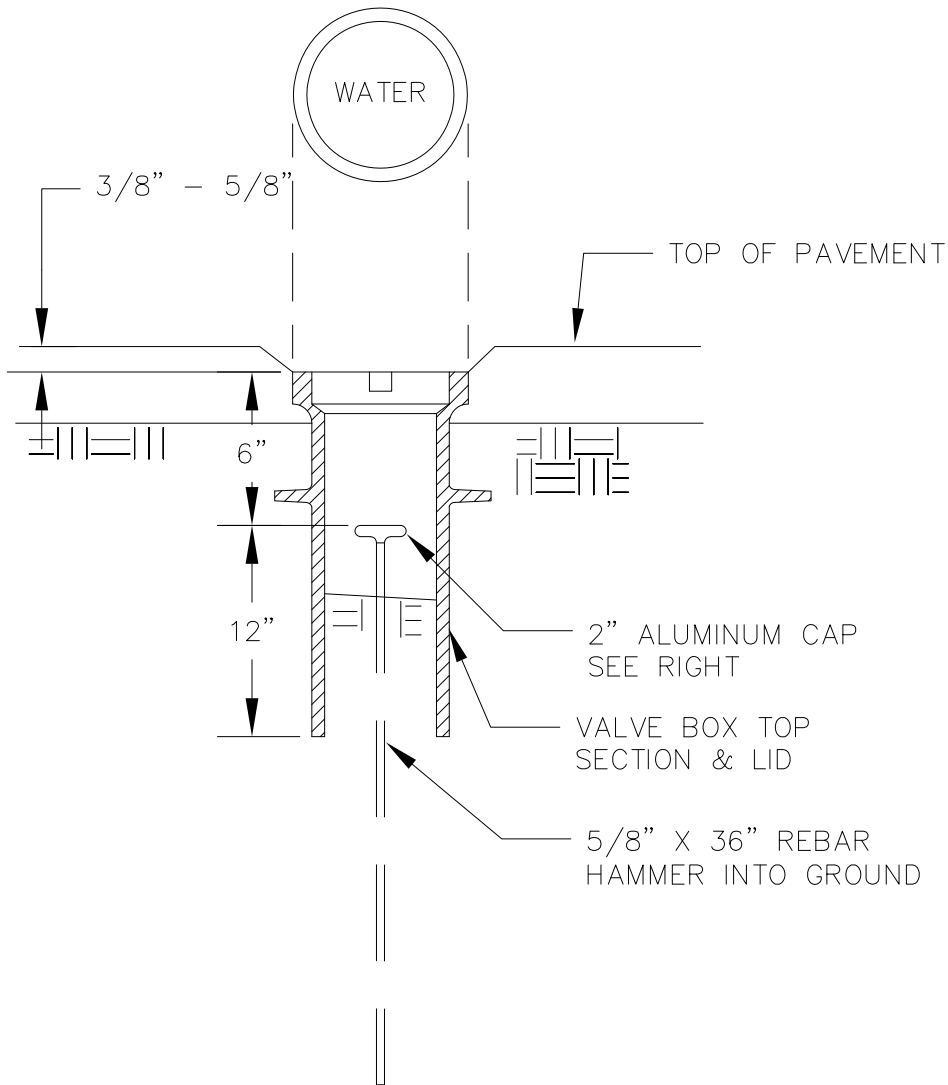


SCALE:  
NTS  
APPROVED:  
REVISOR:  
1/2015

# JOINT BONDING

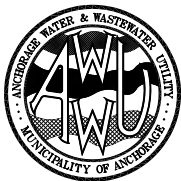
SECTION #  
60.02

DETAIL #  
60-04



2" ALUMINUM CAP

NOTE: BEND SHOWN ON ALUMINUM CAP SHALL MATCH ACTUAL INSTALLED WATER MAIN BEND.



SCALE:  
NTS

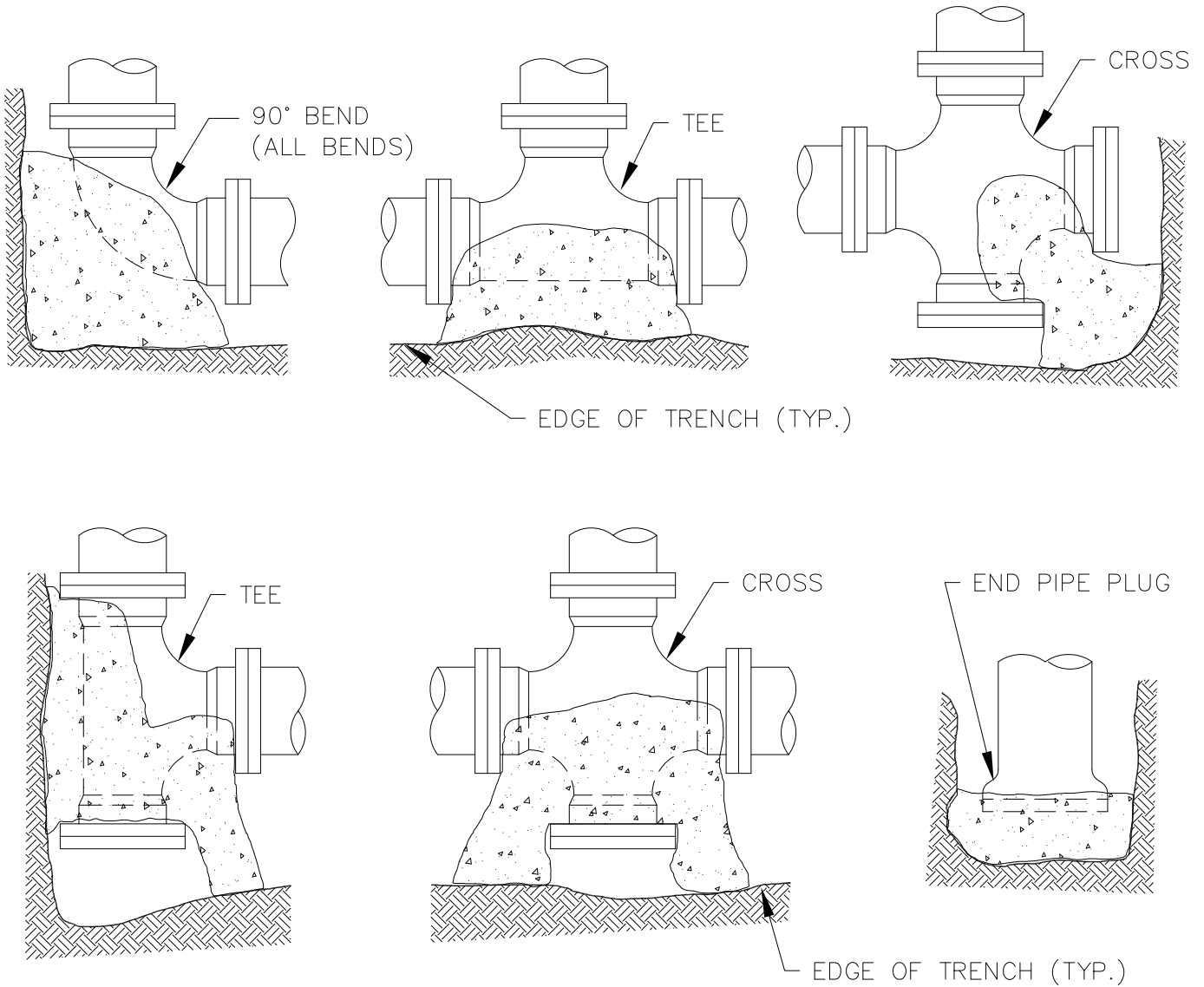
APPROVED:

REVISED:  
1/2015

## TYPICAL PIPE ANGLE MARKER

SECTION #  
60.02

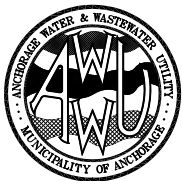
DETAIL #  
60-05



NOTE:

1. MINIMUM THICKNESS OF PRE-CAST CONCRETE THRUST BLOCKS SHALL BE 6-INCH OR AS PER THE CONTRACT SPECIFICATIONS, AND IN CONFORMANCE WITH DIVISION 30 OF MASS.
2. THRUST BLOCK MAY NOT BE USED IN LIEU OF THRUST RESTRAINT
3. CAST IN PLACE THRUST BLOCKS MUST BE CAST AGAINST UNDISTURBED SOIL (HATCH)

MINIMUM BASE AREA SQUARE FEET				
PIPE SIZE	PLUG	90° BEND	45° BEND	22 1/2° BEND
6"	2.0	2.0	1	1
8"	2.5	2.5	1.5	1.5
10"	4.5	4.5	2.5	2.5
12"	6	6	3.5	3.5
14"	8	8	4.5	4.5
16"	10.5	10.5	6	6
24"	24	24	13	13



SCALE:  
NTS

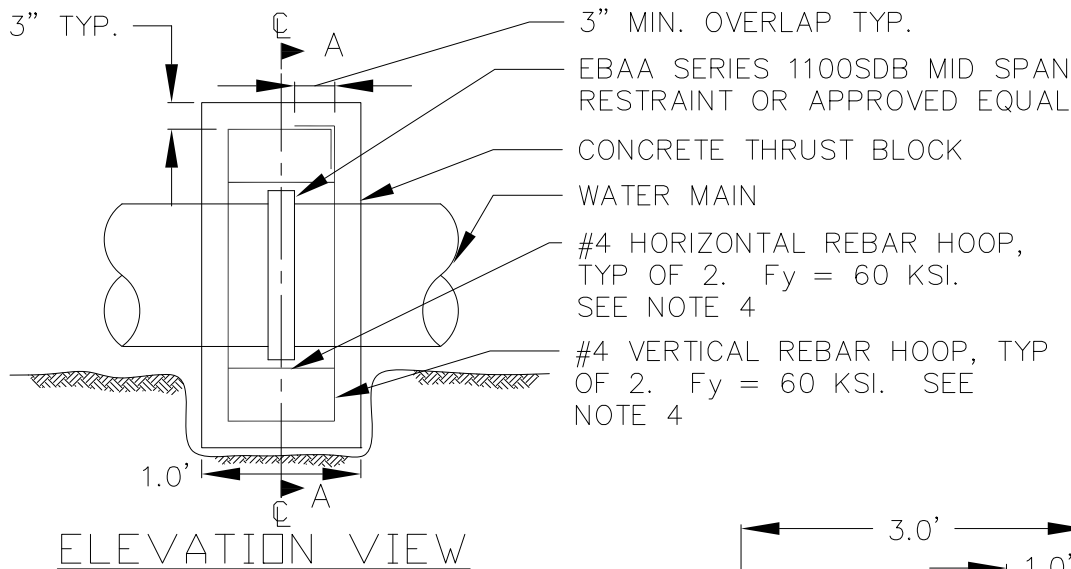
APPROVED:

REVISED:  
1/2015

# THRUST BLOCK

SECTION #  
60.02

DETAIL #  
60-06

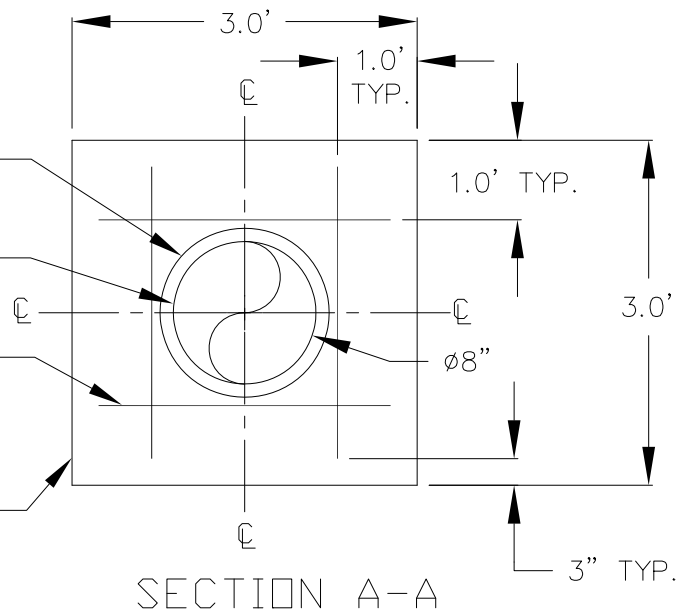


EBAAS SERIES 1100SDB MID SPAN RESTRAINT OR APPROVED EQUAL

WATER MAIN (8")

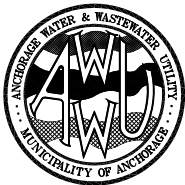
#4 REBAR HOOP, TYP.  $F_y = 60$  KSI. SEE ELEVATION VIEW

CONCRETE THRUST BLOCK



MID SPAN THRUST ANCHOR NOTES:

1. INSTALL MID SPAN THRUST ANCHOR TO PROVIDE TEMPORARY RESTRAINT TO THE END OF EXISTING WATER LINE MAIN, SIZED ACCORDING TO PIPE DIAMETER.
2. INSTALL EBAAS SERIES 1100SDB MID SPAN RESTRAINT PER MANUFACTURER'S INSTRUCTIONS.
3. BACKFILL AROUND THRUST ANCHOR SHALL BE TYPE II-A CLASSIFIED FILL COMPACTED TO A MINIMUM OF 95% MAXIMUM DENSITY.
4. PROVIDE FOUR CONTINUOUS #4 REBAR HOOPS IN THRUST ANCHOR. PLACE HOOPS PARALLEL TO HORIZONTAL AND VERTICAL AXIS 2 EACH.
5. CONCRETE SHALL REACH 75% OF 4000 PSI DESIGN MAXIMUM STRENGTH BEFORE PUTTING THRUST BLOCK ANCHOR INTO SERVICE.
6. WHERE NEW PIPE IS USED, CONTRACTOR MAY CONSTRUCT THE THRUST BLOCK AND PIPE ASSEMBLY COMPLETE BEFORE INSTALLING INTO THE WATER SYSTEM.



SCALE:  
NTS

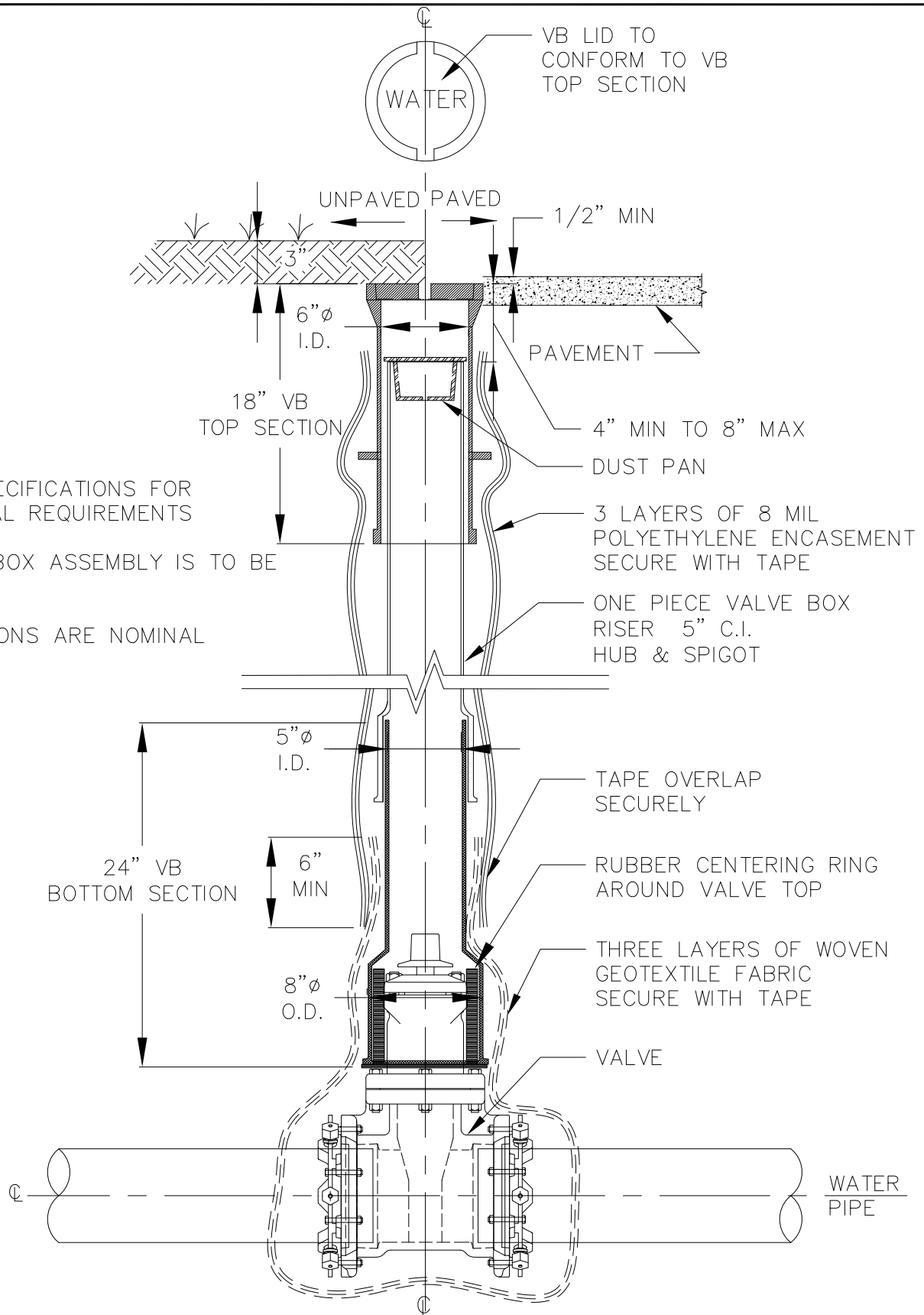
APPROVED:

REVISED:  
1/2015

**MID-SPAN THRUST BLOCK**

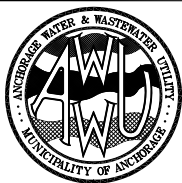
SECTION #  
60.02

DETAIL #  
60-07



NOTES:

1. SEE SPECIFICATIONS FOR MATERIAL REQUIREMENTS
2. VALVE BOX ASSEMBLY IS TO BE PLUMB
3. DIMENSIONS ARE NOMINAL



SCALE:  
NTS

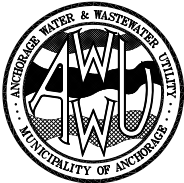
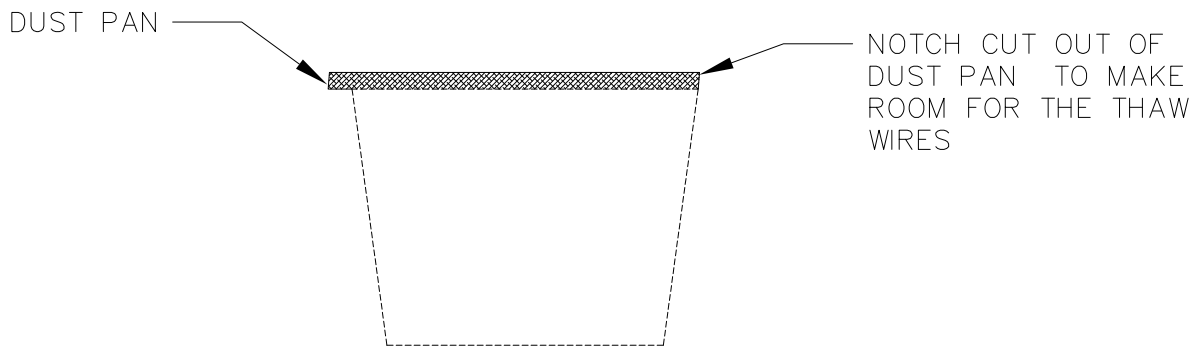
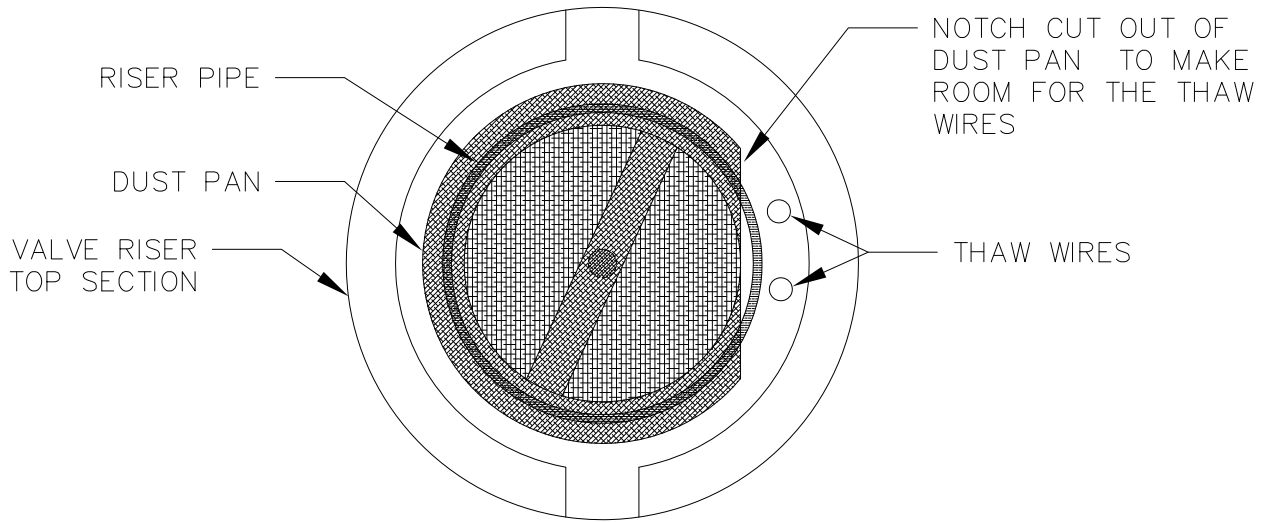
APPROVED:

REVISED:  
1/2015

## TYPICAL VALVE BOX (VB)

SECTION #  
60.03

DETAIL #  
60-08



SCALE:  
NTS

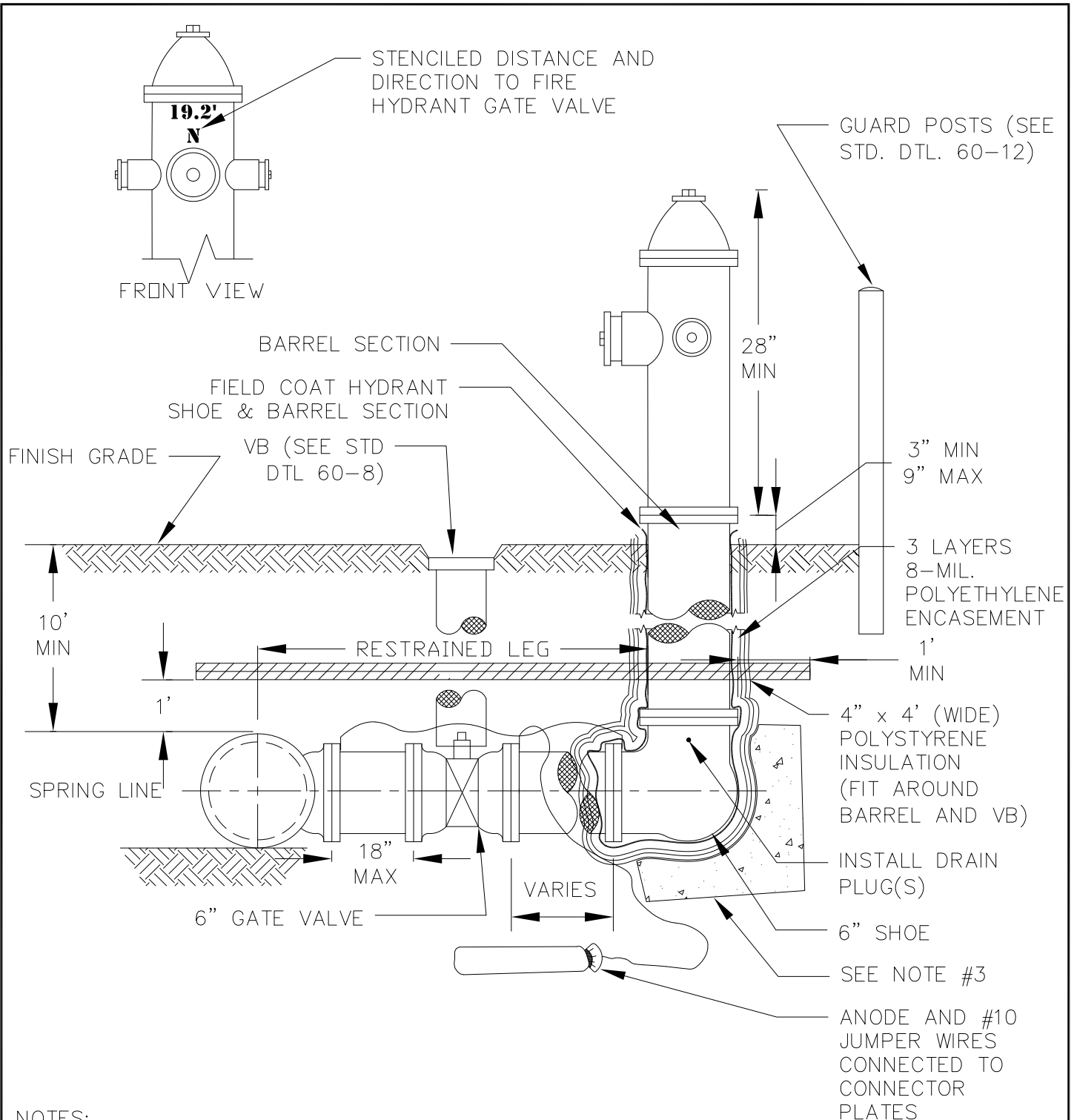
APPROVED:

REVISED:  
1/2015

## DUST PAN WITH THAW WIRES

SECTION #  
60.03

DETAIL #  
60-09



**NOTES:**

1. HYDRANT BARREL SHALL BE INSTALLED PLUMB AND THE LEG SHALL BE LEVEL.
2. ALL BACKFILL MATERIAL WITHIN 3 FEET AROUND HYDRANT BARREL SHALL BE NFS.
3. ALL PVC C-900 HYDRANT LEG SHALL HAVE THRUST BLOCKS (SEE MASS DETAIL 60.06).
4. DUCTILE IRON HYDRANT LEGS DO NOT REQUIRE A THRUST BLOCK



SCALE:  
NTS

APPROVED:

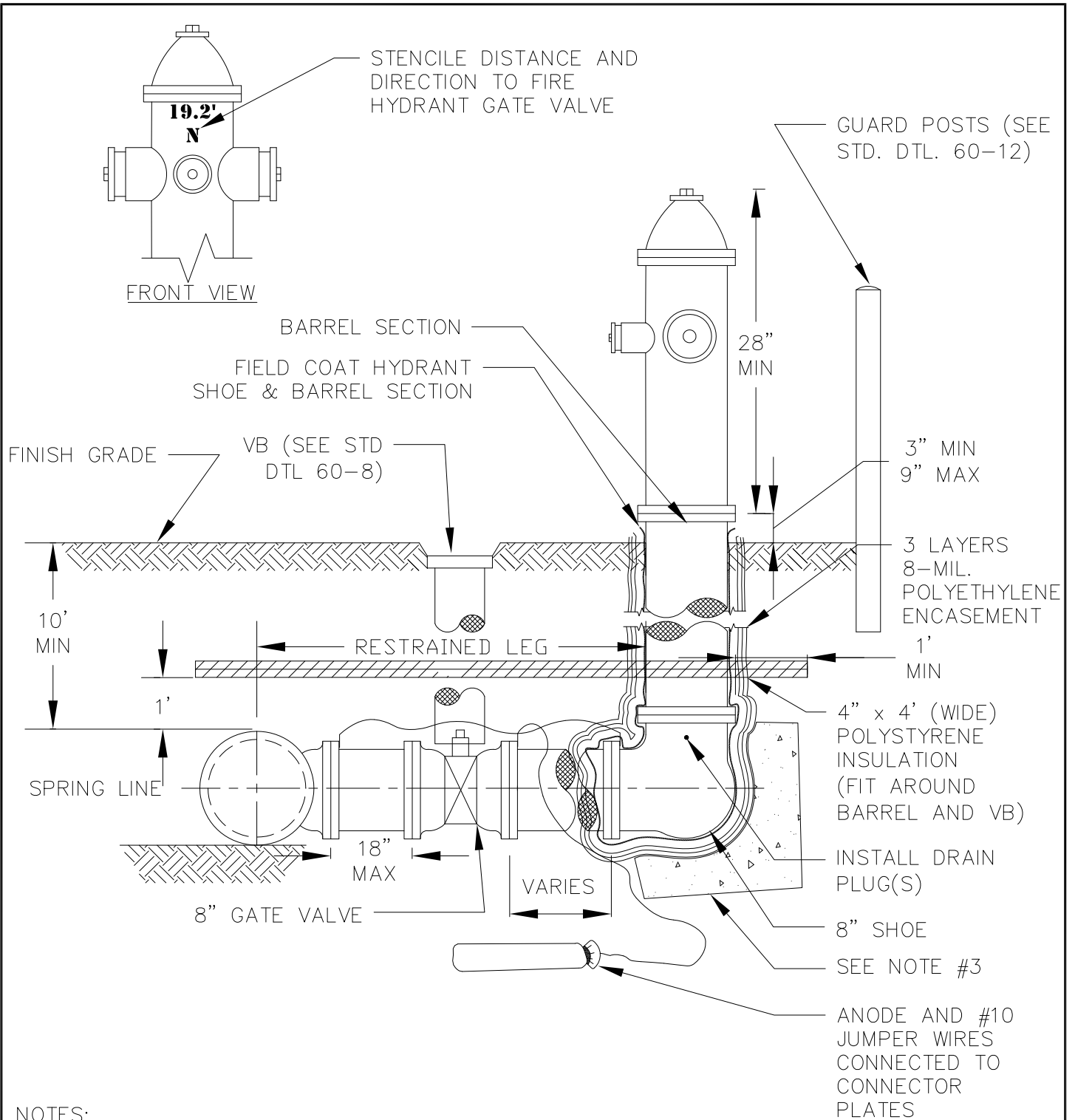
REVISED:  
1/2015

# SINGLE PUMPER "L" BASE FIRE HYDRANT ASSEMBLY

SECTION #  
60.04

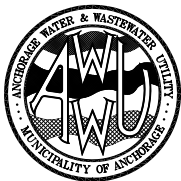
DETAIL #  
60-10





**NOTES:**

1. HYDRANT BARREL SHALL BE INSTALLED PLUMB AND THE LEG SHALL BE LEVEL.
2. ALL BACKFILL MATERIAL WITHIN 3 FEET AROUND HYDRANT BARREL SHALL BE NFS.
3. ALL PVC C-900 HYDRANT LEG SHALL HAVE THRUST BLOCKS (SEE MASS DETAIL 60.06).



SCALE:  
NTS

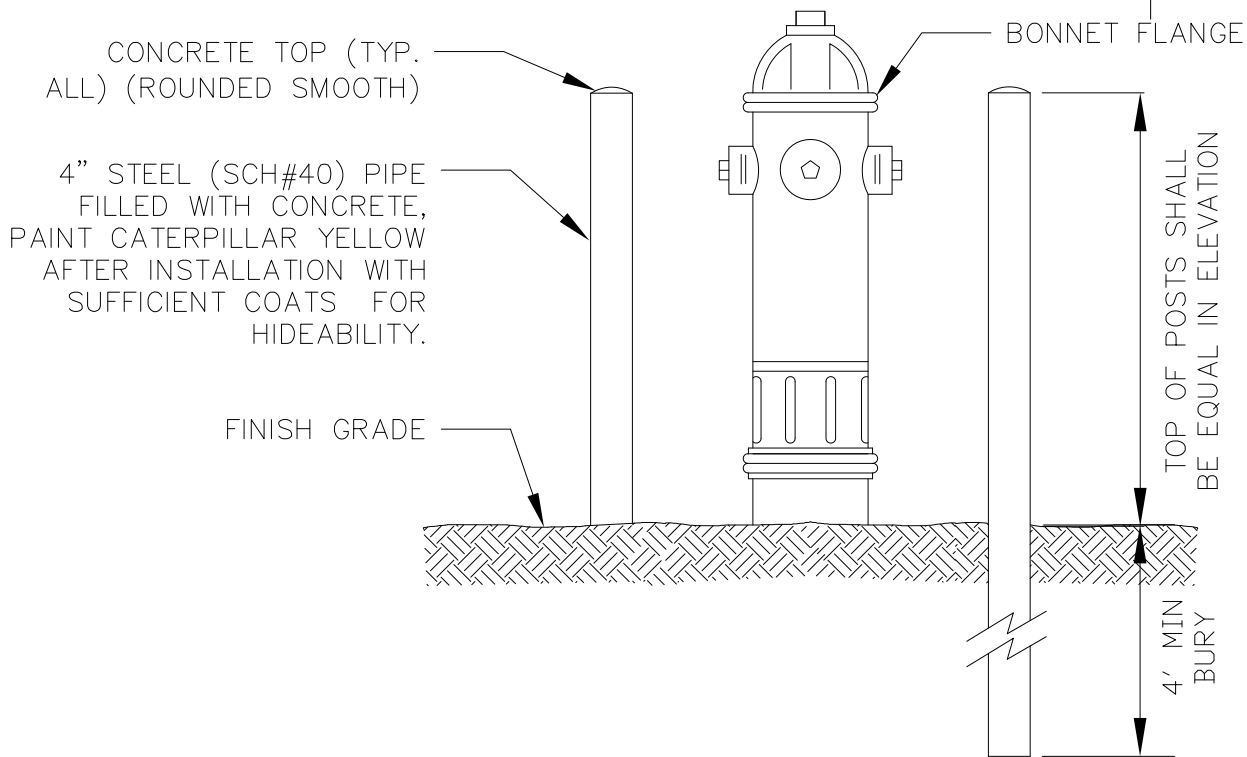
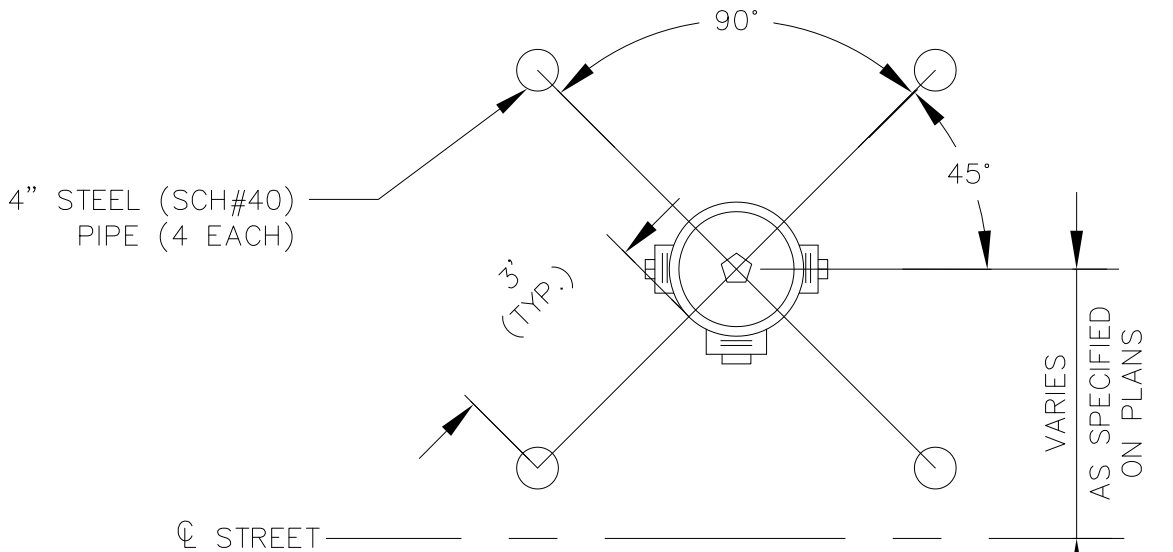
APPROVED:

REVISED:  
1/2015

# DOUBLE PUMPER "L" BASE FIRE HYDRANT ASSEMBLY

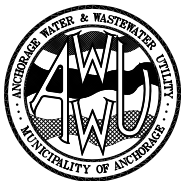
SECTION #  
60.04

DETAIL #  
60-11



NOTES:

1. GUARD POSTS WILL BE FURNISHED & INSTALLED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.
2. GUARD POSTS SHALL BE INSTALLED PLUMB AND LOCATED TO ALLOW UNRESTRICTED ACCESS TO PUMPER AND HOSE CONNECTIONS.



SCALE:  
NTS

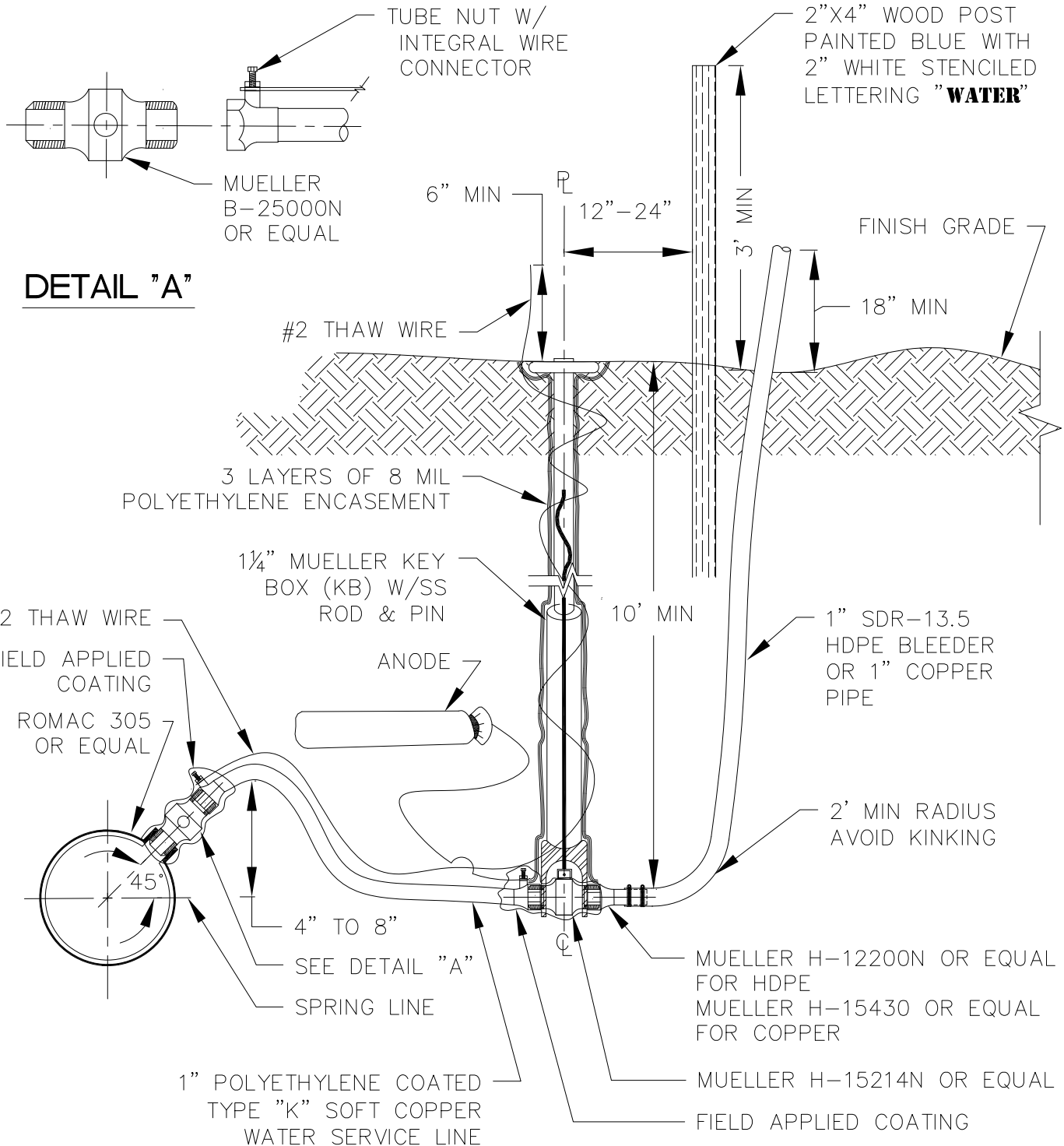
APPROVED:

REVISED:  
1/2015

# FIRE HYDRANT GUARD POSTS

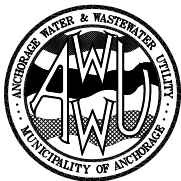
SECTION #  
60.04

DETAIL #  
60-12



NOTES:

1. STAINLESS STEEL (SS) WRAP AROUND SERVICE SADDLE TO BE USED ON ALL TAPS. PVC TAPS ARE TO BE DONE IN ACCORDANCE WITH THE UTILITY COMPANY PVC TAPPING GUIDE.
2. THAW WIRE IS TO BE #2 GAUGE HMWPE INSULATED COPPER WIRE THAT IS LAID PARALLEL TO THE SERVICE LINE WITHOUT CONTACTING THE SERVICE LINE.



SCALE:  
NTS

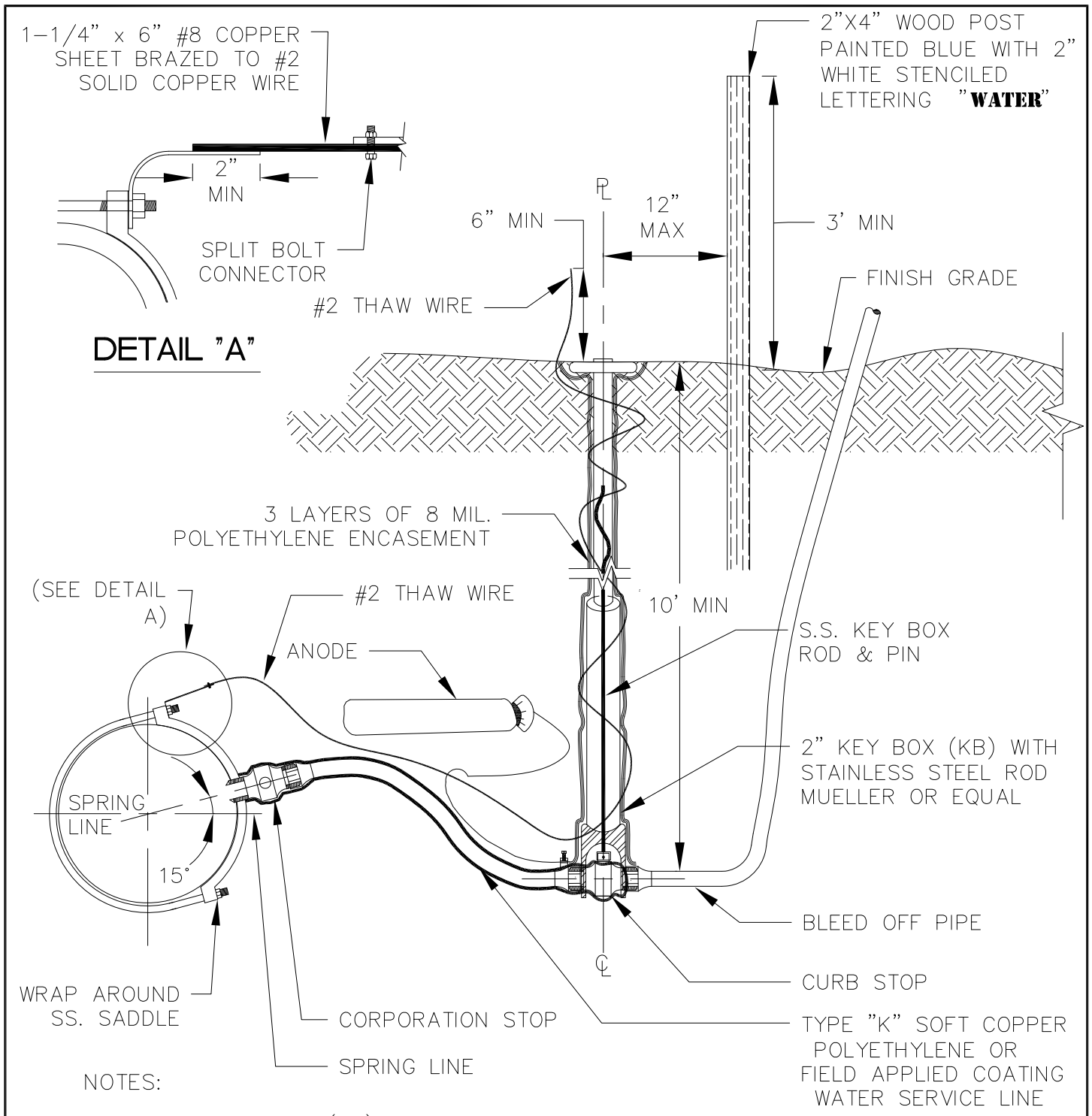
APPROVED:

REVISED:  
1/2015

# 1" WATER SERVICE CONNECT

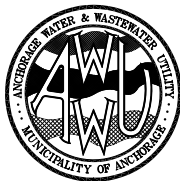
SECTION #  
60.05

DETAIL #  
60-13



NOTES:

1. STAINLESS STEEL (SS) WRAP AROUND SERVICE SADDLE TO BE USED ON ALL TAPS. PVC TAPS MUST BE A MINIMUM OF 3' APART
2. THAW WIRE IS TO BE #2 GAUGE HMWPE INSULATED COPPER WIRE THAT IS LAID PARALLEL TO THE SERVICE LINE WITHOUT CONTACTING THE SERVICE LINE .



SCALE:  
NTS

APPROVED:

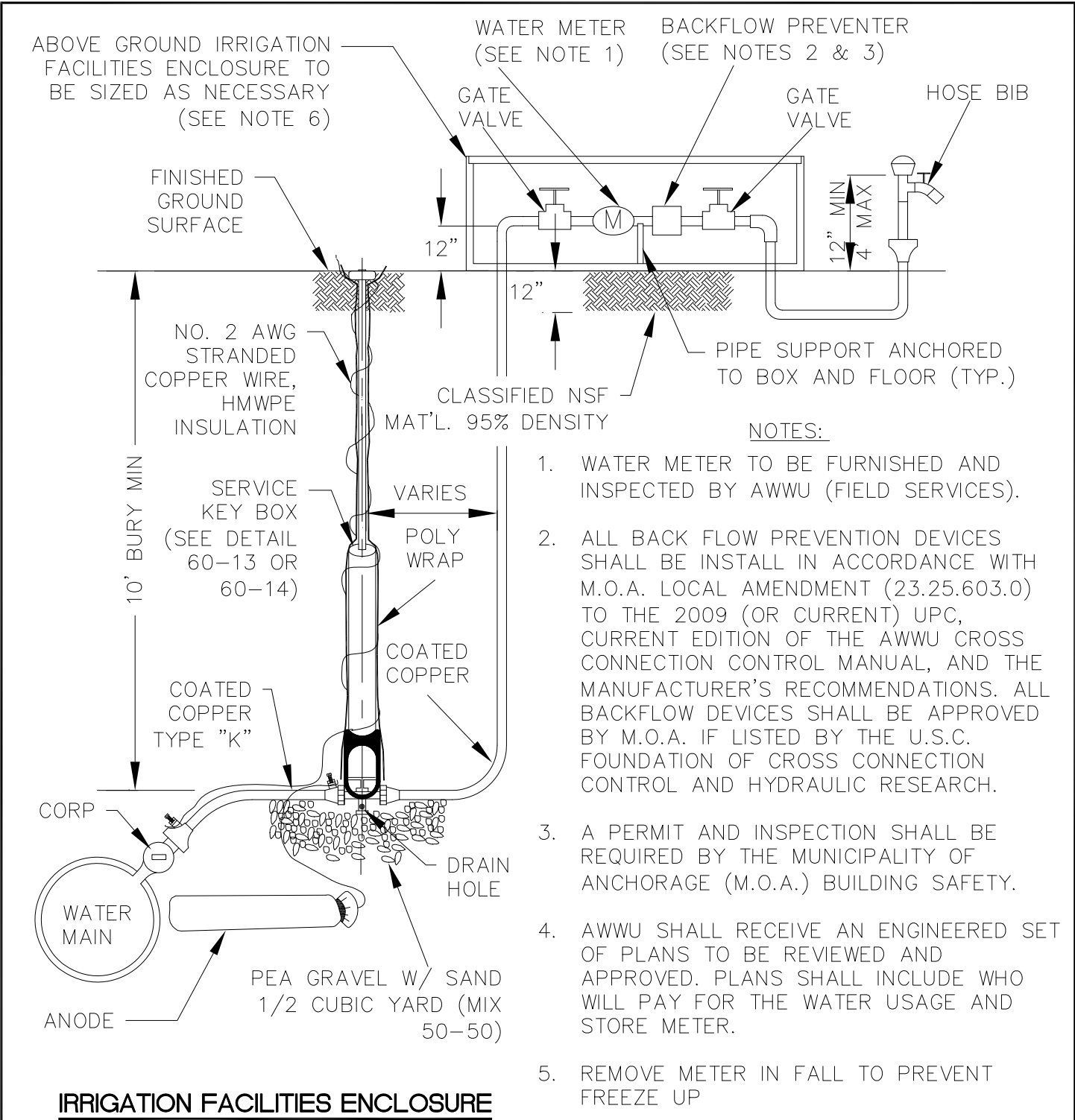
REVISED:  
1/2015

# WATER SERVICE CONNECT

## 1-1/2" AND 2"

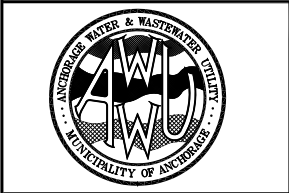
SECTION #  
60.05

DETAIL #  
60-14



**IRRIGATION FACILITIES ENCLOSURE**

6. FOR SECURITY AND PROTECTION, IT IS RECOMMENDED THAT THE ENCLOSURE BE FABRICATED WITH 1-1/2"x 1-1/2" ANGLE IRON (FRAME) COVERED W/ FLAT EXPANDED METAL (MESH) PRIMED AND PAINTED. ENCLOSURE SHALL BE SIZED TO ENCLOSE ALL ABOVE FINISH GRADE APPURTENANCES AND SHALL PROVIDE ADEQUATE DRAINAGE TO KEEP THE BACKFLOE PREVENTER FROM BECOMING SUBMERGED.



SCALE:  
NTS

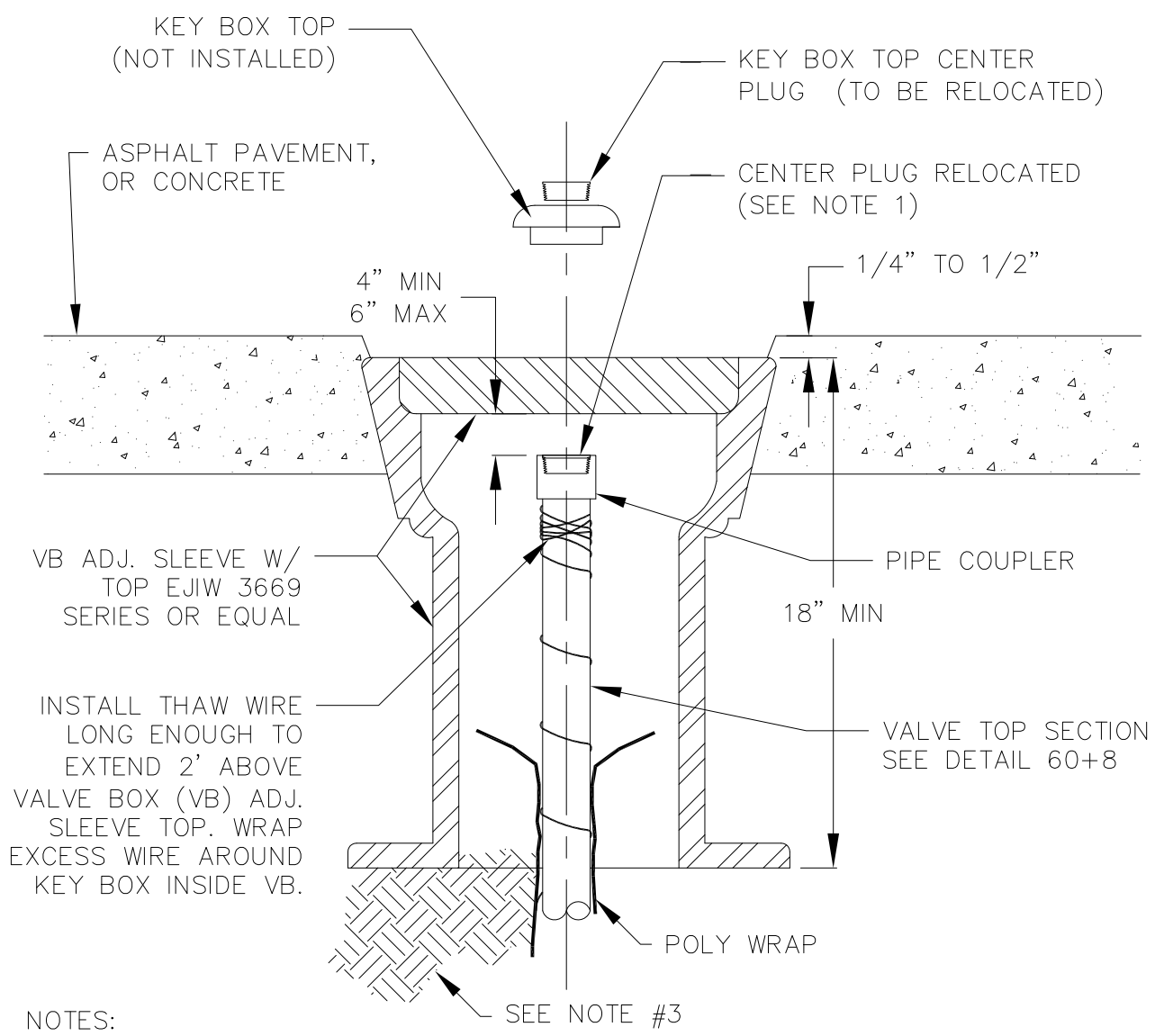
APPROVED:

REVISED:  
1/2015

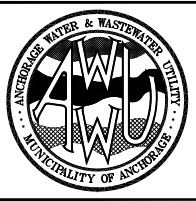
**IRRIGATION SYSTEM**

SECTION #  
60.05

DETAIL #  
60-15



- NOTES:
1. REMOVE KEY BOX TOP AND INSTALL PIPE COUPLING ON STANDARD KEY BOX, REMOVE CENTER PLUG FROM KEY BOX TOP AND INSTALL INTO TOP OF PIPE COUPLER.
  2. TYPICAL INSTALLATION WHEN KEY BOX FALLS WITHIN ASPHALT PAVEMENT, CONCRETE WALK OR DRIVEWAY.
  3. ALL BACKFILL MATERIAL AROUND VALVE BOX SHALL BE NFS AND COMPACTED TO 95% MAX. DENSITY.



SCALE:  
NTS

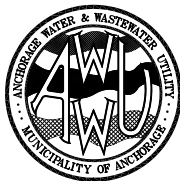
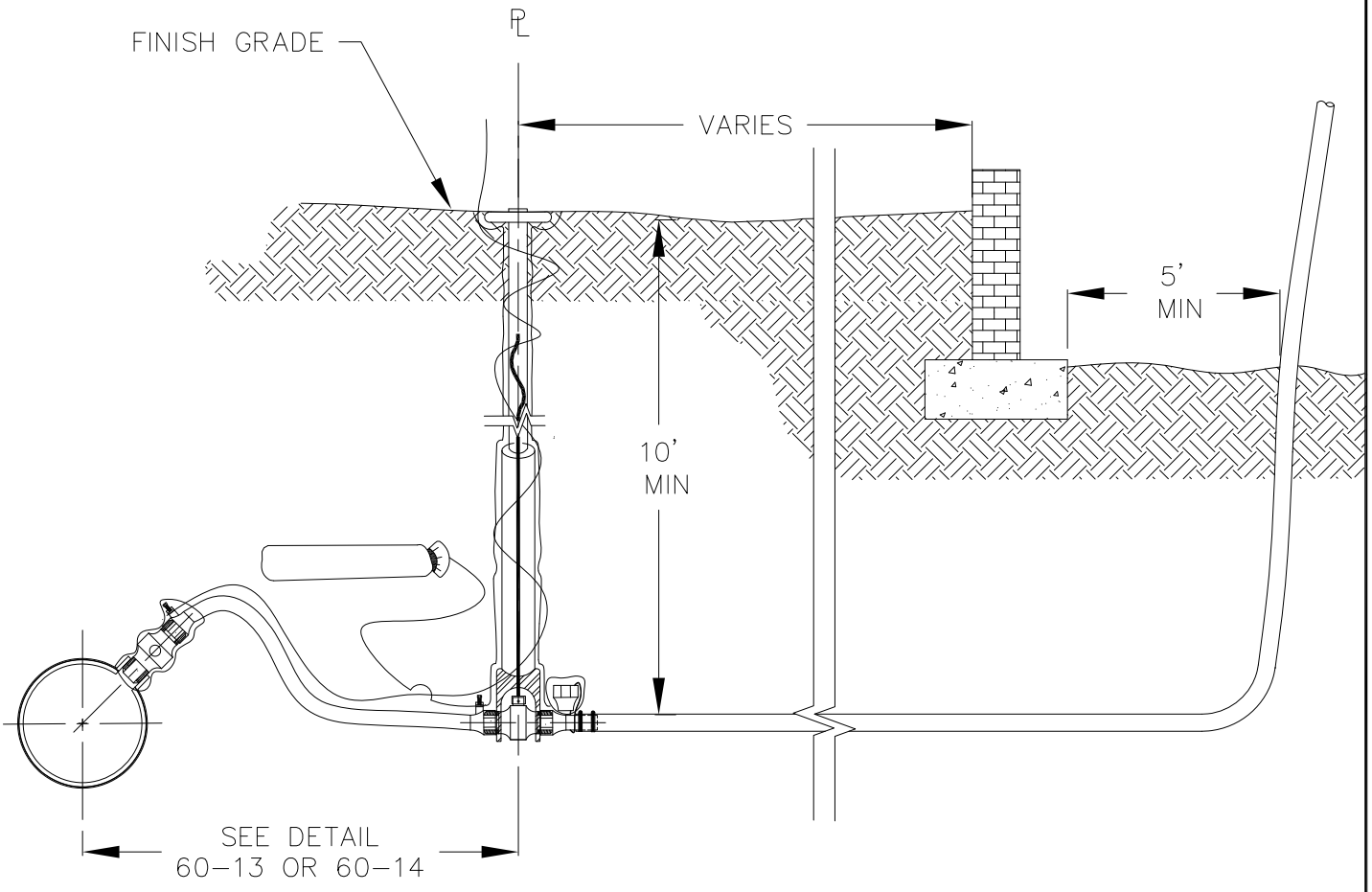
APPROVED:

REVISED:  
1/2015

## ADJUST SERVICE KEY BOX

SECTION #  
60.05

DETAIL #  
60-16



SCALE:  
NTS

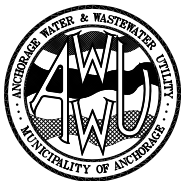
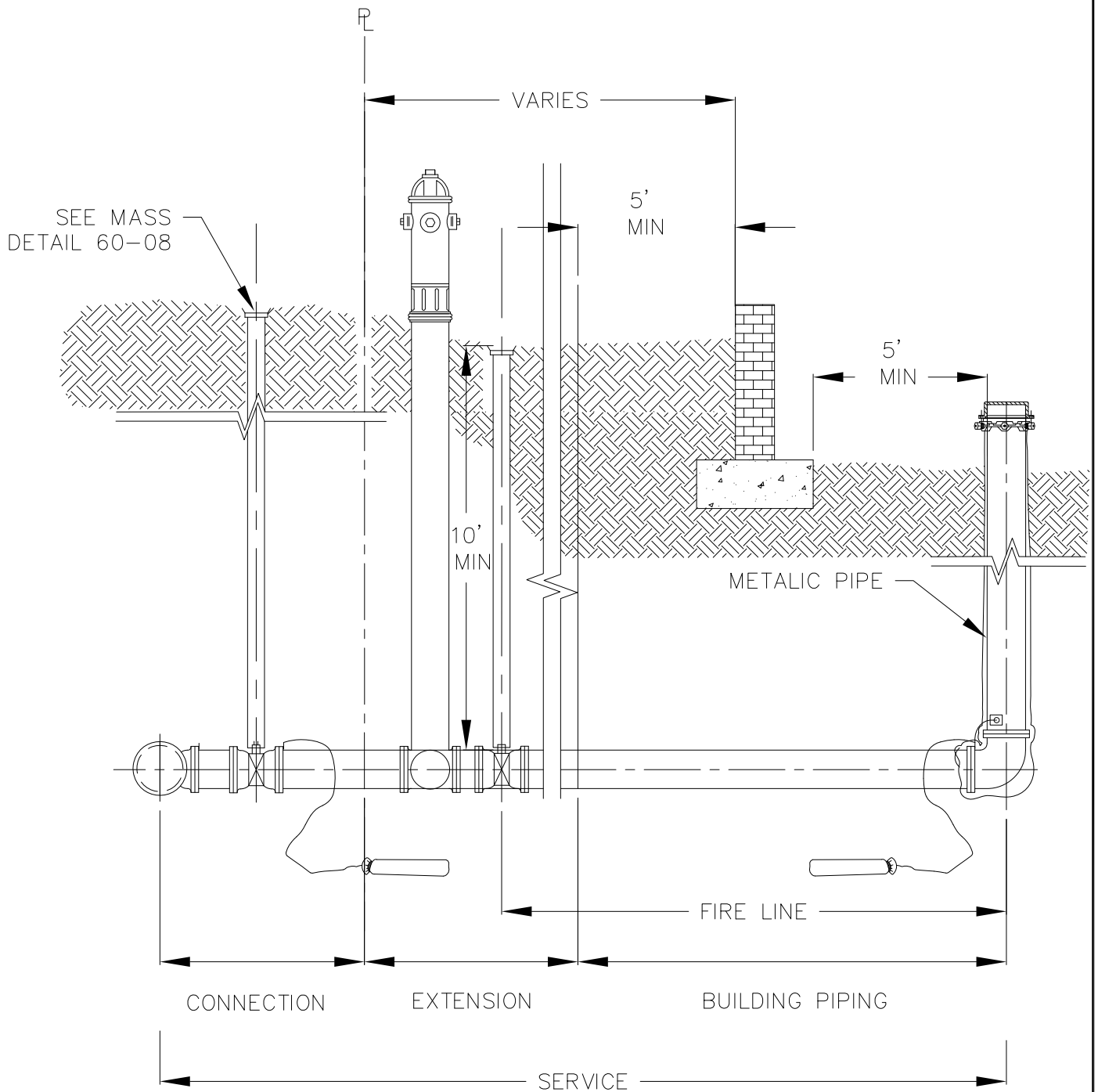
APPROVED:

REVISED:  
1/2015

# SMALL DIAMETER WATER SERVICE EXTENSION UNDER FOUNDATION

SECTION #  
60.05

DETAIL #  
60-17



SCALE:  
NTS

APPROVED:

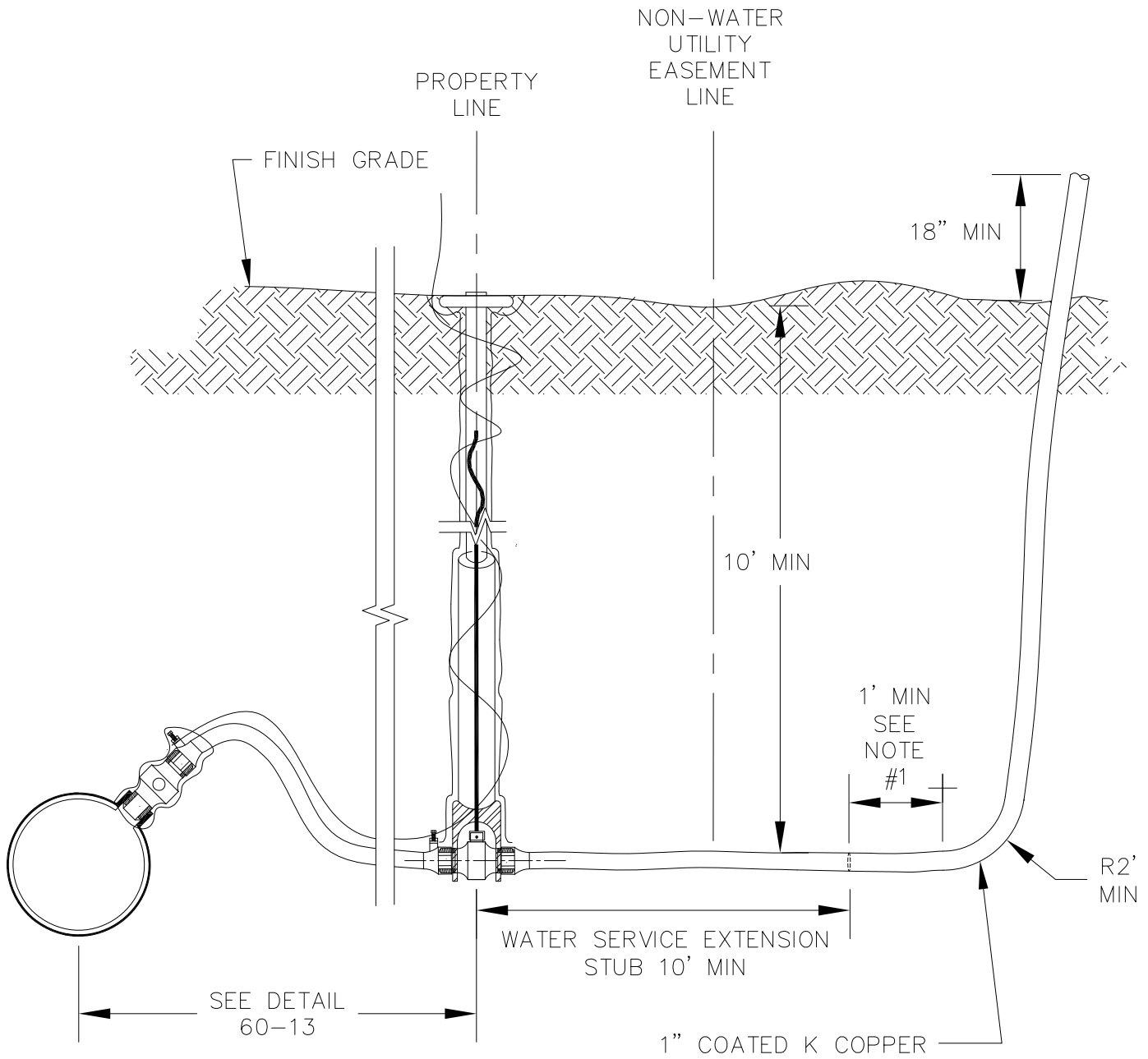
REVISED:  
1/2015

# LARGE DIAMETER WATER SERVICE UNDER FOUNDATION

SECTION #  
60.05

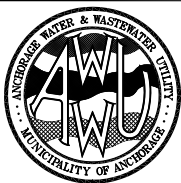
DETAIL #  
60-18





NOTES:

1. EXTENDING FROM THE EXTENSION STUB IS TO BE ACCOMPLISHED BY MAKING A CLEAN CUT ONE FOOT FROM THE BEGINNING OF THE VERTICAL BEND.
2. THE EXISTING CONNECTION AND EXTENSION STUB ARE TO BE FLUSHED PRIOR TO EXTENDING THE EXTENSION.



SCALE:  
NTS

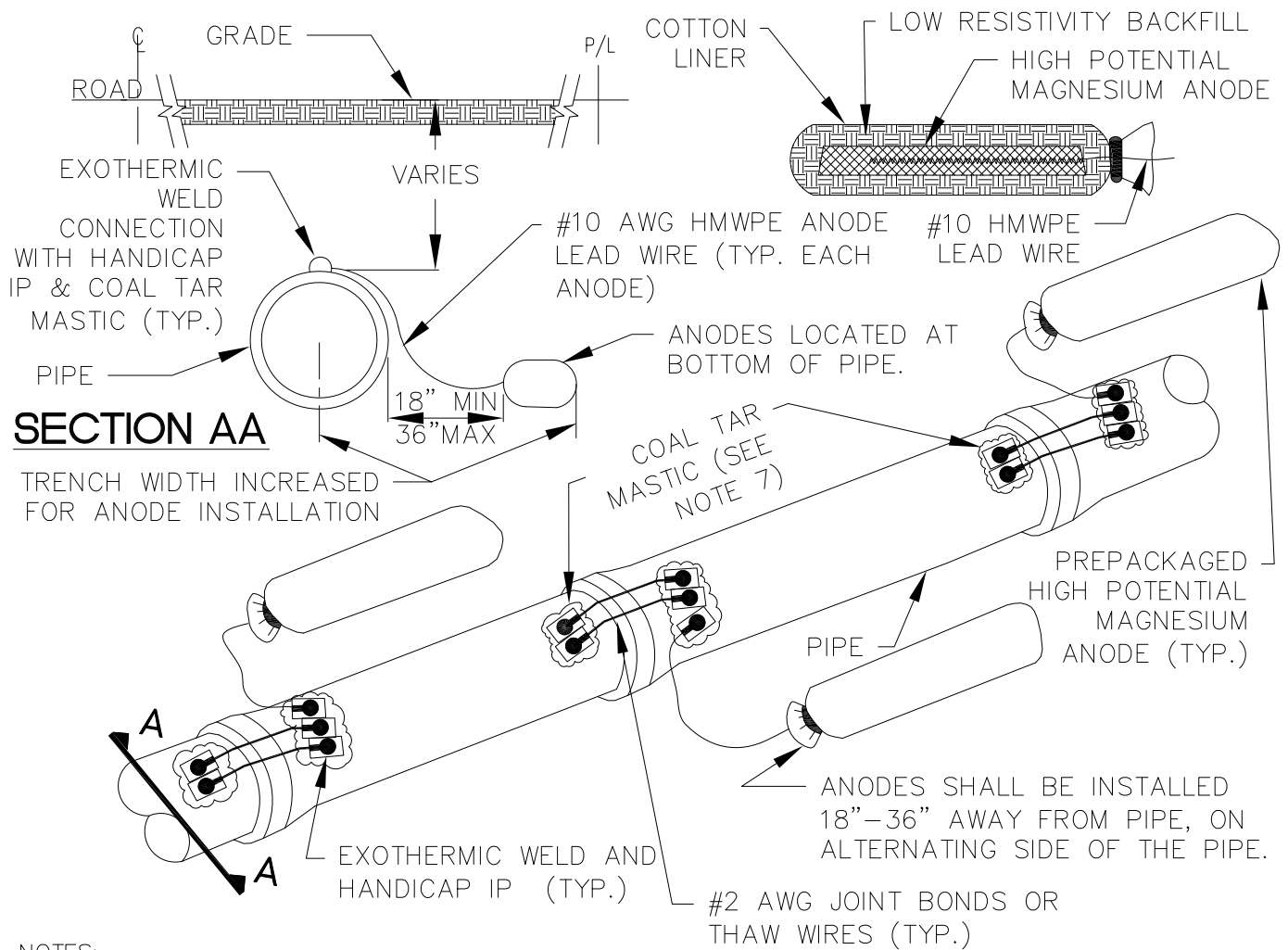
APPROVED:

REVISED:  
1/2015

## WATER SERVICE EXTENSION STUB

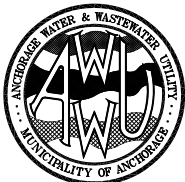
SECTION #  
60.05

DETAIL #  
60-19



NOTES:

1. HIGH POTENTIAL MAGNESIUM ANODES SHALL BE PREPACKAGED IN A CLOTH BAG WITH A BACKFILL MIXTURE OF 75% GYPSUM, 20% BENTONITE AND 5% SODIUM SULFATE. THE ANODES SHALL HAVE A 20 lb. BARE WEIGHT AND APPROXIMATELY 70 lb. PACKAGED WEIGHT.
2. ANODES SHALL BE INSTALLED AT A MAXIMUM SPACING OF 18 FEET OF BURIED PIPE BETWEEN ANODES. AN ANODE IS REQUIRED ON THE FIRST AND LAST JOINT OF PIPE. AN ADDITIONAL TWO (2) ANODES MUST BE INSTALLED ON THE EXISTING TIE-IN PIPE.
3. CONTRACTOR SHALL PROVIDE COORDINATES OR PIPE STATIONING FOR EACH ANODE INSTALLED.
4. TWO #2 AWG JOINT BOND WIRES ARE REQUIRED, WHEN ANODE INSTALLATIONS ARE REQUIRED.
5. ALL CABLES SHALL BE SINGLE CONDUCTOR, STRANDED COPPER, WITH TYPE HMWPE INSULATION RATED FOR 600 VOLTS.
6. SPLIT-BOLT CONNECTIONS SHALL NOT BE ALLOWED ON ANY UNDERGROUND CONDUCTORS. IF SPLICES ARE REQUIRED, COMPRESSION CONNECTIONS (BURNDY OR APPROVED EQUAL) SHALL BE USED. COMPRESSION CONNECTIONS SHALL BE SEALED WITH A HEAT SHRINK SLEEVE RATED FOR BELOW GRADE USE.
7. EXOTHERMIC WELDS SHALL BE MADE IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS (NOTE: COPPER CONDUCTOR SLEEVES ARE REQUIRED FOR #10 WIRE BY SOME MANUFACTURERS). THE EXOTHERMIC WELD AREA SHALL BE COATED WITH HANDICAP IP OR EQUAL AND ANY BASE METAL EXPOSED AFTER INSTALLATION OF HANDICAP IP MUST BE COATED WITH COAL TAR MASTIC.
8. AT FIRE HYDRANT LOCATIONS, INSTALL ONE ANODE (18"-36" AWAY FROM THE PIPE) AT THE MIDPOINT BETWEEN THE TEE FROM THE MAIN LINE PIPE AND THE HYDRANT SHOE.



SCALE:  
NTS

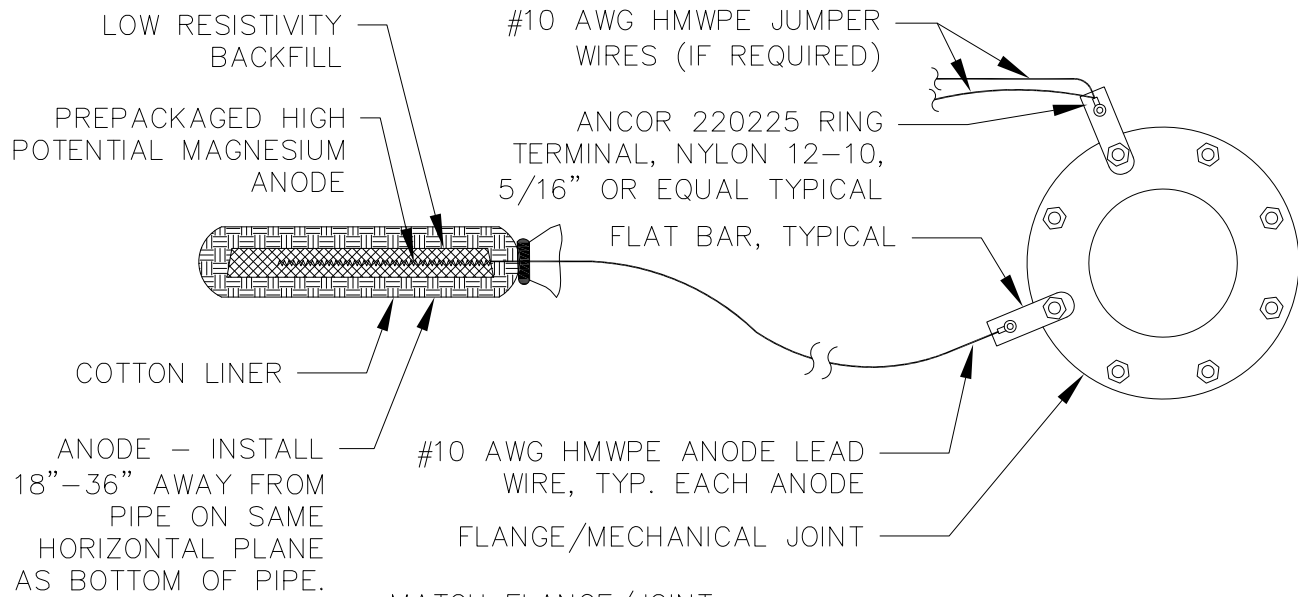
APPROVED:

REVISED:  
1/2015

## ANODE DETAIL

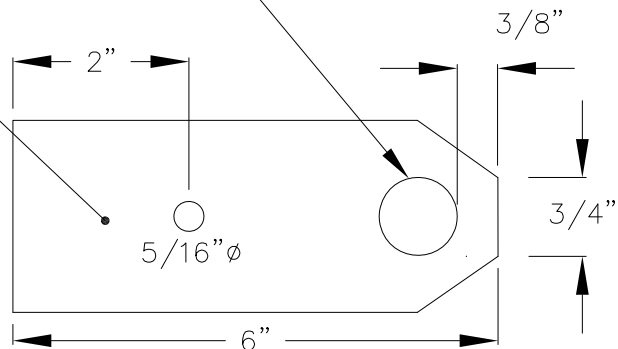
SECTION #  
60.06

DETAIL #  
60-20



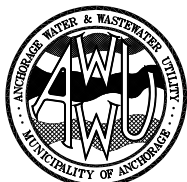
MATCH FLANGE/JOINT  
BOLT HOLE DIAMETER

2½" x 6" FLAT BAR  
STAINLESS STEEL (TYPE 316)  
MATERIAL ⅛" THICKNESS



ANODE WIRE CONNECTION NOTES:

1. CONTRACTOR TO FABRICATE FLAT BAR.
2. INSTALL FLAT BAR ON BODY SIDE OF FLANGE OR MECHANICAL JOINT. REMOVE COATING AT THE FLAT BAR LOCATION PRIOR TO INSTALLATION. METAL TO METAL CONTACT IS REQUIRED. REPAIR VISIBLE COATING DAMAGE WITH DENSYL TAPE AND PRIMER.
3. CONNECT WIRE WITH COMPRESSION RING CONNECTOR AND 1/4"Ø x 1" STAINLESS STEEL BOLT (TYPE 316) WITH WASHER AND SELF LOCKING NUT.
4. TWO #10 AWG HMWPE JUMPER WIRES REQUIRED TO CONNECT EACH VALVE/HYDRANT.
5. WRAP ELECTRICAL INSULATION TAPE AROUND RING CONNECTOR AND BOND STRAP (WIRE END ONLY). DENSYL TAPE OR APPROVED EQUAL.
6. WRAP ELECTRICAL INSULATION TAPE A MINIMUM OF 3" DOWN ON WIRE INSULATION TO ENCAPSULATE CONNECTION.



SCALE:  
NTS  
APPROVED:  
REVISID:  
1/2015

## ANODE WIRE CONNECTION

SECTION #  
60.06

DETAIL #  
60-21



**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 65  
CONSTRUCTION SURVEYS**



**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR MUNICIPAL CONSTRUCTION SURVEYS  
DIVISION 65  
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**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR MUNICIPAL CONSTRUCTION SURVEYS  
DIVISION 65**

**SECTION 65.01 GENERAL**

**Article 1.1 Scope of Work**

The Contractor shall furnish all labor and materials necessary to perform all surveying and staking essential for the completion of construction in conformance with the Drawings, Specifications, and Contract Documents. The Contractor shall perform all the necessary Work and calculations required to accomplish the Work in accordance with this Division.

This Section establishes a minimum standard of field survey specifications and procedures to properly control Municipal construction projects. The Contractor shall insure that commonly accepted practice of survey methods and procedures are followed. Errors or damages resulting from the Contractor's survey shall be corrected or made whole at the expense of the Contractor. The Owner shall not be held liable for any additional expense. Any method conflicting with these survey specifications must be approved by the Engineer prior to its use.

An Alaskan Registered Professional Surveyor, subcontracted to the Contractor shall perform all surveying, staking and cross section for quantities pay item measurements. All personnel involved in measuring and recording survey data shall be directly employed by the Surveying Subcontractor and shall not be employed by the Contractor or any of the other Subcontractors for the duration of the project. Failure to adhere to this specification will result in non-payment for all Work affected by non-compliance.

The Contractor shall notify the Engineer twenty-four (24) hours in advance prior to beginning Work. All requests for information or determinations concerning the project shall be directed to the Engineer.

**Article 1.2 Payment - General**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

## **SECTION 65.02 CONSTRUCTION SURVEYING**

### **Article 2.1 Project Control**

The Owner may provide project horizontal and vertical control monuments to facilitate construction staking or the Owner may not have provided horizontal and vertical control monuments for a project. Regardless, the Contractor shall recover project survey control monuments shown on the Drawings or establish project survey control to ensure the project is properly located and constructed according to the Contract Documents. Survey control monuments may be shown on the Drawings. Prior to construction, the Contractor shall locate these monuments to ensure they have not been destroyed. In the event the Contractor is unable to locate certain monuments, the Contractor shall notify the Engineer immediately and provide five (5) working days for the Engineer to reestablish the missing monumentation. The Contractor shall have no basis for a claim requesting additional compensation for costs incurred due to missing survey control, which is shown on the Drawings, unless the Engineer fails to reestablish said control within five (5) working days after written notification from Contractor. The Contractor may be entitled an extension of time as the Engineer may determine. Claim for extension of time shall be in accordance with Division 10, Section 10.05, Article 5.23 - Delays and Extension of Time.

The Contractor shall notify the Engineer immediately if a discrepancy exists between the field conditions and the Contract Documents. Project staking, which would be directly affected by the discrepancy, shall cease until further notice by the Engineer. Work unaffected by the discrepancy shall continue uninterrupted.

#### **A. Project Control Accuracy**

##### **1. Horizontal Control**

The maximum permissible linear error allowed in establishing horizontal control is 1:10,000 feet. The maximum error allowed in unadjusted angular closure shall be calculated by the formula "15 times the square root of N." The term "N" signifies the number of transit setups in a traverse and "15" signifies fifteen seconds.

##### **2. Vertical Control**

Vertical datum shall originate from the MOA Benchmark Network or NGS Vertical Level Line System. If the Owner provides vertical control on the Drawings, the Contractor shall use the control provided unless the Municipal Surveyor approves the use of other vertical control. The level run will tie to published bench marks at the beginning and end of the leveling loop. All level circuits run to establish temporary bench marks shall have an accuracy no less than the value computed by the equation (five hundredths of a foot (0.05') times the square root of the distance in miles). Foresights and backsights shall be balanced. If the level circuit between bench marks does not meet accuracy specifications, the Contractor shall continue to a third published bench mark. When a published bench mark has been compromised or proven to no longer hold the published elevation, the Contractor must notify the Municipal Surveyor who will direct the Contractor

how to proceed. The maximum sighting distance shall not exceed three hundred feet (300'). All leveling circuits establishing TBMs will be adjusted utilizing recognized standard surveying adjustment methods. Side shots to establish an elevation on TBMs will not be allowed.

A minimum of two known MOA benchmarks shall be utilized when establishing TBMs to verify correct elevation information. A sufficient number of TBMs shall be set to control a project with a maximum spacing of eight hundred feet (800') between marks. Typically, a TBM should not be greater than two hundred feet (200') outside the construction limits of the project. All TBMs shall be located and be comprised of sufficient materials such that their integrity will not be compromised throughout the life of the project.

## B. Construction Centerline

### 1. Establish Centerline

The construction centerline location and stationing shall conform to that shown on the Drawings. Any errors found in the line shall be corrected and shown on the specific plan view with reference to the centerline stationing. If control points do not exist, they shall be established and referenced so that the line can be readily re-established when required. A minimum of two reference points shall be established to reference each project control point or monument. Each reference point shall be visible to the other reference point. The method of referencing control points shall be done in accordance with the Standard Details of these specifications. Reference points shall be placed at locations where there is the least possibility of their being disturbed during the construction period. Measurements and sketches of the reference points shall be kept in the horizontal control survey field book.

### 2. Check Existing Ground Profile

A centerline profile shall be run prior to establishing construction grade stakes. The existing ground elevations shall be checked against the existing profile elevations shown on the Drawings to verify design grade relative to the existing ground conditions. The Contractor shall review the centerline profile information and immediately notify the Engineer of any elevations that do not match the plan profile information. The Engineer will direct the Contractor how to proceed.

### 3. Pavement Rehabilitation Projects

This paragraph pertains only to pavement rehabilitation projects when a field survey of existing conditions was not conducted as part of the design process for the project. Pavement rehabilitation projects include projects where there is pavement removal, roto-milling, reclamation, or a combination thereof. Contractor shall conduct a preconstruction survey to establish the existing road centerline and gutter lip profiles as applicable, within five working days prior to beginning construction staking, Contractor shall submit the survey field notes and a centerline profile plot drawn on paper at the same scale as the Drawing scale to the Engineer. The centerline profile plot may be submitted digitally in pdf format to the Engineer. The Engineer will have five

days to review the survey notes and profile drawings prior to the start of construction.

## **Article 2.2 Field Notes**

The Contractor shall furnish hardbound field books for recording survey information; the field books shall become the property of the Municipality after the survey information has been entered and the project has been completed. At the discretion of the Municipal Surveyor, scanned copies of these field books may be submitted in lieu of the hardbound books. Scanned field books must be clean, readable, and in Adobe Portable Document Format (PDF).

Each book shall be indexed, and its contents referred to by page number prior to delivering them to the Owner. All field books containing field note information shall be sealed and signed by a Professional Land Surveyor Registered in the State of Alaska on the title page of each field book. The date, weather conditions, survey crew personnel, and instruments used shall be shown at the beginning of each day's notes. As a general rule, field notes for each phase of the Work shall be placed in a separate series of field books. Field notes shall conform to the note format shown in the Standard Details and shall be neatly logged as follows:

- observations recorded directly in field book.
- complete an index page in the front of the book with specific references to pages where monument recovery, horizontal and vertical control were established for the project, cut/fill notes, slope staking, laying out the project alignment, as-built of improvements or utilities, and sketches with specific references (dimensions, stationing, point numbers and relationship to ROW).
- notes shall be in pencil; redline book with corrections, means, level adjustments, etc.
- each page shall be labeled with the appropriate header information including date, crew, instrumentation, weather, and north arrows as applicable.
- notes shall be complete and reduced.
- sketches and traverse data shall be graphic.
- stationing shall increase from the bottom to the top of the page.
- notes shall be precise and sufficiently detailed.
- monument recovery pages shall include detailed descriptions of condition and location of the monuments with sketches identifying nearby streets and properties.

Requirements for scanned field book copies submitted in PDF format include:

- scans will be in color using a minimum of 300 dpi.
- scan all pages including the cover, index page and blank pages, excluding those beyond the used portion of the book.
- review the scanned file and ensure that the entire page was captured and is clear and legible.
- use the bookmark function in Adobe add a bookmark to match the index page; the index page shall be included in the bookmarks; the user of the digital file

should be able to go through the book as if they had the physical copy of the book using the bookmarks.

- use Adobe optimization settings to compress the file size and check to ensure they result is still clear and legible; MOA will reject poor quality scans and require a new version be created before acceptance and payment.

Refer to Section 65.02, Article 2.13 – Electronic Data Collection, Radial Surveys, and Global Positioning Systems (GPS) procedures for logging field notes with the use of electronic data collectors and automated field systems.

Pegging of notes and erasures of information will not be acceptable. A line shall be drawn through those portions of the notes in error leaving the original note legible. The correction shall be noted above the original entry. Corrections shall be initialed and dated. Where appropriate, a note of explanation shall be included.

Field notes shall conform to the note format shown in the Standard Details. Failure on the part of the Contractor to keep and maintain complete and accurate field notes, as required by this Section, shall be sufficient reason to withhold payment for those items of Work where survey is required. No final project payment will be made to the Contractor until the field books have been submitted and approved by the Engineer.

### **Article 2.3 Party Chief's Daily Diary**

The survey party chief shall keep a factual daily diary of all Work performed by the survey crew on the project. As a minimum, the diary shall contain the following information:

- date
- crew
- type & location of Work performed
- Work accomplished
- orders from the Engineer
- signature of Party Chief

This record shall be kept on the project site and submitted to the Engineer upon request. At completion of the project this diary shall become the property of the Owner.

### **Article 2.4 Clearing and Grubbing Stakes**

The Contractor shall stake the clearing and grubbing limits as shown on the Drawings and/or as directed by the Engineer. If possible, stakes shall be adjusted to avoid sharp breaks in the width of the clearing line. The staking of clearing limits shall be approved by the Engineer in writing prior to the start of the clearing operations.

Distances shall be measured to the nearest foot and standard lath/flagging shall be placed to clearly designate the intended limits. Intervals for placement of lath/flagging shall vary based on the terrain and foliage density, with a minimum of fifty feet (50') and no greater than one hundred feet (100') between lath. In areas of heavy timber, clearing stakes shall be placed to avoid leaving trees on the clearing line. If, as the Work progresses, revisions are required to the originally staked clearing distances, the revisions shall be duly noted in the field notes.

## Article 2.5 Cross Sections

The Contractor shall perform all cross sections necessary for determination of excavation and fill or backfill quantities, including intermediate and/or re-measure cross sections as may be required. Cross sections shall be required before excavation activity begins unless otherwise specified. When clearing and grubbing work is included in the contract the original cross sections shall be taken immediately after grubbing work is complete. Cross sections measured for pay quantities shall clearly identify in the field notes whether the Work was done before excavation or after excavation. When both usable and unusable excavation are a part of the project, the limits of usable or unusable materials shall be clearly identified in the cross sections, in the field book.

### A. Methods and Procedures

#### 1. Equipment

Cross sections may be accomplished with 1) an engineer's level, 2) a self compensating surveyor's level, or 3) an electronic (laser) level, or 4) by electronic data collection and radial survey method. Neither radial methods nor electronic leveling shall be employed without prior approval from the Engineer. When radial methods or electronic leveling methods are used the survey shall comply with or exceed the accuracy established in this article. Conditions under which these methods may be used shall be discussed and approved in writing at the initial pre-construction meeting with the Engineer. For radial methods see Article 2.13 - Electronic Data Collection and Radial Surveys.

#### 2. Procedure and Accuracy

When an engineering level, self compensating surveyor's level, or an electronic (laser) level is used, cross sections shall be taken perpendicular to the centerline along tangents and on radial lines along curves. A right-angle prism shall be used to determine perpendiculars. The height of the instruments (H.I.'s) shall be recorded to the nearest hundredth of a foot (0.01'). All cross-sectioning work shall be part of a closed level loop. If only one TBM is used the level set-up shall be broken and a different instrument height obtained before closing into the same TBM. The maximum allowable error for level loops used for cross sectioning shall be five hundredths of a foot (0.05'). Cross section readings shall be recorded to the nearest tenth of a foot (0.1'). Horizontal measures shall be recorded and accurate to the nearest tenth of a foot (0.1'). Work shall not be paid for if it does not meet the stated accuracy requirements.

#### 3. Original Ground Measures

Cross section measures of original ground shall be taken at each fifty-foot (50') station as indicated on the Drawings. Intermediate stations shall be measured by cross section wherever grade breaks occur. Additional cross sections shall be taken at stations to include quantities measurement of retaining walls, drainage structures, etc. Elevation shots for original ground cross sections shall be taken at the centerline of construction according to the

Drawings and as a minimum, at the following points perpendicular to and on each side of the centerline:

- grade breaks
- edge of pavement
- curb and gutter
- shoulder of road
- toe of slope
- centerline of ditch
- top of bank
- all other physical features within the project limits.

In areas where overbreak or slides are anticipated, sections shall be extended out from centerline to include the anticipated disturbed ground area.

#### 4. After Excavation Measures

Cross sections shall be taken at the same stations as the original ground cross sections. Elevation shall be for the bottom, sides and top of excavation at the following points on each side and perpendicular to the centerline:

- centerline
- grade breaks
- original ground at a minimum of ten feet (10') beyond the limits of excavation.
- toe of excavation
- top edge of cut

Work not meeting these requirements shall not be accepted by the Engineer for payment.

#### 5. Finished Grade Measures

Finished grade cross sections shall be taken at the same stations as the original ground or after excavation cross sections. Elevations shall be provided for the bottom, sides and top of excavation at the following points on each side of and perpendicular or radial to the centerline:

- centerline
- toe of excavation
- original ground at a minimum of ten feet (10') beyond the limits of excavation.
- grade breaks
- top edge of cut

Quantities based on work not meeting these requirements shall not be accepted by the Engineer for payment.

#### B. Notification Prior To Cross Section Work

The Contractor shall notify the Engineer twenty-four (24) hours prior to conducting any survey measurements involving pay quantities. The Contractor shall obtain approval of the excavation from the Engineer prior to taking cross sections and shall provide the Engineer the opportunity to be present during the survey. Pay quantity Work done without the Engineer's notification and approval, or any Work covered up before proper remeasure is made, shall be just cause for non-payment.

### C. Required Calculations and Submittals

The Contractor shall calculate quantities based upon the aforementioned cross section measurements and provide these values and calculations to the Engineer as basis of payment for this item. Contractor shall submit any and all information required to verify these calculations to the Engineer and/or the Municipal Surveyor; including but not limited to Field Books, AutoCAD drawing files, and Cross Section point listings on station identifying original ground, finished ground, and all control as required to replicate the calculated quantities.

### Article 2.6 Slope Stakes

Slope stakes shall be required for each cross-section station and at additional intervals such as points of curvature and tangency of curves, street intersections, vertical curve intermediate stations to include the high or low point of the curve, and at grade breaks. The stakes are to be set at points where the cut or fill slopes intersect the surface of original ground.

Staking notes shall record the location of the slope stake in relation to the construction centerline, the existing elevation shot at the catch point, the planned elevation that the slope stake is identifying, what level of the design prism the catch point is identifying (i.e., top of unclassified fill, top of subbase, etc.), the percent of slope for cut/fill, the distance to point slope staked, and the station of the slope stake.

The information to be shown on a slope stake is as follows:

- distance from the catch point to the point being staked.
- percent of slope of the cut/fill.
- amount of cut/fill.
- stake's location in reference to the centerline.
- centerline station of the slope stake written on the back of the stake.

The use of hand levels for setting slope stakes shall be limited to one turning point up or down from the instrument to the catch point. Hand level turning points shall be clearly noted in the field book.

A reference stake shall be set for each slope stake. The reference stake shall be set a minimum of ten feet (10') and a maximum of fifteen feet (15') beyond the slope stake. The reference stake shall re-state the slope stake information in the event the slope stake is disturbed or destroyed. A hub shall be driven flush with the ground at the reference stake and all elevations and distances referenced to the hub.

### Article 2.7 Grade Stakes

#### A. Cut or Fill Stakes

Vertical cut/fill stakes shall be used where the design prism does not contain sloped shoulders and ditches and a slope stake would not be needed. The cut/fill stake shall be comprised of a standard wooden hub driven flush with ground surface and accompanied by a guard lath with the following information written on it:

- amount of cut or fill



- distance to the point of cut/fill from the hub
- description of the cut or filled type, i.e., subgrade, top classified
- offset distance from construction centerline to the cut/fill point
- centerline station written on the back of the lath of cut/fill point
- elevation of the top of hub.

Cuts shall be given to the nearest tenth of a foot (0.1'). Elevations of the top of hubs shall be given to the nearest hundredth of a foot (0.01'). Stakes shall be required at each fifty-foot (50') station identified on the Drawings and at additional intervals such as points of curvature and tangency of curves, street intersections, vertical curve intermediate stations to include the high or low point of the curve, and at grade breaks. A record of the cut/fill, the design grade, the distance offset from centerline, the centerline station and the type of cut/fill being staked shall be written in the survey field book.

#### B. Finish Grade

Grade hubs shall be set to verify that the road prism is at the correct elevation prior to the placement of leveling course material. Wooden hubs, painted or topped with colored whiskers, shall be set at the top of classified fill, within two hundredths of a foot tolerance (0.02'). Stationing shall be fifty feet (50') on tangent and twenty-five feet (25') on curves unless the Engineer approves otherwise. All grade breaks, vertical curve intermediate points to include the high/low point of the curve, PC and PT of horizontal curves, and street intersections shall be staked.

Hubs shall be established on the centerline of the road prism as a minimum where poured curb and gutter is incorporated into the designed road prism. Otherwise, hubs shall be established at the shoulder of the designed road prism, as well as the centerline of the road prism.

When parking aprons are staked, hubs shall be set on a fifty-foot (50') grid pattern unless approved otherwise by the Engineer. The field book shall contain the centerline station, the design finish grade elevation of the point staked, the elevation of the hub, and a description of the material being staked.

### **Article 2.8 Drainage Facilities**

The location, type, size, length, and invert elevations for drainage facilities are given on the Drawings. Minor changes in locations and grades to meet existing field conditions may be made where necessary, but only with the approval of the Engineer. If the planned design grade is found to be unworkable in the field, the Engineer shall be notified immediately, and all grade staking of the facility shall cease until further notice from the Engineer.

#### A. Storm Drains, Cleanouts, Outfalls, Catch Basins, Oil and Grease Separators, Culverts

A ground line profile shall be run directly above the centerline of the pipe before trenching occurs. The line and grade for storm drainpipe shall be given from reference hubs offset from each manhole, catch basin, angle point, outfall, or cleanout. Reference hubs for culvert installation shall be offset from the pipe ends

on the extended centerline of the culvert. One reference hub is required at each end of a culvert. Guard stakes shall be provided for each hub and shall identify the following information:

- station
- size, length, and type of pipe
- the amount of cut or fill from the top of the hub to the invert at the end of the pipe
- the horizontal distance from the reference hub to the center of a manhole, cleanout, catch basin, angle point in a pipe, outfall, or end of a culvert pipe.

For each structure, the field book shall show the location, type, and size of the structure with a staking diagram showing all distances and pertinent elevations. Two (2) reference hubs shall be set for each manhole, cleanout, catch basin, angle point, and outfall. The reference hubs shall be offset no greater than twenty-five feet (25') from the facility they are referencing.

#### B. Headwalls

Headwalls for storm drains and culverts shall be staked by setting a hub accompanied by a guard stake on each side of the storm drain or culvert. The hubs shall be online with the face of the headwall, or as directed by the Engineer. An elevation shall be established on the hubs and written on the guard stake along with the offset distance to the center of the headwall.

#### C. Dikes and Ditches

Dikes/ditches shall be staked to the alignment, grade and slopes shown on the Drawings. Dikes/ditches shall be slope staked to the shoulder or flow line of the improvement with distances referenced to the improvement centerline. The criteria outlined in Article 2.6 – Slope Stakes shall govern the establishment of slope stakes for this Work.

#### D. Riprap and Slope Protection

All rip rap and slope protection shall be staked as soon as possible after the pipe, fill, channel change or dike has been constructed. Slope stakes shall be set if needed. See Article 2.6 – Slope Stakes for slope staking criteria.

#### E. Curb and Gutter

Reference stakes shall be set at even fifty-foot (50') stations on tangents as shown on the Drawings. Horizontal curves shall be staked on even twenty-five-foot (25') stations. All grade breaks, PVCs, PVTs, low points and high points on vertical curves shall also be staked. A hub and tack shall be set at an offset distance of three feet (3') to the top back of curb. A lath will be set behind the hub and tack with the offset distance marked below the offset and the station marked on the back of the lath. The cut and fill will be to the top back-of-curb within five hundredths of a foot (0.05'). All radius points at curb returns will be staked and additional stakes set breaking up the arc of the curve between curb returns. If valley gutters are to be built, they shall be staked and referenced.

## **Article 2.9 Water Systems**

The Contractor shall stake in the field the alignment and grade for Work to be done under the Contract. Two (2) offset hubs and lath shall be set for each tee, hydrant, water service, valve, angle point, and grade break in the alignment. The lath shall identify the feature being staked and state the elevation of the hub, the offset distance to the center of the feature, and the station of the feature as shown on the Drawings. The offsets shall be set at a reasonable distance to protect them from disturbance.

The Contractor shall be responsible for, and pay all costs for, the transfer of the control points from the reference hubs to such hubs or batter boards as required for the prosecution of the Work. An original ground line profile directly above the water line shall be run prior to excavation. The ground line profile refers to the elevation of the ground directly above the centerline of pipe and the grade line refers to the elevation of the bottom of pipe, except where otherwise noted. The field notes shall record the profile, the hub elevations, offset of the hubs, and the station of the feature being staked.

## **Article 2.10 Sanitary Sewer Systems**

Line and grade for sanitary sewer pipe shall be given from a minimum of two reference hubs for each manhole, outfall, or cleanout. Guard stakes shall be provided for each hub showing the information necessary to construct the facility. The minimum information to be shown on the reference stakes and in the field book is as follows:

- centerline of pipe station.
- size and type of pipe.
- cut or fill from the hub to the invert at the end of the pipe.
- offset distance from the hub to the end of the pipe or center of the structure.

## **Article 2.11 Major Structures**

Construction survey procedures shall be reviewed by the Engineer prior to commencing any construction staking. The Engineer's review and approval of survey procedures is required prior to commencing construction activities for major structures including bridges, docks, piers, piling foundations, drainage control facilities and large buildings.

Horizontal and vertical control for the project shall be verified by the Contractor prior to any construction activity. The Contractor shall verify existing field elevations where planned foundations, pilings, piers, and support structures are to be placed prior to any construction activity. The Contractor shall verify depth of water and existing ocean or lake bottom elevations for all dock and pier construction prior to commencing pile driving and excavation activity. Contractor shall inform the Engineer immediately if any discrepancies are found between the Contract Documents and existing conditions.

## **Article 2.12 Miscellaneous Construction**

The Contractor shall provide sufficient stakes for adequate control of all structures and incidental construction not specifically covered above. A staking diagram with respect to centerline and measurements for pay quantities shall be maintained in the field notes. Other items such as horizontal and vertical control shall be shown in the field book and shall be governed by procedures established in previous articles of this Specification.

### **Article 2.13 Electronic Data Collection, Radial Surveys and Global Positioning Systems (GPS)**

Data gathered by electronic data collection by radial methods shall be submitted in AutoCAD drawing file format to be determined by the Engineer along with the digital submittals outlined below. The Contractor shall be guided by the following specifications:

- A. A standard field book shall be used to record the date of survey, weather conditions, instrumentation, data collector or GPS units used, crew, project description and sketches, listing of horizontal and vertical control points used and established, and other information needed to set up the reconstruction of the survey.

Project improvements may be identified in the field book by computed point number, station and offset, feature number or the corresponding letter reference used in the Drawings or other unique identifier. The references used for project features in the field book should be readily matched to the Drawings, and raw data or ascii coordinate files submitted with the project.

GPS static field notes shall include receiver/unit name, height readings in feet and meters, antenna type, local start and stop time, GDOP and satellite information. GPS RTK field notes shall include base station name, rover height, horizontal and vertical precision to control checks, local time and C.Q. readings for each point.

All survey point numbers assigned to control, computed positions for staking project improvements, excavation etc. will be noted in the field book with the associated raw data file (name). Radial survey field notes will include: code descriptors, horizontal circle information and vertical circle information based on zenith and slope distance expressed in feet.

- B. The Contractor will provide digital copies of all unedited raw data files from data collectors and GPS receivers used on the project. A sheet containing the explanation of the field descriptor codes used to identify the various shots shall be provided.
- C. The Contractor will prepare CD(s) or DVD(s) with electronic deliverables separated into ACAD, Monument Reports, Survey Field Notes and Raw Data folders. The folders will contain AutoCAD drawings, Monument of Record Forms (MORFs), scanned field notes, ascii point files, and raw data out put files generated by electronic data collection from Total Stations and Static or RTK GPS units. Ascii coordinates files will consist of the reduced and adjusted data represented by point number, northing, easting, station, offset left or right of centerline, elevation, and point descriptor.
- D. All cross-section data shall be submitted in an unedited points file in point, northing, easting, elevation, description (PNEZD) format so it can be independently run through a DTM program by the Engineer.

### **Article 2.14 As-built Surveys and Record Drawings**

As-built survey measurements shall be required for all constructed facilities and improvements to confirm the dimensions, lines, grades, locations, or materials that

deviate from the Drawings. Survey measurements shall be taken, field notes shall be kept, and accuracy shall be attained in accordance with this Division. As-built information shall be marked on a clean set of full-size paper copy Drawings and be submitted to the Engineer at the completion of construction activity. The Drawings shall be clearly stamped "Record Drawings." No final project payment will be made to the Contractor until the Record Drawings have been submitted to and approved by the Engineer.

The following abbreviations shall be used on the Record Drawings to denote a deviation from the Drawings:

ASB "As-Built" - The actual horizontal, vertical, dimension, or quantity measured by survey after it has been constructed.

F.C. "Field Change" - Revision or change of original design made in the field.

"DELETED" - Not constructed.

Minimum requirements for construction of Record Drawings:

- When paper copies are used for record Drawing purposes, As-built Work shall be marked in red ink or red pencil to clearly identify the changes to the original design. If the As-built record drawings are prepared and submitted in pdf format the work shall be marked in red.
- A straight line drawn through stationing, elevations, and notes shall show a change, deletion, or omission and shall be followed with the appropriate symbol.
- Storm sewer, water, sanitary sewer, gas lines, or any construction that has been deleted or relocated will be crosshatched.
- Crossed out information should still remain legible.
- The scale of new gas lines, water, sewer, or any new construction not shown should conform to the scale of the drawings.
- Reference information used to prepare Record Drawings, such as change orders, and field books, shall be noted on the drawings.
- Profile changes will be made with elevations or stationing only. The profile line need not be re-drawn unless the change is significant.
- As-builts for water, sewer, gas lines, and storm drain systems shall be accurate within five hundredths of a foot (0.05') vertically and one-half feet (0.5') horizontally. As-built Information shall be referenced to existing subdivision survey control and/or centerline of the right-of-way control.
- As-builts for structures shall be accurate to within one-half inch (1/2") vertically and horizontally.
- The name of the Record Drawing preparer, the employer, and the date of the preparation shall appear in the appropriate title block on each Record Drawing sheet.

The construction of Record Drawings is incidental to other Work and no measurement or payment shall be made.

### **Article 2.15 Final Acceptance Date**

As identified in Division 10, Section 5, Article 5.26 – Final Inspection, the Final Acceptance Date for the project is dependant on the review and approval of the Municipal Surveyor of the required Construction Survey related submittals including:

- Construction survey field books and/or scanned copies of field books
- Electronic field data and/or reduced GPS data output

### **Article 2.16 Measurement**

The measurement for surveying services shall be a lump sum cost item on the bid schedule. The lump sum cost for Construction Survey Measurement shall include all project control, project staking and quantities measurement for the following unit price items: clearing, clearing and grubbing, pavement removal, pavement rotomilling, pavement reclamation, road excavation, trench excavation, topsoil, seeding, and other areas of miscellaneous final surfacing applications such as asphalt, concrete, RAP, etc. which are measured in SF or SY unit measurements (example bid item: driveway reconstruction).

The measurement for Cross Sections shall be verified by the Engineer and/or Municipal Surveyor. Refer to Article 2.5, SubArticle C - Required Calculations and Submittals for requirements for approval of the pay item.

Measurement for bid schedule item “Two-Person Survey Crew”, will be the cost per hour for a two-person crew. The item, Two-Person Survey Crew, shall be used only for extra, additional, or unanticipated Work required for changes in the project as directed by the Engineer. Additional survey Work requiring one survey person shall be paid at forty-five percent (45%) of the bid amount per hour of a two-person crew. The item One-Person Survey Crew shall be used only for extra, additional, or unanticipated Work required for changes in the Project as directed by the Engineer.

Computer time is incidental to other Work and will not be measured. Certified payrolls and daily time records are required for all Work to be measured by the hour.

### **Article 2.17 Basis of Payment**

Payment for this item shall be in accordance with Division 10, Section 10.07 - Measurement and Payment and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Construction Survey Measurement	Lump Sum
Two-Person Survey Crew	Hour

The owner will withhold 25% of the Construction Survey Measurement Lump Sum payment until all survey submittals identified in this chapter have been received and accepted by the Municipal Surveyor. Survey submittal items subject to the 25% payment withholding are:

- Survey Field Notes (as described in Article 2.2)
- Party Chief’s Daily Diary (as described in Article 2.3)

- Survey Cross-Sections (as described in Article 2.5.C)
- Electronic Data Submittals (as described in Articles 2.13.B, 2.13.C & 2.13.D)
- As-built Surveys and Record Drawings (as described in Article 2.14)





**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 65  
CONSTRUCTION SURVEYS  
STANDARD DETAILS**

**STANDARD CONSTRUCTION SPECIFICATIONS  
DIVISION 65  
INDEX OF STANDARD DETAILS**

65-1	Field Book Index
65-2	Control Reference Points
65-3	Monument Recovery and Horizontal Control
65-4	Vertical Control
65-5	Clearing Limits
65-6	X-Sections/Slope Stakes
65-7	Grade Stakes/Blue Tops
65-8	Drainage Structures
65-9	Retaining Wall Structures
65-10	Storm Sewer Layout
65-11	Drainage Stakes
65-12	Curb and Gutter Stakes
65-13	Water Line Layout
65-14	Static GPS Horizontal Control
65-15	Static GPS Horizontal Control
65-16	RTK GPS Storm Drain Layout

2150 01

Description
Begin retracement & establishment of "P-line"
Complete "P-line" & determine falling at Reeve Blvd.
Tie property corners from "P-line"
Establish & Construction from "P-line"
" " " "
Slope stakes S.E. corner Third & Post
R.P. 20+00 & Nelchina, 26+50 & 31+0335
R.P.'s & S.I.'s
Luminaires
R.P. & S.I. 3rd & Post
Stake Load Center
Curb & Gutter Staking
Stake Load Center & Luminaires
J-Boxes, Post & Third, Concrete St. & Third grades
P.P. Elevations
Storm Drain MH
Before & after Ex X-S
As Built Curb
Curb & gutter Rt. Side 17+18 to Nelchina
Restake C&G on Nelchina St.
Curb & gutter 3rd Ave.
Curb & gutter Post Rd.

INDEX		
Page	Location	Date
2	Third Ave.	9-10-06
3-6	Third Ave.	9-11-06
7-12	Third Ave.	9-12-06
13-16	Third Ave.	9-13-06
17	Third Ave	9-14-06
18-20	" "	9-17-06
21-23	" "	9-18-06
24-27	" "	9-19-06
28-40	" "	10-1,10-2-06
41	" "	10-3-06
42	" "	10-4-06
43-50	" "	10-5-06
51-53	" "	10-6-06
54-55	" "	10-15-06
56	" "	10-22-06
57	" "	11-9-06
58-70	" "	7-23-07
71	" "	7-27-07
72-73	" "	7-30-07
74-75	" "	8-3-07
76-77	" "	8-3-07
78-79	" "	8-4-07

MUNICIPALITY



OF ANCHORAGE

SCALE:  
NTS

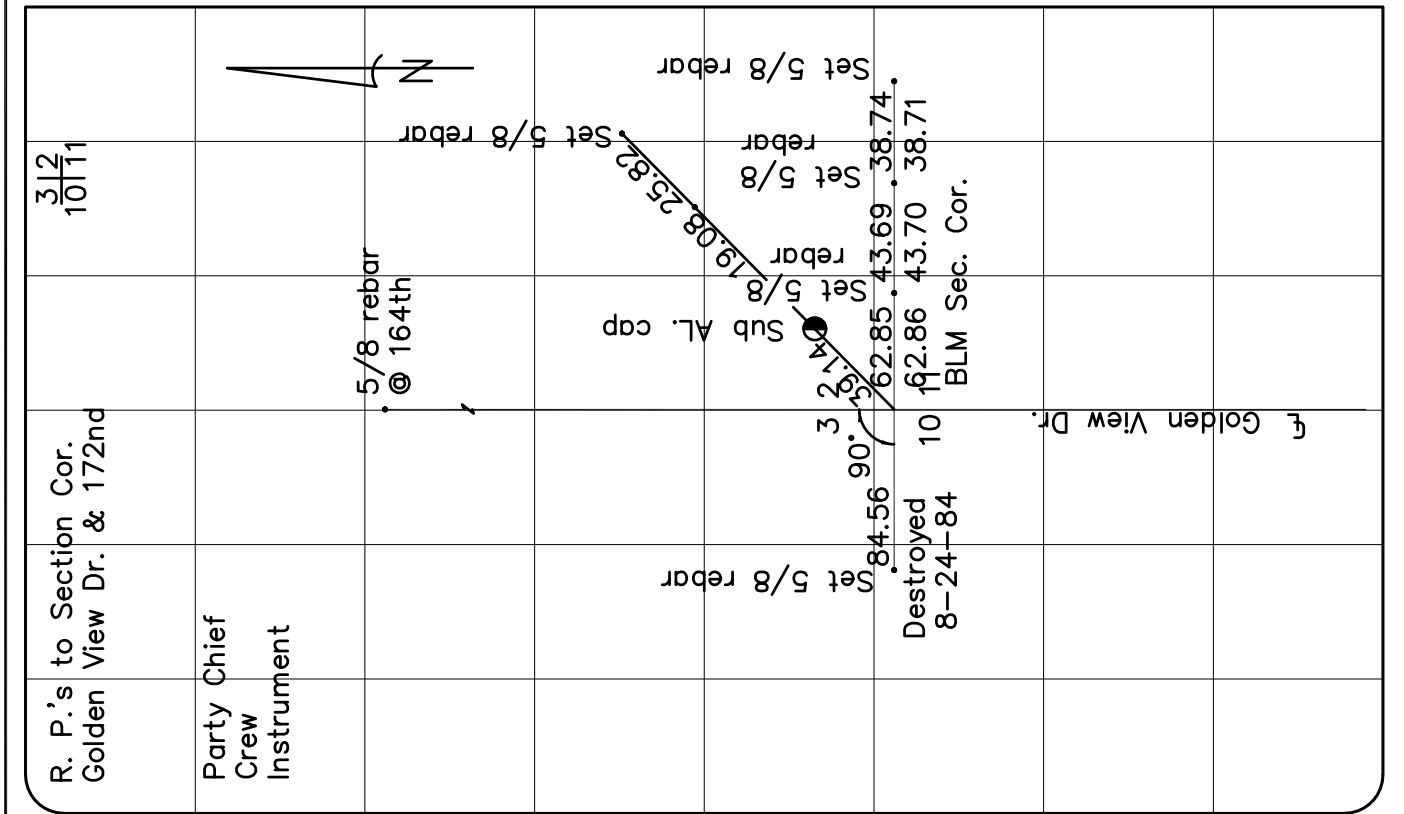
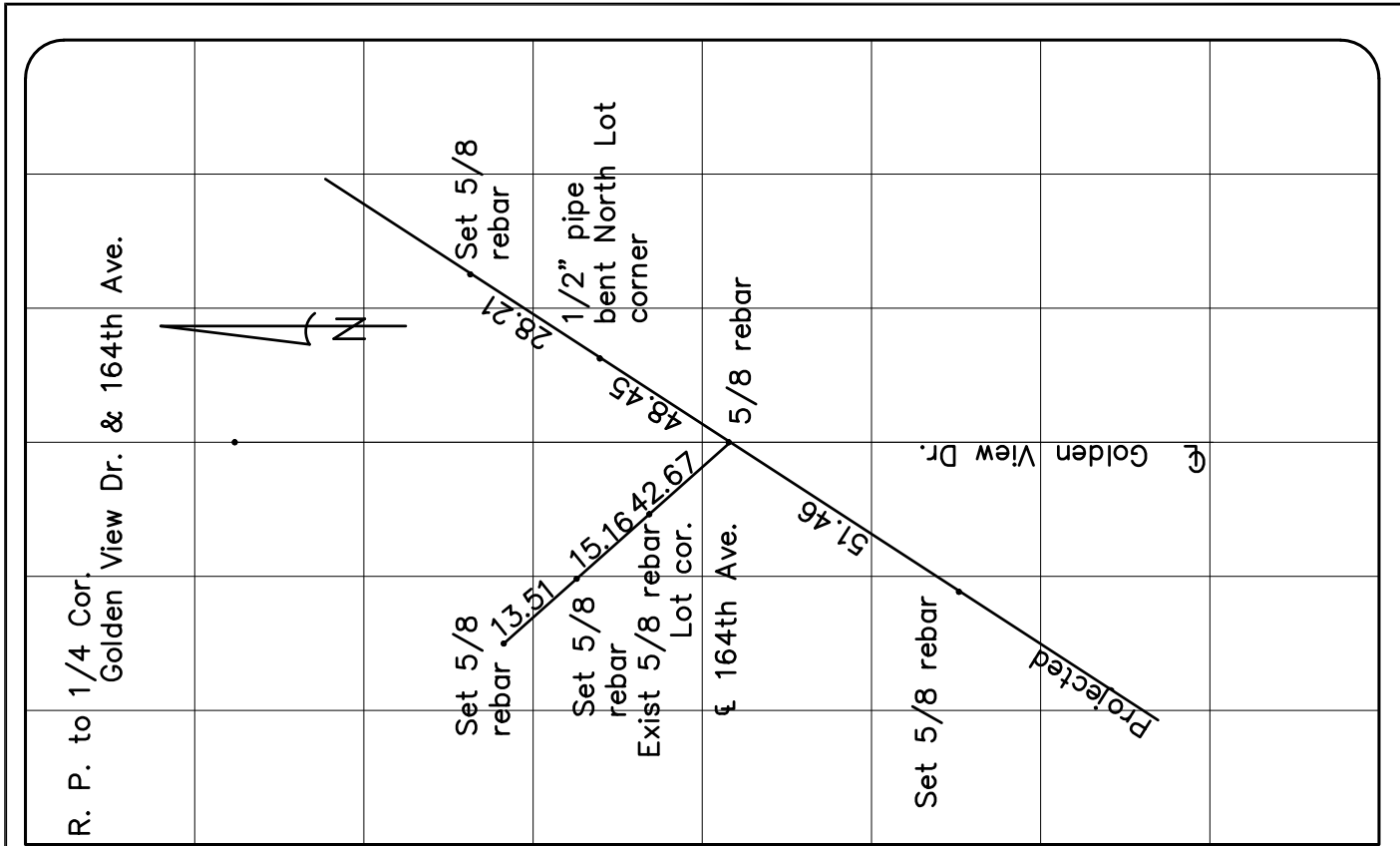
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10/07

# FIELD BOOK INDEX

SECTION #  
65.02

DETAIL #  
65-1



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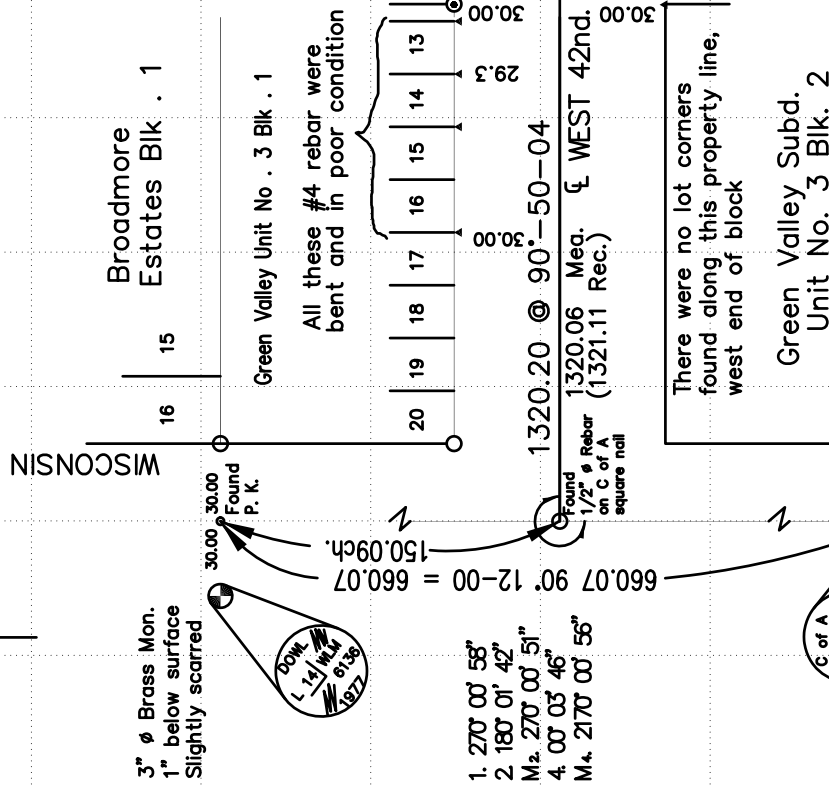
# CONTROL REFERENCE POINTS

SECTION #  
65.02

DETAIL #  
65-2

2058 52

West 42nd. Ave. (Place)  
 Horizontal Control  
 Nov. 13, 2020 Clear±30°F  
 Party Chief  
 Crew  
 Instrumentation



Broadmore Estates Add No. 2  
 P.O. 1972  
 3" # Brass mon. 02 above ground, good condition

Found C of A square nail resembles 1/8" # rebar

1555.78 Meg (1555.63 Rec.)  
 1555.79 @ 90°-13-26

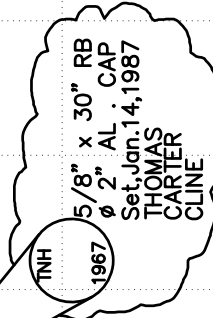
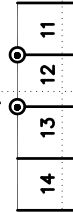


LEGEND:

- ▲ #4 Rebar
- ⊙ #5 Rebar

149.45 ch.  
 150.00 (Rec.)  
 1. 89° 57' 09"  
 2. 179° 44' 12"  
 M2. 89° 52' 06"  
 4. 359° 28' 08"  
 M4. 89° 52' 02"

Set P.K. nail by intersection



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REVISED: 10/23

MONUMENT RECOVERY AND HORIZONTAL CONTROL

SECTION # 65.02

DETAIL # 65-3

MUNICIPALITY



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# VERTICAL CONTROL

SECTION #  
65.02

DETAIL #  
65-4

TBM LOOP FOR 100th AVE. TOPO  
Note: We peg our level immediately  
before beginning this loop, check  
±0.0005 in 400'  
Wild NA<sup>2</sup> #502261

Sta	+	Hi	-	ELEV
TP	0.30	27 <del>68</del>	—	27 <del>38</del>
TP	3.21	39 <del>68</del>	12.30	36 <del>47</del>
TP	1.43	43 <del>98</del>	7.51	42 <del>55</del>
TP	1.74	57 <del>02</del>	14.47	55 <del>28</del>
TP	5.51	61 <del>96</del>	6.68	56 <del>45</del>
GAAB 39	4.20	66.40	9.95	62 <del>22</del>
TP	7.11	66 <del>37</del>	4.15	59 <del>26</del>
TP	3.79	61 <del>75</del>	2.49	57 <del>96</del>
TP	0.02	67 <del>00</del>	9.04	66 <del>98</del>
TP	0.23	77 <del>32</del>	10.34	77 <del>09</del>
TP	6.50	82 <del>90</del>	5.81	76 <del>40</del>
TNH15	5.03	81 <del>88</del>	5.48	

1/26/21

Clear 20°F  
Party Chief  
Crew  
Instrument

TBM DESCRIPTION

<62.20> Fnd. BC Mo@ A&W Root Beer Bldg

<76.85> Fnd. BC@ Dimond H.S. as per MOA BM  
Book Pg. 213

2058 52

2026 04

5/29/20  
Sunny 60°F  
Party Chief  
Crew  
RT & Prism  
100' Rag Tape

45+00 20<sup>0</sup> 20<sup>0</sup>  
46+00 20<sup>0</sup> 20<sup>0</sup>  
47+00 20<sup>0</sup> 20<sup>0</sup>  
48+00 20<sup>0</sup> 20<sup>0</sup>  
49+00 20<sup>0</sup> 20<sup>0</sup>  
50+00 20<sup>0</sup> 20<sup>0</sup>  
50+50 20<sup>0</sup> 20<sup>0</sup>  
51+00 20<sup>0</sup> 20<sup>0</sup>  
52+00 20<sup>0</sup> 20<sup>0</sup>  
52+50 20<sup>0</sup> 20<sup>0</sup>  
52+70 20<sup>0</sup> 20<sup>0</sup>  
End Exc.

UNIVERSITY DRIVE  
STAKE EXCAVATION LIMITS

EXCAVATION LIMITS (FROM  $\phi$ )

Station	Lt	Rt.
34+78	30 <sup>0</sup>	30 <sup>0</sup>
Begin Exc.		
35+35	29 <sup>2</sup>	39 <sup>0</sup>
36+00	29 <sup>1</sup>	34 <sup>8</sup>
36+50	28 <sup>7</sup>	27 <sup>0</sup>
37+00	58 <sup>2</sup>	27 <sup>0</sup>
37+50	57 <sup>9</sup>	27 <sup>0</sup>
38+00	27 <sup>5</sup>	27 <sup>0</sup>
38+50	27 <sup>9</sup>	-
38+63.2	-	30 <sup>8</sup>
39+00	27 <sup>0</sup>	27 <sup>0</sup>
39+13.2	27 <sup>0</sup>	27 <sup>0</sup>
40+00	27 <sup>0</sup>	27 <sup>0</sup>
41+00	27 <sup>0</sup>	27 <sup>0</sup>
41+50	27 <sup>0</sup>	27 <sup>0</sup>
42+00	25 <sup>6</sup>	25 <sup>6</sup>
43+00	22 <sup>8</sup>	22 <sup>8</sup>
44+00	20 <sup>0</sup>	20 <sup>0</sup>
Station	Lt	Rt.

MUNICIPALITY



OF ANCHORAGE

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10/23

# CLEARING LIMITS

SECTION #  
65.02

DETAIL #  
65-5





MUNICIPALITY



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# GRADE STAKES/BLUE TOPS

SECTION #  
65.02

DETAIL #  
65-7

UNIVERSITY DRIVE  
BLUETOPS  
TOPTYPE II

5/24/20  
CLDY 50°

STA. + HI - ELEV. LT.

39+50

270       $\zeta$ Rd      RT. <sup>579</sup>  
142<sup>51</sup> ✓

39+13.2

No B.TOP  $\zeta$ Rd      C-1<sup>0</sup> FG  
<sup>566</sup>  
142<sup>64</sup> ✓

39+00

270       $\zeta$ Rd      No B.TOP

38+50

272       $\zeta$ Rd      No B.TOP

T.P.  $\zeta$ UNIV. 4.69 RT. 148.30 RT. 6.04 RT. 143.59  
at 38+00

143.61

Elev. from Pg. 11

38+00

272       $\zeta$ Rd      No B.TOP  
C-0<sup>4</sup> FG  
<sup>6 15</sup>  
143<sup>48</sup> ✓

37+50

149.63 RT.

270

2150 42

Party Chief  
Crew:  
Instrument

N12  
Philly Rod

2150 42

CULVERT STAKES Eagle River Rd.

Party Chief 5-13-90 55° Cldy  
 Crew: Instrument.

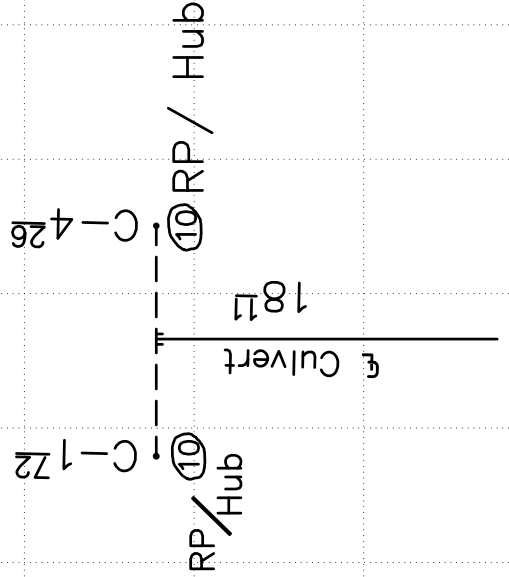
STA + HI - ELEV.

TBM 489.42 8.08 481.34 481.35 Rec.

8<sup>0</sup> 481.4 at outfall Exist. Ditch  
 9<sup>1</sup> 480.3 Bottom<sup>5</sup> Exist. Ditch

0+67<sup>5</sup> N RP (10)S 481.82 480.10 Inv Grade  
 2+03<sup>2</sup> E RP (10)N 5.06 484.36  
 489.42

N. Rim MH at NW cor. E. R. Rd & Wildwood  
 Page 65



MUNICIPALITY



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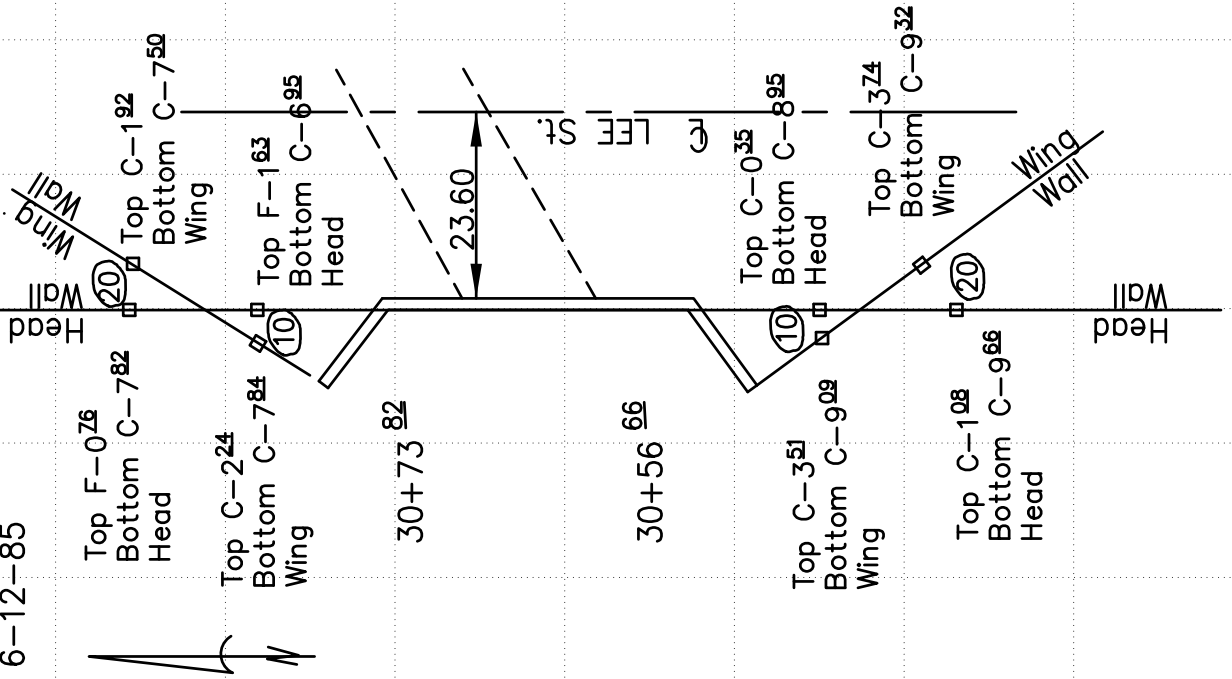
DRAINAGE STRUCTURES

SECTION #  
 65.02

DETAIL #  
 65-8

2150 42

60° F Cldy  
6-12-85



CONST STAKES for W. Headwall Lee St.

Party Chief Leica TS07

Crew Instrument

STA	HI	ELEV. GRADE	FINISH
N. Wing Wall	197.83	6.43	Top of Wall 181.40 Bottom of Footing 189.48
		6.11	Top of Wall 191.72 Bottom of Footing 183.90

Head Wall	197.83	6.11	Top of Wall 191.72 Bottom of Footing 192.48
30+73		6.98	Top of Wall 190.83 Bottom of Footing 183.90

Head Wall	197.83	4.29	Top of Wall 193.56 Bottom of Footing 192.48
30+56		5.00	Top of Wall 192.83 Bottom of Footing 183.90

S. Wing Wall	197.83	4.61	Top of Wall 193.22 Bottom of Footing 189.48
		4.84	Top of Wall 192.99 Bottom of Footing 183.90

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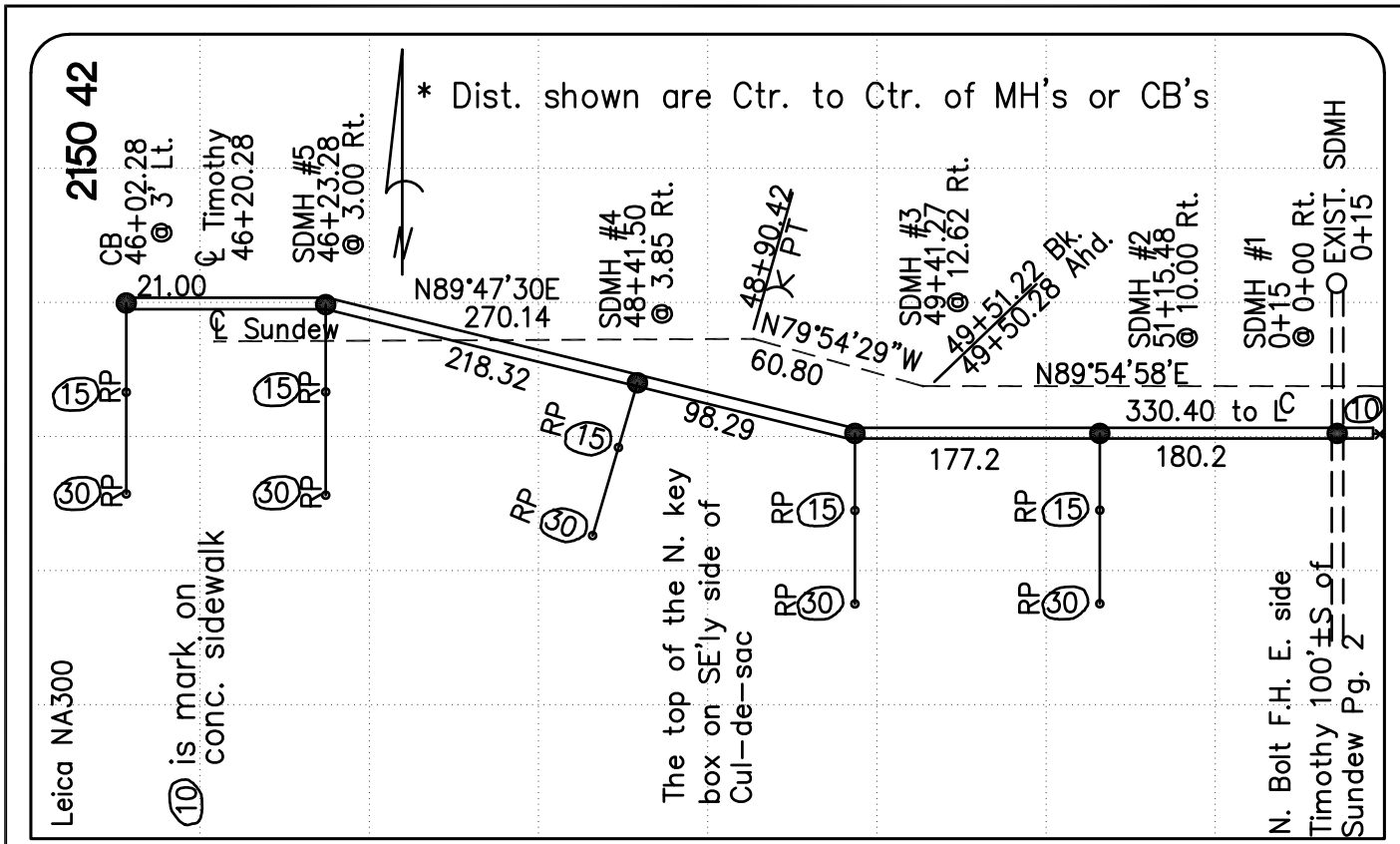
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REVISED:  
10/23

# RETAINING WALL STRUCTURES

SECTION #  
65.02

DETAIL #  
65-9



STAKE STORM SEWER SUNDEW CIRCLE	Sept. 2, 2020 Cldy 55: Party Chief Crew
0 + 15 SDMH #1	80.07
51+15.48 SDMH #2	81.10
49+41.27 SDMH #3	81.44
TP	81.30
48+41.50	77.52
46+23.28 SDMH #5	86.28
46+02.28 CB	85.08
TBM STA.	87.38
4.21 +	91.59 HI
3.62	84.92
10.29	81.30
14.07	77.52
14.15	77.44
5.31	86.28
5.46	81.13
6.51	85.08
5.49	86.10
4.85	80.07
4.82	81.10
6.65	78.27
3.48	81.44
6.36	78.56

 MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 10/23	STORM SEWER LAYOUT	SECTION # 65.02 DETAIL # 65-10
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3111 966

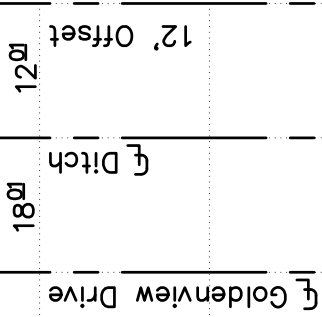
CONSTRUCTION STAKES

OPEN DITCH

Goldenview Dr. 164th to 162nd

Party Chief  
Crew  
Instrument

7-8-19  
Sunny 65°  
Leica NA300



20+00	670.61	3.32	667.29	661.53
27+50	670.61	4.10	666.51	662.20
27+00	670.61	4.45	661.16	662.87
TBM STA	2.07 +	670.61 HI	- -	668.54 ELEV. FINISH GRADE

C-576

C-431

C-329

Spike in PP A-256-A B9 page 7  
DESCRIPTION

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DRAINAGE STAKES

SECTION #  
65.02

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65-11

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# CURB AND GUTTER STAKES

SECTION #  
65.02

DETAIL #  
65-12

## CURB & GUTTER STAKES SUNDEW CIRCLE

LEFT

☒

46+80  
85.36TC

$\frac{6.69}{18'}$

84.79F - 0.5Z

46+60PUC

$\frac{5.69}{18'}$

85.79C - 0.07

BEGIN C&G  
46+56.78  
85.77TC

$\frac{5.77}{18'}$

85.71F - 0.06

Note: Hub/Tack set 0'3" offset to TBC.

TBM  
STA +4.10 +

91.48  
RT.

-

8738 N. Bolt  
ELEV. MOA FB

Party Chief  
Instrm.  
Crew

NA300

RIGHT

$\frac{7.56}{18'}$

83.92F - 1.44

$\frac{7.38}{18'}$

84.10F - 1.62

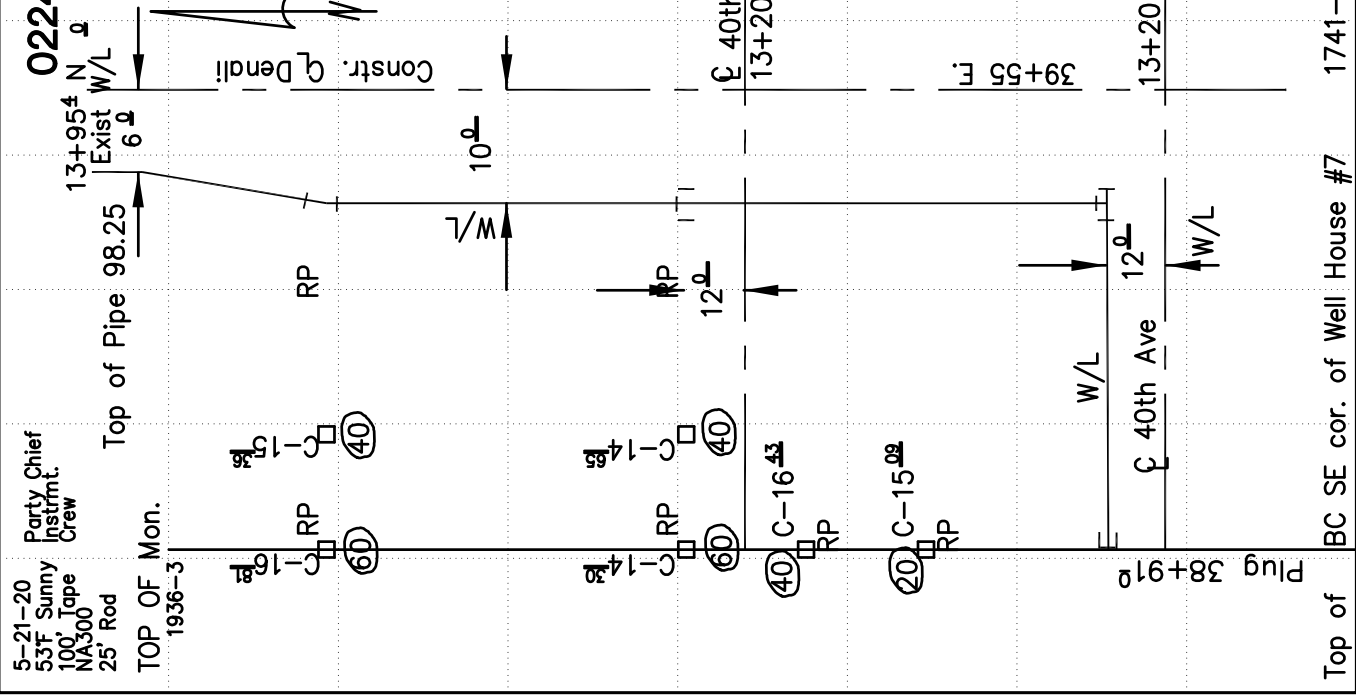
$\frac{7.26}{18'}$

84.72F - 1.55

F.M. E Side Timothy - 100' of Sundew Cir  
1985-4

2179 014

0224 067



CONST. STAKES W/L @ 40th & Denali	114.28	4.81	109.47	109.48
		60		
		3.47	110.81	
22'30' Bend		40		
13+77.4 N	114.28	4.92	109.36	94.00
12 x 16 Tee		60	108.30	BOP
39+45 E		5.98		
13+32 N	114.28	5.63	108.65	94.00
38+91 <sup>0</sup> Plug		40	109.98	BOP
		4.30		
	114.28	5.64	108.64	93.55
STA	1.32	114.28	112.96	FINISH GRADE
	+	HI	ELEV.	
		-		



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APPROVED:  
REVISED: 10/23

# WATER LINE LAYOUT

SECTION # 65.02  
DETAIL # 65-13

MUNICIPALITY



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# STATIC GPS HORIZONTAL CONTROL

SECTION #  
65.02

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65-14

West 32nd. Ave. Storm Drain  
Upgrades PM&E 00-13

Horizontal Control  
Static GPS Observations

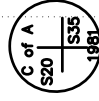
Point	RCVR/UNIT	HI:	START:	STOP:	FILE#:
15	TRIUMPH #546	5.58F (1.700m)	3:15PM ADT	5:40PM	05270515a
16	TRIUMPH #527	5.29F (1.612m)	3:50PM ADT	5:46PM	05460515a
101	TRIUMPH #527	5.29F (1.612m)	3:50PM ADT	5:46PM	05460515a

2058 52

Month Day, 2021  
Clear ±30°F  
Party Chief  
Crew  
Instrument



Cap Detail



Point

15  
Found 3" ø Brass Mon.  
1" below surface  
Slightly scarred

16  
Found 3 1/4" B. C.  
0.25 Below Asphalt 6"  
I. D. Case  
GOOD CONDITION

101  
Set 8in Spike 0.11' Below Cnd.  
Located on the NE shoulder of Virgo  
Ave in the NE cor of the int. of Virgo  
Ave and Woodridge Dr. and 37.0' east  
of "Yield" sign post on West side of  
the int. of Virgo Ave. and Woodridge  
Dr.

See page 50 of this book for Static  
GPS control sketch.



REVISION: 12/12 NEW

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REVISED:  
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# STATIC GPS HORIZONTAL CONTROL

SECTION #  
65.02

DETAIL #  
65-15

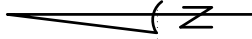
75TH Avenue— Rovenna Wade  
PM&E No. 10-20

Horizontal Control  
Static GPS Observations

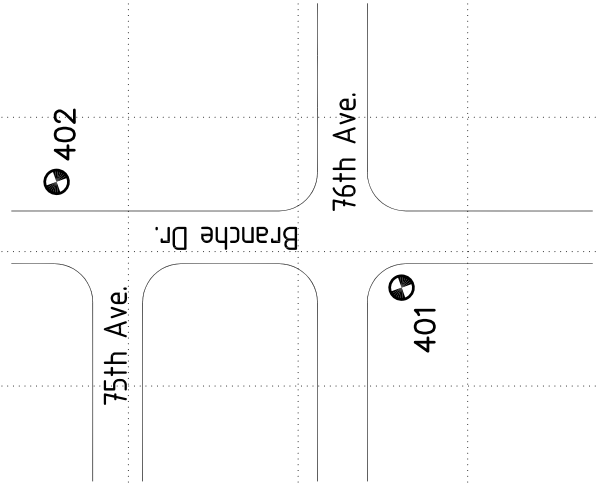
Point	UNIT	HT	ANT O/S	LOCAL TIME
401	STS55A-10	1.293M 4.245F	AX01206G 0.360M	16:17 16:32
402	STS55A-11	3.675M 1.117F	AX01206G 0.360M	16:17 16:32

2058 53

Month, Day, 2019  
Clear±30°F  
Party Chief  
Crew  
Instrument



Point	Description
401	Set mag nail 5' north of stop sign 15' SW of a LP, 1' E of the W. curb
402	Set mag nail 10' W. of a trash bin, 30' NE of the SI of Branche & 75th, 6' W. of EP



REVISION: 12/12 NEW

MUNICIPALITY



OF ANCHORAGE

SCALE:  
NTS

APPROVED:

REVISED:  
10/23

# RTK GPS STORM DRAIN LAYOUT

SECTION #  
65.02

DETAIL #  
65-16

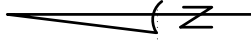
75TH Avenue— Rovenna Wade  
PM&E No. 10-20

RTK GPS Observations

Point	UNIT	HT	ANT O/S	LOCAL TIME	CQ
716	RTK ROV 13	6.562	AX1230 99	10:32	0 AVG
717				10:45	0 AVG
714				11:30	0 AVG
1000				12:45	0.08
1001				12:48	0.08
1002				12:49	0.07
1003				12:50	0.08
1004				12:51	0.084
1005				12:52	0.088

2058 55

Month Day, 2023  
Clear±30°F  
Party Chief  
Crew  
Instrument



Description

- Chk to Fnd. Rb w/ypc in moncase SI E & 5th
- Chk to Fnd. 2-1/2" BC Mon in Case SI C & 5th
- Chk to rb w/ypc in mon case SI E & 6th
- Sta 61+08.35 16.5 RT ⑨ 10, 25 SET HUBS
- Sta 60+93.55 22.03 RT E9-1 (EXISTING)
- Sta 60+60.56 32.05 RT 19-2, RP HUBS SET ⑩ 10RT, 20RT
- Sta 60+38.84 17.38 RT M9-2 RP HUBS SET ⑩ 15RT, 30RT
- Sta 59+08.16 16.55 RT M9-3, RP HUBS SET ⑩ 20RT, 40RT
- Sta 59+0815 17.38 RT S-11, RP HUBS SET ⑩ 10RT, 20RT

NOTE: HORIZONTAL COMPONENTS OF MANY PROPOSED FEATURES MAY BE STAKED USING RTK GPS TECHNIQUES. VERTICAL COMPONENTS MUST BE STAKED USING CONVENTIONAL TOTAL STATION OR DIFFERENTIAL LEVELING METHODS.

**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 70  
MISCELLANEOUS**



**STANDARD CONSTRUCTION SPECIFICATIONS  
MISCELLANEOUS  
DIVISION 70  
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**STANDARD CONSTRUCTION SPECIFICATIONS  
MISCELLANEOUS  
DIVISION 70**

**SECTION 70.01 GENERAL**

**Article 1.1 Scope of Work**

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, materials, transportation, handling and storage, and performing all operations in connection with the adjustment and/or construction of miscellaneous facilities as provided in this Division.

## **SECTION 70.02 ADJUST GAS VALVE KEY BOX TO FINISH GRADE**

### **Article 2.1 General**

The Work under this Section consists of providing all operations pertaining to adjustment of existing gas valve key boxes to finish grade. The Contractor must contact ENSTAR's Distribution Department prior to starting any Work that includes or is adjacent to the gas valve key box.

### **Article 2.2 Material**

ENSTAR will furnish all materials to adjust gas valve key boxes to finish grade.

### **Article 2.3 Construction**

The Contractor shall adjust gas valve key boxes in accordance with the applicable Standard Details, unless otherwise directed by the Engineer. Any damage to gas valve key boxes resulting from construction under this Contract shall be repaired or the damaged portion replaced at the Contractor's expense. All gas valve key box adjustments will be accomplished as requested by the Engineer. The Contractor shall be responsible for ensuring that the gas valve key box is vertical, clean, to proper grade, and readily accessible for operation of the valve.

Contractor shall adjust the service key box to finish grade prior to placement of asphalt pavement. After-the-fact cutting of new asphalt for adjustments is not accepted. Any adjustment(s) requiring cutting of new asphalt shall not be paid and shall be deducted from the plan quantity.

### **Article 2.4 Measurement**

Adjustment of gas valve key boxes will be measured per unit, complete in place.

### **Article 2.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Adjust Gas Valve Key Box to Finish Grade	Each



## **SECTION 70.03 ADJUST GAS VALVE MANHOLE TO FINISH GRADE**

### **Article 3.1 General**

The Work under this Section consists of providing all operations pertaining to adjustment of existing gas valve manholes to finish grade. The Contractor must contact ENSTAR's Distribution Department prior to starting any Work that includes or is adjacent to the gas valve manhole.

### **Article 3.2 Material**

ENSTAR will furnish all materials, except mortar, to adjust gas valve manholes to finish grade.

### **Article 3.3 Construction**

The Contractor shall adjust gas valve manholes in accordance with applicable Standard Detail, unless otherwise directed by the Engineer. Any damage to gas valve manholes resulting from construction under this Contract shall be repaired or the damaged portion replaced at the Contractor's expense. The Contractor shall be responsible for ensuring that the valve box is vertical, clean, to proper grade, and readily accessible for operation of the valve.

Contractor shall adjust the gas valve manhole to finish grade prior to placement of asphalt pavement. After-the-fact cutting of new asphalt for adjustments is not accepted. Any adjustment(s) requiring cutting of new asphalt shall not be paid and shall be deducted from the plan quantity.

### **Article 3.4 Measurement**

Adjustment of gas valve manholes will be measured per unit, complete in place.

### **Article 3.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Adjust Gas Valve Manhole to Finish Grade	Each

## **SECTION 70.04 ADJUST ELECTRIC/TELEPHONE MANHOLE**

### **Article 4.1 General**

The Work under this Section consists of providing all operations and materials required for the preparation and adjustment of electric/telephone manhole lids, frames, and rings to finish grade.

### **Article 4.2 Materials**

All concrete and cement used in the adjustment of electrical/telephone manholes shall conform to the requirements for manholes as specified in Division 55, Section 55.05 - Manholes and Catch Basin Manholes.

The Contractor may utilize Neenah Manhole Adjusting Rings P1979-077, Part No: 19790053, Catalog 1797-01, or an approved equal, for adjusting the electrical and telephone manhole to finish grade.

### **Article 4.3 Construction**

All manholes to be adjusted shall be inspected by the Contractor, the Engineer, and the applicable utility's representative to verify size, condition, and any necessary replacement of the existing lids. Inspection, replacement, and cost of lids will be considered incidental to the Contract and no separate payment shall be made. Manholes may be adjusted by installing grade rings and/or grouting. Manhole adjustment by grouting shall consist of bringing the manhole grade ring and lid to final grade, then grouting underneath the ring. The Contractor shall have an assortment of adjustment rings of various thicknesses on the project site to preclude after-the-fact asphalt cutting for adjustment.

After-the-fact cutting of new asphalt for adjustments will not be accepted; rings will be inventoried before authorization to pave is given. Any utility adjustments requiring cutting of new asphalt will not be paid and will be deducted from the plan quantity.

The Contractor shall contact the appropriate utility at least forty-eight (48) hours prior to beginning the overlay operation, and to schedule a representative of that utility to be on site to supervise the manhole adjustments to finish grade.

Prior to placement of any grade ring adjustment, the existing seat should be cleaned and all loose material shall be blown out or wire brushed to ensure a proper fit.

### **Article 4.4 Measurement**

Adjustments of electric/telephone manholes to finish grade shall be measured per unit, complete in place, and adjusted to the required grade.

### **Article 4.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Adjust Electric Manhole (Type)	Each
Adjust Telephone Manhole (Type)	Each

## **SECTION 70.05    ADJUST ELECTRICAL VAULT**

### **Article 5.1    General**

The Work under this Section consists of performing all operations pertaining to materials, equipment, and personnel required for the preparation and adjustment of a high voltage electrical vault to finish grade. The high voltage electrical vault is typically located within a sidewalk adjacent to a building or in an alleyway and is specifically located on the Drawings.

### **Article 5.2    Materials**

All Portland Cement Concrete utilized in the adjustment of the electrical vault shall conform to the requirements as specified in Division 55, Section 55.05 - Manholes and Catch Basin Manholes. The joint sealing compound utilized to seal the joint between the electrical vault's lid and walls shall be premolded plastic gasket or an approved equal.

### **Article 5.3    Construction**

No later than forty-eight (48) hours prior to commencement of Work on adjustment of the electrical vault, Contractor shall contact the Utility Line Superintendent of CEA. This vault contains energized high-voltage circuits and all Work in and immediately surrounding the vault shall be monitored and supervised by a Journeyman Power Lineman with a current State of Alaska Certificate of Fitness. The Contractor shall be responsible for protecting the Contractor's personnel and the general public from the open vault as well as from the hazardous high voltages present within the vault.

The electrical vault lid to be adjusted typically contains two manhole frames and covers and forms an integral part of the sidewalk, alleyway, or other finished surface. The vault lid shall match the final finish grade of the finished surface in which it is installed. Any proposed adjacent curb shall be in accordance with Standard Detail 30-1 as identified on the Drawings. To lower the vault lid, the Contractor shall remove a portion of the lid in order that the top of the vault lid match the proposed top back of curb elevation with a two percent (2%) transverse slope. The existing area of contact between the vault lid and vault walls is typically a rabbet joint and not a flat surface.

Prior to removal of the electrical vault lid, Contractor, Engineer, and an CEA representative shall inspect and verify the condition of the vault lid and vault structure. After verification of condition, Contractor shall submit a drawing detailing how the vault lid will be lowered. The drawing shall be approved in writing by CEA. The vault lid shall be adjusted by cutting and removing a portion of the vault lid. The vault lid shall be cut to match the existing vault wall rabbet joint. The rabbet joint shall be sealed to provide a watertight seal.

Prior to replacement of the vault lid, the vault lid and vault structure shall be inspected by Contractor, Engineer, and an CEA representative to verify adjustments. Any Work, personnel, and/or materials required to properly correct problems shall be at Contractor's expense. After CEA's written receipt of approval, Contractor shall reset the vault lid at the correct adjusted elevation and grade.

Contractor may propose an alternate adjustment method. This alternate method must be submitted to an CEA representative in writing. CEA shall have sole discretion on the

approval of the Contractor's proposed alternate method. If an alternate method is approved, no added or separate payment shall be made.

**Article 5.4 Measurement**

The method of measurement for all Work in this Section shall be a lump sum. The lump sum cost for adjusting the electrical vault to finish grade shall include all labor, materials, and equipment. The bid item shall include all required usable and unusable excavation, classified fill and backfill material, compaction, concrete cutting and removal, vault lid removal and replacement, traffic control, and required personnel.

**Article 5.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Adjust Electrical Vault	Each

## **SECTION 70.06    ADJUST UTILIDUCT LID**

### **Article 6.1    General**

The Work under this Section consists of all operations pertaining to the adjustment, either up or down, of an existing ACS/CEA concrete utiliduct lid as directed by the Engineer.

### **Article 6.2    Materials**

All Portland Concrete Cement utilized in the adjustment of the utiliduct lid shall conform to the requirements as specified in Division 55, Section 55.05 - Manholes and Catch Basin Manholes.

### **Article 6.3    Construction**

The utiliduct to be adjusted typically consists of a dual channel concrete structure with a structural concrete top/lid. Each utiliduct lid section is typically approximately five feet (5') in width and eight feet (8') in length. Prior to adjustment of the utiliduct lid, Contractor, Engineer, and a representative from both ACS and CEA shall inspect and verify the condition of the utiliduct lid and utiliduct structure. After verification of condition, Contractor shall utilize the method of adjustment in accordance to the Utiliduct Lid Adjustment Detail available from CEA. The utiliduct lid shall match the finished surface in which it is installed.

Contractor may submit an alternative method adjustment to the Engineer detailing how the utiliduct lid will be adjusted. The alternative method of adjustment shall not reduce the existing load rating of the utiliduct and utiliduct lid. The alternative method of adjustment of the utiliduct lid shall be designed, stamped, and signed by a registered professional engineer licensed by the State of Alaska. Contractor shall submit an ACS and CEA approved substitution request in accordance with Division 10, Section 10.05, Article 5.7 - Materials. All costs associated with preparing the design of an alternative utiliduct lid adjustment and obtaining the necessary utility approvals prior to submitting the substitution request shall be considered incidental to this item and no additional payment will be made.

No later than forty-eight (48) hours prior to commencement of Work on adjustment of the utiliduct, Contractor shall contact both the Outside Plant Construction Supervisor of ACS and the CEA Line Superintendent. The utiliduct contains telephone and energized high-voltage circuits. All Work in and immediately surrounding the utiliduct shall be monitored and supervised by a Journeyman Power Lineman with a current State of Alaska Certificate of Fitness. The Contractor shall be responsible for protecting Contractor's personnel and the general public from the open utiliduct, as well as the hazardous high-voltages and telephone lines present within the utiliduct. Should ACS's and/or CEA's cables be damaged, ACS and/or CEA will install new cables at Contractor's expense.

Contractor shall adjust the utiliduct lid to finish grade prior to placement of asphalt pavement. After-the-fact cutting of new asphalt for adjustment(s) will not be accepted. Any adjustment requiring cutting of new asphalt will not be paid and will be deducted from the plan quantity.

**Article 6.4 Measurement**

The method of measurement for all Work in this Section shall be measured in linear feet along the top face at the centerline of the utiliduct, complete in place, and adjusted to finish grade. The bid item shall include all required material, usable and unusable excavation, classified fill and backfill, compaction, Portland Concrete Cement, traffic control, required personnel, and equipment.

**Article 6.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Adjust Utiliduct Lid	Linear Feet

## **SECTION 70.07 REMOVE PIPE**

### **Article 7.1 General**

The Work under this Section consists of performing all operations pertaining to the removal and disposal or salvage of existing pipes (of whatever size of pipe encountered), when encountered in the excavation and/or as directed by the Engineer.

### **Article 7.2 Construction**

Contractor shall remove salvageable pipes and deliver the pipes to a location as directed by the Engineer. Contractor shall provide a disposal site for non-salvageable material in accordance with the provisions of Division 10, Section 10.04, Article 4.9 - Disposal Sites.

Excavation required in the removal of the pipes is incidental to this bid item. Contractor shall backfill the excavation with suitable, non-frost-susceptible materials and compact it to not less than ninety-five percent (95%) of maximum density as directed by the Engineer.

### **Article 7.3 Measurement**

Removal of pipes is measured per linear foot without regard to pipe size. Removal of electrical conduit of whatever size and type is incidental to the Contract, unless provided for elsewhere in the Contract.

### **Article 7.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Remove Pipe	Linear Foot



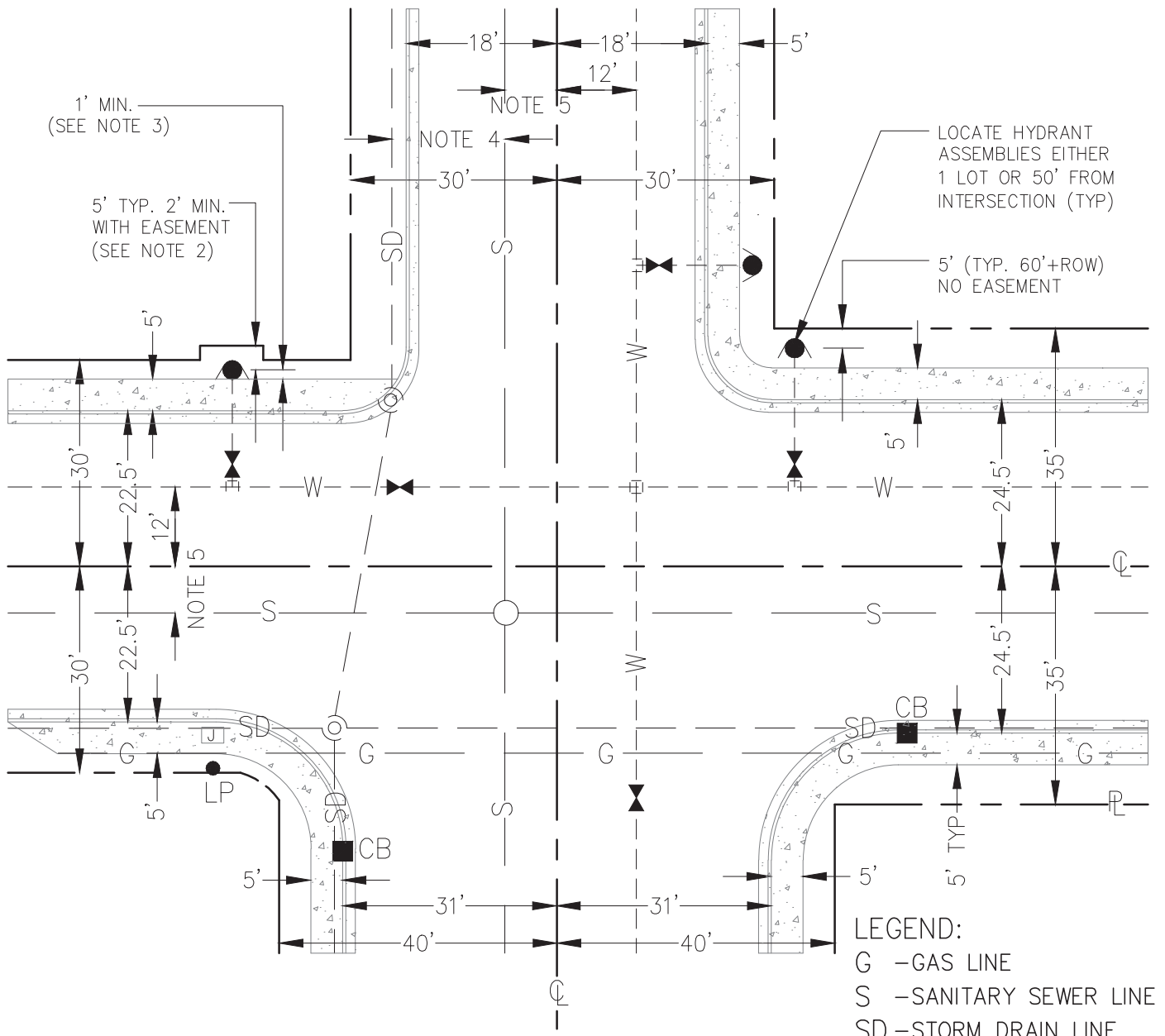


**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 70  
MISCELLANEOUS  
STANDARD DETAILS**

**STANDARD CONSTRUCTION SPECIFICATIONS  
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- 70-3 Typical Water and Sewer Locations
- 70-4 Adjustment for Gas Valve Key Box (1/4" thru 4")
- 70-5 Standard Method for Shoring Phone/Conduit ACS Approved Method and Procedure #86-1
- 70-6 MOA/PM&E Construction Sign Legs & Frames



**NOTE:**

1. OFFSETS ARE TO CENTER OF UTILITY.
2. ADDITIONAL RIGHT-OF-WAY/EASEMENT MAY BE REQUIRED TO MEET MINIMUM SET-BACKS FOR HYDRANTS.
3. SET HYDRANT A MINIMUM OF 5' FROM BACK OF CURB OR 1' FROM EDGE OF SIDEWALK.
4. MAINTAIN SEPARATION DISTANCES AS IDENTIFIED IN THE AWWU DESIGN AND CONSTRUCTION PRACTICES MANUAL, ADEC 18 AAC 72, AND 18 AAC 80.
5. LOCATE SANITARY SEWER BETWEEN 5' AND 6' FROM CENTERLINE. MANHOLE LIDS SHALL BE LOCATED IN THE CENTER OF A TRAVEL LANE. IF THERE IS A TWO-WAY CENTER TURN LANE, THE MANHOLE LIDS SHALL BE PLACED APPROXIMATELY ON THE LINE BETWEEN LANES.
6. ADA REQUIREMENTS SHALL GOVERN WHEN PLACING STORM DRAIN MANHOLE LIDS AND CATCH BASINS IN PEDESTRIAN FACILITIES.



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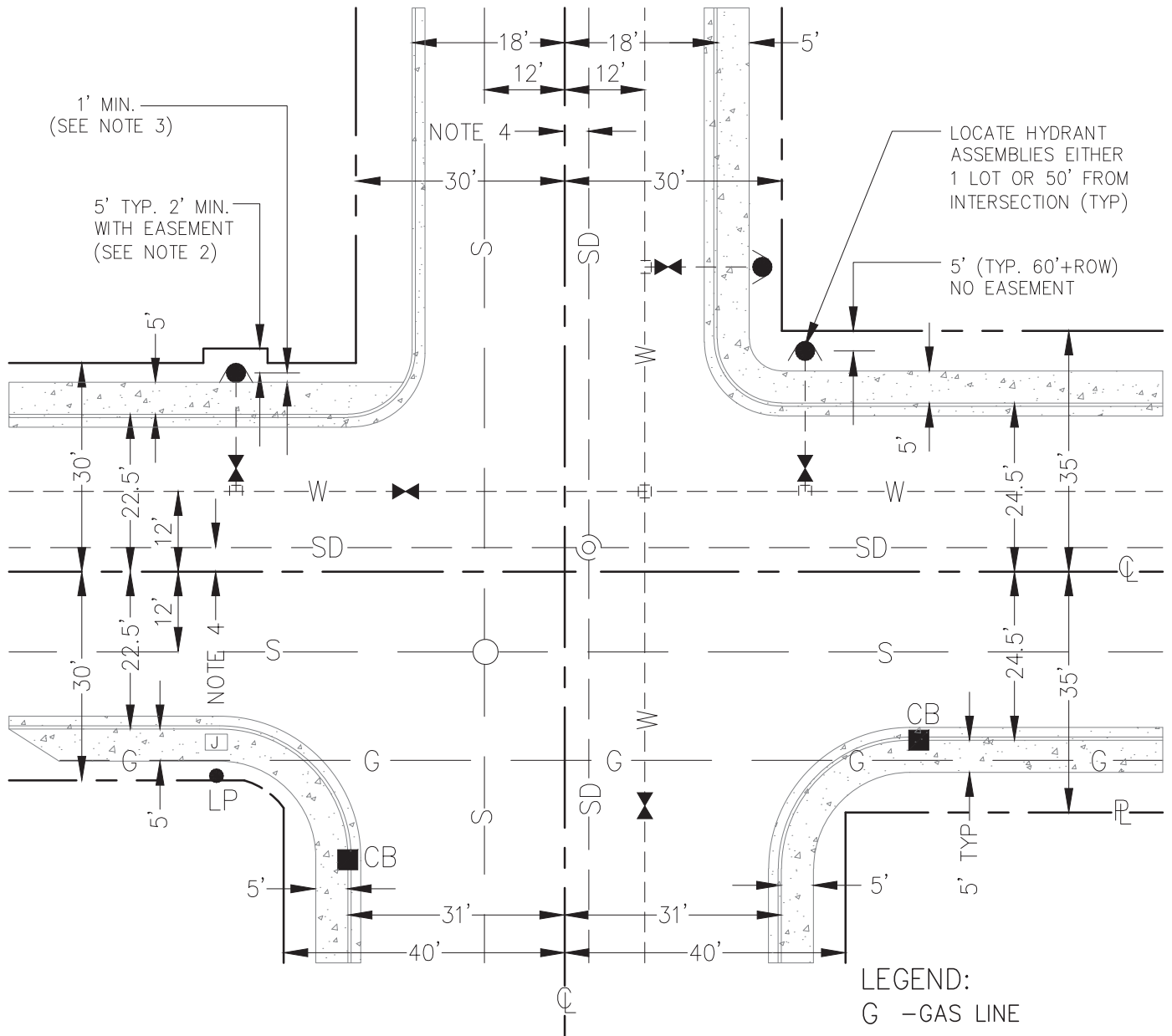
APPROVED:

REVISED:  
2/24

# STANDARD LOCATION FOR NEW UTILITIES

SECTION #  
DIV 50, 55,  
60 & 70

DETAIL #  
70-1



**NOTE:**

1. OFFSETS ARE TO CENTER OF UTILITY.
2. ADDITIONAL RIGHT-OF-WAY/EASEMENT MAY BE REQUIRED TO MEET MINIMUM SET-BACKS FOR HYDRANTS.
3. SET HYDRANT A MINIMUM OF 5' FROM BACK OF CURB OR 1' FROM EDGE OF SIDEWALK.
4. LOCATE UTILITIES TO MAINTAIN MINIMUM SEPARATIONS AS IDENTIFIED IN THE AWWU DESIGN AND CONSTRUCTION PRACTICES MANUAL, ADEC 18 AAC 72, AND 18 AAC 80.

MUNICIPALITY



OF ANCHORAGE

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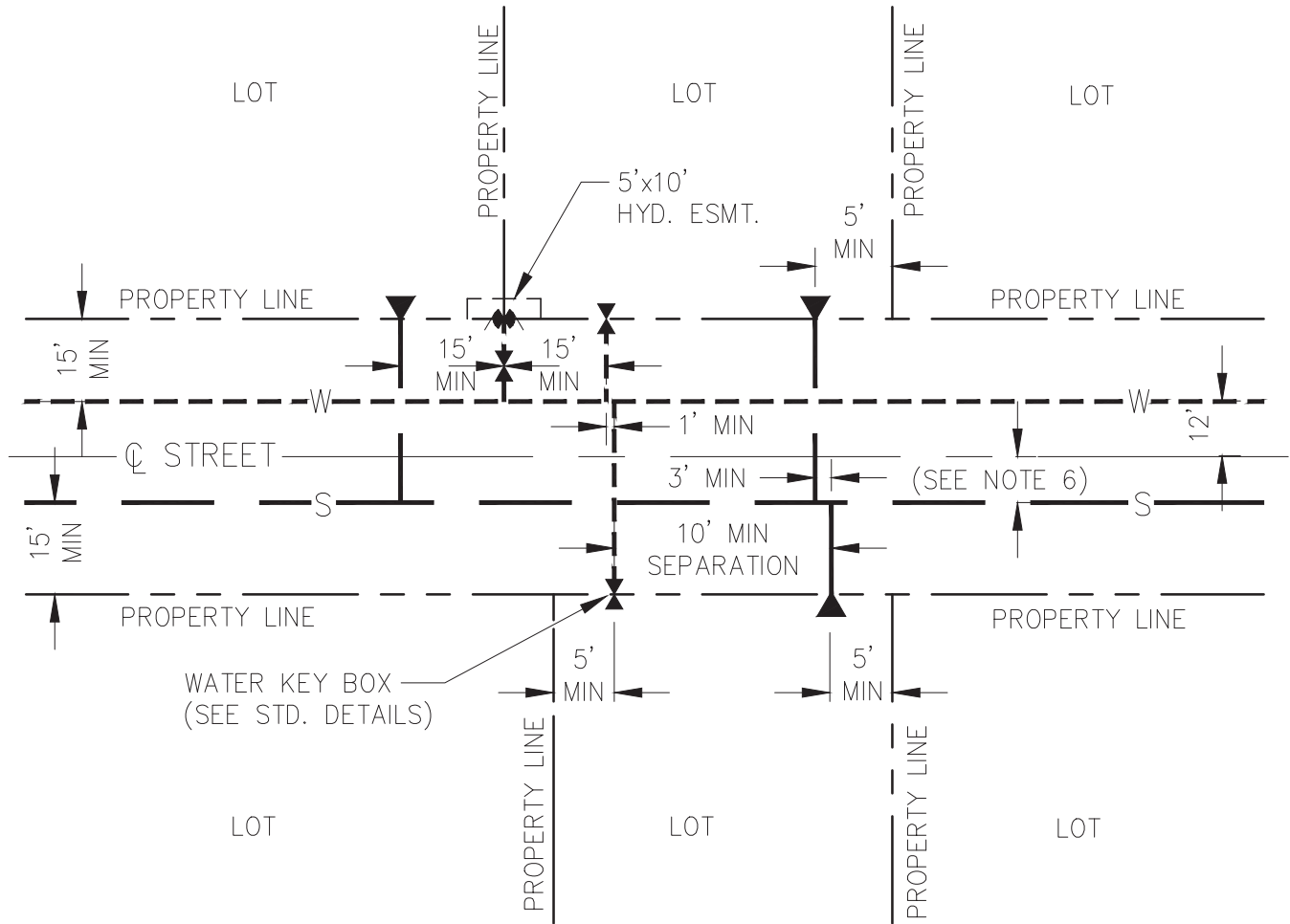
APPROVED:

REVISED:  
2/24

**LOCATION FOR EXISTING  
UTILITIES (APPROVAL REQUIRED  
FOR NEW UTILITIES)**

SECTION #  
DIV 50, 55,  
60 & 70

DETAIL #  
70-2



**NOTE:**

1. SANITARY SEWER SERVICE CONNECTIONS SHALL BE FIVE TO FIFTEEN FEET (5' TO 15') FROM PROPERTY CORNER, IN LOWER ONE-THIRD OF THE LOT TO BE SERVED.
2. WATER SERVICE CONNECTIONS SHALL BE A MINIMUM OF FIVE FEET (5') FROM PROPERTY CORNER OF THE LOT TO BE SERVED.
3. WATER AND SEWER SERVICES SHALL MAINTAIN A MINIMUM TEN FOOT (10') SEPARATION.
4. WATER AND SEWER SERVICES SHALL MAINTAIN A MINIMUM FIFTEEN FOOT (15') SEPARATION FROM FIRE HYDRANTS.
5. LOCATE WATER AND SANITARY SEWER SERVICE TO MAINTAIN A MINIMUM TEN FOOT (10') SEPARATION BETWEEN OUTSIDE OF PIPE AND STORM SEWER, CATCH BASINS, MANHOLES STREET LIGHTING, UTILITY POLES, UTILITY PEDESTALS, METER BASES AND TRANSFORMER PADS.
6. FOR STANDARD LOCATION AND SEPARATION FOR SANITARY SEWER, SEE NOTE 5 ON STANDARD DETAIL 70-1.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

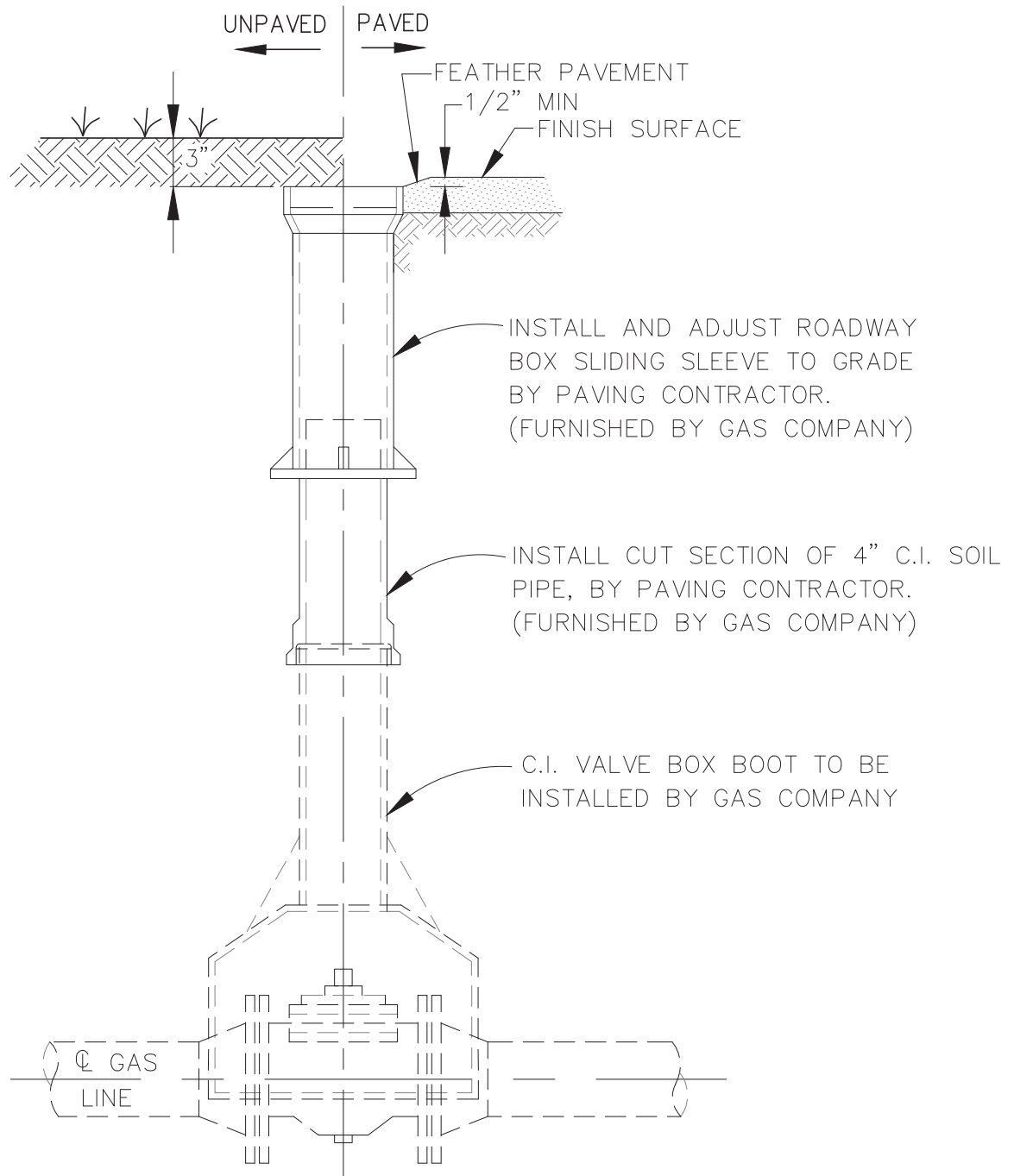
APPROVED:

REVISED:  
2/24

# TYPICAL WATER AND SEWER SERVICE LOCATIONS

SECTION #  
DIV 50, 55,  
60 & 70

DETAIL #  
70-3



MUNICIPALITY



OF ANCHORAGE

SCALE:  
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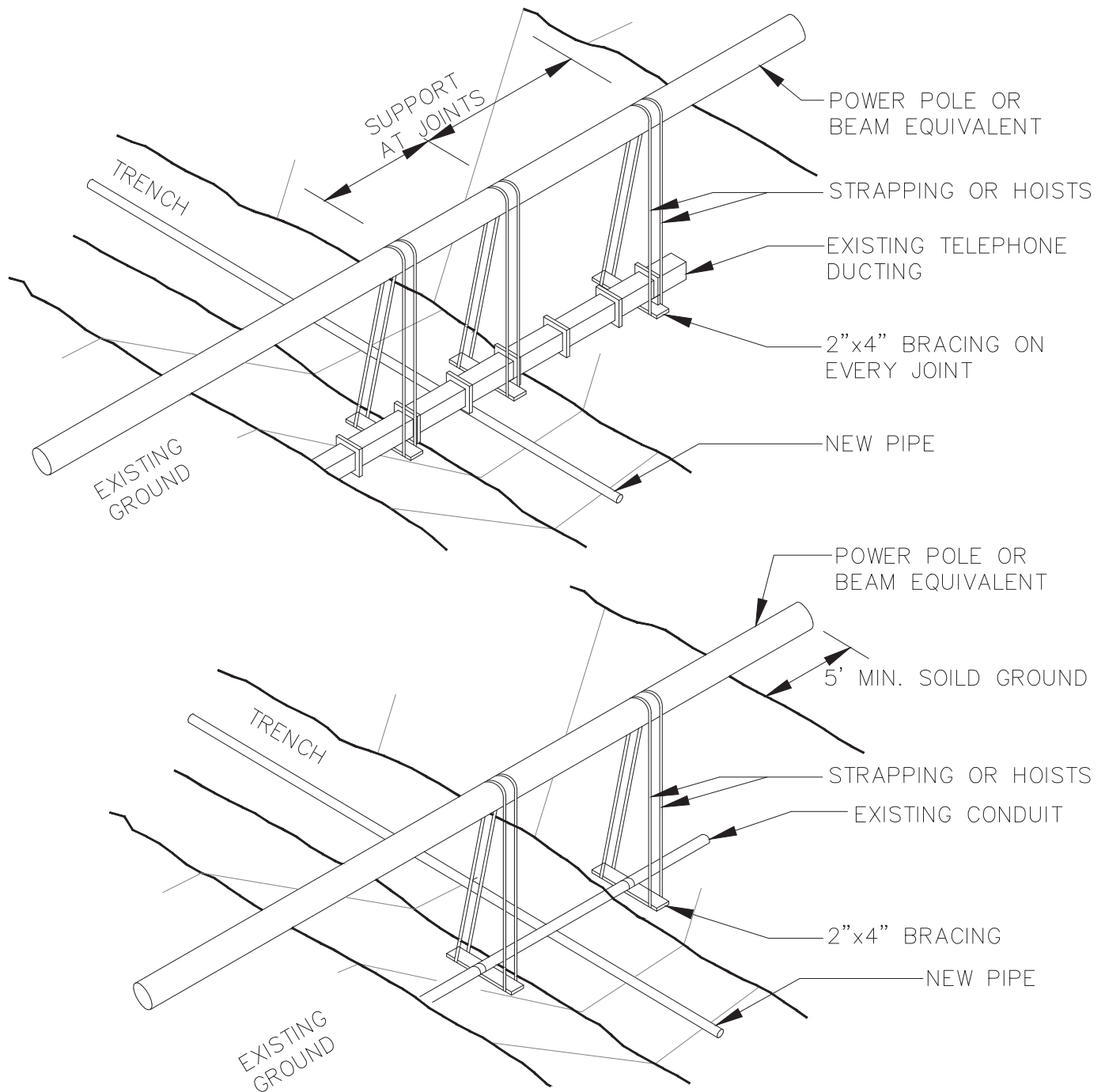
APPROVED:

REVISED:  
2/24

## ADJUSTMENT FOR GAS VALVE KEY BOX (1/4" thru 4")


SECTION #  
70.02

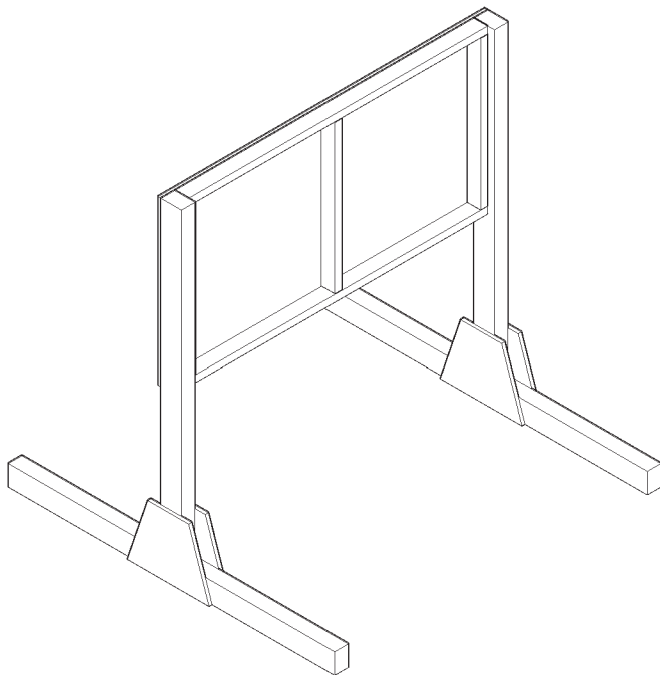
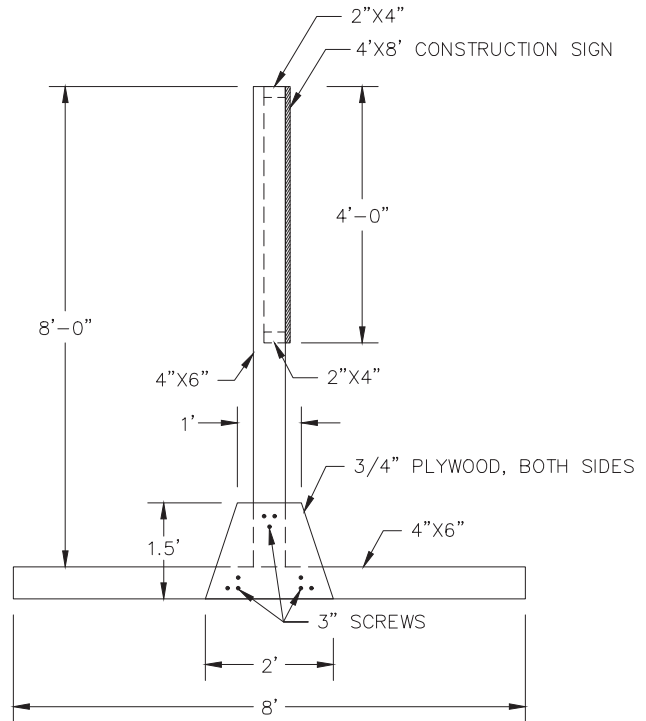
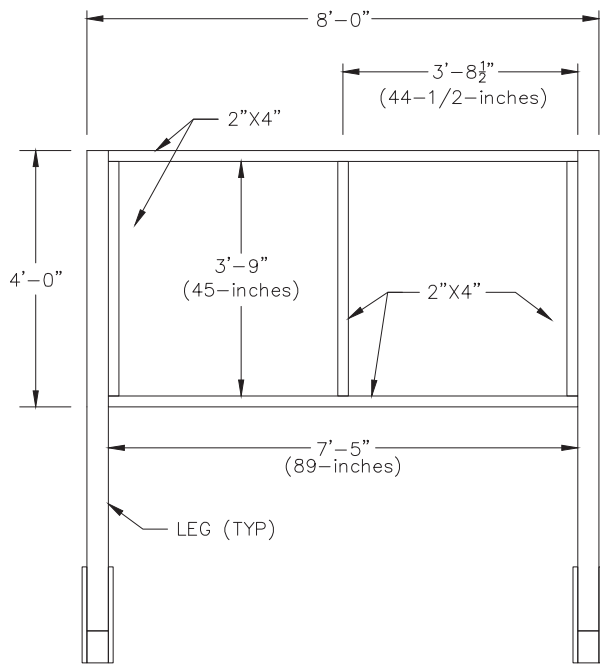
DETAIL #  
70-4



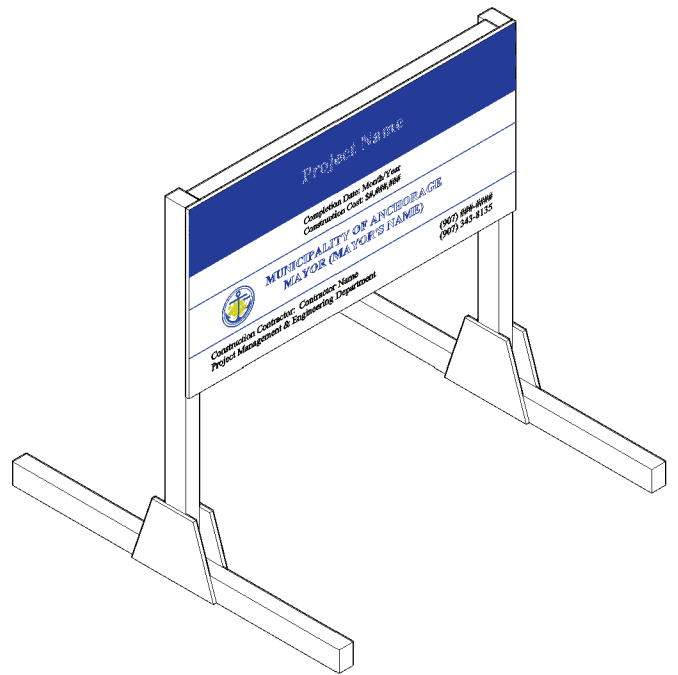
NOTE:

1. SUPPORT DUCTS WITH 2"x4" AND STRAPS AT JOINTS BEFORE EXCAVATING UNDER DUCTS.
2. PLACE AND COMPACT CLASSIFIED MATERIAL UNDER DUCT BANK UP TO WITHIN 18" OF DUCT. THE LAST 18" TO BE CONCRETE OR CONCRETE SLURRY.
3. DUCTS TO BE ENCASED IN 3" OF SAND (ON ALL SIDES).

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>STANDARD METHOD FOR SHORING (SUPPORTING) PHONE/CONDUIT A.C.S APPROVED METHOD AND PROCEDURES #86-1</b></p>	<p>SECTION # 70.04</p> <p>DETAIL # 70-5</p>
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BACK



FRONT



SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

# MOA/PM&E CONSTRUCTION SIGN LEGS & FRAMES DETAIL

SECTION #  
10.04

DETAIL #  
70-6



**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 75  
LANDSCAPING IMPROVEMENTS**



**STANDARD CONSTRUCTION SPECIFICATIONS  
LANDSCAPING IMPROVEMENTS  
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**STANDARD CONSTRUCTION SPECIFICATIONS FOR  
LANDSCAPING IMPROVEMENTS  
DIVISION 75**

**SECTION 75.01 GENERAL**

**Article 1.1 Scope of Work**

The Work covered by these Specifications consists of providing all plants, labor, equipment, supplies, material, transportation, handling and storage, and performing all operations in connection with the construction and maintenance of the landscaping improvements as provided for in this Division.

**Article 1.2 Payment - General**

Payment for all Work (including the Plant Establishment Period) included in this Division shall be paid for in accordance with the Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described.

## **SECTION 75.02 LANDSCAPING**

### **Article 2.1 General**

#### **A. Scope of Work**

The work under this Section consists of providing all operations pertaining to the planting and maintenance of trees, shrubs, ground cover, perennials, and annuals. The Work shall also include all operations pertaining to removing and replacing trees and protecting new and existing trees.

#### **B. Applicable Standards:**

All operations shall meet industry consensus on the planting and care operations and all plant materials used shall be true to name and size in conformity with the following standards:

*ANSI Standard A300 – American National Standards for Tree Care Operations – Tree, Shrub, and Other Woody Plant Management – Standard Practices.* American National Standards Institute, New York, New York, latest edition and parts.

*ANSI Z60.1 - American Standard for Nursery Stock,* American Nursery and Landscape Association, Washington, D.C., latest edition.

*ANSI Standard Z133 – Safety Requirements for Arboricultural Operations,* American National Standard for Tree Care Operations. American National Standards Institute, New York, New York.

*Landscape Plants for Alaska,* [www.alaskaplants.org](http://www.alaskaplants.org).

*Manual of Woody Landscape Plants,* Michael A. Dirr, Stipes Publishing, LLC, latest edition, Champaign, Illinois.

*New Sunset New Western Garden Book,* Lane Publishing Company, Menlo Park, California, latest edition.

#### **C. Definitions**

**Planting Areas:** The term "planting areas" or "planted and seeded areas" as used in this Specification, shall mean all areas to be planted with trees, shrubs, native plant materials, perennials, bulbs, annuals, willow staking, ground cover, sod, and/or seeded areas.

**Caliper:** The diameter of the stem or trunk of nursery stock, measured at a point 6 inches above the ground line if the resulting measurement is no more than 4 inches. If the resulting measurement is more than 4 inches, the measurement is made at a point 12 inches above the ground line.

**Central Leader:** Also referred to as "leader" or the "dominant leader." A dominant, typically upright, stem- usually the main trunk. There can be several leaders in one tree, however the central leader, if present, is a continuation of the main trunk located more or less in the center of the crown, beginning at the lowest main scaffold branch and extending to the top of the tree.

**Clump Form Tree:** Where three or more young trees have been planted in a group and have grown together as a single tree having three or more main stems or



trunks. They are distinguished from shrub-form trees by the manner in which the plant is maintained, in that foliage is generally removed from the lower portion of the plant.

Diameter Breast Height (DBH): The tree diameter at breast height. Breast height is defined as 4.5 feet above the ground.

Multi-stem Tree: Where three or more main stems arise from the ground from a single root crown or at a point just above the root crown. They are distinguished from single-stem trees by the manner in which the plant is maintained, in that foliage is generally removed from the lower portion of the plant. May alternatively be specified as "multi-trunk" trees."

#### D. Submittals

Submittals for this section include, but are not limited to, the following:

1. Plant sourcing report
2. Two pounds of proposed mulch
3. Maintenance Schedule
4. Watering Schedule
5. Water Bag/"Tree Diaper" Product Data
6. Soil testing results
7. Proof of fertilizer safety and acceptability by State, Federal, and Local jurisdictions
8. Proof of certification for fertilizer application
9. Mowing Schedule

### **Article 2.2 Materials**

#### A. Plant Materials

1. Plant Schedule

A complete schedule of plants, including common and Latin names, quantities, sizes, and other requirements, is shown on the Landscape Drawings. The Contractor shall furnish a report listing the proposed sources of the plants and location grown. In the event of plant count discrepancy between the Plant Schedule and the plants counted on the Drawings, the Drawings shall prevail. Discrepancies between the quantity shown on the Plant Schedule and those required by the Drawing shall not entitle the Contractor to claim any additional compensation, nor relieve them of the obligation to complete the Work shown on the Drawings.

No substitutes shall be accepted except with the written permission of the Engineer. The Contractor shall submit all substitution requests, noting the source of plants, location, size, and condition, within thirty (30) days of receiving the Notice to Proceed. Substitutes shall be inspected by the Engineer prior to installation.

Each plant species shall have a durable, legible label with plant size and

name (genus, species, variety, cultivar) securely attached when delivered and it shall remain in place until after acceptance. Labels shall not girdle or damage plants. Contractor shall remove labels from plant material following acceptance.

## 2. Plant Quality

### a. Species and Culture

All plants shall be true to species and variety specified, and in accordance with the American Standard for Nursery Stock and good horticultural practices.

Plants shall be so trained in development and appearance as to be compact and symmetrical. They shall be sound, healthy, vigorous, well-branched, and densely foliated when in leaf. Trees should be representative of their natural form. Plants shall be free of disease and insect adults, eggs, pupa, or larvae. They shall have healthy, well developed root systems, and shall be free from physical damage or other conditions that would inhibit growth.

All plant material shall be free of contamination by any plant not specified, including non-native invasive plants, seeds, and plant parts.

### b. Tree Trunk Specifications

Tree trunks shall be straight and well-tapered. Trees with multiple leaders, unless specified, will be rejected. Damaged, cut, or crooked leaders; included bark, bark abrasions, sunscald, disfiguring knots, mold, and prematurely opened buds, or cut limbs over three-quarter inch (3/4") diameter that are not completely callused are cause for rejection.

Trunk diameter and taper shall be sufficient so that tree remains vertical without support.

### c. Crown Configuration Specification

Crown ratio (distance from bottom of canopy to tree top/tree height) should be at least sixty-six percent (66%) of total tree height.

One-half (1/2) or more of the foliage should be on branches originating on the lower two-thirds (2/3) of the trunk, and one-half (1/2) or less should originate on the upper one third (1/3).

Where formal arrangements of consecutive order of trees are shown, select stock for uniform height, structure, and spread.

### d. Branch Specifications

All branches shall be less than two thirds (2/3) the diameter of the trunk measured one inch (1") above the branch.

The attachment of branches shall contain no bark inclusions.

There shall be one dominant leader straight to the top of the tree. Larger branches shall be spaced at least six inches (6") apart and arranged radially and vertically along the stem.

There shall be live buds or foliage to the ends of all twigs.

All pruning cuts shall comply with ANSI A300 Standards and shall be made outside the branch collar and branch bark ridge. Branches shall not be pruned immediately prior to delivery. Coniferous plants shall not have been sheared.

e. Root Flare and Root Ball Specifications

No root in the root ball larger than one-quarter inch (1/4") diameter shall circle more than one-third around the root ball. There shall be no roots in the root ball that make an abrupt turn of ninety degrees (90°) or more. There shall be no roots in the root ball that are 'J' roots, kinked, stem girdling, or potentially stem girdling. For all plants, including bare root, roots shall exhibit healthy, well-branched root systems characteristic of the species with adequate spread.

Roots in balled and burlapped root balls or in containers shall be well-rooted and uniform throughout soil mix or growth media. Roots shall not be pot bound.

Major roots shall be less than two inches (2") from the top of root flare. The root flare (trunk flare, root collar) shall be at the surface of the root ball (container media). As defined by ANSI Z60.1, root ball depth measurement is from the top of the ball, which in all cases shall begin at the root flare. Soil above the root flare shall not be included in ball depth measurement and should be removed.

Root ball size shall meet ANSI Z60.1.

Nursery Stock root balls shall be of sufficient depth to include absorbing roots. Balls shall be securely wrapped in burlap and tightly bound with rope or twine. Trees may have wire baskets lined with burlap and tightly bound with rope or twine. Balled and burlapped plants with manufactured balls or container plants that are dry, cracked, or broken before the plant operation will be rejected.

The Engineer reserves the right to inspect root system of trees and shrubs and to reject any material found to be non-compliant. This inspection may involve removing the burlap or the plant from the container to inspect the root system. Soil may need to be removed in order to inspect the quality of the root system.

3. Size and Grading Standards

Plants shall have a standard balance between height, crown spread, diameter, and root ball size according to the ANSI Z60.1. All plants shall be typical of their species or variety.

Plants shall conform to the measurements specified except that plants larger than those specified may be used, if approved by the Engineer. If larger plants are approved, the root ball, root spread, or container shall be increased in proportion to the size of the plant.

Caliper measurements shall be taken six inches (6") above the trunk flare for trees up to four inches (4") in caliper, and 12 inches (12") above the trunk flare for trees over four inches (4") in caliper. Plants shall be measured when branches are in their normal position. If a range of size is given, no plant shall be less than the minimum size, and no less than fifty percent (50%) of the plants shall be as large as the maximum size specified. Plants that meet measurements but do not possess a normal balance between height and spread shall be rejected.

Plants shall not be altered by pruning or other means to meet specifications.

#### 4. Plant Certification

All plants shall comply with State and Federal laws governing the shipping, selling, and handling of plant stock and inspection for plant diseases and pest infestations. Plants shall be certified free from disease and infestation and invasive weeds. Any inspection certificates required by law shall accompany each shipment invoiced or order of stock, and on arrival, the certificate shall be filed with the Engineer before acceptance.

#### 5. Delivery, Storage, and Handling

All plants shall be packed, transported, and handled with utmost care to ensure adequate protection against injury or damage to the root ball, and desiccation. Plants must be protected from excessive vibrations. Plants shall not be thrown or bounced off a truck or loader to the ground. Plants shall not be dragged, lifted, or pulled by the trunk or branches in a manner that will damage the branches or loosen the roots in the ball.

Plant material transported in vehicles shall be protected from wind whipping either by use of covered vehicle or secure tarps. Failure to protect plant material during transport to the site will result in rejection of plant material.

#### 6. Inspection

The Engineer shall make periodic inspections prior to and during the installation and maintenance periods of the Work. All plants shall be inspected upon delivery to the job site whereupon the Engineer has the right to reject unacceptable plant material. Should plant materials, installation procedures, or other conditions be observed not in keeping with the Drawings, Details, and these Specifications, the Engineer will direct the Contractor to correct by repair, and/or replacement as appropriate. The Engineer shall be the sole judge of the conditions of quality and acceptability and will direct all corrections in writing to the Contractor. All rejected materials shall be immediately removed from the site and replaced with specified materials at no additional cost to the Owner.

### B. Mulch

Mulch shall consist of wood chips, shredded bark mulch, or rock mulch as specified on the Drawings. Material shall be uniform in size, color, quality, and overall appearance. Mulch shall be free of material injurious to plant growth. Sources of mulch should be free of weeds and invasive plant parts or seeds. The

Contractor shall remove invasive plants and other weeds found in the mulch and soil for the duration of the project. Sawdust, dirt, garbage, or other debris mixed in the mulch is not acceptable. Contractor shall submit two pounds of proposed mulch for inspection by Engineer.

1. Wood Chips

Wood chips shall consist of wood products having a size of two and one-half inch (2-1/2") minus with a thickness not greater than three-eighths inch (3/8"). Wood chips shall be uniform in overall appearance, color, quality, and size and are subject to approval by the Engineer. Wood chips are to be free of sawdust, dirt, twigs, excessive bark, or any other debris. Wood chips from an arborist chipping operation with less than 20% by volume green leaves may be used.

2. Shredded Bark Mulch

Shredded bark mulch shall consist of shredded bark and wood. The size range of fine particles shall be 3/8 inch or less and a maximum size of individual pieces shall be approximately 1 to 1-1/2 inch in diameter and maximum length of approximately 4 to 8 inches. No more than 25% of the total volume shall be fine particles and no more than 20% of total volume shall be large pieces. Mulch shall be free of invasive weeds, seeds, or propagules. The bark mulch shall have the characteristics of retaining moisture, forming a mat not susceptible to spreading by wind or rain, and providing a good growth medium for plants. Shredded bark mulch may contain up to fifty percent (50%) shredded wood material. Bark mulch containing shredded wood shall be aged a minimum of one year prior to installation. Bark mulch shall be free of soil, rocks, and weeds.

3. Rock Mulch

Rock mulch shall be round or angular, washed, and uniform in size per Drawings. All fines shall be screened from the aggregate within a one-quarter inch (1/4") tolerance. The material shall be free of organic and inorganic debris and trash.

C. Anti-desiccants

Anti-desiccants shall consist of "Wilt-Pruf" or equal approved by the Engineer prior to procurement.

D. Planting Soil

Refer to Section 75.03, Article 3.2 - Materials.

E. Chemical or Biological Additives

Refer to Section 75.03, Article 3.2, Sub-article B - Soil Amendments.

F. Water

Water used for the planting, establishment, and all operations of maintenance shall be potable. The water shall be suitable for irrigation, free from substances harmful to plants. The Contractor shall supply a water source unless waived by written

authorization from the Engineer.

G. Wood Stakes and Ties

Deciduous Trees: Contractor shall provide minimum two (2) stakes that are six feet (6') in length and are two by two inches (2" x 2") around. Stakes shall be pointed at one end.

Coniferous Trees: Contractor shall provide minimum three (3) stakes that are twenty-four inches (24") in length and are two by two inches (2" x 2") around. Stakes shall be pointed at one end.

Ties: Ties shall be of three-quarter inch (3/4") or wider bands of polypropylene, elasticized or webbed strapping, or horticultural tape. Ties shall have a smooth surface and be flexible to allow some movement of the trunk without damaging the bark.

**Article 2.3 Construction**

A. Notification

Contractor shall notify Engineer at least 5 (five) working days prior to delivery of plant material to the site. Engineer shall inspect plant material prior to loading and prior to bringing to the project site unless other pre-approved arrangements have been made.

B. Planting Season

Planting shall occur when temperatures are above freezing, the ground is frost free, and the soil is in a workable condition. Unless otherwise specified in writing by the Engineer, planting shall be done between May 1 and October 1. Planting any other time will only be allowed upon written approval from the Engineer.

C. Layout and Coordination

The Contractor shall obtain a utility locate and ensure that utility marking is complete before any excavation begins. The Contractor shall locate any subsurface improvements such as irrigation system or conduits. The Contractor shall be responsible for all damage resulting from neglect or failure to comply with this requirement.

The Contractor shall mark all planting areas with stakes or paint. The Engineer shall approve the layout before planting begins. Contractor shall not stage planting operations on trails or sidewalks.

Shrubs and small trees with mature height less than fifteen feet (15') shall be planted at least ten feet (10') from overhead power lines. Trees with a mature height greater than fifteen feet (15') but less than twenty-five (25') shall be planted at least fifteen feet (15') from overhead power lines. Trees with a mature height greater than twenty-five feet (25') shall be planted at least twenty feet (20') from overhead power lines.

The Contractor shall be responsible for moving trees if planted closer than the specified distance. The Engineer reserves the right to relocate plant materials based on utility locations.

#### D. Protection of Existing Trees

Contractor shall protect existing trees that are not designated for removal on the Drawings. Contractor's arborist shall identify a Tree Protection Zone (TPZ), in which activities are restricted, around each existing tree that is not designated for removal on the Drawings. The TPZ shall be submitted and approved by the Engineer. The Contractor's arborist may increase the size of the TPZ based on the site or soil conditions and/or tree-specific needs that warrant greater protection. The TPZ shall measure as one foot of root area per one inch Diameter Breast Height (DBH), or as noted on the drawings. The TPZ shall be defined with fencing materials that prohibit disturbance, excavation, trenching material storage, including soil or grade changes. Refer to Section 75.14 for Tree Protection Zone Fence. The tree shall be protected to the TPZ. The Contractor shall not stage or store materials within the TPZ. Contractor shall ensure that all land disturbance, excavation, trenching and grade changes, directional boring, routing of utilities and irrigation systems, sidewalks, driveways, construction access roads, changes to street lighting, fire hydrants and utility boxes takes place outside of the TPZ. Do not permit vehicle or foot traffic within the TPZ and prevent all compaction over root systems.

Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations. Contractor shall thoroughly water exposed root systems and cover them with soil, mulch, or burlap until backfilled. Contractor shall ensure bark, branches, roots, and balls of plants are adequately protected at all times from damage, including sun, drying winds, and frost.

Contractor shall ensure tree branches, trunk, and roots of existing trees are protected during construction. Measures for protection may include effective barrier fencing, branch and/or root pruning, protective mulch, supplementary water, soil aeration and information signage. When a tree is damaged by the Contractor, but is deemed salvageable by the Engineer, the Contractor shall prune existing branches and roots in compliance with Section 75.13 Root Pruning and with the American National Standard (ANSI) A300, Part 1, *Standard Practices Pruning* and ANSI Z133.1, *Arboricultural Operations Safety*. No pruning paint or wound dressing shall be used.

Contractor shall replace trees damaged beyond repair with trees of equivalent value based on the *Guide for Plant Appraisal* (latest edition) as appraised by a qualified International Society of Arboriculture Certified Arborist, at no additional cost to the Owner. Contractor shall remove and dispose of damaged trees and shall install replacement trees in accordance with this Section. Payment for this Work is incidental to the Contract.

#### E. Existing Plant Relocation:

Existing plants designated for relocation as shown on the Drawings shall be dug according to the applicable standards for the plant type. Plants shall be dug, balled and burlapped, containerized, or dug bare root, moved, planted, watered, and mulched in accordance with specified planting requirements.

Plants subject to relocation may be stored in a designated plant storage area for heeling-in of materials until final planting areas are prepared. Contractor shall maintain plants in storage areas by bracing plants in vertical position and setting balls in an enclosed berm of topsoil or mulch. Contractor shall water as required to maintain adequate root moisture. Contractor shall re-burlap plant balls if required before final transplanting operations.

#### F. Setting and Planting

Contractor shall set balled and burlapped plants, which are not planted immediately upon delivery, on the ground and protect them with soil, moist organic, mulch or other acceptable material. Contractor shall protect plants from sun damage until they are planted. Contractor shall keep the soil in the containers and root balls in a moist condition.

Width of top of planting pit will be a minimum of three (3) times the diameter of the root ball at the surface sloping to two (2) times the diameter of the root ball at the depth of the root ball. The sides of the hole will be sloped at forty-five degrees (45°) and scarified. The depth of the planting pit will vary but shall match root ball depth. Root ball depth is measured from the trunk flare/root collar to the bottom of the root ball.

Plants shall be gently removed from containers before planting.

Each plant shall be planted straight and plumb per standard planting details. Trees shall be planted so that the root flare is at the soil surface of the ultimate finished grade. Plants planted lower than the surrounding grade shall be replanted to specified grade before final inspection/approval is granted.

Plants shall be set on firm soil (undisturbed or compacted) so that plant will be at the same depth one year after planting. Any repositioning of trees shall be done by supporting and moving the root ball, not lifting by the trunk. Plants shall be set with the top of the root flare at or slightly above finished grade. Any soil above the root flare must be carefully removed. The root flare shall be at the soil surface. At least two primary roots must emerge from the trunk within one to three inches (1" to 3") of the soil surface, measured four inches from the trunk.

Roots that are circling the bottom, sides or surface of the root ball shall be gently separated and directed away from the trunk. Roots of bare root plants shall be spread into a natural position, over a pedestal of firm soil if necessary, free of bunching, kinking or circling. Soil shall be worked firmly into and around the roots so that there are no air pockets. All broken or damaged roots shall be cut back to the point where they are clean and free of rot. No other root pruning shall be done.

After the plant has been set, all ropes, wire, stakes, burlap, plant labels and wrapping around the trunk or branches shall be removed.

Contractor shall remove wire baskets and burlap from the planting area. If a pulp nursery pot is used, it shall be removed from the planting area.

Staking is not recommended as a routine practice. Exceptions include very windy sites, areas where vandalism is expected, or when planting large bare root trees that could be subject to falling over. Roots must remain stationary but the trunk



shall be able to sway in the wind to develop trunk taper and strength. The Contractor shall remove staking and guying material no later than one (1) year after installation.

#### G. Backfilling Planting Pits and Planting Beds

Per Section 75.03 Planting Soil, topsoil shall be used for individual plantings and beds on sites where soil has been removed for and compacted by construction. In areas beyond the limits of excavation, tree and shrub plantings should be backfilled with native soil that has not been altered, compacted, or contaminated before or during construction operations. If modifications to the native soil are necessary to achieve sufficient soil volume after removal of thatch and non-soil debris (including rocks over 6" diameter) from the excavated planting pit, blend the soils to minimize soil stratification.

When holes are approximately two-thirds (2/3) full, soil shall be thoroughly watered to eliminate air pockets. Planting pits and beds shall be backfilled carefully as specified to fill all voids and to avoid breaking rootball or bruising roots. If settling of the backfill occurs after watering, add more backfill to bring to finish grade.

#### H. Tree Plantings

A continuous three-inch height (3") temporary berm shall be formed at the periphery of the rootball of each tree planted to act as a watering basin, except where noted on the Drawings and/or details.

Trees planted on a slope shall have a continuous three inch height (3") temporary berm on the lower side of the slope around the extent of the planting pit of each tree planted to act as a watering basin, except where noted on the Drawings and/or details.

The temporary berm shall be repaired as necessary to continue functioning throughout the maintenance period and shall remain in place throughout the maintenance period. The temporary berm shall be removed at Landscape Acceptance and replaced with mulch as noted on the Drawings.

#### I. Shrub Plantings

A continuous three-inch height (3") temporary berm shall be formed at the periphery of the rootball of each shrub planted to act as a watering basin, except where noted on the Drawings and/or details.

Shrubs planted on a slope shall have a continuous three-inch height (3") temporary berm on the lower side of the slope around the extent of the planting pit of each shrub planted to act as a watering basin, except where noted on the Drawings and/or details.

The temporary berm shall be repaired as necessary to continue functioning throughout the maintenance period and shall remain in place throughout the maintenance period. The temporary berm shall be removed at Landscape Acceptance and replaced with mulch as noted on the Drawings.

#### J. Ground Cover, Perennials, and Annuals

Excavate a hole sufficient to receive the root spread and backfill around plants with

topsoil and tamp soil to hold plant in place. The plants shall be planted in alternate rows, unless otherwise specified.

K. Watering

Thoroughly water each plant immediately following planting. After planting, water the entire planting hole area to thoroughly wet the root ball and the backfill soils. Under no condition shall plants not be watered in the same day as planting. The Contractor shall water per maintenance specifications, Article 2.4, Sub-article B – Watering. The Contractor shall assume full responsibility for plant failure as a direct result of insufficient watering. Upon directive from the Engineer, the Contractor shall remove the affected plants and replace them immediately. Replacement of plants is considered incidental to the Contract and no separate payment shall be made.

L. Mulching

After planting has been approved by the Engineer, mulch materials as specified shall be placed and spread where and to the depth indicated on the Drawings. The boundaries of this mulch shall include planting-saucers around the trees and shrubs unless otherwise indicated. Mulch shall be pulled back four to six inches (4" to 6") from the tree trunk and three to six inches (3" to 6") from the main stem of the shrub. Ground covers shall not be buried in mulch.

M. Pruning and Repair

The only pruning allowed at planting shall be removal of dead, damaged, diseased, or broken branches and roots. Pruning shall conform to ANSI A300. No pruning paint or other wound dressing shall be used.

N. Staking

Do not stake or guy trees unless specifically required by the Contract Documents, or in the event that the Contractor feels that staking is the only alternative way to keep particular trees plumb. The Engineer shall have the authority to require that trees are staked or to reject staking as an alternative way to stabilize the tree.

Ties made of approved material shall be attached directly to the stakes or attached to the stakes by wire. In no case shall the wire extend around the tree trunk, even if covered by a hose.

Ties shall be attached loosely enough to allow the trunk to sway in the wind without allowing movement to the roots. Ties shall be secured at the lowest point on the trunk at which the root ball remains stationary, approximately one-third up the tree. Stakes shall be driven outside the root ball and eighteen inches (18") into solid ground. Tops of stakes shall be cut off above ties so they do not damage the branches.

For trees larger than three inches (3") in caliper, ties shall be attached to three guy wires and ground anchors or stakes or as detailed in the Drawings. Anchors or stakes shall be driven at a forty-five degree (45°) angle to the ground and placed at one hundred and twenty degree (120°) intervals around the trunk.

The Contractor shall remove all stakes, ties, and guy wires one year after

installation. The stakes, ties and wires are the property of the Contractor.

O. Clean-up

The Contractor shall keep the project site, and all roads and trails utilized during the project, clean and free of trash, excess equipment, materials (including topsoil and mulch), and sweeping and washing of trails and pedestrian facilities. Clean-up will be one of the conditions to be met prior to all phases of planting acceptance.

P. Winter Shut-down

Winter shut-down of all installation work shall occur between October 1 and May 1 of the following spring. During winter shutdown periods or work suspensions, the Contractor shall comply with Division 10 – Standard General Provisions regarding responsibilities and protection of all Work under the Contract.

Q. Plant Replacement

A tree is considered defective when the main leader has died back or when twenty-five (25%) of the crown is dead or does not meet standards set out in specifications. Contractor shall provide plant material replacements of the same size, type and requirements as specified on the plant schedule. The Contractor shall repair to the satisfaction of the Engineer, or replace defective, dead, or damaged plant materials at no additional cost to the Owner, within five (5) working days after receiving written notice to do so by the Engineer. If Work is not completed to the Engineer's approval within the time limitation, the Engineer may exercise the option to have a contractor of the Owner's choosing perform the Work. If this option is exercised, the cost of that Work will be the responsibility of the Contractor and the Owner shall withhold payment to the Contractor in enough to recover those costs.

R. Acceptance of Initial Planting Operations

Upon completion of all initial planting operations (planting and seeding), the Contractor shall, per Division 10, Section 10.05, Article 5.26 – Final Inspection, submit a written request for an inspection of landscape material and installation.

Initial planting operation ends when:

1. All plants are installed, mulched, and watered as specified;
2. If used, stakes, guys, and moose protection fencing are in place;
3. All construction material and excess excavated material is removed and clean-up is completed;
4. Planting area is free of weeds or any unspecified plants; and
5. Plant material is healthy and vigorous.

Upon written acceptance of all Work by the Engineer, the one-year Plant Establishment Period shall begin.

Plant Establishment Period: From Acceptance of Initial Planting Operations the Contractor shall be responsible for maintaining the accepted plantings and seeded area for one year. During the Plant Establishment Period, the Contractor shall also, upon receipt of written notification by the Engineer, repair or replace damaged

trees, shrubs, and perennials. If trees or shrubs are replaced within the last 60 days of the Plant Establishment Period, the Plant Establishment Period shall be extended an additional 60 days or further per the Engineer.

## **Article 2.4 Maintenance**

### **A. General**

The Contractor shall furnish all labor, materials, supplies, and equipment required to establish, maintain, and protect the planted and seeded areas, for a Plant Establishment Period, one year in length, starting on the date of Acceptance of the Initial Planting Operations. However, maintenance activities shall commence immediately after each item is planted or when areas have been seeded. The Plant Establishment Period may be extended and paid in monthly increments beyond the first year at the direction of the Engineer.

The Contractor shall supply a maintenance schedule to the Engineer, thirty (30) days prior to the landscape inspection. The Contractor shall also be responsible for protection of their work during the maintenance period and shall repair and replace all materials and seeded areas defective, damaged, or destroyed within the scope of the Work, regardless of cause, at no additional cost to the Owner.

The Contractor's staff shall include supervisory personnel experienced in landscape maintenance. The Work Force is to be experienced and familiar with maintaining plant material in subarctic conditions.

### **B. Watering**

A proposed watering schedule shall be submitted to the Engineer thirty (30) days prior to installation of plant materials. The Contractor shall notify the Engineer of watering activities. The Contractor shall keep a log of date, time of day, and amount of water used for every watering activity.

The Contractor shall deep water all trees and shrubs, at a minimum of once a week during the maintenance period with additional watering as needed given weather conditions, site conditions, and species. Deep watering shall provide water penetration throughout the root zone to the full depth of the planting pits. Deep water application shall be applied at a low-pressure application rate using hand watering with a hose with a minimum of water run-off.

A tree watering bag system may be used at the Engineer's discretion and per the manufacturer's instructions. The system shall include plastic tree watering bags holding a minimum of 15 gallons of water and with a slow drip hole water release system, specifically designed to water establishing trees. Water should release over a several-day period, not within a few hours. Watering bags shall be Treegator Irrigation Bags sized to the appropriate model for the requirements of the plant, Ooze Tube sized to the appropriate model for the requirements of the plant, or approved equal. Submit manufacturer's product data for approval. Water bags shall not contact the tree trunk. The watering bags shall remain the property of the Contractor at the completion of the work unless otherwise specified.

A solid water with air pocket system (or "Tree Diaper") may also be used at the Engineer's discretion and per the manufacturer's instructions. System shall be

TreeDiaper brand, sized to the appropriate model for the requirements of the plant, or approved equal. The system shall remain the property of the Contractor at the completion of the work unless otherwise specified.

Watering shall cease at first hard frost in the fall and shall resume upon ground thaw in the spring.

If at any time during the maintenance period weather conditions (such as extended period with no rain or continuous drying winds) cause the plant root zone to dry out, the Engineer may direct the Contractor to deep water all trees and shrubs. Contractor shall provide supplemental watering immediately and at no additional cost to the Municipality.

Should soil conditions be encountered that are not conducive to water absorption, the Contractor shall take whatever corrective actions that may be required to correct this condition, without additional cost to the Owner.

Turf, seeded, bulb areas, groundcover, perennial, and annual flower beds shall be watered at such frequency as weather conditions require to maintain soil moisture within the root zone. When establishing turf and seeded areas, the soil shall be watered often enough to maintain a moist seedbed to promote healthy seed germination resulting in an even and uniform coverage. If the Contractor does not provide adequate watering as required by the Engineer, the Engineer will hire others to perform this task and deduct costs from final payment to the Contractor.

#### C. Pruning

Pruning shall only be conducted for repair or as specified by the Engineer. Pruning shall conform to ANSI 300 Standards and shall be done under the supervision of a certified arborist. Dead, broken, diseased, or damaged branches may be pruned at any time. Pruning for form shall begin no sooner than two years after installation. No tree shall be topped. Any tree damaged by improper pruning shall be replaced by the Contractor.

#### D. Staking and Guying

Stakes and guys, where used, are to be inspected and adjusted as necessary throughout the maintenance period to prevent girdling of trunks or branches, and to prevent rubbing that causes bark wounds. Damaged or missing tree stakes shall be immediately replaced by the Contractor at no additional cost to the Owner. Contractor shall remove staking after the first year unless the Engineer requests them to be left on longer.

#### E. Plant Repair and Replacement

The Contractor shall repair/replace damaged or defective plant materials, regardless of cause, immediately upon notification by the Engineer. Defective plants shall be defined as plants not meeting these requirements. Repair shall include pruning, guying, staking, etc., as necessary. Should repair of plant materials reduce their acceptance to less than minimum specified conditions, the Contractor shall replace plants with specified plant replacements at no additional cost to the Owner.

F. Fertilization and other Chemical and Biological Additives

If the construction or maintenance period extends into a second growing season, representative soil tests from the project site shall be taken by the Contractor and submitted to an approved testing lab no later than May 5 for fertility testing. The results of these tests and recommendations for application of additives shall be provided to the Engineer and will be the basis for establishing required application rates. All necessary applications shall be completed prior to June 15 or before the end of the maintenance period, whichever occurs first.

Formulations will vary according to soil tests.

G. Diseases and Pests

The Contractor shall coordinate with the Engineer in the event that disease, invasive plant infestation, or pest problems are observed on plants within a Project area. The Contractor and the Engineer shall formulate an Integrated Pest Management program to control the disease, invasive plants, or pests. The IPM program can use biological, physical, cultural, behavioral, and chemical methods to resolve the issue. Chemical pesticides are to be used only when other options are not feasible or effective. If pesticides are used, the least toxic pesticide to accomplish the task shall be used. Any pesticide application will be done by a certified pesticide applicator and will be done in compliance with Title 18, Chapter 90 of the Alaska Administrative Code and Anchorage Municipal Code 15.75.

The Contractor shall apply all materials in complete compliance with all State, Federal, and local regulations, and shall supply the Engineer written proof of their safety and acceptability by State, Federal and Local jurisdictions.

In the event a "restricted use" pesticide is to be applied, the Contractor shall obtain appropriate permits and certifications (according to current 18 AAC 90 Pesticide Control) from the State of Alaska, Department of Environmental Conservation. Proof of certification shall be transmitted to the Engineer prior to application of the chemicals.

H. Weeding

The Contractor shall maintain all areas in a weed-free condition. Weed removal shall be a routine maintenance activity. Upon approval of Engineer any herbicide application shall be done by a certified pesticide applicator and in compliance with State of Alaska rules and regulations and Anchorage Municipal Code 15.75.

I. Clean-up

The Contractor shall keep the project site clean and free of all trash and excess equipment, materials, rubbish, including plant tags, wire, burlap, ribbon, and all debris found within the Project limits, including all roads and trails utilized during Construction. Clean-up will be one of the conditions to be met prior to acceptance of landscape installation and Final Acceptance.

J. Other Tree and Shrub Maintenance

To protect coniferous trees during the winter from excessive desiccation, apply an anti-desiccant such as "Wilt-Pruf" (or equal approved by the Engineer prior to

procurement) prior to the winter shut-down period. Complete coverage of all foliage is required.

K. Inspection

The Engineer shall make periodic maintenance inspections of the work. All deficiencies noted shall be corrected within five (5) calendar days from written notice, at no additional cost to the Owner. All delays beyond the five-day period shall result in an equal number of days added to the one year Plant Establishment Period.

L. Mowing

Areas seeded (or sodded) with Schedule A and E seed mix shall be mowed each week or when grass exceeds a height of two and one-half inches (2.5"). Clippings shall not be caught and removed unless they are determined by the project Engineer to be unsightly or damaging to the lawn. Contractor is not to mow areas seeded with Schedules B, C and D seed mix, unless otherwise directed by the Engineer for the purpose of mechanical weed control or site distance issues.

Seeded areas will be mowed on a regular schedule as part of the routine maintenance during the Plant Establishment Period. A copy of the mowing schedule will be provided to the Engineer. The final mowing of the grass in the fall and prior to the Seeding Acceptance inspection should be at a height of two inches (2").

## **Article 2.5 Landscaping Acceptance**

A Landscaping Acceptance Inspection of the project will occur after completion of the Plant Establishment Period. Engineer shall verify that Contractor performed maintenance functions as identified in Article 2.4 – Maintenance of this Section. Additional conditions governing Landscaping Acceptance of the planted and seeded areas are that, in the opinion of the Engineer, all plants are in a live, uniform, and sound and healthy and flourishing condition; free of disease, insect infestation and physical damage, and free of weeds, rubbish and construction debris. The Engineer shall verify that all Moose Protection Fence, stakes, and guys have been removed as specified. Fencing shall be allowed to remain only at the direction of the Owner. If the Engineer does not accept the plantings and removal of Fence, stakes and guys, the Contractor shall correct all deficiencies. All costs associated with correcting the deficiencies and extending the Plant Establishment Period shall be paid by the Contractor without additional cost to the Owner.

Should required corrections not be made within thirty (30) days after the initial Landscaping Acceptance Inspection, the Contractor shall be assessed liquidated damages per Division 10, Section 10.05, Article 5.27 – Liquidated Damages, until all Work is complete and accepted by the Engineer.

## **Article 2.6 Measurement**

Seventy percent (70%) of each bid item shall be measured as quantity of plants by individual plant count, or by area as specified.

The remaining thirty percent (30%) of each bid item shall be measured as maintenance Work performed during the Plant Establishment Period and the acceptance of the

landscaping improvements in the condition identified in Article 2.5 of this Section. Payment process and exceptions are identified in Article 2.7 below and in Division 10, Section 10.07, Article 7.7 – Final Payment.

**Article 2.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for all plants, except seeding, includes payment for the Plant Establishment Period. Extensions of the Plant Establishment Period beyond the one year minimum as specified in Special Provisions shall be paid separately. Extensions of the Plant Establishment Period due to rejection of the work by the Engineer or replacement of damaged materials shall be performed at the Contractor’s expense. Owner will pay the accepted quantity of trees, shrubs, perennials, and groundcover after the Acceptance of Initial Planting Operations, based on seventy percent (70%) of the Contract unit price for the respective pay items. Mulch is considered incidental to the Work described in Section 75.02. unless otherwise noted.

The remaining thirty percent (30%) for the maintenance during the Plant Establishment Period shall be paid upon Landscaping Acceptance except as noted below. The Engineer shall make inspections before payment. The Engineer shall be the sole judge of the conditions of quality and acceptability and will direct inspection reports to the Contractor in writing. Work rejected by the Engineer will not receive payment for that month.

If Contractor did not perform maintenance in accordance with Article 2.4 – Maintenance, the remaining 30% shall not be paid.

If damaged plants and seeding are not repaired or replaced as required within fourteen (14) days of written notice, the Engineer may replace or have replaced the damaged items and deduct the cost of said repair or replacement work from the remaining payments. The cost of said repair or replacement work is based on receipts for replacement plants plus ten percent (10%) administrative markup. Replacement by the Owner of any plantings within the last sixty (60) days of the Plant Establishment Period shall trigger a sixty (60) day extension of the Plant Establishment Period.

Payment shall be made on the following basis:

ITEM	UNIT
Trees (by species and size as indicated on Drawings)	Each
Shrubs (by species and size as indicated on Drawings)	Each
Ground Cover (by species and size on Drawings)	Each
Perennials (by species and size on Drawings)	Each
Annuals (by the species and size on Drawings)	Each
Extended Plant Establishment Period (by month)	Each



## **SECTION 75.03 PLANTING SOIL**

### **Article 3.1 General**

The Work under this Section consists of providing all operations pertaining to furnishing, transporting, and spreading of planting soil.

#### **A. Applicable Standards**

ASTM D422 Standard Test Method for Particle Size Analysis of Soils

ASTM D2974 Standard Test Method for Moisture, Ash and Organic Matter of Peat and Other Organic Soils

ASTM D2434 Standard Test Method for Measurement of Hydraulic Conductivity of Coarse-Grained Soils

ASTMD1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

ASSHTO T 267 Standard Method of Test for Determination of Organic Content in Soils by Loss of Ignition

US Council Seal of Testing Assurances (STA)/Test Methods for Examining of Composting and Compost (TMECC) criteria

#### **B. Submittals**

1. Topsoil: lab analysis results
2. Limestone Fertilizer: product data and the manufacturer's guaranteed analysis of the contents
3. Compost: a two-gallon sample of the compost and the STA Program certified lab analysis results

### **Article 3.2 Materials**

The Contractor shall furnish soil analysis test reports to the Engineer ten (10) days prior to final placement for Engineer comment or acceptance.

#### **A. Planting Soil**

Planting Soil furnished by the Contractor shall consist of a natural friable surface soil without admixtures of undesirable subsoil, refuse, or foreign materials. It shall be shredded and free from roots, hard clay, rocks larger than one inch (1"0 in any dimension, weeds, noxious plants, seeds, or plant propagules, tall grass, brush, sticks, stubble, or other litter, and shall have indicated by a healthy growth of crops, grasses, trees, or other vegetation that it is free-draining and non-toxic. Planting Soil shall contain not more than ten percent (10%) gravel by dry weight of total sample. For the purposes of this specification gravel is defined per ASTM D422 modified to include only material passing on inch (1") and retained on the No. 4 sieve.

The Contractor shall provide the Engineer with a copy of the lab analysis verifying that the planting soil meets the product parameters stated in this specification. The lab analysis shall not be more than 90 days old. Planting soil shall conform to the

following requirements, as tested using the procedures included in ASTM D422, ASTM D2974, and AASHTO T267. The planting soil shall be tested and inspected by the Engineer before approval will be granted for its use.

Organic material for incorporation into planting soil, shall be partially decomposed peat moss. Organic material shall be from a source above the water table. Peat moss may require chopping or shredding to ensure thorough mixing with the topsoil. Organic matter is to be determined by loss-on-ignition of oven-dried material in accordance with ASTM D2974.

1. Planting Soil shall consist of the following:

a. Modified Existing Soil

Existing soil shall be used only as designated on the Drawings as suitable for reuse as Planting Soil but cannot be adequately protected in-situ during construction. Soil is to be harvested, stockpiled and re-spread with or without further modifications as indicated.

i. Modifications:

- a. Excavate existing soil from the areas and to depths designated on the Drawings. Stockpile in zones noted on the Drawings or in areas proposed by the Engineer.
- b. Contractor to prepare a soil stockpile plan for approval
- c. Excavate soil using equipment and methods to preserve the clumps in the soil. Generally this means using the largest piece of equipment that is practical for the project size and scope.
- d. Protect stockpiles from erosion by compacting or tracking the soil surface, covering with breathable fabric or planting with annual grasses as appropriate for the season, location, and length of expected time of storage.

b. Topsoil

Topsoil shall be used for plantings, seed mixes, and sod unless otherwise noted in the Drawings.

Topsoil Mix:

Organic Material	Silt	Sand
15% to 25% by total sample dry weight	25% to 45% by dry weight	35% to 55% by dry weight

c. Athletic/Sports Field Topsoil

Athletic/Sports Field Topsoil shall be used for Athletic/Sports Fields with Schedule E Seed Mix, unless otherwise noted in the Drawings.

Topsoil Mix for Athletic/Sports Fields:

Organic Material	Silt	Sand
15% to 25% by volume	20% to 35% by volume	50% to 55% by volume

d. Sports Field/Infield Loam

Sports Field/Infield Loam shall be used in sports fields in areas intended to be free of grass and other vegetation, unless otherwise noted in Drawings.

Topsoil Mix for Loam:

Organic Material	Silt	Sand
0.0% by volume	75% to 85% by volume	15% to 25% by volume

e. Engineered Soil for Stormwater Treatment

Engineered Soil for Stormwater Treatment shall be used in bioretention or stormwater infiltration areas, as noted in the Drawings.

The final soil mix (including compost and soil) shall have a long-term hydraulic conductivity of approximately 1.0 inch/hour. Note that infiltration rate and hydraulic conductivity are assumed to be approximately the same in a uniform mix soil.

The pH for the soil mix should be between 5.5 and 7.0. If the pH falls outside of the acceptable range, it may be modified with lime to increase the pH or iron sulfate plus sulfur to lower the pH. The lime or iron sulfate must be mixed uniformly into the soil prior to use in the bioretention system.

The final soil mixture should be tested by an independent laboratory prior to installation for fertility, micronutrient analysis, and organic material content. Soil amendments per laboratory recommendations (if any) should be uniformly incorporated for optimum plant establishment and early growth.

It shall be uniform and free of stones, stumps, roots, or other similar organic matter greater than 2" diameter.

The final soil mixture shall be tested per:

ASTM Designation D 2434 (Standard Test Method for Hydraulic Conductivity of Coarse-Grained Soils)

ASTM Designation D 1557 (Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort)

ASTM Designation D 2974 (Standard Test Method for Moisture, Ash and Organic Matter of Peat and Other Organic Soils)

Topsoil Mix for Engineered Soil for Stormwater Treatment:

Hydraulic Conductivity at 80% compaction	1.0 inch/hour
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Minimum Organic Content	10% by dry weight
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Clay Content	Less than 5%
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pH	5.5 to 7.0
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B. Soil Amendments

1. Fertilizer shall be a standard inorganic or organic commercial grade supplied separately or in mixtures and furnished in moisture-proof containers. Each container shall be marked with the weight and the manufacturer's guaranteed analysis of the contents showing the percentage for each ingredient contained therein. The proportion of chemical ingredients furnished shall be a mixture such as to provide the total available nitrogen, phosphoric, and potassium as required by the soil analysis or as specified in the Special Provisions. At least five (5) days prior to placement, the Contractor shall submit to the Engineer for approval an analysis of the proposed fertilizer and Manufacturer's Certificate of Compliance indicating Specifications are met.

Tolerances of the chemical ingredients shall be plus or minus two percent ( $\pm 2\%$ ).

No cyanamid compounds or hydrated lime will be permitted in mixed fertilizers.

2. Limestone shall contain not less than eighty-five percent (85%) of calcium and magnesium carbonates. Agricultural ground limestone suitable for application by a fertilizer spreader shall conform to the following gradation:

Sieve Designation	Minimum Percent Passing by Weight
#10	100
#20	90
#100	50

Pelletized limestone may be used subject to approval by the Engineer.

Fertilizer and limestone for use in a hydraulic sprayer shall be soluble or ground to a fineness that will permit complete suspension of insoluble particles in water.

### 3. Compost

Compost shall consist of well-decomposed, stable, weed-free organic matter source(s) designed to produce Compost high in fungal material. It shall be derived from: agricultural, food, or industrial residuals: biosolids (treated sewer sludge); yard trimmings; source-separated or mixed solid waste. The product shall contain no substances toxic to plants and shall be reasonably free (<1% by dry weight) of man-made foreign matter. The compost will possess no objectionable odors and shall not resemble the raw material from which it was derived.

Compost shall be commercially prepared compost and shall meet US Council Seal of Testing Assurance (STA)/Test Methods for Examining of Composting and Compost (TMECC) criteria.

Before delivery of compost, the Contractor must provide the Engineer with a copy of the lab analysis, performed by an STA Program certified lab, verifying that the compost meets the product parameters stated in this specification. The lab analysis should not be more than 90 days old.

Provide a two-gallon sample with manufacturer’s literature and material certification that the product meets the following requirements.

Compost shall comply with the following parameters:

pH	5.5 to 8.0
Soil Salt (electrical conductivity)	Maximum 5 dS/m (mmhos/cm)
Moisture content (% wet weight basis)	30 to 60
Organic matter (% dry weight)	30 to 60
Particle size	98% pass through ¾ inch screen
Stability carbon dioxide evolution rate	Mg CO <sub>2</sub> -C/g OM/day < 2
Solvita maturity test	>6
Physical contaminants/inerts (% dry weight)	<1%
Chemical contaminants, mg/kg (ppm)	Meet or exceed US EPA Class A standard, 40 CFR 503.13, Tables 1 and 3 levels
Biological contaminants (select pathogens, fecal coliform bacteria, or salmonella)	Meet or exceed US EPA Class A standard, 40 CFR 503.32(a) level requirements

Sufficient fertilizer, limestone, and/or compost shall be applied to the planting soil such that the total natural and applied chemical constituents are within the following ranges:

Nitrogen	30-50 PPM
Phosphoric Acid	60-110 PPM
Potassium	76-150 PPM
Limestone	Sufficient to attain a PH of 6.0 to 7.0

### **Article 3.3 Placing**

Placement of Planting Soil (Modified Existing Soil, Topsoil, Engineered Soil, or other as specified) shall not occur until the project area has been inspected and approved by the Engineer. Prior to installing any soil from stockpiles or mixes blended off site, the Engineer shall approve the condition of the subgrade, the previously installed subgrade preparation, and the installation of subsurface drainage.

In areas of specified soil installation above existing subsoil, scarify the subgrade material to the depth of 3 to 6 inches with the teeth of the backhoe or bucket loader, tiller, or other suitable device prior to installing planting soil.

In the event that the loosened subgrade area becomes overly compacted, loosen the area again prior to installing the Planting Soil.

The Contractor shall protect installed Planting Soil from damage including contamination and over compaction due to other soil installation, planting operations, and operations by other Contractors or trespassers. Maintain protection during installation and other site work construction until acceptance. Utilize fencing and matting as required or directed to protect the finished soil work. Treat, repair, or replace damaged Planting Soil immediately.

Where travel over installed topsoil is unavoidable, limit paths of traffic to reduce the impact of compaction on Planting Soil. Each time equipment passes over the installed soil it shall reverse out of the area along the same path with the teeth of the bucket dropped to scarify the soil.

Loosen compacted Planting Soil and replace Planting Soil that has become contaminated as determined by the Engineer. It shall be loosened or replaced at no expense to the Owner. Till and restore grades to all soil that has been driven over or compacted during the installation of plants or seed.

Planting Soil stockpiled for project use shall be protected to prevent erosion and weed growth.

Contractor shall not place or spread any Planting Soil when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the Work.

Contractor shall keep roadway surfaces within the project area and on haul routes clean during hauling and spreading operations.

- A. Topsoil for Planting and Seeding: For planting beds, topsoil shall be at the depth shown on the Drawings, but no less than 12". Where possible, place large trees first and fill the Topsoil around the root ball.

For seeding operations, the topsoil shall be evenly spread on the designated areas to a depth of four inches (4") after settlement unless otherwise specified on the Drawings. Settlement for seeded areas shall be achieved by rolling the topsoil with a water-filled drum approved by the Engineer. The Engineer may direct that topsoil placed on slopes be track-walked perpendicular to the slope with a small track dozer. Track walking shall be incidental to this bid item and no separate payment shall be made.

- B. Athletic/Sports Field Topsoil: Athletic/Sports Field Topsoil shall be evenly spread on the designated areas to a depth of six inches (6") after settlement unless otherwise specified on the Drawings. Settlement for seeded areas shall be achieved by rolling the topsoil with a water-filled drum approved by the Engineer.
- C. Sports Field/Infield Loam: Loam shall be evenly spread on the designated areas to a depth of six inches (6") after settlement unless otherwise specified on the Drawings. Settlement for these areas shall be achieved by rolling the topsoil with a water-filled drum approved by the Engineer.
- D. Modified Existing Soil: The preparation, storage, and application of the Modified Existing Soil shall be as follows:
  - a. Scarify designated Modified Existing Soil placement areas to a depth of six (6) inches prior to the placement of the soil.
  - b. The Modified Existing Soil shall be placed at a depth of four (4) inches and shall be worked thoroughly into the underlying subgrade. Viable roots shall be sufficiently buried in the soil and subgrade.

**Article 3.4 Measurement**

Planting Soil is measured as the number of 1,000 square foot units measured to the nearest 0.1 unit applied to the ground surface. Stockpiling and/or re-handling of planting soil during stripping operations, or during placement, shall not be measured for payment.

Planting soil placed in planting beds and for individual tree and shrub plantings is incidental to Work described in Section 75.02 and no payment shall be made under this Section.

Fertilizer is incidental to Work described in this Section and no payment shall be made under this Section.

**Article 3.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Unit cost payment shall be made on the following basis:

ITEM	UNIT
Modified Existing Soil (Depth)	1,000 Square Feet (MSF)
Topsoil (Depth)	1,000 Square Feet (MSF)
Athletic/Sports Field Topsoil (Depth)	1,000 Square Feet (MSF)
Sports Field/Infield Loam (Depth)	1,000 Square Feet (MSF)
Engineered Soil for Stormwater Treatment (Depth)	1,000 Square Feet (MSF)
Compost (Depth)	1,000 Square Feet (MSF)



## **SECTION 75.04 SEEDING**

### **Article 4.1 General**

The Work under this Section shall consist of providing all labor, equipment, and materials for the preparation of ground surfaces for the application and maintenance of seeded areas, fertilization, lime application (if necessary), watering, and mulching at locations shown on the Drawings or established by the Engineer.

All seeding shall be performed between May 1 and September 1. Seeding any other time will only be allowed upon written approval from the Engineer. Seeding shall not be done during windy conditions or when climatic or ground conditions would hinder placement or proper germination of seed mixes.

#### **A. Applicable Standards**

ASTM D5268-19e1 Standard Specification For Topsoil Used For Landscaping and Construction Purposes (for Article 4.2 Sub-article B)

#### **B. Submittals**

1. Seed testing certification
2. Certification tags
3. Analysis of the proposed fertilizer and Manufacturer's Certificate of Compliance indicating Specifications are met.
4. Product data

### **Article 4.2 Materials**

#### **A. Seed**

Seed shall be certified and shall be furnished in standard containers with the seed name, lot number, net weight, percentage of hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the Engineer with duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within a 9-month period prior to application. This statement shall include name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, and percentage of weed content for each kind of seed furnished and, in case of a mixture, the proportions of each kind of seed. Seed that has become wet, moldy, or otherwise damaged in transit or storage will not be acceptable. If species/cultivars listed are unavailable then the Contractor shall submit availability for review and approval.

The Contractor shall submit to the Engineer a certification tag for the seed mixes provided listing species, and proportion by weight. The certification tag shall come from the specified seed mixes and be removed from the unopened bags in the presence of the Engineer. Contractor shall deliver seed to the site in its original unopened container, which shall bear the vendor's guarantee of analysis.

Seed shall conform to one of the following seed mix types and application rates:

**Schedule A: Mowable/Turf Seed Mix**

*Application Rate: 4 lbs./1000 s.f.*

Name	Proportion by Weight
Red Fescue ( <i>Festuca rubra</i> – ‘Boreal,’ ‘Oracle,’ ‘Arctared’)	35%
Kentucky Bluegrass ( <i>Poa pratensis</i> ‘Kenai’)	35%
Kentucky Bluegrass ( <i>Poa pratensis</i> - ‘Baron,’ ‘Shamrock’)	25%
Annual Ryegrass ( <i>Lolium multiflorum</i> )	5%

**Schedule B: Grass and Wildflower Seed Mix**

*Application Rate: 2 lbs./1000 s.f.*

Name	Proportion by Weight
Gruening Alpine Blue ( <i>Poa alpina</i> ‘Gruening’)	30%
Red Fescue ( <i>Festuca rubra</i> - ‘Boreal,’ ‘Oracle,’ ‘Arctared’)	20%
Perennial Lupine ( <i>Lupinus perennis</i> )	20%
White Yarrow ( <i>Achillea millefolium</i> )	10%
Dwarf Columbine ( <i>Aquilegia vulgaris</i> )	10%
Rocket Larkspur ( <i>Delphinium consolida</i> )	10%

**Schedule C: Wetland Seed Mix**  
*Application Rate: 2 lbs./1000 s.f.*

Name	Proportion by Weight
Nortran Tufted Hairgrass <i>(Deschampsia caespitosa</i> 'Nortran')	45%
Egan American Slough <i>(Beckmannia syzigachne</i> 'Egan')	40%
Red Fescue <i>(Festuca rubra – 'Boreal,'</i> 'Oracle,' 'Arctared')	15%

**Schedule D: Revegetation Seed Mix**  
*Application Rate: 2 lbs./1000 s.f.*

Name	Proportion by Weight
Nortran Tufted Hairgrass <i>(Deschampsia caespitosa</i> 'Nortran')	60%
Red Fescue <i>(Festuca rubra – 'Boreal,'</i> 'Oracle,' 'Arctared')	30%
Annual Rye <i>(Lolium multiflorum)</i>	10%

**Schedule E: Athletic Field Seed Mix**  
*Application Rate: 4 lbs./1000 s.f.*

Name	Proportion by Weight
Kentucky Bluegrass Kenai ( <i>Poa pratensis</i> 'Kenai')	25%
Kentucky Bluegrass Baron ( <i>Poa pratensis</i> 'Baron')	25%
Kentucky Bluegrass Shamrock ( <i>Poa pratensis</i> Shamrock')	25%
Red Fescue ( <i>Festuca rubra</i> – 'Boreal,' 'Oracle,' 'Arctared')	20%
Perennial Ryegrass ( <i>Lolium perenne</i> – 'Manhattan,' 'Pinstripe')	5%

**B. Soil Amendment**

A biodegradable Hydraulic Biotic Soil Amendment (HBSA), such as 'Verdyol,' 'Proganics,' or equal approved by the Engineer prior to procurement may be substituted for topsoil for areas to be seeded. HBSAs shall meet ASTM D5268-19e1.

HBSAs are engineered to improve the development of deficient soils and to facilitate sustainable vegetation. HBSAs typically consist of organic material and nutrient sources combined with soil building and biostimulant components designed to facilitate faster plant growth as well as sustained long-term growth. The blend of organic and natural fibers with fast-acting soil building and growth components increases the water and nutrient holding capacity of the soil and create an environment for growth of beneficial microorganisms while allowing seed germination and vegetation establishment.

Provide an HBSA that is composed of non-toxic materials. Use HBSA materials certified to be weed seed free. Additional seed, fertilizer, tackifier, and/or any other soil amendments may be needed to mix with or be used in conjunction with the HBSA for application as determined by the Engineer or recommendations by the product manufacturer.

Certain HBSAs may help achieve a minimal level of erosion control but may not replace the use of erosion control products. Strictly follow manufacturer's delivery, storage, handling, and installation requirements.

C. Fertilizer

Fertilizer shall meet requirements as identified in Section 75.03 Planting Soil Article 3.2 Materials, B - Soil Amendments.

D. Limestone

Limestone shall meet requirements as identified in Section 75.03 Planting Soil Article 3.2 Materials, B - Soil Amendments.

E. Hydroseeding Mulch

Shall be dried shredded peat moss, cellulose wood, or paper fiber such as "Astromulch," "Eco Fiber," "Conwed," or equal approved by the Engineer prior to procurement.

F. Water

Water used in all operations shall be of potable quality.

**Article 4.3 Application**

A. Soil Preparation

After grading of areas has been completed in conformity with the lines and grades shown on the Drawings, and before beginning seeding operations, the areas to be seeded shall be cultivated to provide a reasonably firm but friable seedbed. Cultivation shall be carried to a depth of two inches (2"). On slopes steeper than 3:1, depth of cultivation may be reduced as directed by the Engineer. All areas to be cultivated shall be raked or cleared of stones (one inch [1"] in diameter and larger), weeds, plant growth, sticks, stumps, and other debris or irregularities which might interfere with the seeding operation, germination of seed, or subsequent maintenance of the seed-covered areas. Cultivation shall include the entire ground surface, regardless of existing ground cover. Contractor may be required to track-walk slopes 2:1 or over as directed in the Drawings or by the Engineer. Prior to seeding application, site inspection by the Engineer is required to confirm that preparation conditions are satisfactory for the seeding work to proceed.

B. Fertilizer

Fertilizer used with topsoil shall be applied at a rate to provide two (2) pounds actual Nitrogen per thousand (1,000) square feet of area. In the absence of soil tests and direction from the Engineer, the Contractor shall apply 16-16-16 at the rate of twelve and one-half (12.5) pounds per thousand (1,000) square feet. Fertilizer shall be in accordance with Section 75.03 – Planting Soil.

When applying a fertilizer used with the soil amendment, the Contractor shall apply a natural /organic based fertilizer with 25% slow-release materials such as Arctic Gro Biotic Fertilizer. The organic based fertilizer shall have a minimum guaranteed analysis of 10-10-10-8.5S. It should provide a minimum of 10% (N) nitrogen, 10% (P) phosphate, 10% (K) potash, and 8.5% (S) sulfur. The fertilizer shall contain

Humic DG (Dispersing Granule) to promote microbial growth and soil fertility and Sustane Organic, or approved equal, for greater root development. It should be in a granular form that is easily spread. Apply at five hundred pounds per acre (500 lbs/acre).

C. Limestone

Limestone, whether in liquid or dry form, shall be applied at a sufficient rate to attain a soil pH between 6.0 and 7.0.

D. Application Methods

All machinery shall be free of invasive weeds, seeds, or plant propagules. Apply seed mixtures as specified under Article 4.2, Sub-article A - Seed at rates as specified and/or as directed by the Engineer. Seed, fertilizer, limestone, mulch, and water may be applied by the following methods:

1. Hydraulic Method

Seeding by hydraulic methods shall consist of furnishing and placing a slurry made of seed, fertilizer, dried peat moss, or cellulose wood fiber and water.

The dried peat moss or cellulose wood fiber shall be added to the water slurry in the hydraulic seeder after the proportionate amounts of seed and fertilizer have been added. The slurry mixture shall then be combined and applied in such a manner that the rate of application will result in an even distribution of all materials.

Hydraulic seeding equipment shall be capable of maintaining a continuous agitation so that a homogeneous mixture can be applied through a spray nozzle. The pump shall be capable of producing sufficient pressure to maintain a continuous, non-fluctuating spray capable of reaching the extremities of the seeding area with the pump unit located on the roadbed. Sufficient hose shall be provided to reach areas not practical to seed from the nozzle unit situated on the roadbed.

2. Dry Method

Mechanical spreader, seed drills, landscape seeder, cultipacker seeder, fertilizer spreader, or other approved mechanical spreading equipment may be used when seed and fertilizer are to be applied in dry form.

Fertilizer shall be spread separately at the specified rates, and then incorporated in one operation to a minimum depth of two inches (2"). Seeded areas shall be compacted within twenty-four (24) hours from the time the seeding is completed, weather and soil conditions permitting, by cultipacker, roller, or other equipment satisfactory to the Engineer. Compacting equipment shall be operated at right angles to the slope. Compaction shall not be performed when the soil is in such condition that it will be picked up by the equipment, nor shall heavy soils be compacted unless directed by the Engineer.

### 3. Hand Method

Hand broadcasting by means of portable, hand operated mechanical spreaders or "by hand" may be substituted for the preceding two (2) methods provided that the application rate is twice that of the dry method, and that the application is applied in a minimum of two (2) passes over the areas to be seeded (at ninety degrees [90°] to one another in order to assure uniform and even coverage to all seeded surfaces).

### 4. Hydraulic Biotic Soil Amendments

The area where the hydraulic biotic soil amendment (HBSA) is to be sprayed should be inspected by the Engineer prior to seeding operations to evaluate the need of tillage before application. If tillage is required, the soil should be loosened to a minimum depth of 3 inches before the application commences. For seedbeds on a slope, an acceptable method of preparation is vertically tracking the seedbed up and down using proper equipment.

As a quality assurance method, an area should be measured and stick delineated that matches the tank capacity of the hydroseeder equipment. The hydroseeder operator must totally empty the hydroseeder tank in the delineated area. This ensures that the soil equivalent dose is applied according to specification and homogeneously distributed. Prior to application, the soil must be inspected to evaluate the need for tillage (as described above). It is ideal to spray the material over a roughened area that allows the organic matrix or soil equivalent to stick to the soil.

HBSAs are typically applied using approved hydraulic methods and equipment. The type and size of the hydraulic equipment used can influence the mixing rate of the HBSA. Always follow the manufacturer's specifications and requirements when applying HBSAs. Mix additional seed, fertilizer, tackifier, and/or any other soil amendments with the HBSA before application. If erosion control products are to be used, they should be installed after application of the HBSA is complete. HBSAs should not be applied within 24 hours of recent rain or when rain is forecasted to occur within the next 24 hours unless protected by erosion control products. Follow instructions and/or recommendations from the manufacturer about appropriate conditions for application.

Avoid overspray onto roads, sidewalks, trails, boulders, plantings, and other improvements. All new plantings must be protected from overspray.

## E. Erosion Control

Erosion Control shall be a fully biodegradable growth medium composed of 100% recycled and thermally refined wood fibers, crimped interlocking man-made biodegradable fibers, micro-pore granules, naturally derived cross-linked biopolymers and water absorbents, such as 'Flexterra HP-FGM", or equal approved by the Engineer prior to procurement. The HP-FGM is phytosanitized, free from plastic netting and requires no curing period. Any approved equal must meet the following material composition:

Material Composition:

80% Thermally Processed Wood Fiber

10% Crosslinked Biopolymers and Water Absorbents 5%

Crimped, Man-made Biodegradable Interlocking Fibers 5%

Micro-Pore Granules

Application rates for 'Flexterra' and 'Verdyol Biotic Black Earth' (or approved equal) shall be as recommended by the manufacturer.

**Article 4.4 Maintenance**

All maintenance shall be in accordance with Section 75.02, Article 2.4 – Maintenance. Contractor maintenance requirement concludes when the one-year Plant Establishment Period is successfully completed and the seeded area is accepted in accordance with Article 4.5 – Seeding Acceptance.

The Contractor shall protect seeded areas from damage from all traffic, whether people, animals, on or off-road vehicles, or any other causes which may damage newly seeded and maintained surfaces. Contractor shall maintain a minimum, uniform coverage of 90% in weed free condition. Surfaces damaged shall be repaired by regrading, reseeding (including all specified amendments), as directed by the Engineer, at no additional cost to the Owner. The Contractor shall otherwise maintain seeded areas, including regular mowing, in a satisfactory condition until Seeding Acceptance.

On the fortieth (40th) day of the maintenance period, the Contractor shall apply one application of fertilizer (16-16-16) at the rate of seven (7) pounds per thousand (1,000) square feet.

**Article 4.5 Seeding Acceptance**

A. Acceptance of Initial Seeding Operations

Upon completion of all initial seeding operations, the Contractor shall, per Division 10, Section 10.05, Article 5.26 – Final Inspection, submit a written request for an inspection of seeding.

Initial planting operation ends when:

1. Seeded area is installed, mulched and watered as specified;
2. All construction material and excess excavated material is removed and clean-up is completed.

Upon written acceptance of initial seeding operations by the Engineer, the Contractor may submit the first pay request as defined in Article 4.7.

B. Ninety Percent (90%) Uniform Coverage

When the Contractor believes that ninety percent (90%) uniform coverage of the seeded area has been obtained, the Contractor shall submit a written request for the ninety percent (90%) Coverage inspection. If the Engineer provides written concurrence that ninety percent (90%) of the seeded area is uniformly covered, healthy and weed-free, the Contractor may submit the second pay request as defined in Article 4.7.



### C. Seeding Acceptance

A Seeding Acceptance Inspection of the project will occur after completion of the Plant Establishment Period. Engineer shall verify that Contractor performed maintenance functions as identified in Section 75.02 Article 2.4 – Maintenance. Additional conditions governing Seeding Acceptance of the seeded areas are that, in the opinion of the Engineer, the seeded area is in a live, uniform, and sound and healthy and flourishing condition; free of disease, insect infestation and physical damage, and free of weeds, rubbish and construction debris.

Upon written acceptance of the seeding, the Contractor may submit the final pay request as defined in Article 4.7.

If the Engineer does not accept the seeding, the Contractor shall correct all deficiencies. All costs associated with correcting the deficiencies and extending the Plant Establishment Period shall be paid by the Contractor without additional cost to the Owner.

Should required corrections not be made within thirty (30) days after the initial Seeding Acceptance Inspection, the Contractor shall be assessed liquidated damages per Division 10, Section 10.05, Article 5.27 – Liquidated Damages, until all Work is complete and accepted by the Engineer.

#### **Article 4.6 Measurement**

The measurement of seeding shall be the number of thousand (1,000) square foot units, measured to the nearest 0.1 unit complete, in-place, maintained, and accepted. The seeding bid item includes all labor and material; including cultivating, seed, hydraulic growth medium, erosion control, limestone, if required, appropriate fertilizer and mulch material of the type specified; to obtain seeding that is complete, maintained and accepted.

The measurement of seeding is broken into three milestones. The first stage is Acceptance of Initial Seeding Operations as defined in Article 4.5. The second is ninety percent (90%) coverage as defined in Article 4.5. The third is Seeding Acceptance as defined in Article 4.5. Progress payments, as defined in Article 4.7, will be made upon successful completion of each milestone.

#### **Article 4.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for seeding includes payment for maintenance during the Plant Establishment Period. Owner will pay the accepted quantity seeding after the Acceptance of Initial Planting Operations, based on thirty percent (30%) of the Contract unit price for seeding. An additional forty percent (40%) will be paid upon the Engineer's concurrence that ninety percent (90%) coverage has been obtained. The remaining thirty percent (30%) for the maintenance of seeding during the Plant Establishment Period shall be paid upon Seeding Acceptance as specified in Section 75.02 Landscaping, except as noted below.

If Contractor did not perform maintenance in accordance with Article 4.4 – Maintenance, the remaining 30% shall not be paid.

If damaged seeded areas or areas with insufficient coverage are not repaired or replaced as required within fourteen (14) days of written notice, the Engineer may replace or have replaced the damaged items and deduct the cost of said repair or replacement work from the remaining payments. The cost of said repair or replacement work is based on receipts for replacement seeding, excavation or earthwork as required, and ten percent (10%) administrative markup.

Payment shall be made on the following basis:

ITEM	UNIT
Seeding (Type)	1,000 Square Feet

When more than one type of seeding is specified for any pay item, letter suffixes and all other appropriate information, such as hydraulic biotic soil amendment or erosion control medium, shall be included in the “(Type)” of the bid item in order to differentiate between different types.

**SECTION 75.05 SOD**

**Article 5.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing, installing, and maintaining sod.

A. Agency Standards: Nomenclature

All plant materials used shall be true to name and size conforming to the Guideline Specifications to Turfgrass Sodding, Turf Grass Producers International.

B. Submittals

1. Provide sales slip or certificate describing original seed blend.

**Article 5.2 Materials**

A. Sod shall be:

Name	Proportion by Weight
Kentucky Bluegrass:	
Nugget	50-100%
Merion	0-50%

B. Sod shall be deep green in color, free of chloritic conditions or signs of disease, weeds, or infestation. Sod shall be grown in an area of well-drained, loamy soils.

C. Sod shall be #1 Quality/Premium as described in “Guideline Specifications to Turfgrass Sodding.” It shall be grown on cultivated agricultural lands and grown specifically for sod purposes.

**Article 5.3 Construction**

A. Sod Bed Preparation

After grading of areas has been completed in conformity with the lines and grades shown on the Drawings or as directed by the Engineer, scarify and till to a depth of two inches (2”) all areas designated to receive topsoil. All cultivated areas shall be raked or cleared of stones one inch (1”) in diameter and larger; all debris or irregularities that might interfere with the placement of sod, or subsequent maintenance shall be removed from the site. The Work shall be approved by the Engineer prior to placement of topsoil.

B. Placement of Topsoil in Sod Areas

Following the grading and cultivation of all areas to receive sod, place a uniform layer of topsoil. Topsoil shall be evenly spread on all designated areas to a finish depth of four inches, plus or minus one-half inch (4” ±1/2”) after being lightly rolled with a water-filled roller. Spreading shall not be done when the ground is frozen, excessively wet, or otherwise in a condition detrimental to the Work. The Work shall be accepted by the Engineer prior to continuing other Work.

C. Soil Amendments for Sod Areas

Topsoil shall incorporate fertilizer and lime as necessary to meet topsoil chemical

constituents. Contractor shall provide a soil test to verify nutrient deficiencies and soil pH.

#### D. Sod Placement

##### 1. General

- a. Sod shall be cut no more than twenty-four (24) hours before placement. It shall be stored in a manner that protects sod from moisture loss and from extremes in temperature. Soil shall be kept moist.
- b. Sod shall be cut with sharp blades by mechanized equipment designed for the cutting of sod.

##### 2. Harvest

- a. Within twenty-four (24) hours of harvest, sod shall be mowed to a height of one to one and one-half inches (1" to 1-1/2").
- b. Sod shall be cut so as to leave a full intact root mass. It shall be machine cut with a uniform soil thickness of five-eighths inch, plus or minus one-quarter inch (5/8"  $\pm$  1/4") at the time of cutting. Sod that is dry or without soil firmly attached to roots shall be removed from the project site.
- c. Sod shall be cut in straight lines. Cuts shall be of a width between twelve and twenty-four inches (12" and 24"), with all cuts to be the same width, plus or minus one-half inch ( $\pm$  1/2"), regardless of the width chosen. Each roll of sod shall be no shorter than four feet (4').

##### 3. Placement

- a. The ground surface shall be wet before placement of sod, to the extent that soil is damp to a six inch (6") depth.
- b. Existing sod areas adjacent to areas to be installed shall have a clean, straight edge and shall be cut with clean, sharp tools. Existing sod edge shall be cut exactly perpendicular to soil surface.
- c. Sod shall be laid perpendicular to the slope of the ground and anchored as appropriate. Where curves are necessary, the sod shall be cut to provide edges in full contact with adjacent sod. There shall be no gaps between adjacent pieces of sod. No sod pieces shall be less than three feet (3') in length, or as approved by the Engineer.
- d. The first row of sod shall be laid in an even line commencing on lowest portion of slopes with subsequent rows placed parallel to and tightly against each other. Lateral joints shall be staggered to promote more uniform growth and strength. Care shall be exercised to ensure that the pieces are not stretched or overlapped and that all joints are butted tightly.

##### 4. Finishing

Water the sod immediately after transplanting to prevent drying. As sodding is completed in any one section, the area shall be lightly rolled. The new sod shall then be thoroughly watered to a depth sufficient that the underside of the

new sod pad and soil immediately below the pad are thoroughly wet. Contractor is responsible for having adequate water available at the site prior to and during installation.

**Article 5.4 Maintenance**

Maintenance of sod shall conform to Section 75.02, Article 2.4 - Maintenance.

**Article 5.5 Measurement**

Sod shall be measured per 1,000 square feet and shall be placed in all areas disturbed by construction, or as directed by the Engineer. The sod bid item shall include all labor and material, including all cultivating, materials, limestone, if required, and fertilizer. Seventy percent (70%) of sod bid item shall be measured as quantity of sod installed as specified. The remaining thirty percent (30%) of sod shall be measured as maintenance performed during the Plant Establishment Period and Landscaping Acceptance in the condition identified in Article 5.4 of this Section. Payment process and exceptions are identified in Article 5.6 below and in Division 10, Section 10.07, Article 7.7-Final Payment.

**Article 5.6 Basis of Payment**

Payment of this Work shall be in accordance with Division 10, Section 10.07-Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for sod includes payment for maintenance during the Plant Establishment Period. Owner will pay the accepted quantity of sod after the Acceptance of Initial Planting Operations, based on seventy percent (70%) of the Contract unit price for sod. The remaining thirty percent (30%) for the maintenance of sod during the Plant Establishment Period shall be paid upon Landscaping Acceptance except as noted below.

If Contractor did not perform maintenance in accordance with Article 5.4-Maintenance, the remaining thirty percent (30%) shall not be paid.

If damaged sod areas are not repaired or replaced as required within fourteen (14) days of written notice, the Engineer may replace or have replaced the damaged items and deduct the cost of said repair or replacement work from the remaining payments. The cost of said repair or replacement work is based on receipts for replacement sod and ten percent (10%) administrative markup.

Payment shall be made under the following unit:

ITEM	UNIT
Sod	1,000 S.F.

**SECTION 75.06 LANDSCAPE EDGING**

**Article 6.1 General**

The Work under this Section consists of all labor, equipment, and materials necessary to furnish and install landscape edging. All Work shall be in accordance with these Specifications and shall be placed at the locations shown on the Drawings.

A. Submittals

- 1. Product data

**Article 6.2 Materials**

Landscape edging shall be "Curv-Rite, Inc.," black, aluminum, one-eighth inch (1/8") thickness by five and a half inch (5 1/2") depth with twelve inch (12") standard aluminum stakes. Comparable products by other manufacturers will be considered for approval by the Engineer provided complete supporting data from the manufacturer is submitted to the Engineer prior to procurement. Comparable products must be architecturally similar in size, type, and grading of materials, dimensions, finishes, and textures.

Curv-Rite, Inc.  
3603 North Main Street  
Wayland, MI 49348

**Article 6.3 Construction**

Landscape edging shall be installed per manufacturer's specifications, in all locations shown on Drawings.

**Article 6.4 Measurement**

Landscape edging shall be measured per linear foot, delivered, and accepted in place.

**Article 6.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Landscape Edging	Linear Foot

**SECTION 75.07 LANDSCAPE FABRIC**

**Article 7.1 General**

The Work under this Section consists of all labor, equipment, and materials necessary to furnish and install landscape fabric. All Work shall be in accordance with these Specifications and shall be placed at the locations shown on the Drawings.

A. Submittals

- 1. Product data

**Article 7.2 Materials**

Landscape fabric shall be UV resistant, black polypropylene polyester blend with a permeability minimum of 12 gals/s.f./min. Landscape fabric shall be DeWitt Pro 5 Weed Barrier (1-800-888-9669) or equal approved by the Engineer prior to procurement.

**Article 7.3 Construction**

Landscape fabric shall be installed per manufacturer’s specifications as called out on Drawings. Landscape fabric should not be used around trees. Landscape fabric shall not be visible under mulch and all loose ends shall be cut off, tucked under, or otherwise covered with mulch by the Contractor. Landscape fabric shall be in direct contact with soil.

**Article 7.4 Measurement**

Landscape fabric shall be measured per square yard, delivered, and accepted in place.

**Article 7.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Landscape Fabric	Square Yard

## **SECTION 75.08 WILLOW STAKING**

### **Article 8.1 General**

The Work under this Section consists of providing all operations pertaining to the gathering, planting, and establishing willow vegetation using willow stakes.

For additional reference, see the document "Stream Bank Revegetation and Protection – A Guide for Alaska, Revised 2005" published by the Alaska Department of Fish & Game.

#### **A. Submittals**

1. Product source
2. Maintenance Schedule

### **Article 8.2 Materials**

Feltleaf Willow cuttings shall be used and no substitutions shall be accepted without the written permission of the Engineer. The Contractor shall be responsible for obtaining dormant cuttings and necessary permits for the collection of willow stakes.

The technique for using dormant cuttings relies on cuttings of stems taken from plants in the wild during late winter and requires proper storage and care of the cuttings between the time of collection and the time of planting.

Dormant cuttings are live stakes taken in the late winter or early spring before buds have opened. Live stakes should be ten to eighteen inches (10" to 18") long and one-half to one and one-half inches (1/2" to 1.5") in diameter, with visible buds. Place cuttings in plastic and keep frozen or refrigerated until the site is ready to plant. Stakes must not be allowed to dry out, nor should they be kept too moist. If cold storage facilities are not available, cuttings can be stored in a snowbank along the north side of a building or some other location that will remain cold until planting. Cuttings may be taken directly from storage to the site for planting. Plant in early spring, after the ground has thawed, and no later than July 1.

### **Article 8.3 Construction**

#### **A. Planting**

To plant the cuttings, stick a shovel or three-quarter inch (3/4") or less rebar into the ground as far vertically as possible, push the shovel forward and place the cutting right side up in the ground behind the shovel so that at least three-fourths (3/4) of the length will be buried. Leave a maximum of two leaf buds exposed above ground. Remove the planting implement and step lightly around the cutting to firm the soil. Create a small depression around the planting to collect water.

Willow stakes shall be planted as vertically as possible.

#### **B. Spacing**

Dormant cuttings shall be planted one to three feet (1' to 3') on center unless otherwise shown on the Drawings.



C. Watering

Thoroughly water each plant immediately following planting to remove air pockets and increase contact between the soil and the stake. Under no condition shall plants not be watered in the same day as planting. The Contractor shall maintain moist soil conditions for four to six (4 to 6) weeks to establish plants. Water shall be supplied by the Contractor unless otherwise specified. The Contractor shall assume full responsibility for plant failure as a direct result of insufficient watering.

D. Inspection

The Engineer shall make periodic inspections during the installation and maintenance periods of the Work. Should plant materials, installation procedures, or other conditions be observed not in keeping with the Drawings, details, and these Specifications, the Engineer will direct the Contractor to correct by repair, and/or replacement, as appropriate. The Engineer shall be the sole judge of the conditions of quality and acceptability and will direct all corrections in writing to the Contractor. All rejected materials shall be immediately removed from the site and replaced with specified materials at no additional cost to the Owner.

E. Time of Planting

Spring planting and maintenance shall not begin before May 1, and planting operations may commence as soon as the ground is frost free. Planting and maintenance shall not occur later than July 1, unless otherwise specified or approved in writing by the Engineer.

**Article 8.4 Maintenance**

A. General

The Contractor shall furnish all labor, materials, supplies and equipment required to establish, maintain, and protect the planted areas, for the Plant Establishment Period from date of acceptance of the initial planting operations. However, maintenance activities shall commence immediately after each item is planted.

The maintenance period shall consist of the time from initial planting through acceptance after the Plant Establishment Period.

The Contractor shall supply a maintenance schedule to the Engineer, thirty (30) days prior to the landscape inspection. The Contractor shall also be responsible for protection of his work during the maintenance period, and shall repair and replace all materials damaged or destroyed within the scope of the Work, regardless of cause.

Contractor shall replace any willow stake damaged during maintenance at no additional cost to the Owner.

B. Watering

A proposed watering schedule shall be submitted to the Engineer thirty (30) days prior to installation of plant materials. The Contractor shall deep-water all planted areas, providing water penetration throughout the root zone.

The Contractor shall maintain soil around willow stakes in a moist condition during

the maintenance period. Watering shall cease at first hard frost in the fall and shall resume upon ground thaw in the spring.

If at any time during the maintenance period, weather conditions (such as an extended period with no rain or continuous drying winds) cause the plant root zone to dry out, the Engineer may direct the Contractor to deep water all plantings. Any supplemental watering is to be done immediately and at no additional cost to the Owner.

Water application shall be applied at a rate that will provide moisture penetration throughout the entire root zone with a minimum of water run-off. Should soil conditions be encountered, not conducive to water absorption, the Contractor shall take whatever corrective actions that may be required to correct this condition, without additional cost to the Owner. If the Contractor does not provide adequate watering as required by the Engineer, the Engineer will hire others to perform this task and deduct costs from final payment to the Contractor.

C. Plant Repair and Replacement

The Contractor shall repair/replace damaged plant materials, regardless of cause, upon notification by the Engineer. Should repair of plant materials reduce their acceptance to less than minimum specified conditions, the Contractor shall replace plants with specified plant replacements at no additional cost to the Owner.

D. Inspection

The Engineer shall make periodic maintenance inspections of the Work. All deficiencies noted shall be corrected within five (5) calendar days from written notice to do so, at no additional cost to the Owner.

**Article 8.5 Willow Staking Acceptance**

A Willow Staking Acceptance Inspection of the project will occur after completion of the Plant Establishment Period. Engineer shall verify that Contractor performed maintenance functions as identified in Article 8.4 – Maintenance of this Section. Additional conditions governing final acceptance of the planted areas are that, in the opinion of the Engineer, all willow stake areas are in a live, uniform, and sound and healthy and flourishing condition; free of disease, insect infestation, and physical damage, and free of weeds, rubbish, and construction debris. If the Engineer does not accept the improvements, the Contractor shall correct all deficiencies. All costs associated with correcting the deficiencies and extending the Plant Establishment Period shall be paid by the Contractor without additional cost to the Owner.

Should required corrections not be made within thirty (30) days after the initial Final Maintenance Acceptance Inspection, the Contractor shall be assessed liquidated damages per Division 10, Section 10.05, Article 5.27 – Liquidated Damages, until all Work is complete and accepted by the Engineer.

**Article 8.6 Measurement**

Seventy percent (70%) of each bid item shall be measured as quantity of plants by square yard as specified.

The remaining thirty percent (30%) of each bid item shall be measured as maintenance Work performed during the Plant Establishment Period and the acceptance of the improvements in the condition identified in Article 8.5 of this Section. Payment process and exceptions are identified in Article 8.7 below and in Division 10, Section 10.07, Article 7.7 – Final Payment.

**Article 8.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for all willow plantings includes payment for the Plant Establishment Period. Owner will pay the accepted quantity of willow stakes after they are acceptably planted, based on seventy percent (70%) of the Contract unit price for the respective pay items.

The remaining thirty percent (30%) for the maintenance during the Plant Establishment Period shall be paid per Section 75.02 Landscaping, except as noted below.

If Contractor did not perform maintenance in accordance with Article 8.4 – Maintenance, the remaining 30% shall not be paid.

If damaged willows are not repaired or replaced as required within fourteen (14) days of written notice, the Engineer may replace or have replaced the damaged items and deduct the cost of said repair or replacement work from the remaining payments. The cost of said repair or replacement work is based on receipts for replacement cuttings plus ten percent (10%) administrative markup. Replacement by the Owner of any plantings within the last sixty (60) days of the Plant Establishment Period shall trigger a sixty (60) day extension of the Plant Establishment Period.

Payment shall be made on the following basis.

ITEM	UNIT
Willow Staking	Square Yard

## **SECTION 75.09 SITE FURNISHINGS**

### **Article 9.1 General**

Work under this Section consists of providing all operations pertaining to the removal, disposal, relocation, pickup, delivery, assembly, and installation of Owner-supplied Transit or Park site furnishings, including the labor, equipment, and materials. Work may include relocation of bus stop signs, removal and/or installation of bus shelters, trash receptacles, bear-proof trash cans, benches, poop stations, playground equipment, picnic tables, and other transit, park, or urban street furnishings.

#### **A. Submittals**

1. Product data

### **Article 9.2 Materials**

Contractor shall provide installation materials including, but not limited to, concrete footings, anchor bolts, and any other mounting hardware required for the complete installation of the site furnishings. Cost for installation materials is incidental to this pay item.

The Contractor is solely responsible for loading, transporting, unpacking, and assembly of site furnishings.

#### **A. Transit Materials**

Transit-related materials for benches, trash receptacles, signs, and bus shelters shall be furnished by the Owner and shall be the type shown on the Drawings. The Contractor shall contact Anchorage Transit System to pick-up materials. The Contractor shall notify Transit Staff within forty-eight (48) hours in the event parts are missing.

#### **B. Park Furnishings**

Owner supplied park furnishings shall be the type shown on the Drawings. The Contractor shall contact Anchorage Parks and Recreation to pickup materials.

Park furnishings not Owner supplied must be consistent with current park standards. Contractor shall contact Anchorage Parks and Recreation for specific standards per location.

### **Article 9.3 Construction**

Contractor shall load and transport the owner-supplied site furnishings to the site. Contractor shall assemble and install materials in accordance with the Drawings and the manufacturer's specifications.

Contractor shall be responsible for protection of their work during transportation and installation and shall repair and replace all furnishings damaged or destroyed within the scope of the Work, regardless of cause.

Removal and relocation of bus sign(s) shall be in accordance with Division 85, Section 85.04 Standard Signs.

**Article 9.4 Measurement**

Method of measurement for the removal and disposal of existing bus shelters and trash receptacles is for each unit.

Method of measurement for the installation of the Owner-supplied furnishings is for each unit complete in place.

Method of measurement for the removal and relocation of the bus stop sign is for unit relocated and complete in place.

**Article 9.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Install Owner-supplied Furnishing (Type)	Each
Remove and Relocate Bus Sign	Each
Remove Furnishing (Type)	Each

## **SECTION 75.10 BOLLARDS**

### **Article 10.1 General**

The Work under this Section consists of all labor, equipment, and materials necessary to complete the construction of wood, concrete pipe, and removable steel bollards as shown on the Drawings. Where existing bollards are removed prior to reuse, Contractor shall erect "hasty" fence or snow fence to deter vandalism by motorized vehicles.

A. The following Applicable Standards shall be used:

#### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36M	(1997a) Carbon Structural Steel
ASTM A 123	(1989a) Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products
ASTM A 307	Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rods of 60000 PSI Tensile Strength in Sized from ¼ inch to 4 inches in Diameter
ASTM A 500	(1996) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 501	Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
ASTM A 615/A 615M	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM C 150	Portland Cement

American Wood Protection Association (AWPA) AWPA P5 Standards of Waterborne Preservatives

West Coast Lumber Inspection Bureau standard grading and dressing rules

Western Wood Products Association standard grading and dressing rules

B. Submittals

1. Product data

### **Article 10.2 Materials**

A. Wood Bollards

1. Storage and Protection: Protect lumber from weather. Store inside whenever possible.
2. Grading Rules: Standard grading and dressing rules of the West Coast Lumber Inspection Bureau or the Western Wood Products Association.

Each piece of yard and structural lumber shall bear official grade mark of the appropriate bureau or association. Provide Common No. 1 or better Hem/Fir wood, surfaced four (4) sides unless otherwise noted on the Drawings, and kiln dried. Moisture content shall not exceed nineteen percent (19%).

3. Preservative Pressure Treatment

- a. Pressure-treat all wood in direct contact with ground with chromate copper arsenate, Type II (AWPA P-5) with a retention of 0.45 lbs. per cubic foot of wood. Contractor shall submit a certificate of treatment to the Engineer for approval prior to use on the Project.
- b. After treatment, wood shall be clean, of natural color and finish, non-corrosive, water repellent, paintable, odorless, dry, and non-staining.
- c. Cut Wood bollards to length necessary for construction before preservative pressure treatment is applied.

4. Paint: Stain Wood bollards with two coats Color Shield '4000' Alkyd Flat stain or approved equal. Color to be Russet Brown, or similar. Apply stain to clean dry surface, free of dust or dirt, in accordance with the manufacturer's recommendations and specifications.

B. Concrete Pipe Bollards

Contractor shall use only new products in construction and installation of concrete pipe bollards. Standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory use for at least two years.

1. Concrete

Portland cement shall conform to ASTM C 150 Types I, II, or III.

2. Finish

Finish shall be galvanized. Exposed surfaces and edges shall be rounded, polished, or sanded. Finish shall be non-toxic, non-glare, and resistant to corrosion.

3. Galvanizing

After fabrication, hot-dip galvanized components in zinc in accordance with ASTM A 123. Remove Tailings and sharp protrusions formed as a result of the hot-dip process and burnish exposed edges.

4. Tubing

Provide Schedule 40 steel tubing of the size specified in the Drawings.

5. Paint

Prime Tubing and cover with two coats minimum of dark green powder coat paint in accordance with the manufacturer's instructions. Top coat

with two coats Yellow Carboline 139, unless guard post cover or sleeve is to be installed.

C. Removable Steel Bollards

Furnish hardware as necessary and as detailed for the project. Items include bolts, nuts, anchor bolts, washers, nuts, and rods (ASTM A-307). Hot-dip galvanize all bolts, nuts, washers, and plates in accordance with ASTM A-123.

Provide steel that conforms with ASTM A-36 structural carbon steel, shop fabricated and galvanized.

Painting: Etch galvanized surface with "Galvaprep."

D. Guard Post Cover/Sleeve

Provide guard post covers molded from a durable polyethylene with ultra-violet (UV) stabilizers to ensure product life and color fastness.

Secure the polyethylene guard post cover or sleeve in accordance with the manufacturer's recommendations. Provide Carsonite SAV-T Sleeve, the guard post cover or sleeve, or approved equal.

**Article 10.3 Construction**

A. Acceptance of Existing Surfaces

The Contractor shall verify that finished grade and other operations affecting mounting surfaces have been completed prior to the installation of bollards. Install Bollards plumb and true in accordance with the approved manufacturer's instructions or recommendations.

B. Installation

For concrete pipe bollard, provide footing as shown on Drawings. Slope drainage from tubing at two percent (2%) grade. Place concrete inside steel pipe or tubing for full extent. Rod concrete to remove air voids. Dome top to provide clean transition from top surface to bollard sides. Do not leave exposed edge. Provide brushed finish to concrete dome.

Install bollards plumb, level and true to line. Top of a row of bollards shall be maintained at a consistent level above adjacent ground.

C. Removable Bollards

Install bollard base plate flush with top of paved trail. Install bollards plumb, level, and true to line. Use only three-sixteenth inch (3/16") fillet welds. Grind all edges smooth.

Fasteners: Padlocks for removable bollards shall be American Padlock, 2 inch shackle that accepts the interchangeable or IC best core purchased. Cores shall be keyed to Municipality Of Anchorage cores matched to a 645 key.

Installation of the cores must be authorized by Facilities Management at 907-343-8270 or email [FacilitiesManagementWorkRequests@anchorageak.gov](mailto:FacilitiesManagementWorkRequests@anchorageak.gov). Padlocks are incidental to this pay item.



D. Clean Up

Clean the site of all materials associated with the installation. Clean surfaces of dirt, stains, filings, and other blemishes occurring from shipment and installation. Provide cleaning methods and agents according to manufacturer's instructions or as indicated. Remove excess concrete.

**Article 10.4 Measurement**

Measurement will be based on complete units in place for all bollards.

Measurement for concrete pipe bollard with sleeve shall be for a concrete pipe bollard with polyethylene guard post cover or sleeve installed in place.

Measurement for "Remove Bollard" shall be for each bollard removed and disposed of as directed on the Drawings. Footings, anchoring devices, and other items shown on the Drawings shall be considered incidental to the bid item "Removable Bollard" and no separate payment shall be made.

Any other items required for a complete and finished installation shown on the Drawings are measured separately for payment purposes.

**Article 10.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Bollard (Type) (Color as appropriate)	Each
Remove Bollard	Each
Remove & Reset Bollard	Each

## **SECTION 75.11 MODULAR CONCRETE BLOCK WALL**

### **Article 11.1 Description**

Work under this Section consists of furnishing all labor, equipment, and materials to complete the construction of a modular concrete block wall and steps. Accomplish all work as shown on the Drawings and as described herein.

#### **A. Submittals**

1. Product data

### **Article 11.2 Materials**

- A. Wall units shall be eight inch (8") Allan Block Retaining Wall System or equal approved by the Engineer prior to procurement. Capstones and corner blocks are required.

Color: Grey  
Size: 8"H x 12"D x 18L  
Style: AB Classic

All materials required for proper installation of the retaining wall system, including specified backfill, are incidental to this Section.

- B. Anti-graffiti Protection: Use a two-step anti-graffiti protection system designed specifically for this use. The system shall consist of a single component clear acrylic base coat covered by a clear urethane finish coat. This material is not a sealer or vapor barrier and no discoloration is allowed.

### **Article 11.3 Manufacturer and Local Representative**

Manufacturer:	Local Representative:
Allan Block Corporation	Anchorage Sand and Gravel Co., Inc.
7400 Metro Boulevard, Suite 185	1040 O'Malley Road
Edina, MN 55439	Anchorage, AK 99515
800-835-5309	907-348-6300
952-835-0013 (fax)	907-349-3967 (fax)

### **Article 11.4 Construction**

Contractor shall install wall in accordance with manufacturer's specifications and as shown on Drawings. Contractor shall install wall to match the geometric layout shown on Drawings, including corners. Any changes in the layout require Engineer's approval. Contractor shall ensure the tops of wall elevations are continuous.

Contractor shall secure capstone with Type P1 Premium Water-Proof Construction adhesive per the manufacturer's specifications.

If anti-graffiti protection is required per Drawings: Apply the system in accordance with the manufacturer's recommendations. Apply appropriate masking as required. Apply the system to concrete surfaces to a minimum of one-foot below finished grade.

### **Article 11.5 Measurement**

Measurement is the area in square feet based on the above-grade vertical face of complete units in place. Blocks, specified backfill or other items shown on the Drawings,

are not measured separately for payment and are incidental to this bid item.

**Article 11.6 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Modular Concrete Block Wall	Square Foot
Anti-graffiti Protection	Square Foot of coated surface area

## **SECTION 75.12 BOULDERS**

### **Article 12.1 General**

Work under this Section includes furnishing the labor, equipment, and materials necessary for the furnishing and placing of Contractor-supplied boulders.

#### **A. Submittals**

1. Product photos
2. Source data

### **Article 12.2 Materials**

Contractor shall furnish boulders similar in appearance, color, type, and approximate size as shown on Drawings or specified in the Contract Documents. No evidence of drilling, scrapes, large flakes, or cracks shall be visible after the boulder is set in place.

### **Article 12.3 Construction**

The Contractor shall coordinate with the Engineer prior to setting boulders to ensure desired face and orientation is achieved. Boulders shall be placed on site as directed by the Engineer.

The Contractor shall form a pocket for boulder installation, ensuring that the boulder is even and true to line, buried one-third to one-half ( $1/3$  to  $1/2$ ) of the boulder depth, and in accordance with the Standard Detail, or as shown on the Drawings.

### **Article 12.4 Measurement**

Boulders will be measured as units of the specified size complete in place.

### **Article 12.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Boulder (Size)	Each

## **SECTION 75.13 ROOT PRUNING**

### **Article 13.1 General**

Work under this Section includes but is not limited to all equipment, labor, and transportation necessary to provide root pruning as shown on the Drawings and specified herein. Root Pruning is required where all work abuts mature tree plantings that are to remain in place.

- A. Submittals
  - 1. Tree Service Firm Qualifications
  - 2. Arborist Qualifications

### **Article 13.2 Materials**

Burlap: A strong woven fabric made of jute, hemp, or flax fibers.

### **Article 13.3 Quality Assurance**

- A. Tree Service Firm Qualifications: The Contractor shall furnish the Engineer with firm qualifications for approval. The firm shall be an experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to the project site during execution of tree protection, trimming, and root pruning.
- B. Arborist Qualifications: The Contractor shall furnish the Engineer with arborist's certifications or licenses. The arborist shall be certified by ISA or licensed in the jurisdiction where the Project is located.

### **Article 13.4 Construction**

- A. Workmanship and Procedure
  - 1. Root Pruning shall be performed when below ground construction occurs within 16 feet of a mature tree. Mature trees are trees that are 4" diameter at breast height (DBH) or greater in size. Root Pruning shall be done to a depth of 18 inches. The distance to prune away from the base of a tree shall be determined by providing 1 foot of horizontal distance from the trunk of the tree for every 1 inch of DBH of that tree. Roots exposed for pruning should be done in the least impactful way, such as by air or water excavation, to minimize damage to remaining root system. Hand digging would be the second best option. Excavation with equipment can create damage, tearing and breaking roots within the Tree Protection Zone.
  - 2. All roots 1" in diameter or greater shall be cut clean with a root pruner, a sharp saw, and/or hand pruners.
  - 3. Roots must not be pruned or removed from more than one side of a tree.
  - 4. All pruned roots are to be covered by wet burlap or mulch and kept moist for the duration of time that the root is exposed.
  - 5. Topsoil or native soil shall be used to backfill the excavated area around the root.

B. Maintenance

1. Keep the burlap or mulch that is covering pruned roots moist for the duration of time that the root is exposed.

**Article 13.5 Measurement**

Measurement for Root Pruning shall be by the linear foot.

**Article 13.6 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Root Pruning	Linear Foot

## **SECTION 75.14 TREE PROTECTION ZONE FENCE**

### **Article 14.1 General**

Work under this Section includes all equipment, labor, and transportation necessary to furnish, install, and remove Tree Protection Zone Fences as specified herein. Tree Protection Zone Fences are required where all work abuts mature tree plantings that are to remain in place. Tree Protection Zone Fences are to be removed when construction is complete.

Tree Protection Zone (TPZ): Tree Protection Zones shall be per Section 75.02

#### **A. Submittals**

1. Product data

### **Article 14.2 Submittals**

**Certification:** Provide a certification from a certified arborist that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

**Maintenance Recommendations:** Provide a copy of recommendations, from a certified arborist, for care and protection of trees affected by construction during and after completing the Work.

### **Article 14.3 Quality Assurance**

- A. Tree Service Firm Qualifications:** The Contractor shall furnish the Engineer with firm qualifications for approval. The firm shall be an experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to the project site during execution of tree protection, trimming, and root pruning.
- B. Arborist Qualifications:** The Contractor shall furnish the Engineer with arborists certifications or licenses. The arborist shall be certified by ISA or licensed in the jurisdiction where the Project is located.
- C. Tree Pruning Standards:** Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance – Standard Practices (Pruning)."
- D. Pre-installation Conference:** Before tree protection operations begin, the Contractor shall meet with the Engineer and Contractor's Arborist to review tree protection procedures and responsibilities and determine tree protection fencing limits on site. Contractor's arborist may increase the size of the TPZ based on the site or soil conditions and/or tree-specific needs that warrant greater protection.
- E. Prior to any excavation, tree protection limits will be staked by the Contractor and approved by the Engineer.**
- F. Provide written acceptance from a certified arborist that trees indicated to remain and protected by Tree Protection Zones have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.**

**Article 14.4 Materials**

- A. Temporary Construction Fencing: 4' High, high visibility, orange safety fence.
- B. Steel T-Posts: Green steel T-posts with pointing and with reflective safety caps.
- C. Chain Link Fence: 6 feet tall fence metal chain link fence set in metal frame panels on movable core drilled concrete blocks of sufficient size to hold the fence erect in areas of existing paving to remain.

**Article 14.5 Construction**

Construction Fencing: Install fencing around tree protection zones to protect remaining trees and vegetation from construction damage. Maintain temporary fence in place continuously during construction. The temporary fencing shall remain in place during the duration of the Work and shall be removed when construction is complete.

Damaged trees shall be repaired in accordance with Section 75.02, 2.3 Construction, D. Protection of Existing Trees.

**Article 14.6 Measurement**

Measurement for Tree Protection Zone Fencing shall be by the linear foot.

**Article 14.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Tree Protection Zone Fencing	Linear Foot



## **SECTION 75.15 MOOSE PROTECTION FENCE**

### **Article 15.1 General**

Work under this Section includes all equipment, labor, and transportation necessary to furnish, install, and remove Moose Protection Fence as specified herein. Moose Protection Fence is required around all new individual trees and/or tree groupings. Moose Protection Fence is to be removed at the completion of the Plant Establishment Period, unless otherwise directed by the Engineer. The Engineer may notify the Contractor about damages to the Moose Protection Fence, in which case the repairs shall be made within two (2) working days. The Contractor shall repair and replace all materials damaged or destroyed within the scope of the Work, regardless of cause.

#### **A. Submittals**

1. Product data

### **Article 15.2 Materials**

- A. Fabric: 1"x 2" welded wire mesh. Min. 14-gauge wire diameter.
- B. Steel T-Posts: 10' height, green steel T-posts with pointing.

### **Article 15.3 Construction**

Workmanship and Procedure: Moose Protection Fence shall be erected immediately following the tree installation. The Moose Protection Fence shall be placed at the outside edges of individual trees and/or tree groupings. Posts shall not damage roots or break rootballs. All trees shall be enclosed within the fence without damaging branches or allowing branches to protrude. The fence shall be stable with posts that are set plumb. Attach mesh securely with zip ties or wire ties. The fence shall remain in place during the duration of the Work and shall be removed at the end of the maintenance period. Holes and disturbed mulch areas shall be repaired.

### **Article 15.4 Measurement**

Measurement for Moose Protection Fence shall be by the linear foot.

### **Article 15.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM

Moose Protection Fence

UNIT

Linear Foot

**Section 75.16            RESET FENCE**

**Article 16.1    General**

The Work under this Section consists of providing all operations pertaining to removing, storing, and resetting existing fence whatever height and type of fencing material as indicated on the Drawings or as directed by the Engineer.

**Article 16.2    Material**

All materials which can be reused shall be salvaged from the existing fence. Those materials which cannot be salvaged or are damaged by the Contractor's operations shall be replaced, at the Contractor's expense, with new materials which as nearly as possible duplicate the kind and quality of materials in the original installation.

Nails, staples, fastening wires or devices, and all materials required for the construction of such anchors, end posts or other portions of the fence which can be replaced more efficiently than they can be moved, shall be furnished by the Contractor.

If the property owner elects to replace any of the existing fencing materials with other materials in better condition, they shall furnish and deliver such materials to the site of the Work, upon the approval of the Engineer and the Contractor.

**Article 16.3    Construction**

The fence shall be set in close conformity with the property line shown on the Drawings or as directed by the Engineer. Posts and anchors shall be set at the same depth and spacing as in the original fence. Wire shall be drawn taut but care shall be taken to avoid over-stressing the salvaged materials. Permanent anchors, end posts or other parts which cannot be economically moved shall be replaced by equivalent construction. If any new materials require painting, they shall be painted to match the original materials as nearly as possible. If a match cannot be attained to the satisfaction of the Engineer, the entire fence will be painted. The reset fence shall be placed in at least as good condition as the existing fence before it was moved.

**Article 16.4    Measurement**

Resetting fence will be measured by length in linear feet, complete and accepted in its final position.

**Article 16.5    Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Remove and Reset Fence	Linear Foot
Reset Fence	Linear Foot

## SECTION 75.17 CHAIN LINK FENCE

### Article 17.1 General

The Work under this Section consists of providing all materials and operations pertaining to construction of chain link fencing.

A. Applicable Standards:

The following applicable standards shall be used:

ASTM A641	Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM A53	Pipe, Steel, Black and Hot Dipped Zinc Coated Welded and Seamless
ASTM A121	Metallic-Coated Carbon Steel Barbed Wire
ASTM A123/AASHTO M111	Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products
ASTM A153/AASHTO M232	Zinc Coating (Hot Dip) on Iron and Steel Hardware
ASTM A227	Steel Wire, Cold-Drawn for Mechanical Springs
ASTM A307	Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength

B. Submittals

a. Product data

### Article 17.2 Materials

Material used in the construction of chain link fencing shall be in accordance with the Standard Details and the requirements of the Chain Link Fence Manufacturers Institute, as described below.

A. General

Posts, gate frames, braces, rails, stretcher bars, and truss rods shall be of steel; reinforcing wires shall be of high carbon steel; and gate hinges, post caps, barbed-wire supporting arms, stretcher bar bands, and other parts shall be of steel, malleable iron or equal except that ties and clips may be of aluminum.

Contractor shall form parts accurately to dimensions. All steel and iron parts shall be zinc coated after fabrication, using zinc grade "E" in accordance with Federal Specifications QQ-Z-351.

The weight of the zinc coating per square foot of actual surface shall average not less than 1.2 ounces and no individual specimen shall weigh less than 1.0 ounce. Zinc-coated surfaces shall be free from imperfectly coated spots, bruised or scaled coating, drops of zinc, sharp projections, and sal ammoniac spots.

Posts, gate frames, rails, and braces shall conform to the dimensions and weights shown in the Dimensions and Weights Table in Article 17.3 – Tables.

B. Fabric

Fencing fabric shall be zinc coated by the hot-dip process after fabrication. The zinc coating shall be commercially uniform. It shall not have less than 1.2 ounces per square foot when tested. Fabric gauge shall be as shown in the Fencing Fabric Size Table in Article 17.3 - Tables.

C. Gates

Gates shall be swing or sliding, single or double, as specified, complete with latches, stops, keepers, hinges, or rollers and roller tracks, and, when so specified, with provisions for three (3) strands of barbed wire above the fabric.

Gate frames shall be constructed of tubular members and shall be constructed in a manner such as to provide a rigid frame and ample strength and shall be free from sag and twist. Where a barbed wire top is specified, the end members of gate frames shall be extended approximately one foot (1') above the top member and arranged for attaching three (3) uniformly spaced strands of barbed wire and furnished with bands or other suitable method for securely attaching the wire. Fabric shall be attached securely to the gate frame at intervals not to exceed fifteen inches (15").

Hinges shall be of heavy pattern, of adequate strength for the gate, and with large bearing surfaces for clamping them in position. The hinges shall not twist or turn under the action of the gate. The gates shall be capable of being opened and closed easily by one person.

Latches, stops and keepers shall be provided for all gates. Latches shall have the plunger-bar arranged to engage the gate stop, except that for single gates with openings less than ten feet (10') wide, a forked latch may be provided. Latches shall be arranged for locking. Center stops shall consist of a device arranged to be set in concrete and to engage the plunger of the bar latch of double gates. No stop is required for single gates. Keepers shall consist of a mechanical device for securing the free end of the gate when in the full open position.

D. Posts

Posts shall be of the lengths specified and shall be tubular, except that line posts may be H-beam. Dimension and weight shall conform to the Dimensions and Weights Table in Article 17.3 – Tables, unless otherwise specified.

E. Post Braces

Post braces shall be provided for each gate, corner, pull, and end post for use with fabric five feet (5') or more in height, and shall consist of a round tubular brace extending to each adjacent post at mid-height of the fabric, and a truss consisting of a rod not less than three-eighths inch (3/8") in nominal diameter from the adjacent post back to the gate, corner, pull, or end post, with a turnbuckle or other equivalent provision for adjustment.

F. Post Tops

Post tops shall consist of ornamental tops or combination tops and barbed-wire supporting arms, as specified. When so specified or when a top rail is to be

provided, the top shall be provided with a hole suitable for the through passage of the top rail. The post tops shall fit over the outside of the posts and shall exclude moisture from the tubular posts.

G. Barbed-Wire Supporting Arms

Barbed-wire supporting arms, when specified to be furnished, shall be at an angle of approximately forty-five degrees (45°) and shall be fitted with clips or other means for attached three lines of barbed-wire. The top outside wire shall be approximately twelve inches (12") horizontally from the fence line and the other wires spaced uniformly between the top of the fence fabric and the outside barbed wire.

H. Top Rails

Top rails shall be round (tubular), shall be in lengths not less than eighteen feet (18'), and shall be fitted with couplings for connecting the lengths into a continuous run. The coupling shall be not less than six inches (6") long, shall provide a substantial connection, and shall allow for expansion and contraction of the rail. Suitable ties or clips shall be provided in sufficient number for attaching the fabric securely to the top rail at intervals not exceeding two feet (2'). Means shall be provided for attaching the top rail to each gate, corner, pull, and end post.

I. Stretcher Bars

Stretcher bars shall not be less than three-sixteenth inch by three-quarter inch (3/16" x 3/4") and shall be of lengths one inch (1") less than the full height of the fabric with which they are to be used. The stretcher bars shall be arranged for attaching the fabric to all terminal posts by threading through the fabric, by bands, or by other positive mechanical means.

J. Ties or Clips

Ties or clips of adequate strength shall be provided for attaching the fabric to lineposts.

K. Fabric Bands

Fabric bands of adequate strength shall be provided for attaching the fabric and stretcher bars to all terminal posts.

L. Tension Wires

A bottom tension wire shall be provided unless otherwise specified. Top tension wire shall be provided, when so specified, in lieu of a top rail. The tension wires shall be of coiled spring wire not less than seven (7) gage plus or minus 0.005 inch in diameter. Ties or clips shall be provided for attaching each wire to the fabric at intervals not exceeding two feet (2').

M. Barbed Wire

Barbed wire shall consist of two (2) strands of twelve and one-half (12.5) gauge wire with fourteen (14) gauge four (4) point barbs spaced approximately five inches (5") apart. All wire shall be zinc coated with a minimum coating of 0.80 ounces per square foot of surface area on twelve and one-half (12.5) gauge

wire.

N. Vinyl Clad Fencing

Those components specified to be vinyl-clad or coated shall have a vinyl covering ten to fourteen (10-14) mils in thickness. Fabric is to be nine (9) gauge wire. Products are to be Colorbond II as manufactured by Colorguard Corporation, or approved equal.

**Article 17.3 Tables**

**DIMENSIONS AND WEIGHTS**

Use and Section		Nominal Outside Diameter Dims (Inches)	Nominal Weight per Foot, (Pounds)
Tubular End, Corner, and Pull Posts for:			
fabric height: 6 feet and less	Round	2.375	3.65
fabric height: over 6 feet	Round	2.875	5.79
Rails and Post Braces	Round	1.66	2.27
Intermediate Posts for:			
fabric height: 6 feet and less			
Tubular	Round	1.90	2.72
C-Section		1.875 x 1.625	2.28
fabric height: over 6 feet			
Tubular	Round	2.375	3.65
C-Section		2.25 x 1.70	2.64
Gate Posts with Fabric Over 6 Feet for Gate Leaf Widths:			
leaf width: 6 feet and less	Round	2.875	4.64
leaf width: over 6 to 13 feet	Round	4.000	8.65
leaf width: over 13 to 18 feet	Round	6.625	18.02
leaf width: over 18 to 24 feet	Round	8.625	27.12
Gate Frame Members for:			
fabric height: Less than 6 feet	Round	1.66	1.83
fabric height: 6 feet and over	Round	1.90	2.28
Interior Bracing:	Round	1.66	1.83

## FENCING FABRIC SIZE

Recommended Usage	Height of Fabric	Mesh Size	Gauge	Nominal Diameter Coated Wire (Inches)
Heavy Industrial	36" through 144"	2"	6	0.192
Industrial/Residential	36" through 144"	2"	9	0.148
Light Industrial/Residential	36" through 84"	2"	11	0.120
Tennis Court	120" through 144"	1-3/4"	11	0.120

### Article 17.4 Construction

#### A. Grading

All trees, brush and other obstacles which would interfere with the construction of the fence shall be removed and disposed of at a Contractor-provided disposal area and shall be considered incidental to the Contract. The fence shall follow a smooth profile. Throughout the fence length the distance between the ground surface and the bottom tension wire shall not be greater than four inches (4"), nor less than two inches (2"). Where excavation is necessary to meet this requirement, the ground will be graded level not less than one foot (1') on either side of the fence and backslopes of one and one-half to one (1½:1) provided. Where backfill is necessary to meet this requirement, natural surface vegetation will be removed prior to placing fill material. The top of the fill shall be level for one foot (1') on either side of the fence line and the shoulder slopes shall be one-half foot to one foot gradient (½:1'). Grading for all specific conditions shall be such that water will not be allowed to pond in the immediate area of the fence. Where drainage is required across the fence line, the Engineer shall be consulted and channels provided in accordance with his decision.

#### B. Posts

All posts shall be set in Class B Portland Cement Concrete footings. The tops of the footings shall be level with the ground, shall be crowned to provide drainage and shall be troweled smooth. The dimensions of the footings shall be as shown on the Drawings. The footings shall be allowed to cure for a period of at least seven (7) days before attaching fabric.

The Contractor shall set the posts vertical and of uniform and equal height above the ground with a maximum horizontal spacing of ten feet (10') center. On straight runs, pull posts shall be provided at intervals not to exceed five hundred (500) lineal feet. Changes in line of thirty degrees (30°) or more shall be considered corner posts. Steep slopes and abrupt changes in topography may require changes in various elements of the fence. The chain link fabric shall be stretched taut and securely fastened to end, corner, or gate posts. The top edge of the fabric shall be fastened to the top rail, and the lower edge of the fabric shall be fastened to the bottom tension wire.

C. Fabric

Place fabric on the side specified, stretched taut, and securely fastened to the posts. Fasten fabric to end, gate, corner and pull posts with stretcher bars and fabric bands spaced at intervals of fifteen inches (15") or less. Fastening to line posts shall be with ties or clips at fifteen inch (15") intervals.

Join rolls of wire fabric by weaving a single strand into the ends of the rolls to form a continuous mesh. Horizontal splices are not permitted.

D. Top Rail

Top rails shall pass through the ornamental tops of the line posts, forming a continuous brace from end to end of each stretch of fence. Join lengths of tubular top rail by sleeve couplings. Secure top rails fastened to terminal posts by pressed steel fittings or other appropriate means.

E. Tension Wire

Provide one continuous length of tension wire between pull posts. Apply sufficient tension to avoid excess sag between the posts. Tie or otherwise fasten tension wires to end, gate, corner, or pull posts by methods approved by the Engineer.

F. General Appearance

Runs of fence shall present the same general appearance and the product of one manufacturer only will be accepted, except for items which do not influence the appearance of the completed fence. No used, rerolled, or open-seam steel will be permitted in posts, gate frames, rails or braces.

**Article 17.5 Measurement**

Chain link fencing will be measured per linear foot, in place, from outside to outside of end or corner posts, except for the space occupied by gates.

Gates will be measured per each, complete in place for a particular size.

**Article 17.6 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Unit cost payment shall be made on the following basis:

ITEM	UNIT
Chain Link Fence (Include Heights and Gage)	Linear Foot
Gate (Type and Size)	Each

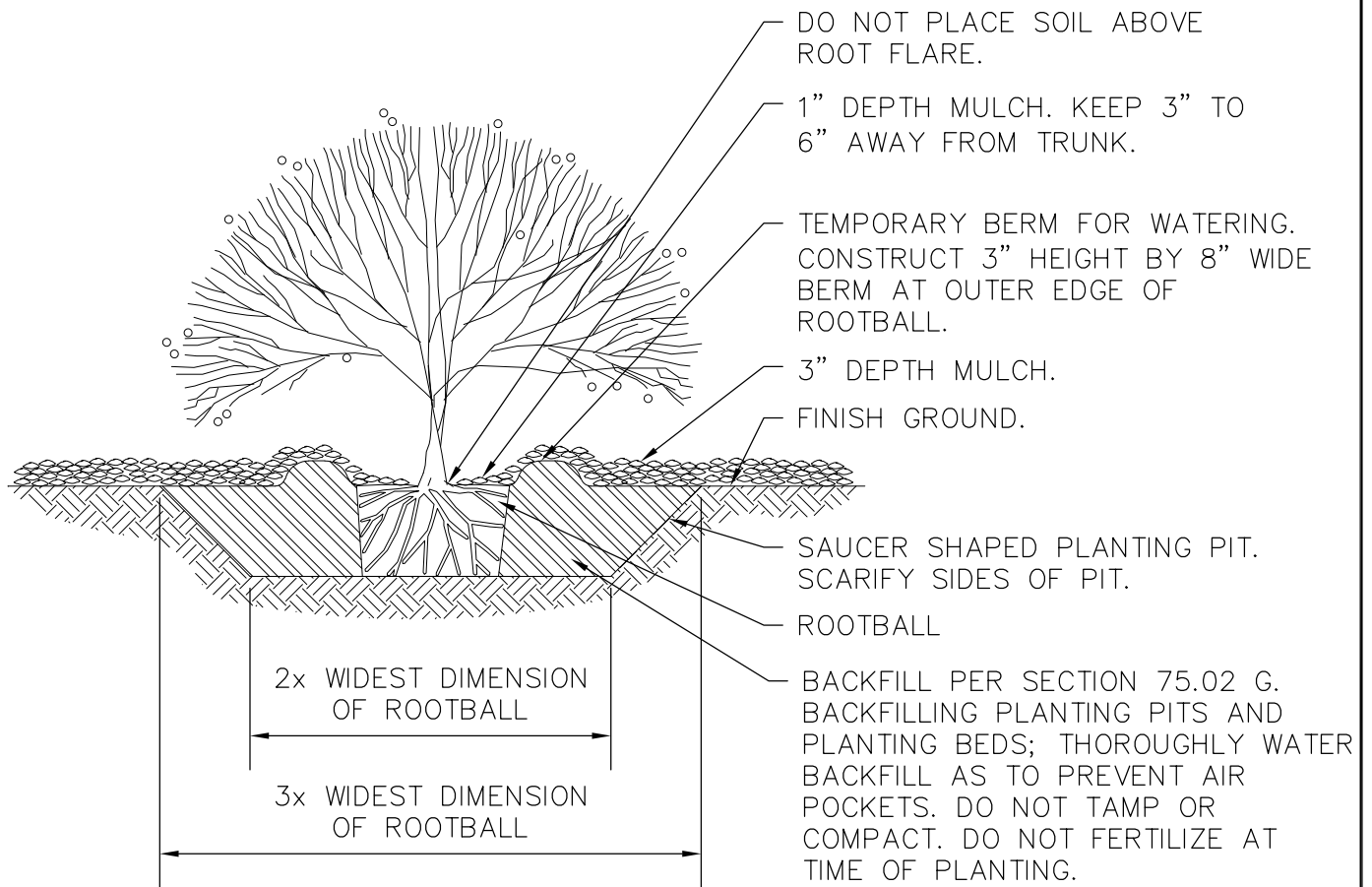


**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 75  
LANDSCAPING IMPROVEMENTS  
STANDARD DETAILS**

**STANDARD CONSTRUCTION SPECIFICATIONS  
DIVISION 75  
INDEX OF STANDARD DETAILS**

75-1	Shrub Planting Detail
75-2	Conifer Planting Detail
75-3	Deciduous Tree Planting Detail
75-4	Wood Bollard
75-5	Removable Wood Bollard
75-6	Removable Bollard (Rectangular)
75-7	Steel Bollard
75-8.1	Removable Bollard (Round) (Sheet 1 of 2)
75-8.2	Removable Bollard (Round) (Sheet 2 of 2)
75-9	Boulder
75-10	Tree Protection Zone Fence
75-11	Moose Protection Fence
75-12	Fence Details
75-13	Fence Details

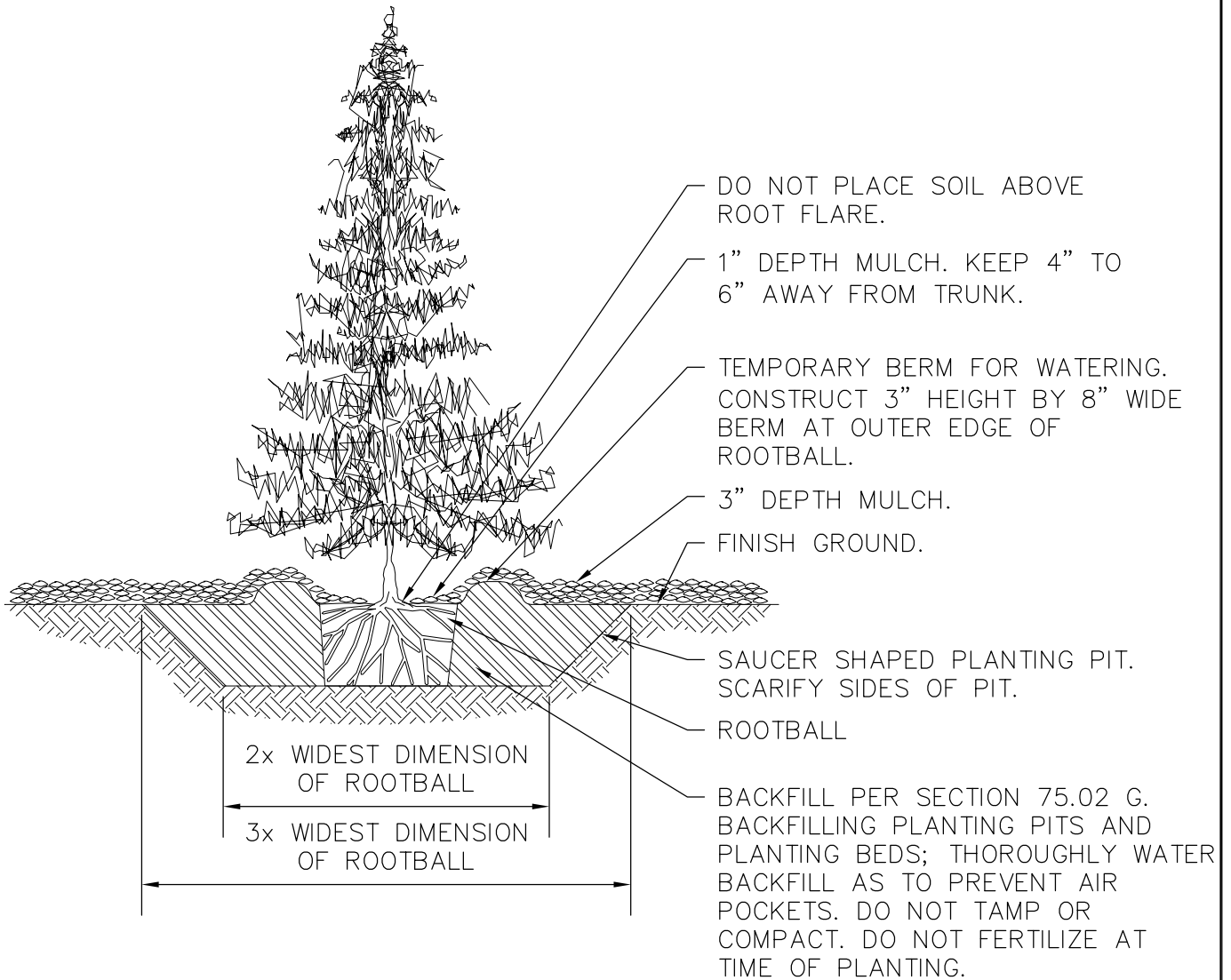


NOTES:

1. DEPTH OF PLANT PIT VARIES DEPENDING ON ROOTBALL THICKNESS.
2. SOIL SHALL BE LOOSENED AND SUITABLE FOR ROOT GROWTH SLOPING TO TWO TIMES THE DIAMETER OF THE ROOTBALL AT THE DEPTH OF ROOTBALL. TOP WIDTH OF PLANT PIT SHALL BE 3 TIMES ROOTBALL DIAMETER.
3. CONTRACTOR SHALL COMPLETELY REMOVE BURLAP, WIRE, WIRE BASKETS, AND CONTAINERS.
4. TEMPORARY BERM SHALL BE REMOVED AT LANDSCAPE ACCEPTANCE AND REPLACED WITH 3" DEPTH MULCH.

<p>MUNICIPALITY OF ANCHORAGE</p> 	<p>SCALE: NTS</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>SHRUB PLANTING DETAIL</b></p>	<p>SECTION # 75.02</p> <p>DETAIL # 75-1</p>
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\* STAKE ONLY IF NEEDED TO STABILIZE ROOTBALL. SEE SPECIFICATIONS FOR FURTHER REQUIREMENTS RELATED TO THIS DETAIL.

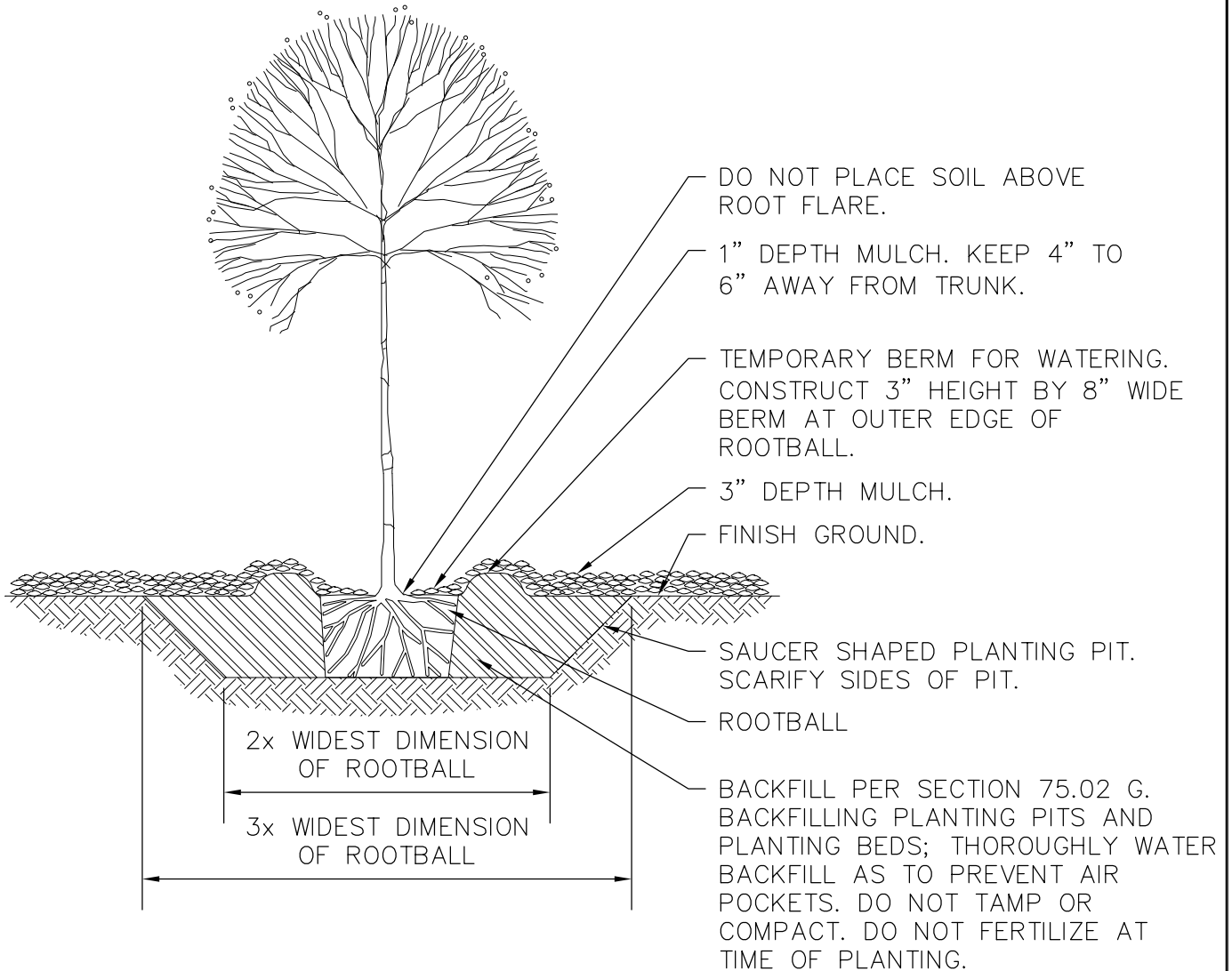


NOTES:

1. DEPTH OF PLANT PIT VARIES DEPENDING ON ROOTBALL THICKNESS. ROOTBALL DEPTH IS MEASURED FROM THE TRUNK FLARE/ROOT COLLAR TO THE BOTTOM OF THE ROOT BALL. SOIL MAY NEED TO BE REMOVED FROM THE TOP OF THE BALL/SOIL MEDIUM TO FIND THE TRUNK FLARE/ROOT COLLAR.
2. SOIL SHALL BE LOOSENED AND SUITABLE FOR ROOT GROWTH SLOPING TO TWO TIMES THE DIAMETER OF THE ROOTBALL AT THE DEPTH OF ROOTBALL. TOP WIDTH OF PLANT PIT SHALL BE 3 TIMES ROOTBALL DIAMETER. SET ROOTBALL ON SOLID GROUND TO PREVENT SETTLING. PLANT TREE TRUNK WITH TRUNK FLARE AT OR UP TO 1" ABOVE FINISHED GROUND.
3. CONTRACTOR SHALL COMPLETELY REMOVE BURLAP, WIRE, AND WIRE BASKETS.
4. TEMPORARY BERM SHALL BE REMOVED AT LANDSCAPE ACCEPTANCE AND REPLACED WITH 3" DEPTH MULCH.


 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: NTS</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>CONIFER PLANTING DETAIL</b></p>	<p>SECTION # 75.02</p> <p>DETAIL # 75-2</p>
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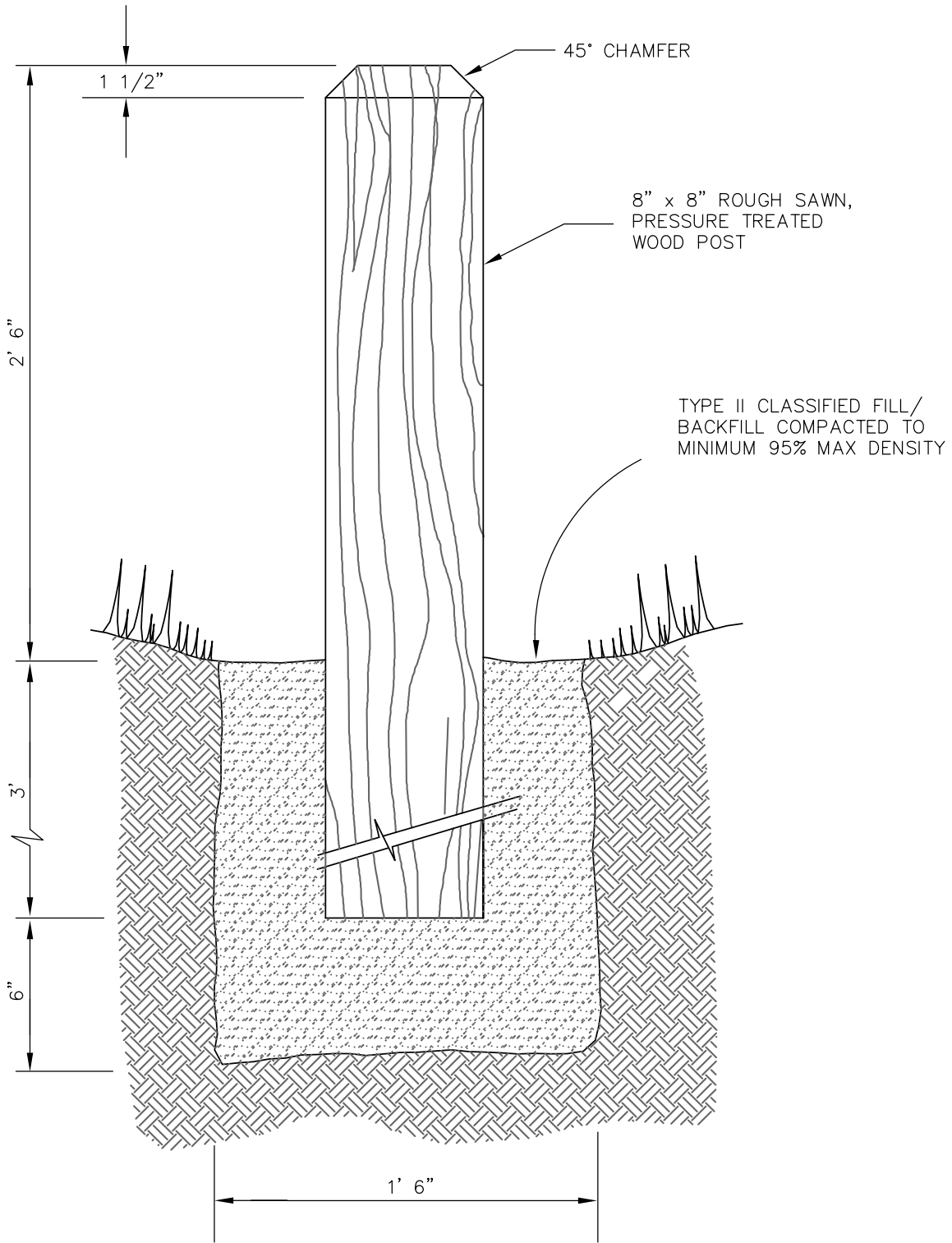
\* STAKE ONLY IF NEEDED TO STABILIZE ROOTBALL. SEE SPECIFICATIONS FOR FURTHER REQUIREMENTS RELATED TO THIS DETAIL.



NOTES:

1. DEPTH OF PLANT PIT VARIES DEPENDING ON ROOTBALL THICKNESS. ROOTBALL DEPTH IS MEASURED FROM THE TRUNK FLARE/ROOT COLLAR TO THE BOTTOM OF THE ROOT BALL. SOIL MAY NEED TO BE REMOVED FROM THE TOP OF THE BALL/SOIL MEDIUM TO FIND THE TRUNK FLARE/ROOT COLLAR.
2. SOIL SHALL BE LOOSENED AND SUITABLE FOR ROOT GROWTH SLOPING TO TWO TIMES THE DIAMETER OF THE ROOTBALL AT THE DEPTH OF ROOTBALL. TOP WIDTH OF PLANT PIT SHALL BE 3 TIMES ROOTBALL DIAMETER. SET ROOTBALL ON SOLID GROUND TO PREVENT SETTLING. PLANT TREE TRUNK WITH TRUNK FLARE AT OR UP TO 1" ABOVE FINISHED GROUND.
3. CONTRACTOR SHALL COMPLETELY REMOVE BURLAP, WIRE, AND WIRE BASKETS.
4. TEMPORARY BERM SHALL BE REMOVED AT LANDSCAPE ACCEPTANCE AND REPLACED WITH 3" DEPTH MULCH.

<p>MUNICIPALITY</p>  <p>OF ANCHORAGE</p>	<p>SCALE: NTS</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>DECIDUOUS TREE PLANTING DETAIL</b></p>	<p>SECTION # 75.02</p> <p>DETAIL # 75-3</p>
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MUNICIPALITY



OF ANCHORAGE

SCALE:  
NTS

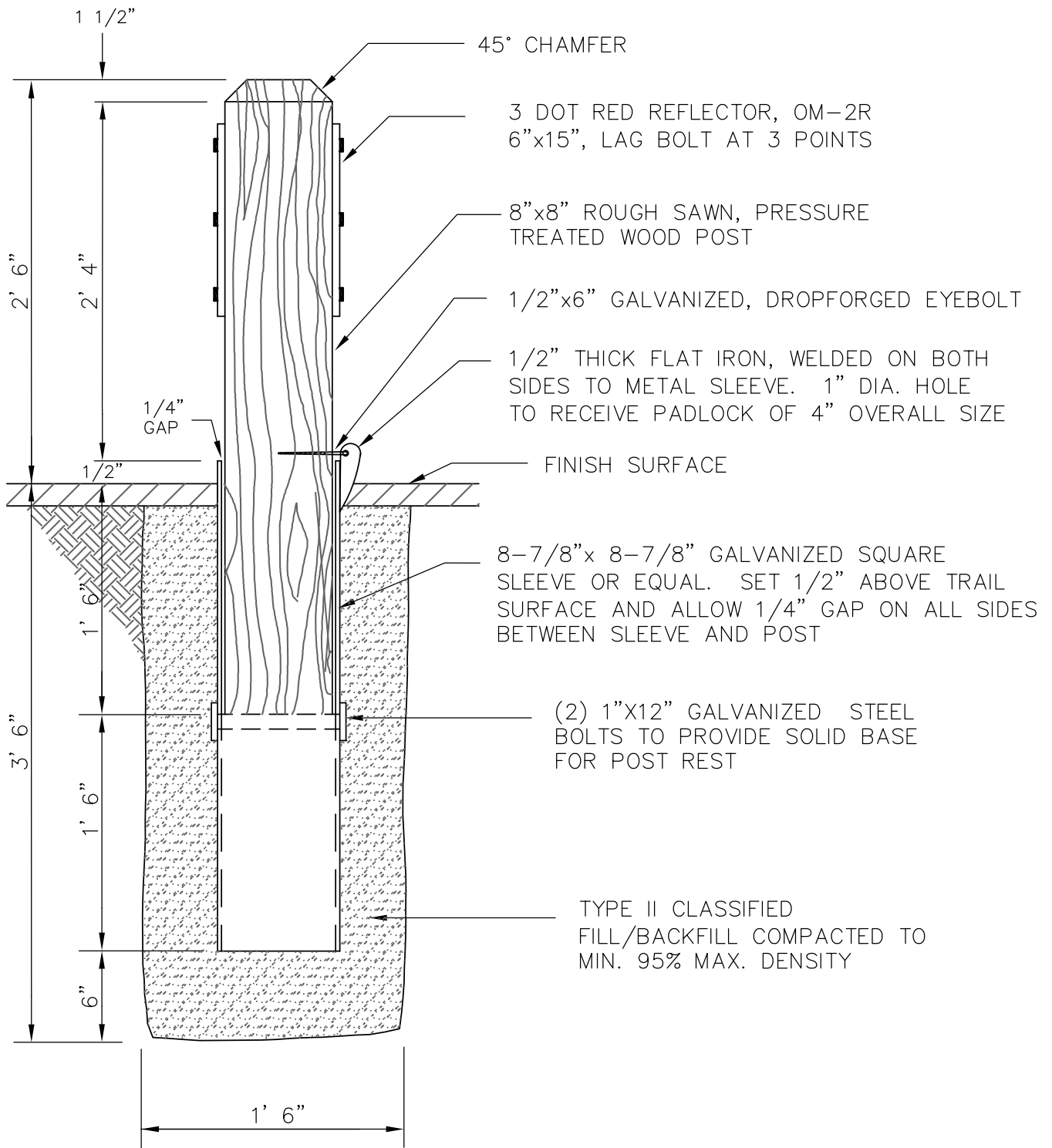
APPROVED:

REVISED:  
2/24

# WOOD BOLLARD

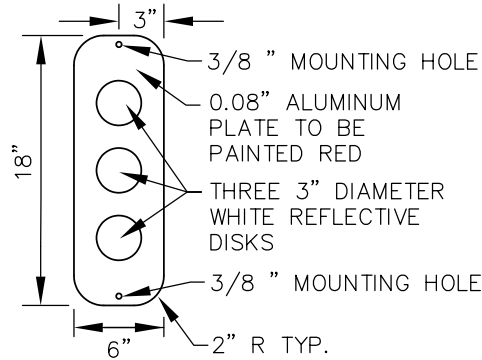
SECTION #  
75.10

DETAIL #  
75-4

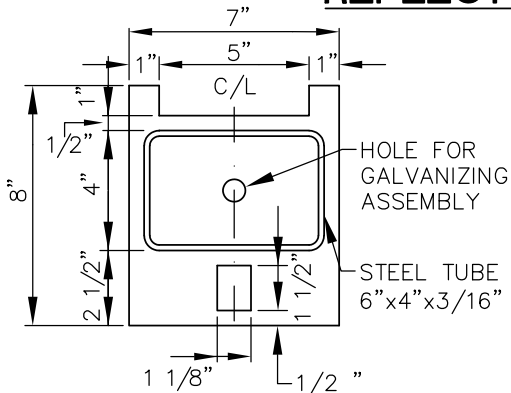
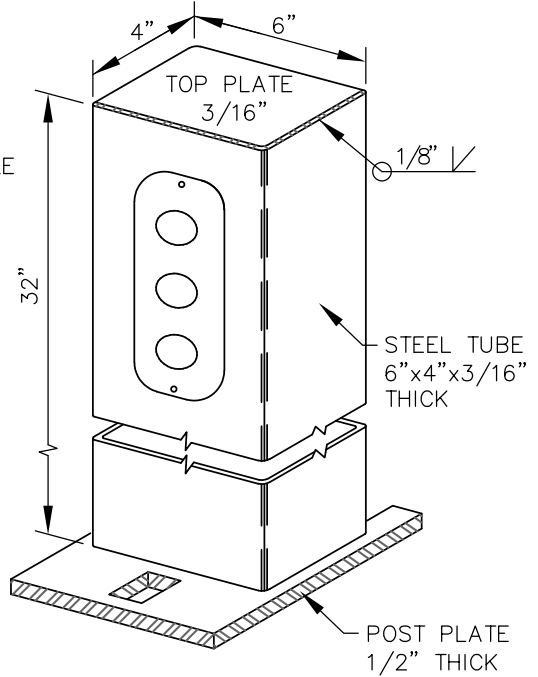


NOTES  
 1. LOCATE PADLOCK AWAY FROM TRAFFIC FLOW.

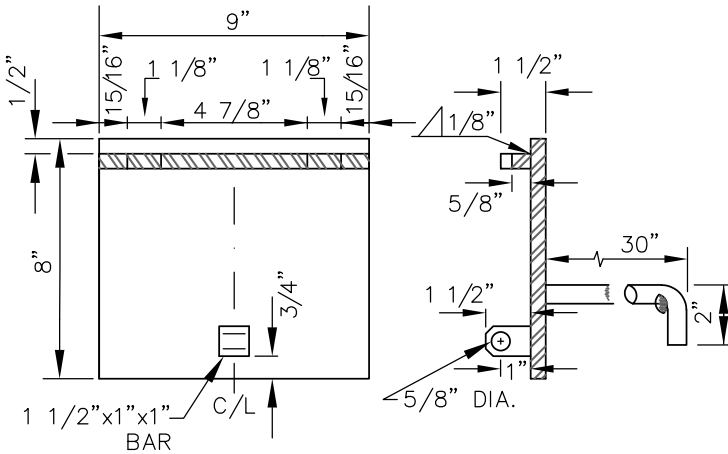
<p>MUNICIPALITY</p>  <p>OF ANCHORAGE</p>	<p>SCALE: NTS</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>REMOVABLE WOOD BOLLARD</b></p>	<p>SECTION # 75.10</p> <p>DETAIL # 75-5</p>
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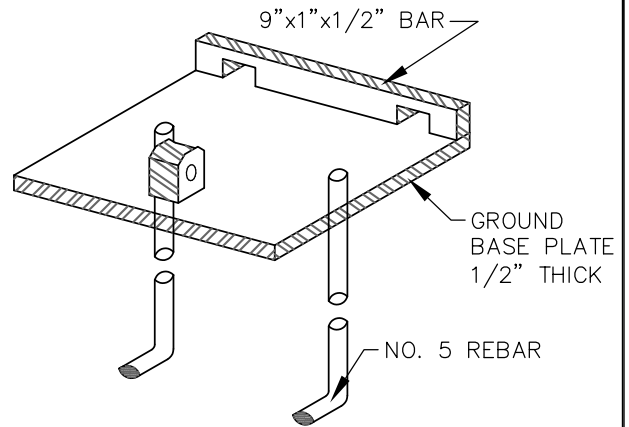
**REFLECTOR PLATE**



**POST BASE PLATE**



**GROUND BASE PLATE**



**ISOMETRIC VIEW**

**NOTES:**

1. ALL WELDS, UNLESS OTHERWISE SHOWN, SHALL BE THREE-SIXTEENTH INCH (3/16") FILLET - ALL AROUND.
2. CAST IN PLACE WITH CLASS 'A' CONCRETE IN A TWELVE INCH DIAMETER BY THIRTY SIX INCH (12" X 36") FOUNDATION TUBE.
3. REMOVABLE BOLLARDS ARE TO HAVE ADHESIVE REFLECTORS ON BOTH FRONT AND BACK OF POST.
4. ALL EXTERIOR CORNERS AND EDGES SHALL BE ROUNDED TO PROVIDE A PROJECTION FREE SURFACE.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
NTS

APPROVED:

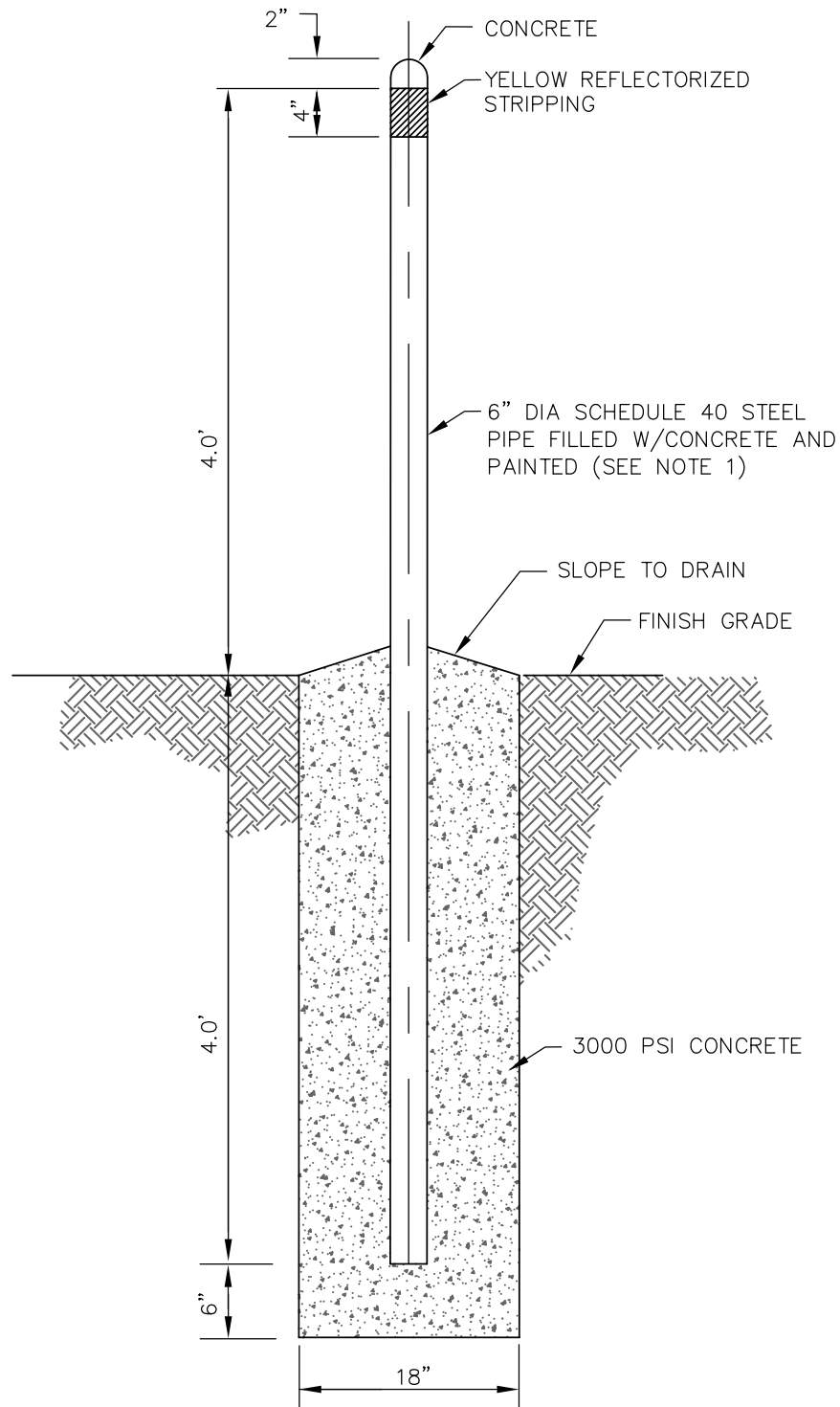
REVISED:  
2/24

**REMOVABLE BOLLARD  
(RECTANGULAR)**

SECTION #  
75.10

DETAIL #  
75-6





NOTES:

1. POSTS SHALL BE PRIMED AND RECEIVE TWO COATS MINIMUM OF DARK GREEN POWDER COAT PAINT I.A.W. MANUFACTURER'S RECOMMENDATIONS. TOPCOAT WITH TWO COATS YELLOW CARBOLINE 139 UNLESS GUARD POST COVER OR SLEEVE IS INSTALLED.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
NTS

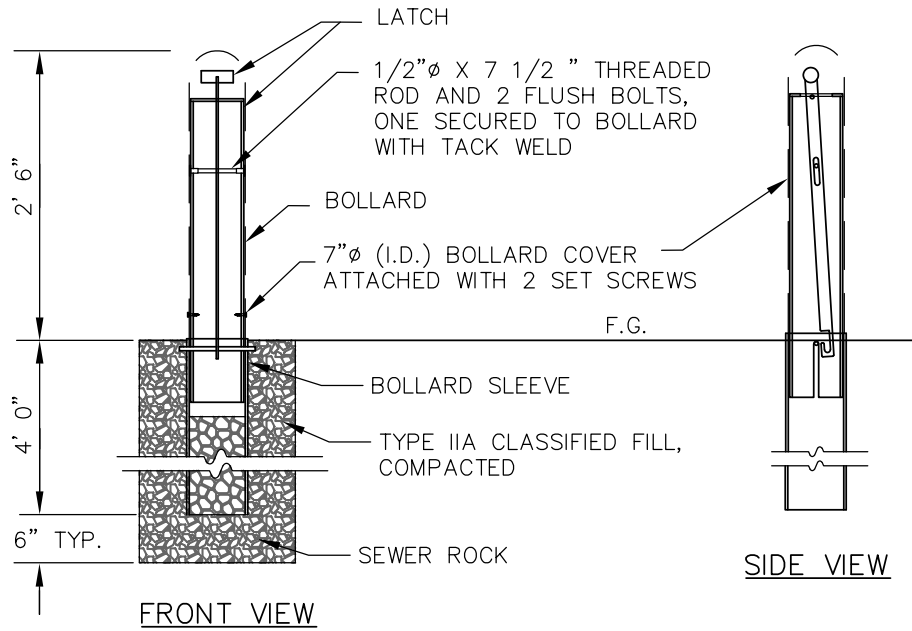
APPROVED:

REVISED:  
2/24

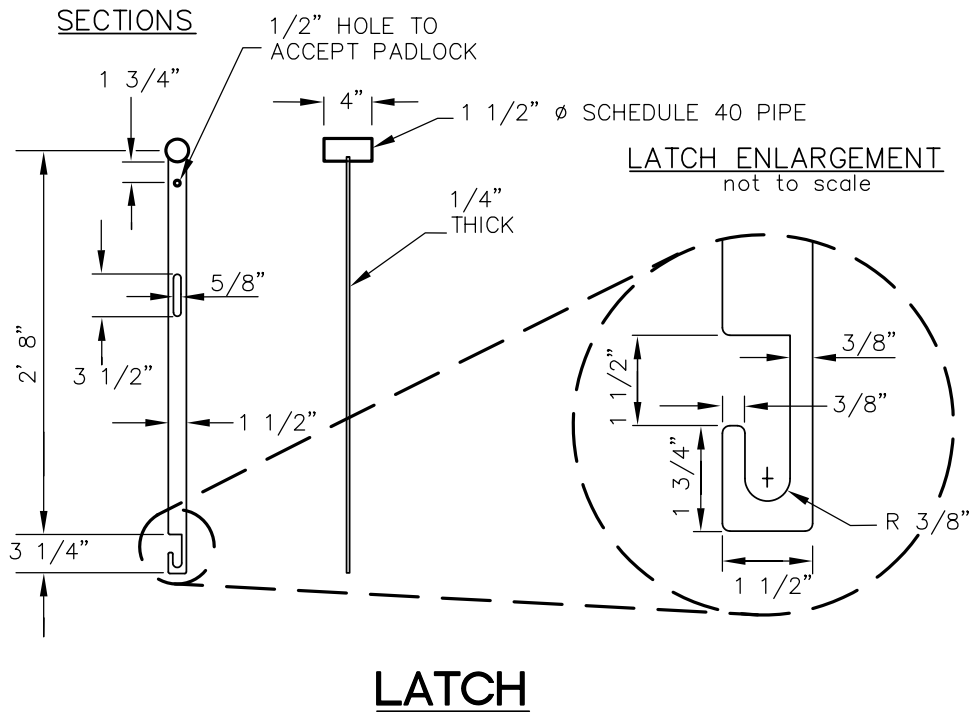
# STEEL BOLLARD

SECTION #  
75.10


DETAIL #  
75-7

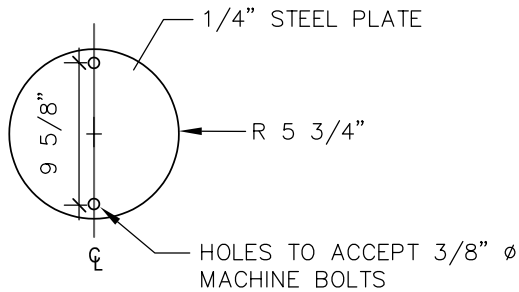


NOTE: ALL FINAL FABRICATIONS TO BE GALVANIZED PRIOR TO ASSEMBLY



**LATCH**

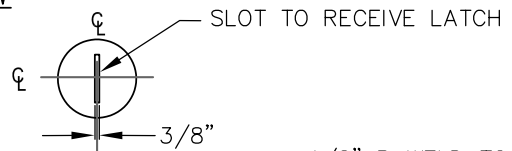
 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: NTS</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>REMOVABLE BOLLARD (ROUND)</b></p> <p>SHEET 1 OF 2</p>	<p>SECTION # 75.10</p> <p>DETAIL # 75-8.1</p>
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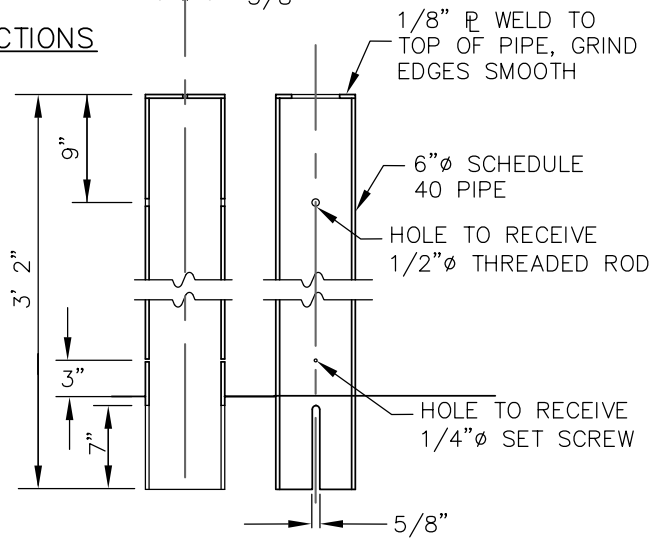
NOTE: PROVIDE 1 TEMPORARY CAP PER REMOVABLE BOLLARD TO OWNER.

## REMOVABLE BOLLARD TEMPORARY CAP

### PLAN VIEW

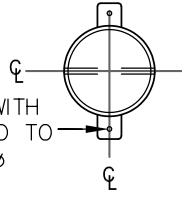


### SECTIONS



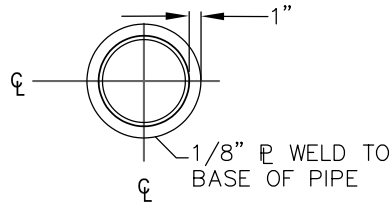
## BOLLARD

### CROSS-SECTION: TOP



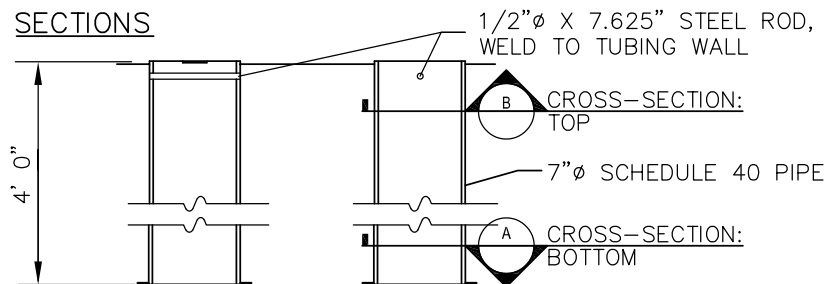
A

### CROSS-SECTION: BOTTOM



B

### SECTIONS



NOTE: SET SLEEVE 1/8" ABOVE ADJACENT SURFACE

## BOLLARD SLEEVE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
NTS

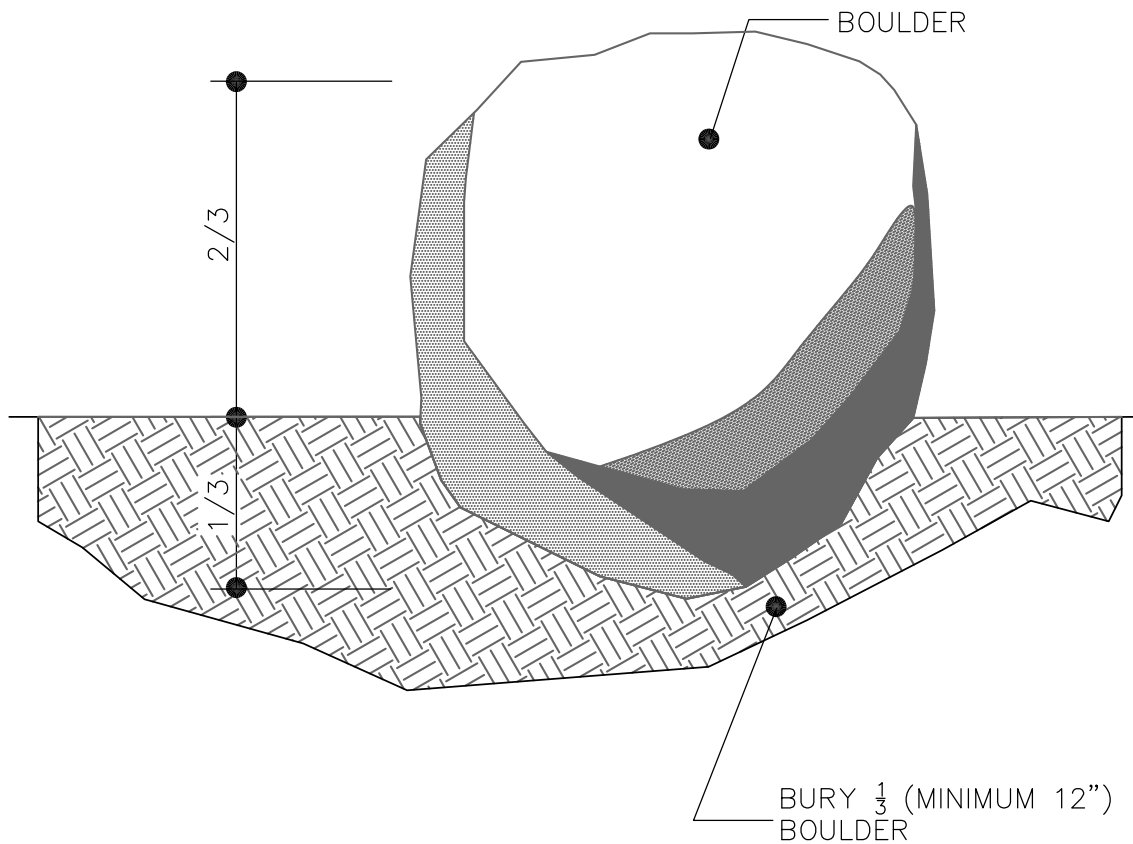
APPROVED:

REVISED:  
2/24

# REMOVABLE BOLLARD (ROUND) SHEET 2 OF 2

SECTION #  
75.10

DETAIL #  
75-8.2



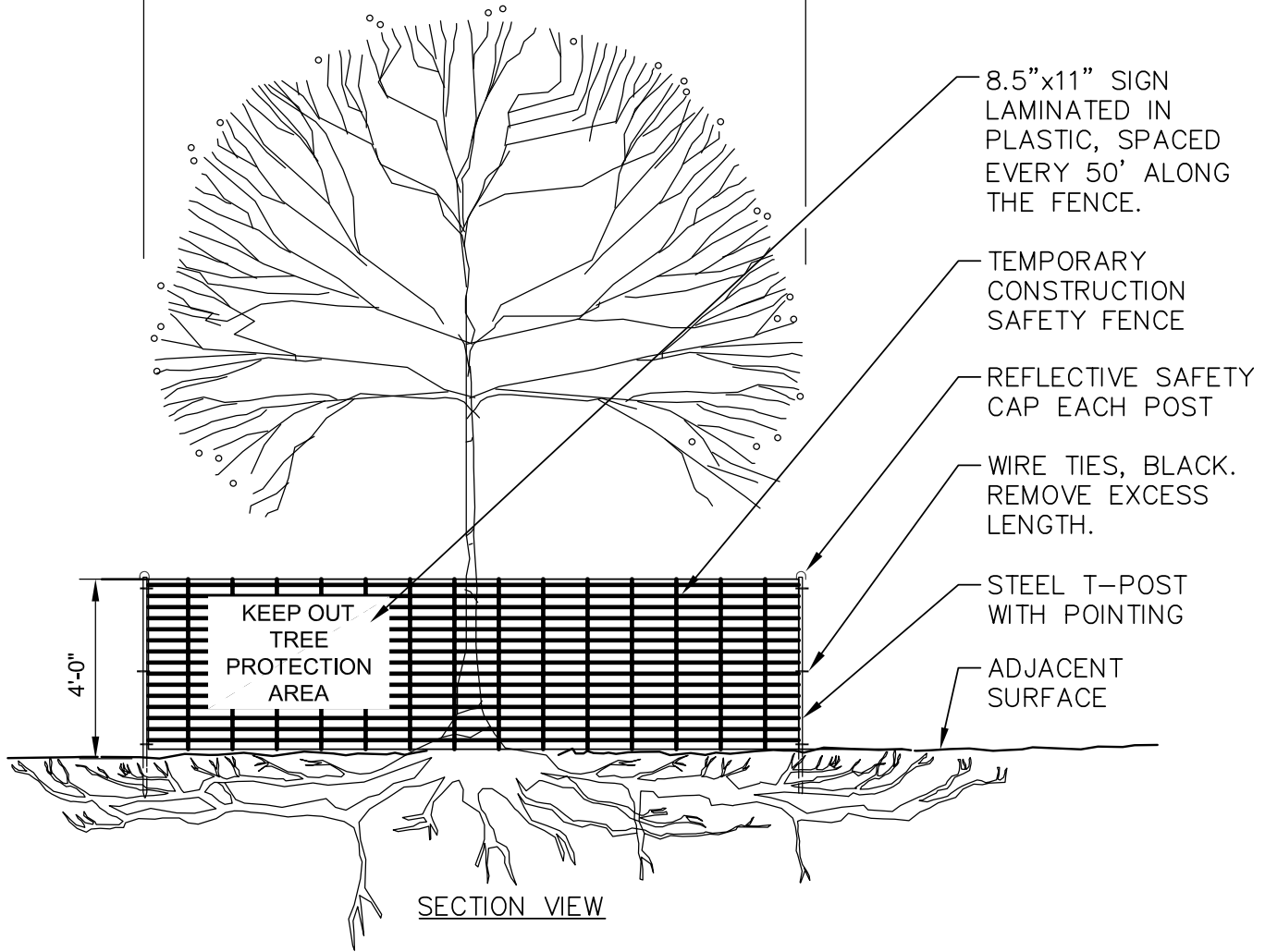
**BOULDER**

NOTES:

1. ORIENTATION OF BOULDERS DETERMINED ON-SITE BY THE ENGINEER.

<p>MUNICIPALITY            OF ANCHORAGE</p>	<p>SCALE:          NTS          APPROVED:          REVISED:          2/24</p>	<p><b>BOULDER</b></p>	<p>SECTION #          75.12          DETAIL #          75-9</p>
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PLACE FENCING AT CROWN DRIP LINE,  
UNLESS OTHERWISE NOTED IN DRAWINGS.



NOTES:

1. SEE MUNICIPALITY OF ANCHORAGE STANDARD SPECIFICATIONS (MASS), SECTION 75.02 FOR ADDITIONAL TREE PROTECTION REQUIREMENTS.
2. NO PRUNING SHALL BE PERFORMED EXCEPT BY ARBORIST.
3. NO EQUIPMENT SHALL OPERATE INSIDE THE PROTECTIVE FENCING INCLUDING DURING FENCE INSTALLATION AND REMOVAL.
4. IF USING CHAIN LINK FENCING, TUBULAR POSTS, AND ADJUSTABLE CONCRETE FOOTERS (DECK FOOTERS) IN LIEU OF PLASTIC MESH AND T-POSTS, POST LOCATIONS OUTSIDE THE DRIP LINE, AS SHOWN HERE, ARE TO BE MAINTAINED.

REVISION:

MUNICIPALITY



OF ANCHORAGE

SCALE:  
NTS

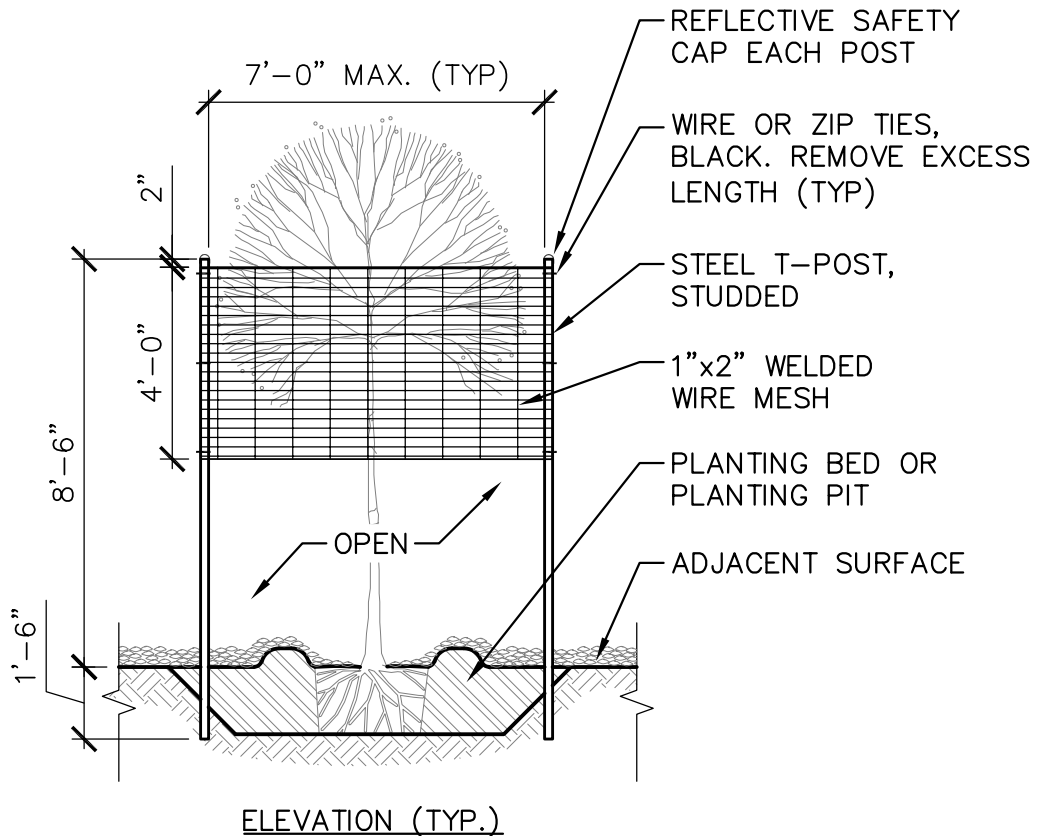
APPROVED:

REVISED:  
2/24

## TREE PROTECTION ZONE FENCE

SECTION #  
75.14

DETAIL #  
75-10



**NOTES:**

1. MOOSE PROTECTION FENCING REQUIRED AROUND ALL NEW TREES.
2. FOR INDIVIDUAL TREES, 3 POSTS (MIN.) REQUIRED PER TREE.
3. FOR TREE GROUPINGS, PLACE T-POSTS AROUND PERIMETER OF GROUPING.
4. MESH SHALL NOT TOUCH BRANCHES.

REVISION:

MUNICIPALITY



OF ANCHORAGE

SCALE:  
NTS

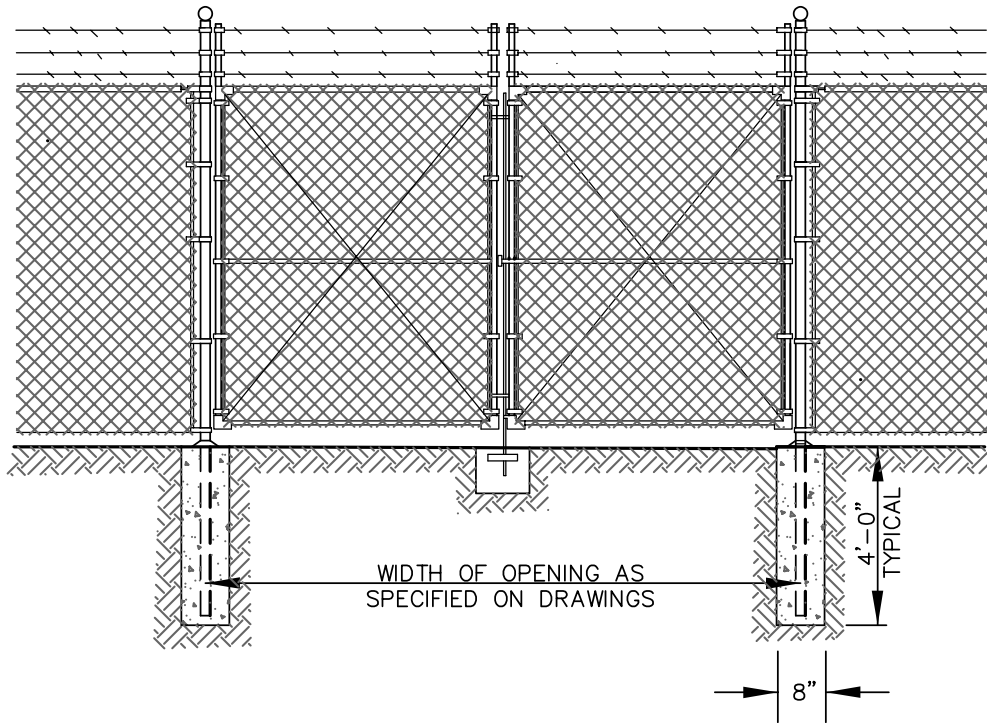
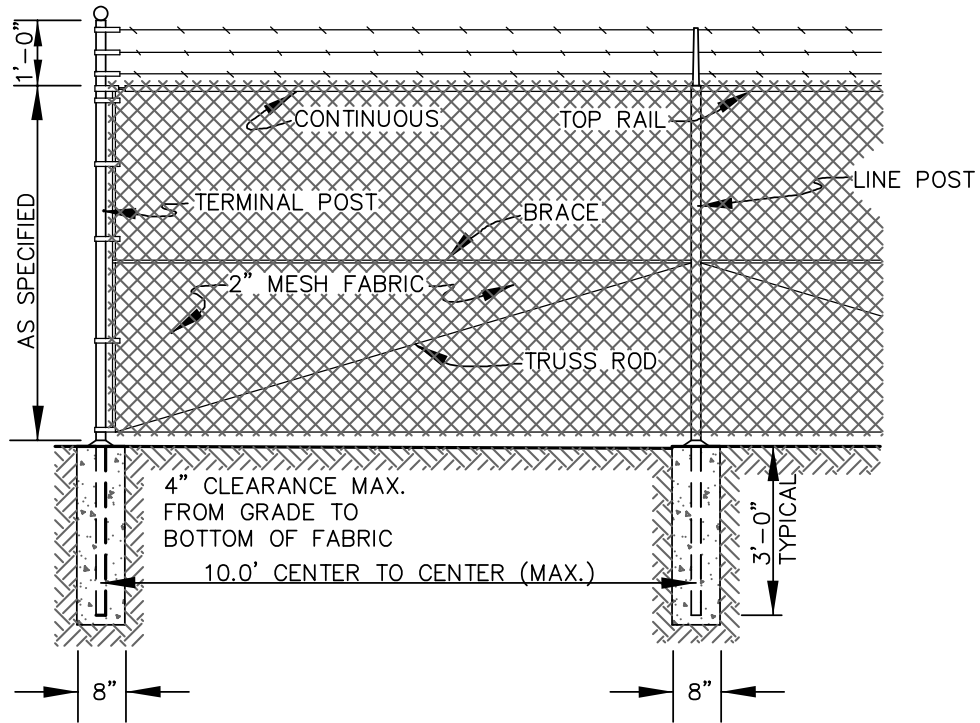
APPROVED:

REVISED:  
2/24

## MOOSE PROTECTION FENCE

SECTION #  
75.15

DETAIL #  
75-11



NOTES:

1. GAUGE OF FABRIC AS SPECIFIED ON DRAWINGS.
2. SIZE OF TUBULAR STEEL FOR GATE FRAMES IS SPECIFIED IN SECTION 75.17 - CHAIN LINK FENCES.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
NTS

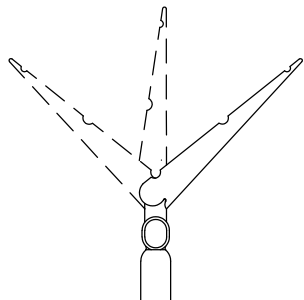
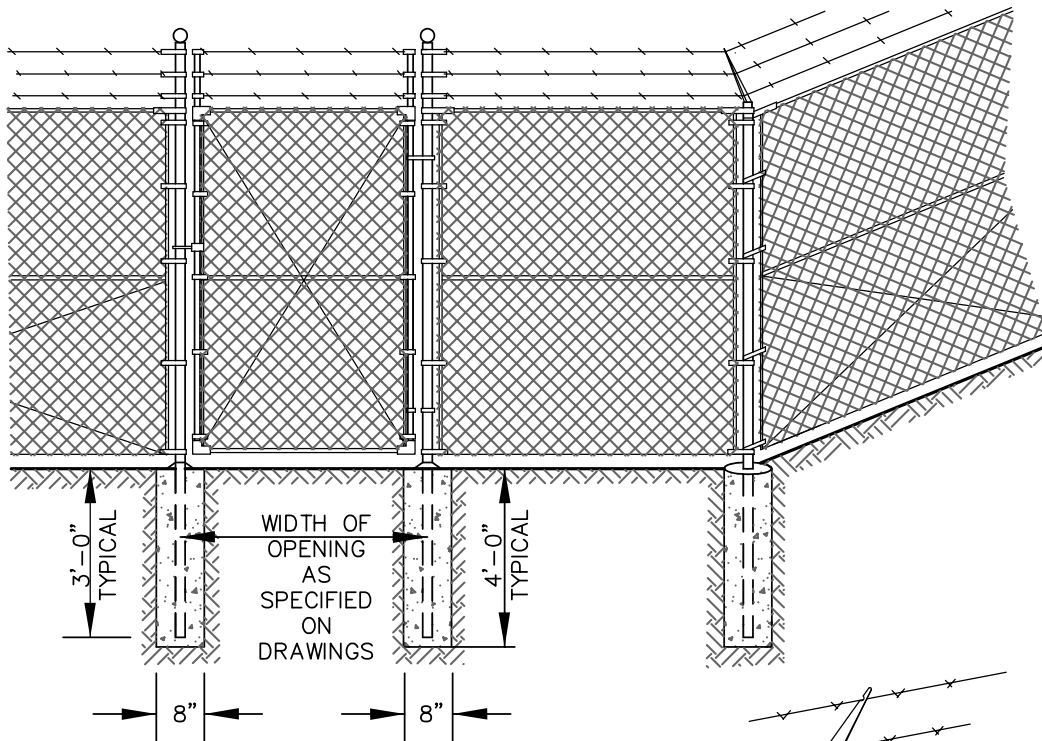
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REVISED:  
2/24

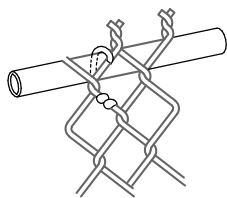
# FENCE DETAILS

SECTION #  
75.17

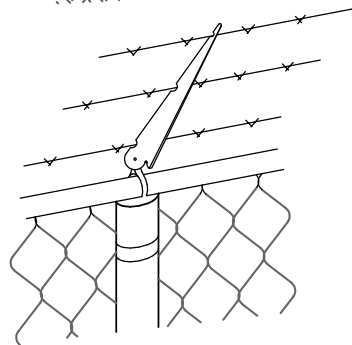
DETAIL #  
75-12



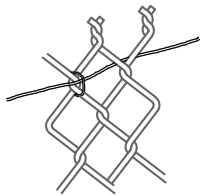
H-H EYETOP  
LINETOP FITTING



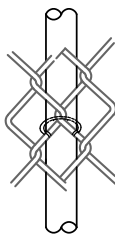
METHOD OF TYING  
FABRIC TO TOP RAIL



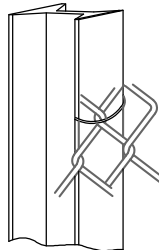
TOP FINISH OF  
STEEL GUARD POST



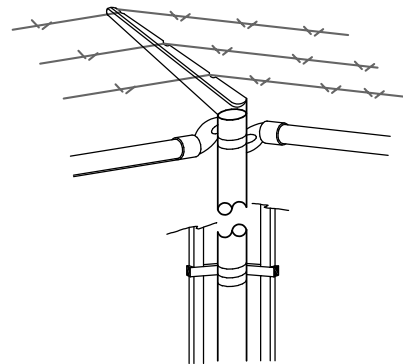
METHOD OF TYING  
FABRIC TO COIL  
SPRING TENSION WIRE



METHOD OF TYING  
FABRIC TO TUBULAR  
POST



METHOD OF TYING  
FABRIC TO H-POST



CORNER POST  
CONNECTION

NOTE:

1. SIZE OF TUBULAR STEEL FOR GATES IS SPECIFIED IN SECTION 75.17 - CHAIN LINK FENCES.

MUNICIPALITY



OF ANCHORAGE

SCALE:  
NTS

APPROVED:

REVISED:  
2/24

# FENCE DETAILS

SECTION #  
75.17

DETAIL #  
75-13



**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 80  
TRAFFIC SIGNALS AND ILLUMINATION**



**STANDARD CONSTRUCTION SPECIFICATIONS  
FOR TRAFFIC SIGNALS AND ILLUMINATION  
DIVISION 80  
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**STANDARD CONSTRUCTION SPECIFICATIONS  
TRAFFIC SIGNALS & ILLUMINATION  
DIVISION 80**

**SECTION 80.01 GENERAL**

**Article 1.1 Scope of Work**

Work shall consist of furnishing and installing, modifying, removing or salvaging one or more traffic signal systems, flashing beacon systems, illumination systems, sign illumination systems, traffic count stations, electrical equipment on structures, falsework lighting, partial installations for future systems, or combinations thereof, all as required by the Drawings, and as specified. All necessary labor and equipment to provide fully functioning traffic signals, intersection lighting, or roadway illumination is included.

Prior to installation of foundations, junction boxes, and conduits; Contractor shall locate and protect all new and existing underground utilities; including, but not limited to, pipelines, signal systems, thaw wires, lighting systems, storm drain, sanitary sewers, water systems, and telephone, cable television, and electrical cables. Not all of the existing utilities may be present or shown on the Drawings. Contractor shall adjust foundation, junction box, or conduit location if conflict exists with either existing utilities or proposed improvements. No additional monies are paid or owed to Contractor for the adjustment.

Materials furnished shall be new, except such used materials as may be specifically provided for on the Drawings or in the Special Provisions. Where an existing system is to be modified, the existing material shall be reused on the project, or disposed of as shown in the Drawings, or specified in the Special Provisions.

All systems shall be complete and in operation with all materials in conformance with Drawings, Specifications and the manufacturer's specifications and recommendations, at the time of final acceptance.

**Article 1.2 Regulations and Codes**

All material, and workmanship where applicable, shall conform to the standards of the Underwriters Laboratories, Inc., the National Electrical Code, and the National Electrical Safety Code together with local amendments. Within this Division, the term "Code" shall mean the National Electrical Code, and the National Electrical Safety Code together with local amendments. For all Division 80 items, furnish listed or labeled components, including individual components as well as complete assemblies, with the listing or labeling.

Where applicable, all electrical equipment shall conform to the standards of the National Electrical Manufacturers Association.

The 1994 Edition of the "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals" published by the American Association of State Highway and Transportation Officials (AASHTO) shall be referred to in this Division as the 1994 AASHTO design criteria. The 2001 Edition AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals" shall be

referred to in this Division as the 2001 AASHTO design criteria. The 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals with 2013 Errata and 2015 Interim Revision shall be referred to in this Division as the 2013 AASHTO design criteria with interim revisions.

### **Article 1.3 Equipment List(s) and Drawings**

- A. The Contractor shall submit for review and approval, within thirty (30) days following award of the Contract, eight (8) collated copies of a portfolio of equipment and materials which he proposes to install. The portfolio(s) shall consist of a table of contents which includes each item's intended use(s) and the following:
1. For materials on the Approved Products List: a description that includes product name, manufacturer, model or part number, and the conditions listed for approval.
  2. For materials not on the Approved Products List: catalog cuts that include the manufacturer's name, type of product, size, model number, conformance specifications, and supplemented by other data as may be required, including manufacturer's maintenance and operations manuals, or sample articles.
  3. A wind stress certificate from the manufacturer of poles, signal mast arms, and luminaire arms. Contractor shall submit to the Engineer for approval the Wind Stress Certificate that includes the signed stamp of a professional engineer registered in the State of Alaska; and a statement that indicates that the poles and mast arms meet the wind and mast arm loading requirements specified in Section 80.05, Article 5.1 - General.
  4. Contractor shall submit to the Engineer for approval the Materials Certifications for all lighting poles, signal poles, mast arms, connector bolts and anchor bolts, indicating that the steel and galvanizing conform to the requirements in this Division.

The Municipality shall not be liable for any material purchased, labor performed, equipment used, or delay to the Work before all equipment and materials have been reviewed and approved.

- B. Three (3) paper copies and two (2) electronic copies, in Adobe pdf format and AutoCAD v2019 or later format of traffic controller cabinet schematic wiring diagrams shall be submitted at the time the controllers are delivered for testing, or if ordered by the Engineer, prior to purchase. This diagram shall list all equipment installed in each cabinet and show in detail all circuits, parts, and schematic wiring. Contractor shall also provide at this time, one (1) reproducible and one (1) electronic set in Adobe pdf format of Operation and Maintenance manuals and wiring diagrams of any cabinet equipment utilized. These manuals shall show in detail all circuits and parts. Such parts shown thereon shall be identified by name or number and in such a manner as to be readily interpreted.
- C. The Contractor shall prepare five (5) complete sets of red lined as-built plans which shall be kept current with the construction. These as-built plans shall detail all construction changes made to the Drawings and also include the following information on each appropriate drawing:

1. Location and depth of conduit runs.
2. Station and offset of all junction boxes.
3. Heights of signal faces and overhead signs.

Copies of such as-built plans shall be furnished at least twice a month during construction so that they may be reviewed for accuracy and completeness. The Contractor shall furnish any additional information required to clarify the as-built plans and shall correct all discrepancies. Progress payment for the signal and illumination Work completed shall not be made until accurate as-built plans reflecting the construction progress have been reviewed and deficiencies corrected.

- D. Prior to final inspection of the Work, Contractor shall submit five (5) complete sets of Record Drawings to the Engineer. The Engineer shall deliver one (1) copy each to Project Management & Engineering; Traffic Department, Signals Section; Traffic Signal Maintenance Shop; Maintenance & Operations, Street Light Maintenance Supervisor; and attach the appropriate sheets of the fifth set in clear envelopes to the inside of each load center.

#### **Article 1.4 Warranties, Guarantees and Instruction Sheets**

Manufacturers' warranties, guarantees, instruction sheets and parts furnished with materials used in the Work shall be delivered to the Engineer.

For equipment brands and models not currently in use within the Municipality of Anchorage, a manufacturer's representative shall be present to supervise the turn on and adjustment of the signal system. In addition, the representative shall provide one workday of continuous instruction and familiarization in the operation and maintenance of the signal system.

#### **Article 1.5 Maintaining Existing and Temporary Electrical Systems**

The Contractor shall maintain the traffic signal and lighting systems, from the time of the Notice to Proceed until the time of final acceptance except during any authorized stoppages when the Municipality of Anchorage shall assume maintenance. Temporary replacement equipment furnished by the Contractor shall be compatible with existing equipment used in the MOA. and approved by the Engineer. Representatives of the Contractor and the Owner shall inspect the project prior to the winter shutdown and prior to spring startup to ascertain those items that need repair and determine responsibility for the repairs. If the project includes traffic signal Work, Traffic Signal Maintenance personnel shall be included in the inspection.

The existing Traffic Signal installation may not be shut down between 7:00 and 8:30 a.m. or 3:00 and 6:00 p.m. weekdays.

The local traffic enforcement agencies and Traffic Department, Signals Section shall be notified prior to any operational shutdown of a traffic signal system.

The Contractor and the Traffic Signal Maintenance personnel shall do a walk-through inspection of the existing traffic signal system prior to commencing Work.

The Contractor shall provide temporary signalization. At no time shall a signalized intersection operate in an unsignalized mode, except for shutdown due to change over

from the existing system to a temporary system, and from the temporary system to a permanent system. Temporary signal system shutdowns shall be limited to periods during normal working hours as specified in this Section, during which flag control shall be used.

The temporary signal system plan shall be submitted to and approved by the Municipal Traffic Engineer or assigned designee prior to implementation. The temporary signal plan shall equal or exceed the system being replaced or modified. That is, the plan shall not downgrade the number of signal heads, signal phases, pedestrian push buttons, emergency preemption detectors, traffic signal communications, etc. The temporary signal system plan shall also include the layout of the temporary intersection. The complete plan shall include intersection geometrics, lane widths, and auxiliary lane pocket lengths.

No vehicle detection shall be required in a temporary system, unless called for in the Drawings and Specifications or specified by the Traffic Department.

The Contractor shall coordinate all Signal Work with the Traffic Signal Maintenance Shop at 343-8355.

The Contractor shall be responsible for maintaining any span wire temporary signal installed. The Traffic Department shall not assume maintenance responsibility for span wire systems.

The Contractor shall obtain Traffic Department approval prior to turning any maintenance responsibilities over to the Traffic Department, including any maintenance required during Winter Shutdown.

The Contractor shall furnish and install all materials and miscellaneous hardware required to provide a functional traffic signal system. All materials shall conform to the requirements of the Drawings and Specifications. Temporary equipment shall be compatible with existing equipment used in Anchorage.

The temporary signal system may consist of any combination of the following:

1. The existing systems,
2. Relocation of component parts,
3. Guyed wood poles, or
4. Any portion of the permanent signal system.

Traffic signals may be suspended from span wire system provided that they are mounted to a catenary cable by standard span wire hangers and secured with a tether wire to prevent misalignment in the wind. Signal cables shall be routed along a separate messenger cable. The span wire cable system shall meet all the requirements shown in the Temporary Traffic Signal Span Wire Details. Messenger cables shall be at least three-eighths inch (3/8") O.D. "High Tensile" grade cable. Tether wire shall be one-eighth inch (1/8") O.D. steel cable installed with a minimum ground clearance of nineteen feet (19'). Catenary cables shall be at least three-eighths inch (3/8") O.D. steel cable. All signal faces shall be equipped with backplates and visors and LED modules. The signal faces of each phase with two or more faces shall be energized using a minimum of two (2) circuits, with each circuit wired with IMSA 20-1 signal cable. Splices shall be made only at the terminal blocks in the signal faces. Sufficient signal cable

slack shall be left at each pole to provide for drip loops and to allow realignment of each signal head. All pedestrian signals shall be equipped to display a countdown timer when the flashing don't walk is on.

Whenever a pole of the existing or permanent signal system is included in a span wire signal system, the Contractor shall guy the pole and provide protective collars to prevent chafe damage. Poles with breakaway bases shall not be included in a span wire supported signal system.

The Contractor shall provide illumination at all locations with preexisting lighting and at all intersections where temporary traffic signalization is specified to be provided.

The temporary facilities shall be provided during the life of the Contract on all roadways open to traffic within project limits. The temporary lighting systems shall be operational by sunset on the same day the replaced system is retired, or the roadway is opened to traffic.

A plan for each temporary lighting system shall be submitted to and approved by the Engineer prior to implementation. The temporary lighting plan shall equal or exceed the system(s) being replaced or modified. At intersections, the temporary system shall include a luminaire located on the far right for each through street approach and installed adjacent to the through street radius returns. The through street is the street with the vehicular right of way; both streets shall be considered through at signalized intersections and four-way stops.

The Contractor shall furnish and install all materials and miscellaneous hardware required to provide a functional lighting system including electrical load centers. All materials shall conform to the requirements of the Drawings and Specifications, except that the branch conductors may be triplex aluminum with messenger cable if they are installed overhead. Illumination conductors shall be sized so that the voltage at the most remote luminaire is not less than specified by the luminaire manufacture for equipment operation. The Contractor shall install intermediate conductor and supports to energize luminaires at locations without electrical service.

Luminaires used in the system may be the existing fixtures or new fixtures with a light distribution compatible with the proposed lighting configuration.

The temporary lighting systems may consist of any of the following lighting pole types, or combinations thereof, provided the luminaires have a minimum of thirty feet (30') mounting height. Mounting height is the difference in elevation between the luminaire retractor and the edge of traveled way at the same station. The existing poles may be reused if they are not utility owned. Any pole of the permanent lighting and temporary signal systems and any Contractor-supplied poles may be wood and shall meet 1994 AASHTO design criteria for one hundred mile per hour (100 mph) winds with gusts to one hundred thirty miles per hour (130 mph). All poles, except traffic signal poles, installed within the clear zone shall be provided with FHWA approved slip bases, transformer bases, or frangible couplings.

The load centers to power the temporary lighting and signal systems may be the permanent installations, the existing installations, or temporary installations. The existing load centers may be used only if they are scheduled to remain intact until completion of the project, and reused only if they are approved. The Contractor shall

provide approved temporary load centers with photoelectrically-controlled lighting circuits whenever a load center is unavailable for use, or when an existing load center that is not approved is retired due to conflict with the Work. An approved load center is any load center UL labeled as Service Equipment, or UL labeled as Industrial Control Equipment and marked "suitable for use as service equipment." The Contractor shall provide all Work to modify these load centers as required to provide functional temporary lighting and signal systems, and to install them completing all Work in accordance with the NEC.

Once the Contractor commences Work on the project, they shall provide all maintenance for the existing electrical facilities. The Municipality shall pay for the electrical power for the abovementioned electrical systems. The above maintenance does not include any prior damage such as burned-out lamps, nonoperative detection or other malfunctioning equipment. The Contractor shall present written documentation of all nonfunctioning and malfunctioning electrical equipment before commencing Work on the project. This malfunctioning equipment shall be inspected jointly by personnel from the Engineer's staff and the Contractor. In the event the Engineer does not receive notice in writing and the Contractor begins Work on the project, this shall suffice as evidence that all equipment is functional and operational.

The Contractor shall furnish the Engineer with the name and phone number of the person responsible for maintaining existing and temporary electrical facilities. Repair work shall commence within one hour of notification for traffic signal systems.

The exact location of existing conduit runs, direct burial cable, pull boxes, and all underground utilities shall be ascertained by the Contractor before using equipment that may damage such facilities or interfere with any system.

Where roadways are to remain open to traffic and existing lighting systems are to be modified, the lighting systems shall remain in operation and the final connection to the modified circuit shall be made so that the modified circuit will be in operation by nightfall of the same day the final connection is made.

Temporary electrical installations shall be kept in effective operation until no longer required. Removal of temporary installations shall conform to the provisions in Section 80.28 – Salvaging Electrical Equipment.

These provisions shall not relieve the Contractor in any manner of his responsibilities as provided in Division 10, Section 10.06 - Legal Relations and Responsibilities.

### **Article 1.6 Scheduling of Work**

Work shall be so scheduled that each new traffic signal system, lighting system, and sign illumination system shall be completed and ready for operation prior to opening to traffic of the corresponding section of new alignment.

Traffic signal systems shall not be placed in operation without energizing the street lighting at the intersection to be controlled if street lighting exists or is being installed with the traffic signals.

Contractor shall not place traffic signal systems into operation. Traffic Signal Maintenance personnel are the only persons authorized to turn on a traffic signal.

Conductors shall not be pulled into conduit until pull boxes are set to grade, crushed rock sumps installed, grout placed around the conduit, and metallic conduit bonded.

In vehicular undercrossings, soffit lights shall be placed in operation as soon as practicable after falsework has been removed from the structure. Lighting for pedestrian structures shall be placed in operation prior to opening the structure to pedestrian traffic.

If the Engineer orders soffit lights or lighting for pedestrian structures placed in operation before permanent power service is available, the cost of installing and removing temporary power service shall be paid for as extra Work as provided in Division 10, Sections 10.05 – Control of Work and 10.07 – Measurement and Payment.

### **Article 1.7 Safety Precautions**

Before starting Work on existing series street lighting circuits, the Contractor shall obtain daily, a safety circuit clearance from the serving utility. By-pass switch plugs must be pulled and suitable signs posted at switch boxes before electrical Work begins.

Suitable signs shall be posted at Load Centers when a contractor is working on any of the circuits from that Load Center.

### **Article 1.8 Definitions**

The Definitions in NEMA TS-2, Traffic Controller Assemblies with NTCIP Requirements Version 02.06, shall be used along with the following:

1. Electrolier: The complete assembly of pole, luminaire arm, luminaire, ballast, and lamp.
2. Luminaire: The assembly which houses the light source and controls the light emitted from the light source. Luminaires consist of the optical, electrical, and mechanical/thermal components of the assembly.
3. Lighting Standard: The pole and luminaire arm which must support the luminaire.
4. Vehicle: Any motor vehicle licensed for highway use by the State of Alaska.
5. Controller Unit: The solid-state device as described in Section 80.17, Article 17.2 – Controller Unit.
6. Controller Cabinet: A cabinet constructed, wired and equipped as described in Section 80.17, Article 17.5 - Controller Cabinet.
7. Controller Assembly. The controller cabinet, controller unit and the equipment described in Section 80.17. The controller assembly shall also be functioning in accordance with Section 80.17, Articles 17.1-General and 17.6 - Operation.
8. Anchor bolts apply to Luminaire poles and anchor rods apply to Signal poles. They are used interchangeably in this Division.

### **Article 1.9 Signs**

Reference Division 85, Section 85.04 – Standard Signs.

**Article 1.10 Measurement**

All Work in this Section shall be measured by lump sum and shall consist of all labor, materials, and equipment necessary to provide temporary signalization and temporary illumination.

**Article 1.11 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Temporary Signalization	Lump Sum
Temporary Illumination	Lump Sum



## **SECTION 80.02 EXCAVATING AND BACKFILLING**

### **Article 2.1 General**

The excavations required for the installation of conductors, conduits, foundations and other appurtenances shall be performed in such a manner as to avoid any unnecessary damage to the streets, sidewalks, landscaping, and other improvements. The trenches shall not be excavated wider than necessary for the proper installation of the electrical appurtenances and foundations. Excavation shall not be performed until immediately before installation of conduit and other appurtenances. The material from the excavation shall be placed in a position that will not cause damage or obstruction to vehicular and pedestrian traffic nor interfere with surface drainage.

Trench, backfill, and disposal of surplus material shall be performed in accordance with Division 20 – Earthwork.

Excavations after backfilling shall be kept well-filled and maintained in a smooth and well-drained condition until permanent repairs are made.

All excavations shall be filled, and sidewalks, pavement, and landscaping restored at each intersection prior to excavating at any other intersection. Excavations in the street or highway shall be performed in such a manner that not more than one traffic lane is restricted in either direction at any time, unless otherwise provided in the Special Provisions.

### **Article 2.2 Construction**

The Contractor shall excavate the trench to the proper depth as described herein and as shown on the Drawings.

The excavations shall be backfilled with material suitable to the Engineer. All backfill placed in the roadway area shall be Type II-A classified backfill as specified in Division 20, Section 20.21, Article 21.2 - Material. All backfill material shall be placed in uniform layers of not more than six inches (6") in depth and compacted to a density of not less than ninety-five percent (95%) of the maximum density as directed by the Engineer.

The Contractor shall be responsible for the restoration of all surfacing, turf, and native material to the original condition and appearance.

### **Article 2.3 Sawcut Trench**

Where shown on the Drawings, or as directed by the Engineer, the Contractor shall construct a sawcut trench as detailed in the Drawings. A sawcut trench shall be used to cross existing traveled lanes, existing curb and gutter, in median islands, along edges of paved roadways, and in sidewalk areas where a neat cut of the surfacing is required.

The Contractor shall cut the surfacing material full depth and remove the surfacing material to expose the subgrade materials. The Contractor shall then excavate a trench, dispose of excess and waste materials, and install conduit as described herein.

In sawcuts of asphalt pavement located within the roadway pavement, Contractor shall remove a minimum distance of one foot (1') back from the edge of the trench, on each side of the trench. Contractor shall remove pavement such that cuts parallel to the direction of travel are not located within the wheel paths.

The entire trench shall be backfilled as specified herein, except non-frost-susceptible sand bedding material shall be used.

The existing surface shall then be restored with like pavement in accordance with Section 40.07 - Remove and Replace Existing Asphalt Surfacing; Section 40.06 - Tack Coat; Section 30.03 - Portland Cement Concrete Sidewalks; or Section 30.02 Portland Cement Concrete Curb and Gutter, and Valley Gutter, as applicable.

Where applicable, asphalt tack coat shall be applied to all edges of the existing pavement prior to placing new asphalt. Asphalt pavement less than three inches (3") in thickness shall be placed in one lift, and asphalt pavement three inches (3") and greater in thickness shall be placed in a minimum of two equal lifts.

In median islands, the Contractor may elect to remove and replace the entire surface of the island along the length of the conduit run. If the Contractor elects to remove the entire surface of the island, the Work shall still be considered as sawcut trenching. The layer of pavement under the median islands, if encountered (normally at the street pavement grade), may be broken out.

The Contractor shall be responsible for the restoration of all surfacing, turf, and native material to original condition and appearance.

**Article 2.4 Measurement**

Measurement for trench and backfill and for sawcut trench shall be per linear foot of horizontal distance of the various widths and depths as set forth in the Bid Schedule. Measurement shall be from station to station or from center of device to center of device as staked in the field and as shown on the Drawings.

**Article 2.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Work not specifically identified for payment under a separate pay item, but required for normal completion of trench and backfill, will be considered incidental and shall be included in the linear foot cost of the trench. Sawcut trench includes removing existing pavement, trench and backfill, and replacing pavement.

Payment shall be made under the following units:

ITEM	UNIT
Trench and Backfill (Width) (Depth)	Linear Foot
Sawcut Trench (Width) (Depth)	Linear Foot

## **SECTION 80.03 REMOVING AND REPLACING IMPROVEMENTS**

### **Article 3.1 General**

Improvements such as sidewalks, curbs, gutters, Portland cement concrete and asphalt concrete pavement, base material, lawns and plants and other improvements removed, broken or damaged by the Contractor's operations, shall be replaced or reconstructed with the same kind of material as found on the Work or with materials of equal or better quality. The new Work shall be left in a satisfactory serviceable condition.

Whenever a part of a square or slab of existing sidewalk, curb and gutter, or driveway is broken or damaged, the entire square, section or slab shall be removed and the concrete reconstructed as above specified.

The outline of all areas to be removed in concrete sidewalks and driveways and in pavements shall be cut to a minimum depth of one and one-half inches (1 1/2") with an abrasive type saw prior to removing the sidewalk, driveways, and pavement material. The cut for the remainder of the required depth may be made by a method satisfactory to the Engineer. Cuts shall be neat and true with no shatter outside the removal area.

When a foundation is to be abandoned in place, the top of foundation, anchor bolts, and conduit shall be removed to a depth of not less than one foot (1') below surface of sidewalk or unimproved ground. The resulting hole shall be backfilled with material equivalent to and compacted to the density of the surrounding material.

### **Article 3.2 Measurement**

All Work under this section is incidental to other Work and shall not be measured or paid for directly.

### **Article 3.3 Basis of Payment**

No separate payment shall be made for this item.

## **SECTION 80.04 FOUNDATIONS**

### **Article 4.1 General**

All foundations for poles, posts and pedestals shall be cast-in-place Portland Cement Concrete. Luminaire poles may be constructed on driven pile foundations.

Unless otherwise shown on the Drawings, all items to be relocated shall be provided with new foundations and anchor bolts of the proper type and size.

The Contractor shall be responsible for contour grading around all post, pole, and pedestal foundations. Final or finished grading shall be such that the earth shall be two inches (2") below the top of the base and drain away from the base.

Foundations for signal poles and breakaway 10' signal poles shall be designed in conformance with the requirements of the 2013 AASHTO design criteria.

Foundations for luminaire poles shall be designed for one hundred mile per hour (100 mph) winds with gust to one hundred thirty mile per hour (130 mph), in conformance with the requirements of the 1994 AASHTO design criteria.

Cabinet foundations shall be precast.

The entire controller foundation, and the entire pole foundation shall be formed and the top given a smooth steel trowel finish. Conduits shall be located in the center of the pole-post foundations with clearance allowed for bushings.

The top of any foundation located on a slope shall be constructed such that the finished slope passes through the top center of the uphill edge of the foundation. The area two feet (2') up and down slope of the edge of the foundation shall be graded so that no portion of the foundation projects above the surrounding slope and so that water will drain away from the foundation.

The Contractor shall field-verify pole foundation stationing and elevations prior to pouring the foundations, to ensure that the final locations of the signal heads and mast arms meet the requirements of the Drawings and Specifications. The field-verification includes checking to ensure that the heads shall be the proper distance above the roadway surface, and mast arms shall be of adequate length to place heads and signs in the right locations. Any discrepancies shall be reported to the Municipal Traffic Engineer prior to pouring the foundation.

### **Article 4.2 Cast-In-Place Concrete Foundations**

The Contractor shall use a minimum 14 gauge corrugated steel pipe (CSP) form to cast concrete foundations in place. The Contractor shall over excavate the area around the form enough to allow for proper compaction. The backfill operation shall conform to the requirements of Division 20, Section 20.19 – Furnish Foundation Backfill. Contractor shall obtain approval from the Municipal Traffic Engineer prior to use of any material that is not specifically identified in Furnish Foundation Backfill. Substitution requests for alternate material, including any flowable fill, shall be designed to produce a comparable compressive strength to the surrounding soil after hardening. The use of water for drilling operations or for any other purpose where it may enter the hole is not permitted.

Concrete shall be Class AA-3 Portland Cement conforming to Division 30 – Portland Cement Concrete.

Reinforcing steel and wire fabric shall conform to the requirements of Division 30, Section 30.01, Article 1.3 – Materials and Section 80.05 – Poles, Steel Pedestals and Posts. Reinforcement shall be placed and fastened in conformance with Division 30, Section 30.05, Article 5.2 – Construction, except that bars to be spliced shall be lapped at least fifty (50) bar diameters. Where bar spacing is less than one (1) foot in each direction, the Contractor may tie alternate intersections.

Drilled holes or forms shall be vertical, and true to the locations shown in the Drawings. Upon completion of excavation for a foundation, and prior to the placement of concrete, all loose material shall be removed in order that the foundation rests on firm, undisturbed ground.

Forms, if indicated or required, shall be true to line and grade, with the top of the foundation at the established elevation.

Conduit shall be included in all concrete foundations for wire and cable entry as shown on the Drawings as required to complete the Work. The conduit in pole or post foundations shall extend above the foundation as shown on the Details (but not above the slip base adapter). These conduits shall exit the foundations in the top center of the foundation surface.

The reinforcing steel cage, if required, shall be placed and secured symmetrically about the vertical axis and shall be securely blocked to clear the sides of the foundation. Anchor bolt assemblies and conduit ends and reinforcing bar assemblies shall be securely supported by templates. Each anchor bolt shall have two (2) nuts and two (2) plate washers.

Anchor bolts, nuts and washers shall conform to ASTM F1554 and shall be hot-dip galvanized after fabrication in accordance with ASTM A153. Anchor bolts for signal mast arm foundations shall conform to ASTM F1554 and Section 80.05, Article 5.4 – Signal Pole Anchor Rods and Bolts. The grade of steel shall be as specified by the pole manufacturer, for the loading specified in Section 80.05, Article 5.1 – General. The exposed end of all anchor bolts used for signal mast arm poles shall be clearly stamped with the appropriate markings so that the type of bolts used in the foundation can be clearly determined after construction, per ASTM F1554 supplementary requirements S2, S3, and S5. Signal mast arm foundation anchor bolts shall conform to Charpy Impact Requirements at –20°F, per supplementary requirement S5. Anchor bolts may not be field cut or bent. Damage to galvanized surfaces as a result of damage during shipping or construction activities shall be repaired in accordance with Section 80.16, Article 16.3 – Galvanizing.

Furnish each anchor bolt with two nuts and two washers. Install the bottoms of the bottom leveling nuts in a level plane within one inch (1”) of the top of foundations. Adjust nuts until their tops form a level plane. Install one washer on top of leveling nuts and, after setting the pole on these washers, install one washer under top nuts. Bring leveling nuts (bottom nuts) to full bearing on the bottom of the base plate. Generously lubricate the bearing surface and internal threads of top nuts with beeswax. Tighten top nuts to a “snug” condition. Use a click type torque wrench to apply 600 foot-pounds of torque to the “snug” top nuts. After the top nuts are tightened to the correct torque, use a hydraulic wrench to rotate top nuts an additional one sixth (60 degree) turn, while preventing the leveling nuts from turning.”

Material certifications for all anchor bolts shall be submitted to the Municipal Traffic Engineer or designated representative prior to acceptance of the foundations for payment.

Reinforcing bars shall be formed into cages and all intersections tied with #14 AWG steel wire. The cages shall be accurately held in position during placing and setting of the concrete. All reinforcing bars shall be bent cold in as smooth a curve as possible and shall conform to standard practice of the WCRSI. Reinforcing steel shall not be welded except as shown in the construction detail Drawings.

All reinforcing steel shall have a minimum of one inch (1") of concrete cover for controller cabinet and load center foundations. Cover for signal pole and luminaire foundations shall be as identified in the appropriate Standard Detail.

Surface water shall not be permitted to enter the hole and all water which may have infiltrated in the hole shall be removed before placing concrete. Both forms and ground shall be thoroughly moistened before placing concrete. Each foundation shall be poured in one continuous pour.

Posts, poles and pedestals shall not be erected or placed on the foundation until ten (10) days after placement of the concrete. If the Engineer approves Type III Portland High-Early-Strength Cement Concrete, then posts, poles and pedestals may be placed on foundations four (4) days after placement of the concrete. Plumbing shall be accomplished by adjusting the nuts on the anchor bolts. Shims or other similar devices for plumbing or raking are only permitted for breakaway pole installations.

After each slip-base post, pole or pedestal is in position, grout conforming to Section 80.05, Article 5.3 – Grouting for Slip-Base Poles, shall be placed under the base plate as shown on the Detail Drawings, and shaped to present a neat appearance. Contractor shall install metal skirting on all non-slip-base posts, poles, or pedestals.

Attach a #4 AWG, bare, copper wire as a grounding electrode conductor to the #4 spiral bar in the reinforcing steel cage. Use two irreversible compression connectors to make the attachment. Protect the attachment during concrete placement. In foundations that lack reinforcing steel cages, install 21 feet of coiled #4 AWG, bare, copper wire as the grounding electrode. Route the conductor to protrude near the top, center of the foundations. Slide a minimum six inch (6") long, PVC or HDPE, protective sleeve over the conductor. Allow one inch (1") of the sleeve and twenty-four inches (24") of conductor to protrude from the foundations.

Install anchor bolts and rods plumb. Anchor bolts and rods greater than 1:40 out of plumb will result in rejection of foundation. Contractor shall reconstruct rejected foundations at no additional expense to Owner.

MATERIAL REQUIREMENTS		
Concrete	Class AA-3	F'c = 4000 psi
CMP	AASHTO M218	14 ga
Vertical Reinforcing Steel	AASHTO M31 #11	GR 60
Spiral Reinforcing Steel	AASHTO M31 #5	GR 60
Ground Wire		#4 AWG
Anchor Rods 2"x96"	ASTM F1554 S2, S3, & S5	GR 105
Fasteners, Washers	AASHTO M293	
Fasteners, Nuts	AASHTO M292	
Finish, Anchor Rods & Fasteners	AASHTO M232	
Ring Plate	AASHTO M270	GR 36
Conduit	Sch 40	RMC
Protective Sleeve	Sch 40	PVC

#### **Article 4.3 Load Center Foundation**

Excavate sixty inches (60") for base and install eighteen inches (18") of coarse aggregate for drain. Backfill above gravel in six inch (6") lifts with non-frost-susceptible material, compacting to ninety-five percent (95%) in accordance with Division 20 – Earthwork.

Install base so that cast-iron cover is flush with pavement, sidewalk, or finished grade. Slope grade away from base with minimum slope of three percent (3%). Use a pre-molded bituminous joint between base and concrete sidewalk or paving.

Install a three-quarter inch by ten foot (3/4"x10') copper clad ground rod inside the base, readily accessible through the removable steel cover. Install an additional external three-quarter inch by ten foot (3/4"x10') copper clad ground rod eight feet (8') from the load center, and additional ground rods as required by Code or the electrical utility.

Connect cast-iron cover of load center base to the ground rod with six feet (6') of copper braid with eyelets every six inches (6") and approved connectors.

Access opening shall be finished with a twenty-four inch (24") square iron frame and cover, approximately 280 pounds total weight, as provided by Olympic Foundry, Part No. SM70 or approved equivalent.

Install four (4) each, three-quarter inch (3/4") ferrule loop inserts for lifting, two (2) on each long side.

Provide one inch (1") chamfer on all exposed concrete edges.

For two-piece units, seal joint with pre-molded plastic bituminous type joint sealer.

#### **Article 4.4 Controller Cabinet Foundation**

Contractor shall install controller cabinet foundation in conformance with Standard Details 80-5, 80-6, 80-7, and 80-8. The top surface of controller cabinet foundations

shall be eighteen inches (18") above finished grade and provided with a one inch (1") diameter drain hole connected to the cabinet interior and emptying above the ground line. All conduits shall be placed in the front half (door side) of the foundation to provide adequate wiring terminal block clearances.

Controller cabinet anchor bolts shall be as recommended by cabinet manufacturer and set with a template. Install a three-quarter inch by ten foot (3/4"x10') copper clad ground rod inside the base, readily accessible through the removable steel cover.

Controller cabinet foundations shall be installed in accordance with Section 80.04, Article 4.3, SubArticles 1, 2, 6, 7 and 8.

#### **Article 4.5 Driven Pile Foundation**

Driven pile foundations shall not be used for signal poles.

Contractor shall supply driven pile foundations of the size and length indicated. Contractor shall ensure that the top surface of the anchor plate is three inches (3") above finished grade at luminaire pole locations or as indicated in the Drawings.

After welding on the pile cap adapter and anchor plate to the driven steel pile, Contractor shall cold galvanize the pile cap, the pile cap adapter, anchor plate, and the top three feet (3') of the steel pile including pile cap and anchor plate. Contractor shall furnish galvanization that complies with Federal Specification DOD-P-210354A (Galvanizing Repair Spec) and is U.L. listed. Contractor shall prepare steel surfaces and apply the cold galvanizing compound in accordance with the manufacturers' recommendations. Five days prior to applying the cold galvanizing compound, Contractor shall provide the Engineer a copy of the manufacturers' instructions.

Driven pile foundation for breakaway traffic signal pole shall be as shown on the Plans and M.A.S.S. Standard Detail 80-12 for the base plate.

Contractor shall excavate a hole with a vactor truck before installing piles when proposed pole location is within 10-feet of an existing buried utility. Excavation depth shall be a minimum of 12-inches below the anticipated depth of the utility before installing pile. Excavation shall be backfilled and compacted after pile installation is complete.

#### **Article 4.6 Measurement**

Foundations shall be measured as units, complete and in place. All survey and staking work required to locate the foundations shall be incidental to the work and no separate payment shall be made. All work to excavate and backfill a hole with a vactor truck for pile foundations shall be incidental to the work and no separate payment shall be made.

#### **Article 4.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.



Payment shall be made under the following units:

ITEM	UNIT
Cast-In-Place- Luminaire Pole Foundations	Each
Driven Pile Luminaire Pole Foundations	Each
Controller Cabinet Foundation (Type)	Each
Signal Mast Arm Pole Foundation	Each
Signal Breakaway Pole Foundation	Each
Driven Pile Signal Breakaway Pole Foundation	Each
Pedestrian Pushbutton Pole Foundation	Each
Load Center Foundation (Type)	Each

## **SECTION 80.05 MAST ARMS, POLES, STEEL PEDESTALS AND POSTS**

### **Article 5.1 General**

A registered professional engineer shall design the structures and provide stamped shop drawings and calculations. Submit the stamped drawings and calculations for each pole to the Municipal Traffic Engineer for approval. Design for the complete-in-place structure including the supported hardware.

In the stamped calculations, indicate the edition of Standard Specifications to which the poles are being designed and provide the input data used to design each pole and mast arm, including: design wind speed, cross section shape, yield strengths of the component materials, dimensions of the pole components, and a summary of the loads used.

On the stamped shop drawings, provide design wind speed and the details for building the luminaire poles, signal poles and mast arms, including: materials specifications, slip fit joint dimensions, pole component dimensions, welds that will be made, and the welding inspection that shall be done.

Contractor shall submit the mill certifications for the steel items (piles, plates, bolts, and other related items) to the Municipal Traffic Engineer or designated representative for written approval. Written approval is necessary for acceptance of and payment for the items identified in this Section.

All steel and iron products which are incorporated into poles, including connection and anchor bolts, shall be manufactured in the United States. All manufacturing processes starting with initial mixing and melting through the final shaping, welding and coating processes must be undertaken in the United States. Manufacturing includes smelting, rolling, extruding, machining, bending, grinding, drilling, painting and galvanizing. This does not apply to raw materials such as iron ore, pig iron, and processed, pelletized and reduced iron ore.

Non-Destructive Testing (NDT) may be required by the Municipal Traffic Engineer on all newly manufactured poles for this project, prior to galvanization. A licensed technician shall perform all testing. NDT shall take the form of Magnetic Particle or Ultrasonic testing, and be performed as described in the current AASHTO standard. If required all NDT reports shall be submitted prior to acceptance for payment.

No exception to the practices mandated by AASHTO shall be allowed.

Poles shall not be relocated or re-used unless Contractor obtains written approval of the Municipal Traffic Engineer or designated representative.

The Contractor shall verify the shaft lengths and mast arm connector plate locations of all poles to ensure the Drawing mounting heights of luminaires and traffic heads are met.

Damage to the galvanized or painted surface of existing poles to be relocated or reused in place and damage to the galvanized or painted surface that occurs during shipping or during the construction process, shall be repaired in accordance with Section 80.16, Article 16.3 – Galvanizing or Article 16.4 – Painting for Steel Structures, as appropriate prior to final acceptance of the poles and mast arms. Holes greater than five-eighths

inches (5/8") in diameter in the shafts of existing poles, due to removal of equipment, shall be repaired. Holes shall be repaired by tapping the hole, coating all exposed edges with zinc rich paint, and plugging the hole with a screw-in type steel plug of the correct size. The plug shall be galvanized, or shall be completely covered with zinc rich paint. Holes less than five-eighths inch (5/8") diameter shall be ground smooth so there are no notches or cracks, and coated with zinc rich paint. Plugging holes and repainting damaged galvanized or painted surfaces shall be incidental to the Project and no additional payment shall be made.

## **Article 5.2 Poles and Arms**

### **A. Traffic Signal Breakaway Poles**

Design and fabricate traffic signal structures to the 2001 Edition of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals with interim revisions and 10' Breakaway Traffic Signal Pole Details. Design must meet Fatigue Category II.

Fabricate signal structures from tapered steel tubes with a round or sixteen (16) sided cross section.

Fabricate tubes with walls up to half inch (1/2") thick from the prequalified base metals listed in AWS D1.1. Fabricate elements greater than half inch (1/2") thick from steel that conforms to AASHTO M270 and meets the Fracture Critical Impact Test requirements for Zone 3. Municipal Traffic Engineering will not accept structures that use laminated steel elements.

Fabricate the cross section of each tube from no more than one (1) piece of steel. Place the welded seams on adjacent sections to form continuous straight seams from the base to the top of the pole.

Fabricate breakaway signal poles in accordance with the 10' Breakaway Traffic Signal Pole Details. Fabricate signal poles from 7 gage (US Standard) sheet steel. Fabricate each post with a minimum inside diameter at the base plate as shown in the Drawings. Use four inch (4") diameter by four inch (4") Schedule 40, ASTM A53, Grade B pipe as a post-top adapter.

The Municipal Traffic Engineer does not allow holes made for lifting purposes in the ends of tubular segments. To add lift points, weld them to the tube opposite the longitudinal seam weld on the outside of female segments and on the inside of male segments. Before shipment, remove lift points added to the outside of the tubes, grind the area smooth with the base metal, and hot stick repair the finish in areas more than twelve inches (12") away from welds and slip fit areas, by applying minimum 7.8 mils of zinc based alloy applied according to ASTM A780. In areas that are within twelve inches (12") of welds and slip fit areas, make the repair by applying a minimum 7.8 mils of zinc rich paint applied according to ASTM A780.

Lift points added to the inside of tubes may be left in place.

The Municipal Traffic Engineer will reject poles and mast arms that are:

1. Not fabricated according to these specifications or the details,
2. Bowed with sweeps exceeding 1 inch throughout the length of the pole.
3. Out of round. Sections are out of round when the diameters of round members or the dimension across the flats of multisided members exceed 2 percent of the dimension specified on the shop drawings.

See Drawings for additional manufacturing and construction requirements.

B. Calculations: Signal Pedestrian Pushbutton Poles and Luminaire Poles and Arms

Street lighting poles, including luminaire arms and head mounting brackets, shall be designed and fabricated to the 1994 AASHTO design criteria.

Minimum design wind velocity shall be the greater of one-hundred miles per hour (100 mph) or the AASHTO recommendation based upon a fifty (50) year mean recurrence interval dependent upon project location. A factor of 1.3 shall be used in design calculations to account for wind gusts. The design for luminaire poles shall include a traffic sign with an area of sixteen (16) square feet, located with its centroid nine feet (9') above the base of the pole.

Should project plan loading develop shear or moments greater than those related to the above loading, special design poles are required. Those "Special Design" poles shall require calculation submitted to the Engineer for approval prior to use on the project.

Direct-embedded luminaire poles are not allowed.

C. Signal Pedestrian Pushbutton Poles and Luminaire Poles and Arms

Poles, prior to installation, shall be straight, with a permissive variation in sweep not to exceed one-quarter inch (1/4") per ten feet (10') of pole length.

A backing plate consisting of a metal sleeve shall be provided at all butt welded, transverse joints. The sleeve shall be No. 12 U.S. standard gauge steel minimum, and made from steel having the same chemical composition as the steel in the pole.

The metal sleeve shall have a minimum length of three inches (3"). The sleeve shall be centered at the joint and have the same taper as the pole outside the sleeve in full contact with the inside of the standard throughout the sleeve length and circumference. The weld metal at the transverse joint shall extend to the sleeve, making the sleeve an integral part of the joint. In round poles, standard steel pipe or tubing may be substituted for the tapered backing sleeve, at the discretion of the Engineer.

All welds shall be continuous. All welding practices shall conform to current AWS Code, AWS D1.1, latest edition.

All exposed welds, except fillet welds shall be ground flush with the base metal.

1. Poles

Pedestrian pushbutton posts shall be constructed of four inch (4") standard (Schedule 40) pipe and meet the requirements of ASTM A53. Multi-sided

poles shall not be used without prior approval of the Municipal Traffic Engineer.

Luminaire poles fifteen feet (15') or longer shall be round or multisided and fabricated from sheet steel of weldable grade.

Poles may be fabricated of full length sheets or shorter sections. When two pieces are used, the longitudinal welded seams shall be directly opposite one another. When the sections are butt-welded together, the welded seams on adjacent sections shall be placed to form continuous straight seams from base to top of pole.

All exposed edges of the plates which make up the pole base assembly shall be finished smooth, and all exposed corners of such plates shall be neatly rounded to one and one-half inch (1 1/2") radius, unless otherwise shown on the Drawings. Anchor holes in the base plate shall be round. Slotted holes shall not be used. Slotted shafts shall be provided with slip fitter shaft caps of either galvanized steel or cast aluminum.

## 2. Arms

Arms less than fifteen feet (15') in length shall be round or multisided, and constructed of No. 11 or heavier U.S. standard gauge steel, or four inch (4") standard (Schedule 40) pipe or conduit. Standard pipe shall conform to the specifications of ASTM A53.

Luminaire arms fifteen feet (15') or longer shall be round or multisided and fabricated from sheet steel of weldable grade.

Arms may be fabricated of full-length sheets or shorter sections. Each section shall be fabricated from not more than two (2) pieces of sheet steel for lengths up to forty feet (40'). Where two (2) pieces are used, the longitudinal welded seams shall be directly opposite one another. When the sections are butt-welded together, the welded seams on adjacent sections shall be placed to form continuous straight seams from base end of arm.

All exposed edges of the plates which make up the base of the arm shall be finished smooth and all exposed corners of such plates shall be neatly rounded to one-eighth inch (1/8") radius, unless otherwise shown on the Drawings. Bolt holes in the mast arm base plate shall be round. Slotted holes shall not be allowed. Mast arm ends shall be provided with slip-fitter shaft caps of either galvanized steel or cast aluminum.

## D. Traffic Signal Poles and Arms Between 15' and 65'

Traffic signal structures shall be designed and fabricated to the 2013 AASHTO design criteria with interim revisions and the Standard Details. Design structures for a 50-year design life, Fatigue Category I with ice loading, and with a basic wind speed of 100 mph. Fatigue design shall include natural wind gust and truck-induced gust.

Fabricate signal and lighting structures from tapered steel tubes with a round or 16 sided cross section. Orient handholes located near the base of poles to face downstream of traffic flow.

Provide traffic signal poles, lighting poles, and signal mast arms in lengths evenly divisible by 5 feet.

Furnish mast arms up to 35 feet long in one piece. Mast arms 40 feet or longer shall be furnished in two segments with a slip type field splice per the Details. For slip type joints, provide a minimum overlap of two and one half (2.5) feet or the overlap specified in the Details, whichever is greater.

Fabricate tubes with walls up to 1/2 inch thick from the prequalified base metals listed in AWS D1.1. Fabricate elements greater than 1/2 inch thick from steel that conforms to AASHTO M270 and meets the Fracture Critical Impact Test requirements for Zone 3. The Municipal Traffic Engineer will not accept structures that use laminated steel elements.

Fabricate the cross section of each tube from no more than 2 pieces of steel. When using 2 pieces, place the longitudinal welded seams directly opposite one another. Place the welded seams on adjacent sections to form continuous straight seams from the base to the top of the pole.

When tenons are needed to install traffic signals and luminaires, make them from two inch nominal schedule 40 pipe that conform to ASTM A 53 Grade B.

The Municipal Traffic Engineer does not allow holes made for lifting purposes in the ends of tubular segments, except in the free ends of luminaire mast arms. To add lift points, weld them to the tube opposite the longitudinal seam weld on the outside of female segments and on the inside of male segments. Before shipment, remove lift points added to the outside of the tubes, grind the area smooth with the base metal, and hot stick repair the finish in accordance with Section 80.16, Article 16.3 – Galvanizing or Article 16.4 – Painting for Steel Structures, as appropriate. Lift points added to the inside of tubes in place may be left in place.

The Municipal Traffic Engineer will reject poles and mast arms that are:

1. Not fabricated according to these specifications or the approved shop drawings,
2. Bowed with sweeps exceeding 3/4 inch throughout the length of the pole, mast arm, or segment, if furnishing a 2 piece pole or mast arm,
3. Out of round. Sections are out of round when the diameters of round members or the dimension across the flats of multisided members exceed two percent (2%) of the dimension specified on the shop drawings.

MATERIAL REQUIREMENTS			
	Between 15' & 35'	Between 40' & 50'	Between 55' & 65'
<b>ALL ASSEMBLIES</b>			
Steel Through ½" Thick	ASTM A572 or A596		
Steel Over ½" Thick	AASHTO M270 F3 (50 ksi)		
Finish	AASHTO M111 & M232		
Mastarm Bolts	AASHTO M164		
Anchor Rods	Article 5.4 – Signal Pole Anchor Rods & Bolts		
<b>POLE (LOWER SECTION)</b>			
Design Length	21.5'		
Section Shape	Round		
Simplex Height	20'		
Fixed End Diameter	15.0" O.D.	17.0" O.D.	19.0" O.D.
Taper	0.14"/ft		
Tube Thickness	0.375"		
Base Plate	24"x24"x2.25"		
Bolt Circle	24"		
Signal Arm Plate	20"x20"x2.2 5"	22"x22"x2.25"	24"x24"x2. 25"
Top Ring Thickness	0.375"		
Bottom Ring Thickness	0.375"		
Gusset Plate Thickness	0.375"		
Handhole Cover Thickness	10 ga		
Pole Skirt Thickness	10 ga		
<b>MASTARM</b>			
Design Length	35'	50'	65'
Section Shape	Round		
Taper	0.14"/ft		
Tube Thickness	See Std Dtl 80-26A	See Std Dtl 80-26B	See Std Dtl 80-26C
Mastarm Rise	3.0 Degrees		
Base Plate	20"x20"x2.2 5"	22"x22"x2. 25"	24"x24"x2.25"
Bolt Circle	20"	22"	6 Vertical O.C.
Mastarm Bolts	1.5" x 4.5"		

POLE (UPPER SECTION)			
Fixed End Diameter	11.99" O.D.	13.99" O.D.	15.99" O.D.
Tube Material	A572, A595 GR A or A1011 50 ksi min		
Luminaire Tube	7 ga		
Connecting Plates	AASHTO M270 F3		
Concentric Reducer	A572 or A595 GR A		
Connection Tube	A572 or A595 GR A		
Upper Section Attachment Bolts	1"-8UNC / AASHTO M164		
Luminaire Attachment Bolts	0.75"-10 / AASHTO M164		
Slip-fit Through Bolt	0.625" / AASHTO M164		
Finish	AASHTO M111 & M232		
Handhole	7"x12.89" O.D.		
Section Shape	Round		
Taper	0.14" / ft		

E. Poles and Arms Greater than 65'

Refer to the project-specific Special Provisions and Drawings.

**Article 5.3 Welding**

Perform welding to conform to the 2001 Edition of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals with interim revisions; current American Welding Society code; the latest edition of AWS D1.1 – Structural Welding Code - Steel; the Standard Details; and the following:

1. Make welds continuous. Grind exposed welds flush with the base metal at slip fit joints for the length of the slip fit joint plus one half the diameter of the female section.
2. On steels 5/16 of an inch thick and thicker, inspect 100 Percent of CJP welds by either radiography (RT) or ultrasound (UT).
3. Inspect a random 25 percent of PJP and fillet welds by magnetic particle (MT). If a defect is found, inspect 100% of the PJP and fillet welds made to fill the order. In steels less than 1/8 inch thick, complete the tests according to AWS D1.1.
4. Only visually inspect welds made on luminaire arms.

**Article 5.4 Signal Pole Anchor Rods and Bolts**

Furnish 2 inch diameter (nominal) anchor rods for signal poles that meet ASTM F1554 Grade 105, are 96 inch minimum length and conform to Supplemental Requirements; S2, Permanent Manufacturer's Identification, S3, Permanent Grade Identification and S-5 Charpy Impact Requirements. Hot dip galvanize according to AASHTO M232. Use nuts that conform to AASHTO Specification M292 of the grade, surface finish, and style for 2 inch diameter anchor rods. Washers shall conform to AASHTO M293.



## Article 5.5 Finishing

Finish the edges of poles and mast arms to conform to the following requirements prior to galvanization in accordance with Section 80.16, Article 16.3 – Galvanizing. Neatly round the following features to the radius specified.

1. On holes through which electrical conductors pass, provide a 1/16 inch radius on both the entrance and exit edges,
2. On pole base plates, provide a 1/8 inch radius on edges along which plate thickness is measured and a smooth finish on all other exposed edges,
3. On the ends of tubes that form slip type joints, complete the following tasks on the two surfaces that contact one another. First, provide 1/16 inch radii on the inside and outside edges of the female and male segments, respectively. Then for the length of the joint plus one half the diameter of the female section grind down welds until they feature a radius concentric with the mating surface and remove material protruding from the two surfaces.

Provide caps to cover the free ends of poles and mast arms.

## Article 5.6 Identification Tags

Identify critical information for poles and arms with visible permanent aluminum tags that contain the information shown in the Pole Markings Table. The measurements shown are for illustration purposes only. Use tags large enough to include required information using 1/4 inch high text, 3/8 inch of space between successive lines of text, and at least 3/8 inch of space between the edges of the tag and the text. Secure the tags with two 1/8 inch blind rivets at the base of poles and the underside of mast arms. If furnishing a two piece signal mast arm with slip type joint, mark both pieces with the same message. Provide the holes for the blind rivets before galvanizing.

**POLE MARKINGS TABLE**

STRUCTURES	MEASUREMENTS	TAG MARKINGS
<b>Signal Poles</b>		
a) Signal mast arm length	45 ft./55 ft.	SMA 45/SMA 55
b) Luminaire mast arm length	22 ft./18 ft.	LMA 22/LMA 18
c) Pole height	36 ft.	PH 36
d) Intersection number (if more than one) -pole number		1 - P 4
e) Sum of signal mast arm moments about centerline of signal pole		SM 4000/SM 3200
f) Design wind speed	100 mph	DWS 100
<b>Light Poles</b>		
a) Luminaire mast arm length	15 ft./15 ft.	LMA 15/LMA 15
b) Pole height	37 ft.	PH 37

<b>Signal Mast Arm</b>			
a)	Mast arm length	40 ft.	SMA 40
b)	Intersection number (if more than one) -pole number		1 - P 4
c)	Sum of signal mast arm moments about centerline of signal pole		SM 3740
d)	Design wind speed	100 mph	DWS 100
<b>Luminaire Mast Arm</b>			
a)	Mast arm length	18 ft.	LMA 18
b)	Pole number (if unique arm design)		P 4

Note:

Italic type indicates additional Tag Markings if poles have 2 luminaire or 2 signal mast arms.

### **Article 5.7 Plumbing**

Plumbing shall be accomplished by adjusting the nuts on the anchor bolts prior to grouting. A slight raking of the pole shall be provided by plumbing the side away from the road. Shims or other similar devices for plumbing or raking shall not be permitted.

### **Article 5.8 Grouting for Slip-Base Poles**

The Contractor shall use a premixed grout having a minimum twenty-eight (28) day compressive strength of four thousand pounds per square inch (4000 psi). Proprietary grout mixtures shall be utilized in accordance with the recommendations of the manufacturer.

Concrete areas to be in contact with the grout shall be cleaned of all loose and foreign matter that would in any way prevent bond between the mortar and the concrete surfaces.

Contractor shall not grout unless ambient temperature will remain a minimum temperature of forty-five degrees Fahrenheit (45°F) for three days after grouting. All improperly cured or otherwise defective grout shall be removed and replaced at the Contractor's expense. No load shall be placed on the grout until it has set for at least ninety-six (96) hours.

For concrete bases, after each post, pole or pedestal is in position, grouting conforming to this Article shall be placed under the base plate as shown on the Drawings, and shaped to present a neat appearance.

### **Article 5.9 Galvanizing**

All signal poles, mast arms, and pedestal poles shall be hot dipped galvanized in accordance with Section 80.16, Article 16.3 – Galvanizing.

### **Article 5.10 Measurement**

Fixed base luminaire poles shall be measured as units complete and in place, including all hardware and all wiring within the poles.

Breakaway base luminaire poles shall be measured as units complete and in place, including frangible couplings, skirt, all hardware, and all wiring within the pole.

Signal mast arm poles and signal breakaway poles shall be measured as complete and installed with all hardware, all wiring within the pole, and either grouting of the base or base plate skirt as appropriate.

Combination signal luminaire poles shall be measured as complete and installed with all hardware, luminaire brackets, all wiring within the pole, and base plate skirt.

Pedestrian push button poles shall be measured as complete and installed with all hardware, all wiring within the pole, and grouting of the base.

All luminaires, luminaire arms, signal heads, pedestrian signal heads, pedestrian pushbutton assemblies, signal mast arms, signs, optical preemption detectors, Pan Tilt Zoom (PTZ) cameras and other equipment on signal poles called for in the Drawings shall be installed and accepted when poles are measured for payment, but shall not be included in payment for poles. These items shall be considered separate pay items, and measured under the appropriate Sections of these Specifications. All other hardware; including wiring within the pole, repair of galvanization when damaged, and grouting of the base; shall be considered incidental to the pay items, and shall not be measured for payment.

Signal and luminaire arms shall be measured as units complete and in place, including labor, equipment, and material necessary to make a complete and functioning unit.

All luminaires, signal heads, signs, optical preemption detectors and other signal equipment on signal and luminaire arms called for in the Drawings shall be installed and accepted when mast and luminaire arms are measured for payment, but shall not be included in payment for mast or luminaire arms. These items shall be considered separate pay items and measured under the appropriate sections of these Specifications. All other hardware, including wiring within the arms, shall be considered incidental to the pay items for signal mast arms or luminaire arms, and shall not be measured for payment.

### **Article 5.11 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Maintenance, 343-8372 prior to final acceptance. Contact Street Light Maintenance a minimum of three business days prior to delivery. The Engineer retains the right to inspect all poles for conformance with the contract documents prior to accepting delivery. The cost of storage prior to delivery and delivery of these materials is subsidiary to the pay item.

Payment shall be made under the following units:

ITEM	UNIT
Breakaway Base Luminaire Pole (ft Length)	Each
Fixed Base Luminaire Pole (ft Length)	Each

Signal Mast Arm Pole	Each
Combination Signal/Luminaire Pole (MTG Height)	Each
Breakaway Signal Pole	Each
Breakaway Signal Pole, Spare	Each
Pedestrian Pushbutton Pole	Each
Signal Mast Arm (ft Length)	Each
Luminaire Arm (ft Length)	Each

## **SECTION 80.06 - FIBER OPTIC SIGNAL INTERCONNECT**

### **Article 6.1 Description**

This item consists of the work required to furnish and install single mode fiber optic cable in polyethylene conduit between equipment shown on the Drawings along the route indicated. The item includes installing vaults, splicing cable, testing cable, and terminating fibers.

### **Article 6.2 Referenced Specifications**

Complete the following work according to the subsections referenced in each bullet.

- Submit and deliver materials for review and approval according to M.A.S.S. Section 80.01, Article 1.3 Equipment Lists and Drawings.
- The fiber optic cable manufacturer shall submit a letter certifying their products conform to all requirements specified herein.
- Complete all excavation and backfill according to M.A.S.S. Section 80.02 - Excavating and Backfilling. Exception: Polyethylene conduits shall be installed in accordance with Article 6.8 - Construction Requirements for Polyethylene Duct System.
- Remove and replace improvements according to M.A.S.S. Section 80.03 - Removing and Replacing Improvements.

### **Article 6.3 Certified Fiber Optic Technician**

Employ a Fiber Optic Technician that has successfully completed at least one four day "Installation of Fiber Optic Products School." A major manufacturer of fiber optic products shall conduct this school or an Engineer approved independent generic four-day school that encompasses all aspects of fiber optic technician certification.

Only employ those technicians that provide documents proving a minimum two years work experience splicing, terminating, and testing fiber optic cable.

The approved technician shall provide evidence of completed courses within 1 week before the beginning of construction. The Engineer reserves the right to revoke the approval of any technician not demonstrating the skill and knowledge to perform at accepted industry standards or to the quality required in this spec.

### **Article 6.4 Manufacturer Warranties**

Manufacturer's support (customary warranties) period shall be provided for all equipment and materials furnished and installed as part of the fiber optic system, including end equipment (modems, panels, switches etc.). Manufacturer's and Contractor's warranties or guarantees shall be continuous throughout their specified duration and state they are subject to transfer. Submit all warranties, guarantees, and instruction sheets according to M.A.S.S. Section 80.01, Article 1.4 Warranties, Guarantees and Instruction Sheets.

### **Article 6.5 Polyethylene Duct System**

Install polyethylene conduits and vaults in excavated trenches to form the duct system for the fiber optic cable. Polyethylene conduits plowed into place shall not be permitted.

For the polyethylene conduit, furnish a smooth wall, schedule 40, high-density polyethylene (HDPE) pipe that conforms to UL 651 B and features a controlled outside diameter.

### **Article 6.6 Fiber Optic Cable, General**

A current ISO9001 certified manufacturer, who is regularly engaged in the production of fiber optic cable according to these specifications, shall produce all of the fiber optic cable installed on this project. The manufacturer shall not only manufacture the fiber optic cables, but they shall also test and prepare the cables for shipping and provide all connectors needed to complete the project.

Install fiber optic cable approved for use in underground ducts and which conform to:

- United States Department of Agriculture Rural Utilities Service (RUS) standard 7 CFR 1755.900
- Department of Agriculture Rural Electrification Administration (REA) Bulletin 1753f-601 (PE-90) dated August 4, 1994, and these specifications.
- National Electrical Code (NEC) Article 770; NFPA-National Fire Protection Agency
- National Electrical Contractors Association (NECA)/Fiber Optic Association (FOA) 301
- Telecommunications Industry Association/ Electronic Industries Association (TIA/EIA) FOTP-Fiber Optic Test Procedures

#### References

- ASTM A615, Grade 60.
- Bellcore Testing Requirements GR-771-CORE.
- EIA/TIA-455-82B: Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable (ANSI/EIA/TIA-455-82B-92; Standard Test Procedures for Fiber Optic Fibers.
- NEC 250-1: National Electric Code Grounding.; Article 770 Optical Fibers and Raceways
- Telcordia GR20-CORE: Optical Fiber and Optical Fiber Cable; GR409-Mechanical Requirements for Optical Fiber Cable.
- Telcordia GR-771: Fiber Optic Splice Enclosure.
- TIA/EIA-4720000-A: General Specification for Fiber Optic Cable (ANSI/TIA/EIA-4720000-A-93).
- TIA/EIA-598-A: Optical Fiber Cable Color Coding (ANSI/TIA/EIA-598-A-95).

Use loose tube fiber optic cables with all-dielectric construction, i.e. with no metal armor or conductive material. Optical fibers shall be contained in kink resistant buffer tubes. Each cable shall be equipped with 6 buffer tubes stranded around an anti-buckling central strength member using a reverse oscillation or “SZ” stranding process.

Each buffer tube shall contain 12 optical fibers and shall have an inside diameter much larger than the total diameter of the fiber it supports.

Fillers are allowed in the cable to achieve cable cross-section symmetry.

All cable fibers shall be usable and shall be sufficiently free of surface imperfections and inclusions to meet or exceed the optical, mechanical and environmental requirements contained in this specification.

Each optical fiber shall consist of a doped silica core surrounded by a concentric silica cladding.

A. Fibers shall contain no factory splices

Fiber coating shall be a dual-layered, UV cured acrylate applied by the fiber manufacturer. The coating shall be mechanically or chemically strippable without damaging the fiber.

Repairs to the fiber coatings are not allowed except as determined by the Traffic Signal Maintenance Technician at designated splice locations.

A water-blocking gel shall displace the voids between the buffer tubes and void areas around the individual buffer tubes to prevent water entry. The gel shall be non-nutritive, electrically non-conductive and homogeneous and shall facilitate free movement of the fibers within the tubes such that mechanically or environmentally induced stress on the cable is not induced in the optical fibers. The gel shall be free of dirt or foreign matter and shall be readily removable with nontoxic solvents.

Two (polyester or aramid) yarn binders shall be applied contra-helically with sufficient tension to secure each buffer tube layer to the central strength member without crushing the buffer tubes. The binders shall be non-hygroscopic, non-wicking and dielectric with low shrinkage.

Use cables that gain tensile strength by using a combination of high tensile strength yarns helically wrapped around the buffer tubes before the application of the outer jacket (sheath). The fiber optic cable shall withstand a maximum pulling tension of 600 lbs during installation (short term loading) with no damage and 200 lbs (long term loading). Tensions on the cables shall not be exceeded under any circumstances.

Furnish cables that use the TIA/EIA-598-B, "Optical Fiber Cable Color Coding" to distinguish individual buffer tubes and optical fibers. During temperature cycling, the coloring compounds shall not fade or smear onto each other or into the gel filling material, and not cause fibers to stick together. The color-coding is as follows:

1. Blue	5. Slate	9. Yellow
2. Orange	6. White	10. Violet
3. Green	7. Red	11. Rose
4. Brown	8. Black	12. Aqua

For cables containing more than 12 buffer tubes, use the color code shown above for tubes 1 through 12, and use stripes or tracers in conjunction with the standard color code for tubes 13 through 24.

Furnish cables with the outer jacket applied directly over the high tensile strength yarns. The jacket shall be free of holes, splits, or blisters. The minimum nominal jacket thickness shall be 55 mils.

The outer jacket material shall be a medium density polyethylene (MDPE) conforming to ASTM D 1248, Type II, Class C, Category 4 or 5, Grade J4 and contain carbon black to provide ultra-violet light protection. The jacket material shall be fungus inert as described in ASTM G 21. The light absorption coefficient, when measured in accordance with ASTM D3349, shall be a minimum of 400 at a wavelength of 375 nanometers.

The cable shall contain at least one ripcord under the jacket for easy jacket removal.

The shipping, storage and operating temperature range of the cable shall be -40 °F to +160 °F.

In each vault, provide the additional length of cable listed in Article 6.9 - Construction Requirements for Fiber Optic Cable.

All cable markings shall be approximately 1/8-inch (3 mm) nominal height, clearly legible and distinguishable, and made at 2-foot intervals to be used as length markers. If initial markings fail to meet marking criteria, i.e. illegible, incorrect spacing, spelling error, etc., cables may be remarked to meet criteria. Cable markings shall include:

- Cable ID
- Sequential numbers in whole foot or meter intervals to determine the length of the cable and amount remaining on the reel.
- Number of fibers
- "SM" (for Single Mode Fiber)
- "MOA Fiber"

#### B. Fiber Optic Drop Cable

Drop Cable is defined as the assembly or pigtail consisting of fiber optic cable, connectors, protective tubing and fan-outs (if required) and all incidental materials used for connectivity between a fiber trunk cable and field devices, i.e. signal controller, modems, etc.

Cable design and installation shall meet requirements for outdoor use as described in Article 6.6 - Fiber Optic Cable, General.

Optical jackets (3mm), where used, shall be yellow for single mode fibers.

No splices are allowed within the cable length.

Drop cables shall be factory assembled.

Non-connectorized ends shall be suitable for heat fusion splicing as described in the Article 6.9, subsection Splices.



The manufacturer shall provide factory-testing information of each fully assembled fiber optic drop cable for each connector/fiber on tags attached to the individual or paired connector/fiber.

Drop cables shall be packaged individually within a plastic package marked clearly with the manufacturer's part number. Drop cables shall be a factory assembled SM fiber pigtailed splice cassette with 12 or 24 fiber LC UPC duplex connectors. Drop cable assembly housing shall be manufactured by Corning or an approved equal.

Field testing information of each Fiber Optic Drop cable (fully assembled) shall in accordance with Article 6.09 – Construction Requirements for Fiber Optic Cable, subsection, Field Testing and Performance of Fibers. Documentation of testing shall be in accordance with subsection, Documentation of Testing.

Fiber optic drop cables shall be equipped with:

1. Twelve (12) optical fibers or number as specified in the plan.
2. Fiber optic connectors that are:
  - a. compatible with the equipment being used for fiber strands with preset usage.
  - b. in accordance with subsection, Connectorization.
  - c. factory installed unless otherwise allowed by the Engineer.
3. Drop Cable Fan-out Kits that feature the heavy duty Spider design. Install fan-out kits for all connectorized ends to build up to 3 mm jacket.
4. Tubing that is 900  $\mu\text{m}$  or 3 mm fanout as required by the application.
5. Buffer tubes protected by the cable sheath or fan out kit. Exposed buffer tubes are not acceptable.
6. Individual fiber strands protected by aramid fiber tubes.
7. Minimum tubing length: no requirement for this project.

#### C. Single Mode Optical Fibers

Single Mode (SM) fibers utilized in the cable shall be fabricated from 100 kpsi proof stress glass and primarily composed of silica which shall provide a matched clad index of refraction (n) profile and the following physical and performance characteristics:

1. Core Diameter: 8.3 $\mu\text{m}$
2. Maximum Attenuation: 0.4/0.25 dB/Km at 1310/1550 nm, respectively.
3. Maximum Dispersion:  $\leq 3.2$  psec/nm-km from 1285 nm to 1330 nm;  $\leq 17$  psec/nm-km at 1550 nm.
4. Dispersion Wavelength (ZWD): 1301.5 to 1321.5 nm
5. Zero Dispersion Slope: 0.092 ps/nm<sup>2</sup>-km
6. Cladding Diameter: 125 +/- 1.0  $\mu\text{m}$
7. Core-to-Cladding Offset (concentricity):  $\leq 0.8$   $\mu\text{m}$

8. Cladding Non-Circularity:  $\leq 1.0\%$
9. Fiber Coating Diameter: 245 +/- 10  $\mu\text{m}$
10. Secondary Coating: 900  $\mu\text{m}$  (as specified for breakout cable/kits, distribution cable, pigtails and patch chords only)
11. Fiber Colored Diameter: 250 +/- 10  $\mu\text{m}$  nominal
12. Mode-Field Diameter: 9.3 +/- 0.5  $\mu\text{m}$  at 1310 nm; 10.5 +/- 1  $\mu\text{m}$  at 1550 nm
13. Attenuation Uniformity: No point discontinuity greater than 0.10 dB at either 1310nm or 1550nm
14. Cutoff Wavelength: <1260 nm
15. Maximum End-to-End Attenuation per cable length: 15dB
16. Maximum cable outside diameter: 0.5 inch
17. Fiber Polarization Mode Dispersion (PMD): 0.5 psec/ km<sup>1/2</sup>
18. Proof Test: All Optical fibers shall be proof tested by fiber manufacturer
19. Attenuation at Water Peak: The attenuation at 1383  $\pm$  3 nm shall not exceed 2.1 dB/km.
20. Numerical Aperture: 0.13.

D. Testing and Performance by Manufacturer

All outdoor cable installations shall meet or exceed the requirements of the Fiber Optic Test Procedure criteria referenced in RUS 7 CFR 1755.9 and Bulletin 1753f-601 (PE-90) and these specifications.

The following requirements apply to the referenced Fiber Optic Test Procedure (FOTP):

1. TIA-455-3-A, FOTP-3, "Procedure to Measure Temperature Cycling Effects on Optical Fibers, Optical Cable, and Other Passive Fiber Optic Components": The average change in attenuation at extreme operational temperatures (-40° F to +160° F) shall not exceed 0.05 dB/km at 1550 nm for single-mode fiber. The magnitude of the maximum attenuation change of each individual fiber shall not be greater than 0.15 dB/km at 1550 nm.
2. When a one-meter static head or equivalent continuous pressure is applied at one end of one-meter length of unaged cable for 24 hours, no water shall leak through the open cable end. When a one-meter static head or equivalent continuous pressure is applied at one end of one-meter length of aged cable of one hour, no water shall leak through the open cable end. The aging cycle is defined as exposing the cable to 85° C for 168 hours and two cycles of -40° C to +70° C with cable held at these temperatures for 24 hours. At the end of this cycle, the cable will be decreased to +23 °C and held for 24 hours. The water penetration test is completed at the end of the 24-hours hold. Testing shall be performed in accordance with the industry standard test, TIA-455-82-B, FOTP-82, "Fluid Penetration Test for Fluid-Blocked Fiber Optic Cable".

3. TIA/EIA-455-81-B, FOTP-81, "Compound Flow (Drip) Test for Filled Fiber Optic Cable": the cable shall exhibit no flow (drip or leak) of filling and/or flooding material at +65° C.
4. TIA/EIA-455-41-A, FOTP-41, "Compressive Loading Resistance of Fiber Optic Cables": Ten percent of the fibers shall not experience a magnitude of attenuation change greater than 0.1 dB at 1550 nm (single mode fiber). The magnitude of the attenuation change shall be within the repeatability of the measurement system for the remaining 90% of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. No fibers shall exhibit a measurable change in attenuation after test load is removed.
5. TIA/EIA-455-104-A, FOTP-104, "Fiber Optic Cable Cyclic Flexing test": Change in attenuation shall not exceed 0.1 dB at 1550 nm for single mode fiber. The magnitude of the attenuation change shall be within the repeatability of the measurement system for 90% of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10% of the fibers shall not experience an attenuations change greater than 0.1 dB at 1550 nm (single mode fiber). The cable jacket shall not exhibit evidence of cracking or splitting at the completion of the test.
6. TIA/EIA-455-25-C FOTP-25, "Repeated Impact Testing of Fiber Optic Cables and Cable Assemblies": The magnitude of the attenuation change shall be within the repeatability of the measurement of 90% of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at 1550 nm (single mode fiber). The cable jacket shall not exhibit evidence of cracking or splitting at the completion of the test.
7. TIA-455-33-A FOTP-33, "Fiber Optic Cable Tensile Loading and Bending Test": While subjected to a minimum load of 600 lbf, the cable sample shall be able to withstand a twist of 360 degrees in less than 3 meters of length. The magnitude of the attenuation change shall be within the repeatability for the measurement system for 90% of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at 1550 nm (single mode fiber). The cable shall not experience a measurable increase in attenuation when subjected to the rated residual tensile load, 200 lbf.
8. TIA/EIA-455-85-A FOTP-85, "Fiber Optic Cable Twist Test": The magnitude of the attenuation change shall be within the repeatability for the measurement system for 90% of the test fibers; the repeatability of the measurement system is typically 0.05 dB or less. The remaining 10% of the fibers shall not experience an attenuation change greater than 0.1 dB at 1550 nm (single mode fiber). The average increase in attenuation for the fibers shall be <0.40 dB at 1300 nm. The cable jacket shall exhibit no cracking or splitting under a 5x magnification after completion of test.

## E. Packaging

Fiber optic cables shall be shipped on wooden reels. The diameter of the drum shall be a least 20 times the diameter of the cable.

The following information must be either stenciled on the reel, on a weatherproof tag firmly attached to the reel or a combination of both in order to trace the manufacturing history of the cable:

1. Optical Cable
2. Number of Fibers
3. Date cable was tested
4. Non-armored
5. Year of cable manufacture
6. Name of cable manufacturer
7. Gross weight
8. Part Number
9. Handling Instructions
10. Arrow indicating cable wind direction

Furnish the Engineer, who shall provide copies to the MOA Traffic Department, cable data sheets that contain the following information:

1. Manufacturer Name
2. Cable ID Number and fiber type
3. Factory Order Number
4. Cable Length
5. Factory measured attenuation (each fiber)
6. Index of Refraction
7. Bandwidth Specification (where applicable)

Sufficient cable length, in addition to the quantities shown on the plan, shall be provided for testing. Both ends of the cable shall be available for testing. Pack one continuous length of fiber optic cable per reel; maximum overage shall not exceed 10% unless approved by the Engineer. Compensation shall not be granted for overage or excess cable needed for testing and installation methods.

Package the cable for shipping to prevent the cable from coming loose in transit. Secure the outer and inner end of the cable. Cover the reel with thermal wrap to protect the cable. Apply end seals to each end of the cable to prevent moisture and from entering the cable. Project the inner end of the cable a minimum of 6 ft into a slot in the side of the reel or into a housing on the inner slot of the drum, in such a manner to make it available for testing.

Include the manufacturers test documentation with each reel. This documentation indicates the attenuation of each cable fiber in dB/km (dB/ft), measured at 1310 nm and 1550 nm for single mode fiber.

Mark each reel to indicate the direction in which it should be rolled to prevent loosening of the cable on the reel.

#### F. Connectorization

Connectors: Furnish and install connectors (in-line or terminated ends) or attenuators as required in the Drawings or as required to provide a fully operational fiber optic system.

Hybrid adaptors shall not be used to connect two different connectors. Instead, complete the interface using jumper cables with connectors that match the two incompatible connectors.

A Certified Technician, as described in these specifications, shall install all connectors.

Connectors shall be LC connectors to assure compatibility with equipment as required for fibers with a preset usage and approved by the Engineer.

Ceramic ferrules shall be provided for all fiber optic connector applications. Install connectors per manufacturer application and recommendations, including proper termination to the outer tubing (900 micron, 3 mm fan-out) as required by the application.

Connectors shall be rated for operating temperatures of -40 °F to 160 °F.

Connectors shall be factory-installed for all applications except where approved by the Engineer.

Connectors shall be installed with ceramic ferrules with fibers secured within ferrule with epoxy, heat set or air dried, as specified by the manufacturer; machine polished mating faces shall be provided.

Boots shall be provided for durable cable strain relief.

Dust caps shall be provided and installed at all times when connector is not in use.

If connections are made, connectors shall be cleaned once prior to the first connection and once every time thereafter prior to reconnection. Connectors shall be cleaned according to manufacturers recommended practice.

Connector losses shall not exceed limits as described in Article 3.09 – Construction Requirements for Fiber Optic Cable, subsection, Field Testing and Performance of fibers.

Repeatability of keyed connectors shall not exceed 0.2 dB.

#### G. Attenuators

Attenuators shall be provided at no extra payment to the Contractor to achieve the desirable signal losses at the receiving end equipment (modems, etc.). Attenuators shall only be installed on the receiving end closest to the originating transmission.

Connecting ends shall be compatible to connectors described in subsection, Connectors.

#### H. Splice Closures

Fiber optic splice closures (FSC) shall be installed in the locations on the plan at designated splice locations. Closures shall contain splice trays or organizers that contain the splices.

Prior to installation, the Contractor shall provide certification from the manufacturer that the splice closures conform to the specifications and test procedures.

Splice closures shall be designed for use under the most severe conditions such as moisture, vibration, impact, cable stress and flex temperature extremes as demonstrated by successfully passing factory test procedures and these specifications. The closure shall prevent the intrusion of water without the use of encapsulates.

Closure re-entry and subsequent reassemble shall not require specialized tools or equipment; these operations shall not require the use of additional parts.

Splice closures shall provide housing and storage for all splices, stripped cable and undisturbed buffer tubes. All splices enclosures shall provide protection and strain relief to optical fibers.

Splice closures shall be suitable to handle straight, butt or branch splices.

Closures shall be provided with external valve pressurization ports.

Closure shells shall be glass-filled high-density thermoplastic that effectively withstands corrosion, high impact, and freeze thaw stresses.

Closure endplates shall be interchangeable with each size of closure available from the closure supplier.

Where additional access is required into an existing splice closure, replace the existing endplate with an endplate suitable for the task.

Splice closures must accept up to six cables in a butt configuration and 12 for in-line configuration without special adaptors.

Closure shall contain a permanent neoprene gasket seal.

All closures, including closing hardware, shall be from the same supplier.

External Shrader valve pressurization port shall be supplied.

The splice case shall be designed and equipped with the necessary mounting hardware to be attached to the side of the manhole or vault, and to be suspended with sufficient clearance at each end for acceptable cable bends.

All cables shall be properly dressed and affixed to rails or racks within the manhole or vault. No cables or enclosures shall be permitted to lie on the floor.

Fiber optic cables shall be restrained within the splice enclosure such that there is no discernible tensile force on the optical fiber.

The splice closure shall have provisions for storing fiber splices in an orderly manner, mountings for splice organizer assemblies, and space for excess or unspliced fiber. Splice organizers shall be re-enterable and re-sealable.

The closure shall be capable of accommodating splice organizer trays that accept mechanical, fusion, or multi-fiber array splices.

Splice cases shall hold a minimum of 2 splice trays with a maximum of number of splice trays to hold up to 96 splices.

One splice tray shall be designed to hold a minimum of 12 mechanical splices. A second splice tray (for Fiber Optic Drop Cable splicing) shall be designed to hold a minimum of 12 fusion splices. All other splice trays provided in the closure shall be designed to hold fusion splices of 12 (typical) up to 36 splices. Total number of splices supported shall be 96 splices.

Splice trays shall allow for optical fiber storage as recommended by the manufacturer.

The splice closure shall have provisions for controlling the fiber bend radius (1.5 inches typical) to a minimum as required by the manufacturer.

Splice closure shall contain a basket allowing fiber buffer tube storage of exposed buffer tubes.

The splice case shall be UL listed for use in wet locations.

The closure shall be installed according to the manufacturer's recommended guidelines.

- I. Splice Closures -Factory Testing Requirements: The construction and testing of the fiber optic splices and splice enclosures shall comply with all applicable industry standards including: Electronic Industry Standards (EIA/TIA), ANSI and ASTM standards.

Compression Test: The closure shall not deform more than 10% in its largest cross-sectional dimension when subjected to a uniformly distributed load of 300 lbf (1335 N) at temperatures of 0 °F and 100 °F (−18 °C and +38 °C). The test shall be performed after stabilizing at the required temperature for a minimum of 2 hours. It shall consist of placing an assembled closure between two flat paralleled surfaces, with the longest closure dimension parallel to the surfaces. The weight shall be placed on the upper surface for a minimum of 15 minutes. The measurement shall then be taken with weight in place.

Impact Test: The assembled closure shall be capable of withstanding an impact of 21 ft-lbf (28 N-m) at temperatures of 10 °F and 100 °F (−12 °C and 38 °C). The test shall be performed after stabilizing the closure at the required temperature for a minimum of 2 hours. The test fixture shall consist of a 20 lb (9 kg) cylindrical steel impacting head with a 2-inch (5 cm) spherical radius at the point where it contacts the closure. It shall be dropped from a height of 12 inches (30 cm). The closure shall not exhibit any cracks or fractures to the housing that would preclude it from passing the water immersion test. There shall be no permanent deformation to the original diameter or characteristic vertical dimension by more than 5%.

**Cable Gripping and Sealing Testing:** The cable gripping and sealing hardware shall not cause an increase in fiber attenuation in excess of 0.05 dB/fiber @ 1550nm when attached to the cables and the closure assembly. The test shall consist of measurements from six fibers, on from each buffer tube or channel, or randomly selected in the case of a single fiber bundle. The measurements shall be taken from the test fibers, before and after assembly to determine the effects of the cable gripping and sealing hardware on the optical transmission of the fibers.

**Vibrations Test:** The splice organizers shall securely hold the fiber splices and store the excess fiber. The fiber splice organizers and splice retaining hardware shall be tested per EIA standard FOTP-11, Test condition I. The individual fibers shall not show an increase in attenuation in excess of 0.1 dB/fiber.

**Water Immersion Test:** The closure shall be capable of preventing a 3 meter (10-foot) waterhead from intruding into the splice compartment for a period of 7 days. Testing of splice closure is to be accomplished by the placing of the closure into a pressure vessel and filling the vessel with tap water to cover the closure. Apply continuous pressure to the vessel maintain a hydrostatic head equivalent to 10 ft (3 m) on the closure and cable. This process shall be continued for 7 days. Remove the closure and open to check for the presence of water. Any intrusion of water in the compartment containing the splices constitutes a failure.

**Certification:** It is the responsibility of the Contractor to ensure that either the manufacturer, or an independent testing laboratory has performed all of the above tests, and the appropriate documentation has been submitted to the Engineer. Manufacturer certification is necessary for the model of closure supplied. It is not necessary to subject each supplied closure to the actual tests described herein.

## **Article 6.7 Communications Vaults**

Work under this item consists of installing communications vaults with bolt on lids according to the details shown in the Drawings and as specified in the following.

Shall be spaced at interval no greater than 2,500 feet (800-1,000 feet typical). In extreme cases where conduit has no bend, as permitted by the Municipal Traffic Engineer or designee, 5,280 feet is allowable (conduit shall be lubricated with no bends).

Shall be installed at locations prior to exceeding 360 degrees cumulative conduit bends, measured from the last vault.

Vaults are not required for change in conduit installation method.

Each vault shall consist of two sections that stack one atop the other and a lid that features nominal dimensions of 30-inches by 48-inches. The top and bottom sections shall measure 24 and 36-inches tall, respectively, and with a 3-inch overlap, shall provide an effective height of 57-inches. The vault shall have an open base.

The vault lid shall have a minimum design load of 15,000 pounds and include two pull slots, each 1/2-inch wide by 4-inches long. Furnish lids with a permanently recessed logo that reads "TRAFFIC". The lid surface shall have a coefficient of friction of 0.50 according to ASTM C 1028. Lids shall meet the Heavy Duty requirements of AASHTO M306, Drainage, Sewer, Utility, and Related Castings.



Furnish lids that contain steel rebar or mesh pieces completely encased within the lid to enable locating the vault with a metal detector. Provide lids with a minimum 1-inch of cover over the steel. Lid construction shall preclude the need to ground the lid.

Furnish vaults and lids that are gray in color and constructed of the polymer concrete material, "cosmopolite".

To keep water from entering the vault, install manufacturer-approved gaskets in the two joints in the vault: between sections and between the lid and the top section.

Furnish vaults with lids that can be bolted down with two 3/8-inch 16 UNC stainless steel pentahead bolts. Install the pentahead bolts and stainless steel washers upon acceptance of the completed fiber optic cable interconnect system.

Furnish each vault with brackets that support the length of fiber optic cable and any splice enclosure required in the vault. Furnish brackets recommended by the manufacturers of the fiber optic cable and splice enclosures. Furnish brackets made from corrosion resistant materials and anchor them with stainless steel hardware. These brackets shall be incidental to the communications vault.

The stainless steel hardware used to attach the fiber optic cable support assembly shall not fully penetrate vaults to prevent water intrusion.

Furnish vaults with conduit openings machined at the time of fabrication as shown on the vault detail sheets, or punch-driven at the time of placement. Size each opening to accommodate the conduit called for in the Drawings.

Furnish vaults with one 5 3/4-inch diameter knockout for future multiduct installation in those walls with one or no conduits. The knockouts shall be aligned across from each other to the extent possible

#### **Article 6.8 Construction Requirements For Polyethylene Duct System**

Install polyethylene conduits at least 36-inches below finished grade in trenches separate from those used to install the traffic signal and highway lighting systems.

Install clean conduits that remain free of water and earthen materials during and after installation. Before removing polyethylene conduits from their reels, install expandable rubber plugs in the conduit ends. When conduits are cut, install expandable rubber plugs in all exposed conduit ends.

Install one-piece conduits between vaults. Fuse shorter sections together according to the conduit manufacturer's written instructions. The Department shall not accept mechanical connectors for joining shorter sections of conduit together.

Install the polyethylene duct system without using elbows. Run the HDPE pipes straight through vault walls as detailed in the attached vault details sheets. After fully backfilling the conduit trenches and backfilling around the vaults, trim the HDPE pipes to protrude 50 mm inside the vault wall. Reinstall the expandable rubber plugs in the conduit ends.

Mark underground ducts with a continuous strip of polyethylene marker taped four mils thick and six-inches wide. Furnish orange marker tape with a black legend that reads "CAUTION FIBER OPTIC CABLE BURIED BELOW". Install the tape 24-inches ±three inches below finished grade.

Keep junction boxes and conduit ends covered until you begin pulling conductors. After installing the fiber optic cable, install special termination kits, recommended by the conduit manufacturer, to seal the conduits from contamination, rodents and flooding. Kits shall be designed to fit the number and size of cable(s) within the conduit and shall allow cable entry and exit within vaults or manholes without inducing stress on the fiber optic cable or damaging cable jacket.

Install a 12 AWG stranded copper locate wire furnished with orange insulation in each HDPE conduit in system. The locate wire shall be approximately 10 feet longer than the run of conduit. All locate wires entering vaults shall be electrically connected together to provide a continuous locate signal throughout the conduit system for locating purposes.

A polyethylene pull rope shall be installed in all spare conduits for future cable installations. The rope shall be rated for 1,000 lbs or greater and shall not be less than ¼ inch in diameter.

Install conduit marker posts at each vault and on approximate 400 feet centers. Each marker shall consist of a two inch perforated steel tube that supports a one-foot square, four line sign that reads "CAUTION FIBER OPTIC CABLE BURIED BELOW" in one inch tall series B lettering and a double headed arrow.

#### **Article 6.9 Construction Requirements For Fiber Optic Cable**

Cable installation in conduit (duct) systems shall conform to Corning Cable Systems procedure SRP-005-011, "Fiber Optic Cable Placing-Duct", or manufacturer approved methods of jetting or pulling.

Submit a detailed construction plan and installation procedure for the Engineer's approval before cable installation.

Cable shall only be spliced in vaults where drop cables are required to route fiber into controller cabinets.

Only a certified technician, meeting the requirements of Article 6.3 - Certified Fiber Optics Technician, shall complete the following work: cutting of fiber optic cable, if required, and all splicing, testing, and terminating of optical fibers.

All fibers should be tested upon receiving cable. The Contractor shall assume full responsibility to cable that is damaged if testing is not performed after receiving cable.

Before removing cable from a reel, remove all nails, staples and other materials that might kink or damage the cable when it is unreeled.

Inspect all cables before installation to ensure they are free of damage (nail or staple holes, jacket tears, kinks etc.), material and manufacturing defects, and dimensional non-uniformities that would:

- Interfere with the cable installation using accepted cable installation practices.
- Degrade the transmission performance and environmental resistance after installation.
- Inhibit proper connection to interfacing elements.
- Otherwise yield an inferior product.

Record the physical condition of the cable as outlined in subsection, Documentation of Field Testing.

Take all necessary precautions to protect reeled cable from possible damage while unattended.

Cable shall not be kinked or forced abruptly against conduit edge when pulling cable from conduit ends. Cable feed systems (reels, rollers, guide, tubes etc.) must be used to install or retrieve cable from conduit ends in vaults, manholes or junction boxes.

When cable is installed by pulling, use a swivel and woven cable grip designed for fiber optic cable. Materials for lubricating shall be utilized when pulling.

Fiber optic cable lengths greater than 100 ft shall not be coiled in one continuous direction. Lengthy cables requiring multiple pulls shall be coiled in a "figure-eight" pattern at intermediated access points to avoid twisting of cable unless cable is assisted by jetting or winching. The figure-eight patterns shall be approximately 15-feet in length. Cardboard shims shall be installed between cable layers at the crossover of the "figure eight" to relieve pressure on the cable.

Cable shall be pulled in one continuous run. Splices are only allowed at the designated locations.

When a conduit run contains two or more cables, pull each cable individually when 2 or more 90° bends occur in the run. One continuous cable pull shall not contain more than one 90° bend.

When you are installing cables, monitor the tensile forces in the cable using equipment manufactured for this purpose. Monitoring equipment shall record the maximum tension incurred during each pull.

Replace, at your expense, all cable runs subjected to one of the following conditions:

- Recorded tensions exceeded the maximum tension of 600 lbs during pulling,
- Cables were bent to a radius less than 20 x diameter of the cable during pulling,
- Cables were bent to a radius less than 10 x diameter of the cable when they are coiled into the figure-eight pattern or otherwise handled.

Protect exposed cable from damage at all times.

If cable ends are exposed and unattended, cable caps shall be taped onto cable ends to prevent ingress of moisture into the cable. If the duration of the exposed cable end is short, several wraps of tape shall be provided on the cable end.

Temporary aerial installation methods shall be consistent with Corning Cable Systems SRP-005-010, "Fiber Optic Cable Placing-Lashed Aerial" or a manufacturer approved methods.

Furnish the following lengths of slack cable at the locations indicated:

- 100-feet per splice vault
- 65-feet per non-splice vault
- 6-feet per controller/computer cabinet.

Neatly coil slack cable around the inside perimeter of manholes, vaults and junction boxes on cable brackets. Cable slack shall be supported as to not interfere with access into manholes, vaults or junction boxes.

Manufacturer minimum bend radii for loaded and unloaded conditions shall be exceeded in all circumstances. If radii information is not available, minimum bend radii shall not be less than 20 times the diameter of the cable when loaded or 10 times the diameter of the cable unloaded (at rest).

All fiber optic cable shall be installed with marking tape, copper wire tracer and above ground markers as required in Article 6.8 Construction Requirements For Polyethylene Duct System.

#### A. Splices

A Certified Technician as described in these specifications shall perform all splicing and termination of optical fibers.

Two weeks prior to the start of the fiber optic cabling installation, the Contractor shall submit the following: proposed locations of the mainline spliced points for review by the Engineer; the proposed process to be used for splicing including procedure, cleave tool and specific fusion splicer to be used.

Splicing shall only be allowed in areas as designated on the Drawings or as approved by the Engineer.

All splices and stripped cable shall be housed in a splice closure.

Mainline splices shall consist of end-to-end fusion splices for all fibers within the fiber optic cable where designated in the Drawings.

Drop fiber splices (6 fiber typical) and drop cables (6-fibers typical) shall be used for connectivity between a primary mainline fiber optic cable and field devices (i.e. traffic signal controller cabinet) as identified in the Drawings.

Drop fiber splices shall consist of breaking out the required buffer tube(s) from the fiber optic trunk cable and fusion splicing the appropriate number of fibers to the fiber optic drop cable (6 fibers typical). Remaining undisturbed fibers, if any, shall be protected in the splice tray. End-to-end fusion splicing shall be conducted for any disturbed fibers within the disturbed buffer tube(s). Remaining buffer tube(s) that are not required for splicing shall be undisturbed and protected in the Splice Closure.

Splicing (drop splice) shall be performed for each device location at locations shown on the Drawings. Splicing shall be performed as per Corning Cabling Systems Recommended Procedure SRP-004-013, Mid-Span Access of Fiber Optic Cable (Cable Slack Present), or an equivalent manufacturer's recommended procedure approved by the Engineer.

Cable ends involved in splicing shall match colors of the fibers and buffer tubes to the extent possible.

Fiber splices shall be contained within fiber splice closures (FSC) in designated locations shown on the Drawings.

All splices shall be fusion splices protected with a heat shrink sealant (RTV fusion splices). Mechanical splices are not allowed.

Fusion splices shall be made with a portable fusion splicer. The unit must be able to splice fibers specified in these with 250 micrometer coating and 900 micrometer coating with little or no modification in the field.

End-to-End splicing shall be performed per written manufacturer instructions for the supplied splice closure units.

No stresses shall be placed on the fibers before or after the splice is completed.

Splice loss shall not exceed the limits described in subsection, Field Testing and Performance of Fibers.

Fan-out kits are required for splices to multiple fibers in the buffer tubes for single mode fiber (NCHRP).

Splices shall be located in the center of the slack cable in junction boxes, manholes or vaults.

#### B. Field Testing and Performance of Fibers

A Certified Technician, as described in subsection, Certified Fiber Optic Technician, shall perform all testing of optical fibers.

All fibers should be tested upon receiving cable. The Contractor shall assume full responsibility to cable that is damaged if testing is not performed after receiving cable.

Physical condition of the cable shall be recorded as outlined in subsection, Documentation of Field Testing.

The Contractor shall schedule the date, time and location of all tests required by this specification with MOA Traffic Personnel (907-343-8355) 72 hours before performing the tests. MOA Traffic personnel shall be present when the tests are conducted. The certification technician shall demonstrate clearly how the tests are being performed and shall be made available to discuss testing strategies with MOA personnel.

Tests shall be conducted using standard operating procedures as defined by the manufacturer of the test equipment.

The following tests shall be conducted after the cable has been installed, spliced and connectorized. Test results shall be submitted in accordance with subsection, Documentation of Field Testing (NCHRP). Tests shall be performed before making permanent equipment connections. All fibers shall be tested for continuity, events above 0.05 dB and total attenuation of the cable. If the fiber optic cable installed is connected to an existing fiber optic cable, perform installation tests the installed cable and all existing fibers to which it is spliced or connected:

1. End-to-end Optical Time Domain Reflectometer (OTDR) testing shall be conducted to identify attenuation associated with each fiber. Traces shall be provided for each operational wavelength for the type of fiber in the system to indicate attenuations and their locations.

A Certified Technician utilizing an OTDR and Optical Source/Power Meter shall conduct the tests after installation. The Technician shall conduct the test according to the standard operating procedure as defined by the manufacturer of the test equipment.

To eliminate or shift the “dead zone”, either a factory patch chord or “fiber launch box” of length greater than the dead zone shall be used.

Measurement shall be conducted for 1310 and 1550 nm for single mode fiber.

2. Attenuation Test: All fiber links shall be tested with a standard power-meter test and all attenuation shall be documented.

For every fiber installed or connected to under this Contract, perform end-to-end attenuation test. For the test, use a calibrated optical source and power meter using the standard three-stage procedure. Determine acceptable link attenuation by the cumulative value of standard losses based on length, number and type of splices and connectors.

Fiber optic cable loss limits shall be in accordance with the following; The Engineer may elect to allow bi-directional averaging of OTDR testing due to splice loss core alignments:

No event shall exceed 0.10 dB. If any event is above 0.10 dB, repair or replace that event location.

Total dB loss of a cable fiber less events shall not exceed +3% of the factory test or 1% of the manufacturer’s published production loss at 1310 and 1550 nm. Cable fiber loss shall not exceed Maximum Attenuation Limits as defined in subsection, “Single Mode Fiber Optic Cable”.

$$\text{Cable Fiber Loss (dB)} = \text{Total Loss (dB)} - \sum \text{events (dB)}$$

$$\text{Cable Fiber Loss (dB/km)} = \frac{\text{Cable Fiber Loss (dB)}}{\text{Cable Fiber Length (km)}}$$

Where total or event losses exceed these specifications, replace or repair that cable run and assume all expenses, both labor and materials. Elevated attenuation due to exceeding pulling tension during installation shall require replacement of cable at no expense to the Department.

Fusion splice losses shall not exceed 0.10 dB per fiber. Mechanical splices, where allowed, shall not exceed 0.30 dB.

Each connector, after factory assembled, shall not exceed the maximum loss of 0.50 dB (typical loss is 0.25dB) and optical return reflective loss of <-0.45dB.

If event losses exceed these specifications, event locations shall be replaced or repaired without additional cost reimbursement for expenses.

If total loss exceeds these specifications, Fiber Optic cable shall be replaced or repaired without reimbursement for expenses.

All fibers within the cable shall be usable.

### C. Documentation of Testing

Upon completion of the field tests, the Contractor shall provide three copies of all documentation to the Engineer.

Except for standard bound materials, documentation shall be neatly bound in 8.5" x 11" (size A4) documentation in logical groupings. Bindings shall be of either the 3-ring or plastic slide-ring type. Permanently and appropriately label each such bound grouping of documentation.

Documentation from manufacturer shall include manufacturer data of cable and fiber including: Optical performance (OTDR) including dB/km loss measured at 1310 and 1550 nm for single mode, manufacturer's name, date of manufacture, Index of Refraction, cable ID, connector losses and bandwidth/dispersion data.

Documentation of field testing shall include a map of the cable part numbers, manufacturer, cable length markings, as-built cable routing map, location of splice points and hardware at each splice point location (see below under testing also). Documentation shall include the information below for end-to-end testing, splice loss measurements, OTDR traces.

The documentation shall be neatly tabulated for each field test and shall include the following:

#### 1. Cable and Fiber Identification:

Manufacturer

Operator Name

Cable ID

Date and Time

Fiber ID (tube and fiber color)

Date of Installation

Cable Location (begin and end point)

Fiber Count

Cable (ie single mode, loose tube, OSP, OFNG, etc.)

#### 2. Setup Parameters

Wavelength

Range (OTDR)

Pulse Width (OTDR)

Scale (OTDR)

Refractory Index (OTDR)

Jumper and/or Launch Box Length

### 3. Test Results

#### a. OTDR Test:

Total Fiber Trace (mile)

Total Length

Splice Loss/Gain

Events  $\geq$  0.05 dB

Measured Cable Length (Cable Marking)

Backscatter

Provide traces on CD/USB to Engineer

#### b. End to End Attenuation Test

Length, Number, and type of splices and connectors

Length Attenuation

Fiber optic cable test results shall demonstrate that dB/km losses do not exceed limits specified in subsection, Field Testing and Performance of fibers.

Submit to the MOA and maintain on file a current calibration certificate for the OTDR being used.

### **Article 6.10 Construction Requirements For Communications Vaults**

Do not install vaults in or near the ditch bottoms, in areas that collect drainage, or where vehicular traffic is anticipated. If you cannot avoid installing a vault in a broad area that collects drainage, install the top of the vault one foot higher than the drainage outlet and fill around the vault with Type II-A Classified Fill and Backfill placed on a 4:1 slope.

To the extent possible, install vaults at the locations shown on the Drawings. If a vault needs to be moved, the distance between adjacent vaults shall not exceed 1000 feet.

Under all vaults, place a 48-inch by 66-inch sump that is 12-inches thick and consists of coarse concrete aggregate material of a minimum depth of 18 inches.

Finish grade shall be in accordance with pertinent sections of Article 8, Junction Boxes.

After installing the conduits, fill the gaps between the conduits and the sides of conduit openings with a self-curing caulking that provides a permanent, flexible rubber that is unaffected by sunlight, water, oils, mild acids and alkali. The cured compound shall be mildew resistant, non-flammable, and gray in color. The material shall provide a permanent bond with the polymer concrete. Allow caulking to fully cure per the manufacturer's written installation instructions before placing backfill around the vault.

Install the fiber optic cable support assemblies according to the vault manufacturer's written instructions.

### **Article 6.11 Method Of Measurement**

The Engineer shall measure the accepted quantities of polyethylene conduit by the linear foot measured on the alignment and slope of a straight line that connects the centers of adjacent vaults and controller cabinet.



The Engineer shall measure the accepted quantities of fiber optic cable using the distances measured between vaults for conduit payment and add the slack cable installed in the vaults.

The Engineer shall measure the accepted quantities of communications vault on a per each basis.

**Article 6.12 Basis Of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment for HDPE conduit shall be full payment for furnishing and installing all materials, including plugs, locating wire, and marker posts and all excavation, backfilling, and disposal of surplus material; and for all labor, tools, equipment and incidentals necessary to complete the work.

Payment for fiber optic cable shall be full payment for furnishing and installing all materials, including drop cables, splice closures; and for all labor, tools, equipment and incidentals necessary to complete field tests and splicing.

Payment for each communications vault shall be full payment for furnishing and installing all materials, including, lids, gaskets, pentahead bolts, washers, fiber optic cable support assembly with stainless steel mounting hardware, caulking, and coarse concrete aggregate; for all excavation, backfilling, and disposal of surplus material; and for all labor, tools, equipment and incidentals necessary to complete the work.

Payment shall be made under the following units:

ITEM	UNIT
Communications Vault	Each
HDPE Conduit	Linear Foot
Fiber Optic Cable	Linear Foot

## **SECTION 80.07 CONDUIT**

### **Article 7.1 General**

Contractor shall run electrical conductors in conduit, except for overhead wiring, wiring inside poles and when otherwise called for in the Drawings. All conduit and fittings shall be galvanized, rigid type manufactured of mild steel or wrought iron conforming to U.L. Underwriters Laboratory Standard UL-6 and hot dip galvanized in accordance with American National Standards Institute specification ANSI C-80.1. If called for in the Drawings, rigid non-metallic type conduit shall conform to the applicable UL Standard UL-651 or UL-651A. Only one type of conduit shall be used in any one run from one junction box to another. Where non-metallic conduit is to be installed, the conduit runs between a load center and the nearest junction box shall be of the rigid metal type.

Conduit and fittings to be installed on the surfaces of poles or in structures and foundations shall be rigid metal type as specified above for underground installations.

Couplings for new rigid metal conduit shall be threaded. Where existing conduit is intercepted and extended, twist-on compression type couplings shall be allowed. Set-screw couplings are not allowed on the project.

Conduit in foundations for ground rods shall be one inch (1") diameter.

Contractor shall join conduits together with standard threaded couplings using a pipe wrench to ensure tight joints. Tapered or universal fit plugs are not acceptable for final usage. Provide NPT threads on the ends of all shop and field cut conduits. Slip joints and straight threads shall not be used. Cut conduits with a rolling pipe cutter to ensure a square end and proper threading. Before threading, ream the cut ends to remove the sharp edge and all burrs. Thread the ends to within one thread of the factory threaded length and then paint the cut end and threads with a zinc rich paint overlapping the original galvanized finish. Galvanized coatings that have been cut or damaged shall be repaired in conformance with Section 80.16.3 - Galvanizing.

Until wiring is started, all conduit ends shall be capped with standard pipe caps or approved plug and coupling combinations. When caps are removed, the threaded ends shall be provided with approved conduit grounding bushings.

Contractor shall lay conduit to a minimum depth of thirty inches (30") below finished grade. See Division 20, Section 20.13 - Trench Excavation and Backfill for backfill requirements.

Clean all debris and moisture out of conduits before installing conductors or cables.

If the conduit is for thaw wire only, then:

1. Fittings for use in below-grade storm drains shall be suitably rated as NEMA 7, complete with gaskets for watertight installations.
2. Provide suitable conduit seals and sealant to make connections to junction boxes installed with manholes watertight.
3. Junction boxes for installation in manholes shall be NEMA Type 7, with gasketed covers for watertight installations.

4. Couplings and all threaded connections shall be provided with Teflon tape or approved water treatment applied to threads before tightening.

Bottom of trenches for non-metallic conduit shall be relatively free of sharp irregularities which would cause pinching and excessive bending of the conduit. The first six inches (6") of backfill shall be free of rocks exceeding the one inch (1") maximum dimension.

Conduit entering the bottom of concrete junction boxes shall terminate with a ninety degree (90°) sweep inside the box wall. Conduit openings shall terminate not less than five inches (5") above the bottom of all boxes and a minimum of six inches (6") below the top of the Type I and Type IA boxes and twelve inches (12") below the top of Type II and Type III boxes. Conduits entering through the junction box wall shall extend a minimum of two inches (2") to a maximum of three inches (3") inside the box wall, and be a minimum of six inches (6") above the bottom.

Conduit runs shall avoid drainage collection points where possible. At low points in all conduit runs, a one-half inch (1/2") drain hole shall be drilled in the bottom of the lower straight section of the sweep elbow and sump containing approximately two cubic feet of coarse concrete aggregate material shall be installed. Additional drains shall be placed adjacent to all junction boxes and structures, regardless of the method of conduit placement employed. Drilled holes in conduit shall be deburred inside and out to prevent scraping of conductors. The exterior of the one-half inch (1/2") hole shall be wrapped with approved filter cloth material and secured as directed or approved by the Engineer.

Conduits for future use shall be provided with grounding bushings, bonded to ground, and capped with an approved plastic insert type or expandable rubber plug. Tapered or universal fit plugs are not acceptable for final acceptance. A polypropylene pull rope with two hundred pound (200 lb) minimum tensile strength shall be installed in all conduits which are to receive future conductors. At least two feet (2') of pull rope shall be doubled back into the conduits at each end.

Contractor shall mark all underground conduits with a continuous strip of 4-mil-thickness, six inch (6") width polyethylene marker tape. Contractor shall mark the tape with a black legend on a red background and buried nine inches plus or minus three inches (9" ± 3") below the finished grade. Contractor shall place two strips of marker tape side-by-side under all road crossings.

Where new junction boxes are placed in existing rigid metal conduit runs, the conduit shall be fitted with threaded bushings and bonded.

Conduit leading to soffit, wall or other lights or fixtures below the grade of the junction box shall be sealed by means of an approved sealing fitting and sealing compound.

Existing underground conduit without conductors to be incorporated into a new system shall be cleaned with a mandrel or cylindrical wire brush and blown out with compressed air.

The Contractor, at his expense, may use conduit of larger size than shown on the Drawings, and where used, it shall be for the entire length of the run from outlet to outlet. Reducing couplings are not permitted.

When extending existing conduits or installing junction boxes in existing conduit runs, extend the conduit into the proposed junction box or foundation using drains, elbows and bonding as required for new installations. When adjusting junction boxes, shorten or lengthen existing conduits to meet clearance requirements. Complete extensions and modifications to existing conduits using the same size and types of materials.

Contractor shall clean all debris and moisture out of conduits before installing conductors or cables.

All abandoned conduits shall be removed from junction boxes. Contractor shall remove all conductors prior to abandoning conduit.

All knockouts, in junction boxes and for new conduit or removed conduit shall be grouted.

For thaw wire systems, one inch (1") liquid tight flexible metal conduit (LFMC) shall be used in manholes and oil & grit separator facilities. LFMC shall conform to UL 360 and be third party certified for outdoor use in wet and oily locations, for direct burial in Portland Cement Concrete, and for sunlight exposure. Provide liquid tight fittings that are third party certified for use in wet and Class 1, Division 2 locations.

### **Article 7.2 Measurement**

Measurement for furnishing and installing conduit is per linear foot of the size and type set forth in the Drawings and Bid Schedule. Measurement is the horizontal distance from center of device to center of device, or from station to station. Measurement shall include all fittings, couplings, pull wires, caps, vertical conduit risers, and elbows, and bonding and grounding conductors, which shall be considered incidental to conduit installation.

Conduits installed in manhole and catch basins shall not be measured, but rather the following distances shall be considered standard unless determined otherwise by the Engineer:

Manhole	forty feet (40')
Catch Basin	sixteen feet (16')

### **Article 7.3 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section. Payment for trench, backfill, and wire are separate bid items.

Payment shall be made under the following units:

ITEM	UNIT
GRC Steel Conduit (Size)	Foot
Schedule 40 PVC Conduit	Foot
Schedule 40 HDPE Conduit (Size)	Foot

## **SECTION 80.08 JUNCTION BOXES**

### **Article 8.1 General**

The Work under this Section consists of performing all operations pertaining to removing and adjusting existing junction boxes to grade and for furnishing and installing a new junction box of the type specified. This Work shall include all excavation, bedding material, and bonding and grounding hardware.

Type I junction boxes shall not be used.

Junction boxes shall be installed at the approximate locations shown on the Drawings. The Contractor, at his expense, may install additional junction boxes to facilitate his Work. Junction boxes shall be located so they are not in the roadway, sidewalk, driveway, or pathway surfaces, unless otherwise noted in the Drawings. Where practical, junction boxes shown in the vicinity of curbs shall be placed a minimum of two feet (2') from the back of curb. Junction boxes shall not be located in areas where drainage collects or flows, including side slopes.

### **Article 8.2 Materials**

Contractor shall provide precast reinforced concrete boxes (junction boxes) with cast iron lids, of the sizes and details shown on the Drawings.

Contractor shall provide precast reinforced concrete additions (junction box extensions) of the sizes and details shown on the Drawings with dimensions confirmed by field measurements.

Illumination junction boxes shall be pre-cast reinforced concrete with cast iron lids of the sizes and details shown on the Drawings.

All Portland concrete cement utilized in the adjustment of the Junction Box shall conform to the requirements as specified in Division 55, Section 55.05 - Manholes and Catch Basin Manholes. The joint sealing compound utilized to seal the joint between the electrical vault's lid and walls shall be Ram-Nek Flexible Plastic Gasket or an approved equal.

All hardware installed inside junction boxes shall be stainless steel.

### **Article 8.3 Construction**

All junction boxes with metal covers shall have the covers effectively grounded with a four foot (4') tinned copper braid for Type I and Type IA Junction Boxes or a six foot (6') tinned copper braid for Type II and Type III Junction Boxes. Use only stainless steel bolt assembly components to attach bonding braid to the cover (lid). Bond junction box lids to the grounding conductor using copper braid with a cross sectional area equal to an 8 AWG conductor and eyelets spaced at six inch (6") intervals.

The entire bottom of all junction boxes shall be bedded in coarse concrete aggregate material of a minimum depth of eighteen inches (18").

Top of junction boxes shall be recessed not to exceed one-quarter inch (1/4") below the sidewalk grade or top of adjacent curb. When located in an unpaved section adjacent to a paved shoulder the junction box shall be located one inch (1") below the finished grade and shall be installed one-quarter inch (1/4") below the surface in paved areas.

Junction boxes located in areas requiring grading shall be adjusted as directed by the Engineer. Junction boxes located in seeded areas shall be adjusted to two inches (2") below the surface.

Junction boxes shall be located immediately adjacent to the pole or fixture they serve and at additional intervals to reduce the distance between junction boxes to:

1. 400 feet maximum for 25 pair interconnect cable.
2. 200 feet maximum for any other conduit runs.
3. If the limitations require additional junction boxes they shall be located on equal spacings subject to the above limitations.

Emboss the word LIGHTING on the lids of all junction boxes containing only lighting or thaw wire conductors, or only lighting and signal controller power conductors. Emboss the word TRAFFIC on the lid of all other junction boxes.

No later than forty-eight (48) hours prior to commencement of Work on adjustment of the Junction Box, Contractor shall contact the Traffic Signal Maintenance Shop.

Prior to removal of the Junction Box associated with traffic detector loops, Contractor, Engineer, and a Traffic Signal Maintenance Shop representative shall inspect and verify the condition of the Junction Box.

Prior to replacement of the Junction Box, Contractor, Engineer, and a Traffic Signal Maintenance Shop representative shall inspect the vault lid and vault structure to verify adjustments. Any Work, personnel, and/or materials required to properly correct problems shall be at Contractor's expense.

#### **Article 8.4 Measurement**

The method of measurement is the actual number of junction boxes removed, adjusted to grade and accepted, and the actual number of new junction boxes of the specified types furnished, installed, and accepted.

The unit cost for adjusting the Junction Box to finish grade shall include all labor, materials, and equipment. This shall include all required usable and unusable excavation, classified fill and backfill material, compaction, concrete cutting and removal, and required personnel. If the adjustment of the Junction Box necessitates pulling new cable to meet the specifications, all Work associated with pulling new cable, including the cost of the new cable and the work to pull the cable up into the required termination point, is considered incidental to the bid item "Adjust Junction Box to Grade".

All survey and staking work required to locate the junction boxes shall be incidental to the work.

#### **Article 8.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Junction Box (Type)	Each
Adjust Junction Box to Grade	Each
Remove Junction Box	Each
Junction Box Extension (Type)	Each

## **SECTION 80.09    EXPANSION FITTINGS**

### **Article 9.1    General**

Expansion fittings, as detailed on the structure Drawings, shall be installed where the conduit crosses an expansion joint in the structure. Each expansion fitting shall be provided with a bonding jumper of stranded, No. 6 AWG, copper wire.

Expansion-deflection fittings shall be waterproof and permit a three-quarter inch (3/4") expansion and contraction and a three-quarter inch (3/4") deflection without deformation.

### **Article 9.2    Measurement**

Expansion fittings shall be considered as incidental to other Work.

### **Article 9.3    Basis of Payment**

No separate payment for these items is allowed.



## SECTION 80.10 CONDUCTORS

### Article 10.1 General

Conductor sizes shall be based on the American Wire Gauge (AWG). Sizes shall conform to the Drawings or, when not shown, to the Conductor Termination Table below. Conductors shall be seven-conductor No. 14 AWG (7C-#14 AWG) for all vehicle heads, and five-conductor No. 14 AWG (5C-#14 AWG) for all pedestrian heads.

Conductor Termination Table

CONDUCTORS/ CABLE	CIRCUIT	WIRE COLOR	AWG NO.	BAND LEGEND
7	Vehicle Red Arrow	Red	14	Head Number
	Vehicle Yellow Arrow	Orange		
	Vehicle Green Arrow	Green		
	Common Neutral	White		
	Spare	White/Black		
	Spare	Black		
	Spare	Blue		
7	Vehicle Red Arrow	Red	14	Head Number(s)
	Vehicle Yellow Arrow	Orange		
	Vehicle Flashing Yellow Arrow	Black		
	Vehicle Green Arrow	Green		
	Common Neutral	White		
	Spare	White/Black		
	Spare	Blue		
7	Vehicle Red	Red	14	Head Number(s)
	Vehicle Yellow	Orange		
	Vehicle Green	Green		
	Common Neutral	White		
	Spare	White/Black		
	Vehicle Yellow Arrow	Black		
	Vehicle Green Arrow	Blue		
5	Pedestrian Don't Walk	Red	14	Head Number
	Pedestrian Walk	Green		
	Common Neutral	White		
	Spare	Orange		
	Spare	Black		
5	Photo Elec. Control	Black	14	PEC
	PEC Load to Contactor	Red		
	Neutral	White		
	Spare	Orange		
	Spare	Green		
3	Pedestrian Pushbutton	Black	14	Head Number Located Under
	Neutral	White		
	Spare	Red		

### Conductor Termination Table

CONDUCTORS/ CABLE	CIRCUIT	WIRE COLOR	AWG NO.	BAND LEGEND
3	Flashing Beacon Ckt 1	Black	14	Head Number
	Flashing Beacon Ckt 2	Red		
	Neutral	White		
3	Preemption Confirmation Light	Black	14	"PRE" Conf Lt
	Neutral	White		
	Spare	Red		
3	Luminaire	Black	8	Circuit Number Circuit Number
	Luminaire	Red		
	Luminaire	White		
3	Service to Controller	Black	6	"SIG" No Band No Band
	Neutral	White		
	Spare	Red		
3	Sign Luminaire	Black	8	SIGN SIGN
	Sign Luminaire	Red		
	Sign Spare	White		

All insulated conductors shall consist of uncoated, stranded copper conforming to the specifications of ASTM B8, except for detector loop lead-in which shall consist of stranded, tinned copper.

Grounding conductors shall be bare copper of the gauge required by the Code and may be stranded, solid or braided.

Conductors used for the following purposes shall conform to the referenced specifications.

#### Article 10.2 Control Cables

Vehicular signal faces, pedestrian signal faces, pedestrian pushbutton detectors, flashing beacons, preemption confirmation light, and photo electric controls shall be wired with signal cable conforming to IMSA 20-1.

#### Article 10.3 Power Conductors and Cables

Power conductors and cable shall conform to ICEA Publication No. S-66-524, NEMA Publication No. WC7, and U.L. Standards. Conductors shall be insulated with chemically cross-linked polyethylene conforming to U.L. type XHHW or XHHW-2. Insulation shall be rated for 600 volt operation.

Three conductor cables shall have black, white, and red colored conductors.

All single-wire conductors and cables shall have clear, distinctive and permanent markings on the outer surface throughout the entire length giving the manufacturer's name or trademark, the insulation type-letter designation, the conductor size, voltage rating and the number of conductors if a cable.

Roadway and sign illumination cable shall consist of insulated conductors with a low density, high molecular weight polyethylene jacket.

Power cables with conductors No. 6 AWG and larger shall be PVC or neoprene jacketed.

Load center control circuit wiring shall be No. 12 AWG XHHW.

Conductors in controller cabinets that carry the full signal load circuit shall be No. 10 AWG or larger.

All cabinets shall be wired with conductors sized to handle the amperage drawn under full cabinet use.

Illumination tap conductors that run from the fused disconnect kit in the pole base to the luminaire shall be No. 10 AWG.

Temporary overhead illumination conductors shall be Triplex #6 Aluminum with black cross-linked polyethylene insulation.

#### **Article 10.4 Detector Cables**

##### **A. Loops and Lead-in Detector Cables**

Conductors for detector inductive loops shall be UL listed as Tube loop detector wire No. 14 AWG stranded single conductor in PVC tube (IMSA specification 51-5).

Loop Lead-in Cables. Use a tray cable that conforms to the following specifications to connect the loop detectors to the terminal blocks in the controller cabinet. Furnish this cable, also known as Snyder Cable, manufactured according to UL Standard 1277. Third-party certify these cables as Type TC and certified for use in underground conduit or as an aerial cable supported by a messenger, rated for 600 volts AC operation and sunlight resistance.

Use No. 18 AWG, sixteen (16) strand, tinned copper conductors per ASTM B-33 insulated with wet rated cross-linked polyethylene. Twist the conductors into seven (7) pairs colored to match the following: Black & Red, Black & White, Black & Green, Black & Brown, Black & Yellow, Black & Orange and Black & Blue.

Provide each twisted pair with an overall aluminum foil coated Mylar shield that provides one hundred percent (100%) coverage and a 20 AWG tinned copper drain that is in constant contact with the foil side of the shield. Apply a tight fitting PVC jacket over the conductor assembly.

##### **B. Optical and GPS Radio Detector – Preemption Cable**

The three-conductor No. 20 AWG (3C-#20 AWG) cable shown on the Drawings shall be used in the Optical Detectors – Preemption System. The cable shall be sheathed in a black PVC jacket and include three (3) No. 20 AWG insulated conductors, and one (1) No. 20 AWG drain wire enclosed within an aluminized polyester shield. All conductors shall be stranded, individually tinned copper. The cable shall contain one yellow, one blue, and one orange insulated conductor. The cable shall be rated for 600 volts operation and be suitable for direct bury, installation in a conduit, and direct exposure to the atmosphere. Cable shall be a GTT Company's No. 138 Opticom cable, or approved equal.

GPS Radio detection cable shall be Opticom Model 1070 GPS Installation cable.

C. Radar Detector Cable

Cable for each radar unit shall be a Matrix Type 2 Home Run cable (MTX2 HMRN).

**Article 10.5 Telemetry Cable**

Interconnect cable shall consist of solid copper No. 19 AWG conductors of the number of pairs called for in the Drawings meeting the requirements of REA specification PE-39 for filled telephone cables. The shield may be either copper or aluminum.

Telemetry interconnect cable shall contain the number of pairs as shown on the Drawings. The conductors shall be covered with a .005-inch copper or aluminum shield that is electrically intact throughout the entire length of the new circuit. Grounding continuity of all copper shields shall be maintained at all termination points. T-Splices shall be made at the terminal block in the controller cabinet. Configuration and color coding shall be in accordance with the Interconnect Termination Table.

INTERCONNECT TERMINATION TABLE

Telemetry Cable: Type PE-39, No. 19 AWG, Solid Copper

Pair #	Tip	Ring	Pair #	Tip	Ring
1	White	Blue	14	Black	Brown
2	White	Orange	15	Black	Slate
3	White	Green	16	Yellow	Blue
4	White	Brown	17	Yellow	Orange
5	White	Slate	18	Yellow	Green
6	Red	Blue	19	Yellow	Brown
7	Red	Orange	20	Yellow	Slate
8	Red	Green	21	Violet	Blue
9	Red	Brown	22	Violet	Orange
10	Red	Slate	23	Violet	Green
11	Black	Blue	24	Violet	Brown
12	Black	Orange	25	Violet	Slate
13	Black	Green			

**Article 10.6 Measurement**

In this Article, the word “structure” means a pole, junction box, load center, or controller cabinet, and the word “cable” also refers to single conductors, when individual conductors are in the bid schedule. Each cable the Contractor installs shall be measured in horizontal feet from the center of a structure to the center of the adjacent structure, or from station to station. All terminations, markings, slack and other incidental supplies required to meet the provision of the Specifications are not measured, and are considered incidental to the Contract.

Wire and cable within poles, cabinets, and other devices are included under those bid units.

All grounding conductors are incidental to other Work and shall not be measured for payment.

**Article 10.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
(No. of Conductors) (Size of Conductors) (Type of Cable)	Foot

## **SECTION 80.11 WIRING**

### **Article 11.1 General**

Conductors in fixtures and cabinets shall not be spliced and shall be cabled together with self clinching nylon ties. All conductors, including spares shall be attached to terminal blocks with "spade" type terminal lugs.

Conductors shall not be pulled into conduit until junction boxes are set to grade, crushed rock sumps installed, grout placed around the conduit, and rigid metal conduits are bonded to ground.

Conductors shall be pulled by hand or by commercially built cable pulling equipment that is specially designed for that purpose. The cable pulling device shall be equipped with a force limiting circuit and force gauge. The cable-pulling device shall be approved by the Engineer before it is allowed to be used. Powdered soapstone, talc, or other inert lubricant shall be used in placing the cables and conductors in conduit.

When new conductors are to be added to a conduit with existing conductors, all conductors shall be removed and the conduit cleaned with a mandrel or brush. Then both old and new conductors shall be pulled through as a unit. In a new installation, all conductors shall be pulled through the conduit as a unit.

Contractor shall leave at least three feet (3') of slack, but not more than four feet (4'), for each conductor at each lighting and combination pole, and in each junction box, splice location, and controller base. Where lighting conductors are contained in a conduit within the pole, the slack is not required.

Contractor shall install a nylon pull rope in all conduits where cable is replaced and/or removed.

The neutral for pedestrian push button circuits shall be separate from the signal indication circuit neutral.

All control/signal conductors shall be run continuously without splices from a terminal block located in a cabinet, compartment, or signal head, to a similarly located terminal block.

Contractor shall splice illumination cable in pole bases and shall use approved fuse kits only. Contractor shall not use wire binding screws, studs or nuts.

With the prior approval of the Engineer, Contractor may use illumination cable splices in junction boxes. Contractor shall join the individual conductors by the use of non-insulated, overlap type pressure connectors insulated with mastic-lined shrink tubing. Contractor shall not use wire binding screws, studs or nuts. Contractor shall stagger splices to minimize overall diameter.

Illumination cable conductor splices shall be encapsulated in a rigid, two-piece, transparent, snap together, plastic mold specifically designed for each splice type. Molds shall have dimensions suitable for the splice, encase the cable outer protective jackets, be rated for 600 volts, and have fill and vent funnels for epoxy resin. Contractor shall fill the splice mold bodies, with epoxy resin, that are resistant to weather, aromatic and straight chain solvents, and does not sustain combustion.

Splices shall be insulated by: 1) a heat shrink tubing internally coated with an approved sealing compound or, 2) a cast of self-curing epoxy resin which is compatible with the wire insulation to form a weatherproof joint. Each insulated kit shall encompass only one cable and include the outer protective jacket(s).

Loop lead-in cable shall be run in a continuous manner without splices from the controller cabinet to the curbside detection junction box. Splicing of the loop conductors to the lead-in cable shall be in conformance with Section 80.18, Article 18.1 – Loop Detectors and Standard Detail 80-60.

Each loop lead-in cable pair shall then run without splices to the terminal block in the controller assembly, where all series or parallel connections shall be made. At a splice location, a short section of the cable jacket shall be removed and only the shielded pairs dedicated to the loops being spliced shall be cut.

All cables and single wire conductors shall be permanently identified using labels in all pole bases and cabinets, at each detector loop tail/lead in cable and illumination cable splices and in junction boxes.

Contractor shall furnish the two types of identification tags listed below that require a written legend, and write the legends specified neatly and legibly, using a black marking pen specified by the manufacturer. Contractor shall ensure that legends conform to Section 80.10, Conductor Termination Table, or as shown on the Drawings or detailed in the Special Provisions. Contractor shall replace, at no expense to the Owner, all identifications tags that the Engineer deems are illegible.

Use identification cable ties for labeling loop detector tails and for each set of paired loop lead-in conductors in the controller cabinet. Furnish identification cable ties made of nylon that have a nonmagnetic stainless steel locking device embedded in the head and a tag attached “flag style” to the head. The cable ties shall consist of a single strap with a minimum size tag of three-quarters inch by five-sixteenth inch (3/4” x 5/16”).

To label all other cables, use cable tags made of nylon reinforced vinyl that is impervious to the elements and shall not tear. Provide tags with a four inch by one and three-quarters inch (4” x 1 3/4”) minimum size that are attached flag style at one corner to a single strap. Furnish yellow tags for labeling all signal and interconnect cables and red tags for labeling lighting and feeder cables.

Contractor shall remove abandoned conductors/cables.

The control and power cables shall be terminated as shown in 80.10, Conductor Termination Table. Three conductor power cables shall always have a spare. The white or red conductor shall be left as a spare, when the circuit is either 480 volt or a neutral is required, respectively.

Terminate all spare conductors on terminal blocks.

## **Article 11.2 Measurement**

Work performed under this article is considered incidental to other Work.

Removal and disposal of abandoned conductors is not measured for payment and is incidental to other Work. All splices, pull rope, cable tags, connectors, and fused disconnects are also considered incidental and no payment shall be made.

The Traffic Signal Maintenance personnel shall test and perform termination for all traffic loop detectors. The Contractor shall prepare the lead-in cables for termination, including labeling, insulation stripping and fitting with termination connectors.

When an existing active signal system is being modified, the Traffic Signal Maintenance personnel shall terminate all control cables within the traffic signal controller cabinet. It shall be the Contractor's responsibility to prepare the cables for termination.

The Traffic Signal Maintenance personnel shall splice, test and perform termination on all interconnect wiring operations.

The Traffic Signal Maintenance personnel shall install the connectors on the ends of PTZ/Network camera and radio interconnection cables.

### **Article 11.3 Basis of Payment**

No separate payment is allowed for this item.



## **SECTION 80.12 FUSED SPLICE CONNECTORS**

### **Article 12.1 General**

A fused, quick disconnect, splice connector shall be installed between the line and luminaire down lead conductors in the base of every pole equipped with a luminaire.

Fused splice connectors shall be installed for all other electrical or communication equipment installed on the pole and shall connect, at the pole handhole, the line conductors coming up from the base to the conductors in the pole shaft.

The connector shall be weather tight and consist of two halves: a single unit line side socket and load side plug. The plug and socket assembly shall be designed so that the fuse remains in the load side plug without exposing live metal parts when the connector separates. Coil springs shall not be a part of the current carrying circuit.

For circuits with a neutral, the neutral conduct shall pass through the fused splice connector.

For shorter poles with smaller handholes, two (2) single conductor fused splice connectors shall be installed.

Contractor shall provide fuses for luminaires that are five (5) ampere, midget (13/32" x 1 1/2") ferrule type with a fast acting current limiting (KTK type) design or as specified by the Engineer. Fuse for other equipment shall be sized per the Drawings.

The Contractor shall install the fused connectors so they are readily accessible from the handhole. Tap conductors shall be installed so there is no slack when their ends touch the top of the foundation.

Ensure line side conductors enter the splice box body via the segment immediately adjacent lug to which they are terminated.

### **Article 12.2 Measurement**

Work performed under this article is considered incidental to other Work.

### **Article 12.3 Basis of Payment**

No separate payment is allowed for this item.

## **SECTION 80.13 BONDING AND GROUNDING**

### **Article 13.1 General**

Metallic cable sheaths, metal conduit, non-metallic conduit grounding wire, ballast and transformer cases, service equipment, sign switches, metal poles and pedestals shall be made mechanically and electrically secure to form a continuous system, and shall be grounded. Bonding and grounding jumpers shall be copper wire or copper braid of the same cross-sectional area as No. 8 AWG for all systems.

Bonding of slip-base type standards and pedestals shall be by means of two conductors from the conduit, one attached with a ground rod clamp to an anchor bolt and the other connected to the lower portion of the shaft. Bonding of standards with frangible coupling type bases shall be made by attaching one conductor from the conduit to the lower portion of the shaft. The attaching bolt shall be weather resistant and be a minimum of three-sixteenth inches (3/16") in size. The conductor for the shaft shall be forty-eight inches (48") long.

One side of the secondary circuit of step-down transformers shall be grounded.

Grounding of metal conduit, service equipment and neutral conductor at service point shall be accomplished as required by the Code and the serving utility, except that grounding electrode conductor shall be No. 6 AWG, or equal.

Unless otherwise sized on the Drawings, Contractor shall install a bare No. 8 AWG copper wire in all non-metallic and metallic type conduits for bonding purposes. When wire is pulled into or out of existing conduit and the conduit does not have an existing bare No. 8 AWG copper wire, Contractor shall install the ground wire.

Contractor shall splice grounding conductors with irreversible compression type connectors listed for the purpose.

Contractor shall install galvanized grounding bushings with insulated throats and stainless steel hardware on the ends of all metallic conduits. All non-metallic conduits, except for detector loop home runs, shall have a bushing installed. Contractor shall allow for bushings when installing conduits in foundations.

Contractor shall replace all missing or damaged conduit grounding bushings, conduit bonding jumpers and junction box lid braided bonding jumpers.

Contractor shall provide a minimum bare No. 8 ground connected to the tapped hole in the pole handhole.

Contractor shall provide a minimum No. 10 AWG green grounding insulated conductor in the pole shaft of all poles with luminaires, and shall terminate the conductor in the lighting fixture. Additional No. 10 AWG green grounding insulated conductors shall be installed for additional electrical or communication equipment installed on the pole.

Bond junction box lids to the grounding conductor using copper braid with a cross sectional area equal to an No. 8 AWG conductor and eyelets spaced at six inch (6") intervals.

An integral bare ground shall not be used in any cable.

Ground rods shall be three-quarter inch by ten foot (3/4" x 10') copper clad steel. Ground rod clamp and associated hardware shall be stainless steel.

Contractor shall ensure that the grounding conductor, between all ground rods, is continuous or spliced with irreversible ground rated splices.

Contractor shall install a three-quarter inch by ten foot (3/4" x 10') copper clad steel ground rod in the foundation space of a two-piece vault style traffic signal controller foundation. If two-piece vault style controller foundation isn't being installed, then install ground rod within Type 3 junction box adjacent to controller cabinet base.

Contractor shall use only stainless steel bolt assembly components to attach bonding braid to the cover (lid).

Furnishing and installing bonding and grounding conductors for electrical installations is incidental to this Contract and no additional payment is made.

Ground rods are not required to be installed in junction boxes unless otherwise noted on the Drawings.

### **Article 13.2 Measurement**

Work performed under this article is considered incidental to other Work.

### **Article 13.3 Basis of Payment**

No separate payment is allowed for this item.

## **SECTION 80.14 LOAD CENTERS**

### **Article 14.1 General**

When the positioning of the load center is not detailed on the Drawings, the location shown is approximate and the Contractor shall determine the exact location from the Engineer or the serving utility.

If a junction box is not shown on the Drawings adjacent to or within five feet (5') of any new or reconstructed load center, contact the Engineer immediately for clarification. A junction box of the appropriate size and type for the new system is required to be installed with the load center.

Where Contractor is required to install the service on a utility-owned pole, the positioning of the riser and service equipment is determined by the serving utility.

The serving utility shall approve load center meters, complete with manual circuit closing device and sealing rings. Contractor shall not mount meter sockets on doors.

All accessible sections containing non-metered conductors shall have sealing provisions that will accept Brooks Type 623 seal (0.047 stainless bail).

Contractor shall ensure that the load center is located ten to fifteen feet (10' to 15') from the power source, with a two inch (2") minimum conduit stubbed to within two feet (2') of the power source, and at a minimum depth of forty-two inches (42"). The conduit shall contain a pull-rope, and the end capped and marked with a two by six inch (2" x 6") board. Contractor shall coordinate exact location with the serving utility.

Contractor shall stub service conduit through base as shown on the Drawings.

Prior to the load center being energized by the serving utility, Contractor shall arrange to have it inspected and approved by the Engineer. Once the Engineer has provided approval, a Municipal Electrical Inspector shall provide the final authorization for energizing the load center. The certificate of electrical inspection, attached to the load center, indicates that the load center may be energized.

At all new and existing load centers, which require modification, the Contractor shall furnish conduit, conductors, contactors, breakers, transformers, and all necessary materials to complete the installation of the service, and upgrade to current code requirements.

Contractor shall label the load center as a unit by an Approved Independent Electrical Testing Laboratory (such as UL, ETL, CSA, etc.) defined by ANSI Standard Publication Z34.1 "Third Party Certification Programs for Products, Processes and Services" and conform to applicable published standards noted herein, the Drawings, and Special Provisions. Contractor shall label the load center as service entrance equipment. All Work shall conform to the latest edition of the National Electric Code as last amended and adopted by the Municipality of Anchorage.

All lighting load centers shall contain a multi-pole, 3-position control switch to provide selection of photocell operation. Contractor shall label switch positions "Auto," "Off" and "On." In the "Off" and "On" positions of the switch, Contractor shall ensure all leads to the photo control device are de-energized. Contractor shall install the switch inside the load center, accessible only through one of the lockable doors.

Contractor shall provide UL-approved and listed circuit breakers. Contractor shall provide an enclosed operating mechanism that is:

1. trip-free from operating handle on overload
2. trip-indicating
3. plainly marked with trip and frame size.

Multiple-pole circuit breakers shall have a common trip. Contractor shall ensure that all circuit breakers are quick-make, quick-break on either automatic or manual operation, and shall meet the requirements of the serving utility. Contractor shall ensure that the contacts are silver alloy enclosed in an arc-quenching chamber. An ambient temperature range of from -40° to +160° Fahrenheit shall not influence overload tripping of breakers.

Contractor shall connect ground bus of load center to ground rod(s) with #6 soft drawn bare copper and approved connectors.

Dimensions given are typical. Slight variations are allowable, subject to Engineer's approval.

Contractor shall submit four (4) copies of manufacturer's shop drawings for Engineer approval.

Contractor shall indicate the interrupting rating on panel schedules for each location.

On panel schedules for each location, Contractor shall indicate service rating of 120/240V, 3 wire; 240/480V, 3 wire; 100 AMP or 200 AMP.

Contractor shall provide a typed circuit directory for each load panel inside of the load center door, protected with a laminated plastic cover, describing each circuit, with even and odd numbered circuit breaker positions shown on separate parts of the directory. Contractor shall provide a power and control 1-line diagram protected by a laminated plastic cover inside the load center. Contractor shall include the following information on the directory and one-line diagram: Load Center Identification (A, B, etc.), Project Name, Municipal Project Number and Service Voltage.

Contractor shall ensure that the wiring configuration conforms to the appropriate electrical diagram, and as the panel schedule indicates for each intersection. Contractor shall complete a load center summary per appropriate detail drawing for each load center location.

Contractor shall ensure that all terminals are suitable for AL/CU termination, sized in accordance with ampere ratings.

Contractor shall provide #12 AWG XHHW as the load center control wiring.

Contractor shall ensure that the utility section is isolated from main load section and the distribution load sections by non-removable metal barriers, and equipped with landing lugs for utility termination.

The meter section shall contain a meter safety socket with safety shield and provisions for manual bypass of the meter. Contractor shall provide a link or lever type bypass with no external screws, bolts, or nuts. Horn and sliding types are not acceptable.

External screws, bolts, and nuts are not acceptable.

Contractor shall provide exterior ScotchCAL 220 labels with ownership and purpose, safety labels, interior identification labels, wiring diagram, and installation instructions with the load center enclosures.

Contractor shall label in a prominent manner all switches and circuit breakers for circuit and direction.

Contractor shall install load centers having 30 milliamp (ma) ground fault circuit breakers with ratings for all heat trace circuits as indicated on the Drawings.

Contractor shall label each load center with durable, weather resistant identification tags inscribed with: Maximum Fault Current \_\_\_\_\_A, Calculated \_\_\_/\_\_\_/\_\_\_.

Load Centers shall be equipped with a hasp for padlocks.

Circuit breakers shall be manufactured to fit the existing load center panel, industrial grade, and rated for the maximum available fault current indicated on the Plans.

Install short circuit fault current and arc flash placard on the existing load center. Placard shall reflect the calculation results shown on the Plans.

#### **Article 14.2 Illumination Control**

Contractor shall install photoelectric controls capable of switching multiple lighting systems directly. The photoelectric control shall consist of a photoelectric unit that shall cause a contactor to be energized, thus controlling the lighting circuit.

Photocell Installation:

Contractor shall install photoelectric units on the load center, unless the Engineer requires pole mounting of the photoelectric unit because a load center mounted unit will not work properly due to ambient light sources. If required, Contractor shall provide photoelectric units for pole top mounting with a slip fitter, terminal block and with cable supports or clamps to support pole wires. Load center mounted photoelectric units shall be installed using ¾" GRC and mounted a minimum of 18" above the load center. There shall be no separate payment for providing the required photoelectric units.

Contactors:

The contactors shall have contacts rated to switch thirty (30) or sixty (60) AMP inductive loads as the Drawings specify, and are normally open. Contractor shall provide mechanical armature type contactors consisting of an operating coil, a laminated core, a laminated armature, contacts, and terminals with contacts made of fine silver, silver alloy, or superior alternative materials and rated for 480V.

Contractor shall provide the lighting contactor coil(s) rated for operation at 240 VAC.

Photoelectric Unit:

1. The photoelectric unit shall consist of a light sensitive element connected directly to a normally closed, single pole throw control relay without intermediate amplifications.

2. The unit is either the horizontal sensing or zenith sensing type and shall conform to the following:
  - a. The supply voltage rated is 60 hertz (Hz), 105-277 volts.
  - b. The maximum rated load is a minimum of 1,800 volt-amperes.
  - c. The operating temperature range is from -40°F. to +150°F.
  - d. The power consumption is less than 10 watts.
  - e. The base of the unit has a 3-prong, standard, twist-lock plug mounting.
3. Units for highway lighting shall have a "turn-on" between one (1) and five (5) foot candles and a "turn-off" at between one and one-half and five (1½ and 5) times "turn-on."
4. Contractor shall ensure measurements conform to the procedures set forth in EEI-NEMA Standards for Physical and Electrical Interchangeability of Light-Sensitive Control Devices Used in the Control of Roadway Lighting.
5. The photoelectric control unit shall plug into a phenolic resin twist lock receptacle, adjusted to north sky set in a cast aluminum-mounting bracket with a threaded base. When installed on the load center, Contractor shall ensure the bracket is coupled to the end of a rigid metal conduit. When installed on the top of steel poles, Contractor shall ensure the bracket is installed in the center of the rain cap, secured with a locknut and made watertight with a fillet of silicone caulking compound. When installed inside the load center, Contractor shall ensure the installation conforms to the manufacturer's recommendations and that all load center penetrations/openings are silicon sealed.
6. Contractor shall screen photoelectric units to prevent artificial light from causing cycling.

#### Control Selector Switch:

Load centers with illumination control shall contain a three position, maintained selector switch. The left position shall be "On". The center position shall be "Off". The right position shall be "Auto". In the on and off position the Contractor shall ensure the switch interrupts all leads to the photocell.

The selector switch shall have three contacts closed in the auto position and one contact closed in the on position.

There shall be an intermediate terminal between the selector switch and the photocell leads. The photocell leads shall not be terminated directly on the switch contacts. The intermediate terminal shall be accessible to maintenance personal without disconnecting or removing other equipment installed in the load center.

### **Article 14.3 Step Up/Step Down Transformer**

Step up/step down transformers in 480 volt circuits shall be 240-120 volt, 60 Hz type with volt-ampere ratings as shown on the Drawings. Transformers shall carry rated volt-amperes continuously without exceeding 85°C temperature rise above 25°C ambient.

Where installed outside of the load center, use a non-ventilated transformer fabricated of aluminum, stainless steel or galvanized steel. Coat enclosures fabricated of sheet metal with moisture resistant paint.

The case shall be fabricated of aluminum, brass, or galvanized steel. The case shall be coated with moisture resistant paint.

The unit shall be filled with a high melting point insulating compound and shall be hermetically sealed to ensure satisfactory operation under continuous submersion in water.

Transformer leads shall be insulated with non-hygroscopic material and shall extend at least nine inches (9") outside the case seal.

The primary and secondary sides of the transformer shall be "protected" in the load center.

#### **Article 14.4 Load Center Enclosure**

All doors shall be equipped with continuous stainless steel pin hinges, coin latches, and hasp for padlock.

Meter section door shall have a clear lexan meter reading window, 0.187" minimum thickness, with a minimum size of eight by eight inches (8.0" x 8.0"), and shall include a silicon seal to door.

The load center shall be provided with internal mounting facilities for a one-half inch (1/2") anchor bolt installation as well as for use with a standard factory mounting base assembly.

Construction shall be of zinc-coated A60 finish steel with minimum thickness as follows:

Exterior Shell - 12 GA.

Interior Doors - 14 GA.

Interior Panels - 14 GA.

Interior Covers - 16 GA.

The load center shall be painted with a two-part urethane paint undercoating inside and out. The final finish shall be a two-part urethane paint, standard white for removable panels and non-gloss silver-gray, Benjamin Moore GN-42, for the enclosure.

The required location for the hand-off-auto switch and the contactor is in the distribution load section.

All non-current carrying parts shall be bonded to ground.

#### **Article 14.5 Post-Mounted Load Center, Type 2 - Underground Service**

A post-mounted load center, Type 2, shall be defined in the Construction Drawings by reference to appropriate Standard Details for the load center, wiring diagram, and panel schedule.



**Article 14.6 Post-Mounted Load Center, Type 3 - Overhead Service**

A post-mounted load center with overhead service, Type 3, shall be defined in the Construction Drawings by reference to appropriate Standard Details for the load center, wiring diagram, and panel schedule.

**Article 14.7 Single-Meter Pad-Mount Load Center, Type 1 & 1A**

A single-meter pad-mount load center, Type 1A, shall be similar to Circle AW CMP-4111MN mounted on MB-1514 base or equivalent approved by the Municipal Traffic Engineer. It shall be defined in the Construction Drawings by reference to appropriate Standard Details for the load center, wiring diagram, and panel schedule.

A single-meter pad-mount load center, Type 1, shall be similar to Circle AW CMP-4900 series mounted on MB-2820 base or equivalent approved by the Municipal Traffic Engineer. It shall be defined in the Construction Drawings by reference to appropriate Standard Details for the load center, wiring diagram, and panel schedule.

**Article 14.8 Measurement**

Load centers shall be measured as units, complete and in place. Bases for load center enclosures shall be a separate bid item under "foundations."

Photoelectric units mounted on the load center shall not be measured separately for payment. The Work performed under Article 14.2 – Illumination Control, is considered incidental to Work performed under Articles 14.5 through 14.7, unless a pole mounted photoelectric unit is required.

Load center modifications shall be measured as units, complete and in place. This work includes furnishing and installing new circuit breakers in the existing load center, all work to terminate new cables on new circuit breakers, and installing short circuit and arc flash placards on the load center.

**Article 14.9 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Owner shall pay fifty percent (50%) of the Contract unit price for each load center installed once each load center is green tagged by Building Safety. The remaining fifty percent (50%) of the Contract unit price for each load center shall be paid after the Contractor submits an approved final inspection from Building Safety.

Separate payment shall be allowed for pad-mount bases.

Payment shall be made under the following units:

ITEM	UNIT
Post-Mounted Load Center Overhead Service, Type 3	Each
Post-Mounted Load Center Underground Service, Type 2	Each
Single-Meter Load Center Enclosure, Type 1	Each
Single-Meter Load Center Enclosure, Type 1A	Each

Pole-Mounted Photocell Installation, Complete	Each
120/240 - 240/480, Transformer	Each
Load Center Modifications	Each

## **SECTION 80.15 WOOD POLES**

### **Article 15.1 General**

Wood poles for service or temporary installations shall be of the class shown on the Drawings. Wood poles used in temporary installations shall meet or exceed ANSI class 4 for poles used for temporary illumination only, and ANSI class 3 for poles used for temporary signalization.

Poles shall not have more than 180 degrees twist in grain over the full length. Sweep shall be no more than four inches (4"). Poles shall be placed in the ground to a depth of at least six feet (6'). The lengths of poles shall be twenty-five feet (25') for service poles and thirty-five (35') feet for other poles, unless otherwise specified.

After each wood pole is set in the ground, the space around the pole shall be backfilled with selected earth or sand, free of rocks four inches (4") or larger, or deleterious material, placed in layers approximately four inches (4") thick and thoroughly compacted with mechanical tampers.

Mast arms and tie rods for wood pole installations shall conform to the provisions of Section 80.05 – Poles, Steel Pedestals, and Posts, and to the details shown on the Drawings. Each mast arm shall be provided with an insulated wire inlet and wood pole mounting bracket for mast arm and tie rod cross arm.

Overhead equipment shall provide a minimum vertical clearance of eighteen feet (18') from bottom of equipment to the pavement.

Wood poles, not to be painted, shall be pressure treated after fabrication with creosote, pentachlorophenol (oil borne), or copper naphthenate (oil borne) in accordance with the latest applicable standards of the American Wood Preservers Association. Where it is impractical to obtain the specified retentions because of the character of the wood in the charge, the treatment shall be to refusal. The retentions may be determined either by gauge or scale readings or by assay. Treated poles shall be coated in conformance with current EPA regulations.

Wood poles shall not be used for permanent installations.

### **Article 15.2 Measurement**

Wood poles used for temporary support of signals, signs and illumination shall be measured as temporary wood pole structures installed and removed.

### **Article 15.3 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Temporary Wood Pole Structures	Each

## **SECTION 80.16 MISCELLANEOUS**

### **Article 16.1 Sign Switches**

Each sign illumination installation shall be provided with a disconnect switch mounted on the sign standard or structure, as shown on the Drawings. Where the sign lighting is served from a multiple service, each sign structure shall have a 120-volt, 240-volt, or 480-volt circuit breaker, approved by UL as service equipment, and rated as shown on the Drawings.

Enclosures for the sign breaker shall be galvanized or baked enamel NEMA Type 3R, and shall be provided with top hinged cover, hasp for sealing cover and provisions for locking.

### **Article 16.2 Field Tests**

Prior to acceptance of the Work, the Contractor shall perform the following tests on all traffic signal, sign illumination, and lighting circuits, in the presence of the Engineer.

#### **A. Tests**

Any fault in any material or in any part of the installation revealed by these tests shall be replaced or repaired by the Contractor at his expense in an approved manner, and the same test shall be repeated until no fault appears.

##### **1. Continuity**

Each circuit shall be tested for continuity.

##### **2. Grounds**

The test for grounds in each circuit shall consist of the physical examination of the installation to ensure that all required grounding bushings, bonding jumpers, and ground rods have been installed and are mechanically firm.

##### **3. Insulation**

A megohm test shall be made on each circuit, between circuits and between the circuit and a ground. The insulation resistance shall not be less than 100 megohms or the minimum specified by the manufacturer, measured at 500 volts direct current (VDC). All lamps and magnetometer sensing probes shall be disconnected prior to performing the megger test.

##### **4. Circuit**

Every signal indication circuit shall be energized with lamps installed prior to installation of the load switches.

##### **5. Functional**

The following tests shall be performed on each signal and lighting system after all of the component circuits have satisfactorily passed the tests for continuity, grounding, insulation integrity and circuitry.

#### **B. Functional Testing**

During the test periods, the Contractor shall maintain the system or systems. The cost of any maintenance necessary shall be at the Contractor's expense.

1. The functional test for each new or modified traffic signal system shall consist of not less than twenty-four (24) hours nor more than five (5) days of continuous flashing operation, followed by not less than five (5) days of continuous satisfactory operation. The Municipal Traffic Engineer may decide to omit the flashing portion of the test for modified signals systems and for new signals that replaced existing signals that remained in operation during the construction phase.
2. During the functional tests, signals shall not be switched from flashing operation to normal, continuous operation on a Saturday, Sunday, Monday, a Holiday, or the day after a Holiday.
3. The functional test for each lighting system and sign illumination system shall consist of an operational test for five (5) consecutive nights according to the regular lighting schedule.
4. The functional test for each flashing beacon system shall consist of not less than five (5) days of continuous, satisfactory operation.
5. A continuous five (5) day burning test shall be made on each pedestrian overcrossing and undercrossing lighting system before final acceptance.

The initial turn-on shall be made between 9:00 a.m. and 2:00 p.m. unless specified otherwise in the Special Provisions. Prior to turn-on, all equipment shown on the Drawings shall be installed and operable. This includes, but is not limited to, pedestrian signals and push buttons, signal face backplates and visors, vehicle detectors, intersection lighting and all regulatory, warning and guide signs. All signal faces shall be aimed as required by Sections 80.19 – Signal Heads and 80.20 – Pedestrian Signals.

### **Article 16.3 Galvanizing**

#### **A. General**

Standards, pedestals, posts and cabinets of ferrous materials shall be galvanized in accordance with the provisions of ASTM A123 except that cabinets and cut out boxes may be constructed of material galvanized prior to fabrication.

Iron or steel pipe standards and mast arms shall be hot-dip galvanized after fabrication in conformance with the ASTM A123.

Tie-rods, nuts, washers, clamps, anchor bolts and other miscellaneous ferrous parts shall be hot-dip galvanized after fabrication in accordance with the provisions of ASTM A153. Anchor bolts shall be fully galvanized.

After galvanizing, the bolt threads shall accept galvanized standard nuts without requiring tools or causing removal of protective coatings.

Rigid metal conduit shall be hot dip galvanized in accordance with American National Standards Institute specification ANSI C-80.1.

Galvanized coatings that have been cut or damaged shall be repaired in conformance with ASTM A780.

Lighting and signal structures shall be hot-dip galvanized to meet AASHTO M 111 and these specifications. Galvanizing kettles shall be large enough to completely submerge each element, the mast arm, and the pole. Submerge the complete/whole element in the galvanizing process. An element galvanized in sections shall not be accepted. After the poles and mast arms are galvanized, remove all excess zinc from all drip lines and points and the surfaces of all tube ends that form slip type joints to provide a smooth finish.

**B. Cold Galvanizing**

Repair hot-dip galvanized finishes that have been cut or damaged and cold galvanize the tops of pipe pile foundations with a premixed, single component, zinc rich paint that:

1. Meets the requirements of Federal Specification DOD-P-21035A, Galvanizing Repair Specification and ASTM A 780, Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings,
2. Contains ninety-five percent (95%) zinc, by weight, in the dried film, and
3. Is recognized under Underwriters Laboratories, Inc. component program as an equivalent to commercial hot-dip galvanizing.

Apply the paint directly to surfaces devoid of grease, oil, mill scale, rust, and paint. Clean soiled surfaces according to the following Steel Structures Painting Council (SSPC) specifications before applying the paint:

Solvent clean greases and oils according to SSPC-SP1

Power tool clean rust and easy to remove paint according to SSPC-SP3

Sandblast mill scale and firmly adhered paint according to SSPC-SP6 (commercial).

Apply the paint whenever the temperature of the pipe pile is at least five degrees Fahrenheit (5°F) above the dew point to avoid possible condensation and the relative humidity is less than eighty-five percent (85%). Apply two (2) coats of three (3) mil wet film thickness, applying the second coat at least twelve (12) hours after applying the first coat. (Each gallon will cover about four hundred and fifty (450) square feet of three (3) mil wet film thickness.)

**Article 16.4 Painting for Structures**

- A. General Requirements. Ship paint in strong, substantial containers, plainly marked with the name, weight, and volume of the paint content, together with the color formula, batch number, and the name and address of the manufacturer.

Reduction and clean-up thinners shall be as approved by the coating manufacturer. Ship all thinners in the manufacturer's original containers.

- B. The paint shall conform to the requirements outlined below:

1. Prime Coat. A generic single component, moisture cure, polyurethane (SC-MC-U) containing not less than 78% by weight zinc powder. Volume of solids shall be 60% minimum. Pigment type shall be zinc dust. Zinc in dry film shall

be 83% minimum, by weight. Weight per liter shall be 2750 g, minimum. Volatile organic compounds (VOC's) shall not exceed 450 g/L.

2. Intermediate Coat. A SC-MC-U containing not less than 480 g/L micaceous iron oxide (MIO). Volume of solids shall be 60% minimum. Pigment color shall contrast between the intermediate and prime coat and the intermediate and top coat. Weight per liter shall be 1550 g minimum. VOC's shall not exceed 450 g/L.
3. Top Coat. A single component, moisture cure, aliphatic polyurethane (SC-MC-ALIP-U), containing not less than 480 g/l micaceous iron oxide (MIO). Volume of solids shall be 60% minimum. Pigment color of the top coat shall be FSS FED-STD-595B, color number 26492. The color match shall be evaluated as a general match under a daylight source using ASTM D 1729. Weight per liter shall be 1550 g minimum. VOC's shall be less than 450 g/L.
3. All coatings shall pass the following tests:
  - a. Corrosion Resistance, ASTM B 117, Salt Spray Test. Minimum of 4000 hours with less than 2 mm creep from scribe. Panels shall be 3 mm minimum thickness cold rolled steel, having SSPC Near White Blast with 25 to 50  $\mu$ m angular profile.
  - b. Accelerated Weathering, ASTM G 53. Minimum 400 hours QUV B bulb with no chalking, cracking, or gloss loss greater than 20%.
  - c. Forward Impact, ASTM D 2794. Minimum 17 Nm impact.
  - d. Abrasion Resistance, ASTM D 4060. Less than 90 mm loss on CS-17 wheel, 1000 g/load, 1000 cycles.
  - e. Moisture Resistance, ASTM D 4585. Minimum 1000 hours at 38o C with no change in appearance.
  - f. Flexibility, ASTM D 522, Cylindrical Mandrel Bend Test. Bend around 12.5 mm diameter mandrel with no cracking.
  - g. Adhesion, ASTM D 4541. Minimum 3.5 Mpa on a certified pull test.

#### C. New Equipment.

1. Factory finish signal housing, brackets, fittings, backplates, and visors, with a single coat of environmentally safe, ultraviolet-resistant, polyester powder coating that is applied electrostatically at 90kV and baked for 20 minutes at 400 degrees Fahrenheit per ASTM D-3359, ASTM D-3363, and ASTM D-522. Coating to be a Dull Black finish meeting Federal Standard 595b-37038.
2. After erection, all exterior surfaces shall be examined for damage, and such damaged surfaces shall be cleaned and spot coated with primer and finish coat.

#### D. Reused Equipment.

1. Existing non-galvanized, damaged equipment shall be painted in the field, including Owner-furnished equipment. The equipment shall be washed with a stiff bristle brush using a solution of water containing two tablespoons (2

- tbsp/gal) of heavy duty detergent powder per gallon. After rinsing, all surfaces shall be wire brushed to remove all poorly bonded paint, rust, scale, corrosion, grease or dirt. Any dust or residue remaining after wire brushing shall also be removed prior to priming.
2. Factory or shop cleaning methods for metals shall be acceptable if equal to the methods specified herein.
  3. Immediately after cleaning, all bare metal shall be coated with Pre-Treatment, Vinyl Wash Primer, followed by two (2) prime coats of Zinc Chromate Primer for Metal.
  4. Signal equipment, excluding standards, shall be given a spot finishing coat on newly primed areas, followed by one (1) finishing coat over the entire surface.
  5. Ungalvanized standards shall be given two (2) spot finish coats on newly-primed areas.
  6. All paint coats may be applied either by hand brushing or by approved spraying machines. The Work shall be done in a neat and workmanlike manner. The Engineer reserves the right to require the use of brushes for the application of paint, should the Work done by the paint spraying machine prove unsatisfactory or objectionable.

Galvanized equipment with rusted areas shall be repaired as provided for in Article 16.3 - Galvanizing.

**Article 16.5 Measurement**

The Work performed under this section is considered incidental to other Work.

**Article 16.6 Basis of Payment**

No separate payment is allowed for Work performed under this Section.



## **SECTION 80.17 CONTROLLER ASSEMBLIES**

### **Article 17.1 General**

Each solid-state, traffic controller assembly shall operate various traffic signal devices as shown on the Drawings, to provide right-of-way, clearance and other indications with duration and sequence as determined by preset programming.

Details of operation for the complete controller assembly shall be in accordance with the traffic phases, preferential phase sequence and concurrence, signal indications, signal indication sequence, detection requirements and other details shown on the Drawings or as specified herein.

All controller assemblies shall conform to NEMA Standard Publication TS 2-2003 V02.06 level 2, Traffic Controller Assemblies with NTCIP Requirements as defined in NTCIP1202. Traffic Controller Assemblies shall meet or exceed the Environmental Requirements of Section 2 of the NEMA TS2-2003 V02.06 document. The Original Equipment Manufacturer (OEM) and its manufacturing and testing facilities shall be ISO 9001:2000 certified for processes involving the Traffic Controller Assemblies.

The cabinet shall be 100% compliant with Section 1605 of the American Recovery and Reinvestment Act of 2009, requiring the use of American iron, steel and manufactured goods.

The cabinet assembly shall be completely manufactured in the United States of America.

LED indicators shall be used for all electronic devices covered under Article 80.17.

Controllers shall be compatible with the existing Anchorage traffic control system and contain necessary internal communication modems. Compatibility must be 100% at the cabinet level to include inputs, outputs, telemetry protocol, and block upload and download of RAM data.

Manufacturer schematic shall be submitted to the Municipal Traffic Engineer or designated representative prior to approval of all controller assemblies.

The existing traffic signal monitoring system is Centracs ATMS by Econolite

Features of the existing local controllers and controller modules must be functionally duplicated to meet or exceed the performance of the existing equipment.

The existing local controller cabinets at other intersections include the following equipment: Econolite Cobalt ATC Touch 2100

### **Article 17.2 Controller Unit**

Actuated Controller Unit (CU).

Provide solid state, Type A2N Actuated Controller Units (CU) meeting the requirements of Section 3 of the NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with NTCIP Requirements.

1. The CU must meet the referenced National Transportation Communications for ITS Protocol (NTCIP) and comply with publication TS 3.2 the Simple

Transportation Management Framework, and shall meet the requirements for Conformance Level 2

2. The software shall comply with NEMA TS 3.3, the Class B Profile, and shall include both an EIA/TIA 232-E and an FSK modem interface for NTCIP based communications.
3. The CU shall implement conformance groups and optional object groups as defined in NEMA TS 3.4 and TS 3.5 for A2N level 2.
4. Provide controllers with display heaters or enhancements to improve viewing in temperatures below 0 °F.
5. Provide controllers having an interface compatible with Trafficware Synchro traffic modeling software.

Furnish one (1) Econolite Cobalt ATC Touch 2100 controller unit with TS2 Type 2 connectors or approved equal also meeting the following requirements:

A. HARDWARE

1. Enclosure
  - a. Compact the controller to fit in limited cabinet space. It shall rest on a shelf that is not more than 7" deep. External dimensions shall be no larger than 10 1/4" x 15 1/4" x 9" (H x W x D).
  - b. Construct the enclosure of aluminum and finish with an attractive and durable protective coating. Permanently display model, serial number, and program information on the top surface.
2. Electronics
  - a. Modular electronics with vertical circuit boards. Horizontal circuit cards are not acceptable.
  - b. Use a microprocessor for timing and control functions. Verify continuing operation of the microprocessor by an independent monitor circuit that is set an output and indicate an error message if a pulse is not received from the microprocessor within a defined period.
  - c. In the interest of reliability, do not use sockets for any electronic device. Devices must be directly soldered to the printed circuit board. Use surface mount parts for the majority of the electronic components in the controller.
  - d. Use a built-in, high-efficiency switching power supply to generate required internal voltages as well as 24 VDC for external use. Regulate voltages and monitor with control signals. Mount the fuses on the front of the controller for 120 VAC input and 24 VDC output.
  - e. Derive timing of the controller from the 120 VAC power line.
  - f. Store user-programmed settings and intersection configuration data in Flash Memory. Memory requiring an energy storage device (battery or capacitor) to maintain user data is not acceptable. To facilitate the

transfer of user programmed data from one controller to another, a data transfer module (data key) using a separate serial flash memory device is an option. This data transfer module shall be easily removable and directly accessible from the front of the controller. The controller shall not require this module to be present for proper operation.

- g. Store controller software in Flash Memory devices. The controller software shall be easily updated without the removal of any memory device from the controller. The use of removable PROMS or EPROMS from the controller is not acceptable. Option to update software on the controller using a Windows based computer. Allow updating the controller software via a serial or Ethernet port from the front of the controller. Updating the controller software shall require the intersection to be in flash for no more than ten seconds using Ethernet file transfer.
  - h. Printed circuit boards shall meet the requirements of the NEMA Standard plus the following requirements to enhance reliability:
    - (1) Plated -through holes and exposed circuit traces with solder.
    - (2) Solder mask material covering both sides of the printed circuit board.
    - (3) Clearly marked circuit reference designation for components and the polarity of capacitors and diodes adjacent to the component. Designated pin 1 for integrated circuit packages on both sides of printed circuit boards.
    - (4) Printed circuit board assemblies, except power supplies, coated with a clear moisture -proof and fungus -proof sealant.
3. Front Panel
- a. Front of the controller consisting of a panel for the display, keyboard, and connectors for necessary user connections. Maintenance of the electronic circuits and option installation will be possible by opening the front panel only.
  - b. Required 16-line by 40-character/line alphanumeric liquid crystal display (LCD) to show program, and status information with the display area nominal measurements of 2 1/2" x 4 1/2" (H x W), or larger. Provide, for ease of viewing, backlighting by light emitting diodes and multiple levels of contrast adjustment. Adjustable display contrast with front panel mounted push buttons. The use of user potentiometers for display contrast shall not be acceptable.
  - c. Clearly labeled front-panel operator inputs and environmentally sealed electrometric keys. Including a 10 digit numeric keypad, nine function keys, an oversized ENTER key, and an oversized four arrow cursor control key.
  - d. Required nine function keys, clearly labeled, and providing the following operation:  
MAIN MENU - Pressing the Main Menu key displays the main menu.

SUBMENU - Pressing the Sub Menu key from a data screen displays the current submenu.

NEXT DATA - Pressing the Next Data key searches for the first non-zero data field, thus allowing rapid search for valid entries.

NEXT SCREEN - Pressing the Next Screen key I displays the next screen, thus allowing rapid advancement from screen to screen.

HELP - Pressing the Help key at a data entry field displays a help screen about that field.

STATUS DISPLAY - Pressing the Status Display key presents the intersection status display.

NEXT PAGE - Pressing the Next Page key advances to the previous or next group of data entry screens in a submenu.

BACKLIGHT - Pressing up and down arrow-shaped keys adjusts the backlighting of the LCD display screen for brighter or dimmer contrast.

SPECIAL FUNCTION - Pressing the special function key places Pedestrian Calls while viewing the main status display, lock access to controller data until supervisor or data change access codes are entered, and enter hexadecimal values.

CLEAR - Pressing the clear key aborts a data entry and restores the current value.

#### 4. Data Key

- a. A data key available for use as a database storage device (backup) or as a database transfer module capable of storing a minimum 256KB of data.
- b. The data key hot swappable, to be inserted and removed without powering down the controller.
- c. The data key capable of storing the entire controller database and shall retain the information without use of battery or capacitor backup.
- d. The data key is not required by the controller to be present during normal operation.

#### 5. Connectors

- a. Accessible interface connectors from the front of the controller. Controller models able to accommodate different versions, as follows:
  - (1) NEMA TS2 Type 1
  - (2) NEMA TS2 Type 2
  - (3) NEMA TS1
- b. Connectors and signals compatible with the Econolite Model ASC/2, ASC/2S & ASC -8000 25 pin telemetry port and D connector.
- c. Capable of assigning special applications of input or output function to any input or output pin respectively on the interface connectors, with the

exception of Flashing Monitor, Controller Voltage Monitor, AC+, AC-, Chassis Ground, 24 VDC, Logic Ground and TS2 Mode bits.

6. Serviceability

- a. Electronic modules including the power supply easily removable from the front of the controller using a screwdriver as the only tool. Plug in connector for power and signal connections to the circuit boards.
- b. Allow the removal and replacement of any circuit boards without unplugging or removing other circuit boards, except for the power supply. No more than two boards shall be attached together to form a circuit assembly.
- c. Designed for one side of any circuit board to be accessible for troubleshooting and testing while the controller is still in operation and accomplished without the use of extender cards or card pullers.

B. DISPLAY

1. Dynamic Displays

- a. Provide dynamic displays listed below to show the operational status of the controller and offering additional displays for programming. Possible to place vehicle, pedestrian, and preemption calls from the keyboard while displaying status information.
- b. Intersection status displaying a summary of ring, phase, coordination, preemption and time-based control status.
- c. Controller status display indicating current interval, pedestrian, density, maximum, and maximum extension timing by phase and ring. Display the status of vehicle and pedestrian signal outputs in combination with vehicle and pedestrian calls.
- d. Coordinator status display indicating the command source, current coordination pattern information, local and system cycle count, commanded/actual offset, offset correction, time based control status, hold, force off, vehicle permissive, split count down, split extension, offset from ring 1 and green band indications.
- e. Preemptor status display indicating priority (railroad, fire, emergency) preemptors and bus preemptors with calls, preemptor active, inhibit, and delay status. When a preemptor is active, the display also indicates preemptor interval, timing, duration, and hold status. A portion of the display indicating the controller status during preemption including current status, interval, and timing by phase and ring and the status of vehicle and pedestrian signals for each phase.
- f. Time base status display indicating the current time and date, the current day and week program, the active program step for both coordination pattern and time of day functions, the start time of the next program step, and the highest step used. Also displays the programmed selections of the active coordination pattern and time of day pattern.

- g. Communications status displays for Port 1 (SDLC), Port 2 (terminal) Port 3, Ethernet, and NTCIP.
  - h. Port 1 (SDLC) status display indicating the frame responses from the MMU, the terminal and facilities BIUs and the detector BIUs.
  - i. Ports 2 and 3 status display indicating the interconnect format, transmit, valid data, data error, carrier detect and the last valid command.
  - j. An Ethernet status display indicating the line speed, the line status, the total number of transmitted and received counts and transmitted and received error counts.
  - k. An NTCIP status display indicating the total number of SNMP and STMP transmitted and received counts.
  - l. A detector status display indicating activity for up to 64 detectors. The display shows the detector calls as processed by the controller.
  - m. Flash/malfunction management unit (MMU) status display indicating flash status plus MMU channel, conflict, and monitoring function status. A separate display indicating the results of the controller's comparison of its MMU programming to the programming in the controller.
  - n. An input and output status display indicating the activity of the logic level inputs and outputs to the controller.
2. Programming Displays
- a. Programming displays in the form of menus to aid the operator in entering data from the front -panel keyboard.
  - b. A main menu allowing the user to select a major function of the controller. A submenu shall then be displayed to allow the user to select a sub -function within the major function. A four arrow cursor key allows the user to scroll through programmed data.
  - c. English language and traffic engineering terminology shall be used throughout to facilitate programming. The display organization allows traffic personnel to program the controller without using reference cards or manuals. Data entry and data screens shall be in logical order.
  - d. Programming entries consisting of alpha-numerical values, YES/NO and ON/OFF entries. During program entry, new data is displayed as it is entered. Validated and stored entries only when the consistency check is preformed for entries that are constrained by other programmed data or when the ENTER or cursor key is pressed when they are not.
  - e. An example of constrained data is the sequence of the phases within a ring. Checked with the phase compatibility, phases in the ring and start phases among others.
  - f. An example of non-constrained data is the vehicular extension time entry.

- g. The keyboard entry software shall include context sensitive help screens. Help information accessed by placing the cursor on the data entry in question then pressing the HELP key. Help screens provided for keyboard entered data and shall include at a minimum range, description, and functional operation information for the data entry.

## C. PROGRAMMING

### 1. Programming Methods

- a. Methods listed below shall be available for controller configuration and timing entries. The manufacturer shall be able to provide as off the shelf items firmware and software required to affect the listed methods and to implement network operation with system masters and host PC's.
  - (1) Manual data entry from the front panel keyboard
  - (2) Downloading from telemetry from a system master connected to a host PC in a closed loop system.
  - (3) Downloading from a portable PC-compatible computer via an Ethernet or serial cable.
  - (4) Transfer from one controller to another using the Ethernet port on each controller.
  - (5) Transfer from one controller to another, or restoring for a back up copy, using a data transfer module (data key).

### 2. Programming Security

- a. A minimum of three access levels available to provide programming security.
  - (1) The highest or supervisor level shall have access to programming entries including setting access codes.
  - (2) The second or data change level shall have access to programming entries except access codes.
  - (3) The third or data display level shall only have access to displayed data. No access code shall be required to display data.
- b. User selectable, four digit access codes provided for the supervisor and data change access levels. Access codes shall initially be set to provide unrestricted access.
- c. If there has been no keyboard activity the controller shall automatically logoff the user after 30 minutes.

### 3. Programming Utility Functions

- a. A copy function shall permit copying timing data from one phase to another. It shall also permit copying timing plan from one timing plan to another, one detector plan and detector options plan to another, coordination pattern data from one pattern to another and one sequence to another. This feature will facilitate data entry when programming any two or more phases with the same timing values, or detectors with the

same programming, and/or two or more coordination patterns with the same pattern data.

- b. The controller unit shall contain a backup data base with user specified values stored in nonvolatile memory. A copy function shall permit transferring the backup database to the active database.
- c. A memory clear function shall permit the user to clear data entries for the following controller functions, either individually or all at once:
  - (1) Configuration
  - (2) Controller
  - (3) Coordinator
  - (4) Preemptor
  - (5) Time base
  - (6) Detectors
  - (7) Logic Processor
- d. A sign on message shall allow the user to view the controller software version number. This message shall be displayed upon power up until a key is depressed. It shall also be possible to display the sign on message by keyboard selection. The sign on display shall allow a user defined message of up to two lines with 38 characters per line.
- e. The controller shall have the capability to output a memory image of the user programmed settings and intersection configuration data in binary format. This shall allow transferring the memory image data to a data key.

#### D. ACTUATED CONTROL FUNCTIONS

The controller shall provide actuated control functions and operations required by the NEMA TS2 Standard. In addition, it shall provide the features described in the following paragraphs.

##### 1. Phase Sequence

- a. The phase sequence of the controller shall be programmable in any combination of sixteen phases, eight concurrent groups and four timing rings.
- b. Phase sequence information shall be changeable from the keyboard and stored in EEPROM data memory.
- c. The standard phase sequence of the controller shall also be capable of being altered by coordination, time of day or external alternate sequence command. The alternate sequence commands shall allow reversing the normal phase sequence of each phase pair as shown below:
  - Command A - reverses phases 1 and 2
  - Command B - reverses phases 3 and 4
  - Command C - reverses phases 5 and 6
  - Command D - reverses phases 7 and 8



Command E - reverses phases 9 and 10  
Command F - reverses phases 11 and 12

- d. The operator shall be able to select from a library of standard sequences. As a minimum, the following shall be provided:
  - (1) Standard NTCIP sequence
  - (2) Two through eight phase controller
  - (3) Sixteen phase quad left turn controller
  - (4) Four single ring 4 phase controllers
  - (5) Dual TS2 eight phase quad controllers
  - (6) TXDOT three phase diamond controller
  - (7) TXDOT four phase diamond controller
- e. An exclusive pedestrian clearance movement provided that will time and display the pedestrian indications with the vehicle movements remaining in all red.

## 2. Timing Intervals

- a. Timing intervals shall be programmable from 0-255 in one second increments or from 0-25.5 in one tenth second increments, depending on the function.
- b. Four independent timing plans provided and selectable on a time of day basis or by coordination pattern. Each plan shall contain the following interval timings:

- |                                  |                                  |
|----------------------------------|----------------------------------|
| (1) Minimum Green                | (15) Maximum 3                   |
| (2) Bike Green                   | (16) Dynamic Maximum             |
| (3) Delay Green                  | (17) Dynamic Maximum Step        |
| (4) Walk                         | (18) Yellow Clearance            |
| (5) Walk 2                       | (19) Red Clearance               |
| (6) Walk Maximum                 | (20) Red Maximum                 |
| (7) Pedestrian Clearance         | (21) Red Revert                  |
| (8) Pedestrian Clearance 2       | (22) Actuations before Reduction |
| (9) Pedestrian Clearance Maximum | (23) Seconds per Actuation       |
| (10) Pedestrian Carryover        | (24) Maximum Initial             |
| (11) Vehicle Extension           | (25) Time before Reduction       |
| (12) Vehicle Extension 2         | (26) Cars Waiting                |
| (13) Maximum 1                   | (27) Time to Reduce              |
| (14) Maximum 2                   | (28) Min Gap                     |

- c. Guaranteed minimum interval values specified at the time of purchase and shall not be changed or overridden from the keyboard. Values provided for the following intervals:
  - (1) Minimum green
  - (2) Walk
  - (3) Pedestrian clearance
  - (4) Yellow clearance
  - (5) Red clearance
  - (6) Red revert
  - (7) Overlap Green
- d. A bike green interval provided that will replace the phase minimum green if the interval time is larger than the min green time and if a detector input designated as a bike detector has been activated.
- e. Two Walk and Pedestrian Clearance intervals provided for each phase per timing plan. The second Walk and Pedestrian Clearance activated by a time base action plan.
- f. Two vehicle extension intervals provided for each phase per timing plan. The active vehicle extension interval selected by a time base action plan.
- g. If enabled, a Delay Green timer shall delay the vehicle phase from starting until the timer has expired. This shall provide an additional all red for the vehicles movement until the timing is complete.
- h. The Pedestrian Walk interval shall extend from Walk to the smaller of the Walk Max time or the phase maximum in effect with a constant input from the "Walk Extension detector".
- i. Volume density intervals shall include actuations before and cars waiting. Actuations before added shall provide a user specified number of actuations that must occur before adding variable (added) initial time. Cars waiting shall provide a user specified number of actuations, or cars waiting, that must occur before starting gap reduction. Gap reduction shall be initiated by either; time before reduction or cars waiting, whichever reaches its maximum value first.
- j. Capable of dynamically extending the maximum green time for each phase based on vehicle demand. Three maximum green intervals shall be selectable per phase based on either time of day, coordination pattern or external input. The initial interval shall be selectable as Max 1, Max 2, or Max 3. If the phase terminates due to max out for two successive cycles, then the maximum green time in effect shall automatically be extended by a dynamic max step interval on each successive cycle until it is equal to dynamic maximum. If the phase gaps out for two successive cycles, then the maximum green time reduces by the dynamic max step time until it reaches to the original max value.
- k. Each phase shall have a red maximum timing interval. An input (red extension) shall extend the all red period of the assigned phase as long as the detector input is true. This input must be true within the all red

time of the assigned phase to be able to extend the all red period. If this detector fails then the all red extension feature shall be disabled.

3. Overlaps

- a. The controller shall provide sixteen internally generated overlaps (A - P). These shall be individually programmable as standard, other (see Section 5.3.2) or minus green / yellow. The green, yellow and red intervals shall be individually programmable following termination of the parent phase. The overlaps programmed as minus green / yellow overlaps shall provide overlap green when any of the overlap phases are green or when in transition between overlapped phases and a modifier phase is not green. The overlap will be yellow when an overlapped phase is yellow and the modifier phase is not yellow and none of the overlapped phases are next.
- b. The other overlap option shall provide for protected, pedestrian protected, not overlap, trailing, leading and advance green programming.
- c. A protected overlap shall be green, yellow, or red like a normal overlap except its outputs shall be blank when the protected phase is green, or the controller is transitioning to a non included phase.
- d. A pedestrian protected overlap shall be green under the following conditions:
  - (1) When an included phase is green and the protected pedestrian is NOT in walk or pedestrian clearance
  - (2) When the controller is in transition between included phases and a pedestrian protected phase is not next
  - (3) After servicing an included phase pedestrian demand if there is enough time before max out to service the overlap minimum green
- e. The controller shall provide the capability of sixteen pedestrian overlaps. These shall be capable of overlapping the pedestrian displays of any combination of phases with a pedestrian movement.
- f. Overlap functions shall be programmable from the controller keyboard.
- g. The controller shall provide a programmable conditional service feature. When selected, the controller shall service an odd numbered phase once normal service to that phase has been completed and enough time for additional service exists on the concurrent even phase.
- h. A conditional service minimum green time shall be programmable for each phase. This interval shall ensure a minimum green if the phase is conditionally served.
- i. It shall be possible to program the controller to re-service the even phase after conditionally serving an odd phase. Once an even phase has been conditionally re-served, the odd phase shall not be conditionally served again until returning to the concurrent group that is timing.

#### 4. Additional Features

- a. The following features shall be programmable for each phase in each of four separate detector plans:
  - (1) Locking/non-locking detector memory
  - (2) Vehicle recall
  - (3) Pedestrian recall
  - (4) Maximum recall
  - (5) Soft recall No-rest phase
  - (6) Enable Added Initial
- b. Also programmed by phase shall be:
  - (1) Phase in use
  - (2) Exclusive Pedestrian phase
- c. Soft recall shall return the controller to the programmed phase in the absence of other calls.
- d. If a phase is designated as a no rest phase the controller shall not rest in the phase.
- e. The controller shall permit power start and external start to be individually programmed by phase and interval. Start intervals shall be green, yellow red, or yellow with overlaps forced yellow.
- f. During a power start condition, the controller shall be capable of timing an all red or flash interval before the power start phase(s) and interval are displayed.
- g. The controller shall provide guaranteed passage operation on a per phase basis. When selected, this feature shall provide a full passage (vehicle extension) interval when a phase gaps out with a gap in effect less than the vehicle extension interval (preset gap).
- h. The controller shall provide both single and dual entry operation. When selected, dual entry shall cause the controller to ensure that one phase is timing in each ring.
- i. It shall be possible via keyboard selection to inhibit the service of a phase with other phase(s) within the same concurrent group.
- j. The controller shall provide the following additional selectable pedestrian functions:
  - (1) Actuated phase rest in WALK
  - (2) Flashing WALK output
  - (3) Pedestrian clearance protection during manual control
  - (4) Pedestrian clearance through yellow
  - (5) Pedestrian indications remain dark with no call
  - (6) Pedestrian timing shall be capable of being carried over from one phase to another

- (7) Programming shall be provided to inhibit re-service of odd phases (left turns) within the same concurrent group.
- k. The controller shall provide a programmable simultaneous gap termination feature. When programmed, phases in both rings shall gap out together in order to terminate the green interval and cross the barrier.
- l. The controller shall provide automatic flash selection according to the requirements of the MUTCD. Both the flash entrance and exit phases shall be programmable through the keyboard, and flashing shall be controlled by either setting the fault/voltage monitor output to be FALSE or by flashing through the load switch driver outputs. If flash desired through the load switches, both the phase and flash overlap outputs either yellow or red as selected by the operator. Automatic flash will be selectable by external input, system command, or time of day action plan.
- m. The controller provides dimming for selectable load switch outputs. Dimming will be accomplished by inhibiting the selected outputs for alternate half cycles of the 120 VAC line. Dimming controllable by time of day and an external input; both functions must be TRUE for dimming to occur. Programming permits individual dimming of the Green/Walk, Yellow/Ped Clear, Red/Don't Walk outputs for each load switch.

## E. COORDINATION

Coordination functions to control intersection cycle lengths, system offset relationships, and phase split percentages provided as a standard feature, with no need for additional modules or software.

### 1. Coordination Patterns

- a. Provide a minimum of 120 coordination patterns. Each pattern allows selection of an independent cycle length, offset value and split pattern. The coordination patterns selected using telemetry (system), hardwire, or non-interconnected (time base) coordination commands.
- b. The coordination patterns selected by the coordination command using the following formats:

**Pattern.** This format allows selecting the coordination patterns directly, that is, commanding Plan 1 selects Pattern 1. Pattern command includes 1-120 patterns, pattern 254 shall select free and pattern 255 shall select flash.

**Standard.** This format allows selecting the coordination patterns using a pattern number derived from a cycle offset split command. Each pattern assignable to a specific cycle offset split combination. The coordination pattern selected using the formula

$$(((\text{Cycle} - 1) * 20) + ((\text{Split} - 1) * 5) + \text{Offset}).$$

**TS2.** This format allows selecting the coordination patterns as a function of Timing Plan and one of three offsets. With this format a

minimum of 20 Timing Plans available for selection of one of sixty coordination patterns.

- c. The following functions programmable in each coordination pattern:
    - (1) Cycle length
    - (2) Split pattern
    - (3) Offset value
    - (4) Alternate phase sequence
    - (5) Split and offset in seconds or percentage
    - (6) Crossing artery pattern
    - (7) Permissive timing
    - (8) Action plan
    - (9) Coordinated phase split extension
    - (10) Timing plan
    - (11) Actuated rest in walk
    - (12) Phase re-service
    - (13) Ring extension
    - (14) Split demand pattern
    - (15) Ring displacement
    - (16) Directed split preferences
    - (17) Special function outputs
  - d. The following functions shall be programmable for each of the 120 Split patterns:
    - (1) Coordinated phase
    - (2) Split value by phase
    - (3) Omit by phase
    - (4) Min recall by phase
    - (5) Max recall by phase
    - (6) Pedestrian recall
    - (7) Max and Pedestrian recall
2. Cycle Length
- a. One cycle length provided for each coordination pattern. The cycle adjustable over a range of 30-255 seconds in 1-second increments.
  - b. The cycle length serves as the reference time for coordination timing.
- ### 6.3. Synchronization
- c. For systems with a single system sync pulse, coordination timing synchronized to the leading edge of that pulse that serves as the master zero reference for offset timing.
  - d. For hardware systems with multiple sync pulses, the coordinator locks onto the correct sync by trying different syncs and checking for reoccurrence during successive cycles.
  - e. After a valid system sync pulse has been received the coordinator checks for the proper occurrence of the system sync pulse during each subsequent cycle. If a sync pulse does not occur, the coordinator self syncs and continue to operate with the last set of coordination commands for a programmable number of cycles from 0-255. If a sync

pulse does not occur within the programmed period (or until the first sync pulse is received), the coordinator shall revert to the non-interconnected coordination mode.

### 3. Offset

- a. Offset normally defined as the time period from the system sync pulse to the beginning of the leading coordinated phase green (local zero). The coordinator capable of referencing the offset to the beginning of the lagging coordinated phase green, coordinated phase yield or start of yellow point.
- b. Offsets shall be programmable using both percent and seconds. The range is from 0-99% of the cycle length in 1% increments or 0-254 seconds in 1 second increments. An offset value of 255 results in free.
- c. Offset changes achieved by adding or subtracting cycle time over a maximum of three cycle periods to allow a smooth transition to the new offset. Other offset change methods may be to add 20% to each cycle or to snap to the sync point once the permissive periods are complete and the coordinated phases are green. Offset correction using dwell also selectable.

### 4. Split

- a. Each split provides a split interval for each of sixteen phases. The split interval is programmable using percent or seconds. The range is from 0-99% of the cycle length in 1% increments or 0-255 seconds in 1 second increments.
- b. Split interval settings determine the maximum time, including vehicle clearance (yellow and red), for a non-coordinated phase, or the minimum time for a coordinated phase. Phase termination controlled by establishing a force off point for each phase within the cycle. Except for the coordinated phases the force off point is selectable to be a fixed point within the cycle or allowed to float. If floating force offs are selected each phase shall time no more than its own split interval.
- c. During coordination, it shall be possible to operate a coordinated phase as actuated or non-actuated. If a coordinated phase is actuated, vehicle detections shall permit the coordinator to extend a phase beyond the normal yield point. Extended coordinated phase green shall be selectable using the same range as split interval settings (percent or seconds). If actuated coordinated phases are used they shall be able to have actuated or non-actuated (walk rest) pedestrian movements.

### 5. Permissive Periods

- a. Permissive periods provided to control the time period during coordinated phases released to service calls on non-coordinated phases.

- b. Permissive timing begins at the lead coordinated phase yield point. A yield point automatically computed for the coordinated phase in each ring. The coordinated phase yield point allows the coordinated phases to yield independent of each other. The yield point is the point that the coordinated phase is released to allow the controller to service calls on non-coordinated phases. The computation takes into account the coordinated phase split interval plus pedestrian and vehicle clearance times.
  - c. Automatic permissive period operation provided by automatically calculating a permissive period for each non-coordinated phase. The permissive period shall consist of a separate vehicle and pedestrian period computed from the phase split interval and the vehicle/pedestrian minimum time. The controller answers a call only during the associated phase permissive period. However, once the controller has been released to answer a call, remaining phases are served in normal sequence.
  - d. Single permissive period operation provided by defining a single time period per cycle beginning with the yield point during which the controller is allowed to answer phase calls for any phase. The duration of this period will be selectable in each coordination pattern.
  - e. Dual permissive period operation provided. During the first permissive period, the controller answers only vehicle or pedestrian calls on the phases following the coordinated phase. If the controller services a call during this period, calls on the remaining phases are served in normal rotation. During the second permissive period, the controller shall answer calls on remaining phases except the first permissive phase. The duration of the two permissive periods, and the time to start the second permissive period (displacement), will be selectable in each coordination pattern.
6. Phase Re-service
- a. If actuated coordinated phases are in use, it shall be possible to re-service non-coordinated phases within the same cycle if sufficient time remains. A phase shall be re-serviced only if the permissive period for the phase indicates there is sufficient time remaining in the cycle to service the phase.
  - b. Phase re-service shall be capable of being enabled/ disabled in each coordination pattern.
7. Transition Cycles
- a. The controller provides a smooth and orderly transition when changing from free operation to coordinated operation and from one coordination command to another.
  - b. During a free to coordinated transition, the controller shall initiate a pick up cycle beginning upon receipt of a sync pulse and a valid coordination



command. The controller shall then enter coordination mode upon crossing a barrier or if resting in the coordinated phases.

- c. Each coordination command selects a pattern. A command change implements concurrent with a sync pulse. Cycle, offset, and split changes does not take effect until local zero.

#### 8. Crossing Artery Control

- a. The coordinator capable of implementing dual coordination at an intersection where two arterials are under control of separate masters.
- b. An external input enables dual coordination. Once enabled, the coordinator places a continuous call on the crossing artery phases so as to ensure that these remain green for their full split interval.
- c. The coordinator outputs a crossing artery sync signal to indicate the beginning of the crossing artery phase split interval.
- d. Dual coordination forces a selectable crossing artery split plan to be used so as to allow a particular split to be optimized for dual coordination in each coordination pattern.

#### 9. Local Split Demand

- a. The coordinator provides a minimum of two split demand detector inputs that allow the selection of a preferred split plan based on intersection demand.
- b. If the split demand detector indicates continuous vehicle presence during a programmed monitoring period beginning with the onset of a selected phase green, the coordinator forces a selectable split plan to be in effect during the next cycle. This split plan remains in effect for a selected number of cycles from 0 - 255. A specific split plan is capable of being selected in each coordination pattern.

#### 10. Adaptive Split Demand

The coordinator provides a method to select the split using measurement of each phase's green utilization. From the measurement, the coordinator determines which phase or phases had excess time that was not used during the last measurement period. Then the excess time is added to the first set of preferential phases. If the first set of preferential phases gapped out during the last measurement period, then the excess time will be added to a second set of preferential phases. If both sets of preferential phases gapped out during the last measurement period then the time shall be added to the beginning of the coordinated phases.

#### 11. Free Mode

- a. The coordinator provides a free mode of operation, where coordination control is removed.
- b. Free mode operation is selectable by coordination commands, by external input or by keyboard entry.

- c. The coordinator reverts to the free mode when active controller inputs or functions would interfere with coordination. Such inputs or functions include the following:
  - (1) Manual control enable
  - (2) Stop time
  - (3) Automatic flash
  - (4) Preemption
- d. The coordinator provides an active free mode, where coordination control is removed but the coordinator continues to monitor system sync so as to keep its timing in step with the system master.

## 12. Manual Control

The controller allows manual override of the current coordination command from the keyboard. The manual command allows selection of coordination patterns to be in effect.

## 13. Interconnect Modes

- a. The coordinator capable of operating with any of the following interconnects types:
  - (1) Non-interconnected coordination (time-based)
  - (2) Telemetry
  - (3) Hardwired
- b. The coordinator is compatible with fixed time interconnect that provides the sync pulse superimposed on the offset lines. Also operates within an interconnected system using a separate sync line. The non-interconnected coordination mode serves as a backup when using telemetry or hardwired interconnect.

## 14. Master Coordinator

The coordinator shall output the coordination command, including sync pulse. This will permit the controller to be used as a time of day master in a hardwired interconnected system.

## F. PREEMPTION

The controller shall provide a minimum of ten preemption sequences that can be programmed as either railroad-fire emergency or bus vehicle preemption sequences. Preemption capability standard and not requiring additional modules or software:

### 1. Railroad-Fire-Emergency Vehicle Preemption

- a. The ten railroad fire emergency vehicle preemptors selectable as a priority or non-priority Type. Priority preemptor calls overriding non-priority preemptor calls. Low numbered priority preemptors overriding higher numbered priority preemptor calls. Non-priority preemptor calls serviced in the order received.

- b. Each preemptor providing a locking and non-locking memory feature for preemptor calls. If a preemptor is in the non-locking mode and a call is received and dropped during the delay time, the preemptor is not serviced.
- c. Preemptor timing intervals programmable from 0 - 255 in one-second increments or 0 -25.5 in one-tenth second increments, depending on function. Delay, max presence, and duration timing intervals programmed from 0 – 65535 seconds in one-second increments.
- d. A programmable delay time interval shall be provided to inhibit the start of the preemption sequence. This interval shall begin timing upon receipt of a preemption call. This time shall be programmable from 0 - 255 seconds in one second increments.
- e. An inhibit time shall be provided as the last portion of the delay time interval. During this time, phases that are not part of the preempt sequence shall be inhibited from service. This time shall be programmable from 0 - 65535 seconds in one second increments.
- f. A programmable extend input causing the preemptor to remain in the dwell interval following the removal of the preempt call. If a preempt call is reapplied during this time, the preemptor shall revert to start of dwell interval. This time is programmable from 0 - 25.5 seconds in one tenth second increments.
- g. A programmable duration time provided to control the minimum time that a preemptor remains active. This time is programmable from 0 - 65535 seconds in one second increments.
- h. A programmable maximum time provided to control the maximum time that a preemptor input remains active and still be recognized by the controller. Once failed, the input must return to inactive state to be recognized again.
- i. Phase timing at the beginning of a preemption sequence remains in effect for a minimum time before the controller advances to the next sequential interval. If the phase has been timing for longer than the programmed preemptor minimum time, the controller shall immediately advance to the next sequential interval. Minimum times shall be programmable for the following intervals:
  - (1) Green/walk/pedestrian clearance
  - (2) Yellow
  - (3) Red
- j. A phase shall advance immediately to pedestrian clearance if it has been timing a WALK interval at the beginning of a preemption sequence. It shall be possible to time the minimum pedestrian clearance through the yellow interval, or alternately to advance immediately to yellow. During preemption, pedestrian indicators is selectable as being a solid DONT WALK, OFF (blank) or fully operational.

- k. If an overlap is in effect when the preemption sequence begins, it shall be possible to terminate the overlap so that it remains red for the remainder of the preemption sequence. Overlaps terminating or forced to terminate shall time the preemptor minimum yellow and red clearance times.
- l. Each preemptor provides user programmable green, yellow, and red track clearance intervals. Timing begins immediately after the preemptor minimum red interval.
- m. Up to four permissive phases selectable as track clearance phases. During the track clearance period, the selected phases times the track clearance green, yellow and red intervals once, and then advance to the hold interval. If track clearance phases are not selected the track clearance interval omitted from the preempt sequence and is the controller interval timing used if track clearance interval times have been programmed as zero.
- n. The preemption hold interval begins immediately after track clearance. It remains in effect until the preemptor duration time and minimum hold times have elapsed and the preemptor call has been removed or the preemptor maximum time has been exceeded. During the preemption hold interval, any one of the following conditions shall be selectable:
  - (1) Hold phase green
  - (2) Limited phase service
  - (3) All red
  - (4) Flash
- o. Any valid phase, except a track clearance phase, selectable as a hold phase. If hold phases are not selected, the controller remains in all red during the hold interval. If flash is selected for the hold interval, up to two permissive phases shall be selectable to flash yellow, and the remaining phases shall flash red. Overlaps associated with the phases flashing yellow also flashes yellow unless they have been forced to terminate, in which case flashes remain red.
- p. The preemptor shall immediately cause flashing operation if the preemption input and the track interlock input are not in opposite states and the track interlock function is enabled.
- q. Each preemptor provides a user programmable green, yellow, and red hold interval, during which the hold phase(s) shall operate normally, except that the minimum green interval time shall equal the hold green time. At the completion of the hold green interval, the controller times the hold yellow and red clearance intervals before transfer to the exit phases.
- r. Up to four permissive exit phases will be selectable to time after the preemption sequence is completed serving as transition phases to return the controller to normal operation. It shall also be possible to place calls

on selected phases upon exiting preemption. The option causes the preemptor to exit preemption to the correct phase to maintain coordination.

- s. Each preemptor provides a user programmable exit maximum time. Upon exiting the preemption sequence, times shall serve as the maximum green time effective for one controller cycle for all phases except hold phases.
  - t. Preemptor linking permits preemption sequences, where lower priority preemptors may call the higher priority preemptors from their preemption sequence.
  - u. Preemptor active outputs provided for each of the preemptors. The output sets to ON when the preemption sequence begins and remains ON for the duration of the sequence. Possible to program preempt active outputs to be ON only during preempt hold intervals. Additionally, it shall be possible to program the non-active, non-priority preemptor outputs to flash while another preemptor is active.
  - v. Preemptors normally override automatic flash. It will be possible to inhibit this feature for each preemptor.
2. Bus Preemption
- a. Ten bus preemptors provide control for bus or other low priority vehicles. Bus preemptors have low priority and are overridden by railroad/fire/emergency vehicle preemptor calls.
  - b. The preemptor is programmed to accept either a 6.25 pulse per second signal with a 50% duty cycle or a solid input to identify a bus preemptor call. Bus preemptor calls shall be capable of preemptor call memory and served in the order received.
  - c. Bus preemptor timing intervals programmable from 0 - 255 in one second increments or 0 - 25.5 in one tenth second increments depending on the function.
  - d. A re-service time provided to avoid excessive utilization of the same bus preemptor. If a call is received before the re-service time has elapsed, the bus preemptor shall not be re-serviced. If re-service time has not been entered then all phases with a call when leaving the bus preemption sequence shall be serviced before the bus preemptor may be served again.
  - e. Bus preemptors shall provide delay, inhibit, and maximum time functions similar to those for railroad/fire/emergency vehicle preemptors described above.
  - f. Bus preemptors shall provide the following entrance intervals:
    - (1) Green/walk/pedestrian clearance
    - (2) Yellow
    - (3) Red

- g. At the completion of the entrance red clearance, the bus preemptor shall advance to the hold green interval. During this interval, up to four permissive phases shall be selectable to remain green until the minimum hold time has elapsed and the bus preemptor call has been removed or the preemptor maximum time has been exceeded.
  - h. It shall be possible to program the controller to allow concurrent phases to be serviced for a bus preemptor with only one phase selected as the hold interval phase.
3. Preemption Safeguards
- a. If a preemptor call is active when power is restored to a controller, the fault/voltage monitor output shall be set to FALSE, placing the intersection in flash. Similarly, if external start is applied during a preemption sequence, the intersection shall be set to flash. Intersection flash shall remain in effect until the preemptor call has been removed and the preemptor duration time has elapsed.
  - b. An input provided to stop timing of the current active preemptor under control of the MMU/CMU.
  - c. A preemptor safety interlock provided to cause the intersection to go into flash whenever the controller has been removed or has not been programmed for preemption. This is achieved with an appropriate signal to the MMU/CMU.
4. Transit Signal Priority
- a. The controller includes a transit signal priority algorithm that provides for transit vehicle movement through the intersection, while not interrupting coordination or skipping phases.
  - b. Provide a check in detector input that senses the arrival of the transit vehicle. When active this input initiates Transit Signal Priority (TSP).
  - c. A TSP delay shall delay the beginning of TSP operation until a set interval after check in.
  - d. A check out detector input shall determine the departure of the transit vehicle.
  - e. Assignment of a single pulse from the check in detector and check out detector to the controller inputs programmable to any controller input. Including, inputs from devices that continuously pulse (pulsing as long as the vehicle requires TSP) through EVP 1 - 4, for a controller with a C1 connector, or through Preemptor inputs 3 – 6, on a controller with an MSD connector.
  - f. When under coordination the TSP sequence shall use alternate split times to accommodate transit vehicles while maintaining coordination.
  - g. When under free operation the TSP sequence uses alternate maximum times to accommodate transit vehicle while not skipping phase.

## G. TIME-BASED CONTROL & NON-INTERCONNECTED COORDINATION

The controller shall include time based control. This capability is a standard feature and shall not require additional modules or software.

### 1. Clock/Calendar Functions

- a. The controller shall provide a time of day (TOD) clock that is used for all time based control functions. The only required clock settings are the current time (hour, minute and second) and date (month, day and year). Day of week and week of year are automatically computed from the date setting. Also possible to set the number of hours that the local standard time is ahead or behind Greenwich Mean Time.
- b. During normal operation, the TOD clock shall use the power line frequency as its time base. When power is removed, a crystal oscillator maintains the time for up to 30 days. The oscillator has a timing accuracy of  $\pm 0.005\%$  over the entire NEMA temperature range as compared to the Universal Coordinated Time Standard.
- c. In addition to entering time and date via the keyboard, it is possible to download the information from another controller, a computer, or a system master.
- d. The controller includes a time reset input. This feature resets the TOD clock to 03:30 whenever the time reset input is TRUE.
- e. The TOD clock automatically compensates for leap year and shall be programmable to automatically switch to daylight savings time.

### 2. Time Based Control

- a. Time based control utilizes a day plan program format. The month program consists of 200 programmable schedules, each assignable to one of sixteen day programs. Each day program consists of from 1 to 50 program steps that define a program for the entire day. Each program step is programmed with a starting time and an action plan number. The day plans are also assigned to days of the week and days of the month.
- b. Time based control shall use action plans to assign:
  - (1) Coordination pattern number
  - (2) Vehicle detector plan number
  - (3) Controller sequence
  - (4) Timing plan
  - (5) Vehicle detector diagnostic plan
  - (6) Pedestrian detector diagnostic plan
- c. Time based control shall also use action plans to enable:
  - (1) Automatic flash
  - (2) System override
  - (3) Detector log

- (4) Dimming
  - (5) Special functions
  - (6) Auxiliary functions
  - (7) By-Phase functions
    - (a) Pedestrian recall - Walk 2 enable
    - (b) Vehicle extension 2 enable
    - (c) Vehicle recall
    - (d) Vehicle max recall
    - (e) Max 2 enable - Max 3 enable
    - (f) Conditional service inhibit
    - (g) Phase omit
  - d. A minimum of 36 holiday or exception day programs that override the normal day program. Holiday programs capable of being set as floating (occurs on a specific day and week of the month) or fixed (occurs on a specific day of the year) and, possible to program a fixed holiday so that it automatically repeats in the following year.
  - e. Possible to manually force any of the action plans to override the current action plan. The forced plan entered from the keyboard and remains in effect until removed.
3. Non-Interconnected Coordination
- a. A minimum of 200 time base schedule programs shall be available for the day-programs. These shall not have to be entered in any special sequence. It shall be possible to add and delete steps from a day program without affecting any other day-program. Each of the program steps shall permit selection of the following functions:
    - (1) Day program assignment
    - (2) Start time
    - (3) Action plan
  - b. Selection of system override in an action plan allows the coordination pattern selected by the action plan to override the current telemetry or hardwire system commanded coordination pattern.
  - c. When operating in the non-interconnected coordination mode the synchronization point for cycles references to a user selected reference time (sync reference), last event or last sync as selected from the keyboard. The sync reference time is that time at that cycles are reset to zero.
  - d. If the sync reference time is selected, the synchronization point for the cycle selected by the current program step is computed using the present time, sync reference time, and cycle length. The synchronization point occurs whenever the present time is an even



number of cycle length periods has occurred since the sync reference time.

## H. DETECTORS

### 1. Detector Functions

The controller provides a minimum of 64 vehicle detector inputs. Each input is assignable to any phase and programmable as to detector function. Extend and delay timing is provided for each detector. Each detector is capable of operating in a lock or non-lock mode. The controller is capable of providing 16 pedestrian detector inputs. Each pedestrian detector shall be assignable to any phase.

### 2. Detector Cross Switching

The controller provides detector cross switching that permits vehicle detectors to alternately place calls on assigned phases and assigned cross switch phases. If the assigned phase is not green and the cross-switch phase is green, the detector places calls on the cross switch phase. If the assigned phase is omitted, for any reason, the detector places calls on the cross switch phase.

### 3. Detector Types

Each vehicle detector is user programmable to operate as one of the following 3 detector types:

Type 0 (zero): supports all NTCIP or standard detector functionality.

Type 1: (GREEN DELAY) The first detection received when the phase goes green is recognized immediately, whether the detector is active when green starts or is activated after the green is timing. Detections received before the first timeout of the extension interval are also recognized immediately. Once the detector extension interval (not the phase extension interval) times out, further detector inputs are recognized only if continuously present for a period equal to the programmed delay time AND the delayed signal is NOT extended. The first detection received when the phase goes green, whether present when green starts or received later, is recognized immediately. Detections received before the first timeout of the extension interval are also recognized immediately. Once the detector extension interval (not the phase extension interval) times out, further detector inputs are recognized only if continuously present for a period equal to the programmed delay time AND the delayed signal is NOT extended.

Type 2: (STOP BAR WITH EXTEND TIME AND RESET) The detector input must be true when assigned phase green starts else the detector is disconnected for the balance of phase green. If the detector input is true when phase green starts the extension timer is reset while the input remains true. When the detector input is removed the extension timer begins running. If another detector input is received before extension time expires, the extension timer

is reset for the duration of the input and once again begins timing when the input goes false. This action is repeated until the extension timer times out, at which time it is disconnected for the balance of phase green.

#### 4. System Detectors

- a. Each detector input shall be capable of functioning as one of 16 system detectors.
- b. Vehicle detectors shall be capable of being assigned to a minimum of 16 speed detectors. Speed shall be detected using both one and two detector configurations. Speed shall be computed using a keyboard entered average vehicle length and loop length for a one detector configuration. When using two detectors, speed shall be calculated using a keyboard entered distance between detectors and travel time between detectors.

### I. SYSTEM COMMUNICATION

#### 1. On-Street Master Communications

The controller is capable of communicating with an on street system master. This capability provided by a separate telemetry module that is included in the controller when required by the drawings and specifications. The telemetry module receives system master commands and data transmissions. In addition, it transmits the controller status, data base and system detector information to the system master.

#### 2. System Commands

- a. The telemetry module allows the controller to receive, as a minimum, the following commands:
  - (1) Cycle, offset, and split (coordination pattern)
  - (2) System sync
  - (3) Special function commands (minimum of four)
  - (4) Free and flash mode commands
  - (5) Time and date
  - (6) Request for local status
  - (7) Recall to Max
- b. Commands must occur more than once in any three second period in order to be recognized.
- c. Mode and special function commands cleared after 20 minutes of loss of communication between controller and system master.
- d. Status Data – The status of each of the following functions shall be transmitted to the system master in response to a local status request:
  - (1) Green and yellow status for all phases and overlaps
  - (2) Walk and pedestrian clearance status for all phases

- (3) Vehicle and pedestrian detector status
  - (4) Phase termination status
  - (5) Local time
  - (6) Coordination status
  - (7) Command source
  - (8) Sync or transitioning status of coordinator
  - (9) Conflict flash status
  - (10) Local flash status
  - (11) Preempt activity and calls
  - (12) Volume and occupancy data from a minimum of 16 system detectors
  - (13) Speed data from a minimum of two speed detectors
  - (14) Maintenance required (cabinet door open) status
  - (15) Status of two user-defined alarms
- e. Split Reporting – The status of each of the following parameters calculated on a per-cycle basis and transmitted to the system master:
    - (1) Actual time spent in each phase
    - (2) Time of day at end of cycle
    - (3) Phases forced off during cycle
    - (4) Type of coordination operation
    - (5) Whether transitioning to new offset
    - (6) Cycle, offset, and split in effect during last cycle
    - (7) Flash status if operation is Free
  - f. Upload/Download Capability – The telemetry module provides the capability to upload/download the entire intersection database. Phase assignments for overlaps and preemptors are not to be downloaded to preclude unsafe controller operation. It is possible to inhibit downloading of phases in use and left turn head control. Data transfer shall not require the intersection to be in flash.
3. Telemetry
- a. Telemetry shall utilize TDM/FSK data transmission from 1200 baud to 9600 baud over two pairs of wires. These may be leased lines (Type 3002, voice grade, unconditioned) or dedicated cable. Optional fiber optic communications capability shall also be available.
  - b. The nominal transmitter output level shall be 0 dBm into a 600 ohm load. The receiver sensitivity shall be -34 dBm and adjustable from -40 to +6 dBm.
  - c. Parity and error checking employed to assure transmission and reception of valid data. Indicators provided on the telemetry module to show telemetry activity as follows: transmit, receive carrier, and valid data.

- d. In the event of a telemetry failure, the controller shall revert to the non-interconnected coordination mode after it has self synchronized for a number of cycles, which shall be selectable from 0-255.

#### 4. Communications Protocols

The controller has the capability of supporting communications with traffic management systems using industry standard protocols with the installation of appropriate optional software. At a minimum the controller has optional software to support the following protocols:

CalTrans AB3418

ECPIP

NTCIP

Level 2 as defined by Section 3.3.6 of NEMA TS2 - 2003. NTCIP v02.06 capabilities shall include for NTCIP mandatory and optional objects. The controller vendor provides access to controller data via vendor specific objects. These and other objects supported by the controller are defined in a standard MIB file.

#### 5. Ethernet Communications

The controller has the capability of supporting communications through Ethernet. This communications uses internal circuitry. The Ethernet port supports auto sensing of 10/100 Base T and half or full duplex operation.

#### 6. External Clock

The controller has the capability of communicating with an external clock like a GPS or WWV clock in order to set its internal time of day clock.

#### 7. Communications Ports

- a. The controller shall have as a minimum the following internal communications ports:

- (1) Port 1- SDLC for communications to other devices in the cabinet

- (2) Port 2 - Terminal port for communications with a computer for the purposes of uploading, downloading or upgrading the controller software

- (3) Port 3 - Systems communications port. This port provides either communicate to an on-street master or a central computer system

- (4) An option circuit board is available to expand communications by adding two additional serial communications ports

- b. Serial communications shall operate at 1200 to 115.2 K baud

### J. DIAGNOSTICS

#### 1. General Diagnostics Features

- a. The controller includes both automatic and operator initiated diagnostics. This capability is a standard feature and shall not require additional modules or software.

- b. Automatic diagnostics verifies memory, MMU compatibility programming, and microprocessor operation each time power is reapplied to the controller. After power has been applied, diagnostics continually verify the operation of essential elements of the controller including at a minimum: PROM, EE PROM, communications, and the microprocessor.
  - c. Operator initiated diagnostics allows the operator to verify proper operation of controller input, output, communications, keyboard, and display functions. Both manual and automatic test modes are provided.
2. Detector Diagnostics
- a. Time of day controlled detector diagnostics provided to allow testing vehicle and pedestrian detectors for no activity, maximum presence, and erratic output.
  - b. A minimum of eight detector diagnostic plans provided. These plans shall be selectable on a time-of-day basis. This allows varying the detector diagnostic intervals to correspond with changes in detector activity.
  - c. If a detector is diagnosed as failed, the associated phase is placed in one of the following keyboard selectable modes:
    - (1) Detector fail recall from 1 to 255 seconds
    - (2) Maximum Recall
    - (3) Disable the detector from calling or extending.
  - d. Diagnostics for NEMA TS2 detectors connected to the controller using a Bus Interface Unit (BIU) shall also include detection of watchdog, open and shorted loop, and excessive inductance change failures.

## K. LOGGING

The controller shall be capable of logging and reporting detector activity, detector failures, and the occurrence of selected events or alarms. Logs shall be capable of being printed or displayed on the front of the controller.

- 1. Detector Logging
  - a. The controller includes a detector log buffer capable of logging volume, occupancy and average speed for selected vehicle and speed detectors.
  - b. The detector logging interval has keyboard selectable as 5, 15, 30, or 60 minutes.
  - c. Detector logging is capable of being enabled or disabled by time of day.
- 2. Detector Failure Logging
  - a. The controller includes a detector failure log buffer capable of storing a minimum of 100 time and date stamped detector failure events. Once logged, detector failure events remain in the log until cleared or the log buffer capacity is exceeded at which time the oldest detector failure events shall be overwritten.

- b. Detector diagnostic failures are recorded in the detector failure log including: no activity, maximum presence, erratic output, watchdog failure, open loop, shorted loop, and excessive inductance change. If a detector recovers after a diagnostic failure, a detector on-line event shall be stored in the detector failure log.
  - c. Detector failure logging shall be capable of being disabled.
3. Event Logging
- a. The controller includes an event log buffer capable of storing a minimum of 200 time and date stamped events or alarms. Once logged, events remain in the buffer until cleared or the log buffer capacity is exceeded at which time the oldest events shall be overwritten.
  - b. At a minimum the following events logged: communication failures, coordination faults, MMU and local flash status, preempt, power ON/OFF, low battery, and status of a minimum of two alarm inputs, and an on line event logged when an event or alarm returns to normal status.
  - c. If security is enabled, an event logged when a user enters a data change. This event includes the user's ID. It is necessary to log the first change only and not every change. Also an entry is recorded when a user logs in and out of the controller.
  - d. Event logging shall be capable of being enabled or disabled for each category of event or alarm.
4. OE logging
- a. The controller accumulates phase utilization data, phase termination data, and detector data for a number of cycles selectable by the operator.
  - b. The MOE log includes the number of gap outs, force offs and max outs per phase.
  - c. The MOE log includes the mode of operation and phase utilization. If the controller is operating under coordination, the log shall include the pattern in effect and the average phase split for each period. If the controller is operating free, the log shall include the timing plan (1 – 4), the maximum in effect and the average phase maximum for each period.
  - d. Each logged period includes the volume, number of stops and the delay per phase.
  - e. Each log period records the number of times a phase was skipped and the number of times walk was served per phase.

## L. EMULATION

Emulation Software. With each controller provide software designed to emulate the controller. The emulation software shall employ the full functionality of the controller including but not limited to:

Configuration, timing, coordination, preemption, time base, detector setup, status display, utilities including special logic and diagnostic information.

The software shall employ a graphical user interface that looks and acts like the controller. The software shall be designed to operate on the latest Microsoft Windows operating system and be capable of direct interface with the latest version of Trafficware Synchro traffic modeling software.

### **Article 17.3 Standard Auxiliary Equipment**

Provide equipment meeting the requirements of Section 6 of the NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with NTCIP Requirements (NEMA TS-2).

- A. Three Circuit Solid State Load Switches. The cabinet shall come with sixteen (16) load switches. All load switches shall be cube type and have LED indications for both the input and output side of the load. The load switches shall be PDC model SSS87I/O or approved equivalent.
- B. Solid State Flasher. The cabinet shall come with one (1) flasher. The flasher shall be cube type and have LED indications. The flasher shall be PDC model SSF87 or approved equivalent.
- C. Malfunction Management Unit (MMU). The cabinet shall come with one (1) MMU's that meets all the requirements of NEMA TS2-2003 while remaining downward compatible with NEMA TS1. It shall have (2) high contrast LCD displays and an internal diagnostic wizard. It shall come with a 10/100 ethernet port. It shall come with software to run flashing yellow arrow operation. The MMU's shall be an Eberle Design, Inc. model MMU2-16LEip or approved equivalent.
- D. Flash Transfer Relay. The cabinet shall come with eight (8) heavy duty flash transfer relays. The flash transfer relays. The relays shall be Detrol Controls model 295 or approved equivalent.
- E. Inductive Loop Detectors Units. Provide sixteen (16) inductive loop detectors that conform to the requirements of NEMA TS-2, Section 6.5 Inductive Loop Detector Units. Unless otherwise called for in the Drawings provide 4 Channel Inductive Loop Detectors.

The loop amplifiers shall be Eberle Design, Inc. model ORACLE4e or approved equivalent.

- F. Local Coordination Units. Provide actuated coordination that conforms to the requirements of NEMA TS-2, Section 3.6 Actuated Coordination.
- G. System Modem/Interface Unit. The cabinet shall come with an 8 pair copper ethernet switch. Four ports of 10/100TX and a 1000base SFP port. The ethernet switch shall support all of the following minimum requirements; EFMplus technology, virtual local area networks (VLAN) tagging (IEEE 802.1q) and dynamic bridging (IEEE 802.1). The copper ethernet device shall provide for communication over copper pairs split into two directions and the high speed link shall be over bonded copper pairs (IEEE 802.3ah 2Base-TL. The copper ethernet switch shall

be an Actelis Networks model ML698E or approved equivalent. The following items shall be supplied with the copper ethernet switch:

1. Two quad DSL cables 504R20110
2. One AC power adapter 506R00006
3. Four Cat6 patch cables three feet
4. One SFP Optics 100base FX SM 1310nm 15km LC 506R00032
5. Carrier-class element management system
6. Wall mounting kit 510R21080

H. Preemption Units. Provide preemption that conforms to the requirements of NEMA TS-2, Section 3.7 Preemption and the following:

Install the following components of the GTT Company's Opticom Priority Control System according to GTT's written installation instructions at the signalized intersections listed on the Drawings.

1. EVP Infrared Preemption
  - a. The system must be capable of sending a signal to the controller when an Opticom signal from a vehicle-mounted "GTT OPTICOM Emitter" has been received and maintained for a period of 1.7 seconds.
  - b. Use Opticom Priority Control System Model 792H emitters.
  - c. Unless otherwise shown on the Plan use Opticom Traffic Control Systems Opticom Detector Model 721 preemption detectors.
  - d. Furnish one (1) Opticom Traffic Control Systems 764 Phase Selectors. Use rack mounted phase selectors.
  - e. The controller cabinet shall be wired with a Model 768 Auxiliary Interface Panel and a Model 757 Auxiliary Harness for the full utilization of all auxiliary detector and green sensing operations of the 764 Phase Selectors.
  - f. The controller, rather than the phase selector or auxiliary logic, must perform interval timing, signal sequences, and phase skips.
2. GPS Preemption Unit
  - a. The system must be capable of sending a signal to the controller when an Opticom signal from a vehicle-mounted "GTT OPTICOM Emitter" has been received and maintained for a period of 1.7 seconds
  - b. Unless otherwise shown on the Plan use Opticom Model 3100 GPS/Radio Unit containing a GPS receiver with Antenna and a 2.4 GHz spread transceiver with antenna.

3. Preemption Emitters

When emitters are required, provide GTT Opticom Priority Control System, Model 792H Emitter with 793 in vehicle switch. The Emitter shall be factory



- programmed to the class and vehicle identification numbers assigned by jurisdiction as shown in the Drawings and the following:
- a. Provide one copy of 790IS Emitter Software Kit including "Y" cable.
  - b. One GTT Opticom Portable Emitter Kit with 792R emitter on a magnetic base, 793R switch and cigarette lighter adapter power cord in a "Camera Bag" case.
- I. Bus Interface Unit (BIU). Provide six (6) BIUs that fully meet the requirements of NEMA TS-2 Section 8. Unless otherwise called for in the Drawings provide BIUs that meet the NEMA designation BIU2. All BIUs shall provide separate front panel indicator LED's for DC power status and SDLC Port 1 transmit and receive status. The (BIU)'s shall be Eberle Design, Inc. model BIU700 or approved equivalent.
  - J. Power supply. Provide a shelf mounted power supply that conforms to the requirements of NEMA TS-2 Section 5.3. The power supply shall be Eberle Design, Inc. model PS250 or approved equivalent.

#### **Article 17.4 Special Auxiliary Equipment**

When identified on the Drawings, provide equipment meeting the requirements of the cited Sections of the NEMA Standard Publication TS 2-2003 V02.06, Traffic Controller Assemblies with NTCIP Requirements (NEMA TS-2).

- A. Traffic Monitoring Video Camera System
  1. Furnish an Axis Q6010-E 60 Hz Camera with the following:
    - a. Micro SDXC card with a capacity of 256GB and speed class U3 or V30.
  2. Furnish an Axis Q6075-E 60 Hz Camera with the following:
    - a. Micro SDXC card with a capacity of 256GB and speed class U3 or V30.
  3. Furnish an Axis T8144 single port, High PoE midspan, 60 W Industrial Midspan.
  4. Furnish an Axis T91L61 pole mount for camera

#### **Article 17.5 Controller Cabinet**

Contractor shall provide a controller cabinet that meets the requirements of NEMA Standard TS 2-2003 V02.06 Traffic Controller Assemblies with NTCIP Requirements (NEMA TS-2), Section 5 Terminals and Facilities and Section 7 Cabinets. Cabinet enclosure shall be UL listed.

- A. Standard Features. Supply the following standard features:
  1. Materials

Unless otherwise designated in the Drawings, provide cabinets constructed of sheet Aluminum. Back and sides of cabinet shell shall be of one continuous piece of Aluminum. Shall be fabricated from 5052-H32 0.125-inch thick aluminum.

## 2. Cabinet Enclosure

Unless otherwise designated in the Drawings, provide a size 6 cabinet as defined in NEMA TS-2 Table 7-1 and the following:

- a. The cabinet shall be doubled-flanged where it meets the cabinet door.
- b. C channel rails shall be installed on the inside of the cabinet on the back and side walls for the mounting of shelves and panels. Rails shall be welded to the cabinet walls.
- c. All External fasteners shall be stainless steel. Pop rivets shall not be allowed on any external surface.
- d. All exterior seams shall manufactured with a neatly formed continuously weld construction. All welds shall be free from burrs, cracks, blowholes or other irregularities.
- e. The cabinet shall come with lifting ears affixed to the upper exterior of the cabinet. These ears shall utilize only one bolt for easy reorientation.

## 3. Doors

- a. The cabinet main door shall contain two (2) flush mount locking recessed compartments. The upper compartment that houses police accessible switches and a lower compartment that houses a generator bypass switch and receptacle. The police and generator doors shall be recessed into the main door so that the police door is flush with the main door. A closed-cell, neoprene gasket seal shall be bonded to the enclosure doors. A stiffener plate shall be welded across the width of the inside of the main door to prevent flexing. A main door bar stop shall be a two-position, three-point stop that accommodates open-angles at 90, 125, and 150 degrees. A louvered air entrance located at the bottom of the main door shall satisfy NEMA rod entry test requirements for 3R ventilated enclosures. Bearing rollers shall be applied to ends of door latches to discourage metal-on-metal surfaces from rubbing. The lock assembly shall be positioned so handle does not cause interference with key when opening the door. The door handle shall be  $\frac{3}{4}$ " round stock stainless steel bar. The door shall be mounted with a single continuous stainless steel piano hinge that runs the length of the door. Attaching tamper resistant bolts shall also be stainless steel.
- b. The cabinet main door shall be equipped with an OLYMPUS Lock, Inc. # 725RSL or equivalent. A Best™ blue core shall be supplied in the lock. Provide two (2) Best™ blue core keys for the lock assembly.
- c. Provide a Police Compartment meeting the requirements of NEMA TS-2 Section 7.5.7. Provide two (2) keys for lock. The Police Compartment shall house the following switches:
  - (1) "Auto/Flash" switch.-There shall be a switch for the police that puts the cabinet into flashing operations. The switch shall have two positions, "Auto" (up) and "Flash" (down). The "Auto" position shall

allow normal signal operation. The "Flash" position shall immediately cause all signal displays to flash as programmed for emergency flash and apply stop time to the controller. When the police flash switch is returned to "Auto", the controller shall restart except when the MMU has commanded flash operation. The effect shall be to disable the police panel switch when the MMU has detected a malfunction and all controller and MMU indications shall be available to the technician regardless of the position of the police flash switch. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.

- (2) "Signals ON/OFF" switch. There shall be a switch that renders the field signal displays electrically dead while maintaining controller operation for purpose of monitoring controller operations. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.
- (3) Permanently label switches in the Police Compartment. Label both the front side and back side of panel. Including switch pin numbering labeling on the back side of panel.
- (4) The weld for the police compartment shall be done on the inside of the cabinet door. All welds shall be free from burrs, cracks, blowholes or other irregularities.

d. Provide Generator Bypass Compartment

- (1) The cabinet front door shall have a locking generator bypass compartment that shall be used to connect a generator to operate the cabinet during extended loss of service line power. The generator compartment shall be capable of being closed and locked while a generator is connected. The mechanism for allowing generator cable access, while the compartment is closed, shall be an integral part of the generator bypass door, via a sliding panel that will normally be in the closed weather tight position. Inside the compartment there shall be a silkscreened panel housing a Hubbell HBL2615 30A / 125V flanged inlet receptacle capable of accepting a standard generator plug, a BACO HC52DQG cam switch with split AC+ and AC- feeds, and (2) LED lamps with sockets. One LED shall be illuminated when the cabinet has service line power and the other when the cabinet is under generator control. All LED's shall be field replaceable without putting the intersection in flash and shall carry a 5 year manufacturer warranty.
- (2) All wiring to the generator bypass compartment shall be contained in a single cable bundle. The cable shall connect to the backside of the electrical components and shall only be accessible from the inside of the cabinet front door. All electrical components on the inside of the front door that carry AC voltage shall be covered by a see-through plexiglass cover. The generator bypass cable shall terminate at the same power panel location as service line voltage.

- (3) The generator bypass compartment shall be equipped with a universal lock bracket capable of accepting a Best™ style lock. The lock shall be an OLYMPUS Lock, INC. # 725RL-DR-RH or equivalent. With tapered spring plunger latch style lock. A Best™ blue core shall be supplied in the lock.
- (4) The welds for the generator bypass compartment shall be done on the inside of the front door. All welds shall be free from burrs, cracks, blowholes or other irregularities.

#### 4. Shelves

Provide shelves meeting the requirements of NEMA TS-2 Section 7.6. Cabinet shall come with two (2) double beveled shelves 10" deep that are reinforced welded with V channel, fabricated from 5052-H32 0.125-inch thick aluminum with double flanged edges rolled front to back. The shelves shall have slotted holes every 7" on the bottom flange of the rolled edges for tying off wire bundles.

A slide-out computer shelf 16" long by 12" wide by 2" deep shall be installed centered underneath the bottom equipment shelf. The shelf shall have a hinged cover that opens from the front and shall be powder-coated black. It shall be a General Devices Part #VC4080-99-1168. The drawer when fully extended shall hold up to 50lbs.

#### 5. Finish and Preparation

The cabinet shall be supplied with a natural mill finish inside and out. All exterior seams shall be manufactured with a neatly formed continuously weld construction. The weld for the police compartment and generator bypass compartment shall be done on the inside of the cabinet door. All welds shall be free from burrs, cracks, blowholes or other irregularities.

#### 6. Cabinet Mounting

- a. Provide cabinet mounting features as defined NEMA TS-2 Section 7.8.
- b. The cabinet manufacturer is responsible for providing a cabinet that shall mount without modification on the foundation detailed in Municipality of Anchorage Standard Specifications, Section 80-4 and Details 80-5, 80-6, and 80-7.

#### 7. Cabinet Ventilation

Furnish a cabinet that fully meets the requirements of NEMA TS-2 Section 7.9 and the following:

- a. Furnish the fan and cabinet vent with internally mounted metal covers that are fabricated to close off the flow of air during winter operation. The cabinet shall be provided with one (1) finger safe fan mounted on the right side of the cabinet plenum and shall be thermostatically controlled (adjustable between 4-176° Fahrenheit). The ceiling exhaust fan plenum edges shall be sealed with RTV sealant or equivalent material on the interior of the cabinet.

- b. Equip the cabinet with a selectable, 600/900/1500 watt cabinet heating device with a 2 speed fan. The heating device must have a remote air sensing thermostat. The contacts must be rated 20 amps, 120 volts, 60 hertz. The heater shall be mounted on the cabinet door. Heating device shall be a Caframo model 9206CA-BBX or approved equivalent.
  - (1) Construct the thermostat so that contacts close on descending temperature and are adjustable between -30 and 110 °F ±5 °F. The contacts must open on rising temperatures of 15 °F above the closing temperature. The adjustment must have an indicating pointer. Remote bulb type thermostat shall not be used. Thermostat shall be a Johnson Controls model A19BBC-2C or approved equivalent.
  - (2) Connect the thermostat in series with an electrical resistance heater and blower fan. The blower fan must be rated for continuous duty. The heater and fan must be connected in parallel and rated 120 volts, 60 Hertz. Mount the unit on the cabinet door below the auxiliary panel.
  - (3) Do not block the air intake or outlet. Provide the unit with a SPST manual override switch that bypasses the thermostat to enable the fan and heater to operate at warmer temperatures.
- c. The cabinet shall come with two (2) dual-ply Dustlock™ Media polyester, disposable air filters; and the filter performance shall conform to listed UL 900 Class 2 and conform to MERV-8 & ASHRAE Standard 52.2-1999. The filter element shall be secured to louvered entrance on the main door with a metal filter cover. The filter and metal cover shall be secured to entrance on main door by two (2) horizontally mounted restraints.

## 8. Auxiliary Cabinet Equipment

- a. Light fixture. The cabinet shall have two (2) LED lighting fixtures with 15 high power LEDs using a cool white color emitting 300lm min @ 12VDC/750mA. The LED fixtures shall be a Rodeo Electronics TS-LED-05M02. It shall be powered by a Mean Well class 2 power supply LPV-20-12 that shall be mounted on the inside top of the cabinet near the front edge. The cabinet light circuit shall be designed so a second LED fixture will be installed in the cabinet below the rollout drawer without the need a of a second power supply. It shall be attached so that it remains stationary when drawer is extended. An on/off switch that is turned on when the cabinet door is opened and off when it is closed shall activate the lighting fixture(s) power supply. The lighting fixture “ON-OFF” switch must be a toggle switch mounted on the on the inside control panel.
- b. Provide one (1) paper set of complete and accurate cabinet drawings with each cabinet. Make cabinet drawings available electronically in AutoCAD and deliver with paper set. The cabinet shall be furnished with one (1) complete set of cabinet prints. All cabinet wiring and layout shall

come on (1) E1 size sheet, multiple pages shall not be allowed. Provide one (1) flash drive with AutoCAD cabinet drawing for the cabinet wiring.

- c. Provide one paper set of manuals for the controller, Malfunction Management Unit, GTT Opticom Phase Selector and vehicle detector amplifiers with each cabinet. Make said manuals available in electronic Adobe "pdf" format and deliver with paper set.

## 9. Cabinet Wiring

All wiring shall conform to NEMA TS2 section 5.2.5 and table 5-1. Conductors shall conform to military specification MIL-W-16878D, Electrical insulated high heat wire, type B. Conductors #14 or larger shall be permitted to be UL type THHN. Furnish controller cabinets wired to accommodate:

- a. Configuration #4 in Table 5-2 of the NEMA Standards Publications No. TS 2-2003 V02.06, Traffic Controller Assemblies with NTCIP requirements with four each Type 2 detector racks.

- (1) Equip the cabinet with required control and auxiliary equipment connecting cables to operate the phases and detection indicated on the Drawings, including future use with a minimum of 16 load switch positions, 8 flash transfer relay position and 1 flasher socket.
- (2) Size wiring, switches, surge protectors, flash relays, and flashers to handle the necessary amperage required under full cabinet use. Use orange colored wires to run from the flash transfer relay used for emergency flash programming.
- (3) Wire the cabinet to accommodate 6 unique preemption sequences as defined by NEMA TS-2 Section 3.7 and 2 auxiliary preempt sequences. Configure two detector racks to accommodate 4 unique sequences.
- (4) Wire the cabinet with a GTT Company's Opticom Priority Control Model 768 Auxiliary Interface Panel and a Model 757 Auxiliary Harness to accommodate the full quantity of emergency preemption inputs and green sense operations available with GTT Company's Opticom Priority Control System 764 series phase selector.

Wire in a single Model 757 Auxiliary Harness for the GTT Opticom Model 764 Phase Selector operation and terminate the harness with a connector on Detector Rack No.1. Leave sufficient slack in the wiring harness so that it can reach the connection on Detector Rack No. 2. This panel shall have a protective plastic cover.

Locate the Model 768 Auxiliary Interface Panel between the shelves on or near the left wall. This panel shall have a protective plastic cover. If the panel isn't fully covered from above by the upper shelf, the protective cover will need to extend up and over the panel.

- (5) Wire the cabinet so that the control panel's momentary contact test switches for vehicle calls Phase 1-8 are wired to Detector rack Channels 1-8 respectively.
- (6) Wire the cabinet so that each inductive loop detector channel input termination has three adjacent screw terminal positions provide, so that two loops can be series terminated for each individual detector channel.
- (7) Wire the cabinet so that there is a single field terminal wired to each of the cabinet's flasher outputs circuits #1 and #2.
- (8) Wire the cabinet so that channel 1-16 green field outputs are jumpered to a terminal block. Also, route the GTT Opticom phase selector green sense wires to adjacent positions on the terminal block.
- (9) Wire cabinet so that there are terminal block locations (test points) for all T&F BIU's #1 & #2 wiring circuits.
- (10) Provide a load resistor panel with 8 resistors for usage to "load" future circuits for Flashing Yellow Arrow (FYA) operation.
- (11) Wire all preemption outputs from the detector racks to a terminal block. Wire BIU wires for preemption inputs to adjacent positions on same terminal block. Intended for wiring programming of alternative assignment (Preempt 2-5 or Preempt 3-6) for emergency vehicle preemption.
- (12) Wire the cabinet so that confirmation lights are activated via controllers Preempt Active Outputs, not phase selector confirmation light outputs.  
Wire the cabinet so that preemption confirmation light circuits utilize the yellow outputs of LS9 – LS12.  
Wire all BIU preemption outputs wires to a terminal block. Wire conductors for LS9 – LS12 yellow inputs to adjacent positions on the same terminal block. Intended for wire programming of alternative confirmation light assignments.
- (13) Terminate the MMU wires associated with channel # 9–12 yellow outputs on a terminal block, for future use. Install conductors from channel # 9–12 yellow field terminals to adjacent positions on the same terminal block.
- (14) All wires terminated behind the main panel or on the back side of other panels shall be SOLDERED. No pressure or solder-less connectors shall be used.
- (15) All cabinets shall be wired for alternative flashing options for all channels. Flashing operation shall alternate between channels 1,3,5,7,13,14,15,16 and 2,4,6,8,9,10,11,12. Flash programming shall be either red, yellow or no flash operation simply by changing wires on the front of the load-bay.

- (16) Wire size 16 AWG or smaller at solder joints shall be hooked or looped around the eyelet or terminal block post prior to soldering to ensure circuit integrity. All wires shall have lugs or terminal fittings when not soldered. Lap joint/tack on soldering is not acceptable. All soldered connections shall be made with 60/40 solder and non-corrosive, non-conductive flux. All wiring shall be run neatly and shall use mechanical clamps and conductors shall not be spliced between terminations. Cables shall be sleeved in braided nylon loop and wires shall not be exposed.
- (17) A detector panel shall support four (4) channels of emergency vehicle preemption and eight (8) channels of auxiliary emergency vehicle preemption on a single panel. The emergency preempt wires shall be color coded as follows. +24VDC orange, preempt inputs yellow and ground blue. The auxiliary emergency vehicle preemption shall be white with a yellow tracer. This panel will be mounted on the left side of the cabinet below the level of the bottom shelf. Provide the following terminations points Ch. A/B 24VDC, Ch. C/D 24VDC, Ch. A/B Gnd, Ch. C/D Gnd., in addition to termination positions for the 12 emergency preemption detector inputs.
- (18) All wire cable bundles shall be encased in flex or expandable braided loom along their entire free length.
- (19) The SDLC hub shall have nine (9) ports. Eight (8) of those ports shall be screw down connections, with the remaining connection having for spring clip connection. Mount the panel on left wall between the shelves.
- (20) All SDLC cables shall be terminated on both ends, securely terminated to the SDLC interface panel with screw type connection and professionally routed in the cabinet interior to easily reach the load bay, controller, malfunction management unit and detector racks. All SDLC connectors shall be fully populated with 15 pins each. The SDLC cable's drain wire shall only be connected to Pin 12 on the equipment end connection of each cable.
- (21) All load switches, flasher, and flash transfer relay sockets shall be marked and mounted with screws. Rivets and clip-mounting is unacceptable.
- (22) The use of plug and play modules shall not be allowed, except for in detection rack(s).
- (23) The cabinet shall be wired to provide a 55-pin controller "A" connector. The cabinet shall also be wired to provide a 10-pin controller "A" connector.
- (24) Mount the power supply interface panel on the left wall between the shelves. Provide a clear plastic cover material with be a minimum thickness of 0.1". Cover shall be firmly attached.
- (25) BIU wires connection to the PCB of the load bay BIU rack (T & F 1 & 2) shall be two (2) 34 pin connectors. These connectors shall have locking latches.



- (26) Used BIU wiring shall be soldered to backside of a screw terminal. The screw terminals provide access to functions of BIUs. BIU load switch drivers shall be soldered directly to load switch sockets.

#### 10. Field Terminal Blocks

Provide Terminals and Facilities meeting the requirements of NEMA TS-2 Section 5, Configuration #4 (Table 5-2) and the following:

- a. The field terminal blocks shall have No. 10 screw type terminals rated for 600V which are capable of accepting no less than three (3) No. 12 AWG wires fitted with spade connectors. Two (2) rows of four (4) 12-position terminal blocks shall be provided across the bottom of the main panel for terminations of field wiring. Spade lugs from internal cabinet wiring are not allowed on field terminal screws.

There shall be a third row above said terminals, of four (4) 12-position terminal blocks with No. 10 screw type terminals above the field terminal blocks. These blocks shall operate the flash program. It shall be changeable from the front of the load-bay.

The two rows of field terminations shall be tied together in series. Each channel shall have six (6) terminations, two (2) complete rows each consisting of three (3) terminations from left to right beginning with Channel 1 corresponding to the appropriate channel Green, Yellow and Red outputs and following the order of the load switches. Connections shall be soldered on the back sides of the terminal blocks.

Default wiring shall be left to right Green, Yellow, Red for vehicle phases channels 1-8, Walk, Yellow, Don't Walk for pedestrian phase channels 9-12 and Green, Yellow, Red for vehicle phases channels 13-16 following the order of the load switches.

- b. Terminate conductors from the controller unit and MMU unit in ring type terminal lugs or solder them to a through panel solder lug on the rear side of the terminal. Terminate other conductors in spade type terminal lugs.

MMU conductors connections on field terminal blocks shall be soldered on the back side of the terminal blocks.

A ring type terminal connector shall be used for any screw terminal and stud terminal connection of conductors to the power supply interface panel, the power terminal block on the load bay panel and to terminal blocks and components on the power panel.

- c. Do not bring more than 3 conductors to any one terminal. Two flat metal jumpers, straight or U shaped, may also be placed under a terminal screw. Fully engage at least 2 full threads of terminal screws when the screw is tightened. Do not extend live parts beyond the barrier.
- d. A TII Porta Systems Model No. 1512 building entrance protector 12-pair unit shall be installed for telemetry cable pair terminations. A 3M 2810-HCO/87-DPM cross connect terminal block with pigtails and a 3M 80-6113-3163-0 frame shall also be installed. The building entrance

protector unit and the cross connect terminal block with frame will be mounted on a common panel on the right side of the controller cabinet.

- e. On the right side of controller cabinets, install two 16 position bus bars, for terminating the equipment grounding and neutral conductors used inside the cabinets. On the left side of the controller cabinets, install two 32 position bus bars, for terminating the equipment grounding and neutral conductors from field wiring. Offset upper 16 position bus bar past the lower 16 position bus bar where 32 positions are required.
  - f. The power terminal block on the load bay shall be No. 10 screw type terminals capable of accepting no less than three (3) No. 12 AWG wires fitted with spade ring terminal type connectors. One (1) 12-position terminal block shall be provided horizontally on the top right side of the load bay. The placement of the power terminal block on any other panel shall not be allowed.
11. Cabinet Accessories

See NEMA Standard TS 2-2003 V02.06, Section 5 Terminals and Facilities, Figure 5-4 Cabinet Power Distribution Schematic for Items "a." through "f."

- a. Disconnecting Means
  - (1) Main circuit breaker must be a single pole, 40 ampere, 10,000 amperes interrupting capacity for each cabinet.
  - (2) Provide two (2) Auxiliary circuit breakers, each must be single pole, 20 ampere, 10,000 amperes interrupting capacity. One auxiliary circuit breaker shall only service a single outlet receptacle for exclusive use for the cabinet heater. The other auxiliary circuit breaker shall service the fan, cabinet lights and GFIC outlet. The rating of the main disconnect means with overcurrent protection must be not less than 125% of the maximum anticipated continuous load. When using disconnecting circuit breakers, use "trip indicating trip free" type.
- b. Signal Bus. Connect the signal bus to the incoming AC line through a signal bus solid state relay and an overcurrent protection device. Energize the signal bus solid state relay to provide power to the signal bus. The current rating of the signal bus solid state relay must be at least the current rating of the main overcurrent protection device. Solid state relay shall have an LED input status indicator.
- c. AC Service Transient Suppression. Connect the transient suppression device for the primary feed of the cabinet on the load side of the cabinet overcurrent protection device. The transient voltage suppression device connected to the controller power circuit must provide protection against voltage abnormalities of 1 cycle or less duration.
  - (1) The suppressor must be solid state high energy circuit containing no spark gap, gas tube, or crow bar component. The current rating of the device must be 15 amps minimum. The device must provide transient protection between neutral and ground, line and ground,

as well as line and neutral. If the protection circuits fail, they must fail to an open circuit condition. The device must meet requirements of UL Standard 1449.

- (2) The suppressed voltage rating must be 600 volts or less when subject to an impulse of 6,000 volt, 3,000 amp source impedance, 8.0/20 microsecond waveform as described in UL Standard 1449. In addition, the device must withstand, without failure or permanent damage, one full cycle at 264 volts RMS.
  - (3) The device must contain circuitry to prevent self induced regenerative ringing. There must be a failure warning indicator light that must illuminate when the device has failed and is no longer operable. The transient suppression device must withstand a 20,000 ampere surge current with an 8x20 microsecond (time to crest x time to second halfcrest) waveform 20 times at 3 minute intervals between surges without damage or degradation to the suppressor. Output voltage must not exceed 500 volts at any time during the test. Use a device that is a solid state, high energy circuit with no spark gap, gas tube, or bar component.
- d. Radio Interference Suppression. Equip each traffic cabinet, flasher, and other current interrupting device with a suitable radio interference suppressor installed at the input power point. Install the radio interference suppressor after the AC service transient suppression unit described in Article 17.5 A 11.c. It must provide a minimum attenuation of 50 decibels over a frequency range from 200 kilohertz to 75 megahertz, when used with normal installations.
- (1) The interference suppressor must be hermetically sealed in a substantial metal case filled with suitable insulating compound. Terminals must be nickel-plated, 10-24 brass studs of sufficient external length to provide space for connecting two No. 8 conductors and must be so mounted that the terminals cannot be turned in the case. Ungrounded terminals must be properly insulated from each other and must maintain a surface leakage distance of not less than 1/4 inch between any exposed current conductor and any other metallic part, with an insulation factor of 100 to 200 megohms dependent on external circuit conditions.
  - (2) The radio interference suppressor must have a minimum current rating equal to the rating of the main disconnect means as specified in Article 17.5 A 11.a (1). It must be designed for operation on 120 volts, 60 hertz, single phase circuits and be UL and EIA compliant.
  - (3) Connect the ground connection of the radio interference suppressor only to AC neutral. Do not connect to Earth Ground directly.
- e. Communications Transient Suppression. Provide eight (8) 5-pin gas tube/overcurrent protector modules with PTCs. Modules shall have an

orange case. The module shall be a Tii part No. 195-6C9EM-NL or approved equal.

- f. Control Panel. Provide a control panel assembly that is mounted to the interior side of the police panel compartment on the cabinet door. The control panel assembly must consist of:
- (1) "Controller ON/OFF" switch. There shall be a switch that renders the controller and load-switching devices electrically dead while maintaining flashing operations for purpose of changing the controller or load-switching devices. The switch shall be a general-purpose bat style toggle switch with 0.688" long bat. Label and rate the switch for load current.
  - (2) "Cabinet Light ON/OFF" switch. There shall be a switch that turns off the cabinet light when the door is opened. The switch shall be a general-purpose bat style toggle switch with 0.688" long bat.
  - (3) "Auto/Flash" switch. There shall be a switch that places the field signal displays in flashing operation while the controller continues to operate. This flash shall have no effect on the operation of the controller or MMU. The switch shall be a general-purpose bat style toggle switch with 0.688" long bat.
  - (4) "Stop Time AUTO/OFF/ON" switch. There shall be a 3-position switch labeled "Auto" (up), "Off" (center), and "On" (down). With the switch in the "Auto" position, a stop timing command shall be allowed to be applied to the controller by the police flash switch or the MMU (Malfunction Management Unit). When the switch is in its "Off" position, stop timing commands shall not be applied the controller. The "On" position shall cause the controller to stop time. The switch shall be a general-purpose bat style toggle switch with 0.688" long bat.
  - (5) "Heater By-pass ON/OFF" switch. There shall be a switch to bypass the remote heater thermostat & allow power to the heater unit.
  - (6) "Coordination AUTO/FREE" Switch. When the switch is in the "Auto" position, the local controller must use the local coordinators time of day plan. When the switch is in the "Free" position, it will disable the controller coordination plan. The switch shall be a general-purpose bat style toggle switch with 0.688" long bat.
  - (7) "Force-Off" Switches. There shall be 2 momentary test switches, one tied to ring 1 and the other tied to ring 2 on the controller. Switches must provide tactile feedback and be rated at 1 ampere, minimum, for a resistive load at 120 VAC and at 28 VDC. Contacts must be coin silver or gold plated and be enclosed and labeled as to their function.

- (8) Both sides of the panel shall be silkscreened. Silk-screening on the backside of the switch panel shall be upside down so that when the panel is opened for maintenance the silk-screening will be right side up. The backside silk screening shall include terminal/pin numbers.
  - (9) Provide a hinged clear plastic cover over the control panel switches. Plastic cover shall be of a minimum thickness of 0.1”.
  - (10) The control panel shall be secured to the police panel compartment by two (2) screws on the top and shall be hinged at the bottom to allow access to the soldered side of the switches with the use of only a Phillips screwdriver.
- g. Receptacle Outlets. The cabinet shall be wired with one (1) duplex convenience outlet with a ground fault interrupter, one (1) convenience quad outlet without ground fault interrupters and one (1) single outlet, exclusively for the heating device without ground fault interrupter. The ground fault outlet shall be mounted on the right side of the cabinet on or near the power panel. The convenience quad outlet shall be at the top of the “C” channel on the right wall. The heater outlet shall be mounted on the right wall on or above the power panel. No outlets shall be mounted on the door. The GFI power shall be fed through the auxiliary breaker. The convenience 6 outlet power strip shall be fed through a transient voltage suppressor located on the cabinet power panel. There shall be a 2-position terminal block on the power panel, between the power strip and the voltage suppressor.
  - h. Power panel location and cover. Mount power panel on the right wall below the lower shelf. Provide a clear plastic cover material with a minimum thickness of 0.1”. Cover shall be firmly attached at four points. Holes shall be slotted for easy removal and replacement. If panel is located towards the front of the cabinet, protective cover will need to extend up and over top of panel.
  - i. Labeling on the Control Panel, Police Panel and Load Bay shall be silk screened on front and back sides. Labeling on Power Panel and all other panels shall be silk screened. Labels shall be legible and shall not be obstructed by cabinet wiring, panels or cables. All labels shall conform to the designations on the cabinet wiring prints. Silk-screening on the backside of the control panel and load bay shall be upside down so that when the panel is opened for maintenance the silk-screening will be right side up.
  - j. The entire load bay shall roll down and provide access to all of the back of panel wiring. All solder terminals shall be accessible when the load-bay is rolled down. The assembly shall be able to roll down without requiring other components, cables or load switches to be removed. The load-bay shall be balanced such that it will not roll down when fully loaded with load switches, flashers and flash transfer relays, when detached from the “C” channel.

The load-bay shall be designed so that all other cabinet screw terminals are accessible without removing cabinet electronics.

Load sockets spaced on 2" center per NEMA TS2 section 5.3.1.2, figure 5-2.

All load switches and flasher shall be supported by a bracket extending at least ½ the length of the load switch.

Load bay shall be mounted on the back wall with 5¾" of clearance to the bottom of the cabinet.

- k. Provide Amphenol MS (military specification) type connectors with cable clamp and sleeve accessories for the 55-pin controller "A" connector, 10-pin controller "A" connector, MMU "A" and "B" connectors and the Power Supply connector. A "shield" ground conductor is required to be externally attached to each connector assembly.
- l. Provide a Marathon part # 1423307 (or equivalent) power distribution blocks for termination of cabinet power feed conductors.

B. Special Features. Provide the following.

Provide a clear plastic cover mounted on top of the detector racks. Clear plastic cover material shall be a minimum thickness of 0.1" Cover to extend over harness connectors and wiring on card slots.

**Article 17.6 Operation**

- A. The cabinet shall be wired for all red flash operation.
- B. The flashing circuit shall be independent on the controller unit and shall remain in operation upon shutdown of the controller or removal of the controller from the cabinet.
- C. The controller cabinet shall be wired so that removal of the MMU shall cause the intersection to go into flashing operation.
- D. The method by which flashing operation is accomplished shall be determined via program entry and shall be either:
  - 1. Voltage Monitor Output inactive, or
  - 2. Load Switch Driver Output Flashing - Load Switch Driver Output Flashing shall provide an alternating True/False logic output at 1 pulse per second repetition rate with 50 ± 2 percent duty cycle. The selection, via program entry, of Yellow Flashing, Red Flashing, or Dark for each vehicle load switch driver group (G/Y/R) shall be provided. All pedestrian load switch driver groups (W/PC/D) shall be inactive (Dark) in flash.
- E. Pedestrian push buttons shall be operated at 12 VAC.
- F. Controller Priorities. The drives, controls and equipment shall have priorities and each device, control or item of equipment shall override the operation of those items listed below it:
  - 1. Power-Up
  - 2. External Start

3. Preemption
  4. Internal Advance
  5. Stop Time
  6. Automatic Flash
  7. Manual Control Enable
  8. Force Off
- G. Signal Timing Priorities. Patterns and signal plans are capable of being selected on program entry, Interconnect Inputs, Time Base Control events, and a System Interface. The pattern and signal plan select priority shall be as follows:
1. Program Entry
  2. System Interface
  3. Time Base Control Event
  4. Interconnect Inputs

When Time Base Control On-Line is active, the Time Base Control event priority will be lower than the Interconnect Inputs. Should the Sync Monitor diagnostic determine the Interconnect Offset to be invalid, a Time Base Control event may control.

### **Article 17.7 Shop Tests**

Traffic controller cabinet, cabinet wiring diagrams, controller units, and auxiliary equipment shall be shipped to the Traffic Signal Maintenance Lab at 3601 Dr Martin Luther King Jr. Avenue. The Traffic Signal Maintenance personnel shall inspect cabinet wiring, burn in signal cabinet equipment, customize cabinets(s) for desired operation and test in accordance with the following specifications.

The Contractor shall allow six (6) weeks to allow for shop testing. All required equipment including wiring diagrams shall arrive in one shipment. Partial shipments shall not be accepted and will be returned to the vendor.

Traffic signal equipment shall meet the operational and functional requirements of the Drawings and Specifications when tested in accordance with NEMA Standards Publication Number TS2-2003 V2.06, Traffic Controller Assemblies.

If a partial failure occurs at any step in the test physical, environmental, or operational the manufacturer representative shall be permitted to make on site repairs within ten (10) days after notification of the malfunction. The test shall then be restarted at beginning of category in which malfunction occurred. Failure to make repairs in ten (10) days after notification shall result in rejection.

If equipment malfunctions twice in the same category, the equipment shall be rejected. When equipment is rejected, the entire package, including cabinet, will be returned freight collect to the vendor. New equipment, with a different serial number, must then be submitted for testing. Rejected equipment shall not be used on signal projects within the Municipality.

Testing subsequent to rejection of the equipment for failure to comply with specification requirements shall be at the expense of the Contractor. Deductions to cover the costs of such testing shall be made from any monies due or which may come due the Contractor under this Contract.

A failure shall be defined as any occurrence which results in other than normal operation of the equipment. The equipment is considered to have failed if any of the following occur:

1. The controller unit malfunctions.
2. The load switch produces incorrect signal indications.
3. The MMU fails to satisfy the requirements of the Contract Specifications.
4. The detector racks or emergency preemption interface fail to operate correctly.
5. A BIU fails to operate correctly.

After satisfactory completion of the shop test, the Contractor will be notified to pick up the tested and marked equipment at the test site. The Contractor shall pick up successfully tested equipment within two (2) weeks of notification. The Contractor shall deliver said equipment to the Work site. Successful completion of the test does not relieve the Contractor of equipment warranty obligations as specified in Section 80.01, Article 1.4 – Warranties, Guarantees, and Instruction Sheets, or field testing as specified in Section 80.16, Article 16.2 – Field Tests.

Copies of the shop test results shall be sent to the Contractor and associated vendor.

### **Article 17.8 Installation**

- A. Cabinet positioning shall be subject to the review and acceptance of the Traffic Signal Maintenance Foreman.
- B. A three eighths inch (3/8”) fillet of silicone caulking shall be placed between controller cabinet and the concrete foundation to prevent dust and dirt from entering the cabinet.

### **Article 17.9 Measurement**

Traffic signal controllers shall be measured as units, complete and in place, including labor, cabinet, hardware, controller unit, and standard auxiliary equipment, all as required by this Section and by the Contract Drawings Special Provisions to provide a complete and working system.

Traffic monitoring video camera system equipment shall be measured as units complete and in place, including labor, cabinet components, hardware and wiring as required by this Section and by the Contract Drawings to provide a complete working system.

### **Article 17.10 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.



Payment shall be made under the following units:

ITEM	UNIT
TS2-1 Controller Unit	Each
Traffic Monitor Video Camera System	Each

## **SECTION 80.18 VEHICLE DETECTORS**

### **Article 18.1 Loop Detectors**

For the purpose of this Section, the "home run" and the "home run loop wires" are defined as the pair of wires from the loop in the traveled lane to the nearest junction box. The "lead-in" or "lead-in cable" is defined as the shielded twisted pair cable from the junction box to the controller cabinet.

All connections between the loop wire and shielded lead-in cable shall be made as follows:

- A. Shielded lead-in cable pairs shall not be cut except when they are to be spliced to a loop and then only at the junction box where the splice shall be made. Used and unused ends of the cut pairs should be of equal length.
- B. Place tubular heat shrink insulation over the foil and drain wire on all cut ends of the shielded lead-in cable pairs to ensure drain wire and conductive side of foil are insulated from all other foils and drain wires.
- C. Insert the wires into the appropriately sized end of the Multilink part # ML56-16, or approved equal, splice connector. Crimp and heat the connector in accordance with manufacturer's installation instructions.
- D. Secure cable/conductor bundle with nylon cable ties.
- E. Seal the connection in a splice kit as shown on the detail. All cable and conductor sheaths shall extend a minimum of one inch (1") into re-enterable encapsulating compound. A half inch (1/2") of free space, measured from the outside dimensions of the splice cables/conductors to the inside dimensions of the splice tube kit, shall be left around the circumference and at the ends of all splice cables/conductors. Free space shall be completely filled with approved re-enterable encapsulating compound so that there is no space for water to sit inside of splice kit when kit is stood up vertically.

Testing Requirements:

- A. Continuity Test. The Contractor shall test each loop detector circuit for continuity at the roadside junction box before splicing the loop detector to the lead-in cable. Each loop detector must have a resistance less than 0.5 ohms. After splicing the loop detectors to the lead-in cables, the Contractor shall test each pair at the controller cabinet. Each pair must have a value less than 10 ohms for multipair lead-in cables. The continuity test ohm reading at the cabinet must be greater than the ohm reading measured for the loop detector at the junction box. Where existing lead-in cable is being used, the Contractor shall perform the above test on the lead-in cable prior to splicing with the loop wires. If the tests on the existing lead-in cable are not satisfactory, the Engineer may request that it be replaced and paid per Division 10.
- B. Insulation Resistance (megohm) Test. The Contractor shall complete this test to verify the integrity of each conductor's insulation after pulling the conductors and cables into position and before terminating the conductors. At 500 VDC, each conductor's insulation shall measure a minimum resistance of 100 megohms. With

single conductors, complete the test between each conductor and ground. In each multiconductor cable, complete the test between conductors and between each conductor and ground.

Where existing lead-in cable is being used, the Contractor shall perform the above test on the lead-in cable prior to splicing with the loop wires. If the tests on the existing lead-in cable are not satisfactory, the Engineer may request that it be replaced and paid per Division 10.

All the above tests are to be performed, and the results recorded, by the Contractor in the presence of the Engineer. The Contractor shall supply all the test equipment and deliver signed legible copies of the test reports to the Engineer. The Contractor shall be responsible for correcting any problems found during the loop testing.

Conduit-encased loop wires shall be No. 14 AWG stranded copper wire with PVC tube (IMSA Spec. 51-5).

Each detector loop shall be connected to its own detector lead-in pair of seven (7) pair #18 shielded conductor cable to be used for detector lead-ins. All parallel and series connections shall be made at the cabinet terminal strip.

The upstream and intermediate loop home runs shall be routed to the nearest junction box along a path perpendicular to the direction of travel. Home runs for adjacent loops less than sixteen feet (16') apart shall be routed to the nearest junction box in the same trench to the extent possible to minimize excavation of the pavement.

The stop bar loop home runs will generally be routed to the same junction box. All the home runs shall be routed parallel and adjacent to each other along a path perpendicular to the direction of travel. A path parallel to the direction of travel may be needed from the individual loop to the common perpendicular routing.

Loop locations may be staggered plus or minus six inches ( $\pm 6"$ ) to accommodate home run placement.

The loop and home run conduit shall be one inch (1") PVC Schedule 80 conforming to ASTM D1785. One inch (1") galvanized close nipples and PVC adapters shall be used to connect the PVC conduit to the hot dip galvanized Type X conduit outlet body.

The home run conduit shall be one inch (1") PVC Schedule 80.

If an existing detector loop is indicated in the drawings to have its home run conduit extended to a new location, the same size and type of conduit shall be used for the home run conduit extension.

For installation of loops, loops shall be placed in compacted leveling course bedding material conforming to Division 20, Section 20.22 – Leveling Course. There shall be a minimum thickness of one inch (1") of leveling course beneath the loop conduit and Type X conduit body. A minimum of one inch (1") of compacted leveling course shall be placed on top of the loop conduit and Type X conduit body prior to paving.

Sand bedding shall be non-frost-susceptible, consisting of naturally occurring fine mineral aggregates free of clays, silt, or organic matter.

In constructing conduit encased detector loops, the Contractor shall be responsible for devising his own methods of cutting and restoring the existing asphalt concrete pavement, provided that his methods:

- A. Allow for the maintenance of traffic through the construction zone, and;
- B. When installing loop detectors in existing pavement, cut the asphalt with a saw and remove all asphalt within the saw cut, and;
- C. Replace asphalt concrete in two (2) equal lifts, with a minimum thickness of three inches (3") or the existing pavement thickness, whichever is greater, and;
- D. Reconstruct the base material, including new leveling course and disposal of surplus or unusable material, if necessary, and asphalt concrete, in accordance with Division 20 - Earthwork and Division 40 - Asphalt Surfacing, and;
- E. Are approved by the Engineer.

Full-lane-width asphalt patching is required. Any remaining section less than twelve feet (12') between loops must be replaced to provide a continuous patch. The Contractor shall adhere to the following guidelines:

- A. Where existing pavement will not be overlaid, enclose all loops that enter a common junction box within a trapezoidal saw-cut.
- B. Cut to within one foot (1') of the lane and edge lines, preserving the pavement markings.
- C. Remove the asphalt to the lip of the gutter when there are no edge lines.
- D. Cut across lane lines when loops in adjacent lanes are side by side.
- E. Cut trenches a minimum of three feet (3') wide installing loop tails across a lane.
- F. Trenches crossing a shoulder only may be a minimum of one foot (1') wide.
- G. Contractor shall saw-cut asphaltic concrete pavement for loops in existing pavement.
- H. All existing pavement between detection loops within twelve feet (12') of another loop shall be saw-cut and removed, then repaved continuously.
- I. All traffic markings removed as a result of loop installation in existing pavement shall be replaced to the original alignment and messages.

After the asphalt concrete pavement has been removed according to the Contractor's approved method, the area where the conduit-encased detector loop is to be placed shall be cleared of all rocks and protrusions which may damage the conduit. Sand bedding or leveling course may be required by the Engineer to attain an adequate surface. The Contractor shall take care that the subgrade is not disturbed. If the subgrade material is disturbed, the Contractor shall compact the surface to the satisfaction of the Engineer.

The conduit-encased detector loop shall then be installed and sand bedding or leveling course shall be placed over the loop to a minimum of one inch (1") compacted depth.

An asphalt tack coat per Division 40, Section 40.04 – Tack Coat, shall be applied to all edges of the existing pavement prior to placing new asphalt. Asphalt concrete pavement shall be placed and compacted in a minimum of two (2) equal lifts per Division 40 – Asphalt Surfacing.

When loops are installed in existing pavement or as new Work, traffic shall not be allowed to drive over the loops until the first layer of asphalt has been placed.

### **Article 18.2 Optical and GPS Detectors - Preemption**

Any substitutions of cable, material or equipment in this Article must be submitted to the Municipal Traffic Engineer for testing and approval prior to installation.

Mount detectors according to manufacturer recommendations or as approved by the Engineer. Mount and aim detectors to provide maximum emergency vehicle recognition. Detector locations shown on the Drawings are approximate. Before installing the detectors, gain approval of their final location from the Municipal Traffic Engineer or assigned designee.

Install the following components of the GTT Company's Opticom Priority Control System in accordance with manufacturer's written installation instructions at each signalized intersection listed on the Drawings:

- A. Install the quantity of Model 711, 721, or 722 Optical Detectors on the poles as shown on the Drawings. Mounting hardware shall consist of Pelco Products, Inc. "Astro Mini-Brac" Cable Mount Clamp Kits, or approved equal, and GTT Company "M575 Confirmation Light Hardware" Installation Kit, or approved equal. See Standard Detail 80-55 and Drawings for installation details.
- B. Install Model 138 Optical Detector cable and a three conductor #14 AWG signal cable between each optical detector and the controller cabinet. Furnish enough slack in these cables to leave ten feet (10') of slack in the controller cabinet. Label each cable.
- C. Before attaching the conductors to the optical detector, strip one inch (1") of insulation from the conductors in the Model 138 cable and attach all four (4) conductors to chassis ground in the controller cabinet. Attach the signal cable to the confirmation light. The Traffic Signal Maintenance Shop personnel will make final terminations of the conductors in the controller cabinet.
- D. Install an Opticom Model 3100 GPS/Radio Unit containing a GPS receiver with Antenna and a 2.4 GHz spread transceiver with antenna on the traffic signal pole as shown on the Drawings. Mounting hardware shall consist of Pelco Products, Inc. "Astro Mini Brac" Cable Mount Clamp Kits or approved equal. See Standard Detail 80-55 and Drawings for installation details.
- E. Install a Model 1070 GPS Installation Cable between the Model 3100 GPS Radio Unit and the controller cabinet. Furnish enough cable to reach the top of the controller cabinet and to also leave 10 feet (10') slack in the controller cabinet. Before attaching the conductors to the Model 3100 GPS Radio Unit, strip one inch (1") of insulation from the conductors in the Model 1070 GPS Installation cable and attach all eleven (11) conductors to chassis ground in the controller cabinet. Traffic

Signal Maintenance Shop personnel will make final terminations of the conductors in the controller cabinet.

- F. When retrofitting existing controller cabinets, furnish a Model 764 Phase Selector and a Model 768 Auxiliary Interface Panel for each controller cabinet. Deliver these parts to the Traffic Signal Maintenance Shop Foreman. Parts will be installed in the controller cabinet by Traffic Signal Maintenance personnel. New controller cabinets shall include these parts installed by the controller assembly manufacturer per Section 80.17, Article 17.3 - Standard Auxiliary Equipment.
- G. A manufacturer technical representative shall be available to provide telephonic assist with the physical installation, alignment, and configuration of each supplied Model 3100 GPS Radio Unit. Technical support shall be provided thereafter to assist with troubleshooting, maintenance, or replacement of the detector unit should such services be required.

### **Article 18.3 Radar Detectors**

Radar Detection System:

Any substitutions of cables, material or equipment in this Article must be submitted to the Municipal Traffic Engineer for testing and approval prior to installation.

System Hardware. For vehicle detection, provide a Wavetronix digital wave radar vision system that consist of the following components:

- A. Stop bar detector (SBD). For all approaches, indicated on the Drawings, provide a Wavetronix SmartSensor Matrix® above-ground stop bar detector (SBD) that will detect all vehicles, including bicycles for reliable and accurate presence detection.
  - 1. Physical Properties. The SBD shall not exceed 5 lbs. in weight. The SBD shall not exceed 14 in. x 12 in. x 4 in. in its physical dimensions. All external parts of the SBD shall be ultraviolet-resistant, corrosion resistant, and protected from fungus growth and moisture deterioration.
  - 2. Enclosure. The SBD shall be enclosed in a Lexan EXL polycarbonate. The enclosure shall be classified "f1" outdoor weather ability in accordance with UL 746C, watertight according to the NEMA 250 Standard, and conform to test criteria set forth in the NEMA 250 standard for type 4X enclosures.
  - 3. Power. The SBD shall consume less than 10 W, operate with a DC input between 9 VDC and 28 VDC, and have an onboard surge protection.
  - 4. Communication. The SBD shall have two half-duplex RS-485 com ports support for dedicated detection comms; and for configuration, verification, or traffic display without disrupting detection comms. The SBD shall support the upload of new firmware into the SBD's non-volatile memory over Ethernet communication port. Both communication ports shall support all of the following baud rates: 9600, 19200, 38400, 57600 and 115200 bps.
  - 5. Operating Conditions. The SBD shall maintain accurate performance in all weather conditions, including: Rain, freezing rain, snow, wind, dust, fog and changes in temperature and light, including direct light on sensor at dawn and

dusk. SBD operation shall continue in rain up to 1 in. (2.5 cm) per hour; capable of continuous operation over an ambient temperature range of -40°F to 165°F, and a relative humidity range of 5% to 95% (non-condensing).

6. Testing. Each SBD shall be Federal Communications Commission (FCC) certified under CFR 47, Part 15, section 15.249 as an intentional radiator and a FCC certification shall be displayed on an external label on each SBD according to the rules set forth by the FCC. The SBD shall also be tested under IEC 61000-4-5 class 4 and NEMA TS2-2003 Testing. The SBD shall comply with the applicable standards stated in the NEMA TS2-2003 Standard. Third party test results shall be made available when requested.
7. Testing. Each SBD shall be Federal Communications Commission (FCC) certified under CFR 47, Part 15, section 15.249 as an intentional radiator and a FCC certification shall be displayed on an external label on each SBD according to the rules set forth by the FCC. The SBD shall also be tested under IEC 61000-4-5 class 4 and NEMA TS2-2003 Testing. The SBD shall comply with the applicable standards stated in the NEMA TS2-2003 Standard. Third party test results shall be made available when requested.
8. Manufacturing. The SBD shall be manufactured and assembled in the U.S.A.
9. Support. The SBD manufacturer shall provide both training and technical support services.

Training. The manufacturer-provided training shall be sufficient to fully train installers and operators in the installation, auto-configuration, and use of the detector unit to ensure accurate SBD performance.

Technical Assistance. A manufacturer-provided technical representative shall be available to assist with the physical installation, alignment, and configuration of each supplied detector unit. Technical support shall be provided thereafter to assist with troubleshooting, maintenance, or replacement of the detector unit should such services be required.

10. Documentation. SBD documentation shall include an instructional training guide, a comprehensive user guide, as well as an installer quick-reference guide and a user quick-reference guide. The SBD manufacturer shall supply the following documentation and specification test results at the time of the bid submittal:

- a. FCC CFR 47 certification
- b. IEC 61000-4-5 class 4 test report

9. Warranty. The SBD shall be warranted free from material and workmanship defects for a period of two years from date of shipment.

- B. Continuous tracking advance extended range detector (CTAD). For all eastbound and westbound intersection approaches, provide a CTAD equivalent to the Wavetronix SmartSensor Advance Extended Range® for enhanced dilemma zone detection.

The CTAD shall be able to detect and report information on the roadway located with the near boundary at 50 feet and a far boundary of up to 900 feet from the base of the pole on which the CTAD is mounted.

1. **Physical Properties.** The CTAD shall not exceed 5 lbs. in weight. The CTAD shall not exceed 14 in. x 12 in. x 4 in. in its physical dimensions. All external parts of the CTAD shall be ultraviolet-resistant, corrosion resistant, and protected from fungus growth and moisture deterioration.
2. **Enclosure.** The CTAD shall be enclosed in a Lexan EXL polycarbonate. The enclosure shall be classified "f1" outdoor weather ability in accordance with UL 746C, watertight according to the NEMA 250 Standard, and conform to test criteria set forth in the NEMA 250 standard for type 4X enclosures.
3. **Power.** The CTAD shall consume less than 8 W, operate with a DC input between 12 VDC and 28 VDC, and have an onboard surge protection.
4. **Communication.** The CTAD shall have two serial communication ports, and both ports shall communicate independently and simultaneously. The CTAD shall support the upload of new firmware into the CTAD's non-volatile memory over Ethernet communication port. Both communication ports shall support all of the following baud rates: 9600, 19200, 38400, 57600, and 115200 bps.
5. **Windows Mobile®-based Software.** The CTAD shall include graphical user interface software that displays the current traffic pattern using a graphical traffic representation.
  - a. The graphical user interface shall also display all configured alerts and provide visual representation of their actuation.
  - b. The graphical user interface shall provide a means of logging the vehicular track files with an update rate of greater than five times per second.
  - c. The graphical interface shall operate on Windows Mobile, Windows 2000, Windows XP and Windows Vista in the .NET framework.
  - d. The software shall support the following functionality:
    - i. Automatically find the correct baud rate
    - ii. Automatically find the correct serial communication port
    - iii. Operate over a TCP/IP connection
    - iv. Provide a virtual sensor connection for software usability without a sensor
    - v. Give the operator the ability to save/back up the CTAD configuration to a file or load/restore the CTAD configuration from a file
6. **Operating Conditions.** The CTAD shall maintain accurate performance in all weather conditions, including: Rain, freezing rain, snow, wind, dust, fog and changes in temperature and light, including direct light on sensor at dawn and dusk. CTAD operation shall continue in rain up to 1 inch per hour; capable of



continuous operation over an ambient temperature range of -40°F to 165°F, and a relative humidity range of 5% to 95% (non-condensing).

7. Testing. Each CTAD shall be Federal Communications Commission (FCC) certified under CFR 47, Part 15, section 15.249 as an intentional radiator and a FCC certification shall be displayed on an external label on each CTAD according to the rules set forth by the FCC. The CTAD shall also be tested under IEC 61000-4-5 class 4 and NEMA TS2-2003 Testing. The CTAD shall comply with the applicable standards stated in the NEMA TS2-2003 Standard. Third party test results shall be made available when requested.
8. Manufacturing. The CTAD shall be manufactured and assembled in the U.S.A.
9. Support. The CTAD manufacturer shall provide both training and technical support services.

Training. The manufacturer-provided training shall be sufficient to fully train installers and operators in the installation, auto-configuration, and use of the detector unit to ensure accurate CTAD performance.

Technical Assistance. A manufacturer-provided technical representative shall be available to assist with the physical installation, alignment, and configuration of each supplied detector unit. Technical support shall be provided thereafter to assist with troubleshooting, maintenance, or replacement of the detector unit should such services be required.

10. Documentation. Documentation shall include an instructional training guide, a comprehensive user guide, as well as an installer quick-reference guide and a user quick-reference guide. The manufacturer shall supply the following documentation and specification test results at the time of the bid submittal:

FCC CFR 47 certification

IEC 61000-4-5 class 4 test report

- C. Click! Cabinet interface device (CIB). For each signal cabinet, as indicated in the Drawings, provide a Click! cabinet interface device that will provide a streamlined communication for SmartSensor Matrix, Smartsensor Advance, and Smartsensor Advance Extended Range to traffic controllers in one compact case. This module communicates directly to the controller through SDLC and supports contact closure devices as well. It also provides power, surge protection, and Ethernet connectivity for all sensors.

1. Included components.
  - a. Click! CIB, AC power cord, Extra fuse, Terminal blocks for attaching to cable, and 4 jumper cables
2. Physical.
  - a. Weight: 4.9 lbs.
  - b. Physical dimensions: 7.8 in. × 10.3 in. × 3.9 in.
  - c. Ambient operating temp: -29°F to 165°F

- d. Humidity: up to 95% RH
- 3. Mounting.
  - a. Shelf-mount
- 4. Power.
  - a. Power supply voltage: 90 to 260 VAC
  - b. AC frequency: 50–60 Hz
  - c. Max power: 75 W @ 80°C
  - d. 24 VDC output on sensor connectors
- 5. Connections and Communications.
  - a. One RJ-45 10/100 Ethernet jack
  - b. One SDLC port
  - c. Four terminal block connectors on back of device for connecting to sensors
  - d. Four RJ-11 jacks on faceplate of device for connecting to contact closure devices
  - e. Four communication ports on faceplate
    - DB-9 port for communicating via RS-232
    - Two RJ-11 jacks for communicating via RS-485
    - USB mini-B connector
    - T-bus port
- 6. Testing.
  - a. Complies with the applicable standards stated in the NEMA TS2- 2003 Standard
  - b. FCC-compliant
  - c. Passes manufacturer’s test before shipping
- 7. Warranty.
  - a. Two-year warranty against material and workmanship defect
- D. SmartSensor Manager Matrix (SSMM) software
- E. SmartSensor Mount
  - 1. Provide a Wavetronix SmartSensor mounting assembly.
  - 2. The mounting assembly shall provide at least two axes of rotation to ensure proper installation.
    - a. The mounting assembly shall be able to support at least a 15-lb. load.

- b. The mounting assembly shall feature a symmetric hole pattern that mates with fixed and rotational SmartSensor back plates.
  - c. The mounting assembly shall have two contact points with the pole.
  - d. The mounting assembly shall be slotted for 3/4" banding.
3. The mounting assembly shall be constructed of 0.1875" thick or thicker aluminum with 316 stainless steel hardware. The mounting assembly shall be powder coated for oxidation resistance.
- F. Installation Kit. Provide a Wavetronix Install Kit, for use while installing and configuring Wavetronix SmartSensor products, and communication connectivity devices to the Wavetronix Click! products.
- G. Smartsensor Cable Junction Box. For each radar sensor, provide a Wavetronix in-line terminal strip junction box enclosure to connect the Wavetronix 6-conductor pigtail cable to the APT Matrix 2 homerun cable. Enclosure shall readily fit inside the signal pole base via the pole base handhole. Enclosure to meet IP 66 and NEMA 4X ratings.
- H. Wavetronix SmartSensor 6-conductor cable. For each Wavetronix SmartSensor Matrix® above-ground stop bar detector (SBD) indicated in the Drawings provide a cable of the length indicated in the Drawings. Cable to run from the detector to an in-line terminal strip enclosure at the pole base handhole.
- I. Wavetronix SmartSensor Matrix Type 2 Home Run cable. For each Wavetronix SmartSensor Matrix® above-ground stop bar detector (SBD) indicated in the Drawings provide a cable of the length to run from the in-line terminal strip enclosure at the pole base handhole to the Click! device unit inside the controller cabinet. Provide 15' of neatly coiled slack cable in the base of the controller foundation
- J. Wavetronix SmartSensor 6-port SDLC interface panel. For each signal cabinet, indicated in the Drawings, provide a 6-port SDLC interface panel (WS-SDLC-IP6), a 3' SDLC cable (WS-SDLC-TS2-3) and 7' SDLC cable (WS-SDLC-TS2-7) to provide data communication between the new radar detection and existing controller and controller cabinet equipment.

#### **Article 18.4 Ultrasonic Detectors - Ultrasonic Presence Sensors**

Ultrasonic Detectors shall not be used without prior approval of the Municipal Traffic Engineer.

#### **Article 18.5 Video Detectors**

Video Detectors shall not be used without prior approval of the Municipal Traffic Engineer.

#### **Article 18.6 Measurement**

Loop detectors shall be measured as units, complete and in place, including all labor, equipment, specified materials and miscellaneous materials to provide a complete and functioning unit, including the home run to the nearest junction box. Bid item "Install Loop Detectors in Existing Pavement" includes, but is not limited to, all costs of cutting

and restoring existing pavement; excavation; disposal of surplus or unusable material; and placement of leveling course.

Optical and GPS preemption detectors, radar detectors and ultrasonic detectors shall be measured as units, complete and in place, including all labor, equipment, specified materials and miscellaneous materials to provide a complete and functioning unit, including all cabinet assembly and all hardware installed in the cabinet. Radar detector item shall include the 6-conductor cable between the detector and the junction box located inside the pole.

**Article 18.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07, Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Install Loop Detector - New Work	Each
Install Loop Detector - Existing Pavement	Each
Install Optical and GPS Preemption Detector (Type)	Each
Install Radar Detector	Each
Install Ultrasonic Detector	Each
Install Video Detectors	Each

## **SECTION 80.19 VEHICLE SIGNAL HEADS**

### **Article 19.1 General**

LED Signal Heads shall conform to the following publications:

- A. Circular Indications: Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement, 6/27/05 (ITE Publication ST-052). This is hereafter referred to as "VTCSH-05".
- B. Arrow Indications: Vehicle Traffic Control Signal Heads – Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement 7/1/07 (ITE Publication ST-054). This is hereafter referred to as "VTCSH-Arrow-07."

Each signal head shall be adjustable, vertical type with the number and type of sections as specified herein and shown on the Drawings; shall provide an indication in one direction only; shall be adjustable through 360 degrees about a vertical axis; and shall be mounted at the location and in the manner shown on the Drawings.

Vehicle Signal Heads shall have Light Emitting Diode (LED) lamps for all red, green and yellow indications. Red, green and yellow lamps shall conform to Article 19.4 – Light Emitting Diode (LED) Optical Units.

Each lens shall be provided with a removable tunnel visor, with an open slot at the bottom. The visor shall be constructed of aluminum. Visors shall be painted as specified in Section 80.16, Article 16.4 – Painting for Structures.

Vehicle signal housings shall conform to the following:

- 1. All parts of the housing, including the doors and end plates, shall be of die cast aluminum conforming to the specifications of ASTM B85, and all parts shall be clean, smooth, and free from flaws, cracks, blow holes, or other imperfections, unless otherwise called for on the Drawings.
- 2. The housing of each signal section shall be one piece with integral top, bottom, and sides, with square doors.
- 3. All exposed bolts, screws, hinges pins, and door locking devices shall be stainless steel. All interior screws and fittings shall be stainless steel or approved non-ferrous, corrosion-resistant material.
- 4. The top and bottom of each housing shall have an opening to accommodate standard one and one-half inch (1-1/2") pipe fittings and brackets.
- 5. The top and bottom opening of the housing shall have an integral serrated boss that will provide positive positioning of the signal head in five (5) degree increments to eliminate undesirable rotation or misalignment of the signal head as well as between sections. A total of seventy-two (72) teeth shall be provided in the serrated boss. The teeth shall be clean and sharp to provide positive positioning with the grooves of the mating section or framework.
- 6. Individual signal sections shall be fastened together with a cadmium-plated tri-stud connector, lock washers, and nuts with access holes for the passage of electrical conductors from one section to another.

7. Each signal housing shall have two (2) integral hinge lugs located on the left side for mounting the door.
8. Eight inch (8") signal heads shall have one (1) latch and twelve inch (12") signal heads shall have two (2) latches. Latches shall be provided on the right side of each signal housing with stainless steel wing nut assemblies for the purpose of engaging the door latches.
9. Each signal housing shall have a door opening for the periphery which shall have a soft, closed-cell neoprene gasket to provide a weather-tight seal with the mating door.
10. The door of each signal housing shall be provided with a round opening designed to accommodate any standard traffic signal lens.
11. Signal housings shall be painted as specified in Section 80.16, Article 16.4 – Painting for Structures.
12. The top of the signal housing shall be manufactured to shed water. Cast ribs shall be tapered and notch(s) cast in the top back section of the housing to drain water off the signal housing.
13. Housing shall be manufactured so that the surface contact area at each attachment point of the backplate to the signal housing shall be a minimum of 1.5 square inches. The shortest dimension of the contact area shall not be less than 0.75 inches. An attachment location is required at each corner of the signal section housing.

## **Article 19.2 Installation**

- A. Vehicle signal heads shall not be installed at any intersection until all other signal equipment, including the controller, is in place and ready for operation at that intersection, unless the faces are not directed toward traffic or unless the faces are adequately covered. Contractor shall cover heads with beige colored canvas shirts sized to fit the signal faces shown in the Drawings. Each shirt shall feature elasticized openings that fit over the visors and at least two straps to secure it to the signal. Provide shirts with a legend that reads "out of service" and a center section that allows an operator to see the indications during system tests.
- B. Vehicle signal head mounting hardware shall be attached to the side of pole that faces away from traffic unless otherwise approved by the Municipal Traffic Engineer.
- C. All conductor access holes drilled for side mounted vehicular signal heads shall be deburred inside and out to prevent scraping of the conductors. The holes shall be cleaned and painted with two (2) coats of zinc chromate primer for metal.
- D. Through phase vehicle signal faces shall be aimed at a point located a distance from the face as shown in the following table. If two (2) through signal faces are not visible from this point at an eye height of three and one-half feet (3.5') above finished grade, then the Municipal Traffic Engineer shall be consulted for corrective measures.

### Signal Head Visibility Distances

Posted Speed Limit (mph)	Minimum Visibility Distance (ft.)
20	328
25	394
30	460
35	540
40	390
45	624
50	722
55	820
60	902

- E. Backplates shall be attached to the signal head using plated steel rivets with large flange button heads. The rivet shall be two-tenths inches (0.2") in diameter and 0.575 inches long and at least 2380 N and 3000 N shear and tensile strength, respectively. Bore out the mounting holes in the backplates and signal heads to the diameter recommended by the rivet manufacturer.
- F. Each lens shall be provided with a removable tunnel visor, with an open slot at the bottom, constructed of aluminum and securely installed using machine screws. The threads of the machine screws shall be coated with an antiseizing compound before installation.
- G. Removal and relocation of existing signal heads, as shown on the Drawings, shall utilize new mounting hardware.
- H. When installing LED signal heads, the Contractor shall clearly and permanently mark the date installed on the back of each LED signal module.

### Article 19.3 Signal Head Mounting

Mast arm mounted signal head locations shown on the Drawings are approximate. Signal heads shall be installed over lane lines or over the center of lanes, as shown on the Drawings. Mounting locations shall be verified using the as-built lane markings and signal pole foundation location. Obtain the approval of the Engineer before wire access holes are drilled in mast arms.

#### A. Mast Arm Signals

Signal head assembly for suspension from mast arm shall be equipped with a bronze plumbizer.

All holes in mast arms shall be field drilled to ensure proper location of signal heads with respect to traffic lanes. Arms shall be drilled for wire accesses after installation on the base of the pole. The wire hole locations shall be directly centered on the mounting bracket on the signal head side of the mast arm.

All mast arm mounted signal heads shall be mounted using "Astro-Brac" band mount clamp kits part number AB-3035-SS-L (with stainless upgrade option), brackets manufactured by Pelco Products Inc., or an approved substitute. The mounting nipple shall be a two inch (2") rigid metal conduit, cut to a length of six inches (6"). The mounting nipple shall have one inch (1") of tapered thread on

one end, be drilled to accept the plumbizer through bolt and all openings shall be deburred.

#### B. Pole and Post Mounted Signals

Bracket mounted signal heads, as shown on the Drawings, shall be supported by mounting brackets consisting of watertight assemblies of one and one-half inch (1 1/2") standard steel pipe and malleable iron or brass pipe fittings. All members shall be either plumb or level, symmetrically arranged, and securely assembled. Construction shall be such that all conductors are concealed within the assembly.

The horizontal nipples shall be of adequate length to achieve the required offsets indicated on Standard Details 80-27 and 80-29. Offsets are calculated from center of signal head mounting opening to center of vertical riser on terminal compartments. Side mounted frames twenty-two inches (22"), double head post top mount eleven inches (11"), and single head post top mount six inches (6").

Where four (4) or five (5) section vertical signal heads are side mounted on poles, a steel conduit hanger shall be installed on the vertical framework pipe, six inches (6") down from the upper horizontal framework pipe. A conduit hanger shall be mounted to the pole with a five-sixteenth inch (5/16") bolt and lock washer.

Pole side mounted traffic signal heads shall be mounted on the back side of pole unless noted or detailed otherwise on the Drawings. The pole/post-mounted traffic signal heads shall be mounted so that no portion of the backplates are hidden by the pole/post.

At each signal location, unless otherwise shown on the Drawings, a terminal compartment shall be constructed into the mounting brackets.

For post-top mounting of bracket mounted signals, the terminal compartment shall be cast with an integral slip-fitter.

For post-top mounting of a one-way signal head, a slip-fitter without a terminal compartment may be used.

Post-top signal heads with backplates shall be mounted with an offset slip-fitter to allow the signal head backplate to clear the signal pole.

Attach each side mounted terminal compartment with two (2) one-half inch (1/2") - 13 stainless steel cylindrical socket head bolts with washers, threaded into holes tapped into the side of the pole.

#### C. Programmed Visibility Traffic Signal Heads

The Contractor shall program the head as recommended by the manufacturer and as directed.

When programmed, each signal face's indication shall be visible only in those areas or lanes to be controlled, except that during dusk and darkness a faint glow to each side shall be permissible.



## Article 19.4 Light Emitting Diode (LED) Optical Units

All LED vehicle lamps shall be GELcore, Dialight or an approved equal. Any substitutions must be submitted to the Municipal Traffic Engineer for testing and approval prior to bid award. LED vehicle lamps shall meet the following specifications:

### A. Definition

1. Eight inch (8") and twelve inch (12") indications for all vehicle traffic signals faces shall utilize light emitting diode signal modules.
2. Light emitting diode (LED) signal modules shall consist of an assembly that utilizes light emitting diodes as the light source in lieu of an incandescent lamp for use in traffic signal sections.

### B. General

1. LED signal modules shall be designed to be installed in the doorframe of a standard traffic signal housing. The lamp socket, reflector, reflector holder and lens used with an incandescent lamp shall not be used in a signal section in which an LED signal module is installed.
2. LED signal modules shall be a sealed unit with two (2) conductors for connecting to power, a printed circuit board, power supply, a lens and gasket, and shall be weatherproof after installation and connection. The circuit board and power supply shall be contained inside the module.
3. Conductors for modules shall be forty inches (40") in length, with insulated quick disconnect terminals.
4. The lens of the module shall be integral to the unit, shall be convex with a smooth outer surface and made of ultraviolet stabilized plastic or of glass. The lens shall be capable of withstanding ultraviolet (direct sunlight) exposure for a minimum period of five (5) years without exhibiting evidence of deterioration.
5. The module shall be sealed in the door frame with a one-piece EPDM (ethylene propylene rubber) gasket.
6. The LEDs shall utilize AlInGaP technology and shall be the ultra bright type rated for 100,000 hours of continuous operation from 40°F to 165°F (40°C to 74°C). AlGaS LEDs shall not be allowed.
7. The failure of an individual LED in a string shall only result in the loss of that LED, not the entire string or indication.
8. Furnish LED signal modules rated for a minimum useful life of sixty (60) months and that meet current ITE Standards for LED signal modules.

### C. Physical and Mechanical Requirements

1. LED traffic signal modules shall be designed as retrofit replacements for existing optical units of signal lamps and shall not require special tools for installation. LED signal modules shall fit into existing traffic signal section housings built to the VTCSH standard without modification to the housing.

2. Installation of an LED signal module shall only require the removal of the optical unit components, i.e., lens, lamp module, gaskets, and reflector; shall be weather tight and fit securely in the housing; and shall connect directly to electrical wiring.

LED Signal Module Lens. The LED signal module shall be capable of replacing the optical unit. The lens may be tinted or may use transparent film or materials with similar characteristics to enhance ON/OFF contrasts. The use of tinting or other materials to enhance ON/OFF contrasts shall not affect chromaticity and shall be uniform across the face of the lens.

Use only clear lenses for all green signal modules.

If a polymeric lens is used, a surface coating or chemical surface treatment shall be used to provide front surface abrasion resistance.

Environmental Requirements. The LED signal module shall be rated for use in the operating temperature range of -40°F to 165°F (-40°C to 74°C).

The LED signal module shall be protected against dust and moisture intrusion per the requirements of NEMA Standard 250-1991 for Type 4 enclosures to protect all internal components.

The LED signal module lens shall be UV stabilized.

Construction. The LED signal module shall be a single, self-contained device, not requiring on-site assembly for installation into an existing traffic signal housing. The power supply for the LED signal module shall be integral to the unit.

Module Identification. Each LED signal module shall have the manufacturer's name, trademark, and other necessary identification permanently marked on the back of the module. Each individual LED signal module shall be identified for warranty purposes.

The following operating characteristics shall be identified: rated voltage, power consumption, and volt-ampere.

Each LED signal module shall have prominent and permanent vertical marking(s) for correct indexing and orientation within signal housing. The markings shall consist of an up arrow, or the word "UP" or "TOP."

#### D. Photometric Requirements

1. LED traffic signal modules shall meet at least eighty-five percent (85%) of the minimum VTCSH intensity requirements while operating throughout the operating temperature range of -40°F to 165°F (-40°C to 74°C).
2. The minimum initial luminous intensity values for LED traffic signal modules shall be as defined in Section 11.04 of the VTCSH standard at 77°F (25°C).
3. The measured chromaticity coordinates of LED signal modules shall conform to the chromaticity requirements of Section 8.04 and Figure 1 of the VTCSH standard.

## E. Electrical

1. LED signal modules shall operate from a sixty-hertz (60 Hz)  $\pm 3$  Hz AC line over a voltage ranging from eighty (80) volts to one hundred thirty-five (135) volts. The LED circuitry shall prevent perceptible flicker over the voltage range specified above. The fluctuations of line voltage shall have no visible effect on the luminous intensity of the indications. Rated voltage for all measurements shall be one hundred twenty (120) volts. The LED traffic signal lamp unit shall not be capable of functioning at less than forty-five (45) volts.
2. All wiring and terminal blocks shall meet the requirements of Section 13.02 of the VTCSH standard. Two (2) secured, color-coded, 1 m long 600 V, 20 AWG minimum, jacketed wires, conforming to the National Electric Code, rated for service at 221°F (+105°C), are to be provided for electrical connection for each LED signal module.
3. The signal module on-board circuitry shall include voltage surge protection to withstand high-repetition noise transients as stated in Section 2.1.6 of NEMA Standard TS-2, 1992.
4. LED signal modules shall be operationally compatible with currently used controller assemblies (solid state load switches, flashers, and conflict monitors).
5. LED signal modules and associated on-board circuitry must meet Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
6. The LED signal module shall provide a power factor of nine-tenths (0.90) or greater.
7. Total harmonic distortion (current and voltage) induced into an AC power line by a LED signal module shall not exceed twenty percent (20%).

## F. Production Testing Requirements

1. Each new LED traffic signal lamp unit shall be energized for a minimum of twenty-four (24) hours at operating voltage and at a temperature of 140°F (60°C) in order to cause any electronic infant mortality to occur, and to ensure electronic component reliability prior to shipment.
2. After the burn-in procedure is completed, each LED traffic signal lamp unit shall be tested by the manufacturer for rated initial intensity at rated operating voltage.

## G. Warranty

The manufacturer shall provide a written warranty against defects in materials and workmanship for the LED signal modules for a period of sixty (60) months after installation of the modules. Replacement modules shall be provided promptly after receipt of modules that have failed at no cost to the Owner except cost of shipping of the failed modules. Provide the Engineer with all warranty documentation prior to installation. Deliver the replacement modules to Traffic Signal Maintenance

Shop within five (5) working days of notification. The warranty does not include the costs associated with removing and reinstalling units that are replaced or repaired.

### **Article 19.5 Backplates**

Backplates shall be furnished and attached to all vehicle signal heads, including programmed visibility signal heads, except for post mounted flashers which shall be installed without backplates.

Backplates shall be constructed of 0.063-inch minimum thickness aluminum alloy sheet meeting ASTM B 209, alloy 3003-H14. All backplates shall be five inch (5") wide. For backplates consisting of two (2) or more sections, they shall be fastened together with 3/16" aluminum rivets or bolts peened after assembly.

Backplates shall be painted as specified in Section 80.16, Article 16.4 – Painting for Structures.

### **Article 19.6 Signal Head Mounting Hardware**

A signal head assembly for suspension from mast arm shall be equipped with a bronze plumbizer. Replace manufacturer supplied set screws with three-eighth inch (3/8") – 16 by one and one quarter inch (1-1/4") stainless steel hex bolts.

All mast arm mounted signal heads shall be mounted using "Astro-Brac" band mount clamp kits part number AB-3035-SS-L (with stainless upgrade option) brackets manufactured by Pelco Products, Inc., or an approved substitute. The mounting nipple shall be a two inch (2") rigid metal conduit, cut to a length of six inches (6"). The mounting nipple shall have one inch (1") of tapered thread on one end, be drilled to accept the plumbizer through bolt, and all openings shall be deburred.

#### **A. Pipe and Fittings**

Bracket mounting hardware shall be one and one-half inch (1 1/2") standard steel pipe and malleable iron or brass pipefittings. Construction shall be such that all conductors are concealed within a watertight assembly.

Signal heads shall be equipped with positive brass lock rings and fittings designed to prevent heads from turning due to external forces. Lock ring and connecting fittings shall have serrated contacts.

#### **B. Terminal Compartment**

Terminal compartments shall be bronze of sufficient strength to remain intact in event the pole is knocked down.

For post-top mounting of bracket mounted signals, the terminal compartment shall be cast with an integral slip-fitter. Each terminal compartment shall be fitted with a terminal block containing twelve (12) poles, each with two (2) screw type terminals. Each terminal shall accommodate at least three (3) No. 14 AWG conductors. A raintight cover shall be provided, giving ready access to the terminal block.

#### **C. Slip-fitters**

Slip-fitter shall fit over a four inch (4") standard pipe or four and one-half inch (4 1/2") outside diameter end of tapered standard. Each slip-fitter shall be provided with two (2) rows of steel set screws, with three (3) screws in each row to secure

the assembly in plumb position. Set screws shall be cadmium plated. Replace manufacturer supplied set screws with 3/8"-16 x 1 1/4" stainless steel hex bolts.

Slip-fitters, where used without integral terminal compartment, shall be of cast-iron.

Post-top signal heads with backplates shall be mounted with an offset slip-fitter to allow the signal head backplate to clear the signal pole.

#### D. Painting

Mounting brackets and fittings shall be painted as specified in Section 80.16, Article 16.4 – Painting for Steel Structures.

### **Article 19.7 Programmed Visibility Traffic Signal Heads**

Each programmed visibility signal face and the installation thereof shall conform to the provisions of Article 19.1 - General; Article 19.2 - Installation; Article 19.3 - Signal Head Mounting; and Article 19.7 - Signal Head Mounting Hardware, except as modified in this subsection.

Each programmed visibility signal section shall provide a nominal twelve inch (12") diameter circular or arrow indication. Color and arrow configuration shall conform to the latest I.T.E. Specification.

Each section shall be provided with a sun visor.

Each signal section shall be provided with an adjustable connection that permits incremental tilting from zero (0) to ten (10) degrees above or below the horizontal while maintaining a common vertical axis through couplers and mounting axis in five (5) degree increments.

The signal shall be mountable with ordinary tools and capable of being serviced without tools. Adjustment shall be preset at four (4) degrees below the horizontal, unless otherwise specified.

The visibility of each programmed visibility signal face shall be capable of adjustment or programming within the face. When programmed, each signal face's indication shall be visible only in those areas or lanes to be controlled, except that during dusk and darkness a faint glow to each side shall be permissible.

Prior to programming, each signal section with a yellow indication shall provide a minimum luminous intensity of three thousand (3,000) candela on the optical axis, and a maximum intensity of thirty (30) candela at fifteen (15) degrees horizontal from the axis. Each such signal section shall be capable of having its visibility programmed to achieve the following luminous intensities: a minimum of 3,000 candela on the optical axis, a maximum of one hundred (100) candela at from one-half (1/2) to two (2) degrees horizontal from the axis and a maximum of ten (10) candela at from two (2) to fifteen (15) degrees horizontal from the axis. Under the same conditions, the intensities of the red indication and the green indication shall be at least nineteen percent (19%) and thirty eight percent (38%) respectively of the yellow indication.

Each signal face or each signal section shall include integral means for regulating its luminous intensity between limits in proportion to the individual background luminance. Lamp intensity shall not be less than ninety-seven percent (97%) of uncontrolled intensity at 1000 foot-candles, and shall reduce to 15±two percent of maximum intensity at less than one foot-candle. The dimming device shall operate over an applied voltage

range of ninety-five (95) to one hundred thirty (130) volts, sixty hertz (60 Hz) and a temperature range of -40°C to 74°C.

The Contractor shall supply the material required for programming of the head. The programming of the head shall be accomplished by the Traffic Signal Maintenance Shop.

**Article 19.8 Measurement**

New and relocated signal heads shall be measured as units, complete and in place, including all labor, mounting hardware, equipment and materials to provide a complete and functioning unit. Measurement shall be for the actual number of existing signal heads removed and relocated, and the actual number of new signal heads having the specified number of indicators of the specified size. Left arrow, right arrow, and round ball faces of the same size shall be considered identical pay items.

**Article 19.9 Basis of Payment**

Payment for this work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall be full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
(3, 4, 5) Face Signal Head	Each
Remove and Relocate Existing Signal Head	Each

## **SECTION 80.20 PEDESTRIAN SIGNALS**

### **Article 20.1 General**

Pedestrian signals shall be the Light Emitting Diode (LED) Type.

Pedestrian signals shall show the following:

1. Steady "WALKING PERSON" during the pedestrian interval.
2. Flashing "HAND" and countdown time "XX" in seconds during the pedestrian clearance interval.
3. Steady "HAND" after the pedestrian clearance and during the associated phases yellow and all red vehicle clearance intervals.
4. Dark during intersection flash.

Pedestrian signal mounts shall be two-piece hinge connected type (clamshell) unless otherwise shown on the Drawings.

Conductors shall be #14 AWG or larger conforming to IMSA Specification 20-1.

### **Article 20.2 Installation**

Pedestrian signal heads shall be directed at the center of the crosswalk on the opposite side of the street.

Pedestrian signal heads shall not be installed at any intersection until all other signal equipment, including the controller, is in place and ready for operation at that intersection, unless the faces are not directed toward traffic or unless the faces are adequately covered. Contractor shall cover heads with beige colored canvas shirts sized to fit the signal faces shown in the Drawings. Each shirt shall feature elasticized openings that fit over the visors and at least two straps to secure it to the signal. Provide shirts with a legend that reads "out of service" and a center section that allows an operator to see the indications during system tests.

Pedestrian signal head mounting hardware shall be attached to the side of pole that faces away from traffic unless otherwise approved by the Municipal Traffic Engineer.

All conductor access holes drilled for side mounted pedestrian heads shall be deburred inside and out to prevent scraping of the conductors. The holes shall be cleaned and painted with two (2) coats of zinc chromate primer for metal.

Removal and relocation of existing signal heads, as shown on the Drawings, shall utilize new mounting hardware.

When installing LED signal heads, the Contractor shall clearly and permanently mark the date installed on the back of each LED signal module.

### **Article 20.3 Mounting**

Side mounted pedestrian signal hardware shall consist of a two-piece, hinge connected, cast aluminum bracket that mounts directly between the pole and the side of the signal head housing. The two-piece bracket shall be designed to swing open a minimum of 135 degrees. Clearance between the head and pole shall not exceed three inches (3"). The bracket shall properly fit any round pole four inches (4") or greater in diameter and

be capable of being rotated a minimum of thirty (30) degrees when mounted on a four inch (4") pole. A raintight, three (3) position terminal block shall be contained within the mounting bracket.

Mounting brackets and fittings shall be painted as specified in Section 80.16, Article 16.4 – Painting for Structures.

Attach each clamshell bracket with two (2) three-eighth inch (3/8") – 16 stainless steel cylindrical socket head bolts with washers, threaded into holes tapped into the side of the pole.

#### **Article 20.4 Housing**

- A. The case shall be a one-piece, corrosion-resistant, aluminum-alloy die-casting complete with integrally cast top, bottom, sides and back. Four (4) integrally cast hinge lug pairs, two (2) at the top and two (2) at the bottom of each case, shall be provided for operation of a swing-down door.
- B. The case for pedestrian signals shall be dustproof, weatherproof, corrosion resistant, and shall provide for easy access to, and replacement of, all components.
- C. Two (2) versions of the case shall be available. The first version shall be supplied with clamshell mounting hardware installed (ordered concurrently) for installation of "pole left of message." The second version shall be the "pole right of message." Openings in the top and bottom of the housing are not allowed.
- D. The door frame shall be a one-piece, corrosion-resistant, aluminum-alloy die-casting, complete with two (2) hinge lugs cast at the bottom and two (2) latch lots cast at the top of each door. The door shall be attached to the case by means of two (2) Type 304 stainless steel spring pins. Two (2) stainless steel hinged bolts with captive stainless steel wingnuts and washers shall be attached to the case with the use of stainless steel spring pins. Hence, latching or unlatching of the door shall require no tools.
- E. "Z-crate" or "Egg-crate" type filters shall not be used.
- F. All machine screws, studs and washers shall be stainless steel.
- G. Gaskets shall conform to the provisions in ASTM D-1056, Grade RE 42.
- H. The outside of the housing shall be painted in accordance with the provisions of Section 80.16, Article 16.4 – Painting for Structures.
- I. The housings shall accept a sixteen inch by eighteen inch (16" x 18") pedestrian module.
- J. If pedestrian signal head visors are indicated on the Drawings, provide visors that are constructed of aluminum. Visors shall be three sided with the bottom side being open. Visors shall be painted as specified in Section 80.16, Article 16.4 – Painting for Structures.



## **Article 20.5 Light Emitting Diode (LED) Pedestrian Signal Modules**

### **A. General**

LED traffic signal modules shall meet the current ITE standards.

### **B. Installation**

1. LED pedestrian signal modules shall be designed as retrofit replacements for the existing pedestrian signals (ICC 4090 and/or 4094).
2. LED pedestrian signal modules shall not require special tools for installation.
3. LED pedestrian signal modules shall fit into the existing traffic housings built to the PTCSI standard without any modification to the housing.
4. LED pedestrian signal modules shall be weathertight, fit securely in the housing and shall connect directly to existing electrical wiring.
5. Installation of a replacement LED module into the existing pedestrian housing shall only require removal of the existing optical unit components, i.e., lens, lamp, gaskets, and reflector.
6. Each retrofit shall include all necessary components to complete conversion, including a one-piece gasket.
7. Each pedestrian module shall have a sticker attached stating compliance to the ITE standard for color.

### **C. LED Signal Lens**

1. The lens of the LED pedestrian signal modules shall be field replaceable.
2. The lens of the LED pedestrian signal modules shall be polycarbonate UV stabilized and a minimum of six millimeters (6 mm) thick.
3. The exterior of the lens of the LED pedestrian signal module shall be smooth and frosted to prevent sun phantom.

### **D. LED Pedestrian Signal Module Construction**

1. The LED pedestrian signal module shall be a single, self-contained device, not requiring on-site assembly for installation in the existing traffic signal housing.
2. All Portland Orange LEDs shall be "AllnGaP" technology or equal, and rated for 100,000 hours or more at +165°F (+25°C) and twenty milliamps (20 mA). "AllnGaS" technology is not acceptable.
3. Each individual LED traffic module shall be identified for warranty purposes with the manufacturer's trade name, serial number and operating characteristics, i.e., rated voltage, power consumption, and volt-ampere.

### **E. Environmental Requirements**

1. The LED pedestrian signal modules shall be rated for use in the ambient operating temperature range of -40°F to +140°F (-40°C to +60°C).

2. The LED pedestrian signal modules, when properly installed with gasket, shall be protected against dust and moisture intrusion per requirements of MIL-STD-810F Procedure 1, Rain and Blowing Rain.

F. Luminous Intensity

1. Pedestrian LED signal modules shall be designed so, that when operated over the specified ambient temperature and voltage range, the signal shall attract the attention of, and be readable to, a viewer (both day and night) at all distances from ten feet (10') to the full width of the area to be crossed.
2. The luminous intensity of the LED pedestrian signal module shall not vary more than  $\pm 10\%$  for voltage range of 80 VAC to 135 VAC.

G. Chromacity

The measured chromaticity coordinates of the LED signal modules shall conform to the chromaticity requirements of Section 5.3 and Figure C of PTCSI standard.

H. Electrical

1. The secured, color-coded, one meter (1 m) long, 600V, 20 AWG minimum, jacketed wires, conforming to the National Electrical Code, rated for service at  $+221^{\circ}\text{F}$  ( $+105^{\circ}\text{C}$ ), twelve millimeter (12 mm) stripped and tinned are to be provided for electrical connection.
2. The LED pedestrian signal module shall operate from a  $60 \pm 3\text{Hz}$  AC line over a voltage range of 80 VAC to 135 VAC. Rated voltage for all measurements shall be  $120 \pm 3$  volts rms.
3. The LED circuitry shall prevent perceptible flicker over the voltage range specified above.
4. The LED pedestrian signal module circuitry shall include voltage surge protection against high-repetition noise transients as stated in Section 2.1.6, NEMA Standard TS-2, 1992.
5. Catastrophic failure of one LED light source shall not result in the loss of more than the light from that one LED.
6. The LED pedestrian module shall be operationally compatible with the currently used controller assemblies. The LED pedestrian module shall be operationally compatible with conflict monitors.
7. The LED pedestrian module including its circuitry must meet Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of noise.
8. The LED pedestrian module shall provide a power factor of 0.90 or greater over the operating voltage range and temperature range specified above for modules with six (6) watts or more.
9. Total harmonic distortion (current and voltage) induced into an AC power line by an LED pedestrian module shall not exceed twenty percent (20%) over the operating voltage range and temperature range specified above.

I. Production Testing Requirements

1. Each new LED traffic signal lamp unit shall be energized for a minimum of twenty-four (24) hours at operating voltage and at a temperature of 60°C in order to cause any electronic infant mortality to occur, and to ensure electronic component reliability prior to shipment.
2. After the burn-in procedure is completed, each LED traffic signal lamp unit shall be tested by the manufacturer for rated initial intensity at rated operating voltage.

J. Warranty

The manufacturer shall provide a written warranty against defects in materials and workmanship for the LED signal modules for a period of sixty (60) months after installation of the modules. Replacement modules shall be provided promptly after receipt of modules that have failed, at no cost to the Owner except cost of shipping the failed modules. All warranty documentation shall be given to the Engineer prior to installation. The replacement modules shall be delivered to the Traffic Signal Maintenance Shop, within five (5) working days after notification. The warranty does not include the costs associated with removing and reinstalling units that are replaced or repaired.

**Article 20.6 Measurement**

New and relocated pedestrian signal heads shall be measured as units, complete and in place, including all labor, mounting hardware, equipment, and materials to provide a complete and functioning unit. Measurement shall be for the actual number of existing pedestrian signal heads removed and relocated, and the actual number of new signal heads installed.

**Article 20.7 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Pedestrian Signal Head	Each
Remove and Relocate Pedestrian Signal Head	Each

## **SECTION 80.21 PEDESTRIAN PUSHBUTTONS**

### **Article 21.1 General**

Where shown on the Drawings, pedestrian push buttons of substantial tamper-proof construction shall be furnished and installed or relocated. Pedestrian pushbuttons shall be ADA-compliant Bulldog RBDL3-B-4H. Substitutions must be approved by the Municipal Traffic Engineer or designated representative.

The assembly shall be weatherproof and so constructed that it shall be impossible to receive an electrical shock under any weather conditions.

Where a pedestrian pushbutton is attached to a pole, the housing shall be attached to the channel mounting piece and the pole per Detail 80-28 to provide a rigid installation.

Pushbutton and sign shall be positioned on the sidewalk or pathway side of the pole. Arrows on signs shall point in the same direction as the corresponding crosswalk. Pushbutton and sign shall not contain indicator lights unless specified on the Drawings.

Pedestrian pushbutton signs shall be as detailed in the Manual on Uniform Traffic Control Devices (MUTCD) and the Alaska Sign Design Specifications (ASDS). The R10-3E (9"X15") pushbutton sign shall be installed above each pushbutton with the arrow pointing in the direction of the appropriate cross walk. When channel is used for mounting pushbutton signs the top and bottom sign bolt shall be tapped into the pole. Signs shall be in accordance with Division 85, Section 85.04 – Standard Signs.

### **Article 21.2 Measurement**

New and relocated pedestrian pushbuttons shall be measured as units, complete and in place, including all labor, equipment, signs, and other material to provide a complete and working unit. Measurement shall be for the actual number of existing pushbutton assemblies removed and relocated, and the actual number of new pushbutton assemblies installed. Pedestrian pushbutton signs shall not be measured separately, and shall be considered part of the pushbutton assembly.

### **Article 21.3 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Pedestrian Pushbutton Assembly	Each
Remove and Relocate Pedestrian Pushbutton Assembly	Each

## **SECTION 80.22 FLASHING BEACONS**

### **Article 22.1 General**

#### **A. Beacons**

##### **1. Intersection Control and Hazard Beacons**

Each beacon shall consist of one or more single section traffic signal heads, in accordance with the provisions in Section 80.19 - Signal Heads, with yellow or red LED modules as shown on the Drawings.

##### **2. Warning Sign Beacons**

Each Warning Sign Beacons shall consist of twelve inch (12") diameter yellow LED signal indications. The number of units, unit configuration and unit installation shall be as shown on the Drawings.

##### **3. Speed Limit Sign Beacons**

The 'SCHOOL SPEED LIMIT 20 WHEN FLASHING' (S5-1) sign beacon assembly shall consist of four (4) signal heads with eight inch (8") or twelve inch (12") diameter yellow LED signal indications as shown on the Drawings. They shall be mounted horizontally directly above the S5-1 sign. The two upper beacons shall be illuminated alternately and face oncoming traffic. The lower beacons shall face the opposite direction and be illuminated alternately also.

##### **4. Mast Arm Mounted Sign Beacons**

Each mast arm mounted sign beacon assembly shall consist of four (4) twelve inch (12") diameter yellow LED signal indications with backplates, and two signs of the type and size indicated on the Drawings. All signs and signals shall be mounted on the mast arm, with two (2) signals and one (1) sign facing each direction. Any two (2) signals facing the same directions shall be illuminated alternately. Signal heads shall meet the requirements of Section 80.19 - Signal Heads.

#### **B. Control Unit**

##### **1. Flashing Beacon Control Unit**

The Flashing Beacon Control Unit is to be used for the following: Intersection Control Beacons, Hazard Beacons and Crosswalk Warning Sign Beacons. Each control unit shall be a complete flasher cabinet assembly consisting of an On/Off switch, 15-ampere circuit breaker, surge protector, terminal blocks, flasher socket and NEMA flasher. The enclosure shall be a NEMA Type 3R, and shall be provided with a right side hinged door with locking mechanism.

##### **2. Speed Limit Sign Beacon Control Unit**

Each control unit shall be a complete flasher cabinet assembly consisting of a 20-ampere circuit breaker, solid state surge protector, Radio Interference Suppressor, MOV (Metal Oxide Varistor) surge protector, thermostatically controlled incandescent cabinet light with door activated bypass switch, terminal blocks, flasher socket, NEMA flasher and digital time clock. The

enclosure shall be a NEMA Type 3R, and shall be vented and provided with a right side hinged door with locking mechanism.

3. Speed Limit Sign Beacon With Push Button Actuated Warning Beacon Control Unit

Each control unit shall be a complete cabinet assembly consisting of a 20-ampere circuit breaker, solid state surge protector, radio interference suppressor, MOV (Metal Oxide Varistor) surge protector, thermostatically controlled incandescent cabinet light with door activated bypass switch, terminal blocks, flasher socket, NEMA flasher, digital time clock, analog timer and isolation relay. The enclosure shall be a NEMA Type 3R, and shall be vented and provided with a right side hinged door with locking mechanism.

4. Push Button Actuated Warning Beacon Control Unit.

Each control unit shall be a complete cabinet assembly consisting of a 20-ampere circuit breaker, solid state surge protector, Radio Interference Suppressor, MOV (Metal Oxide Varistor) surge protector, thermostatically controlled incandescent cabinet light with door activated bypass switch, terminal block, flasher socket, NEMA flasher, analog timer and isolation relay. The enclosure shall be a NEMA Type 3R, and shall be vented and provided with a right side hinged door with locking mechanism.

C. Control Unit Component Specification

Control unit shall be wired in accordance with the latest cabinet wiring diagram available from the Traffic Signal Maintenance Foreman.

Terminal blocks shall be in accordance with Section 80.17 - Controller Assemblies, except that a single three- (3-) position Box Lug type terminal block capable of accepting three (3) No. 6 AWG wires for terminating power cables must be supplied in all control units.

Switches shall be 15 ampere, single-pole, 120 volt AC.

The Metal Oxide Varistor (MOV), surge protector shall be a V130PA20A.

The cabinet light fixture shall be an incandescent type porcelain lamp holder rated for 660W-250V AC/CA. The lamp shall be 75W.

Flasher socket shall be Cinch-Jones socket S-406-SB, or equivalent.

Flasher shall be a NEMA 2 circuit, solid state, rated at 15 amperes per circuit flasher.

Digital time clock shall be an RTC AP22, or equivalent as approved by the Traffic Signal Maintenance Foreman. Clock to be supplied with Speed Limit Sign Beacon Control Unit and Speed Limit Sign Beacon With Push Button Actuated Warning Beacon Control Unit.

Control unit, complete with all cabinet components, shall be delivered to Traffic Signal Maintenance Shop for testing, prior to installation in the field.

Isolation Relay shall be IDEC power relay model RR2P-U (AC120)

Timer shall be IDEC analog timer RTE-P2 AF20

All other components shall meet the requirements of Section 80.17 - Controller Assemblies.

### **Article 22.2 Measurement**

Flashing beacons, flashing beacon control units, and flashing beacon control units with push button actuated control shall be measured separately as units, complete and in place, including all labor, equipment, and material to provide a complete and working unit.

### **Article 22.3 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Intersection Control Beacon	Each
Hazard Beacon	Each
Warning Sign Beacons	Each
Speed Limit Sign Beacon	Each
Mast Arm Mounted Sign Beacon	Each
Flashing Beacon Control Unit	Each
Speed Limit Sign Beacon Control Unit	Each
Push Button Actuated Warning Beacon Control Unit	Each
Speed Limit Sign Beacon with Push Button Actuated Warning Beacon Control Unit	Each

## **SECTION 80.23 LUMINAIRES**

### **Article 23.1 Luminaire Specification**

All luminaire requirements:

1. Light emitting diode (LED) type
2. Minimum operating temperature range -40C to 40C (-40F to 104F)
3. Include a 7-pin receptacle with a shorting cap installed
4. Gaskets shall be composed of a material suitable for the environment.
5. All parts of the luminaire shall be manufactured from corrosion-resistant materials suitable for the environment.
6. Correlated color temperature (CCT) of 3000K.
7. IES BUG Rating U0

Mast arm mounted luminaire requirements:

1. Utilize slip-fitters designed for mounting on 2" O.D. pipe and shall include mounting hardware suitable for the environment.
2. Utilize a flat plate lens with no part of the lens extending below the luminaire's housing.

To ensure the lighting system constructed implements the Engineer's design, the Drawings shall specify the manufacture and manufacture part number for each luminaire, including any shield installed. Luminaires and shields shall be of the type shown on the Drawings.

Design specification of luminaires shall, at minimum, include the following information:

1. Manufacture
2. Model
3. Manufacture Part Number
4. Lumens
5. Longitudinal Light Distribution - Short (S), Medium (M) or Long (L)
6. Transverse Light Distribution - Type I, II, III, IV or V
7. Voltage - Nominal or voltage range if wide range type
8. Correlated color temperature (CCT)
9. Shield Type House, Street or Side (if applicable)
10. Shield Part Number (if applicable)

Manufacturer's luminaire specifications, shop drawings, and photometric data shall be submitted and approved before installing any luminaire on the project.



**Article 23.2 Luminaire Substitution**

Substitutions of another luminaire shall be approved by the Engineer. A lighting analysis shall be performed to demonstrate the proposed substitution meets the design criteria. The Engineer shall provide an updated electrical sheet with approval of the substitution.

**Article 23.3 Measurement**

Luminaires shall be measured as units complete and in place, including all labor, equipment, and materials to provide a complete and functioning unit. No measurement for payment shall be made until the functional test has been completed in accordance with Section 80.16, Article 16.2 – Field Tests.

**Article 23.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Luminaire (Manufacture Part Number)	Each

## **SECTION 80.24 BALLASTS**

### **Article 24.1 General**

Ballasts for high-intensity discharge lamps shall be an integral part of each luminaire and designed for the voltages and lamp types specified in the Drawings or Special Provisions. The current needed to start the lamps shall be less than the operating current.

Ballasts shall be the regulator type with copper windings electrically isolated from each other, and shall start and operate the lamps in temperatures down to -40°F. The allowable line voltage variation shall be at least plus and minus ten percent (10%).

High pressure sodium luminaires, except those with 1000 watt lamps, shall be equipped with magnetic regulator ballasts with the following additional operating characteristics:

1. The lamp wattage regulation spread at any time over the life of the lamp shall not exceed eighteen percent (18%) of nominal lamp watts at plus or minus ten percent ( $\pm 10\%$ ) line voltage variations.
2. With nominal line and lamp voltages, the ballast shall regulate the lamp output to within five percent (5%) of the ballast design center, and sustain lamp operation with a minimum sixty percent (60%) voltage drop lasting four (4) seconds or less.
3. Grounded socket shell.

Luminaires with 1000 watt high pressure sodium lamps shall be equipped with auto-regulator ballasts that provide a maximum thirty percent (30%) lamp regulation spread, a minimum thirty-five percent (35%) voltage dip tolerance, and with nominal line and lamp voltages regulate lamp output to within five percent (5%) of the ballast design center.

Ballasts for use for soffit luminaires shall be furnished with mounting brackets attached and shall be equipped with terminal blocks for primary connections and lamp socket preconnected to the secondary for flush mounted luminaires and with terminal blocks for both primary and secondary connections for use with suspended luminaires.

The Contractor shall submit the ballast manufacturer's volt-watt trace and specification sheets to the Street Light Maintenance Supervisor for review and approval.

### **Article 24.2 Measurement**

This item shall be considered incidental to other Work.

### **Article 24.3 Basis of Payment**

No separate pay item shall be allowed for this item.

## **SECTION 80.25 FALSEWORK LIGHTING**

### **Article 25.1 General**

When required by the Special Provisions, falsework lighting shall be installed where vehicular traffic with or without pedestrian traffic crosses through or under structure falsework.

Illumination of the portal faces of falsework shall be provided during the hours from dusk to dawn. Illumination of the pavement and pedestrian openings through or under falsework shall be provided twenty four (24) hours per day.

The Contractor shall submit a plan of the proposed lighting installations and shall not commence falsework construction until such Drawings have been reviewed by the Engineer. A subsequent review shall be made by the Engineer after falsework lights have been placed in operation.

Fixtures for illumination of roadway pavement between entrances and exit portals shall be enclosed in units with protective cover lens.

Fixture housing shall be heavy gauge, anodized aluminum and shall have an etched, anodized aluminum reflecting surface, or equivalent. Beam spread shall be between one hundred (100) and one hundred thirty (130) degrees.

Fixtures shall be equipped with high temperature glazed porcelain medium base sockets and six foot (6') conductors for splicing, approved by UL for outdoor use.

Fixtures shall be fully adjustable with bracket and locking screws on a mounting plate and shall provide mounting directly to a standard metal junction box.

Fixtures for pedestrian passageways shall be porcelain box receptacles mounted on standard metal junction boxes and equipped with wire lamp guards. Porcelain box receptacles shall be rated at six hundred sixty (660) watts, two hundred fifty (250) volts. Wire lamp guards shall be made of No. 10 AWG wire and shall be suitable for general construction work.

Lamps shall be of the medium base incandescent type. For pavement illumination, lamps shall be one hundred fifty (150) watts minimum. For pedestrian passageway illumination, lamps shall be one hundred (100) watts minimum.

The face of all falsework and forms located within or adjacent to the traveled way, on the approach side, shall be fully illuminated by a minimum of four (4) three hundred (300) watt PAR reflector flood lights directed upon the vertical and horizontal supports. The lights shall be located a minimum of ten feet (10') and a maximum of fifteen feet (15') from the portal faces adjacent to the traveled way and mounted a minimum of twelve feet (12') and a maximum of fifteen feet (15') high. When a median area contains falsework, a minimum of one (1) additional three hundred (300) watt PAR reflector flood light shall be installed in the same manner to illuminate the median support. Each flood light shall be aimed in such a manner as to preclude glare to oncoming motorists. Floodlights shall be mounted on temporary wood poles set in the ground and located on both sides of the traveled way.

For illumination of roadway pavement between entrance and exit portals, a continuous row of fixtures shall be installed over the center of each lane beneath the falsework

structure at intervals of not more than fifteen feet (15'), with the end fixtures not further than seven feet (7') inside the portal faces. Mounting height of fixtures over the pavement shall be as directed.

Pedestrian openings, through or under falsework, shall be illuminated with fixtures centered over the passageway at intervals of not more than fifteen feet (15'), with the end fixtures not more than seven feet (7') inside the portal faces and at a height of ten feet (10'), unless otherwise directed.

For roadway pavement and portal face illumination, No. 12 AWG conductors with Type XHHW insulation shall be used. For pedestrian passageways, conductors shall be No. 12 AWG and enclosed in a one-half inch (1/2") unpainted, zinc-coated metallic conduit.

Contractor shall provide two branch circuits. Pedestrian passageway lights and roadway pavement lights shall be on one (1) circuit and portal face floodlights shall be on a separate circuit. Each branch circuit shall be fused, not to exceed twenty (20) amperes.

The above-specified portal lighting shall be installed on the day that vertical supports are erected and before traffic is permitted to pass between these supports during the hours from dusk to dawn. The other falsework lights shall be installed as soon as the members on which they are to be supported are in place.

Upon completion of the project or when directed, falsework lighting equipment shall remain the property of the Contractor and shall be removed from the site of the Work.

**Article 25.2 Measurement**

Falsework lighting for each location shall be measured as one lot, installed complete, including all labor, equipment, and material required to provide a complete and functioning system.

**Article 25.3 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Falsework Lighting	Lot

## **SECTION 80.26 INTERCONNECT CABINET**

### **Article 26.1 General**

Install the interconnect cable termination cabinet when called for in the Drawings. All cables shall be terminated in the interconnect cable cabinet and none in the controller cabinet.

Furnish an interconnect termination cabinet that:

1. Is constructed from 16 gauge galvanized steel with an ANSI 61 gray polyester powder coat inside and out.
2. Meets NEMA Standards for Type 3R enclosures.
3. Has a 16-gauge galvanized steel continuous hinge with stainless steel pin.
4. Has a cover fastened securely with captive plated steel screws.
5. Is provided with a hasp and staple for padlocking.
6. Has no gasketing or knockouts.
7. Has no ventilating cover or louvers.
8. Has a standoff mounted back panel with grounding lug assembly.

### **Article 26.2 Measurement**

Interconnect cabinets shall be measured as units installed complete and in place, including all labor, equipment, and material to provide a complete and functioning unit.

### **Article 26.3 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Interconnect Cabinet	Each

## **SECTION 80.27 PROTECTIVE POST ASSEMBLY**

### **Article 27.1 General**

Protective post assembly shall be a concrete-filled Schedule 40, steel pipe installed in accordance with the appropriate Standard Details.

### **Article 27.2 Measurement**

Protective post assembly shall be measured as units installed complete and in place, including all labor, equipment, and material to provide a complete and functioning unit.

### **Article 27.3 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Protective Post Assembly	Each

## **SECTION 80.28 SALVAGING ELECTRICAL EQUIPMENT**

### **Article 28.1 General**

Unless otherwise specified or shown on the Drawings or Specifications, existing electrical equipment including but not limited to: luminaires, standards, mast arms, poles, caps, handhole covers, mounting bolts, controllers, cabinets, optical detectors, signal heads, pedestrian heads, pedestrian push buttons, push button signs, cameras, radar detectors, service equipment, and junction box lids shall be salvaged and delivered to the Municipality of Anchorage Electronics Warehouse or the Municipality of Anchorage Pole Yard to be placed as directed by the Municipal Traffic Engineer.

Traffic Signal Maintenance personnel and Street Light Maintenance personnel shall be allowed to select the equipment and pole/arm items they would like to salvage. Contractor is responsible for disposal of all remaining items. All poles and arms not selected for salvage shall have the pole plate or arm plate cut off to render the item unusable.

Contractor shall contact the Traffic Signal Maintenance Shop Foreman, at 343-8355, one week prior to the tentative delivery date.

Salvaged poles and mast arms shall be stripped of all wire and hardware and any damaged areas, and exposed hole edges shall be cleaned and painted with cold galvanizing paint in accordance with Section 80.16, Article 16.3 - Galvanizing. All caps, hand-hole covers, mast arms and mounting bolts shall be returned with the pole.

Removal, wire and hardware stripping, listed cleaning and cold galvanize painting, and delivery of all salvaged electrical equipment shall be considered incidental to the Contract and no separate payment shall be made.

When a controller assembly is to be salvaged, the salvage material shall include timing modules, switches, detector control units, conflict monitor unit, and all other equipment contained in the controller cabinet prior to award of the Contract.

Care shall be exercised in removing and salvaging electrical equipment so that it shall remain in its original form and existing condition. The Contractor shall be required to replace, at his expense, any of the abovementioned electrical equipment which has been damaged or destroyed by his operations.

Unless otherwise specified, underground conduit, conductors, foundations and detector loops not reused shall become the property of the Contractor and shall be removed from the project Right-of-Way. If said materials do not interfere with other construction, they may, with approval from the Engineer, be abandoned in place except that conductors must be removed from conduit prior to abandonment. Foundations abandoned in place shall conform to the requirements of Section 80.03 – Removing and Replacing Improvements.

Holes formed by removing pull boxes and foundations shall be filled with material equivalent to the original and compacted to the same density as the surrounding material.

When existing electrical equipment is to be reused, the Contractor shall furnish and install all necessary materials and equipment, including signal mounting brackets, anchor bolts, nuts, washers and concrete as required to complete the new installation.

All traffic signal, flashing beacon and lighting fixtures to be reinstalled shall be cleaned, relamped, and reconditioned in accordance with Section 80.16, Article 16.4 – Painting for Structures.

Salvaged materials required to be reused and found to be unsatisfactory by the Engineer shall be replaced by new material and the cost shall be paid as extra Work as provided in Division 10, Sections 10.05 – Control of Work and 10.07 – Measurement and Payment.

### **Article 28.2 Measurement**

Measurement for removal of poles in this Section is per each unit removed; and includes all work and materials necessary to remove poles, hardware disposal, cutting poles to render them unusable, disassemble, salvage, disposal, and delivery to the Municipality of Anchorage Pole Yard as specified in the Drawings or in the Special Provisions. When Drawings are unclear as to the method of pole salvage or disposal, the Contractor shall contact the Municipal Traffic Engineer to receive specific instructions.

Removal of the pole foundation, in accordance with Section 80.03 - Removal and Replacing Improvements, and disposal of the pole foundation is incidental to the pay items in this Section. Salvage and delivery of existing signs, signal hardware and illumination hardware shall also be considered incidental to the pole removal pay items.

If Owner declines ownership, the poles, mast arms, and associated hardware become Contractor property.

### **Article 28.3 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following units:

ITEM	UNIT
Remove Luminaire Pole	Each
Remove Signal Mast Arm or Combination Pole	Each
Remove Signal Pedestal or Pedestrian Pushbutton Pole	Each



## **SECTION 80.29 RADAR SPEED SIGN**

### **Article 29.1 General**

Work under this Section consists of the performance of all operations pertaining to furnishing and installing the radar speed sign, including the labor, equipment, and materials, in accordance with the Drawings.

### **Article 29.2 Manufacturer**

Radar speed sign shall be the "VCalm YS" traffic calming sign as manufactured by Fortel Traffic Inc. (<https://www.vcalm.com>) or approved equal.

### **Article 29.3 Materials**

Contractor shall provide new, undamaged materials to meet the requirements specified on the Drawings and in these Specifications.

#### **A. Radar Speed Sign**

1. Contractor shall install a radar speed sign at the locations shown in the Drawings or as directed by the Engineer. Mount signs to a new 13' breakaway traffic signal pole or electrolier in accordance with the Plans.
2. Radar speed sign shall have the approximate overall dimensions 45" (h) x 28.5" (w) x 4.5" (d).
3. Radar speed sign shall be UL listed.
4. Sign enclosure shall be rated NEMA-3R and be constructed of 11-gauge (0.090) continuous formed aluminum. Finish shall be black powder coat.
5. Upper display shall be static plaquards, but have the option to be upgradable to a variable Light Emitting Diode (LED) message display in the future. The upper display shall read "YOUR SPEED" in two rows with approximate overall dimensions: 12" (h) x 20".
6. Lower display shall be numerals consisting of amber LEDs and have the approximate overall dimensions: 16" (h) x 18" (w). Lens shall be 3/8" polycarbonate.
7. Sign shall have a receptacle capable of receiving an SD card for programming and data retrieval.
8. Install the following optional modules with the radar speed sign:
  - a. Wireless IP Modem/VSpeed Online for programming
  - b. Flashing Strobe for when speeds above the posted speed limit are detected
9. Includes 5 year wireless service subscription.
10. If a means to mount the sign to the pole are not included in the sign kit, or are unstable, the Contractor shall provide mounting hardware in accordance with M.A.S.S., these Special Provisions, and manufacturer's instructions, subject to approval by the Engineer.

11. Provide a short length of RMC between radar speed sign and pole or post, unless directed otherwise by the manufacturer's instructions or the field engineer. Conduit penetration shall be at the sign bottom unless otherwise directed. Pull radar speed sign cable through RMC and terminate.

12. Install a new R2-1 sign as shown on the drawings.

#### **Article 29.4 Construction**

MOA Traffic to be onsite for field installations. Contact Traffic Engineering Department (907-343-8479) seven (7) working days prior to planned field installations. Provide Traffic Engineering Department twenty four (24) hours notice prior to actual installations. Failure to notify Traffic Engineering Department may result in delay of work and withholding of payment. The Owner may withhold from any progress payment the sum of \$500 per day as liquidated Damages for each and every calendar day the Contractor delays notification to Traffic Engineering Department.

Contractor shall install the radar speed sign according to the manufacturer's instructions and in accordance with the Drawings or as directed by the Engineer. Contractor shall ensure that the radar speed sign is level and correctly orientated. Repair any damage to galvanized finishes according to Article 16.3.

Field locate all utilities and existing lighting circuits according to Article 1.1. Hand dig when within 2 feet of utilities.

Route conduit as shown in the Drawings or as directed by the Engineer. Utilize existing junction boxes and conduit where shown in the Drawings for the radar speed sign circuit.

Install new R2-1 signs at radar speed signs as shown on the drawings.

#### **Article 29.5 Measurement**

The radar speed sign system shall be measured as units, complete and in place. Any required mounting hardware is subsidiary to this pay item. Conduit and conductors required for the connection of the radar speed sign system shall be paid for separately under Sections 80-07 and 80-10. The foundation and breakaway traffic signal pole shall be paid for under Sections 80-04 and 80-05. The R2-1 speed limit sign shall be paid for under Section 85.04. Mounting hardware shall be subsidiary to this pay item. All salvage and demolition efforts described in this section shall be subsidiary to this pay item.

Radar speed signs indicated as spares shall be delivered to Street Light Maintenance, 343-8372 prior to final acceptance. Contact Street Light Maintenance a minimum of three business days prior to delivery. The Engineer retains the right to inspect all radar speed signs for conformance with the contract documents prior to accepting delivery. The cost of storage prior to delivery and delivery of these materials is subsidiary to the pay item.

#### **Article 29.6 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Radar Speed Sign	Each
Radar Speed Sign, Spare	Each

## **SECTION 80.30 HEAT TRACE SYSTEM**

### **Article 30.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing and installing a heat trace system as required by the Drawings and these Specifications.

Locations of heat cables, manholes, catch basin and storm drain services, and appurtenances shown on the Drawings are approximate and the exact locations shall be established in the field in consultation with the Engineer.

Materials furnished shall be new, except such used materials as may be specifically provided for on the Drawings or Special Provisions. Where an existing system is to be modified, the existing materials shall be reused on the project or disposed as shown on the Drawings or in the Special Provisions.

All systems shall be complete and in operation with all materials in conformance with Contract Documents at the time of final acceptance.

### **Article 30.2 Regulations and Codes**

Work shall be as specified in Division 80, Section 80.01, Article 1.2 - Regulations and Codes and this Section.

Heat cables shall be provided with Factory Mutual or UL listing indicating approval for freeze protection in the indicated locations shown on the Drawings and specified herein.

### **Article 30.3 Equipment Lists and Drawings**

Work shall be as specified in Division 80, Section 80.01, Article 1.3 - Equipment List(s) and Drawings and this Section. Submittals shall include:

1. Manufacturer's installation and testing instructions.
2. Operations and maintenance instructions.
3. Complete control diagrams in block and schematic form indicating wire sizes, raceway sizes, locations, component configurations, equipment layouts, and all other information necessary to completely describe each and every portion of the controls installation.
4. MEGGER reports before and after installation.

### **Article 30.4 Warranties, Guarantees, and Instruction Sheets**

Provide in accordance with Division 80, Section 80.01, Article 1.4 - Warranties, Guarantees, and Instruction Sheets.

### **Article 30.5 Safety Precautions**

Before starting Work on existing heat cable systems, Contractor shall disconnect and lock-off load centers feeding circuits for the heat trace system. Disconnection shall be made by utility or main and branch breakers locked in "off" position.

Suitable signs shall be posted at load centers when Contractor is working on any of the circuits fed from the load center.

## Article 30.6 Materials

Self-limiting thermoplastic insulation, parallel resistance heating cable with a 300-volt insulation rating, with output of eight (8) watts/linear foot at a 240-volt single phase operation and tinned copper metal braid with fluoropolymer overjacket as manufactured by Thermon Type FLX (8-FLX-2-FOJ). Substitutions: Items of other manufacturers of same quality, construction, rating, capacity, function, and characteristics may be acceptable.

Labeling on cable: Manufacturer, catalog number, rating in volts, or in volts and AMPS.

Color coding: Non-heating lead wire shall be red for 240-volt nominal circuit voltage.

Contractor shall supply an isolated ground wire for each circuit.

Contractor shall install cables in accordance with manufacturer's recommendations for this application.

The heat cable insulation's resistance and continuity shall be tested in accordance with methods and times as required in manufacturer's recommendations. Tests shall be conducted and test results recorded at the following minimum times:

1. When the cable arrives on the job site before installation.
2. After it is installed completely.

Contractor shall install heat cable(s) in galvanized rigid conduit and junction boxes in manholes, storm drains, and other parts of storm drain systems as shown on the Drawings. Conduit placed within culverts shall be installed at one half the radius of the culvert or as shown on the Drawings and secured 2-hole conduit straps attached to the culvert wall using galvanized lag screws, lock washers, and nuts. Supports shall not be placed further apart than 10 feet where practicable.

End terminations in manholes and lift stations shall be in cast junction boxes with gasketed covers and installed above the normal water line. End terminations above grade shall be in NEMA 3R junction boxes.

Liquidtight flexible metallic conduit (LFMC) for heat trace may be run within storm drain structures.

Contractor shall install cable in a single length without splices or joints. Contractor shall provide bonding and grounding of drain in accordance with cable manufacturer's recommendations. All cold lead to heat trace connections and end terminations shall be accessible and waterproof.

All cables shall be protected by 30 mA GFI circuit breakers.

For heat trace system with automatic controls, provide a load center or standalone control panel with the following items:

- Selector switch: Single pole – 3 position with contacts rated 10 Amps at 120V. Label the switch "HEAT TRACE CONTROL" and the switch positions H = "ON", O = "OFF", A = "THERMOSTAT".
- Remote Bulb Thermostat: Open on Rise, SPDT remote bulb thermostat, 120/240VAC, -30°F to 90°F range.

- Contactor: 30A with number of poles as shown on the drawings with contacts rated 60A resistive at 240V and a 120V control coil.
- Pilot Light: 120V light emitting diode (LED) with green lens, NEMA 4X rated in outer door of enclosure. Label “HEAT TRACE ON”.
- Enclosure Heater: Thermostatically controlled 120V fan driven heater sized per the Drawings.

Contractor shall secure cable in dead-end raceways in accordance with manufacturer’s recommendations to ensure cable remains in place after installation.

See Drawings for additional installation requirements.

Contractor shall mount all components grouped neatly and securely fastened to surfaces in accordance with manufacturer’s recommendations.

Provide engraved nameplate at junction box serving heat cables in each storm drain manhole. Nameplate shall be white letters on red background and include the message “WARNING 240 V. HEAT CABLE(S)” and include load center location.

**Article 30.7 Measurement**

The length of measurement shall be the horizontal length of the storm drain systems to be heat traced. Measurement includes all terminations, markings, and incidental supplies as required to meet the provisions of this Section. Cables installed in manholes and catch basins shall not be measured, but rather the following distances shall be considered standard unless determined otherwise by the Engineer.

- Manhole            forty feet (40')
- Catch Basin      sixteen feet (16')

**Article 30.8 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Heat Trace	Linear Foot

**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 80  
TRAFFIC SIGNALS AND ILLUMINATION  
STANDARD DETAILS**

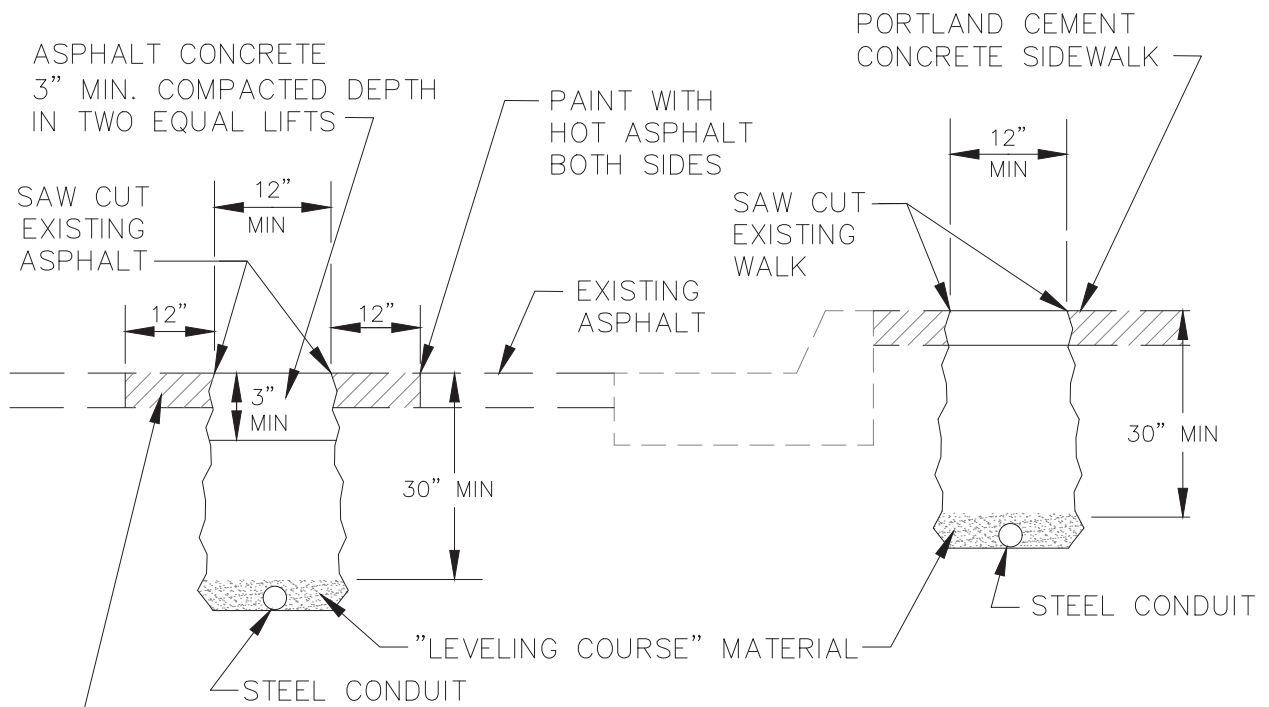
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DIVISION 80  
INDEX OF STANDARD DETAILS**

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AFTER TRENCH BACKFILL HAS BEEN COMPACTED AN ADDITIONAL 12" OF ASPHALT WILL BE REMOVED FROM EACH EDGE OF THE ORIGINAL CUT. THE ENGINEER MAY REQUIRE MORE THAN A 12" ADDITIONAL CUT IF THE EXISTING PAVEMENT HAS BEEN LIFTED IN THE REMOVAL PROCESS OR IF THE JOINT DOES NOT OCCUR ON UNDISTURBED MATERIAL.

REVISION: 2024 M.A.S.S. UPDATE



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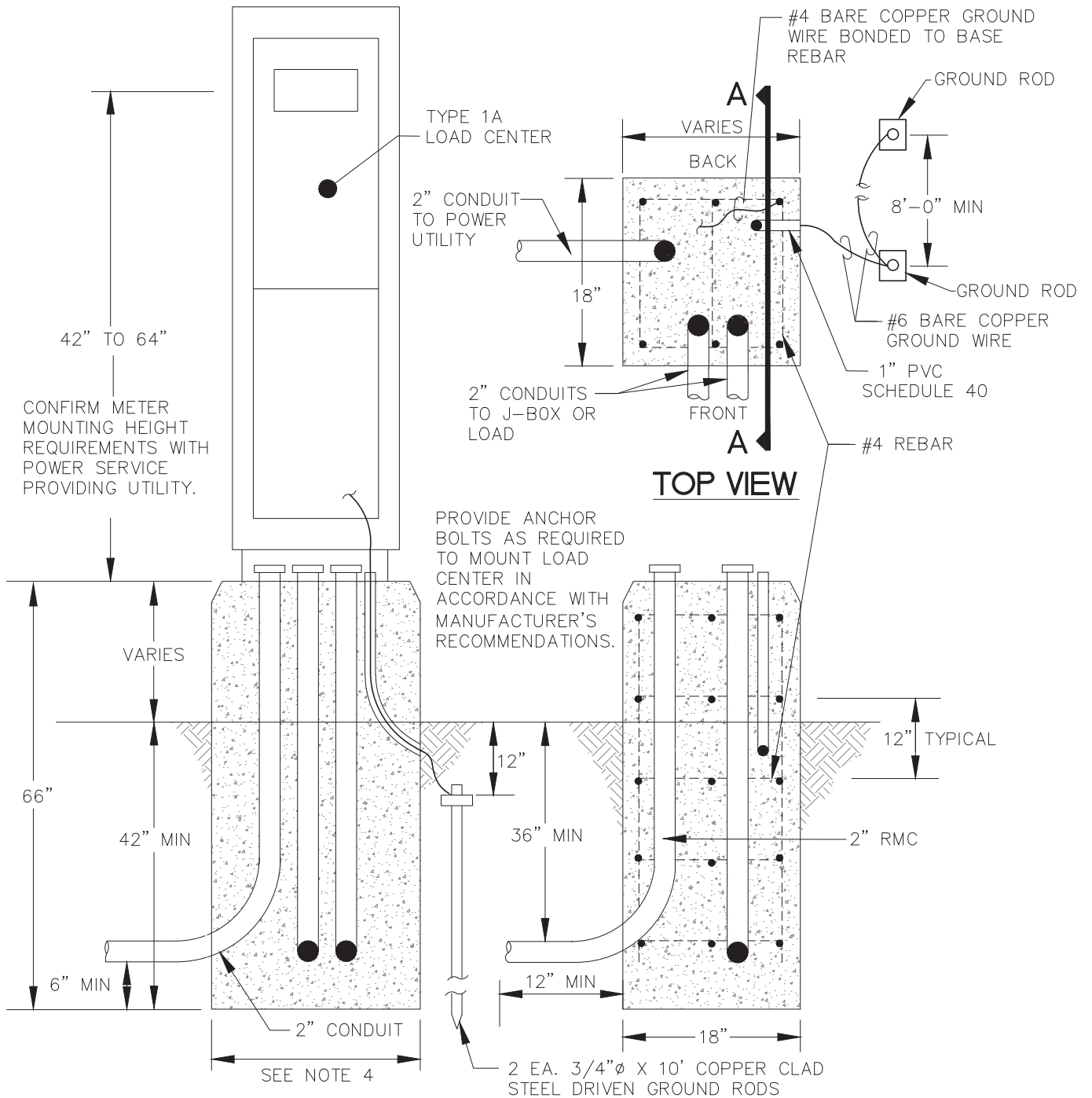
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REVISED:  
2/24

# SAW CUT TRENCH

SECTION #  
80.02

DETAIL #  
80-1



NOTES:

1. ORIENTATION OF CONDUIT SWEEPS IS REPRESENTATIVE. CONTRACTOR SHALL COORDINATE CONDUIT ORIENTATION WITH THE ENGINEER AND UTILITY.
2. PROVIDE NON-FROST SUSCEPTIBLE COMPACTED BACKFILL.
3. INSTALL A TYPE 1A OR TYPE 2 JUNCTION BOX ADJACENT TO LOAD CENTER FOUNDATION. JUNCTION BOX SIZE TO BE DETERMINED USING THE LATEST VERSION OF MOA DESIGN CRITERIA MANUAL, CHAPTER 6.
4. THE BASE DIMENSIONS OF THE FOUNDATION SHALL BE SIZED FOR THE LOAD CENTER BEING INSTALLED SUCH THAT THE LOAD CENTER DOES NOT OVERLAP THE 1" CHAMFER ON ALL SIDES.

**FRONT VIEW**

**SECTION AA**

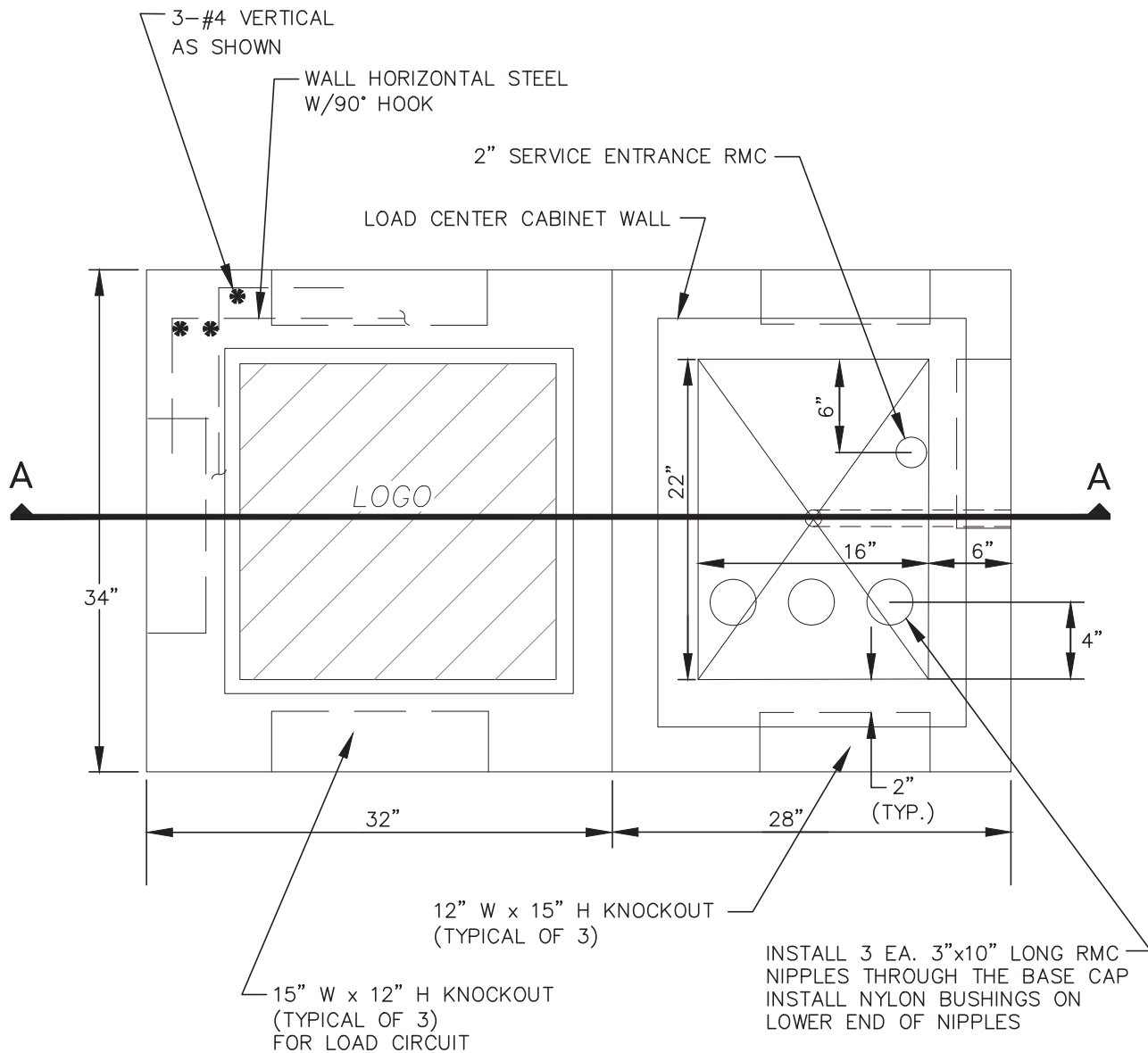
REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
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 APPROVED:  
 REVISED:  
2/24

**CONCRETE FOUNDATION  
 LOAD CENTER  
 TYPE 1A**

SECTION #  
80.04  
 DETAIL #  
80-2



## PLAN VIEW

NOTE:

1. SEE DETAIL 80-4 FOR SECTION AA.

REVISION: 2024 M.A.S.S. UPDATE



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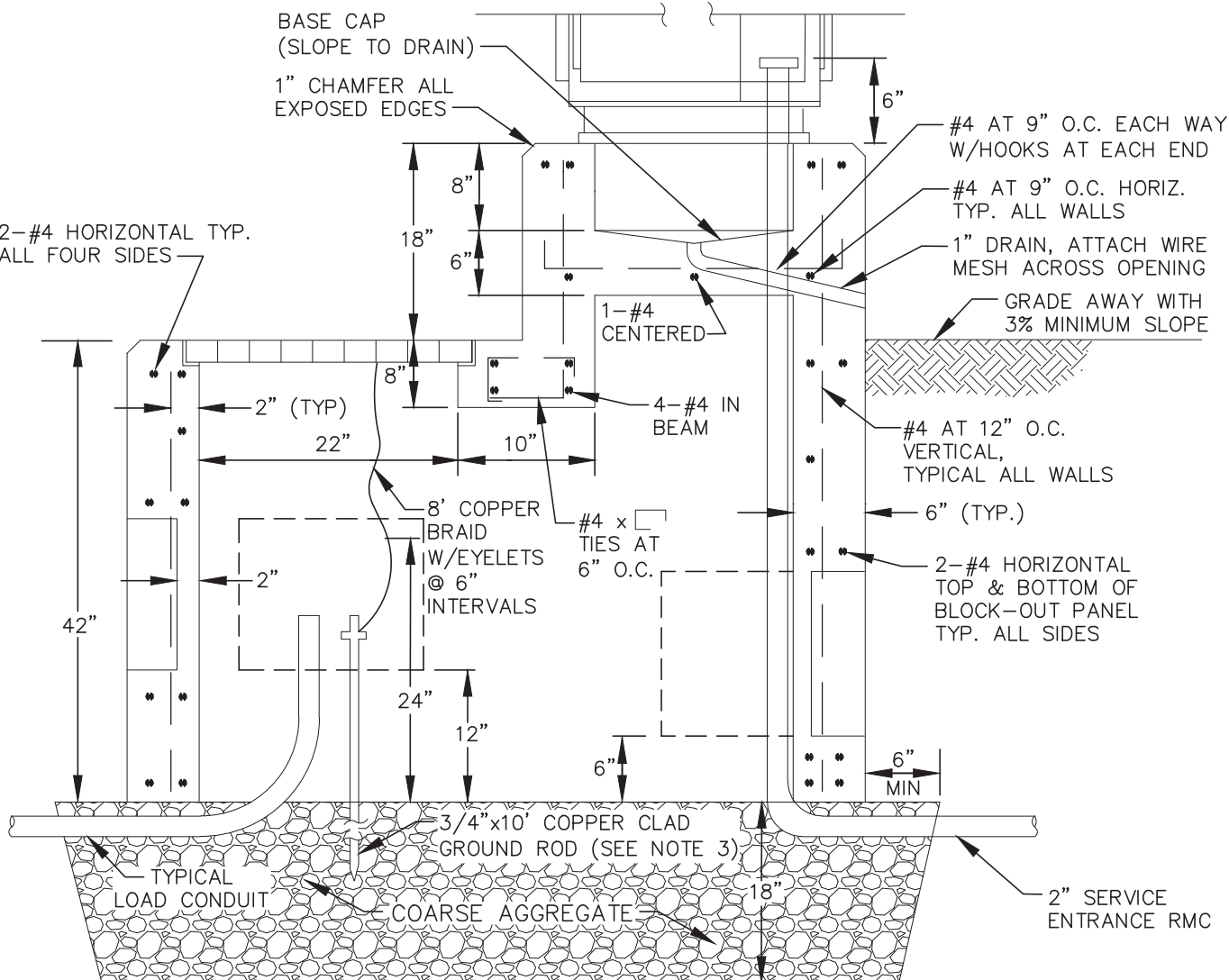
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2/24

# CONCRETE FOUNDATION LOAD CENTER TYPE 1

SECTION #  
80.04

DETAIL #  
80-3




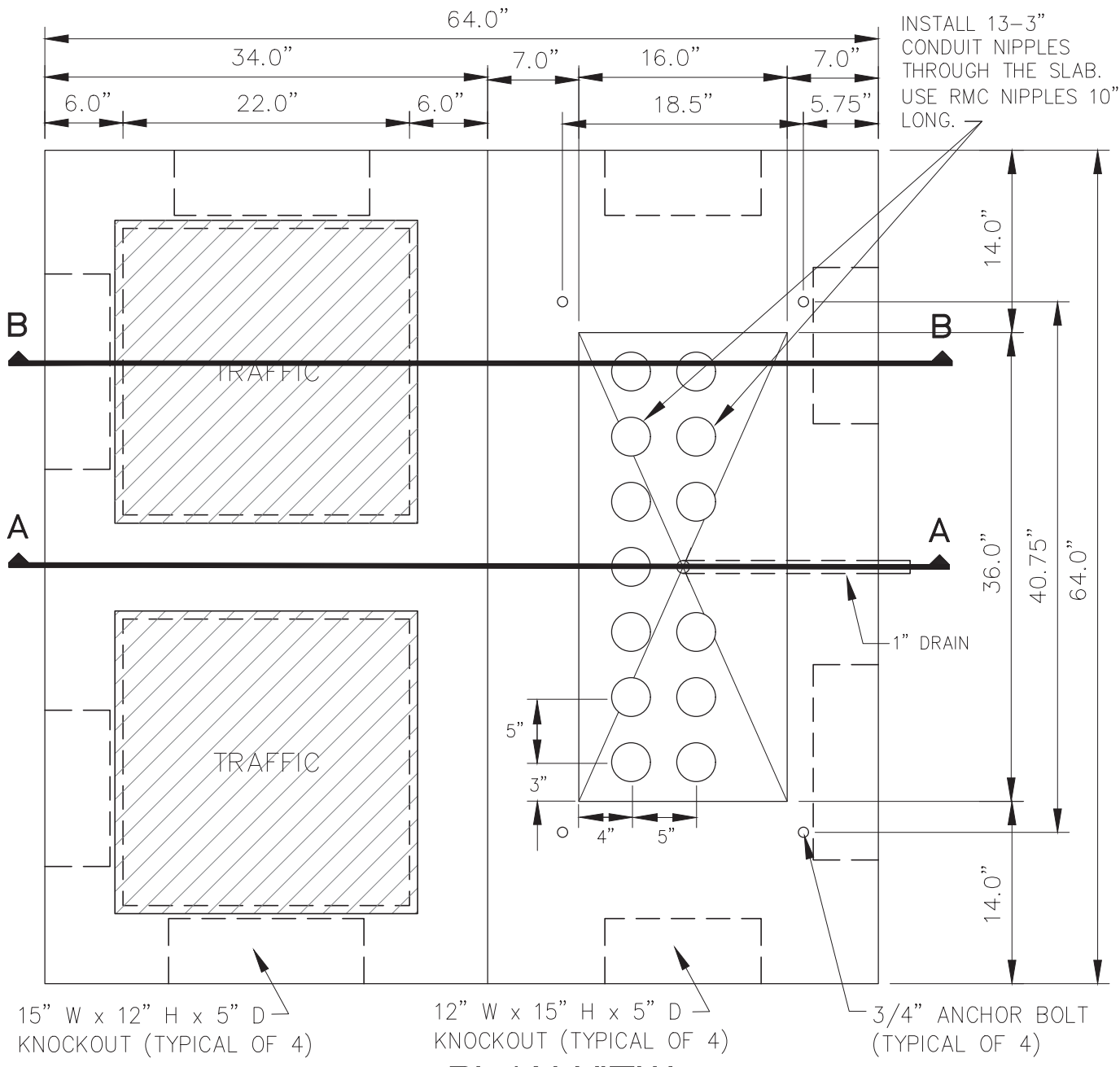
**SECTION AA**

NOTES:

1. STOP HORIZ. & VERT. STEEL AT BLOCK-OUT PANELS & USE 90 HOOK. USE 2-#4 HORIZ. & VERT. EXTRA BARS ALL SIDES AS SHOWN.
2. SEE STANDARD DETAIL 80-3 FOR PLAN VIEW.
3. ADD SECOND 3/4" x 10' GROUND ROD 8' FROM LOAD CENTER PER NEC.

REVISION: 2024 M.A.S.S. UPDATE

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>CONCRETE FOUNDATION TYPE 1 LOAD CENTER SECTION AA</b></p>	<p>SECTION # 80.04</p> <p>DETAIL # 80-4</p>
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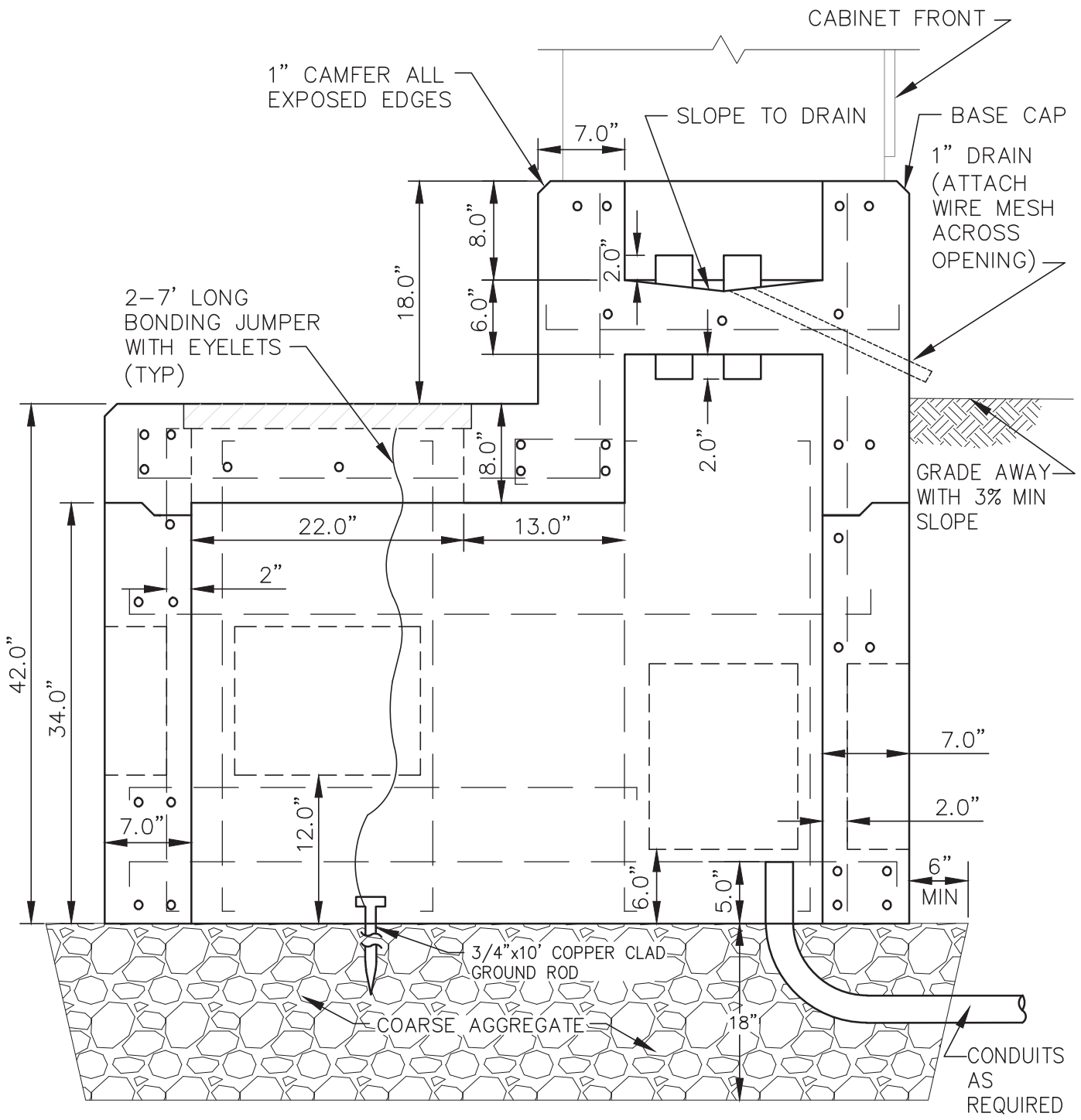
### PLAN VIEW

NOTES:

1. SEE STANDARD DETAIL 80-6 FOR SECTION AA
2. SEE STANDARD DETAIL 80-7 FOR SECTION BB.
3. ANCHOR BOLTS SHALL NOT PROTRUDE MORE THAN 1.5" ABOVE THE TOP OF THE FOUNDATION. CONTRACTOR SHALL USE ANCHOR BOLT DIMENSIONS SPECIFIED BY THE CABINET MANUFACTURER.
4. SEAL UNUSED CONDUIT STUBS WITH WATERTIGHT CAPS. SEAL STUBS CARRYING CONDUCTORS WITH DUCT SEAL TO SEAL AROUND CONDUCTORS AND AGAINST THE CONDUIT WALLS.
5. INSTALL TRAFFIC CONTROLLER WITHIN 1-DEGREE OF PLUMB.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h2 style="margin: 0;">TS2 CONTROLLER CONCRETE CABINET FOUNDATION</h2>	SECTION # 80.04  DETAIL # 80-5
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**SECTION AA**

NOTE:  
 1. SEE STANDARD DETAIL 80-7, SECTION BB, FOR REBAR DETAILS.

REVISION: 2024 M.A.S.S. UPDATE

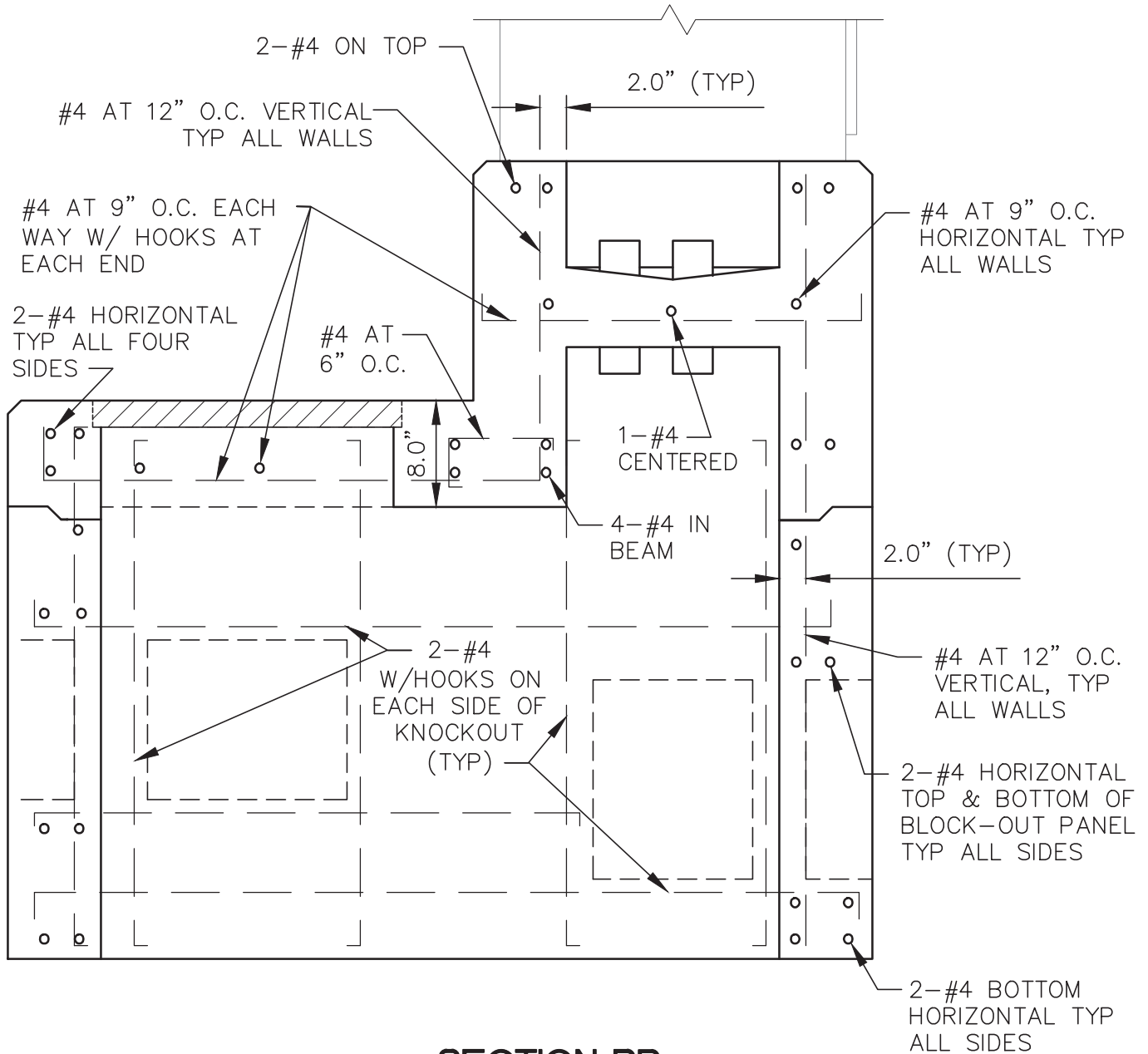
MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
 N.T.S.  
 APPROVED:  
 REVISED:  
 2/24

**CONCRETE FOUNDATION  
 TS2 CONTROLLER  
 SECTION AA**

SECTION #  
 80.04  
 DETAIL #  
 80-6





### SECTION BB

**NOTE:**

STOP HORIZONTAL & VERTICAL STEEL AT THE BLOCK-OUT PANELS & THE JOINT USING 90 DEGREE HOOKS. USE 2 EXTRA #4 HORIZONTAL & VERTICAL BARS ALL SIDES AS SHOWN.

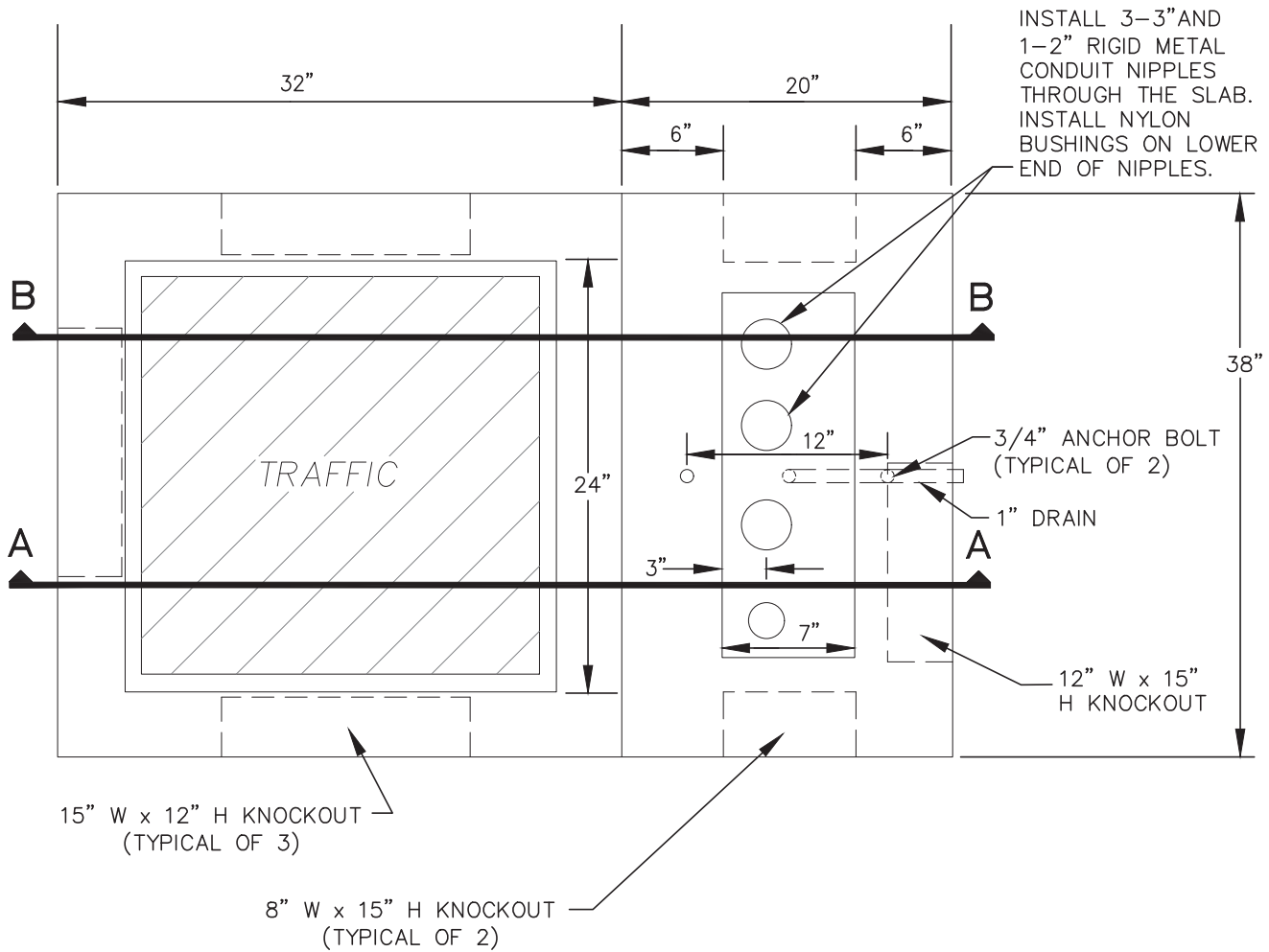
REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.  
APPROVED:  
REVISD:  
2/24

# CONCRETE FOUNDATION TS2 CONTROLLER SECTION BB

SECTION #  
80.04  
DETAIL #  
80-7



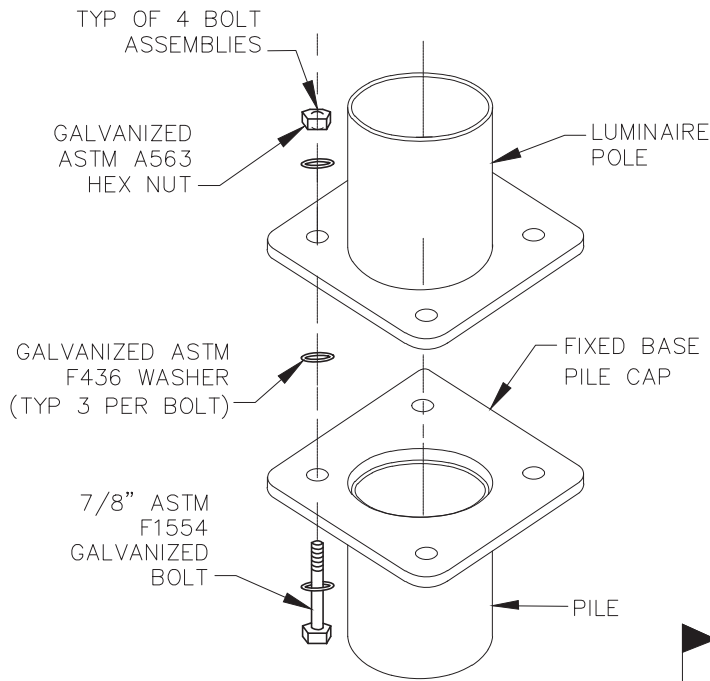
### PLAN VIEW

NOTES:

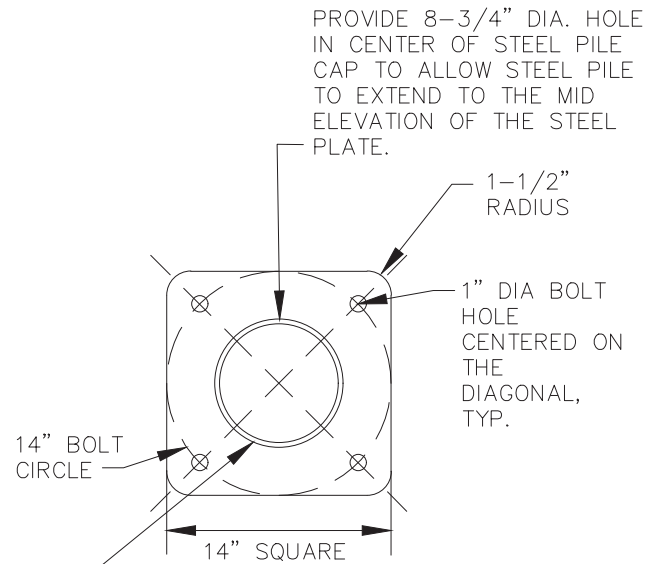
1. SEE DETAIL 80-6 FOR SECTION AA.
2. SEE DETAIL 80-7 FOR SECTION BB.
3. ANCHOR BOLTS SHALL NOT PROTRUDE MORE THAN 1-1/2" ABOVE THE TOP OF THE FOUNDATION. USE CABINET MANUFACTURER SPECIFIED ANCHOR BOLT DIMENSIONS.
4. SEAL UNUSED CONDUIT STUBS WITH WATERTIGHT CAPS.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h2 style="margin: 0;">VAULT TYPE "M" CONTROLLER CABINET FOUNDATION</h2>	SECTION # 80.04  DETAIL # 80-8
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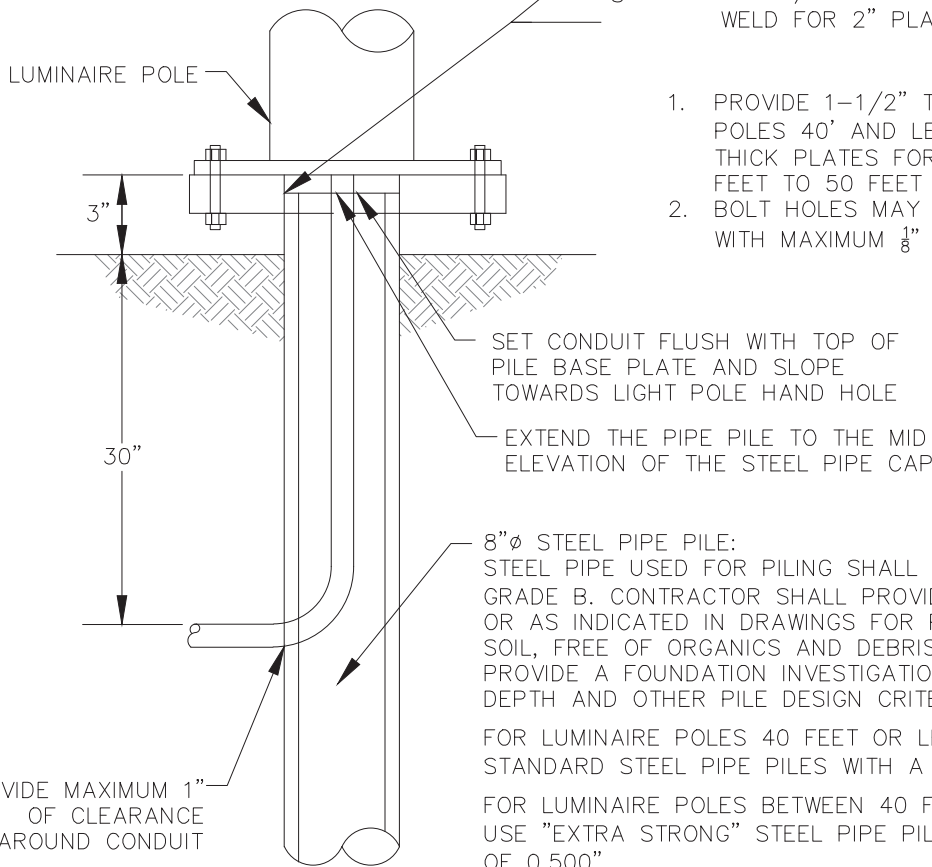
**FIXED BASE ASSEMBLY**



WELD IN CONFORMANCE WITH AWS D1.1 BY WELDERS CERTIFIED FOR AWS 6G QUALIFICATION TEST.

USE 3/8" WELD FOR 1-1/2" PLATE & 1/2" WELD FOR 2" PLATE

1. PROVIDE 1-1/2" THICK PLATE FOR LUMINAIRE POLES 40' AND LESS IN LENGTH. PROVIDE 2" THICK PLATES FOR LUMINAIRE POLES FROM 40 FEET TO 50 FEET IN LENGTH.
2. BOLT HOLES MAY BE DRILLED OR PLASMA CUT WITH MAXIMUM 1/8" LEAD-IN NOTCH.



REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
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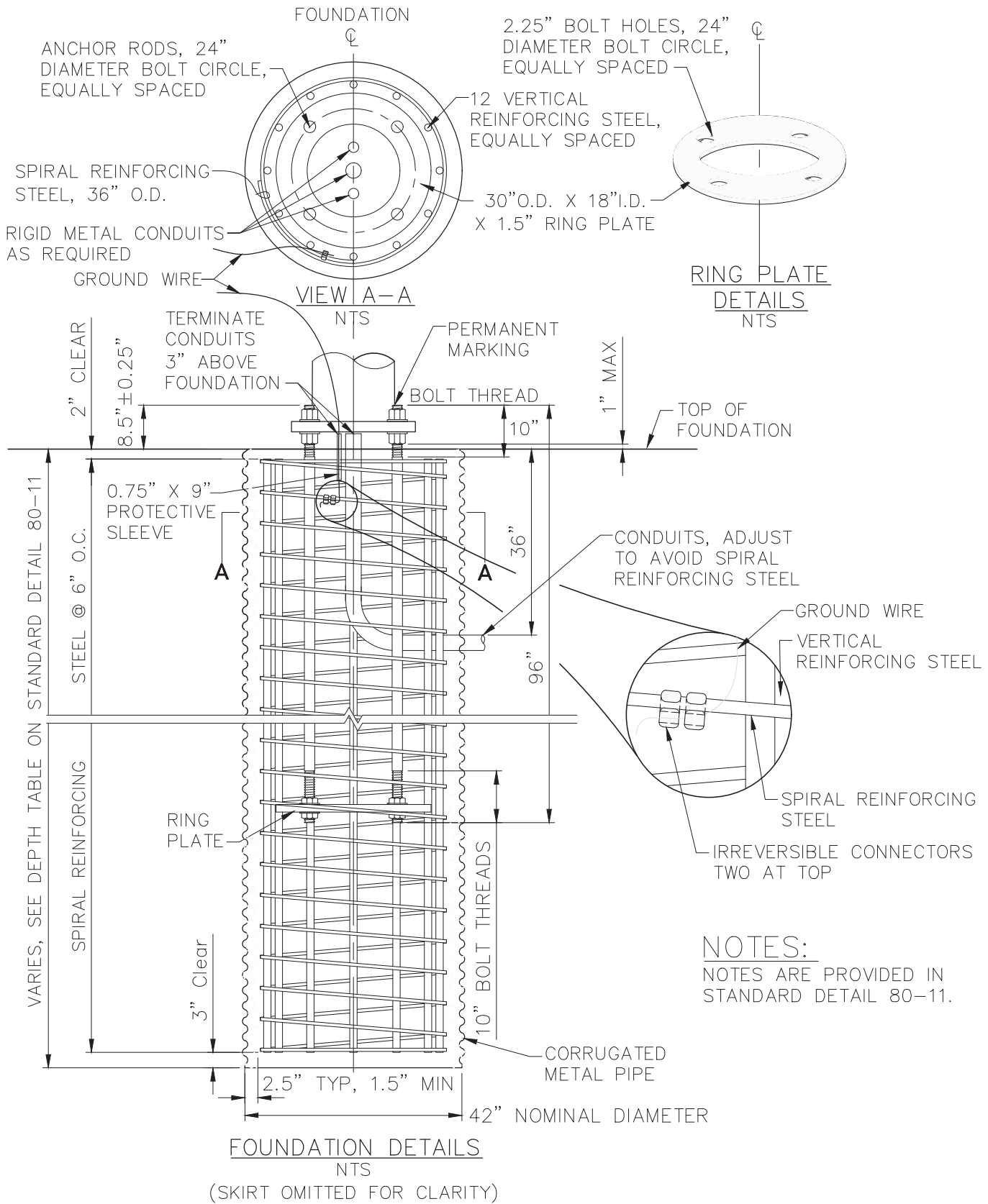
APPROVED:

REVISED:  
2/24

**DRIVEN PILE LUMINAIRE  
POLE FOUNDATION  
FIXED BASE**

SECTION #  
80.04

DETAIL #  
80-9



REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

# SIGNAL POLE FOUNDATION DETAILS CONCRETE 42" DIAMETER

SECTION #  
80.04


DETAIL #  
80-10

NOTES:

1. THIS FOUNDATION IS APPROVED FOR TRAFFIC SIGNAL APPLICATIONS IN COHESIONLESS SOILS WITH AN N1-60 VALUE OF 10 OR GREATER PER AASHTO T-206, "STANDARD PENETRATION TEST" (SPT). THIS FOUNDATION SHALL NOT BE USED IF ANY OF THE FOLLOWING ARE ENCOUNTERED; WATER TABLE ABOVE THE BOTTOM OF FOUNDATION, VERY LOOSE SOILS, ORGANIC SOILS OR, COHESIVE SOILS (CLAY), OR SOILS SUSCEPTIBLE TO FROST JACKING. IF ANY OF THESE CONDITIONS ARE ENCOUNTERED, STOP FOUNDATION WORK AND CONTACT THE ENGINEER.
2. PLACE FOUNDATION IN DRILLED OR EXCAVATED HOLE WITH CENTERLINE OF FOUNDATION LOCATED AT THE STATION, OFFSET, AND ELEVATION SPECIFIED IN PLANS. SET FOUNDATION FLUSH WITH SURROUNDING SURFACE. GRADE TO DRAIN AWAY FROM FOUNDATION WITHOUT EXPOSING MORE THAN 4" OF THE FOUNDATION FROM THE SURROUNDING GROUND SURFACE.
3. FORM THE FOUNDATION IN CORRUGATED METAL PIPE CONFORMING TO M.A.S.S DIVISION 80, SECTION 80.04, ARTICLE 4.2 – CAST-IN-PLACE CONCRETE FOUNDATIONS.
4. PROVIDE 1.5 EXTRA TURNS AT EACH END OF THE SPIRAL REINFORCING STEEL. REINFORCING STEEL SHALL NOT BE SPLICED. TIE VERTICAL REINFORCING STEEL TO EACH INTERSECTION OF THE SPIRAL REINFORCING STEEL.
5. CONNECT GROUND WIRE NEAR THE TOP SPIRAL REINFORCING STEEL WITH TWO IRREVERSIBLE CONNECTORS AS SHOWN. FASTEN CONNECTORS ACCORDING TO THE MANUFACTURERS' RECOMMENDATIONS INCLUDING THE USE OF MANUFACTURER SPECIFIED TOOLS. THE GROUND WIRE MAY BE BARE SOLID, STRANDED, OR BRAIDED COPPER. PROTECT GROUND WIRE WITH PROTECTIVE SLEEVE AS SHOWN AND FILL WITH SILICON SEALANT.
6. THE RING PLATE MAY BE "BUILT UP" OF MULTIPLE STEEL PLATES. THE MINIMUM THICKNESS FOR ANY ONE PLATE IS 0.5 INCHES. FASTEN THE RING PLATE TO ANCHOR RODS WITH NUTS AND WASHERS ON BOTH SIDES OF RING PLATE AS SHOWN. TORQUE RING PLATE NUTS TO 600 FT-LBS.
7. ANCHOR RODS ARE SUBJECT TO CHARPY V-NOTCH IMPACT TESTING. SUBMIT MILL CERTIFICATIONS FOR ANCHOR RODS, NUTS AND WASHERS. GALVANIZE ANCHOR RODS FULL LENGTH. PROVIDE PERMANENT MANUFACTURER'S IDENTIFICATION AND PERMANENT GRADE IDENTIFICATION ON EACH END OF ANCHOR ROD BY STEEL DIE STAMP. SECURE EXPOSED ANCHOR RODS WITH A "RING PLATE" WHEN NOT IN SERVICE. INSTALL ANCHOR RODS PLUMB. ANCHOR RODS GREATER THAN 1:40 OUT-OF-PLUMB WILL RESULT IN FOUNDATION REJECTION.
8. COMPLETE ALL CONCRETE WORK IN CONFORMANCE WITH M.A.S.S. DIVISIONS 30 – CONCRETE AND 80 – TRAFFIC SIGNALS AND ILLUMINATION. USE A TUBE WITH A HOPPER HEAD OR OTHER APPROVED DEVICE WHEN DROPPING CONCRETE MORE THAN 5 FEET. VIBRATE CONCRETE DURING PLACEMENT BY MECHANICAL VIBRATION. ENSURE UPPER ANCHOR ROD THREADS ARE PROTECTED FROM CONTACT WITH CONCRETE DURING POUR.
9. BACKFILL AND COMPACT ACCORDING TO M.A.S.S. DIVISION 20 – EARTHWORK AND DIVISION 80, SECTION 80.04, ARTICLE 4.2 – CAST-IN-PLACE CONCRETE FOUNDATIONS. USE CLASSIFIED FILL & BACKFILL, TYPE II OR TYPE II-A. ENSURE AREA BELOW FOUNDATION MEETS COMPACTION REQUIREMENTS AND IS FREE OF LOOSE MATERIAL AND DEBRIS PRIOR TO CONCRETE WORK.

DEPTH TABLE		
MASTARM(S) LENGTH (FT)	FOUNDATION DEPTH BY APPLICATION (FT)	
	SINGLE MASTARM	DOUBLE MASTARM
L <= 40	10	13
40 <= L <= 50	11	14
55 <= L <= 65	12	15

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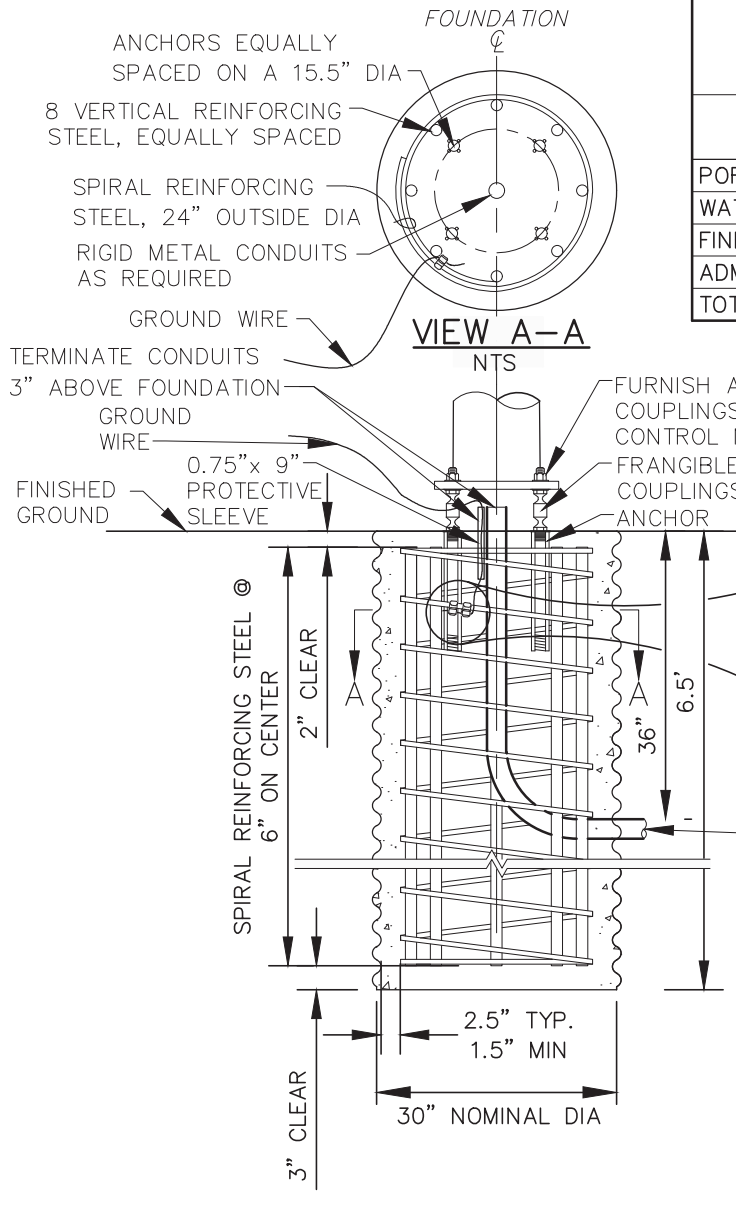
 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h2 style="margin: 0;">SIGNAL POLE FOUNDATION NOTES CONCRETE 42" DIAMETER</h2>	SECTION # 80.05  DETAIL # 80-11
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**NOTES:**

NOTES ARE PROVIDED IN STANDARD DETAIL 80-12B.

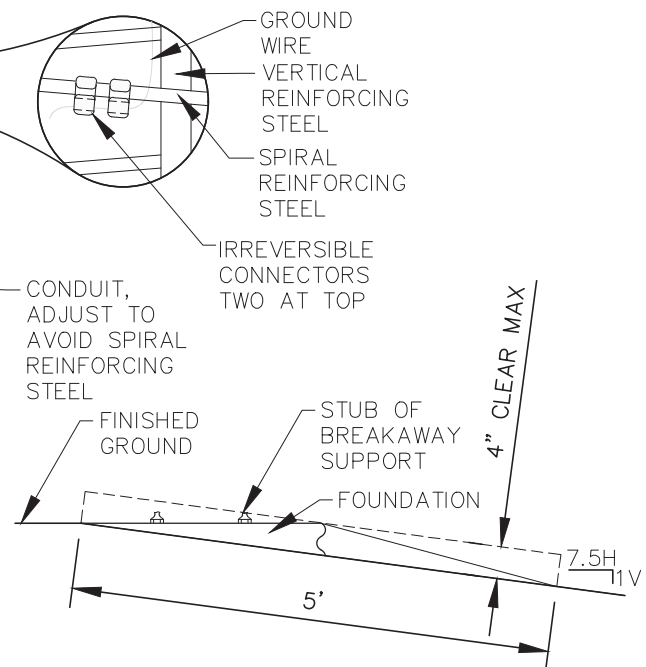
MATERIAL REQUIREMENTS		
CONCRETE	CLASS A	$f'_c = 4000$ PSI
CMP	AASHTO M218	14 ga.
VERTICAL REINFORCING STEEL	AASHTO M31 #11	GR 60
SPIRAL REINFORCING STEEL	AASHTO M31 #5	GR 60
GROUND WIRE		#4 AWG
FRANGIBLE COUPLING	NCHRP 350 TL3 (SEE NOTE 9)	$V_u = 5.5$ KIPS $T_u = 43.2$ KIPS
CONDUIT	SCH 40	RMC
PROTECTIVE SLEEVE	SCH 40	PVC

CONTROLLED LOW STRENGTH MATERIAL MIX DESIGN	
ITEM	BATCHING QUANTITIES PER CY BATCH (LBS.)
PORTLAND CEMENT CONCRETE	188
WATER (52.1 GAL.)	435
FINE AGGREGATE SSD	3041
ADMIXTURE: AIR-ENTRAINMENT	2.0 OZ.
TOTAL	3664



**FOUNDATION DETAILS**

NTS  
(SKIRT OMITTED FOR CLARITY)



**CLEARANCE DETAIL**

NTS  
(SEE NOTE 10)

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY OF ANCHORAGE

SCALE: N.T.S.  
APPROVED:  
REVISED: 2/24

**CONCRETE FOUNDATION FOR BREAKAWAY SIGNAL POLE**

SECTION # 80.04  
DETAIL # 80-12A

DESIGN NOTES:

DESIGN STANDARD: 2013 STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS WITH 2019 INTERIM.

DESIGN LOAD: 1,000 LBS AXIAL, 2,000 LBS SHEAR, 50,000 FT-LBS MOMENT.

NOTES:

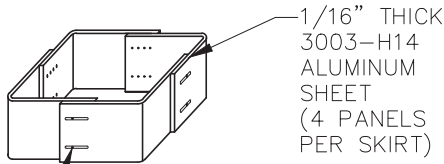
1. THIS FOUNDATION IS APPROVED FOR BREAKAWAY TRAFFIC SIGNAL APPLICATIONS IN COHESIONLESS SOILS WITH AN N1-60 VALUE OF 10 OR GREATER PER AASHTO T-206, "STANDARD PENETRATION TEST" (SPT). THIS FOUNDATION SHALL NOT BE USED IF ANY OF THE FOLLOWING ARE ENCOUNTERED; WATER TABLE ABOVE THE BOTTOM OF FOUNDATION, VERY LOOSE SOILS, ORGANIC SOILS, COHESIVE SOILS (CLAY), OR SOILS SUSCEPTIBLE TO FROST JACKING. IF ANY OF THESE CONDITIONS ARE ENCOUNTERED, STOP FOUNDATION WORK AND CONTACT THE ENGINEER.
2. PLACE FOUNDATION IN DRILLED OR EXCAVATED HOLE WITH CENTERLINE OF FOUNDATION LOCATED AT THE STATION, OFFSET, AND ELEVATION SPECIFIED IN PLANS. SET FOUNDATION TO SATISFY THE CONDITIONS DEPICTED IN CLEARANCE DETAIL.
3. FORM THE FOUNDATION IN CORRUGATED METAL PIPE CONFORMING TO M.A.S.S. DIVISION 80, ARTICLE 4.2.
4. PROVIDE 1.5 EXTRA TURNS AT EACH END OF THE SPIRAL REINFORCING STEEL. REINFORCING STEEL SHALL NOT BE SPLICED. TIE VERTICAL REINFORCING STEEL TO EACH INTERSECTION OF THE SPIRAL REINFORCING STEEL.
5. CONNECT GROUND WIRE NEAR THE TOP OF SPIRAL REINFORCING STEEL WITH TWO IRREVERSIBLE CONNECTORS AS SHOWN. FASTEN CONNECTORS ACCORDING TO THE MANUFACTURERS' RECOMMENDATIONS INCLUDING THE USE OF MANUFACTURER SPECIFIED TOOLS. THE GROUND WIRE MAY BE BARE SOLID, STRANDED, OR BRAIDED COPPER. PROTECT GROUND WIRE WITH PROTECTIVE SLEEVE AS SHOWN AND FILL WITH SILICON SEALANT.
6. COMPLETE ALL CONCRETE WORK IN CONFORMANCE WITH M.A.S.S. DIVISION 30 AND 80. USE A TUBE WITH A HOPPER HEAD OR OTHER APPROVED DEVICE WHEN DROPPING CONCRETE MORE THAN 5 FEET. VIBRATE CONCRETE DURING PLACEMENT BY MECHANICAL VIBRATION. ENSURE UPPER ANCHOR ROD THREADS ARE PROTECTED FROM CONTACT WITH CONCRETE DURING POUR.
7. BACKFILL AND COMPACT ACCORDING TO M.A.S.S. DIVISION 20 AND SECTION 80.04, ARTICLE 4.2 CAST-IN-PLACE CONCRETE FOUNDATION. USE SELECT BACKFILL OR CONTROLLED LOW STRENGTH MATERIAL AS BACKFILL MATERIAL. BATCH ITEMS FOR CONTROLLED LOW STRENGTH MATERIAL MIX SHALL CONFORM TO M.A.S.S. SECTION 30.01, ARTICLE 1.3 MATERIALS. ENSURE AREA BELOW FOUNDATION MEETS COMPACTION REQUIREMENTS AND IS FREE OF LOOSE MATERIAL AND DEBRIS PRIOR TO CONCRETE WORK.
8. INSTALL ALL ANCHORS ACCORDING TO THE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS. ANCHORS SHALL BE INSTALLED PLUMB. ANCHORS GREATER THAN 1:40 OUT-OF-PLUMB WILL RESULT IN FOUNDATION REJECTION.
9. THE FRANGIBLE COUPLING REFERENCED IS NCHRP 350 COMPLIANT. THERE IS NO MASH COMPLIANT DEVICE AVAILABLE AT THIS TIME.
10. SPECIAL GRADING DETAIL AND/OR SHIELDING MAY BE REQUIRED TO MAINTAIN 4" MAXIMUM CLEAR DISTANCE.
11. CONTROLLED LOW STRENGTH MATERIAL MIX DESIGN SHALL FOLLOW APPLICABLE SPECIFICATION OF M.A.S.S. DIVISION 30.

REVISION: 2024 M.A.S.S. UPDATE

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>CONCRETE FOUNDATION NOTES</b></p> <p><b>BREAKAWAY SIGNAL POLE</b></p>	<p>SECTION # 80.04</p> <p>DETAIL # 80-12B</p>
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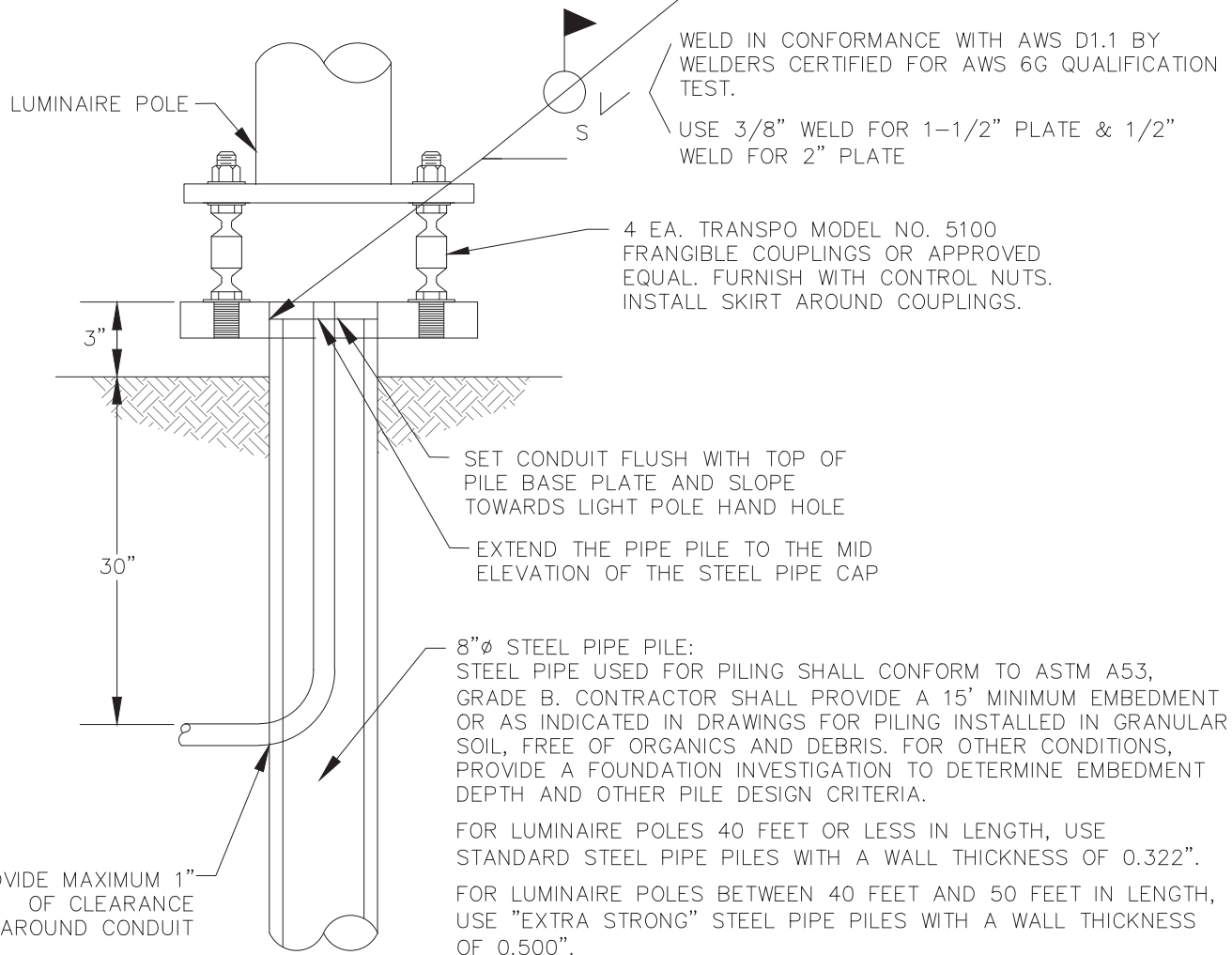
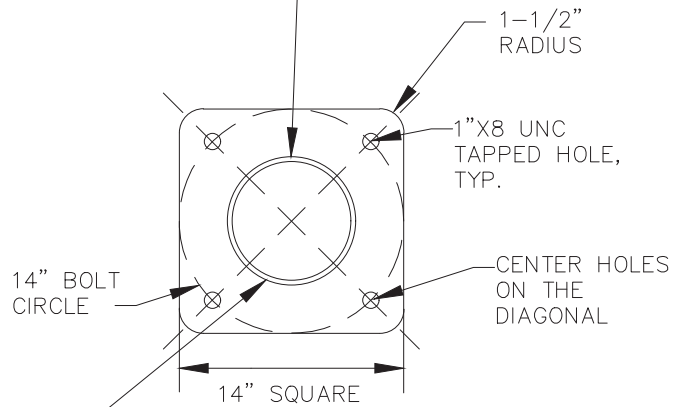
1. PROVIDE 1-1/2" THICK PLATE FOR LUMINAIRE POLES 40' AND LESS IN LENGTH. PROVIDE 2" THICK PLATES FOR LUMINAIRE POLES FROM 40 FEET TO 50 FEET IN LENGTH.
2. BOLT HOLES MAY BE DRILLED OR PLASMA CUT WITH MAXIMUM 1/8" LEAD-IN NOTCH.

PROVIDE 8-3/4" DIA. HOLE IN CENTER OF STEEL PILE CAP TO ALLOW STEEL PILE TO EXTEND TO THE MID ELEVATION OF THE STEEL PLATE.



ASSEMBLE SKIRT WITH EIGHT NO. 10 X 3/8" STAINLESS STEEL SHEET METAL SCREWS

**SKIRT DETAIL**



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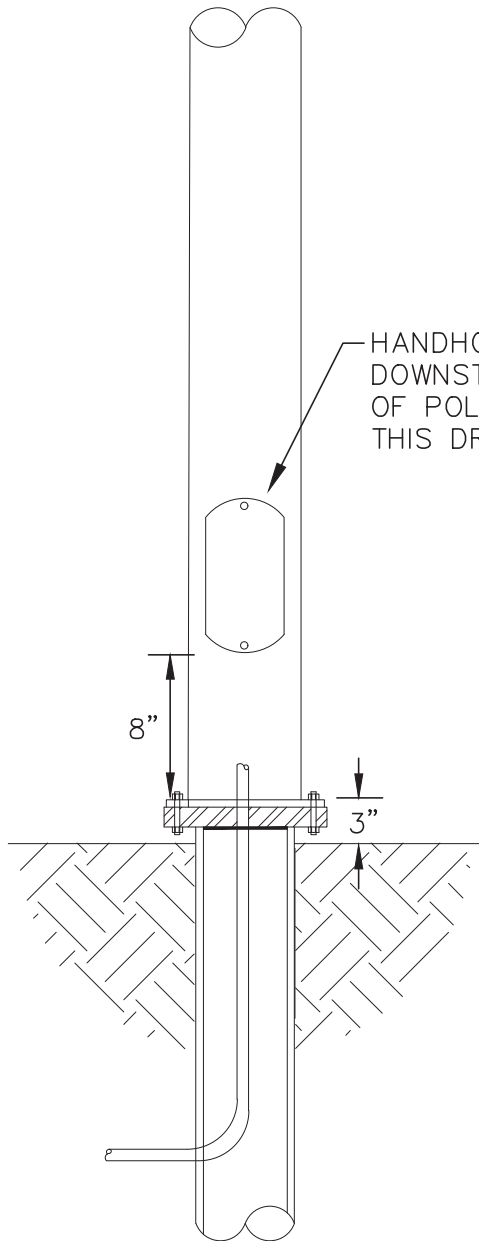
MUNICIPALITY OF ANCHORAGE

SCALE: N.T.S.  
APPROVED:  
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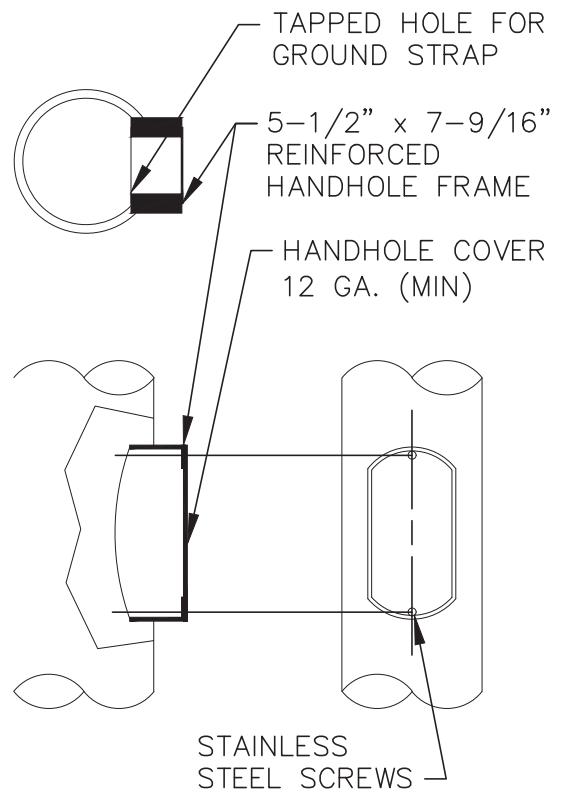
**DRIVEN PILE LUMINAIRE POLE FOUNDATION BREAKAWAY BASE**

SECTION # 80.04  
DETAIL # 80-13





HANDHOLE. LOCATE ON  
DOWNSTREAM TRAFFIC SIDE  
OF POLE. SEE DETAIL A  
THIS DRAWING.



**DETAIL A**

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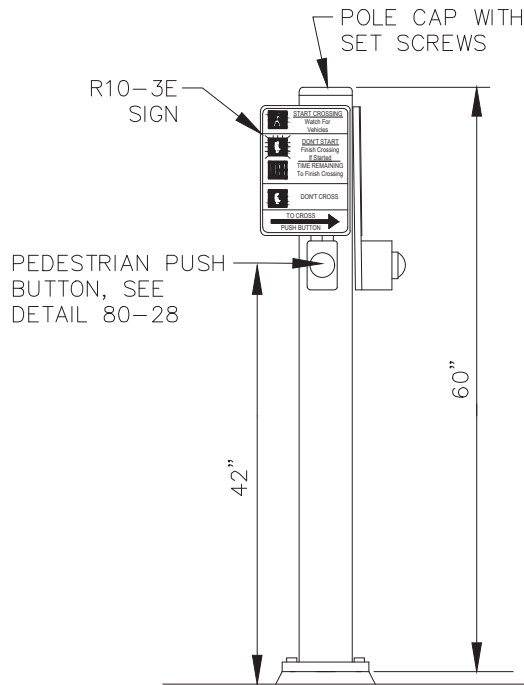
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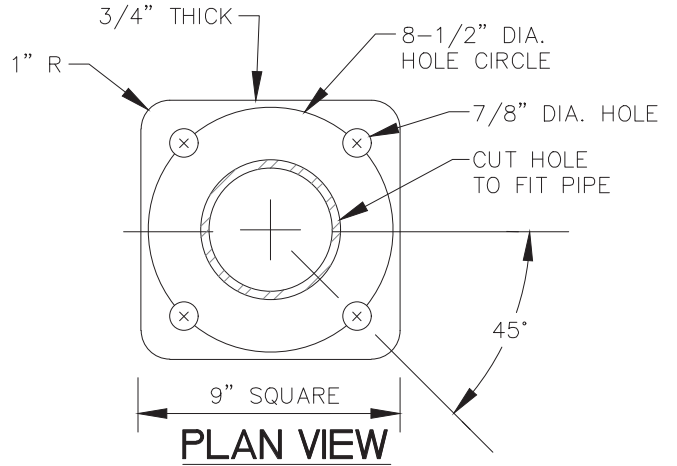
# LUMINAIRE POLE HANDHOLD DETAILS

SECTION #  
80.04

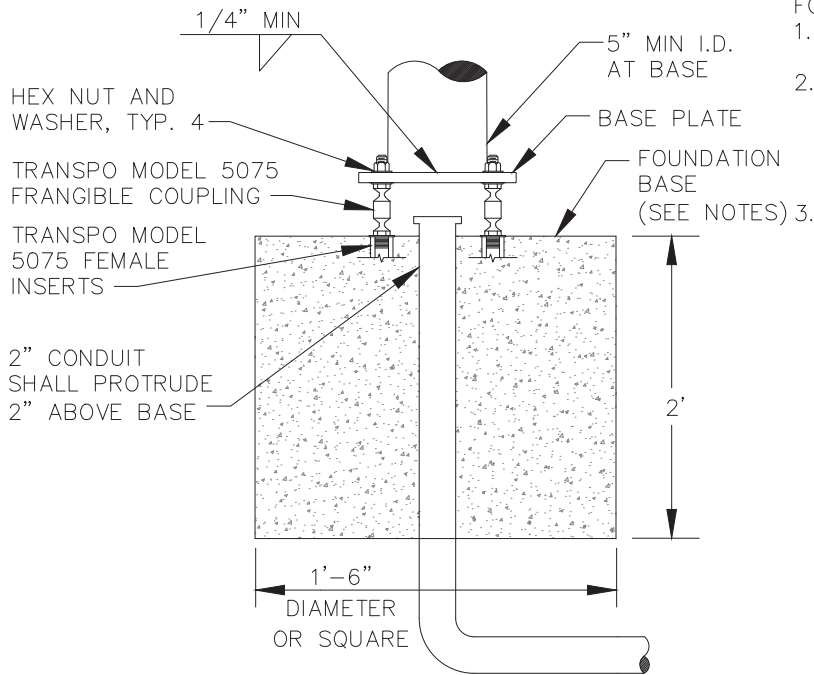
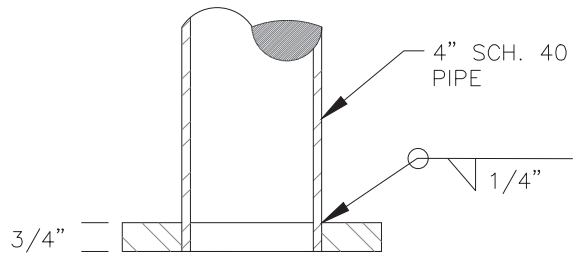
DETAIL #  
80-14



**POLE DETAIL**



**BASE PLATE DETAILS**



**5' PEDESTRIAN PUSH BUTTON FOUNDATION**

**FOUNDATION NOTES:**

1. FOUNDATION BASE SHALL HAVE A BROOMED FINISH.
2. REFERENCE TOP BACK OF CURB IN ESTABLISHING FOUNDATION TOP ELEVATION. SET TOP OF FOUNDATION FLUSH WITH SIDEWALK/PAVING FINISH GRADE OR 2"-4" ABOVE FINISH GROUND ELEVATION.
3. IN FOUNDATIONS THAT LACK REINFORCING STEEL CAGES, INSTALL 21 FEET OF COILED #4 AWG, BARE, COPPER WIRE AS THE GROUNDING ELECTRODE. ROUTE THE CONDUCTOR TO PROTRUDE NEAR THE TOP, CENTER OF THE FOUNDATIONS. SLIDE A MINIMUM 6" LONG, PVC OR HDPE, PROTECTIVE SLEEVE OVER THE CONDUCTOR. ALLOW 1" OF THE SLEEVE AND 24" OF CONDUCTOR TO PROTRUDE FROM THE FOUNDATIONS.

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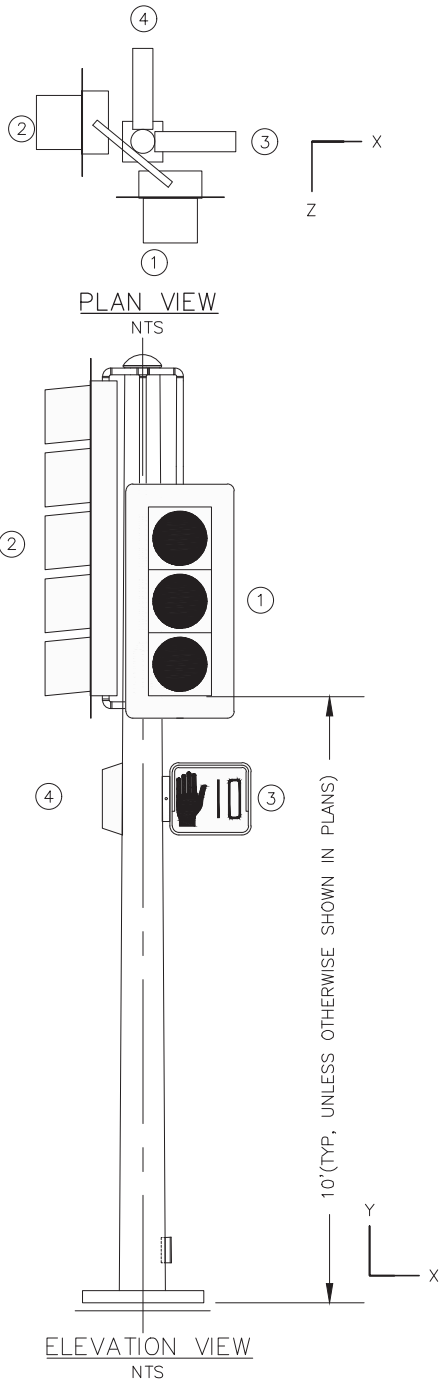


SCALE:  
N.T.S.  
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2/24

**PEDESTRIAN PUSH BUTTON  
POLE AND FOUNDATION**

SECTION #  
80.04,  
80.05

DETAIL #  
80-15



POLE DESIGN LOADING		
LOAD COMPONENT	EFFECTIVE AREA SQ. FT.	WEIGHT LBS.
1 = SIGNAL	7	60
2 = SIGNAL	11	100
3 = PED HEAD	2.5	25
4 = PED HEAD	2.5	25

**NOTES:**

- DESIGN POLE ASSEMBLIES TO THE 2001 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRE AND TRAFFIC SIGNALS, THE ALASKA STANDARD SPECIFICATIONS, STANDARD MODIFICATIONS, SPECIAL PROVISIONS AND THESE PLANS. DESIGN FOR A BASIC WIND SPEED OF 100 MPH, FATIGUE CATEGORY II.
- POLES SHALL BE DESIGNED AND FABRICATED TO INCORPORATE ALL FIXED DESIGN ELEMENTS.
- DESIGN AND FABRICATE TUBES FROM ONE PIECE OF TAPERED STEEL.
- STEEL GREATER THAN 1/2" THICK SHALL CONFORM TO AASHTO M270 AND SHALL MEET THE FRACTURE CRITICAL CHARPY V-NOTCH IMPACT TEST REQUIREMENTS FOR ZONE 3.
- INSTALL A 0.625" THICK 3003-H14 ALUMINUM SHEET SKIRT AROUND THE FRANGIBLE COUPLINGS FASTENED WITH STAINLESS SHEET METAL SCREWS.
- THE DEPARTMENT WILL REJECT DAMAGED OR DEFECTIVE POLES FOR ANY OF THE FOLLOWING, INCLUDING BUT NOT LIMITED TO:
  - VARIANCES FROM APPROVED SHOP DRAWINGS.
  - VARIANCES FROM FIXED DESIGN ELEMENTS.
  - OUT OF ROUND. SECTIONS ARE OUT OF ROUND WHEN THE DIAMETERS OF ROUND MEMBERS EXCEED 2 PERCENT OF THE DIMENSION SPECIFIED ON THE SHOP DRAWINGS.
  - BOWED WITH SWEEPS EXCEEDING 0.75" INCH THROUGHOUT THE LENGTH OF THE POLE, MASTARM, OR SEGMENT.
  - DAMAGED OR DENTED FINISHES.
- WELD SIZE TO BE DETERMINED BY MANUFACTURER.
- PROVIDE PERMANENT TAGS PER MASS DIVISION 80, ARTICLE 5.6.
- THIS DRAWING IS INTENDED FOR POLE DESIGN PURPOSES ONLY. ASSEMBLY CONFIGURATIONS ARE FOR LOADING PURPOSES AND MAY DIFFER FROM THOSE SHOWN IN PLANS. POLES HAVE NOT BEEN EVALUATED FOR LOADING CONDITIONS MORE SEVERE THAN THOSE SHOWN AND WILL REQUIRE INDIVIDUAL ANALYSIS WHEN ENCOUNTERED.

SEE MASS DETAIL 80-16B FOR ADDITIONAL DETAILS

FIXED DESIGN ELEMENTS	
ALL ASSEMBLIES	
LENGTH	10'(TYP, MAY VARY IN PLANS)
FIXED END DIAMETER O.D.	10.0"
TAPER	0.14" /FT
TUBE THICKNESS	7 GA.
HAND-HOLE O.D.	5.63" X 7.31"
BASE PLATE	15.5" X 15.5" X 1.375"
BOLT CIRCLE	15.5"
MATERIAL PROPERTIES	
TUBE	ASTM A572 GR. 55
BASEPLATE	AASHTO M270 F3, GR 50
TOP PLATE	ASTM A36
HANDHOLE REINFORCEMENT	ASTM A53, GR. B
FINISH	AASHTO M111 & M232

REVISION: 2024 M.A.S.S. UPDATE

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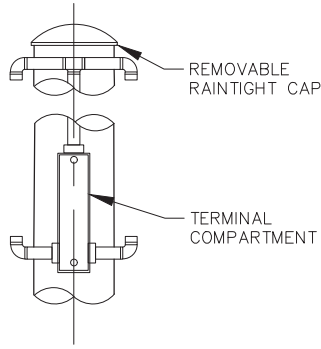
APPROVED:

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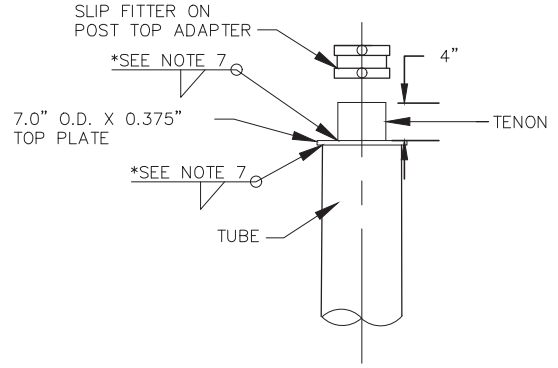
# 10' BREAKAWAY SIGNAL POLE

SECTION #  
80.05

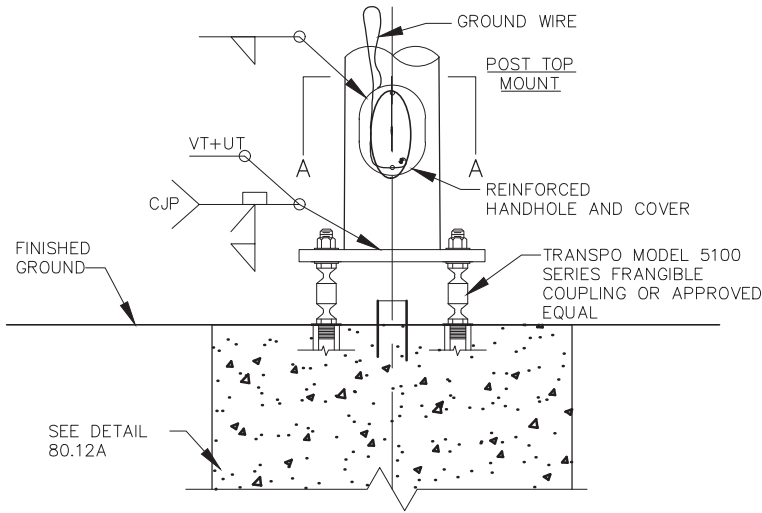
DETAIL #  
80-16A



SIDE MOUNT DETAIL

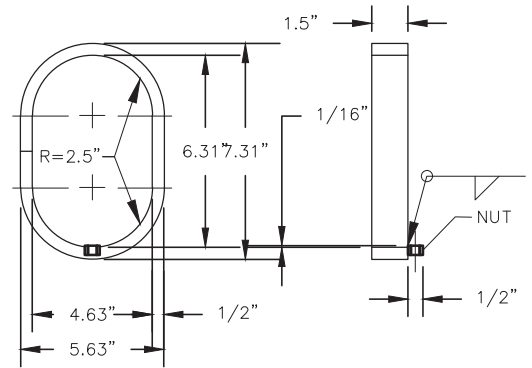


TOP MOUNT DETAIL



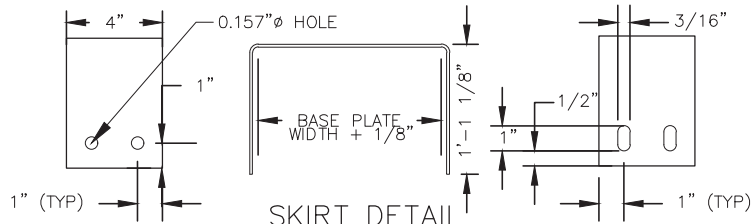
SIGNAL POST AND BASE

NTS



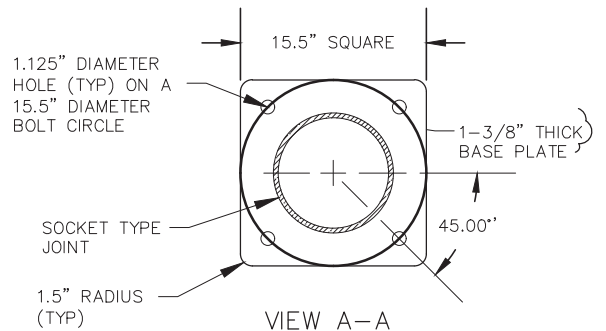
HANDHOLE DETAIL

NTS



SKIRT DETAIL

NTS  
(TWO REQUIRED PER POLE)



VIEW A-A  
PLAN VIEW OF BASE PLATE  
NTS

REVISION: 2024 M.A.S.S. UPDATE

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SCALE:  
N.T.S.

APPROVED:

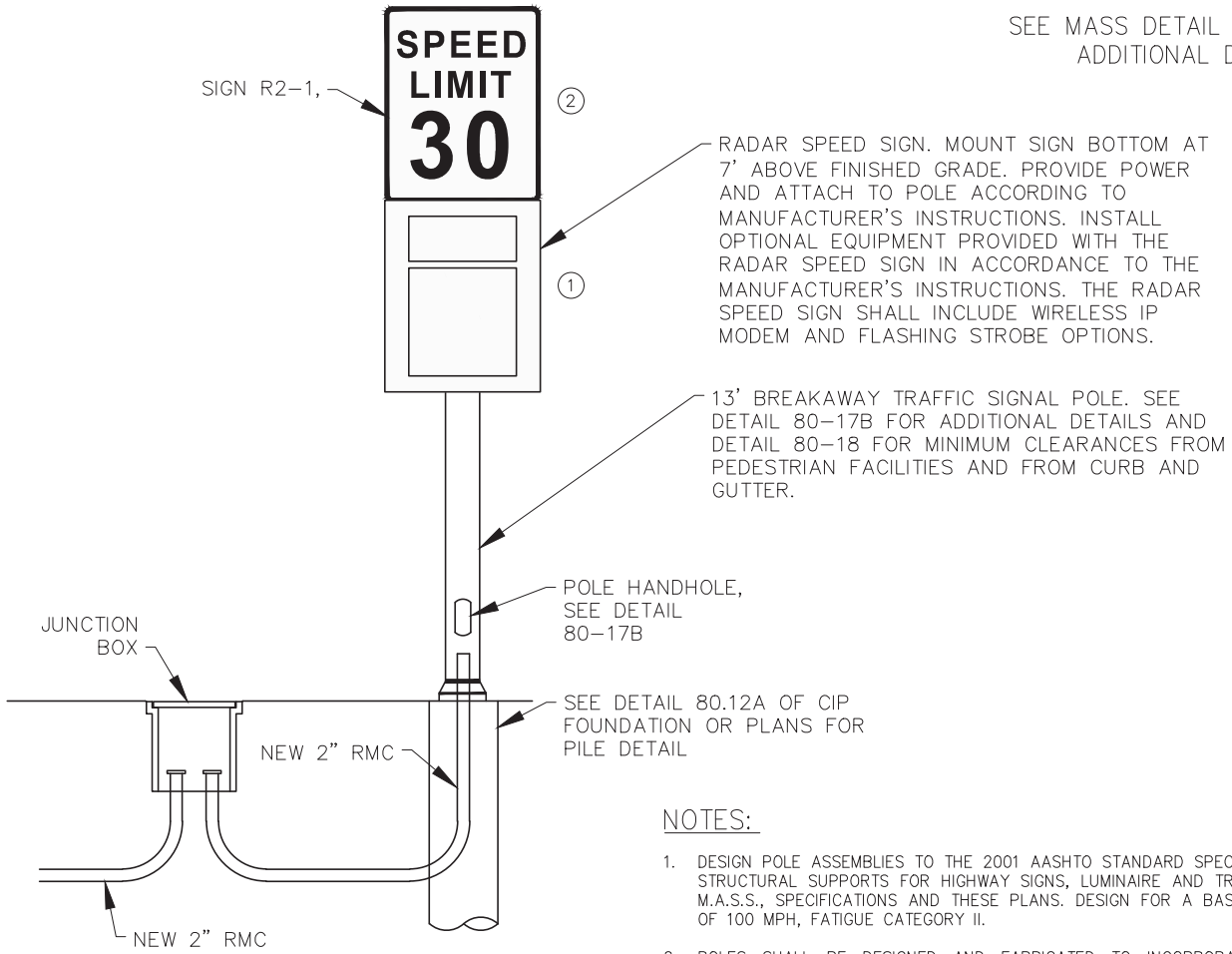
REVISED:  
2/24

# 10' BREAKAWAY SIGNAL POLE DETAILS

SECTION #  
80.05

DETAIL #  
80-16B

SEE MASS DETAIL 80-17B FOR ADDITIONAL DETAILS



**NOTES:**

- DESIGN POLE ASSEMBLIES TO THE 2001 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRE AND TRAFFIC SIGNALS, M.A.S.S., SPECIFICATIONS AND THESE PLANS. DESIGN FOR A BASIC WIND SPEED OF 100 MPH, FATIGUE CATEGORY II.
- POLES SHALL BE DESIGNED AND FABRICATED TO INCORPORATE ALL FIXED DESIGN ELEMENTS.
- DESIGN AND FABRICATE TUBES FROM ONE PIECE OF TAPERED STEEL.
- STEEL GREATER THAN 1/2" THICK SHALL CONFORM TO AASHTO M270 AND SHALL MEET THE FRACTURE CRITICAL CHARPY V-NOTCH IMPACT TEST REQUIREMENTS FOR ZONE 3.
- INSTALL A 0.625" THICK 3003-H14 ALUMINUM SHEET SKIRT AROUND THE FRANGIBLE COUPLINGS FASTENED WITH STAINLESS SHEET METAL SCREWS.
- THE TRAFFIC ENGINEERING DEPARTMENT WILL REJECT DAMAGED OR DEFECTIVE POLES FOR ANY OF THE FOLLOWING, INCLUDING BUT NOT LIMITED TO;
  - A. VARIANCES FROM APPROVED SHOP DRAWINGS.
  - B. VARIANCES FROM FIXED DESIGN ELEMENTS.
  - C. OUT OF ROUND. SECTIONS ARE OUT OF ROUND WHEN THE DIAMETERS OF ROUND MEMBERS EXCEED 2 PERCENT OF THE DIMENSION SPECIFIED ON THE SHOP DRAWINGS.
  - D. BOWED WITH SWEEPS EXCEEDING 0.75" INCH THROUGHOUT THE LENGTH OF THE POLE, MASTARM, OR SEGMENT.
  - E. DAMAGED OR DENTED FINISHES.
- WELD SIZE TO BE DETERMINED BY MANUFACTURER.
- PROVIDE PERMANENT TAGS PER M.A.S.S. DIVISION 80, ARTICLE 5.6.
- THIS DRAWING IS INTENDED FOR POLE DESIGN PURPOSES ONLY. ASSEMBLY CONFIGURATIONS ARE FOR LOADING PURPOSES AND MAY DIFFER FROM THOSE SHOWN IN PLANS. POLES HAVE NOT BEEN EVALUATED FOR LOADING CONDITIONS MORE SEVERE THAN THOSE SHOWN AND WILL REQUIRE INDIVIDUAL ANALYSIS WHEN ENCOUNTERED.
- TERMINATE CONDUIT 3" ABOVE THE TOP OF THE ANCHOR PLATE. INSTALL A GROUNDING BUSHING ON THE END OF THE CONDUIT AND BOND TO THE ANCHOR PLATE.

**POLE DESIGN LOADING**

LOAD COMPONENT	EFFECTIVE AREA SQ. FT.	WEIGHT LBS.
1 = RADAR SIGN	9	42
2 = SIGN	5	-

**FIXED DESIGN ELEMENTS**

ALL ASSEMBLIES	
LENGTH	13' (TYP, MAY VARY IN PLANS)
FIXED END DIAMETER O.D.	10.0"
TAPER	0.14" / FT
TUBE THICKNESS	7 GA.
HAND-HOLE O.D.	5.63" X 7.31"
BASE PLATE	15.5" X 15.5" X 1.375"
BOLT CIRCLE	15.5"
FRANGIBLE BASE	MODEL 5100 POLE SAFE OR APPROVED EQUAL
MATERIAL PROPERTIES	
TUBE	ASTM A572 GR. 55
BASEPLATE	AASHTO M270 F3, GR 50
TOP PLATE	ASTM A36
HANDHOLE REINFORCEMENT	ASTM A53, GR. B
FINISH	AASHTO M111 & M232

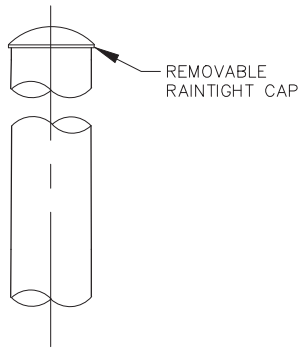
REVISION: 2024 M.A.S.S. UPDATE



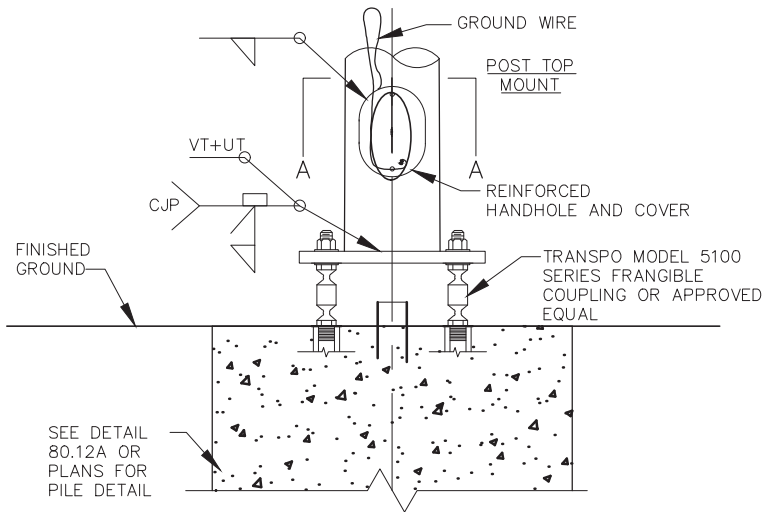
SCALE:  
N.T.S.  
APPROVED:  
REVISD:  
2/24

**RADAR SPEED SIGN  
BREAKAWAY POLE**

SECTION #  
80.05/80.29  
DETAIL #  
80-17A

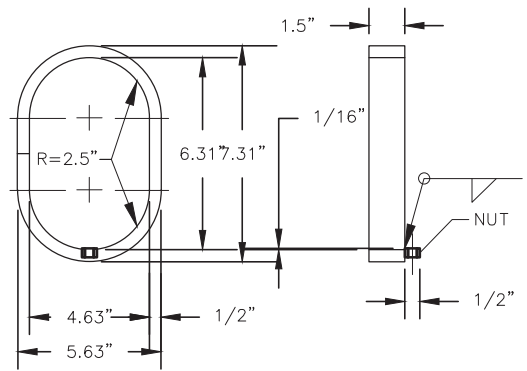


POLE TOP DETAIL



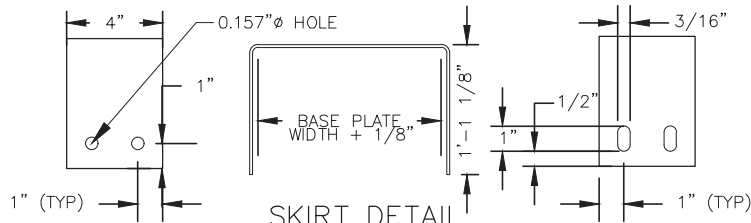
SIGNAL POST AND BASE

NTS



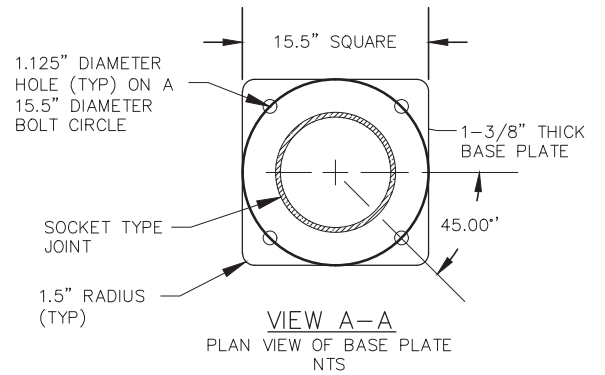
HANDHOLE DETAIL

NTS



SKIRT DETAIL

NTS  
(TWO REQUIRED PER POLE)



REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

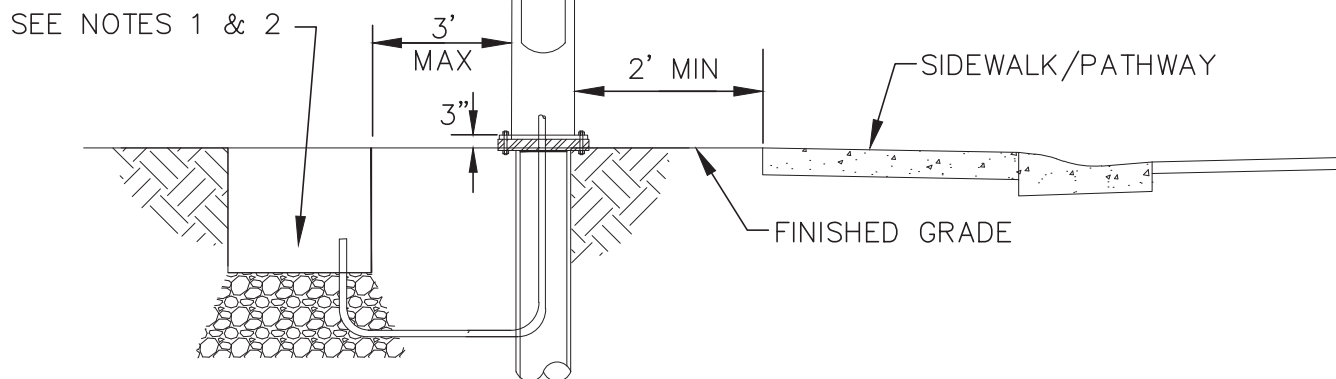
# RADAR SPEED SIGN BREAKAWAY POLE DETAILS

SECTION #  
80.05

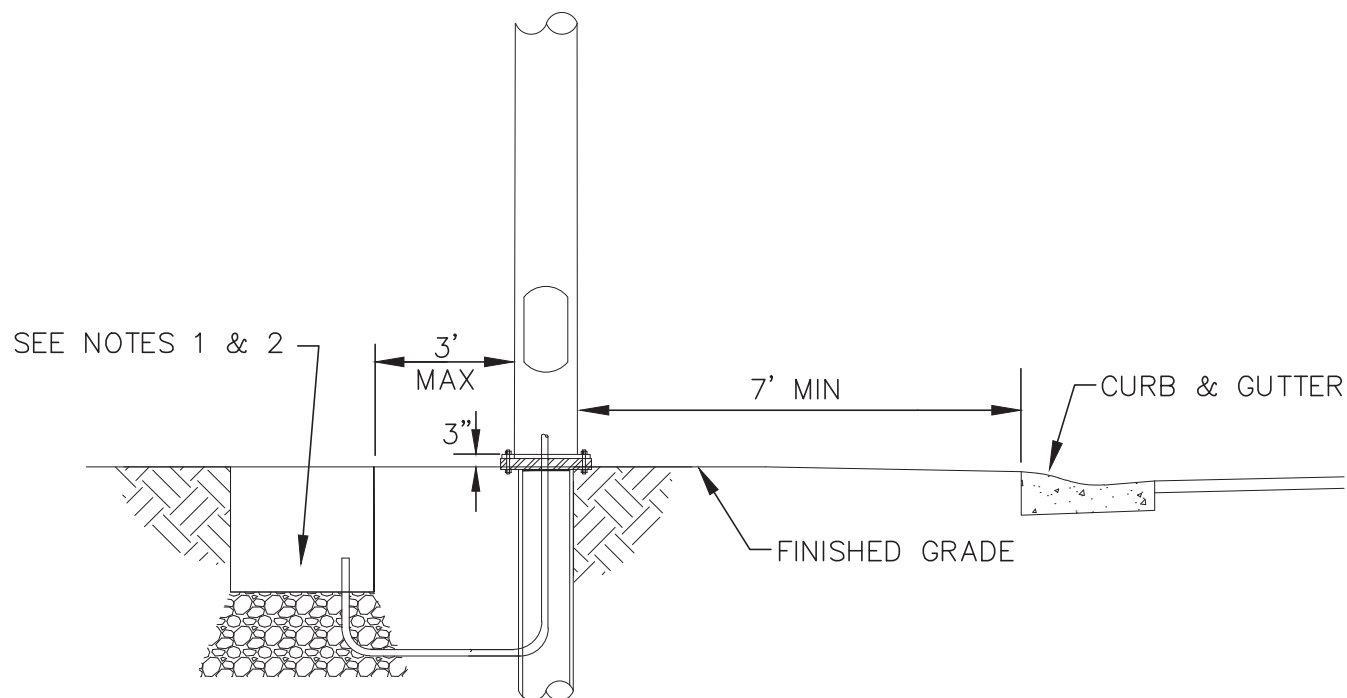
DETAIL #  
80-17B

NOTES:

1. INSTALL JUNCTION BOX BEHIND LIGHT POLE AWAY FROM TRAFFIC OR DOWNSTREAM TRAFFIC SIDE OF THE POLE.
2. PLACE JUNCTION BOXES CONSISTENTLY WITHIN A PROJECT – EITHER ALL BEHIND THE LIGHT POLE OR ALL ON THE DOWNSTREAM TRAFFIC SIDE OF THE POLE.



**CLEARANCES WITH PEDESTRIAN FACILITIES**



**CLEARANCES WITHOUT PEDESTRIAN FACILITIES**

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



SCALE:  
N.T.S.

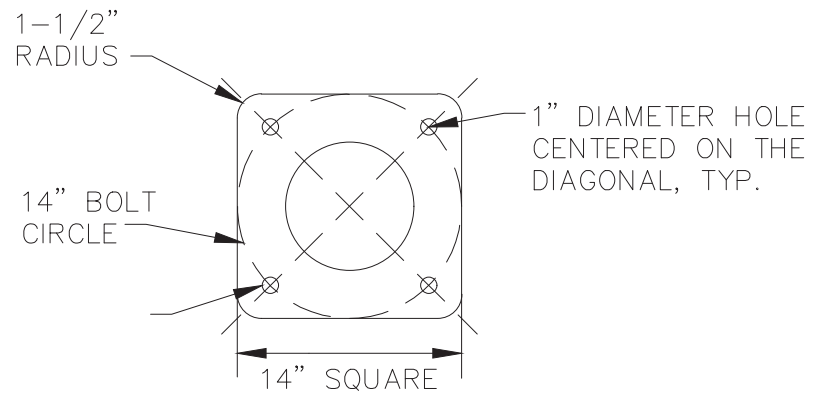
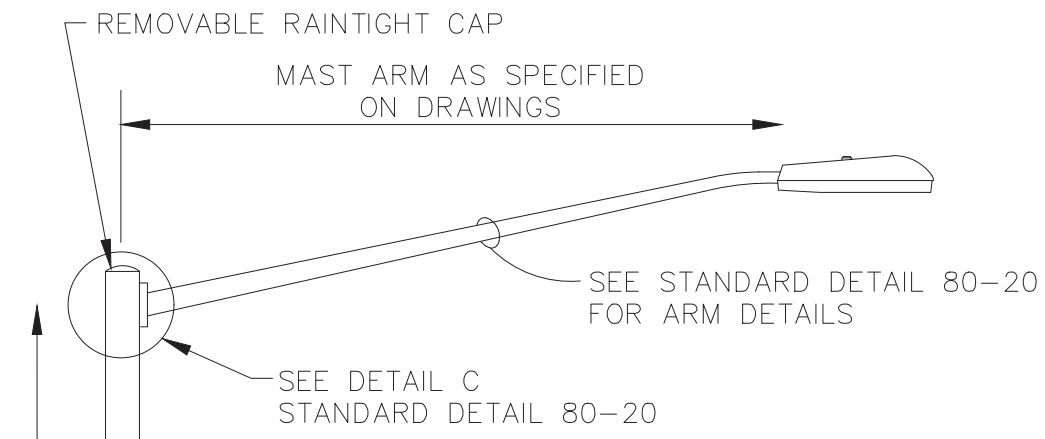
APPROVED:

REVISED:  
2/24

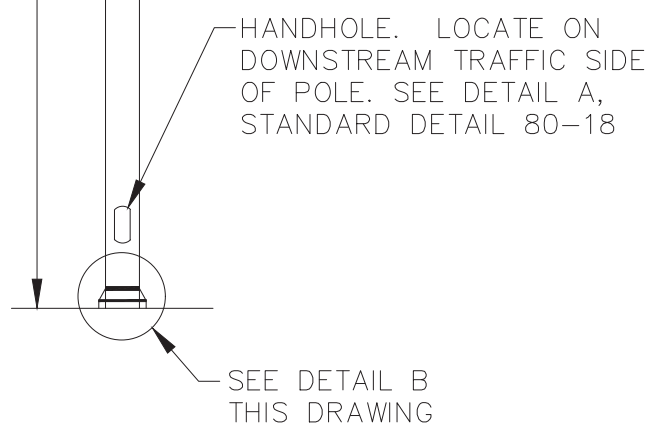
# LUMINAIRE CLEARANCES

SECTION #  
80.08

DETAIL #  
80-18



**DETAIL B**



LUMINAIRE POLE DATA			
POLE LENGTH (H)	O.D. (MIN.)		U.S.S. GAGE
	BASE	TOP	
25' to 30'	8"	3-7/8"	10
+30' to 35'	8-3/4"	3-7/8"	10
+35' to 40'	9"	3-7/8"	10
+40' to 45'	9-1/2"	3-7/8"	10
+45' to 50'	10"	3-7/8"	10

REVISION: 2024 M.A.S.S. UPDATE

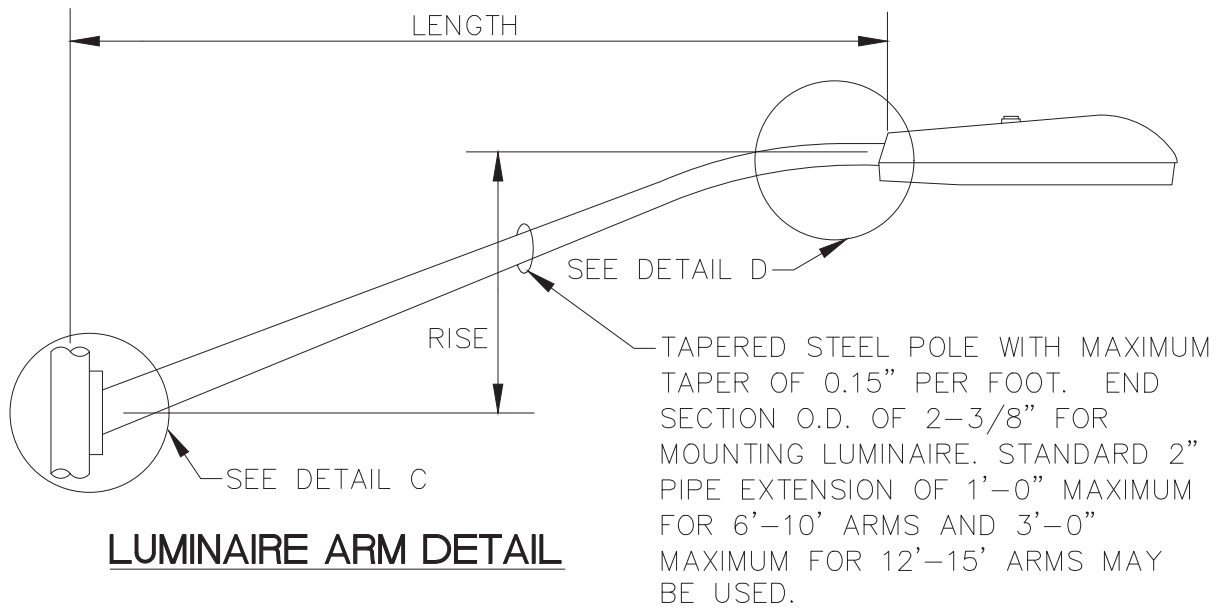
MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
N.T.S.  
 APPROVED:  
 REVISED:  
2/24

# FLANGE-MOUNTED LUMINAIRE POLE

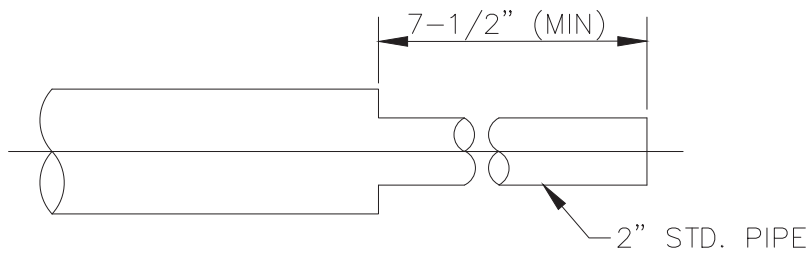
SECTION #  
80.05  
 DETAIL #  
80-19





**LUMINAIRE ARM DETAIL**

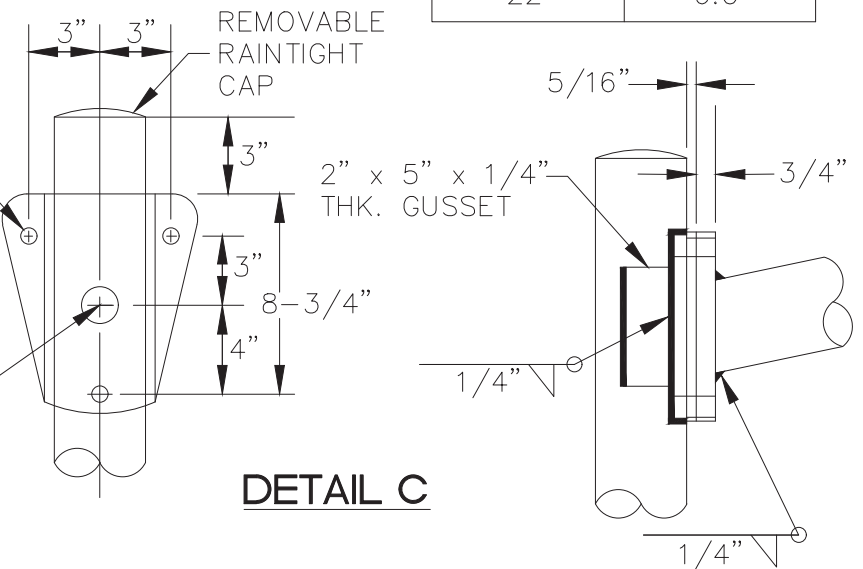
LENGTH	RISE
6'	1.5'
8'	2.2'
10'	2.5'
12'	3.6'
15'	4.3'
22'	6.0'



**DETAIL D**

3 EA. 3/4"-10 TAP. POLE PLATE FOR 3/4" BOLTS. BOLTS SHALL CONFORM TO ASTM A325 AND GALVANIZED IN ACCORDANCE WITH ASTM A135.

2" CHASED OUTLET FOR ELECTRICAL CONDUCTORS



**DETAIL C**

REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

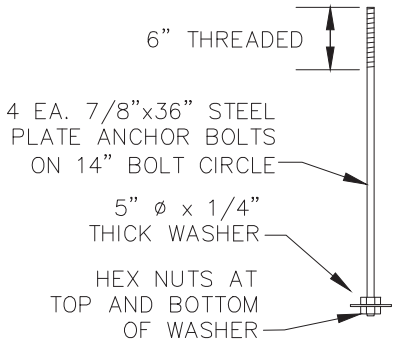
APPROVED:

REVISED:  
2/24

**LUMINAIRE ARM  
DETAIL**

SECTION #  
80.05

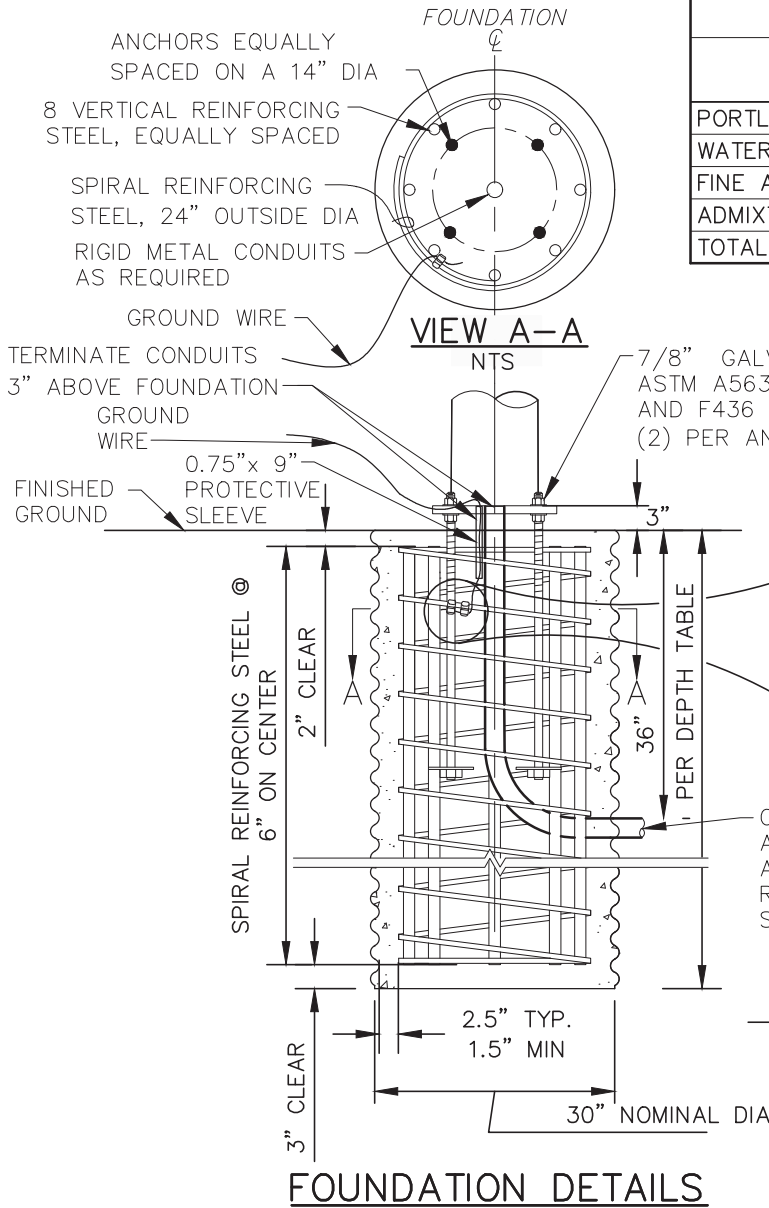
DETAIL #  
80-20



**ANCHOR DETAIL**

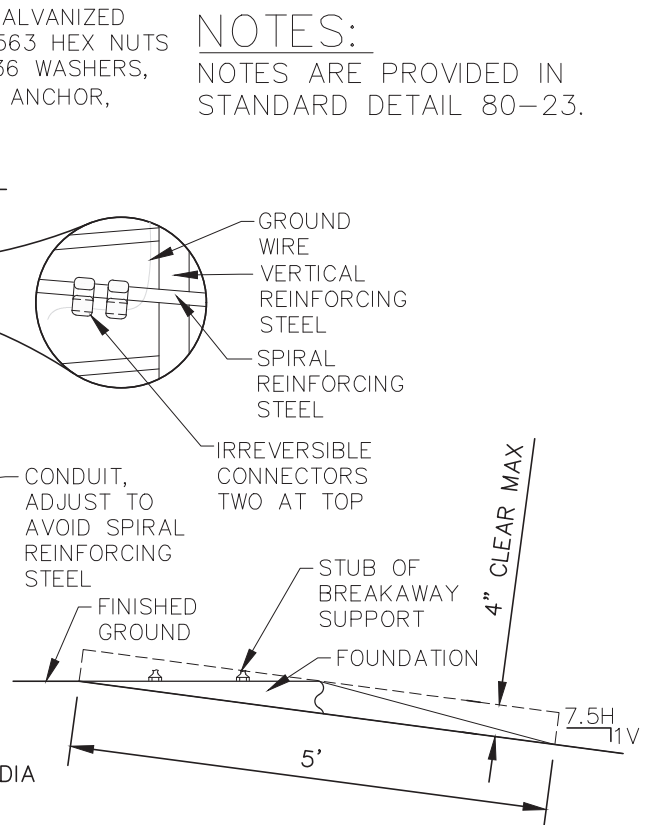
MATERIAL REQUIREMENTS		
CONCRETE	CLASS A	$f'_c = 4000$ PSI
CMP	AASHTO M218	14 ga.
VERTICAL REINFORCING STEEL	AASHTO M31 #11	GR 60
SPIRAL REINFORCING STEEL	AASHTO M31 #5	GR 60
GROUND WIRE		#4 AWG
ANCHOR BOLT	ASTM F1554	GR 55
CONDUIT	SCH 40	RMC
PROTECTIVE SLEEVE	SCH 40	PVC

CONTROLLED LOW STRENGTH MATERIAL MIX DESIGN	
ITEM	BATCHING QUANTITIES PER CY BATCH (LBS.)
PORTLAND CEMENT CONCRETE	188
WATER (52.1 GAL.)	435
FINE AGGREGATE SSD	3041
ADMIXTURE: AIR-ENTRAINMENT	2.0 OZ.
TOTAL	3664



**FOUNDATION DETAILS**

NTS  
(SKIRT OMITTED FOR CLARITY)



**CLEARANCE DETAIL**

NTS  
(SEE NOTE 10)

**NOTES:**  
NOTES ARE PROVIDED IN STANDARD DETAIL 80-23.

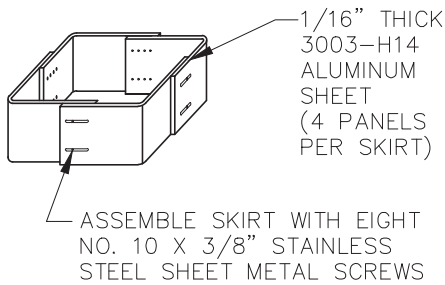
REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.  
APPROVED:  
REVISED:  
2/24

**CONCRETE FOUNDATION FOR  
FIXED BASE  
LUMINAIRE POLE**

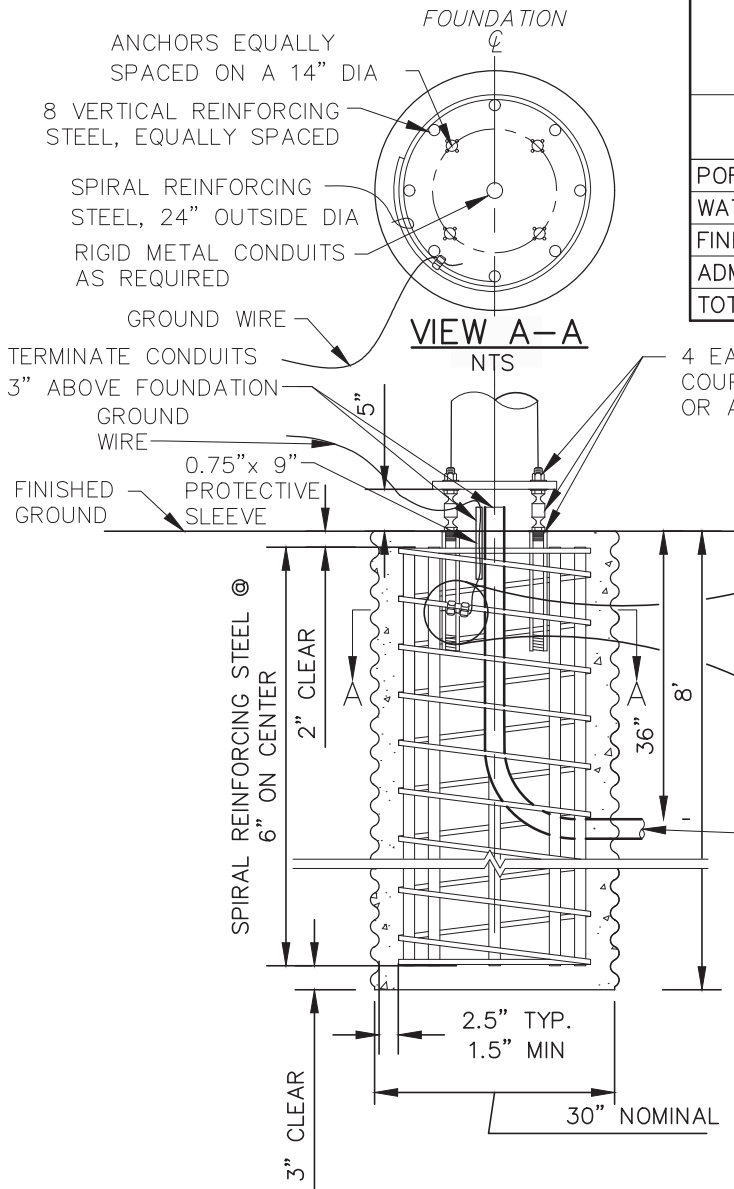
SECTION #  
80.04  
DETAIL #  
80-21



**SKIRT DETAIL**

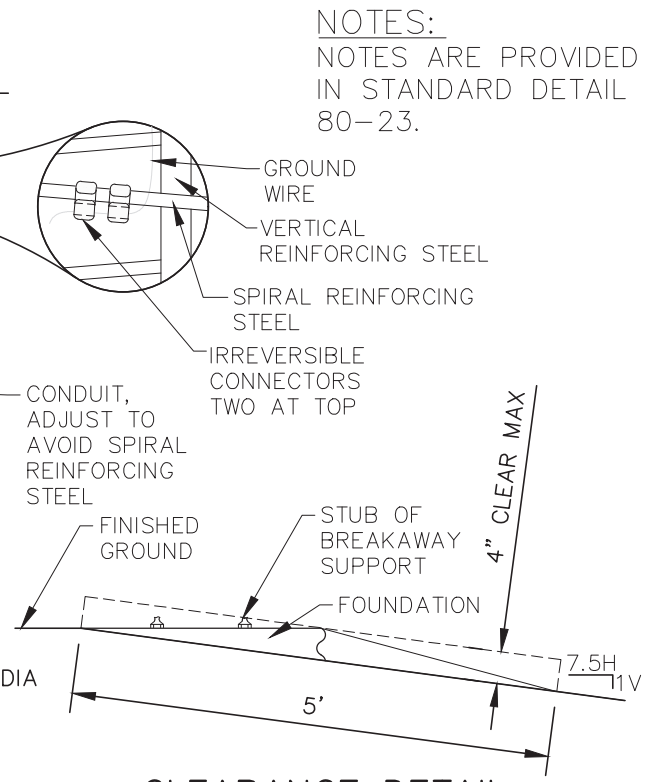
MATERIAL REQUIREMENTS		
CONCRETE	CLASS A	$f'_c = 4000$ PSI
CMP	AASHTO M218	14 ga.
VERTICAL REINFORCING STEEL	AASHTO M31 #11	GR 60
SPIRAL REINFORCING STEEL	AASHTO M31 #5	GR 60
GROUND WIRE		#4 AWG
FRANGIBLE COUPLING	NCHRP 350 TL3 (SEE NOTE 9)	$V_u = 5.5$ KIPS $T_u = 43.2$ KIPS
CONDUIT	SCH 40	RMC
PROTECTIVE SLEEVE	SCH 40	PVC

CONTROLLED LOW STRENGTH MATERIAL MIX DESIGN	
ITEM	BATCHING QUANTITIES PER CY BATCH (LBS.)
PORTLAND CEMENT CONCRETE	188
WATER (52.1 GAL.)	435
FINE AGGREGATE SSD	3041
ADMIXTURE: AIR-ENTRAINMENT	2.0 OZ.
TOTAL	3664



**FOUNDATION DETAILS**

NTS  
(SKIRT OMITTED FOR CLARITY)



**CLEARANCE DETAIL**

NTS  
(SEE NOTE 10)

**NOTES:**  
NOTES ARE PROVIDED IN STANDARD DETAIL 80-23.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY OF ANCHORAGE

SCALE: N.T.S.

APPROVED:

REVISED: 2/24

**CONCRETE FOUNDATION FOR BREAKAWAY BASE LUMINAIRE POLE**

SECTION # 80.04

DETAIL # 80-22

DESIGN NOTES:

DESIGN STANDARD: 2013 STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS WITH 2019 INTERIM.

DESIGN LOAD: 1,000 LBS AXIAL, 2,000 LBS SHEAR, 50,000 FT-LBS MOMENT.

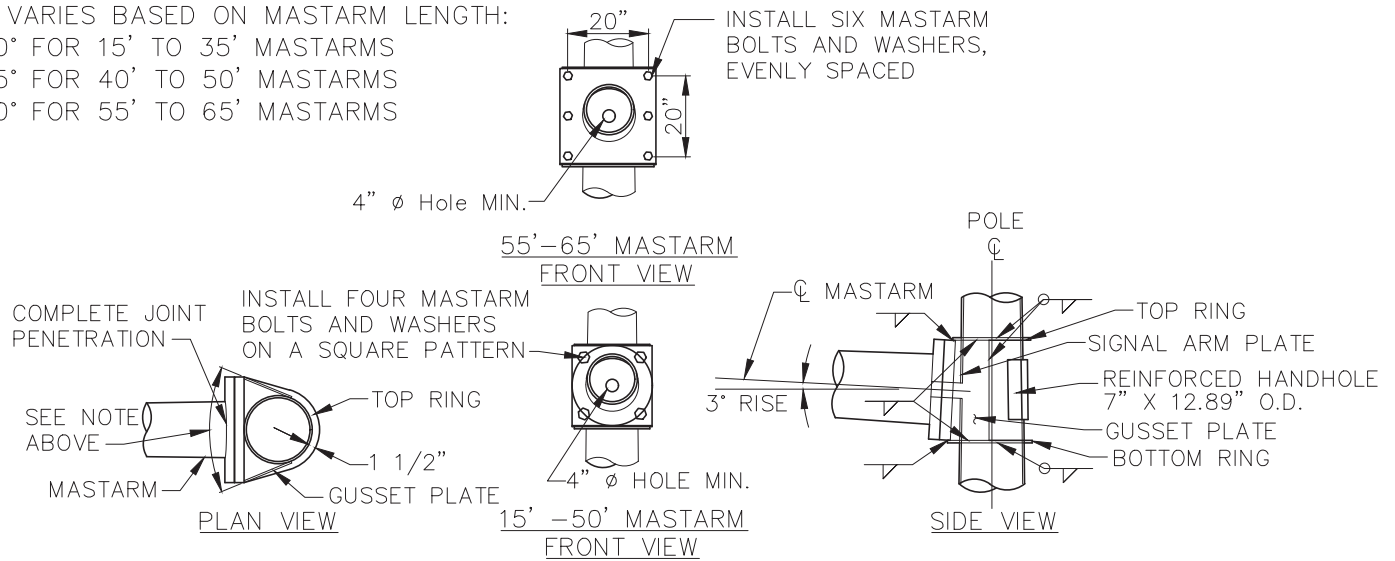
NOTES:

1. THIS FOUNDATION IS APPROVED FOR ELECTROLIER APPLICATIONS IN COHESIONLESS SOILS WITH AN N1-60 VALUE OF 10 OR GREATER PER AASHTO T-206, "STANDARD PENETRATION TEST" (SPT). THIS FOUNDATION SHALL NOT BE USED IF ANY OF THE FOLLOWING ARE ENCOUNTERED; WATER TABLE ABOVE THE BOTTOM OF FOUNDATION, VERY LOOSE SOILS, ORGANIC SOILS, COHESIVE SOILS (CLAY), OR SOILS SUSCEPTIBLE TO FROST JACKING. IF ANY OF THESE CONDITIONS ARE ENCOUNTERED, STOP FOUNDATION WORK AND CONTACT THE ENGINEER.
2. PLACE THE FOUNDATION IN DRILLED OR EXCAVATED HOLE WITH CENTERLINE OF FOUNDATION LOCATED AT THE STATION, OFFSET, AND ELEVATION SPECIFIED IN PLANS. SET FOUNDATION TO SATISFY THE CONDITIONS DEPICTED IN THE CLEARANCE DETAIL.
3. FORM THE FOUNDATION IN CORRUGATED METAL PIPE CONFORMING TO M.A.S.S. DIVISION 80, ARTICLE 4.2.
4. PROVIDE 1.5 EXTRA TURNS AT EACH END OF THE SPIRAL REINFORCING STEEL. REINFORCING STEEL SHALL NOT BE SPLICED. TIE VERTICAL REINFORCING STEEL TO EACH INTERSECTION OF THE SPIRAL REINFORCING STEEL.
5. CONNECT GROUND WIRE NEAR THE TOP OF SPIRAL REINFORCING STEEL WITH TWO IRREVERSIBLE CONNECTORS AS SHOWN. FASTEN CONNECTORS ACCORDING TO THE MANUFACTURERS' RECOMMENDATIONS INCLUDING THE USE OF MANUFACTURER SPECIFIED TOOLS. THE GROUND WIRE MAY BE BARE SOLID, STRANDED, OR BRAIDED COPPER. PROTECT GROUND WIRE WITH PROTECTIVE SLEEVE AS SHOWN AND FILL WITH SILICON SEALANT.
6. COMPLETE ALL CONCRETE WORK IN CONFORMANCE WITH M.A.S.S. DIVISION 30 AND 80. USE A TUBE WITH A HOPPER HEAD OR OTHER APPROVED DEVICE WHEN DROPPING CONCRETE MORE THAN 5 FEET. VIBRATE CONCRETE DURING PLACEMENT BY MECHANICAL VIBRATION. ENSURE UPPER ANCHOR ROD THREADS ARE PROTECTED FROM CONTACT WITH CONCRETE DURING POUR.
7. BACKFILL AND COMPACT ACCORDING TO M.A.S.S. DIVISION 20 AND SECTION 80.04, ARTICLE 4.2 CAST-IN-PLACE CONCRETE FOUNDATION. USE SELECT BACKFILL OR CONTROLLED LOW STRENGTH MATERIAL AS BACKFILL MATERIAL. BATCH ITEMS FOR CONTROLLED LOW STRENGTH MATERIAL MIX SHALL CONFORM TO M.A.S.S. SECTION 30.01, ARTICLE 1.3 MATERIALS. ENSURE AREA BELOW FOUNDATION MEETS COMPACTION REQUIREMENTS AND IS FREE OF LOOSE MATERIAL AND DEBRIS PRIOR TO CONCRETE WORK.
8. INSTALL ALL ANCHORS ACCORDING TO THE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS. ANCHORS SHALL BE INSTALLED PLUMB. ANCHORS GREATER THAN 1:40 OUT-OF-PLUMB WILL RESULT IN FOUNDATION REJECTION.
9. FOR THE BREAKAWAY LUMINAIRE POLE FOUNDATION, THE FRANGIBLE COUPLING REFERENCED IS NCHRP 350 COMPLIANT. THERE IS NO MASH COMPLIANT DEVICE AVAILABLE AT THIS TIME.
10. SPECIAL GRADING DETAIL AND/OR SHIELDING MAY BE REQUIRED TO MAINTAIN 4" MAXIMUM CLEAR DISTANCE.
11. CONTROLLED LOW STRENGTH MATERIAL MIX DESIGN SHALL FOLLOW APPLICABLE SPECIFICATION OF M.A.S.S. DIVISION 30.

REVISION: 2024 M.A.S.S. UPDATE

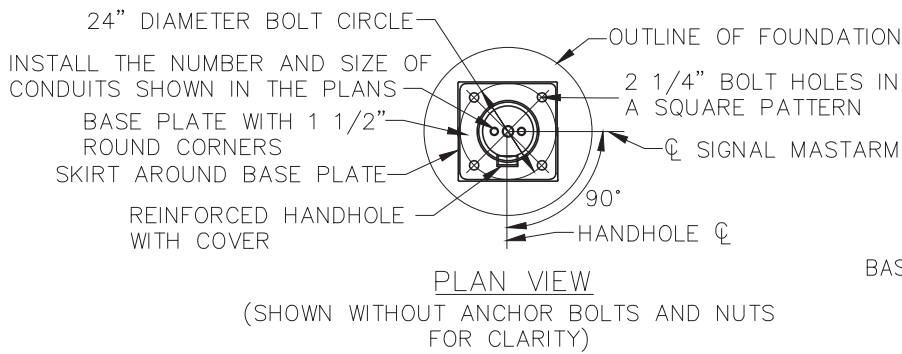
<p>MUNICIPALITY</p>  <p>OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>CONCRETE FOUNDATION NOTES</b></p> <p><b>LUMINAIRE POLE</b></p>	<p>SECTION # 80.04</p> <p>DETAIL # 80-23</p>
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**NOTE:**  
 ANGLE VARIES BASED ON MASTARM LENGTH:  
 50° FOR 15' TO 35' MASTARMS  
 45° FOR 40' TO 50' MASTARMS  
 40° FOR 55' TO 65' MASTARMS



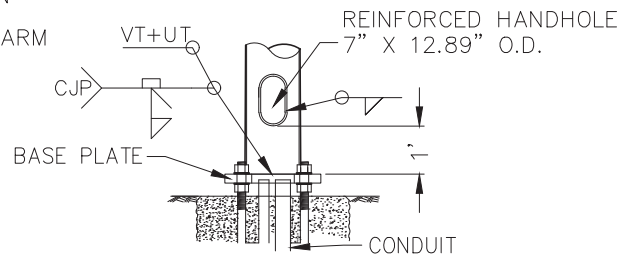
**SIGNAL MASTARM CONNECTION DETAIL**

NTS  
 (ELEVATION VIEW OF A RING STIFFENED BUILT-UP BOX)

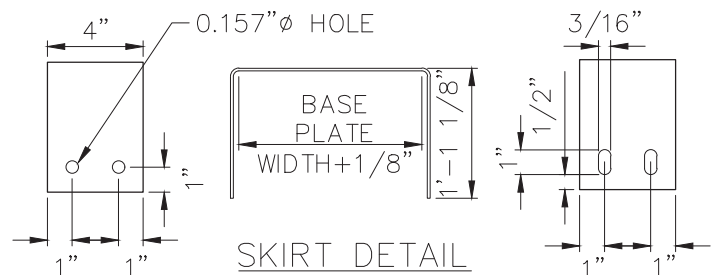


**POLE BASE DETAIL**

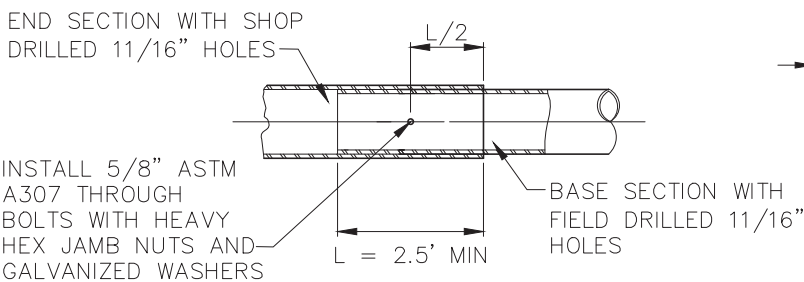
NTS



(SKIRT OMITTED FOR CLARITY)



NTS  
 (TWO REQUIRED PER POLE)



**MASTARM SLIP SPLICE ELEVATION DETAIL**

NTS

NOTES FROM STANDARD DETAIL 80-25 APPLY TO ALL SIGNAL POLE INSTALLATIONS EXCEPT THAT NOTE 11 DOES NOT PERTAIN TO MASTARMS OF LESS THAN 40'.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE: N.T.S.

APPROVED:

REVISED: 2/24

**SIGNAL POLE DETAILS**

SECTION # 80.05

DETAIL # 80-24

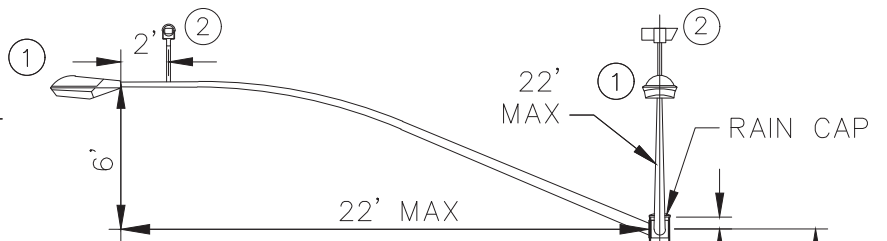
NOTES:

1. PROVIDE POLE ASSEMBLIES MEETING THE FOLLOWING DESIGN CRITERIA; 2001 AASHTO STANDARD SPECIFICATIONS FOR STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES AND TRAFFIC SIGNALS, THE LATEST EDITION OF THE MUNICIPALITY OF ANCHORAGE STANDARD SPECIFICATIONS (M.A.S.S) AND, SPECIAL PROVISIONS. DESIGN FOR A BASIC WIND SPEED OF 100 MPH, FATIGUE CATEGORY III, WITH GALLOPING. MEASURE ALLOWED DEFLECTION DUE TO GALLOPING AT THE FREE END OF MASTARM.
2. PROVIDE POLES TO ACCOMMODATE THE MAXIMUM LENGTH SHOWN IN THE MASTARM DATA WITH THE GIVEN LOADS, DIMENSIONS AND MATERIAL REQUIREMENTS.
3. THIS DRAWING SHOWS LOADS (SIGNS AND SIGNALS) TO BE USED BY MANUFACTURERS WHEN DESIGNING POLES. IT DOES NOT SHOW ACTUAL LOADING OF POLES/MASTARMS ON INDIVIDUAL PROJECTS. THIS POLE/MASTARM DESIGN MAY BE USED WITHOUT FURTHER ANALYSIS IF THE FOLLOWING CONDITIONS ARE MET:
  - THE GUIDE SIGN (LOAD #7) IS ATTACHED TO THE MASTARM BASE SECTION AND,
  - NOT MORE THAN 4 TRAFFIC SIGNALS AND/OR SIGNS ARE ATTACHED TO THE END SECTION OF THE MASTARM.
 IF THESE CONDITIONS ARE NOT MET, THIS STANDARD POLE/MASTARM DESIGN MAY ONLY BE USED IF DESIGN COMPUTATIONS ARE SUBMITTED THAT DEMONSTRATE CONFORMANCE TO DESIGN CRITERIA USING ACTUAL LOADS. NOTE: DEVICES WITH LESS THAN 1 SQUARE FOOT OF PROJECTED AREA MAY BE ADDED TO THE MASTARM WITHOUT CAUSING A NEED FOR ADDITIONAL DESIGN COMPUTATIONS.
4. THE MANUFACTURER IS TO DETERMINE WELD SIZES. ALL WELDS AND TESTING SHALL CONFORM TO THE LATEST EDITION OF THE STRUCTURAL WELDING CODE AWS D1.1. PROVIDE VISUAL TEST (VT) OF 100% OF ALL WELDS. PROVIDE MAGNETIC PARTICLE TEST (MT) OF 100% OF ALL FILLET WELDS. PROVIDE RADIOGRAPHIC (RT) OR ULTRASONIC TEST (UT) OF 100% OF ALL COMPLETE JOINT PENETRATION WELDS AND A RANDOM 25% OF ALL PARTIAL JOINT PENETRATION LONGITUDINAL SEAM WELDS.
5. FABRICATE POLE TUBES FROM NO MORE THAN 2 PIECES OF STEEL. WHEN USING 2 PIECES, PLACE THE LONGITUDINAL WELDED SEAMS DIRECTLY OPPOSITE ONE ANOTHER.
6. FABRICATE LUMINAIRE ARMS AND CONNECTIONS ACCORDING TO STANDARD DETAIL 80-20.
7. PROVIDE PERMANENT TAGS ON ALL POLE SECTIONS IN ACCORDANCE WITH M.A.S.S. SECTION 80.05, ARTICLE 5.6. PROVIDE A RAIN CAP WHEN NO UPPER SECTION IS SPECIFIED.
8. THE TRAFFIC ENGINEER WILL REJECT DAMAGED OR DEFECTIVE POLES IN ACCORDANCE WITH M.A.S.S. SECTION 80.05 AND FOR ANY OF THE FOLLOWING; VARIANCES FROM APPROVED SHOP DRAWINGS, VARIANCES FROM MATERIAL REQUIREMENTS, SECTIONS MORE THAN 2-PERCENT OUT OF ROUND, SECTIONS BOWED MORE THAN 1-INCH THROUGHOUT THE LENGTH OF THE POLE, MASTARM, OR SEGMENT AND, DAMAGED OR DENTED FINISHES.
9. DRILL A 1" MAXIMUM DIAMETER HOLE AT EACH TRAFFIC SIGNAL LOCATION. ORIENT THE HOLE ON THE HORIZONTAL AXIS OF MASTARMS.
10. INSTALL POLE PLUMB BY ENSURING THE SIDE OPPOSITE THE MASTARM IS VERTICAL IN ITS FINAL DEFLECTED POSITION.
11. ALIGN WELDED SEAMS ON ADJACENT SECTIONS OF MASTARMS TO FORM CONTINUOUS STRAIGHT SEAMS THE LENGTH OF THE MASTARM. MECHANICALLY FORCE MASTARM SECTIONS TOGETHER FOR A SNUG FIT.
12. CLEAN AND REMOVE DIRT, BURRS, MILL SCALE, AND EXCESS GALVANIZATION ON ALL FAYING SURFACES AND THREADED PARTS BEFORE ASSEMBLY. LUBRICATE THE THREADS OF ALL BOLTS AND NUTS WITH LUBRICANT CONTAINING A VISIBLE DYE. TIGHTEN ALL BOLTS ACCORDING TO M.A.S.S SECTIONS 80.04 AND 80.05.

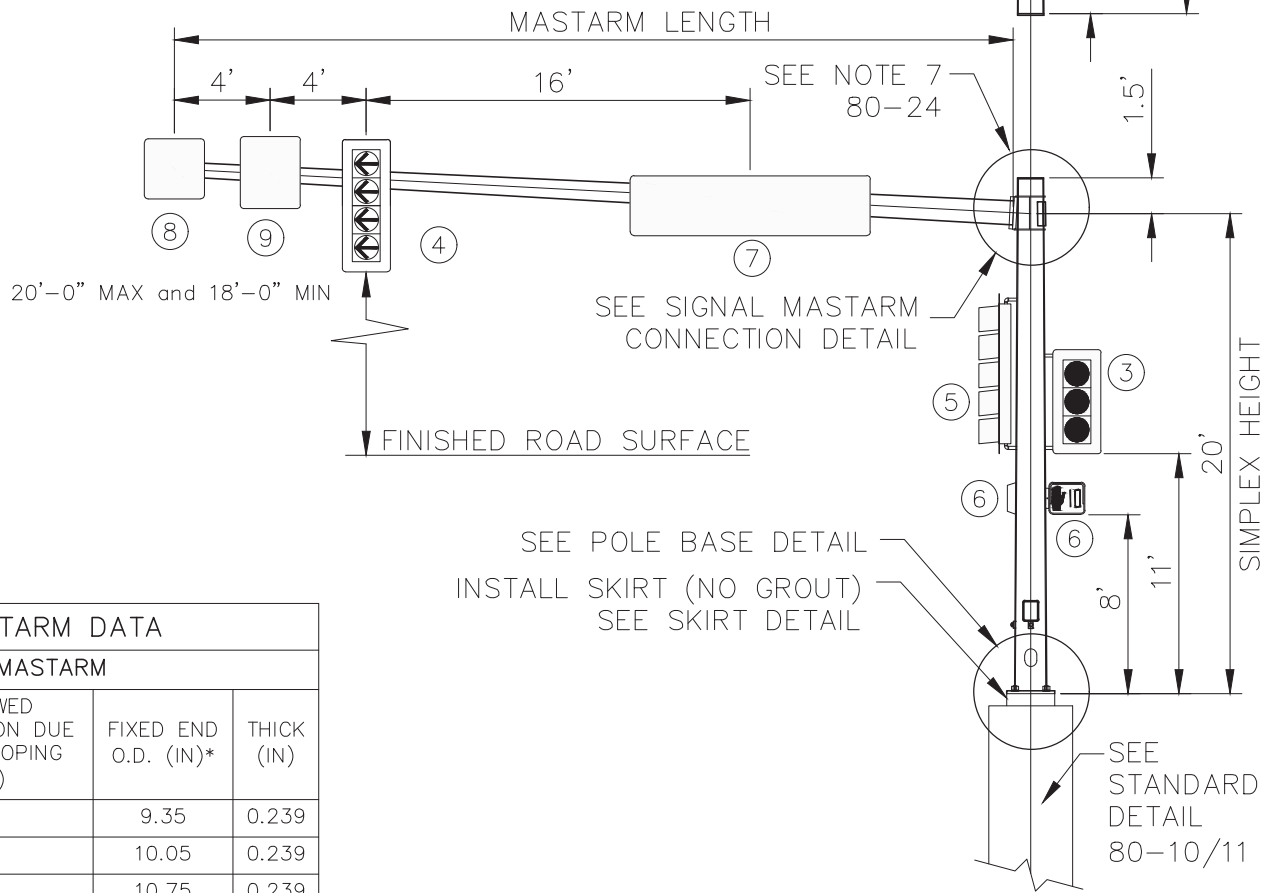
REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY  OF ANCHORAGE	SCALE: N.T.S.  APPROVED:  REVISED: 2/24	<h1 style="margin: 0;">SIGNAL POLE NOTES</h1>	SECTION # 80.05  DETAIL # 80-25
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ALL NOTES FROM STANDARD DETAIL 80-25 APPLY TO ALL SIGNAL POLE INSTALLATIONS EXCEPT THAT NOTE 11 DOES NOT PERTAIN TO MASTARMS OF LESS THAN 40'.



POLE DESIGN LOADING					
LOAD COMPONENT	HEIGHT (FT)	WEIGHT (LBS)	ICE AREA (SQ FT)	WIND AREA (FACE-SQ FT)	WIND AREA (SIDE-SQ FT)
1 LUMINAIRE	0.67	50	6.00	2.00	2.00
2 CAMERA	0.50	20	2.00	0.5	1.00
3 SIGNAL	5.00	60	29.13	12.50	4.25
4 SIGNAL	5.33	100	46.26	20.44	4.25
5 SIGNAL	7.33	100	45.48	18.33	7.08
6 PED HEAD	1.33	25	6.83	2.00	0.67
7 SIGN	2.50	120	30.00	30.00	0.83
8 SIGN	2.50	25	6.25	6.25	0.83
9 SIGN	3.00	30	7.50	7.50	1.00



MASTARM DATA			
MASTARM			
LENGTH (FT)	ALLOWED DEFLECTION DUE TO GALLOPING (IN)	FIXED END O.D. (IN)*	THICK (IN)
15	8	9.35	0.239
20	8	10.05	0.239
25	8	10.75	0.239
30	8	11.45	0.239
35	8	12.15	0.239

\* FIXED END DIAMETER MEASURED AT CONNECTION TO BASEPLATE

REVISION: 2024 M.A.S.S. UPDATE



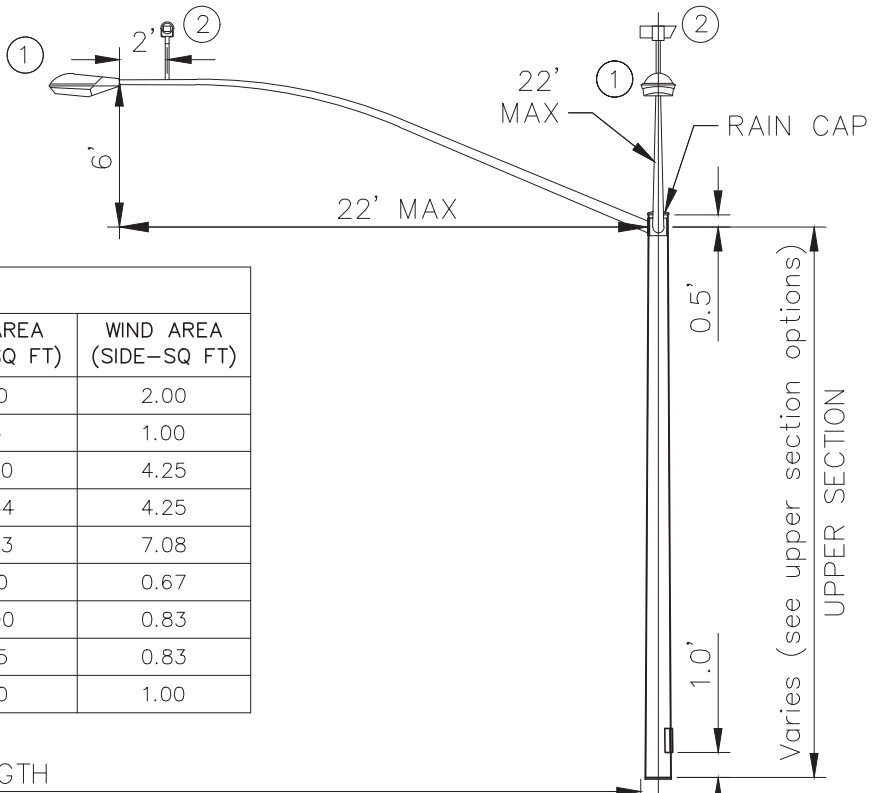
SCALE:  
N.T.S.  
APPROVED:  
REVISED:  
2/24

# SIGNAL POLE 15' TO 35' MASTARM ELEVATION VIEW

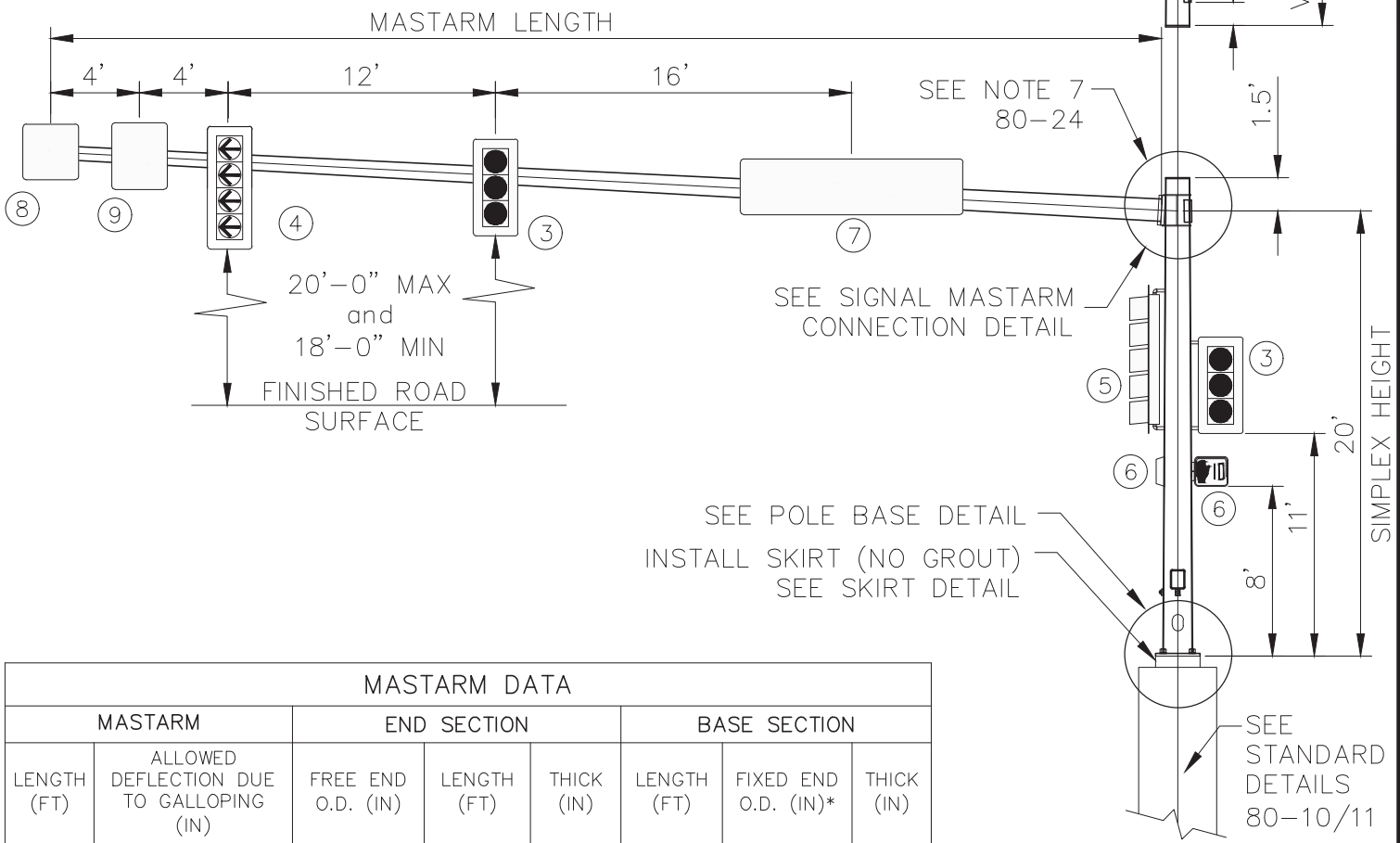
SECTION #  
80.05

DETAIL #  
80-26A

ALL NOTES FROM STANDARD DETAIL 80-25 APPLY TO ALL SIGNAL POLE INSTALLATIONS.



POLE DESIGN LOADING					
LOAD COMPONENT	HEIGHT (FT)	WEIGHT (LBS)	ICE AREA (SQ FT)	WIND AREA (FACE-SQ FT)	WIND AREA (SIDE-SQ FT)
1 LUMINAIRE	0.67	50	6.00	2.00	2.00
2 CAMERA	0.50	20	2.00	0.5	1.00
3 SIGNAL	5.00	60	29.13	12.50	4.25
4 SIGNAL	5.33	100	46.26	20.44	4.25
5 SIGNAL	7.33	100	45.48	18.33	7.08
6 PED HEAD	1.33	25	6.83	2.00	0.67
7 SIGN	2.50	120	30.00	30.00	0.83
8 SIGN	2.50	25	6.25	6.25	0.83
9 SIGN	3.00	30	7.50	7.50	1.00



MASTARM DATA							
MASTARM		END SECTION			BASE SECTION		
LENGTH (FT)	ALLOWED DEFLECTION DUE TO GALLOPING (IN)	FREE END O.D. (IN)	LENGTH (FT)	THICK (IN)	LENGTH (FT)	FIXED END O.D. (IN)*	THICK (IN)
40	8.0	7.3	25.0	0.1793	18.34	12.5	0.3125
45	8.0	7.3	25.0	0.1793	23.34	13.2	0.3125
50	8.0	7.3	25.0	0.1793	28.34	13.9	0.3125

\* FIXED END DIAMETER MEASURED AT CONNECTION TO BASEPLATE

REVISION: 2024 M.A.S.S. UPDATE

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 OF ANCHORAGE

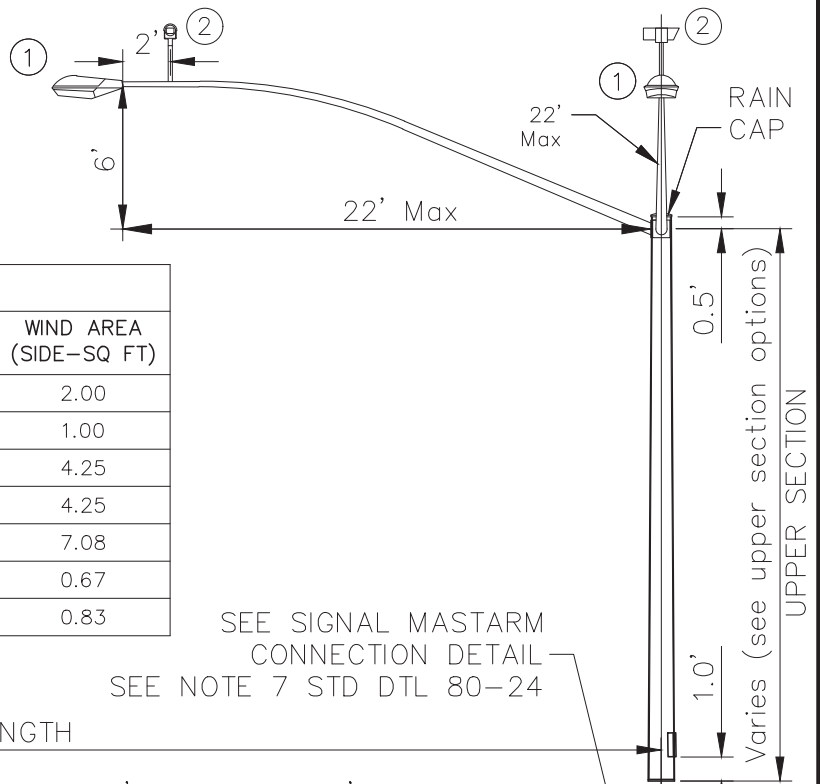
SCALE:  
N.T.S.  
 APPROVED:  
 REVISED:  
2/24

# SIGNAL POLE 40' TO 50' MASTARM ELEVATION VIEW

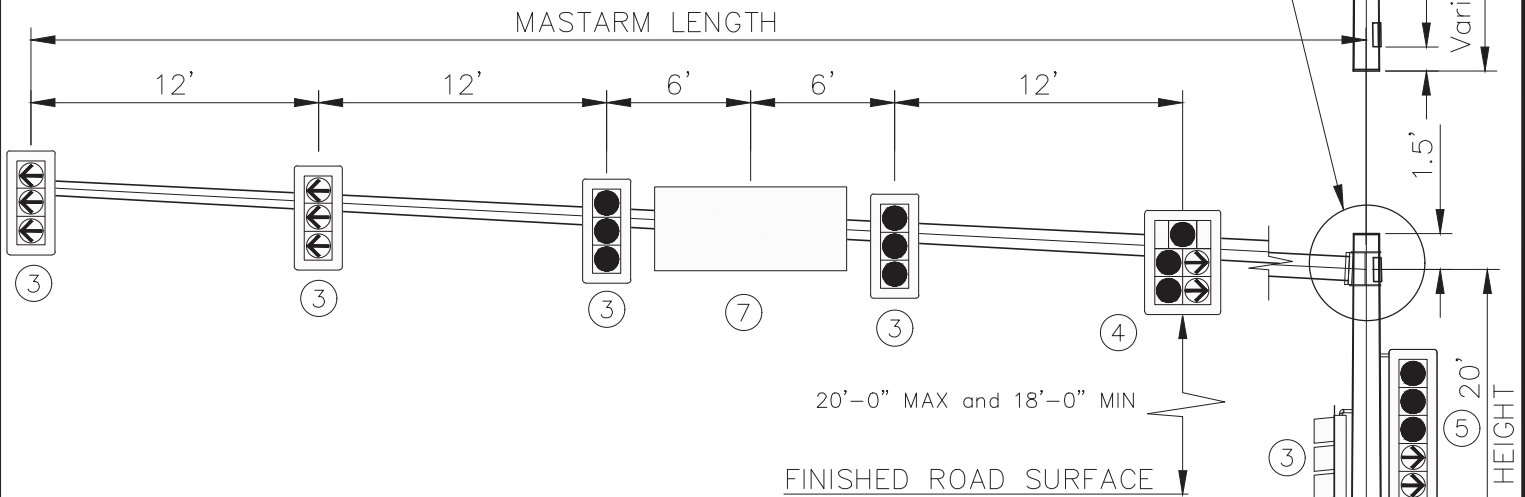
SECTION #  
80.05  
 DETAIL #  
80-26B



ALL NOTES FROM STANDARD DETAIL 80-25 APPLY TO ALL SIGNAL POLE INSTALLATIONS.



POLE DESIGN LOADING					
LOAD COMPONENT	HEIGHT (FT)	WEIGHT (LBS)	ICE AREA (SQ FT)	WIND AREA (FACE-SQ FT)	WIND AREA (SIDE-SQ FT)
1 LUMINAIRE	0.67	50	6.00	2.00	2.00
2 CAMERA	0.50	20	2.00	0.5	1.00
3 SIGNAL	5.00	60	29.13	12.50	4.25
4 SIGNAL	5.33	100	46.26	20.44	4.25
5 SIGNAL	7.33	100	45.48	18.33	7.08
6 PED HEAD	1.33	25	6.83	2.00	0.67
7 SIGN	2.50	120	30.00	30.00	0.83



MASTARM DATA							
MASTARM		END SECTION			BASE SECTION		
LENGTH (FT)	ALLOWED DEFLECTION DUE TO GALLOPING (IN)	FREE END O.D. (IN)	LENGTH (FT)	THICK (IN)	LENGTH (FT)	FIXED END O.D. (IN)*	THICK (IN)
55	10.0	7.3	25.0	0.1793	33.34	14.6	0.375
60	10.0	7.3	25.0	0.1793	38.34	15.3	0.375
65	10.0	7.3	25.0	0.1793	43.34	16.0	0.375

\* FIXED END DIAMETER MEASURED AT CONNECTION TO BASEPLATE

SEE POLE BASE DETAIL  
 INSTALL SKIRT (NO GROUT) SEE SKIRT DETAIL  
 SEE STD DTLS 80-10/11

REVISION: 2024 M.A.S.S. UPDATE

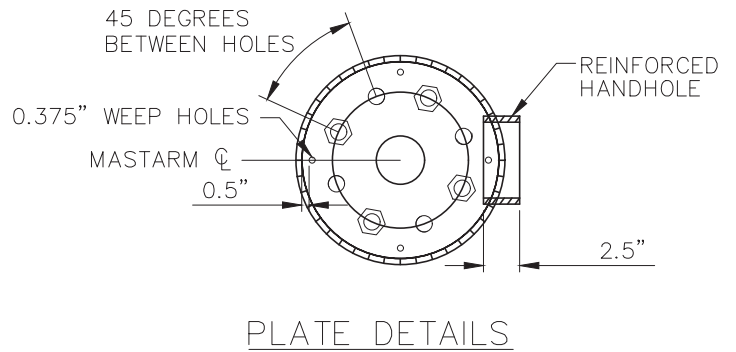
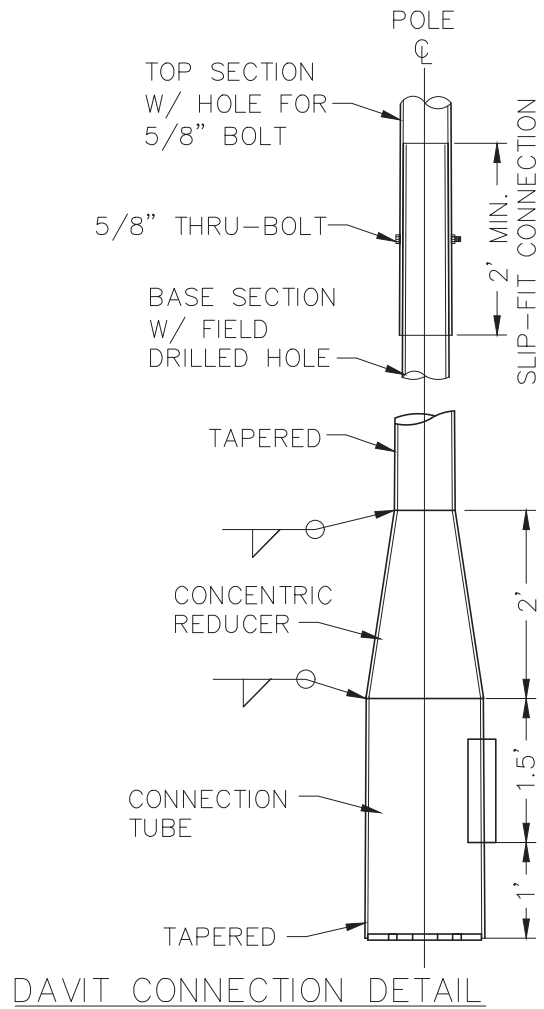
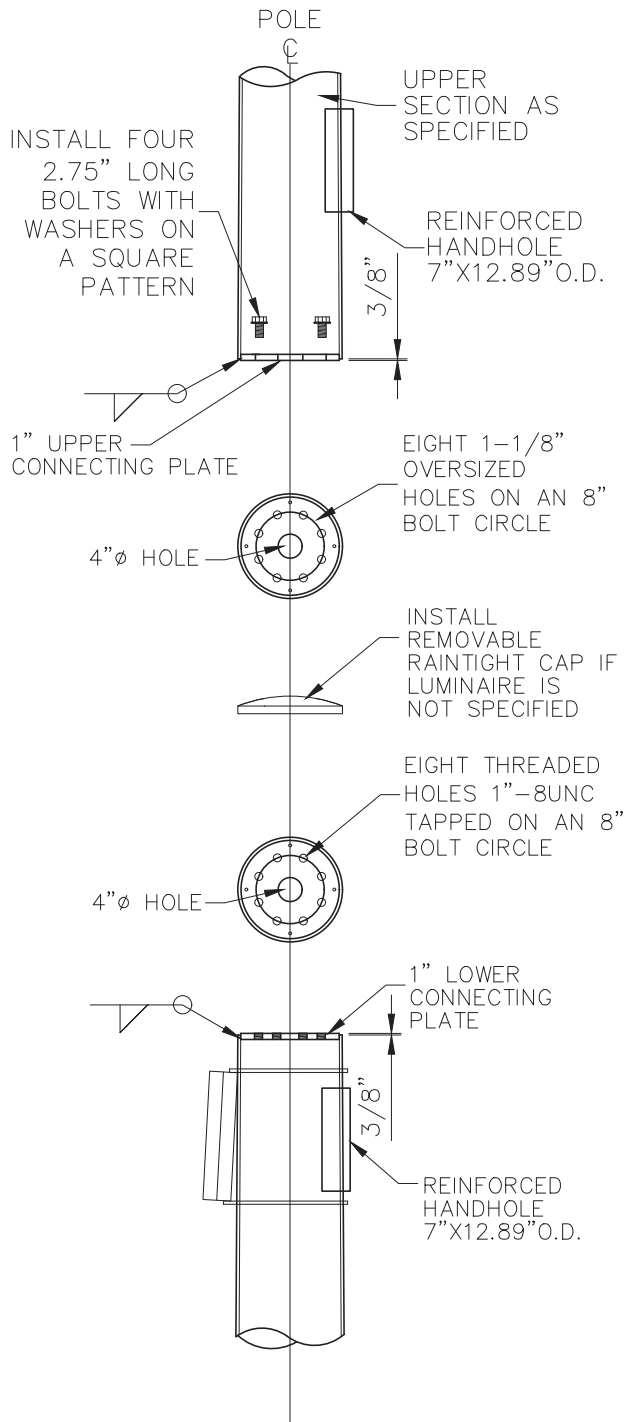
MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
 N.T.S.  
 APPROVED:  
 REVISED:  
 2/24

# SIGNAL POLE 55' TO 65' MASTARM ELEVATION VIEW

SECTION #  
 80.05  
 DETAIL #  
 80-26C

REVISION: 2024 M.A.S.S. UPDATE

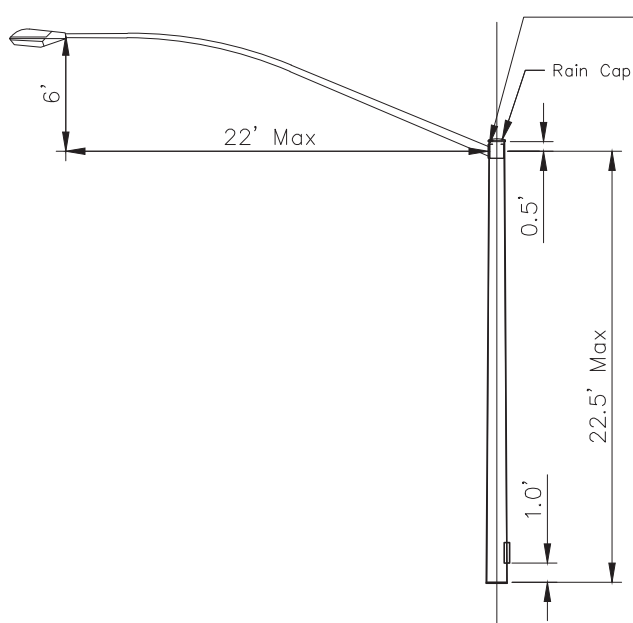


SCALE: N.T.S.  
 APPROVED:  
 REVISED: 2/24

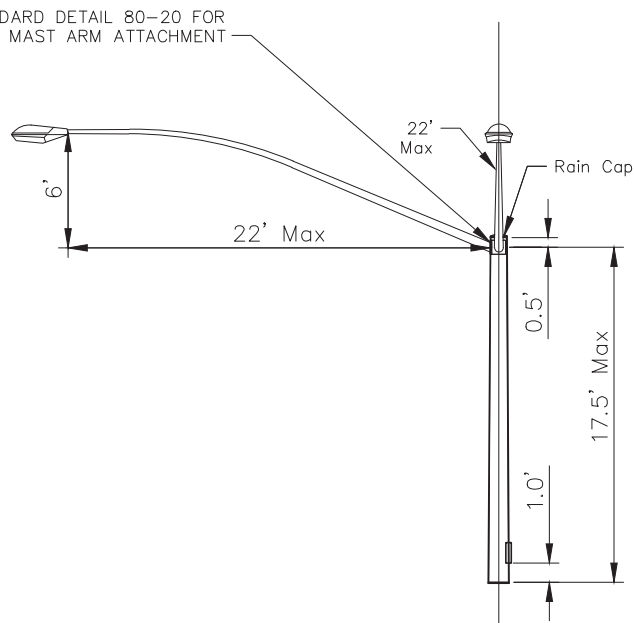
# SIGNAL POLE UPPER SECTION OPTIONS PART 1

SECTION # 80.05

DETAIL # 80-26D

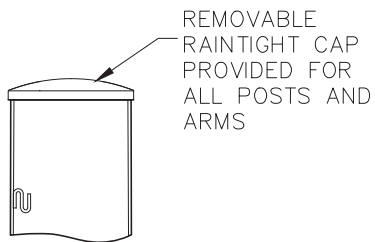


SINGLE LUMINAIRE

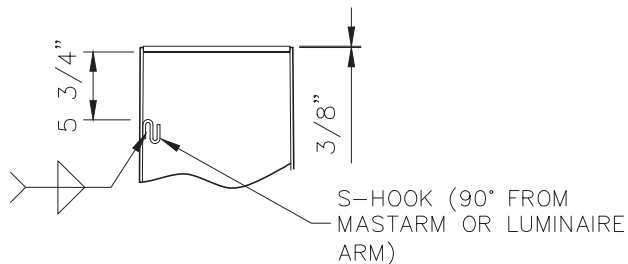


DOUBLE LUMINAIRE

UPPER SECTION OPTIONS  
NTS



RAIN CAP DETAIL



LOWER SECTION POST TOP  
NTS

REVISION: 2024 M.A.S.S. UPDATE

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SCALE:  
N.T.S.

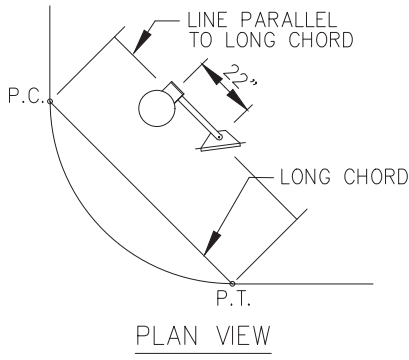
APPROVED:

REVISED:  
2/24

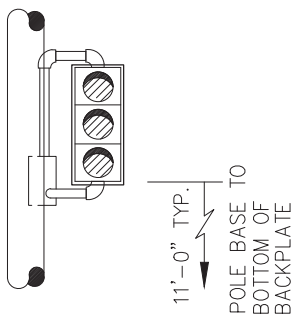
SIGNAL POLE  
UPPER SECTION OPTIONS  
PART 2

SECTION #  
80.05

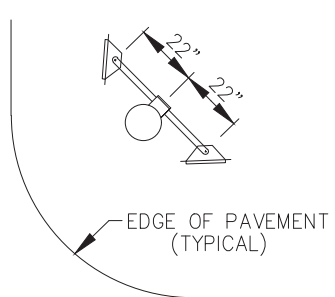
DETAIL #  
80-26E



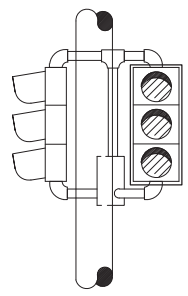
PLAN VIEW



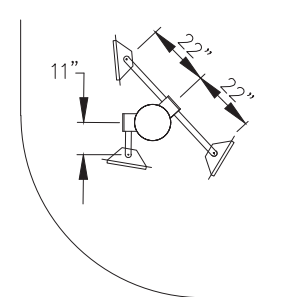
USE A ONE WAY, L.O.D. FRAME FOR INSTALLING ONE FACE



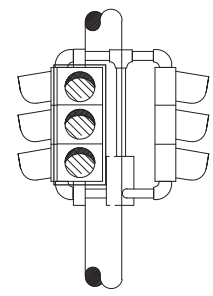
PLAN VIEW



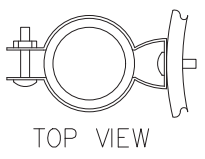
USE A TWO WAY FRAME FOR INSTALLING TWO FACES



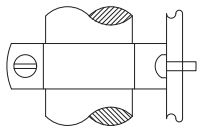
PLAN VIEW



USE TWO FRAMES FOR INSTALLING THREE FACES: A TWO WAY AND A ONE WAY R.O.D.



TOP VIEW

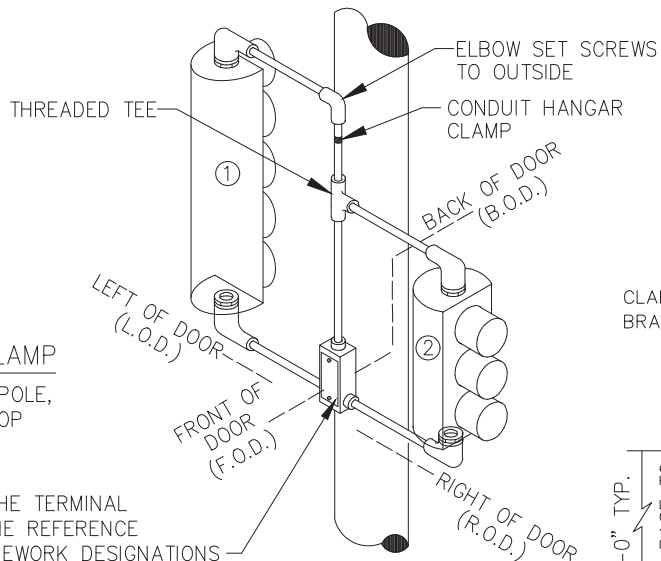


SIDE VIEW

CONDUIT HANGER CLAMP

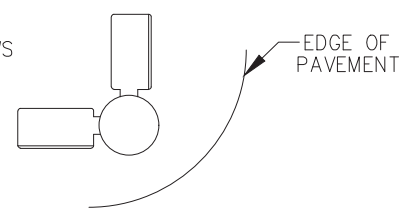
BOLTED TO THE SIGNAL POLE, 6" TO 12" BELOW THE TOP MOST 90° BEND

USE THE DOOR OF THE TERMINAL COMPARTMENT AS THE REFERENCE POINT FOR ALL FRAMEWORK DESIGNATIONS

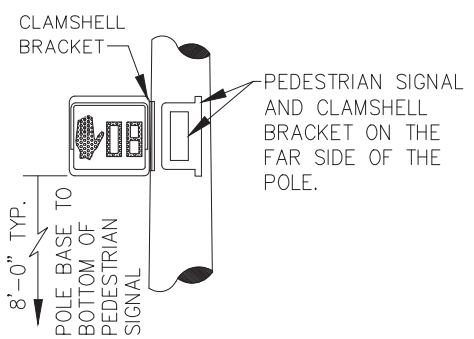


FRAMEWORK DESCRIPTION

HEAD NO. 1 OFFSET L.O.D.  
HEAD NO. 2 OFFSET R.O.D.



PLAN VIEW



PEDESTRIAN SIGNAL

NOTE: SHOWN WITHOUT BACKPLATES

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N.T.S.

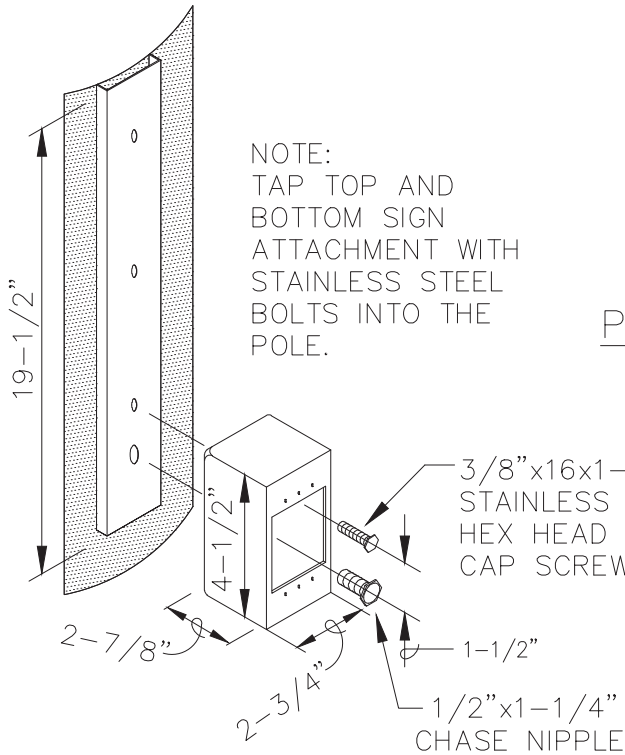
APPROVED:

REVISED:  
2/24

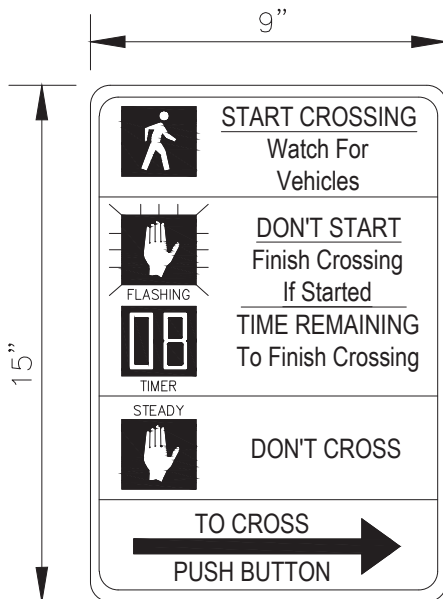
**SIDE-MOUNTED SIGNAL  
DETAILS**

SECTION #  
80.19

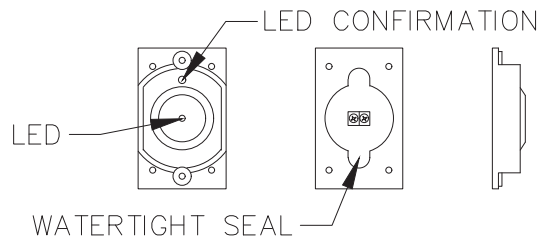
DETAIL #  
80-27



PEDESTRIAN BUTTON  
HOUSING DETAIL



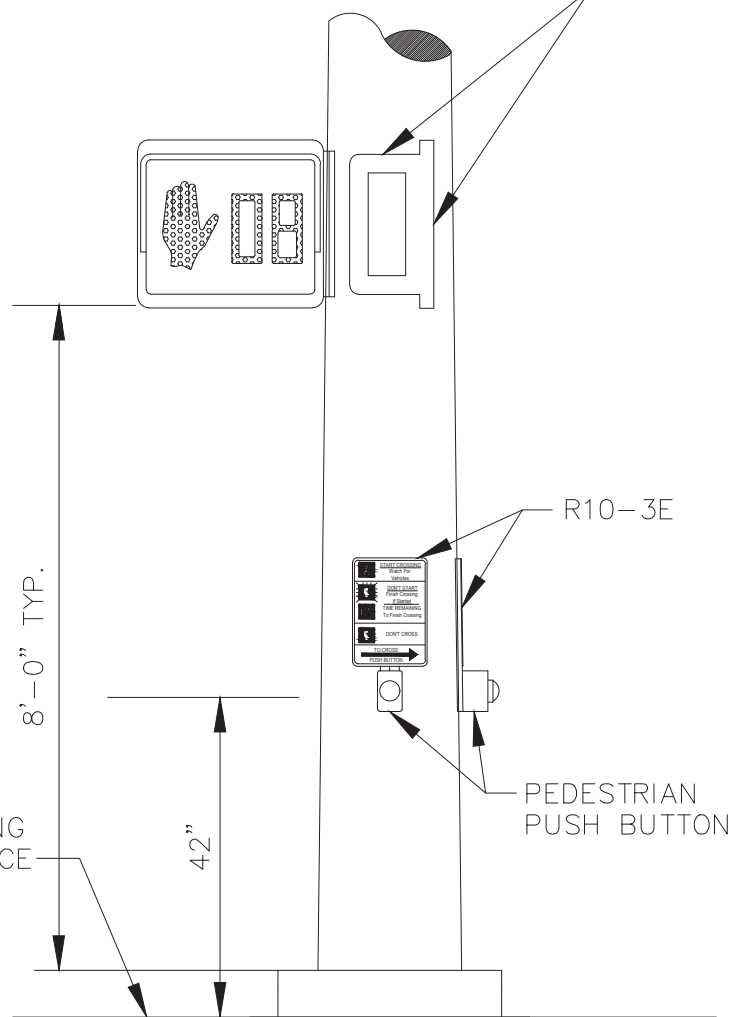
R10-3E  
SIGN DETAIL



PEDESTRIAN PUSH BUTTON SWITCH

POLARA BULLDOG MODEL  
RBDL3-B-4H, OR APPROVED EQUAL

PEDESTRIAN SIGNAL AND  
CLAMSHELL BRACKET ON  
THE FAR SIDE OF THE POLE



PEDESTRIAN HARDWARE

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

PEDESTRIAN PUSH BUTTON  
ASSEMBLY

SECTION #  
80.21

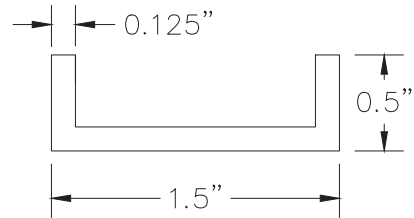
DETAIL #  
80-28A

DRILL AND TAP MOUNTING HOLES IN POLE FOR 1/4" X 20 STAINLESS STEEL HEX CAP SCREWS AND STAINLESS STEEL FLAT WASHERS, SEE NOTE 2

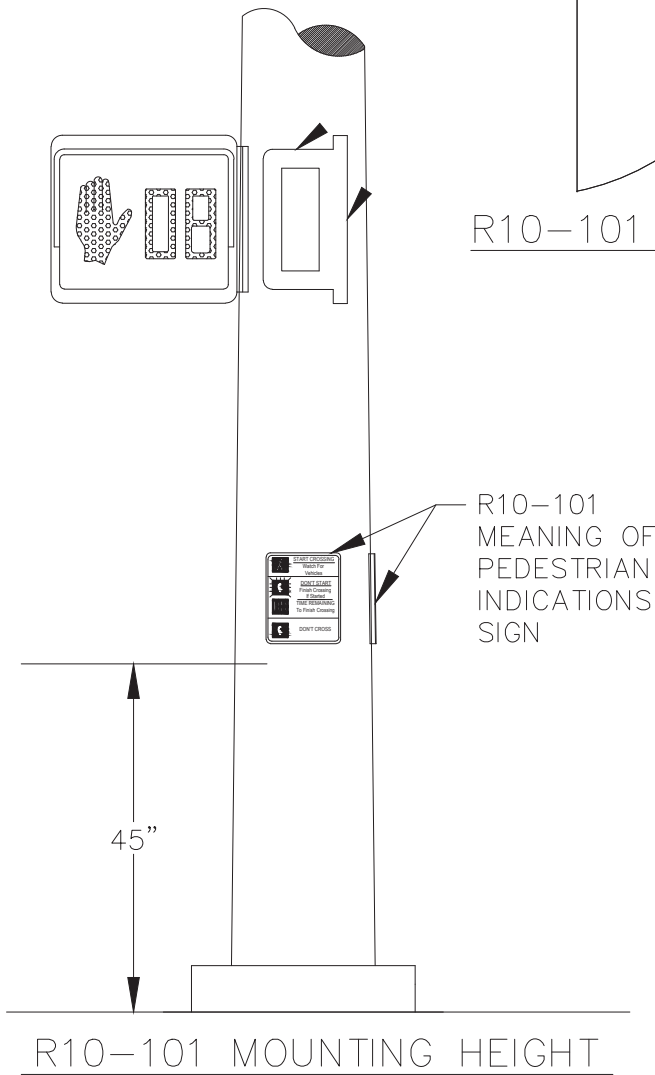
DRILL SLIGHTLY OVERSIZED HOLES IN ALUMINUM CHANNEL

11.5"

R10-101 SIGN MOUNT



ALUMINUM ARCHITECTURAL CHANNEL 6063-T52



NOTES:

1. INSTALL THE R10-101 MEANING OF PEDESTRIAN INDICATIONS SIGNS SHOWN IN THE PLANS AS DETAILED ON THIS SHEET AND PER ALASKA TRAFFIC MANUAL.
2. POSITION MOUNTING HOLES SO THAT CAP SCREW AND FLAT WASHERS DON'T OBSCURE SIGN LEGEND.

R10-101 MOUNTING HEIGHT

REVISION: 2024 M.A.S.S. UPDATE

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OF ANCHORAGE

SCALE:  
N.T.S.

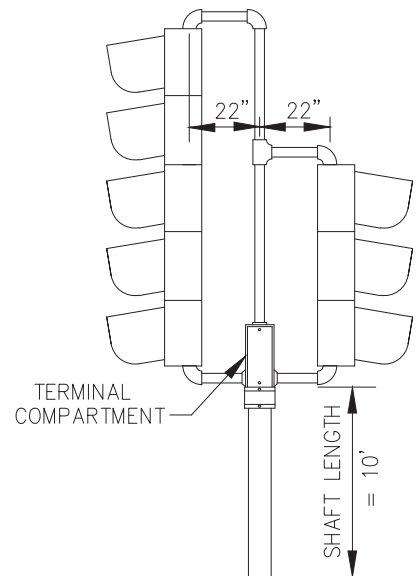
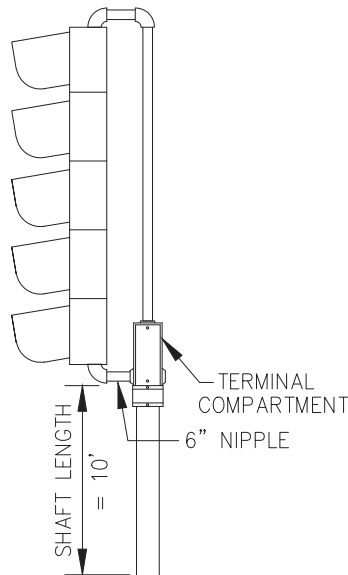
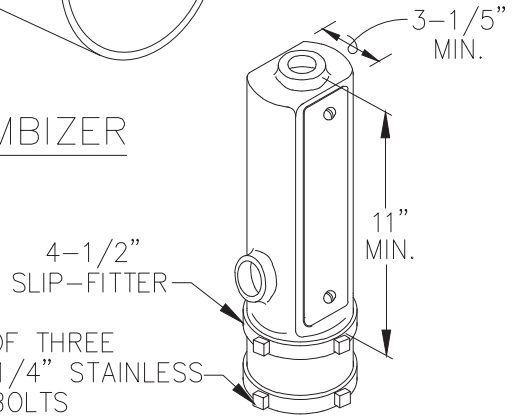
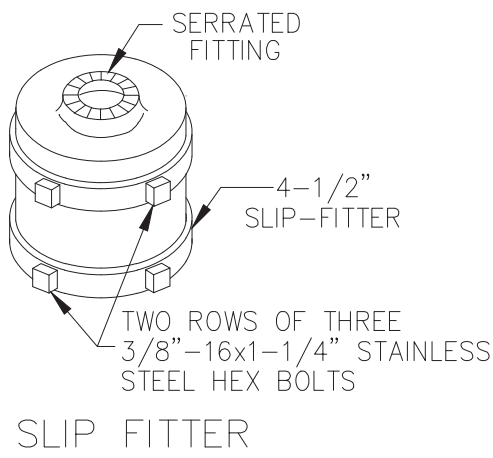
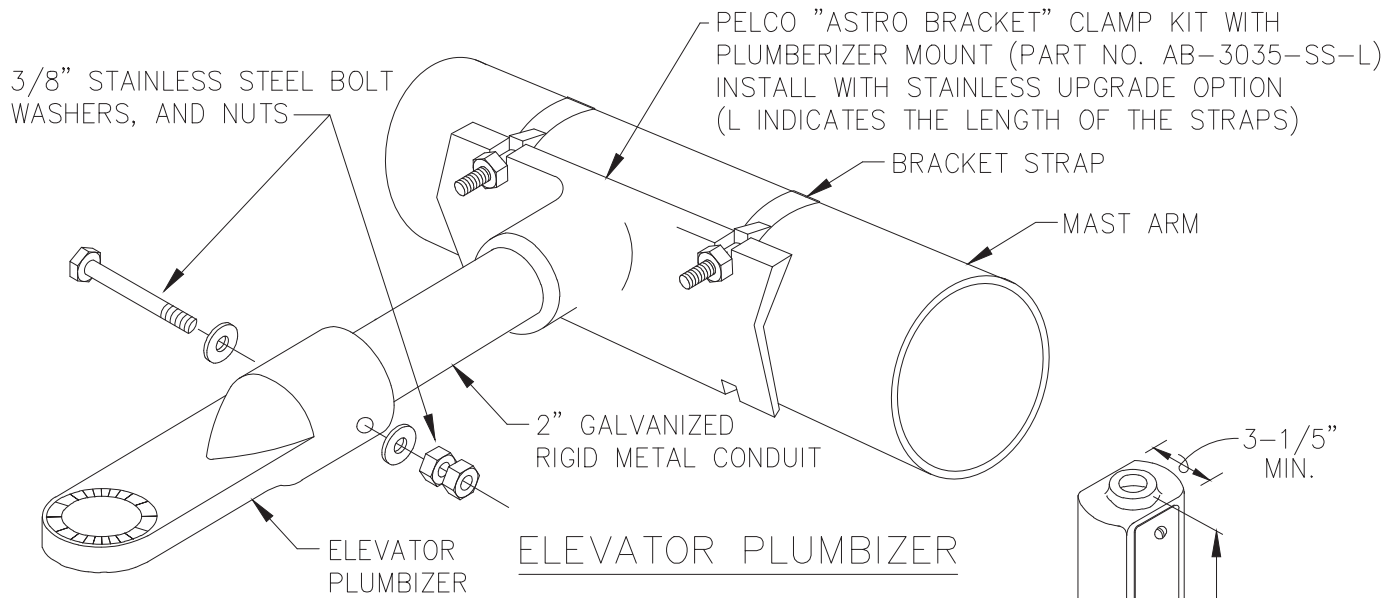
APPROVED:

REVISED:  
2/24

**R10-101 PEDESTRIAN SIGN MOUNTING DETAILS**

SECTION #  
80.21

DETAIL #  
80-28B



POST TOP MOUNTED SIGNAL DETAILS  
(SHOWN WITHOUT BACKPLATES)

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SCALE:  
N.T.S.

APPROVED:

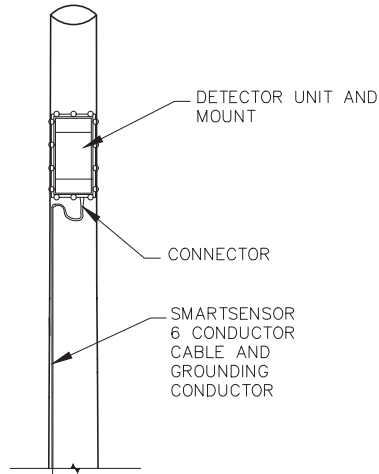
REVISED:  
2/24

**POST TOP AND MAST ARM  
MOUNTED SIGNAL DETAILS**

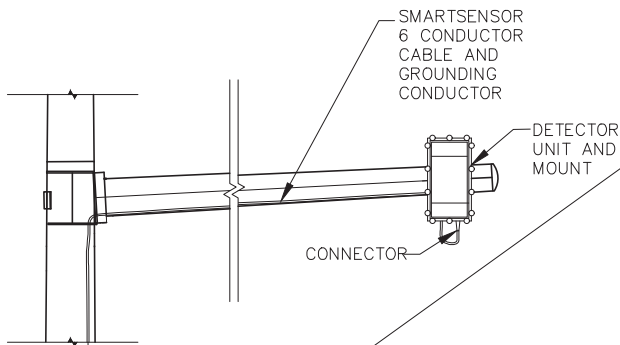
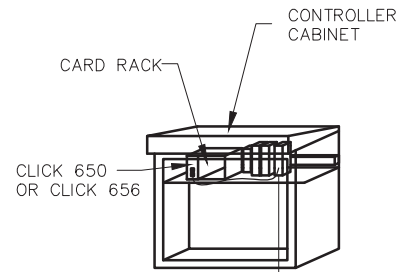
SECTION #  
80.19

DETAIL #  
80-29A

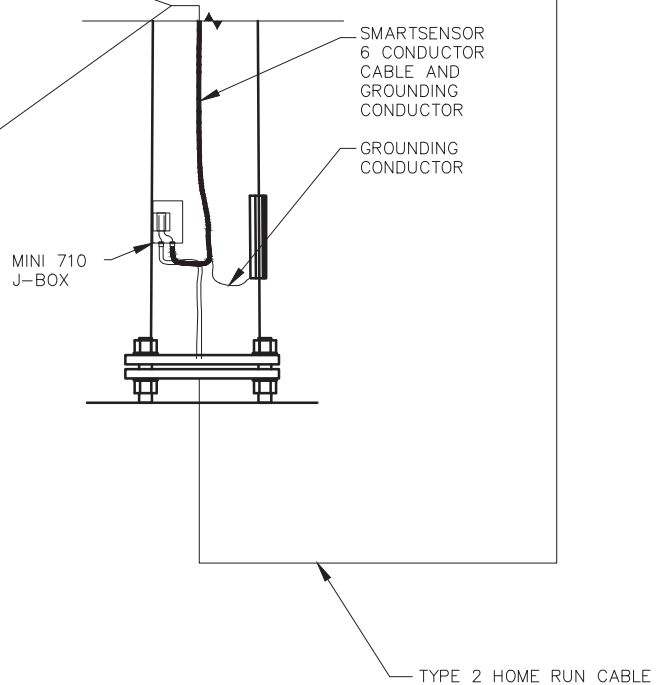
NOTES:  
 NOTES AND EQUIPMENT LISTS  
 ARE PROVIDED ON  
 STANDARD DETAIL 80-29C.



SIDE POLE  
 MOUNTING STYLE 1



MASTARM  
 MOUNTING STYLE 2



REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
 N.T.S.

APPROVED:

REVISED:  
 2/24

# RADAR DETECTION DETAILS

SECTION #  
 80.19

DETAIL #  
 80-29B




NOTES:

1. PROTECT CABLE ENDS FROM MOISTURE AT ALL TIMES.
2. PULL CABLE IN ACCORDANCE WITH MASS DIVISION 80. PULL CABLE SO THAT THERE IS SUFFICIENT LENGTH TO REACH THE TOP OF THE CONTROLLER CABINET. WHEN CABLE HAS BEEN PULLED TO FINAL LOCATIONS INSTALL AND MAKE FINAL CONNECTIONS.
3. CABLE RUNS ARE TO BE MADE CONTINUOUS WITHOUT SPLICES.
4. CABLE WITH DAMAGED INSULATION, OR THAT HAS BEEN CRIMPED OR BENT BEYOND THE MINIMUM BEND RADIUS MUST BE REPLACED AT CONTRACTORS EXPENSE.
5. THE MINIMUM BEND RADIUS SHALL NOT EXCEED MANUFACTURERS RECOMMENDATIONS.
6. ENSURE ADEQUATE LENGTH OF EACH CABLE TO ALLOW WORK ON THE ENDS OF THE CABLE IN THE CONTROLLER CABINET, AT THE POLE MOUNT ENCLOSURE AND RADAR MOUNTING LOCATION.
7. MOUNT THE RADAR AT THE LOCATION STATED IN THE PLANS. PLACEMENT MAY BE ADJUSTED BY THE ENGINEER TO ALLOW FOR BETTER AIMING OF THE RADAR OR TO AVOID OTHER HAZARDS.
8. INSTALL WATERTIGHT THREADED RIGID COMPRESSION CONNECTOR WHERE CABLE PASSES THROUGH THE POLE.
9. FURNISH ONLY NEW EQUIPMENT OF THE BRAND AND TYPE LISTED OR ITS APPROVED EQUAL. PROVIDE AT NO ADDITIONAL COST ALL NECESSARY DEVICES, WIRES, BRACKETS/HARDWARE ETC. TO PROVIDE A FULLY FUNCTIONING RADAR DETECTION SYSTEM.
10. INSTALL #10 AWG GROUNDING CONDUCTOR WITH GREEN COLORED INSULATION BETWEEN THE EXTERNAL GROUNDING LUG ON THE SMARTSENSOR UNIT AND THE HAND HOLE AT THE POLE BASE. CONNECT THE GROUNDING CONDUCTOR TO A POLE GROUNDING CONDUCTOR USING AN IRREVERSIBLE COMPRESSION CONNECTOR. IDENTIFY THE CONDUCTOR WITH TAG AS "RADAR GND".

MATRIX RADAR DETECTION EQUIPMENT
ITEMS TO BE PROVIDED FOR INSTALLATION
SENSOR MOUNT – 6" 3 AXIS ALUM. BRACKET. (SS-611)
MINI 710- SENSOR CABLE J-BOX WITH TERMINAL BLOCKS (102-0453)
MATRIX TYPE 2 HOME RUN CABLE (MTX2 HMRN)
SMARTSENSOR 6 CONDUCTOR CABLE (SS-704-040) WITH SINGLE END CONNECTOR (SS-709) FACTORY INSTALLED
SMARTSENSOR MATRIX (SS-225)
KNUCKLE BRACKET (360-0129), WHEN IDENTIFIED IN PLANS

ADVANCE RADAR DETECTION EQUIPMENT
ITEMS TO BE PROVIDED FOR INSTALLATION
SENSOR MOUNT – 6" 3 AXIS ALUM. BRACKET. (SS-611)
MINI 710- SENSOR CABLE J-BOX WITH TERMINAL BLOCKS (102-0453)
MATRIX TYPE 2 HOME RUN CABLE (MTX2 HMRN)
SMARTSENSOR 6 CONDUCTOR CABLE (SS-704-XXX) WITH SINGLE END CONNECTOR (SS-709) FACTORY INSTALLED
SMARTSENSOR ADVANCE EXTENDED RANGE (SS-200E)
SMARTSENSOR ADVANCE VIEW FINDER (360-0283)
KNUCKLE BRACKET (360-0129), WHEN IDENTIFIED IN PLANS

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h2 style="margin: 0;">RADAR DETECTION NOTES AND EQUIPMENT LISTS</h2>	SECTION # 80.19  DETAIL # 80-29C
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SEE MASS DETAIL 80-29E  
FOR NOTES AND  
ADDITIONAL DETAILS

CAMERA LOCATION

SEE CAMERA/HOUSING  
DETAIL

SEE NOTE 9

VARIABLES (SEE PLANS)

VARIABLES (SEE PLANS)  
UPPER SECTION

20'  
SIMPLEX HEIGHT

SIGNAL  
POLE

POLE MOUNT  
BRACKET

CABLE 1, ROUTE THROUGH POLE  
MOUNT BRACKET AND WALL  
MOUNT ADAPTER.

ADAPTER  
HARDWARE

WALL &  
POLE MOUNT

WALL MOUNT  
ADAPTER

AXIS CABLE

AXIS CONNECTOR

INTERNAL THERMOST  
CONTROLLED HEATER  
AND FAN

PAN, TILT, ZOOM (PTZ)  
CAMERA

CAMERA/HOUSING  
DETAIL  
NTS

CONTROLLER  
CABINET

SWITCH/ROUTER

CABLE 1

CONNECTOR

CONDUIT FROM CABINET

SYSTEM LAYOUT  
NTS

REVISION: 2024 M.A.S.S. UPDATE

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REVISED:  
2/24

# PAN, TILT, ZOOM, CAMERA MOUNTING DETAILS

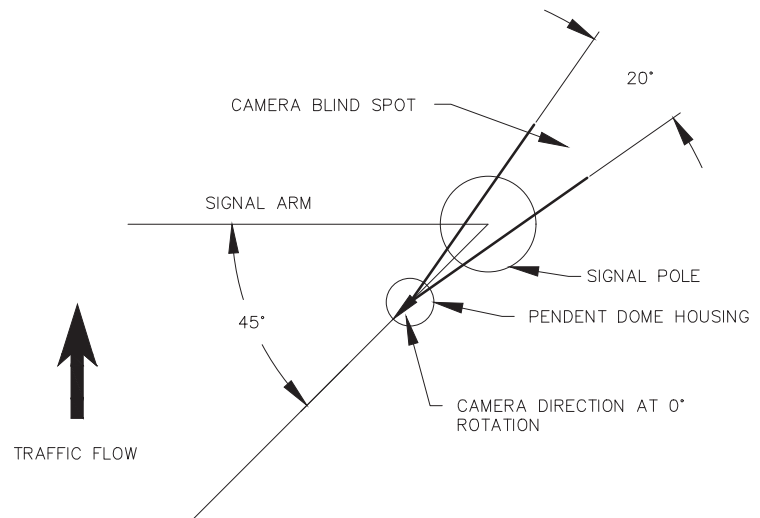
SECTION #  
80.19

DETAIL #  
80-29D

MATERIAL REQUIREMENTS	
ALL ASSEMBLIES	
MOUNTING BRACKET	ASTRO-BRAC AB-0160-45-SS-PNC
WALL ADAPTOR	STEEL FABRICATORS OR APPROVED EQUAL
WALL MOUNT	AXIS T91L61 OR APPROVED EQUAL
CABLE 1 (SIGNAL)	CAT-5E, SHIELDED, DIRECT BURIAL
CONNECTOR	ENVIRONMENTALLY HARDENED RJ-45
STRAIN RELIEF	REMKE 2201-013 OR APPROVED EQUAL
	CAMERA
CAMERA	SEE SPECIFICATIONS

NOTES:

1. PROTECT CABLE ENDS FROM MOISTURE AT ALL TIMES.
2. PULL CABLE IN ACCORDANCE WITH MASS DIVISION 80. PULL CABLE SO THAT THERE IS SUFFICIENT LENGTH TO REACH THE TOP OF THE CONTROLLER CABINET. CABLES ARE TO BE PULLED WITHOUT CONNECTORS ATTACHED. WHEN CABLE HAS BEEN PULLED TO FINAL LOCATIONS INSTALL AND MAKE FINAL CONNECTIONS.
3. CABLE RUNS ARE TO BE MADE CONTINUOUS WITHOUT SPLICES.
4. CABLE WITH DAMAGED INSULATION, OR THAT HAS BEEN CRIMPED OR BENT BEYOND THE MINIMUM BEND RADIUS MUST BE REPLACED AT NO ADDITIONAL COST.
5. THE MINIMUM BEND RADIUS SHALL NOT EXCEED THE MANUFACTURERS RECOMMENDATIONS.
6. ENSURE ADEQUATE LENGTH OF EACH CABLE TO ALLOW WORK ON THE ENDS OF THE CABLE IN THE CONTROLLER CABINET AND THE CAMERA MOUNTING LOCATION.
7. MOUNT THE PENDENT DOME HOUSING AT A 45° ANGLE AT THE REQUIRED HEIGHT. ANGLE AND HEIGHT MAY BE ADJUSTED BY THE ENGINEER TO AVOID WELDS, APPENDICES AND TO APPROVE SIGHT DISTANCE.
8. ADJUST CAMERA INSIDE THE PENDENT DOME HOUSING AS SHOWN. ENSURE THAT THE CAMERA IS MOUNTED AT A 0° TILT ANGLE.
9. CAMERA/HOUSING MOUNTING HEIGHT TO BE DETERMINED IN THE FIELD BY THE ENGINEER.



CAMERA/PENDENT DOME ORIENTATION  
NTS

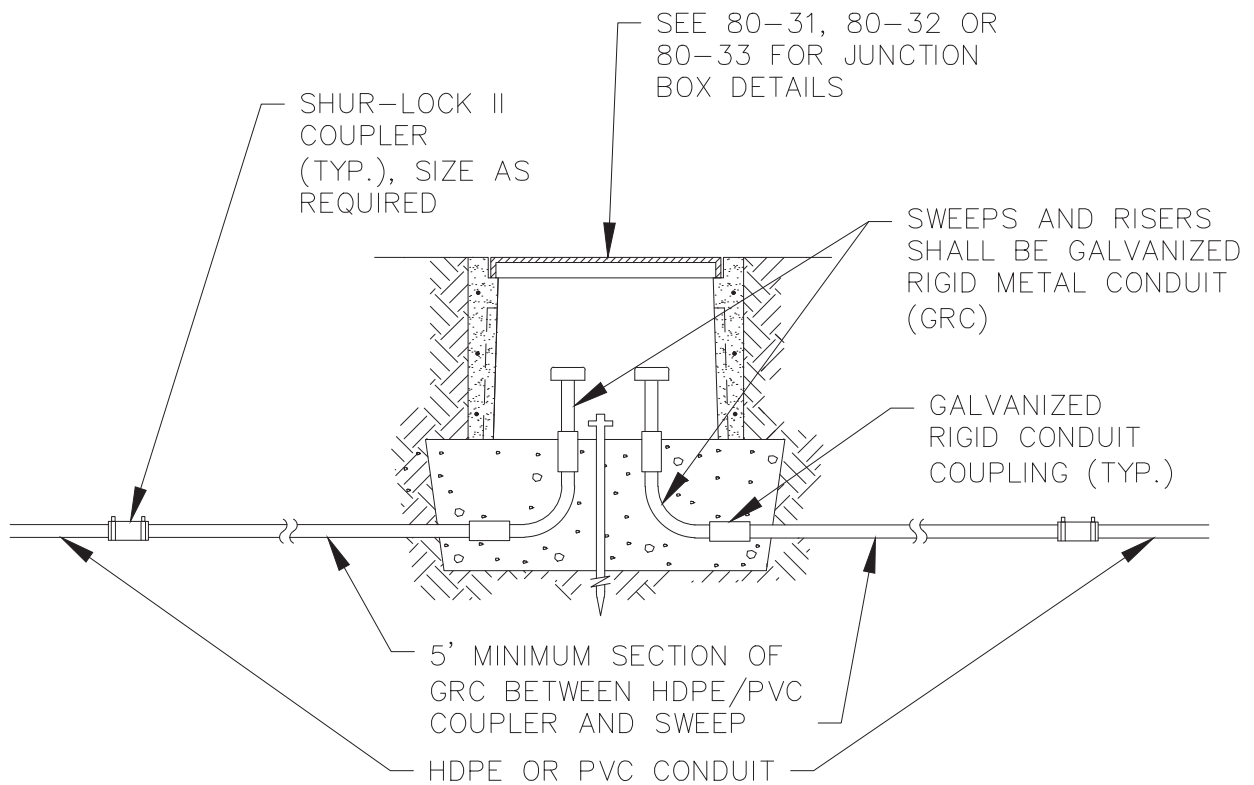
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 REVISED:  
2/24

**PAN, TILT, ZOOM, CAMERA  
 NOTES AND MATERIAL  
 REQUIREMENTS**

SECTION #  
80.19  
 DETAIL #  
80-29E



SIZE CONDUIT AS SHOWN ON DRAWINGS

REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

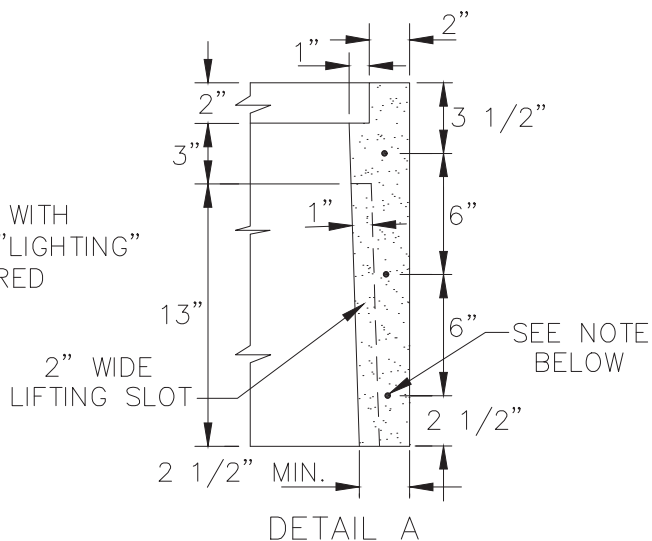
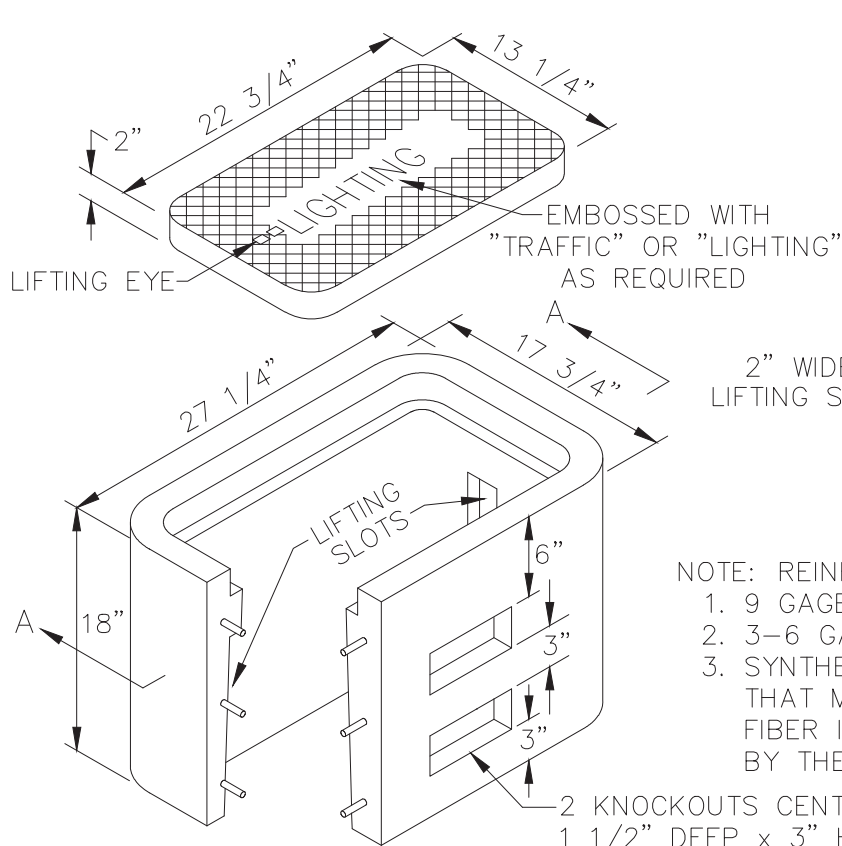
APPROVED:

REVISED:  
2/24

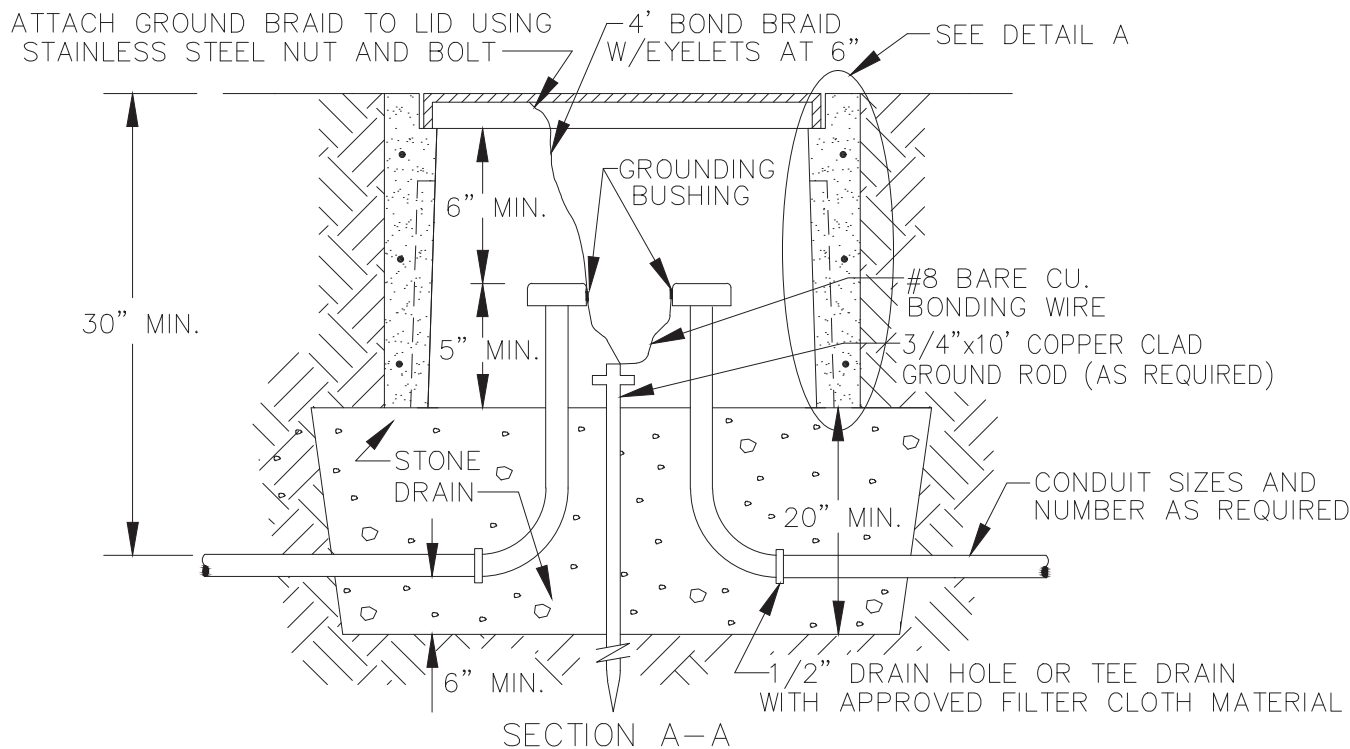
# HDPE/PVC TRANSITION DETAIL

SECTION #  
80.07

DETAIL #  
80-30



- NOTE: REINFORCEMENT MAY CONSIST OF;
1. 9 GAGE WELDED WIRE FRAME.
  2. 3-6 GAGE HORIZONTAL WIRE LOOPS.
  3. SYNTHETIC FIBER REINFORCED CONCRETE THAT MEETS ASTM C 1116 AND CONTAINS FIBER IN PROPORTIONS AS RECOMMENDED BY THE FIBER MANUFACTURER.



REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY

OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

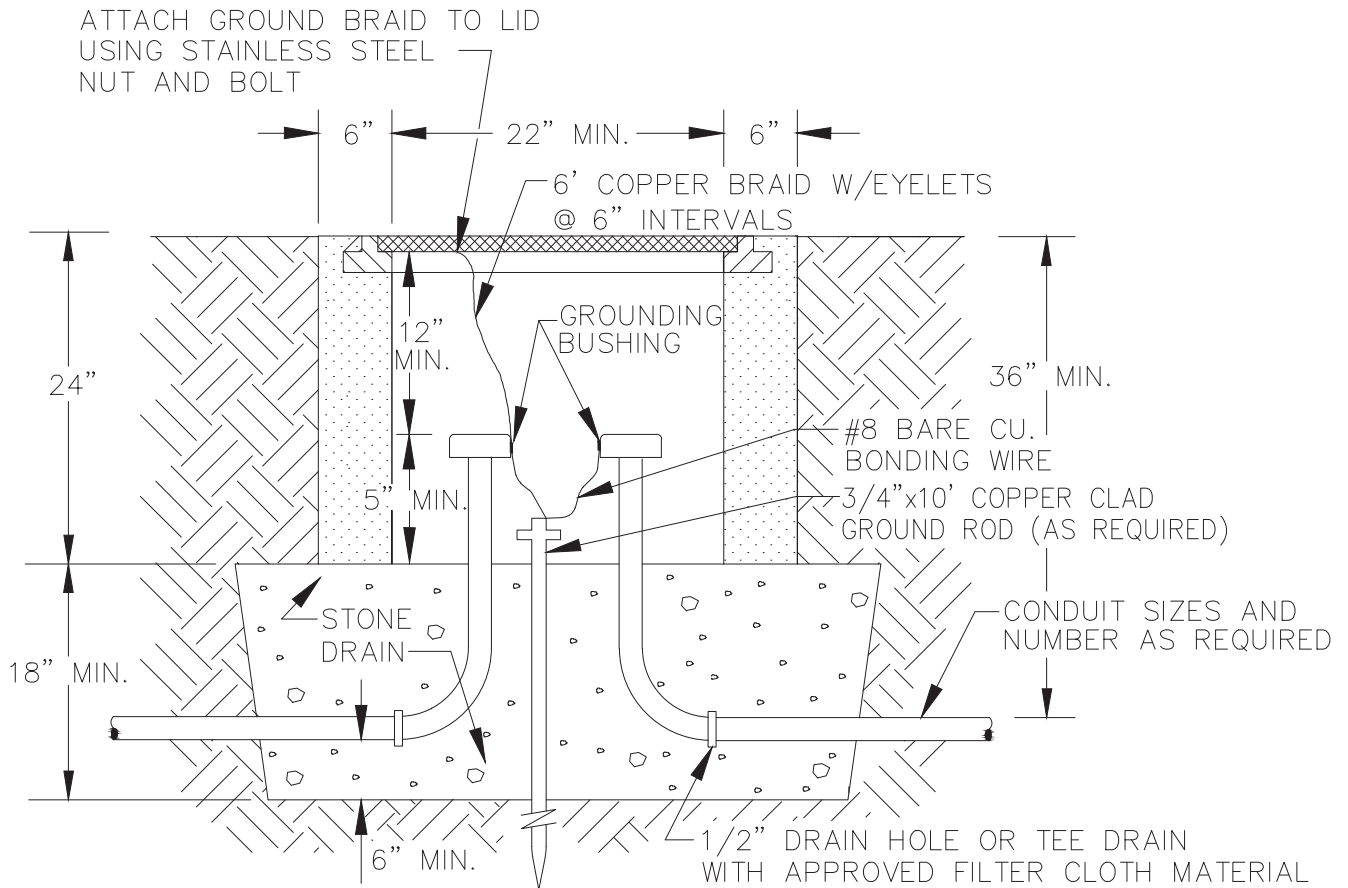
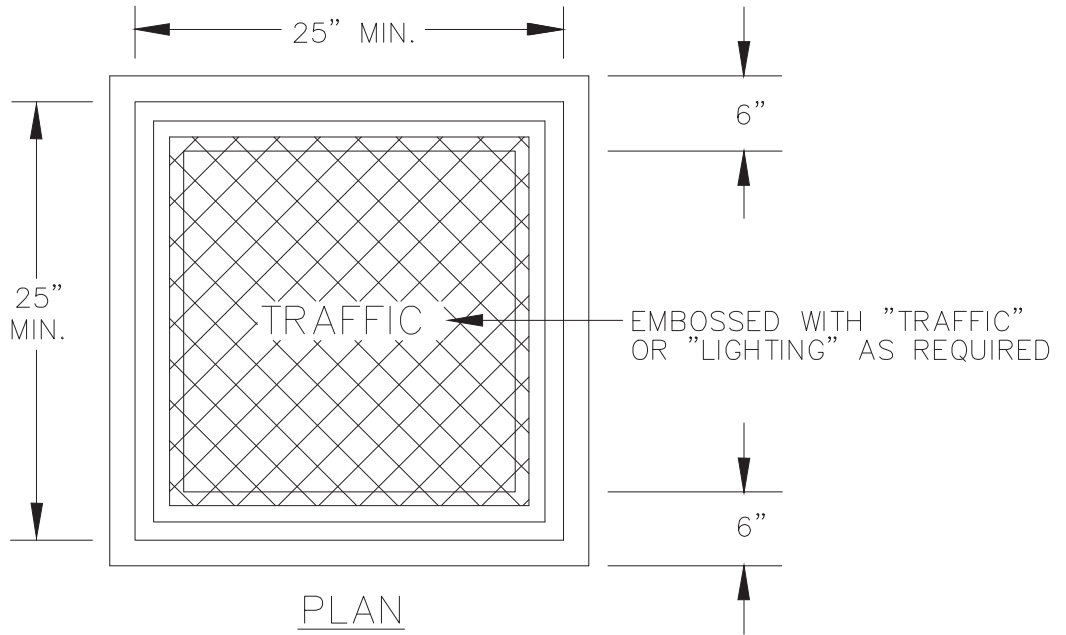
REVISED:  
2/24

# TYPE 1A JUNCTION BOX

SECTION #  
80.08

DETAIL #  
80-31

NOTE: WHEN A MODIFIED TYPE II JUNCTION BOX IS INDICATED IN THE DRAWINGS ADD ONE ADDITIONAL 5" DEEP x 3" HIGH x 18" WIDE KNOCKOUT 12" BELOW TOP OF JUNCTION BOX



SECTION

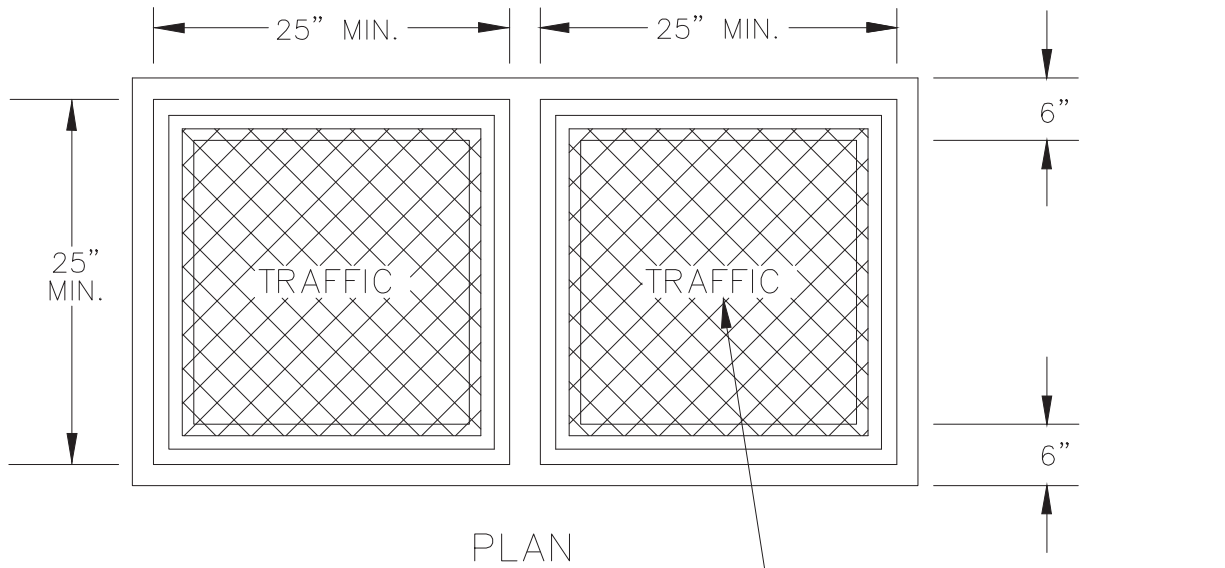
REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
N.T.S.  
 APPROVED:  
 REVISED:  
2/24

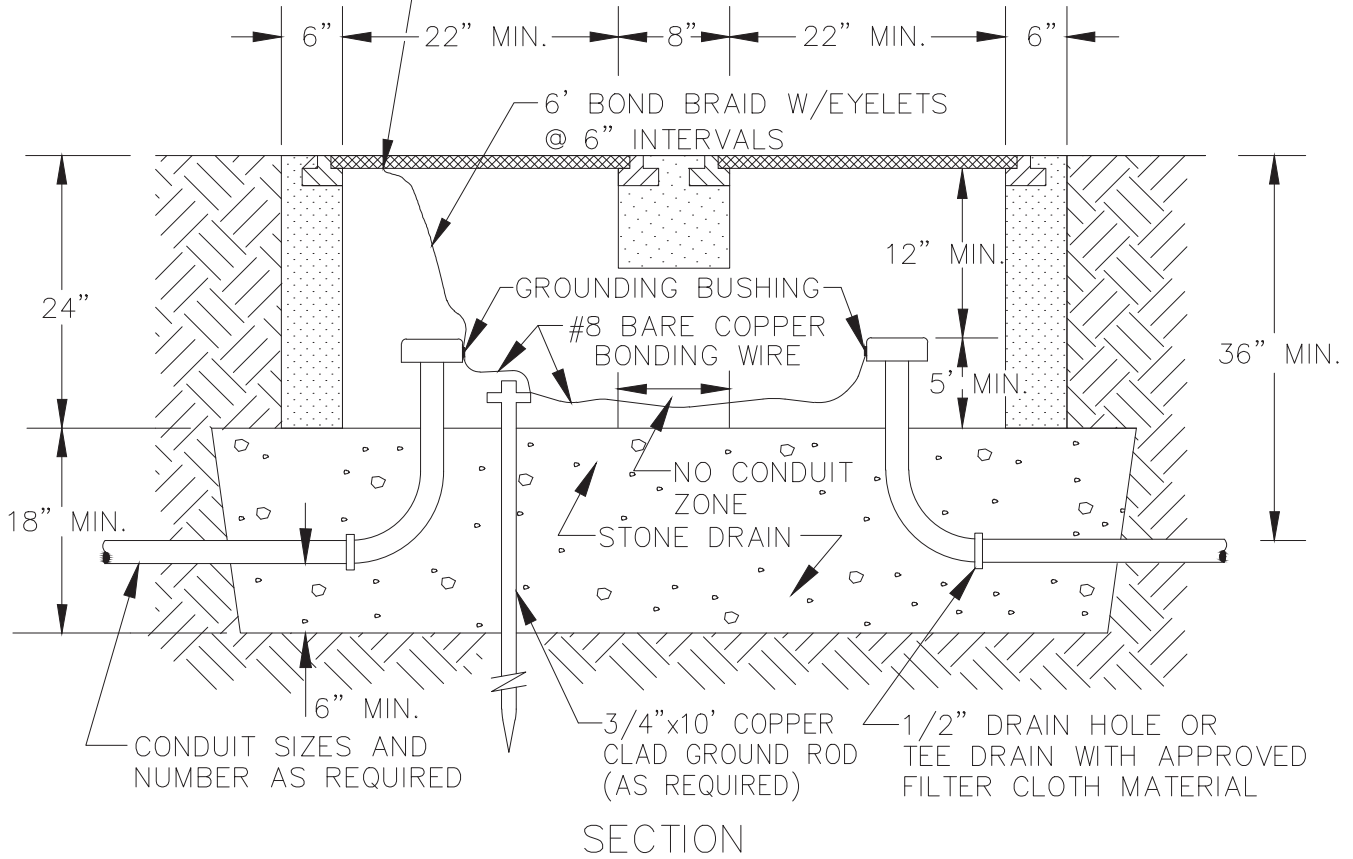
# TYPE II JUNCTION BOX

SECTION #  
80.08  
 DETAIL #  
80-32



EMBOSS WITH "TRAFFIC" OR "LIGHTING" AS REQUIRED

ATTACH GROUND BRAID TO LID USING STAINLESS STEEL NUT AND BOLT



REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

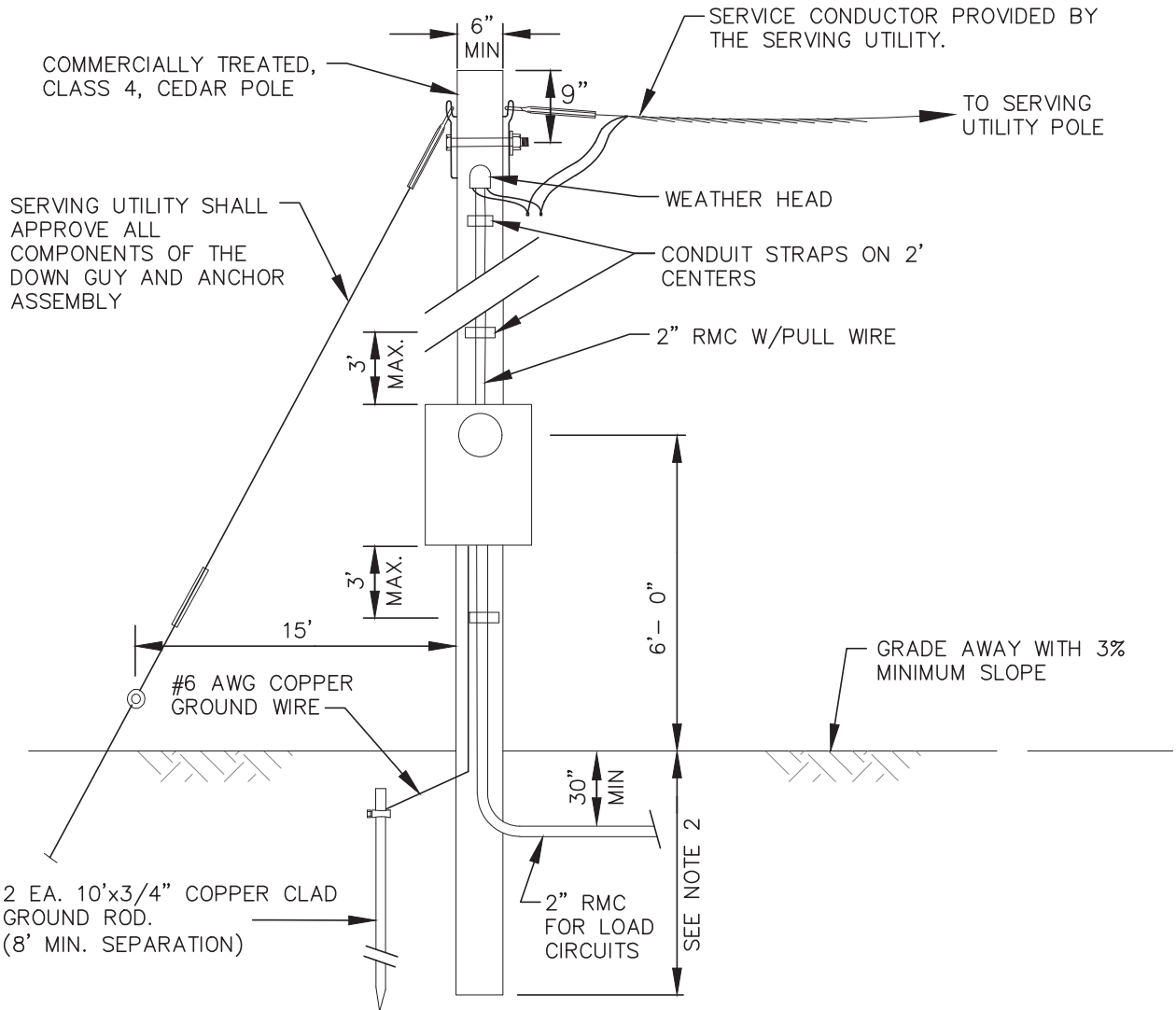
APPROVED:

REVISED:  
2/24

# TYPE III JUNCTION BOX

SECTION #  
80.08

DETAIL #  
80-33



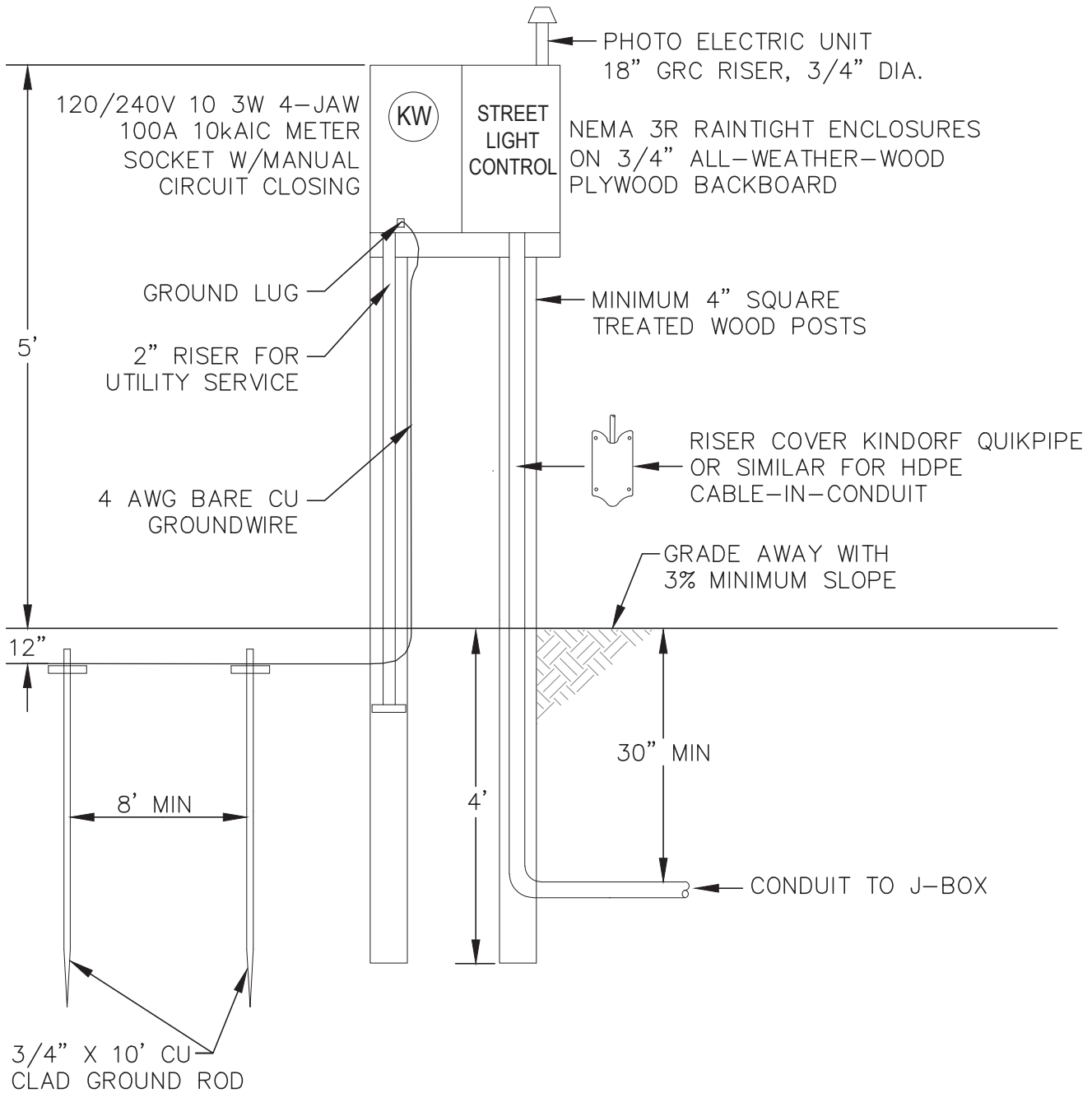
NOTES:

1. COORDINATE WITH SERVING UTILITY REGARDING SPECIFIC CONSTRUCTION REQUIREMENTS FOR SERVICE.
2. SET THE BUTT END OF TYPE 3 LOAD CENTER POLES TO THE FOLLOWING MINIMUM DEPTH:
  - A. 10 PERCENT OF ITS LENGTH PLUS 2 FEET, OR 5 FEET, WHICHEVER IS GREATER, IF IT IS INSTALLED IN EARTH OTHER THAN SOLID ROCK OR MUSKEG.
  - B. 10 PERCENT OF ITS LENGTH, OR 4 FEET, WHICHEVER IS GREATER, IF IT IS INSTALLED IN SOLID ROCK.
  - C. CONSIDER MUSKEG TO BE AIR, AND SET THE BUTT ENDS TO THE DEPTH GIVEN IN A OR B, WHICHEVER APPLIES, IN THE UNDERLYING EARTH OR ROCK.
3. WHENEVER MORE THAN TWO FEET OF EARTH OVERLAYS ROCK, OR THE DIAMETER OF THE DRILLED HOLE IN ROCK EXCEEDS TWICE THE DIAMETER OF THE POLE AT THE GROUND LINE, CONSIDER THE INSTALLATION AS EARTH.

REVISION: 2024 M.A.S.S. UPDATE

<p>MUNICIPALITY</p>  <p>OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>POST MOUNTED LOAD CENTER - TYPE 3</b></p>	<p>SECTION # 80.14</p> <p>DETAIL # 80-34</p>
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NOTES:

1. ATTACH GROUND WIRE TO POLE AT 12" INTERVALS.
2. LOCATE OUT OF DITCH LINE, 5 FT. MINIMUM FROM BACK OF CURB.
3. COORDINATE WITH SERVING UTILITY REGARDING SPECIFIC CONSTRUCTION REQUIREMENTS FOR SERVICE.
4. MARK CONTROL PANEL TO WARN QUALIFIED PERSONS OF POTENTIAL ELECTRIC ARC FLASH HAZARDS DURING EXAMINATION, ADJUSTMENT, SERVICING AND/OR MAINTENANCE OF EQUIPMENT. MARKING MUST BE CLEARLY VISIBLE.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY

OF ANCHORAGE

SCALE:  
N.T.S.

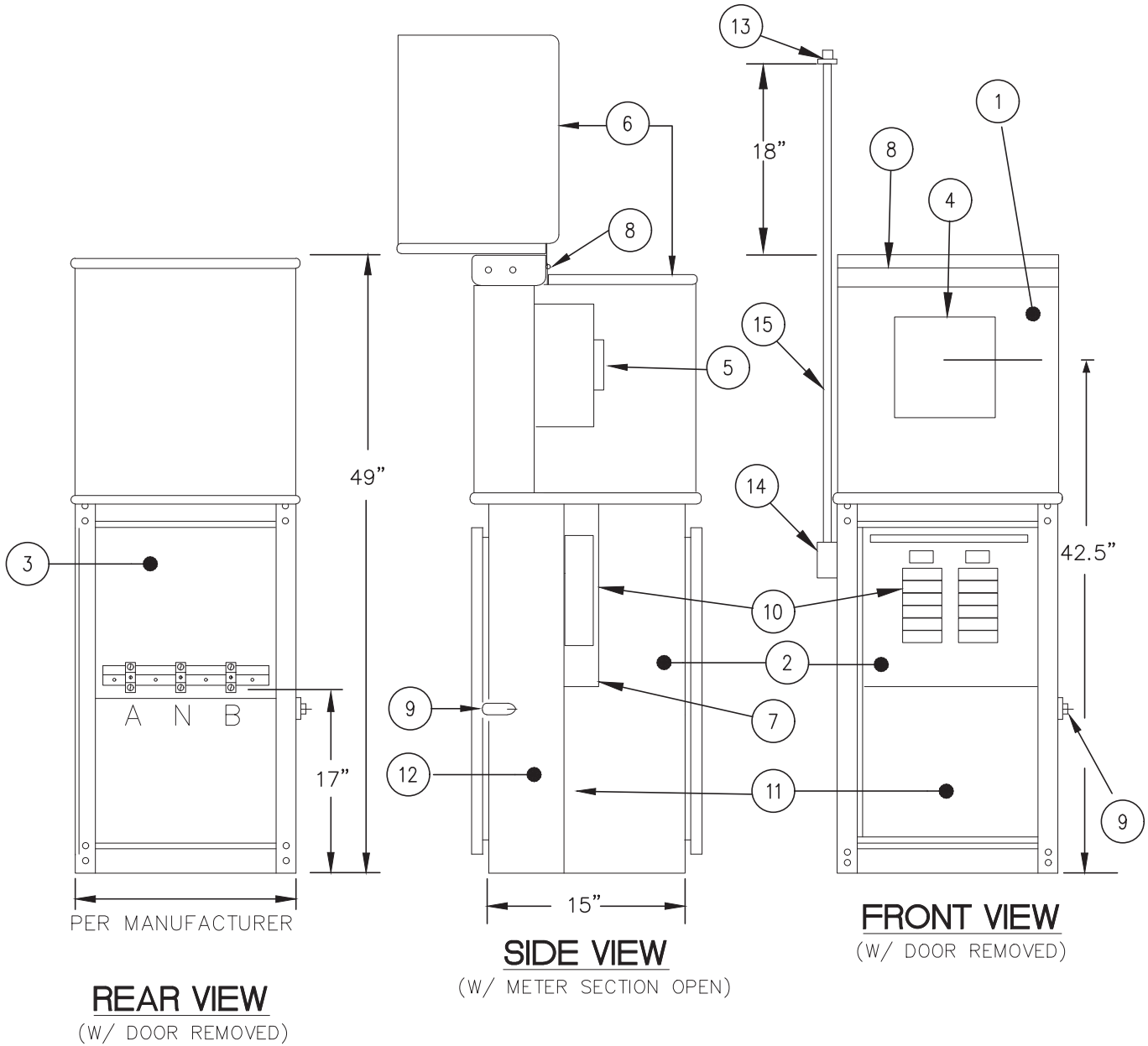
APPROVED:

REVISED:  
2/24

# POST MOUNTED LOAD CENTER - TYPE 2

SECTION #  
80.14

DETAIL #  
80-35



EQUIPMENT LEGEND/DESCRIPTION

- |  |  |  |
|--|--|--|
| 1. METERING SECTION                          | 7. DEADFRONT                           | 13. PHOTOCELL                              |
| 2. LOAD SECTION                              | 8. STAINLESS STEEL PIN HINGE           | 14. WEATHERTIGHT LB                        |
| 3. UTILITY CONNECTION AND TEST BLOCK SECTION | 9. PADLOCKING PROVISIONS               | 15. 3/4" GRC CONDUIT, STRAP ON 24" CENTERS |
| 4. METER READING WINDOW (8"x8")              | 10. DISTRIBUTION PANEL W/ MAIN BREAKER |  |
| 5. METER SOCKET W/BYPASS & SAFETY SOCKET     | 11. ACCESSORY MOUNTING EQUIPMENT AREA  |  |
| 6. LIFT AWAY METER SECTION COVER             | 12. SERVICE PULL SECTION               |  |

REVISION: 2024 M.A.S.S. UPDATE

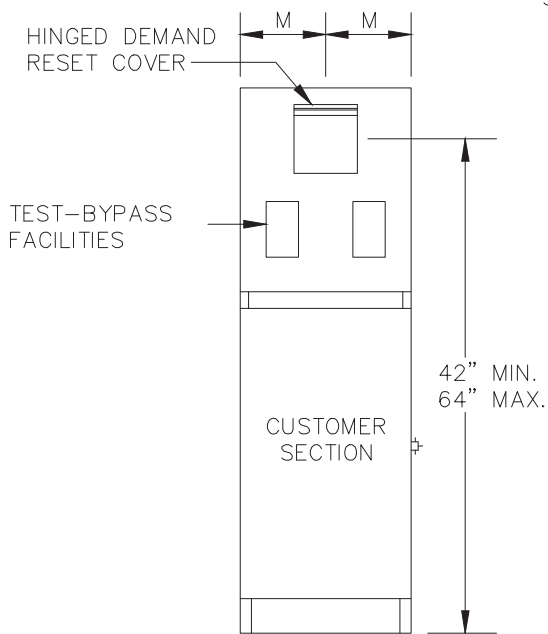
MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
N.T.S.  
 APPROVED:  
 REVISED:  
2/24

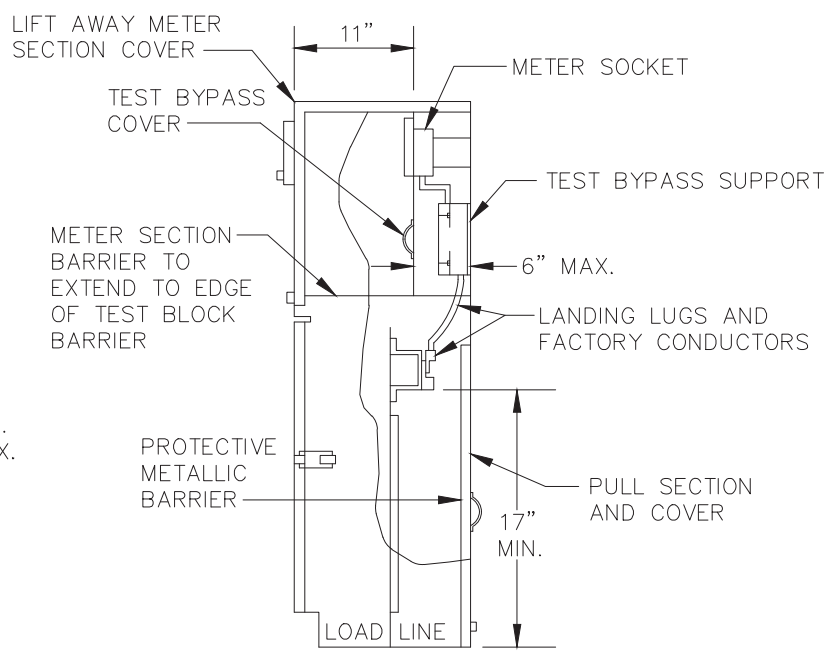
# LOAD CENTER ENCLOSURE TYPE 1A

SECTION #  
80.14  
 DETAIL #  
80-36

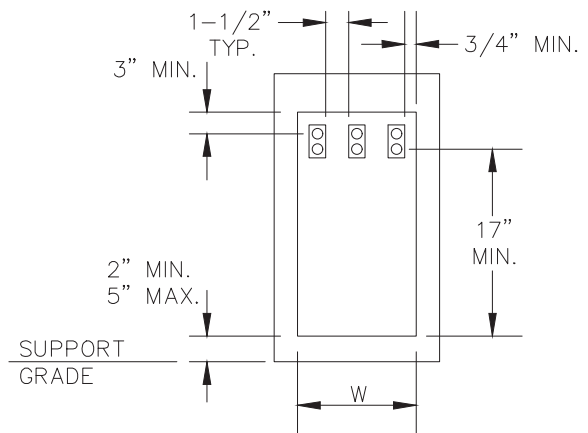
REVISION: 2024 M.A.S.S. UPDATE



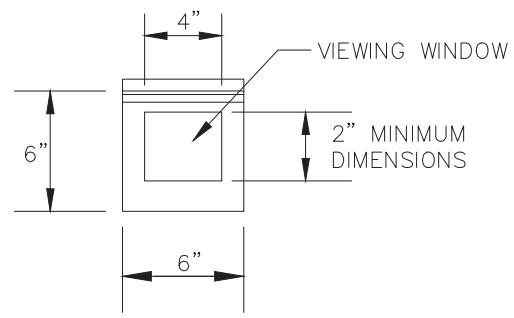
**FRONT VIEW**



**SIDE VIEW**



**WIREWAY PULL SECTION**



**HINGED DEMAND RESET WITH POLYCARBONATE VIEWING**

MINIMUM DIMENSIONS

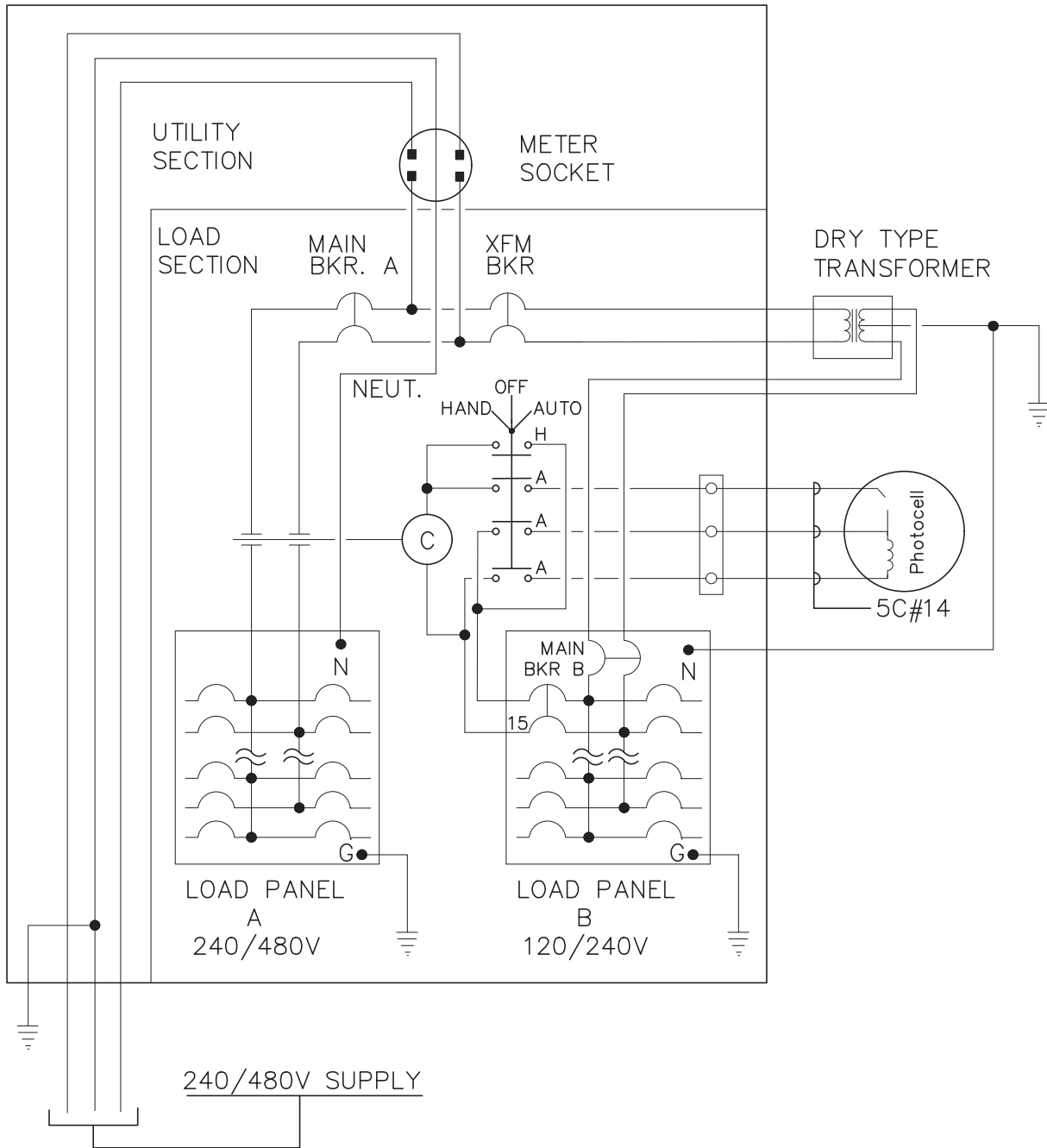
SERVICE	W	A
1 PHASE	10-1/2"	10"
3 PHASE	12-1/2"	



SCALE:  
N.T.S.  
APPROVED:  
REVISD:  
2/24

**LOAD CENTER ENCLOSURE  
TYPE 1**

SECTION #  
80.14  
DETAIL #  
80-37



NOTE:

1. SEE PANEL SCHEDULE, STANDARD DETAIL 80-39

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

# LOAD CENTER WIRING DIAGRAM "A"

SECTION #  
80.14

DETAIL #  
80-38

LOAD CENTER NO. \_\_\_\_\_ TYPE \_\_\_\_\_

LOCATION \_\_\_\_\_

240/480 VOLTS, SINGLE PHASE, \_\_\_\_\_ AMP SUPPLY

\_\_\_\_\_ AMPS INTERRUPTING CURRENT

MAIN BREAKER A : 2 POLE, \_\_\_\_\_ AMPS, 480 VOLTS

MAIN BREAKER B : 2 POLE, \_\_\_\_\_ AMPS, 240 VOLTS

CONTACTOR RATING: \_\_\_\_\_ AMPS

TRANSFORMER RATING: 120/240-240/480., \_\_\_\_\_ KVA

PANEL A \_\_\_\_\_ 240/480 VOLTS \_\_\_\_\_ SINGLE PHASE 3 WIRE  
 \_\_\_\_\_ AMPS MAIN LUGS, \_\_\_\_\_ AMPS INTERRUPT CAPACITY

CKT. DESCRIPTION	KVA	AMP			AMP	KVA	CKT. DESCRIPTION
			1	2			
			3	4			
			5	6			
			7	8			
			9	10			
			11	12			
			13	14			
			15	16			
			17	18			
			19	20			

PANEL B \_\_\_\_\_ 120/240 VOLTS \_\_\_\_\_ SINGLE PHASE 3 WIRE  
 \_\_\_\_\_ AMPS MAIN LUGS, \_\_\_\_\_ AMPS INTERRUPT CAPACITY

CKT. DESCRIPTION	KVA	AMP			AMP	KVA	CKT. DESCRIPTION
PHOTO CELL ↓	0.115 ↓	15 ↓	1	2			
			3	4			
			5	6			
			7	8			
			9	10			
			11	12			
			13	14			
			15	16			
			17	18			
			19	20			

NOTE: SEE CONSTRUCTION DRAWINGS FOR NUMBER & SIZE OF BREAKERS.

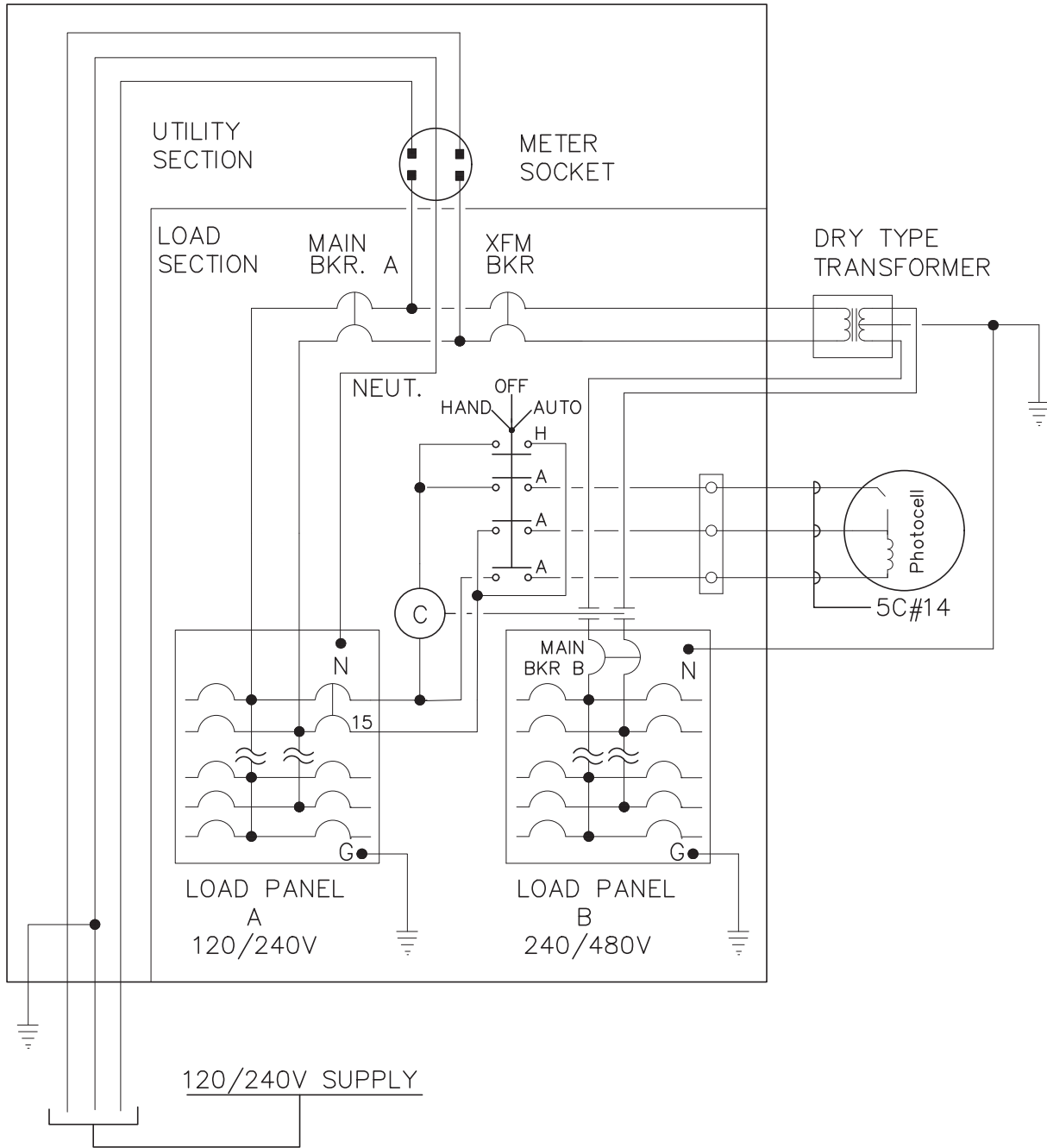
REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.  
APPROVED:  
REVISD:  
2/24

## PANEL SCHEDULE FOR WIRING DIAGRAM "A"

SECTION #  
80.14  
DETAIL #  
80-39



NOTE:

1. SEE PANEL SCHEDULE, STANDARD DETAIL 80-41

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

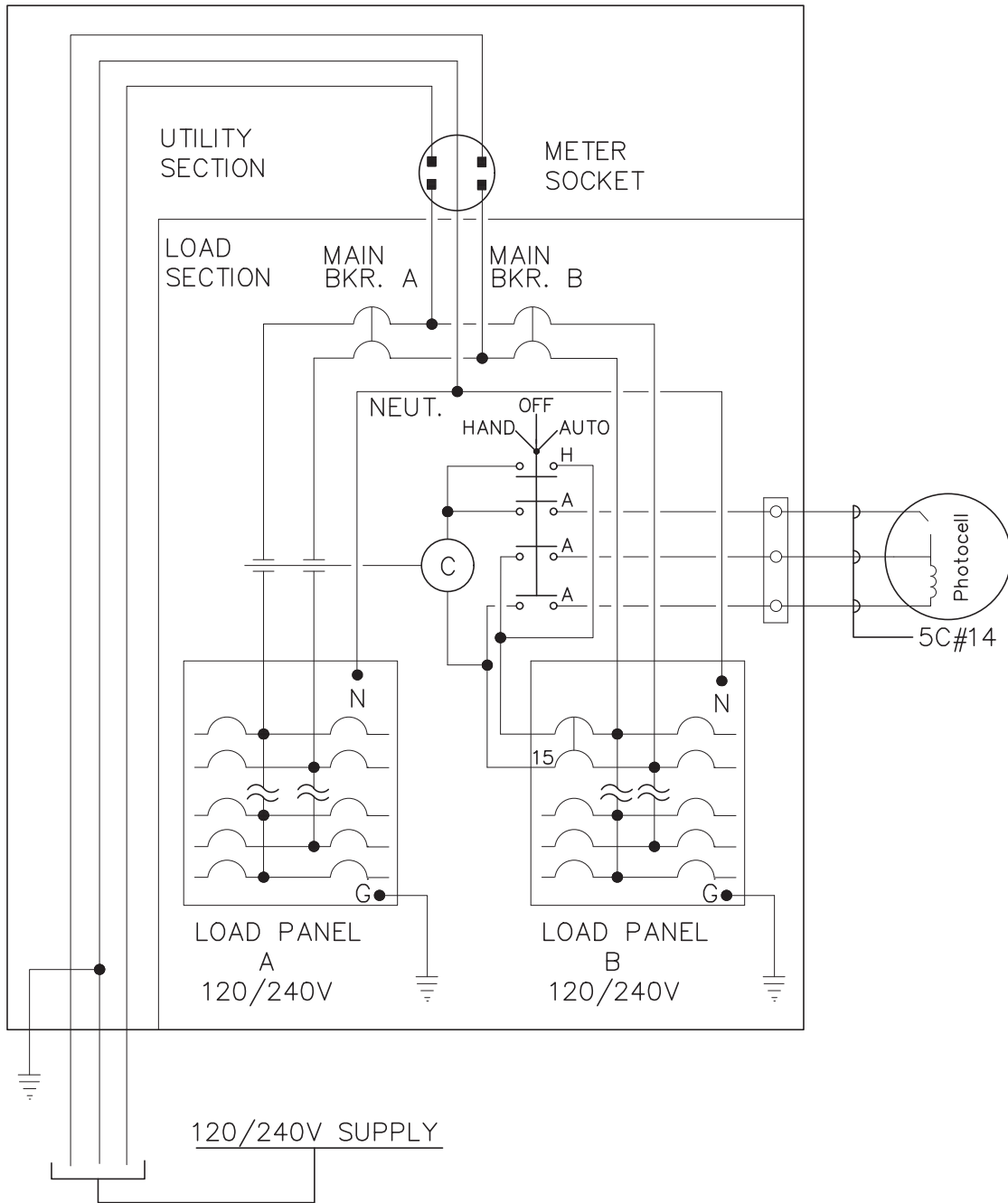
REVISED:  
2/24

# LOAD CENTER WIRING DIAGRAM "B"

SECTION #  
80.14

DETAIL #  
80-40





NOTE:

1. SEE PANEL SCHEDULE, STANDARD DETAIL 80-43

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

# LOAD CENTER WIRING DIAGRAM "C"

SECTION #  
80.14

DETAIL #  
80-42



LOAD CENTER NO. \_\_\_\_\_ TYPE \_\_\_\_\_

LOCATION \_\_\_\_\_

120/240 VOLTS, SINGLE PHASE, \_\_\_\_\_ AMP SUPPLY  
 \_\_\_\_\_ AMPS INTERRUPTING CURRENT

MAIN BREAKER A : 2 POLE, \_\_\_\_\_ AMPS, 240 VOLTS

MAIN BREAKER B : 2 POLE, \_\_\_\_\_ AMPS, 240 VOLTS

CONTACTOR RATING: \_\_\_\_\_ AMPS, 240 VOLTS

PANEL A \_\_\_\_\_ 120/240 VOLTS \_\_\_\_\_ SINGLE \_\_\_\_\_ PHASE \_\_\_\_\_ 3 \_\_\_\_\_ WIRE  
 \_\_\_\_\_ AMPS MAIN LUGS, \_\_\_\_\_ AMPS INTERRUPT CAPACITY

CKT. DESCRIPTION	KVA	AMP			AMP	KVA	CKT. DESCRIPTION
			1	2			
			3	4			
			5	6			
			7	8			
			9	10			
			11	12			
			13	14			
			15	16			
			17	18			
			19	20			

PANEL B \_\_\_\_\_ 120/240 VOLTS \_\_\_\_\_ SINGLE \_\_\_\_\_ PHASE \_\_\_\_\_ 3 \_\_\_\_\_ WIRE  
 \_\_\_\_\_ AMPS MAIN LUGS, \_\_\_\_\_ AMPS INTERRUPT CAPACITY

CKT. DESCRIPTION	KVA	AMP			AMP	KVA	CKT. DESCRIPTION
PHOTO CELL ↓	0.1	15 ↓	1	2			
			3	4			
			5	6			
			7	8			
			9	10			
			11	12			
			13	14			
			15	16			
			17	18			
			19	20			

NOTE: SEE CONSTRUCTION DRAWINGS FOR NUMBER & SIZE OF BREAKERS.

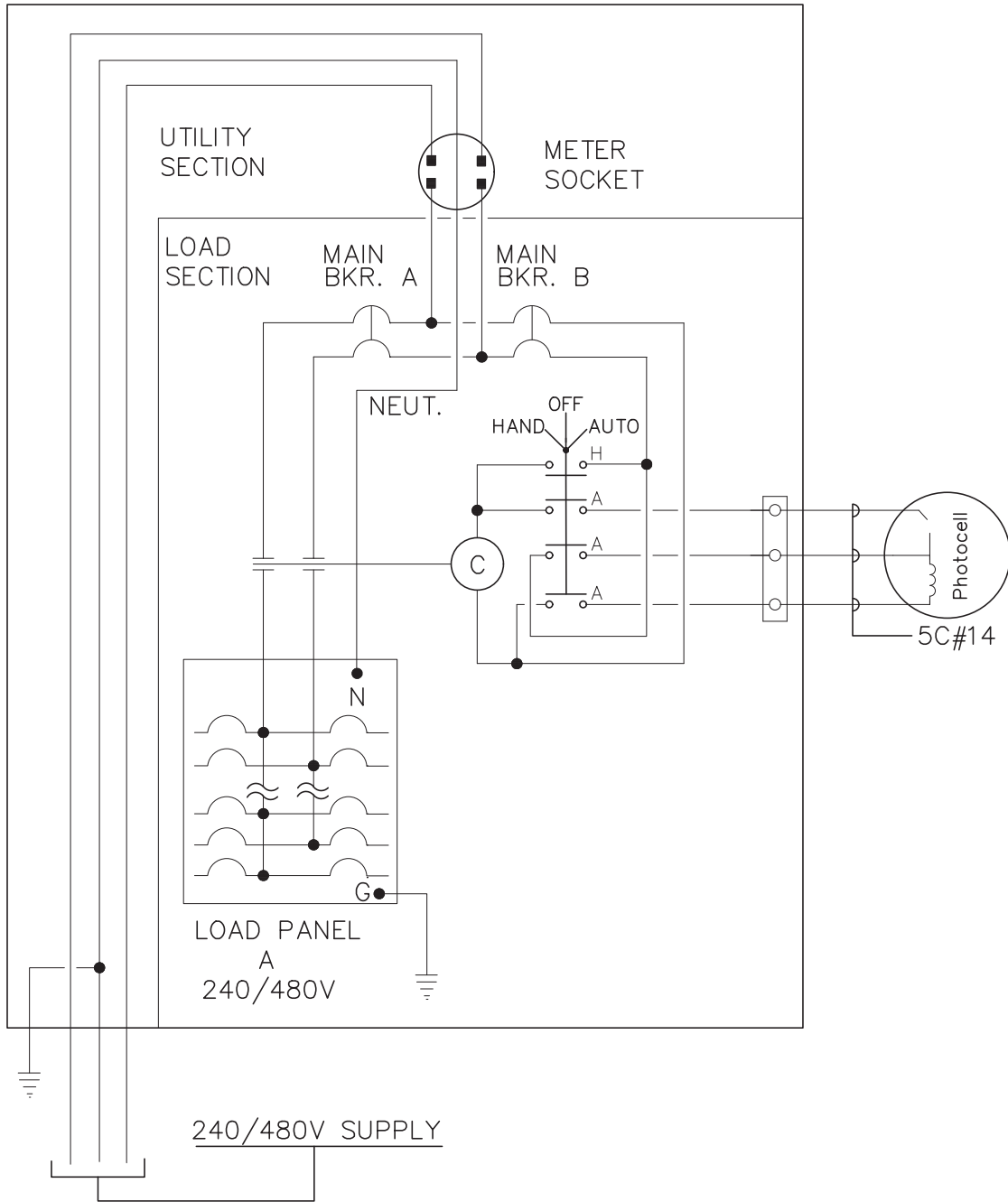
REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
N.T.S.  
 APPROVED:  
 REVISED:  
2/24

## PANEL SCHEDULE FOR WIRING DIAGRAM "C"

SECTION #  
80.14  
 DETAIL #  
80-43



NOTE:

1. SEE PANEL SCHEDULE, STANDARD DETAIL 80-45

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

# LOAD CENTER WIRING DIAGRAM "D"

SECTION #  
80.14

DETAIL #  
80-44

LOAD CENTER NO. \_\_\_\_\_ TYPE \_\_\_\_\_

LOCATION \_\_\_\_\_

240/480 VOLTS, SINGLE PHASE, \_\_\_\_\_ AMP SUPPLY

\_\_\_\_\_ AMPS INTERRUPTING CURRENT

MAIN BREAKER A : 2 POLE, \_\_\_\_\_ AMPS, 480 VOLTS

MAIN BREAKER B : 1 POLE, \_\_\_\_\_ 15 \_\_\_\_\_ AMPS, 240 VOLTS

CONTACTOR RATING: \_\_\_\_\_ AMPS, 240 VOLTS

PANEL A \_\_\_\_\_ 240/480 VOLTS \_\_\_\_\_ SINGLE \_\_\_\_\_ PHASE \_\_\_\_\_ 3 \_\_\_\_\_ WIRE  
 \_\_\_\_\_ AMPS MAIN LUGS, \_\_\_\_\_ AMPS INTERRUPT CAPACITY

CKT. DESCRIPTION	KVA	AMP			AMP	KVA	CKT. DESCRIPTION
			1	2			
			3	4			
			5	6			
			7	8			
			9	10			
			11	12			
			13	14			
			15	16			
			17	18			
			19	20			

NOTE: SEE CONSTRUCTION DRAWINGS FOR NUMBER & SIZE OF BREAKERS.

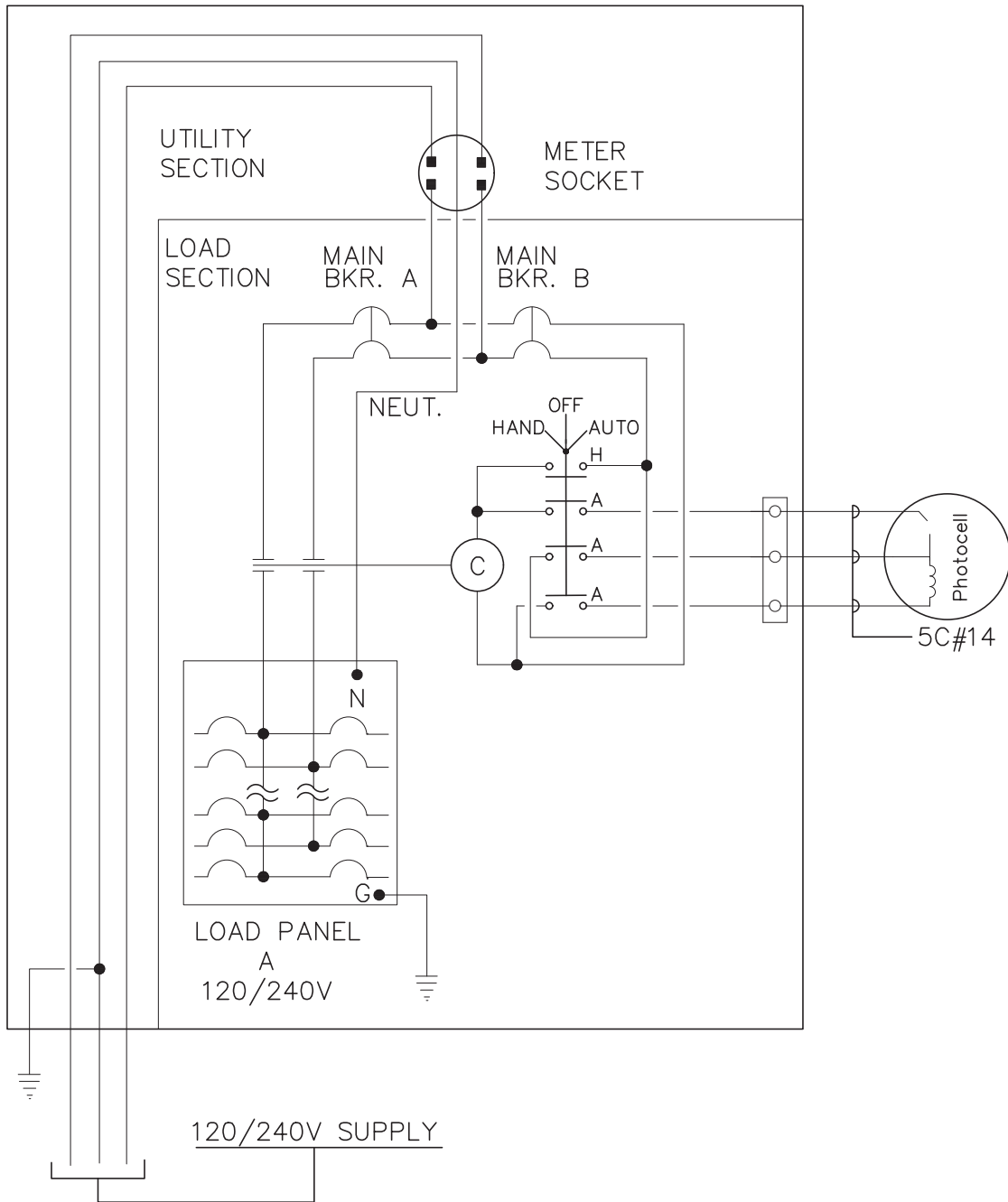
REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.  
APPROVED:  
REVISED:  
2/24

**PANEL SCHEDULE FOR  
WIRING DIAGRAM "D"**

SECTION #  
80.14  
DETAIL #  
80-45



NOTE:

1. SEE PANEL SCHEDULE, STANDARD DETAIL 80-47

REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

# LOAD CENTER WIRING DIAGRAM "E"

SECTION #  
80.14

DETAIL #  
80-46

LOAD CENTER NO. \_\_\_\_\_ TYPE: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_  
 120/240 VOLTS, SINGLE PHASE, \_\_\_\_\_ AMP SUPPLY  
 \_\_\_\_\_ AMPS INTERRUPTING CURRENT  
 MAIN BREAKER A : 2 POLE, \_\_\_\_\_ AMPS, 240 VOLTS  
 MAIN BREAKER B : 2 POLE, \_\_\_\_\_ 15 \_\_\_\_\_ AMPS, 240 VOLTS  
 CONTACTOR RATING: \_\_\_\_\_ AMPS

PANEL A \_\_\_\_\_ 120/240 VOLTS \_\_\_\_\_ SINGLE PHASE 3 WIRE  
 \_\_\_\_\_ AMPS MAIN LUGS, \_\_\_\_\_ AMPS INTERRUPT CAPACITY

CKT. DESCRIPTION	KVA	AMP			AMP	KVA	CKT. DESCRIPTION
			1	2			
			3	4			
			5	6			
			7	8			
			9	10			
			11	12			
			13	14			
			15	16			
			17	18			
			19	20			

NOTE: SEE CONSTRUCTION DRAWINGS FOR NUMBER & SIZE OF BREAKERS.

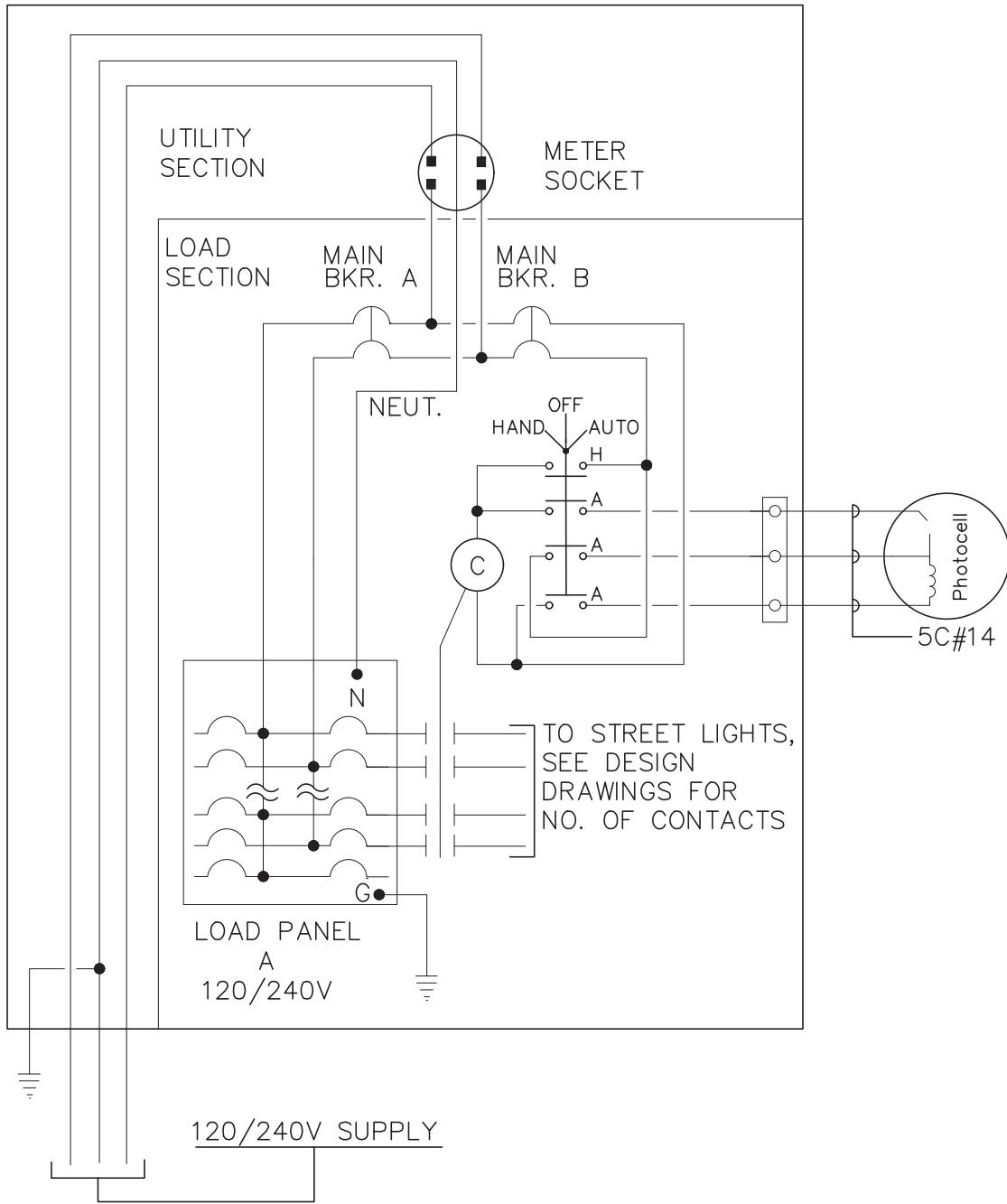
REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.  
APPROVED:  
REVISD:  
2/24

**PANEL SCHEDULE FOR  
WIRING DIAGRAM "E"**

SECTION #  
80.14  
DETAIL #  
80-47



NOTE:

1. SEE PANEL SCHEDULE, STANDARD DETAIL 80-49

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

# LOAD CENTER WIRING DIAGRAM "F"

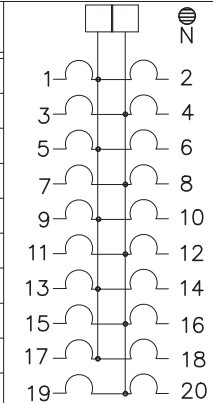
SECTION #  
80.14

DETAIL #  
80-48

LOAD CENTER NO. \_\_\_\_\_ TYPE: \_\_\_\_\_

LOCATION: \_\_\_\_\_

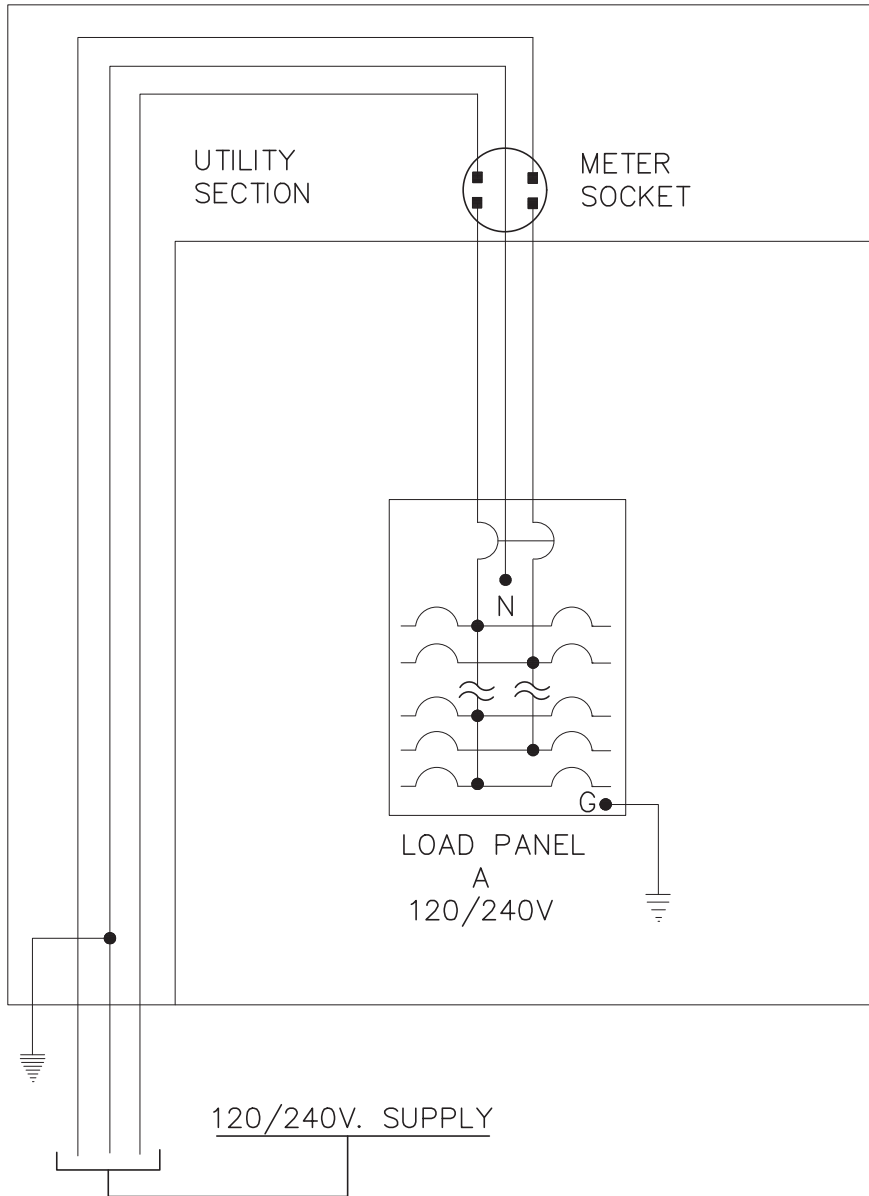
\_\_\_\_\_ POLE, \_\_\_\_\_ AMP CONTACTOR

PANEL A		_____ 120/240 _____ VOLTS	_____ SINGLE _____ PHASE _____ 3 _____ WIRE			
		_____ AMPS MAIN LUGS,	_____ AMPS INTERRUPT CAPACITY			
CKT. DESCRIPTION	KVA	AMP		AMP	KVA	CKT. DESCRIPTION
			1			
			2			
			3			
			4			
			5			
			6			
			7			
			8			
			9			
			10			
			11			
			12			
			13			
			14			
			15			
			16			
			17			
			18			
			19			
			20			

NOTE: SEE CONSTRUCTION DRAWINGS FOR NUMBER & SIZE OF BREAKERS.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	PANEL SCHEDULE FOR WIRING DIAGRAM "F"	SECTION # 80.14  DETAIL # 80-49
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NOTE:  
 1. SEE PANEL SCHEDULE, DETAIL 80-51

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY  
  
 OF ANCHORAGE

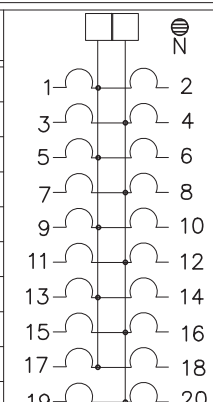
SCALE:  
 N.T.S.  
 APPROVED:  
 REVISED:  
 2/24

# LOAD CENTER WIRING DIAGRAM "G"

SECTION #  
 80.14  
 DETAIL #  
 80-50



LOAD CENTER NO. \_\_\_\_\_ TYPE: \_\_\_\_\_  
 LOCATION: \_\_\_\_\_

PANEL A		120/240	VOLTS	SINGLE	PHASE	3	WIRE
		_____ AMPS MAIN LUGS,		_____ AMPS INTERRUPT CAPACITY			
CKT. DESCRIPTION	KVA	AMP			AMP	KVA	CKT. DESCRIPTION
			1	2			
			3	4			
			5	6			
			7	8			
			9	10			
			11	12			
			13	14			
			15	16			
			17	18			
			19	20			

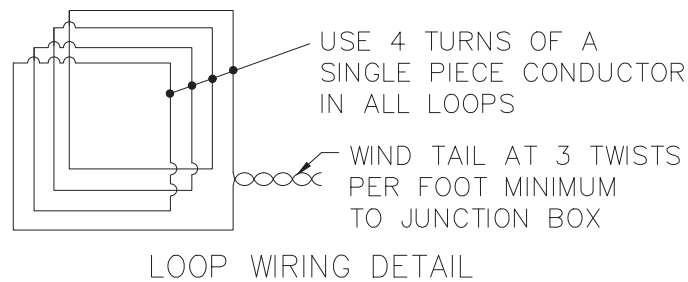
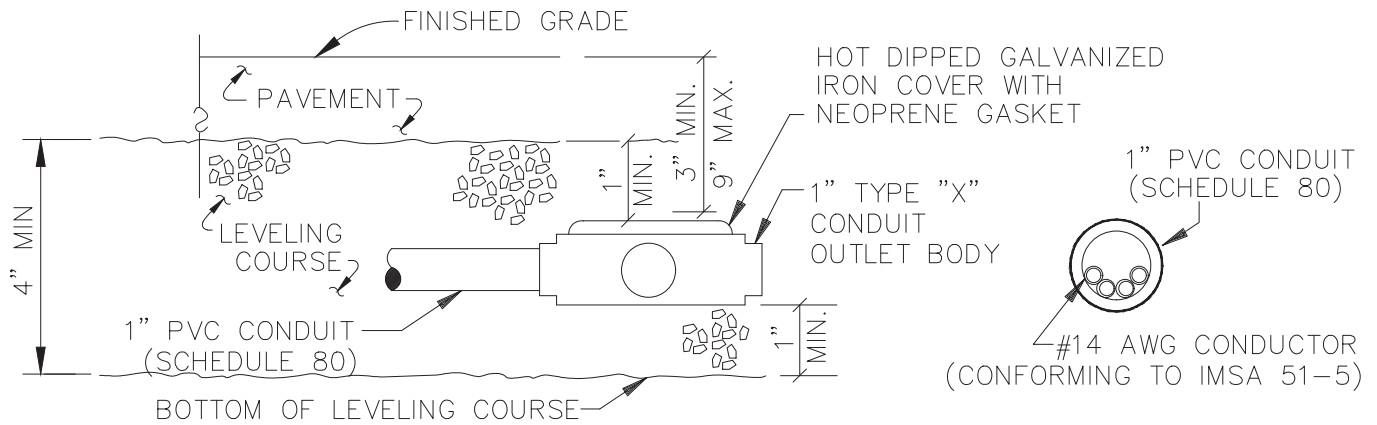
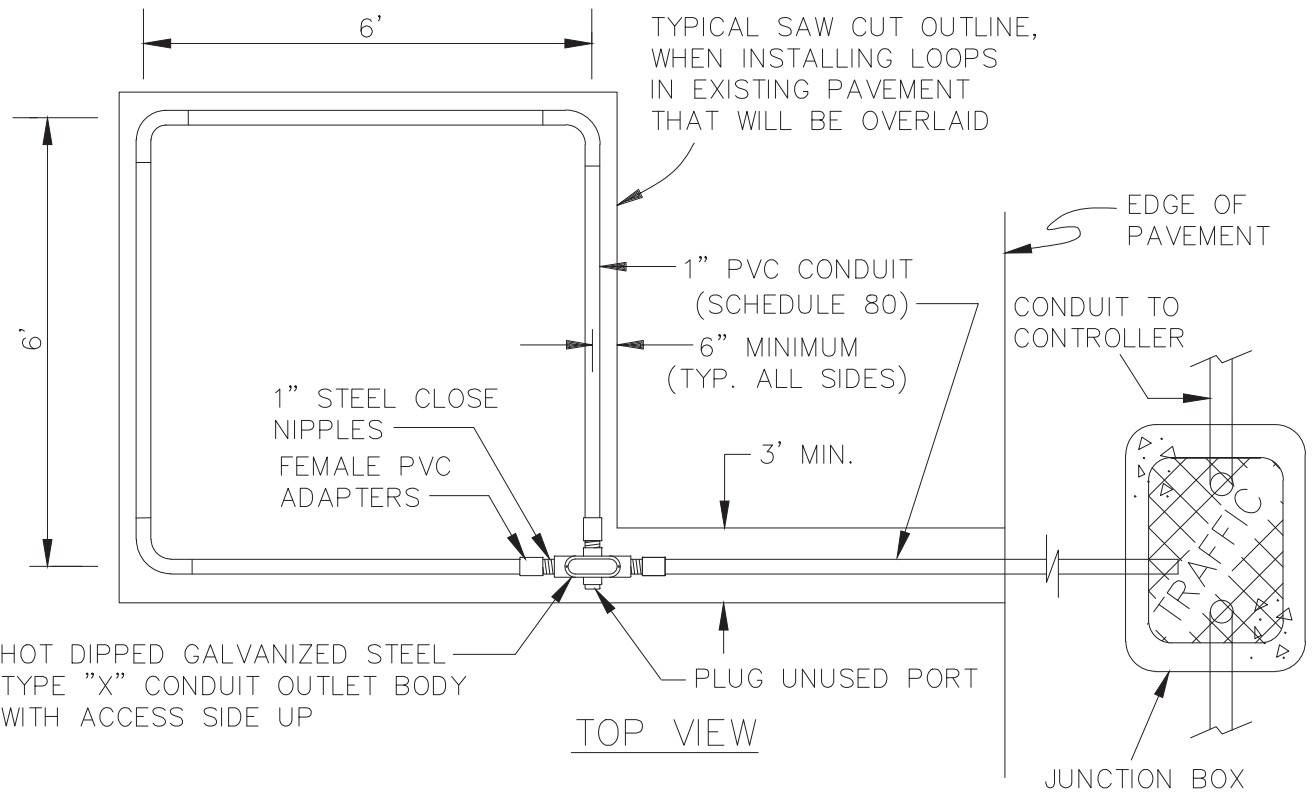
REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.  
APPROVED:  
  
REVISED:  
2/24

## PANEL SCHEDULE FOR WIRING DIAGRAM "G"

SECTION #  
80.14  
  
DETAIL #  
80-51



REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY

OF ANCHORAGE

SCALE:  
N.T.S.

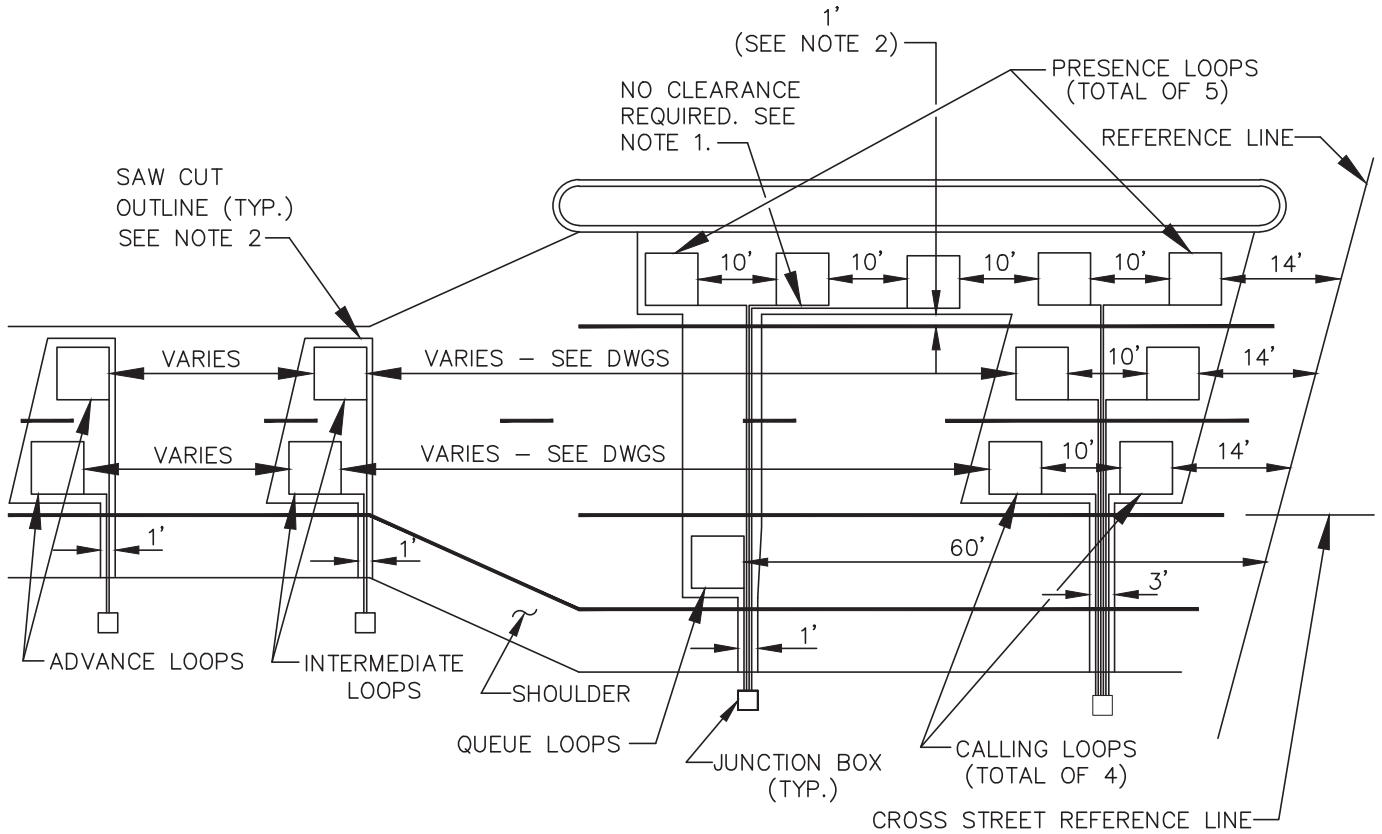
APPROVED:

REVISED:  
2/24

# CONDUIT ENCASED LOOP DETECTOR

SECTION #  
80.18

DETAIL #  
80-52



### TYPICAL LOOP SETBACKS

MEASURE THE SETBACKS FROM THE REFERENCE LINE  
ALONG THE CENTER OF EACH LANE

#### NOTES:

1. NO MINIMUM CLEARANCE IS REQUIRED BETWEEN A DETECTOR LOOP AND HOMERUN LOOP WIRES OR BETWEEN HOMERUN LOOP WIRES. HOMERUN LOOP WIRES SHALL NOT CROSS LOOP CONDUITS.
2. WHERE EXISTING PAVEMENT WILL NOT BE OVERLAID, ENCLOSE ALL LOOPS THAT ENTER A COMMON JUNCTION BOX WITHIN A TRAPEZOIDAL SAW CUT. CUT TO WITHIN 1 FOOT OF THE LANE AND EDGE LINES, PRESERVING THESE PAVEMENT MARKINGS; REMOVE THE ASPHALT TO THE LIP OF THE GUTTER WHEN THERE ARE NO EDGE LINES. CUT ACROSS LANE LINES WHEN LOOPS IN ADJACENT LANES ARE SIDE BY SIDE. CUT TRENCHES A MINIMUM OF 3 FEET WIDE WHEN INSTALLING LOOP TAILS ACROSS A LANE; CUT TRENCHES A MINIMUM 1 FOOT WIDE WHEN CROSSING A SHOULDER.

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MUNICIPALITY



OF ANCHORAGE

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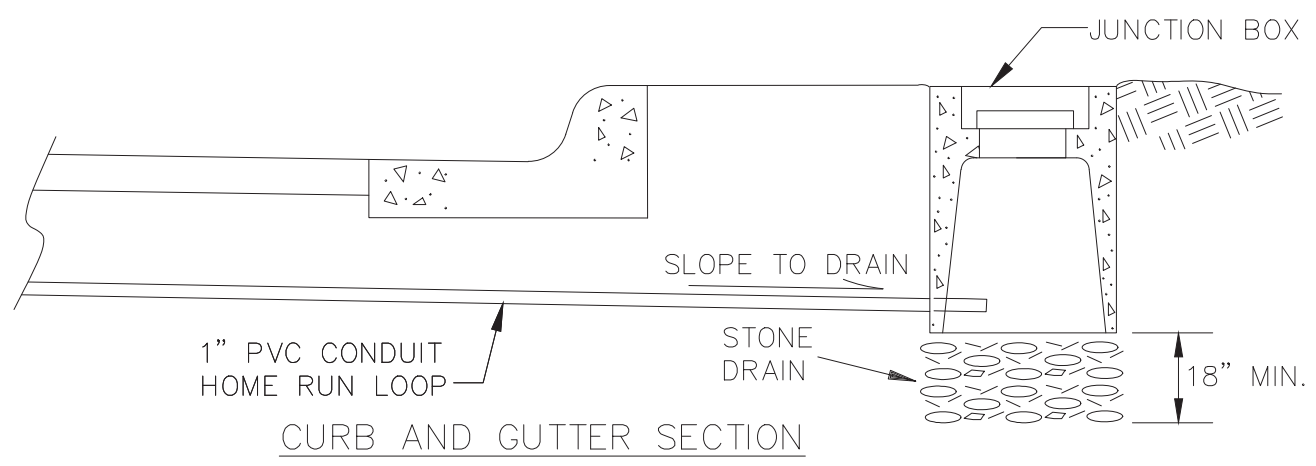
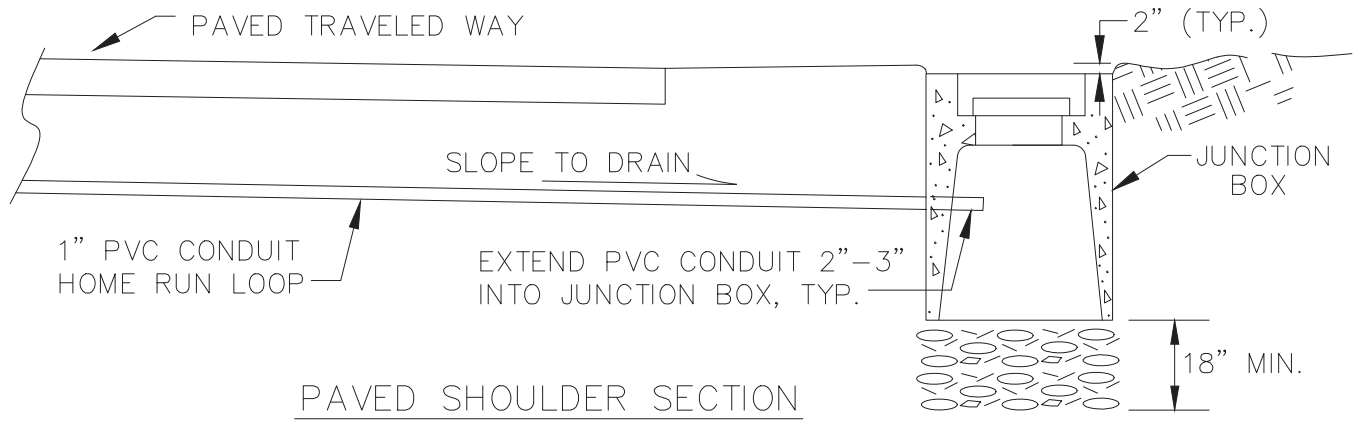
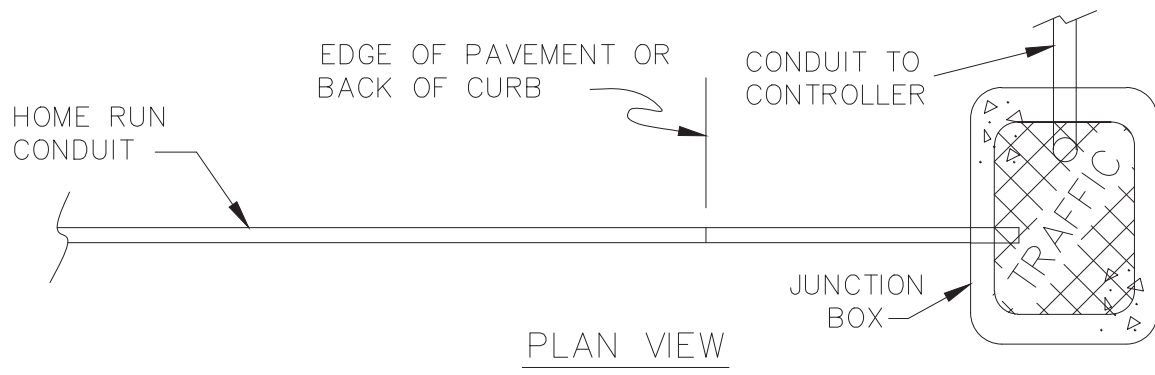
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2/24

# LOOP DETECTOR INSTALLATION DETAILS

SECTION #  
80.18

DETAIL #  
80-53



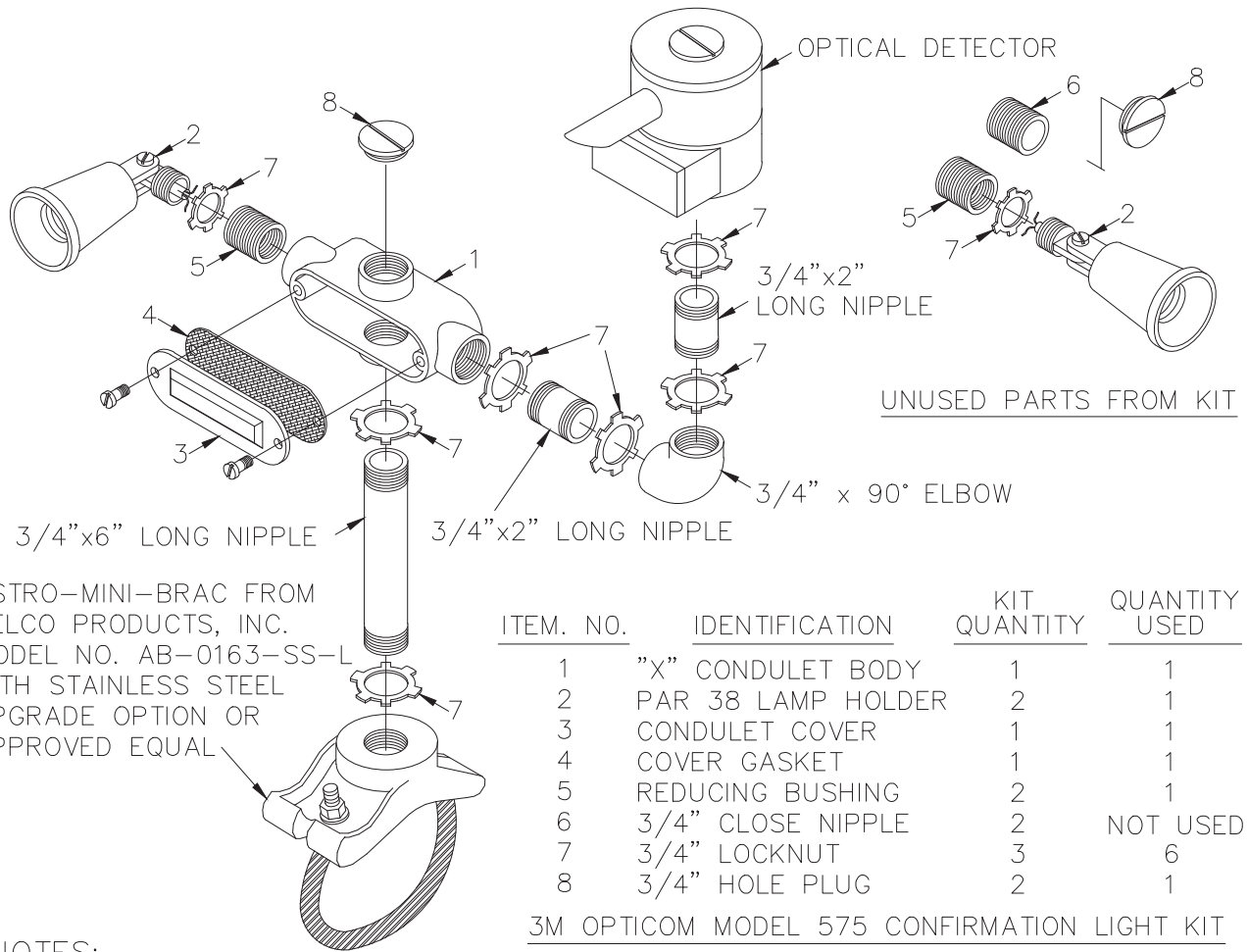
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 OF ANCHORAGE

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# LOOP DETECTOR HOME RUN

SECTION #  
80.18  
 DETAIL #  
80-54



ASTRO-MINI-BRAC FROM  
 PELCO PRODUCTS, INC.  
 MODEL NO. AB-0163-SS-L  
 WITH STAINLESS STEEL  
 UPGRADE OPTION OR  
 APPROVED EQUAL

ITEM. NO.	IDENTIFICATION	KIT QUANTITY	QUANTITY USED
1	"X" CONDULET BODY	1	1
2	PAR 38 LAMP HOLDER	2	1
3	CONDULET COVER	1	1
4	COVER GASKET	1	1
5	REDUCING BUSHING	2	1
6	3/4" CLOSE NIPPLE	2	NOT USED
7	3/4" LOCKNUT	3	6
8	3/4" HOLE PLUG	2	1

3M OPTICOM MODEL 575 CONFIRMATION LIGHT KIT

NOTES:

- SEE THE SIGNAL PLANS FOR THE SIGNAL MAST ARMS SCHEDULED FOR OPTICOM DETECTOR INSTALLATION.
- FOR EACH OPTICOM INSTALLATION, FURNISH THE FOLLOWING PARTS:
  - A 3M MODEL 711, 721, OR 722 OPTICOM DETECTOR AS SHOWN ON THE PLANS.
  - A 3M MODEL 575 CONFIRMATION LIGHT KIT, OR AN APPROVED EQUAL, THAT CONSISTS OF STEEL PARTS WITH A HOT DIP GALVANIZED FINISH.
  - A 3/4"x6" LONG PIPE NIPPLE, TWO 3/4"x2" LONG NIPPLES, AND A 3/4" 90° PIPE ELBOW. FURNISH PARTS WITH A HOT DIPPED GALVANIZED FINISH.
  - THREE ADDITIONAL 3/4" LOCKNUTS WITH ZINC PLATED FINISH.
  - AN ASTRO-MINI-BRAC, MODEL AB-0163-SS-L, MANUFACTURED BY PELCO PRODUCTS, OR AN APPROVED EQUAL.
  - A 20 WATT, PAR 38, LED FLOOD LAMP RATED FOR 120 VOLT OPERATION, 1250 INITIAL LUMENS, AND A 25000 HOUR LAMP LIFE.
- DRILL A 1" HOLE IN THE TOP DEAD CENTER OF THE MAST ARM AT THE OPTICOM DETECTORS PRE-APPROVED LATERAL LOCATION. ASSEMBLE THE PARTS AS SHOWN ON THIS SHEET.
- BEFORE ATTACHING THE MODEL 138 DETECTOR CABLE TO THE OPTICOM DETECTOR, STRIP 1" OF THE INSULATION FROM THE THREE INSULATED CONDUCTORS AT THE CONTROLLER CABINET AND ATTACH ALL FOUR CONDUCTORS TO GROUND.

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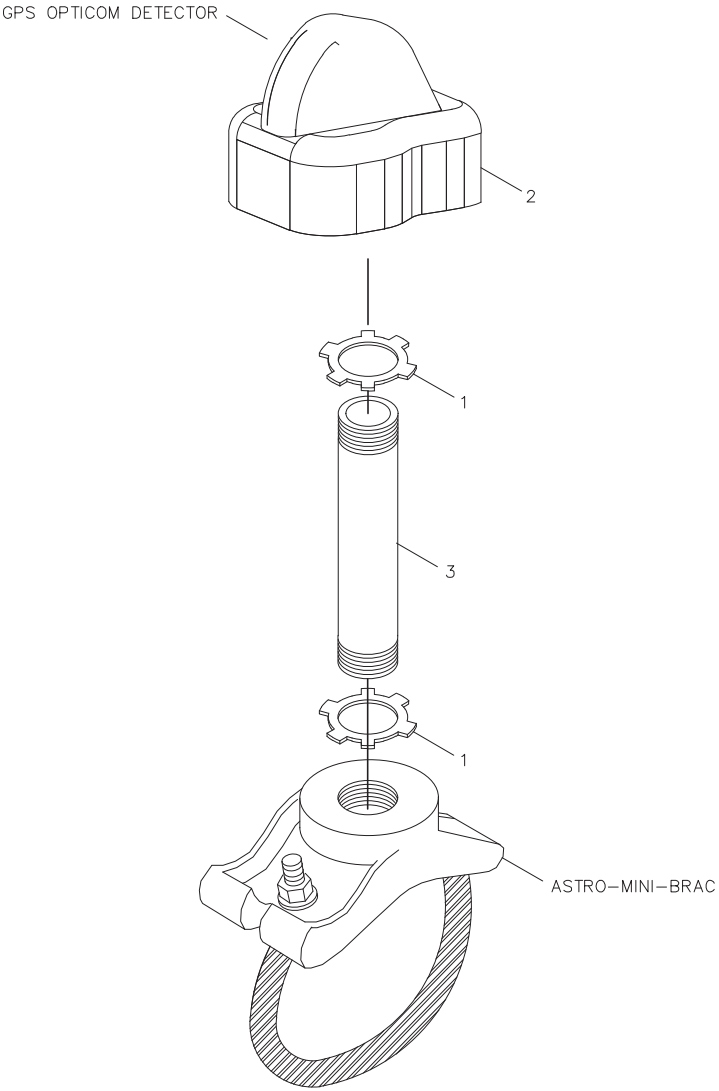
# OPTICOM DETECTOR INSTALLATION DETAILS

SECTION #  
80.18

DETAIL #  
80-55A

NOTES:

1. SEE THE SIGNAL PLANS FOR THE SIGNAL POLE MAST ARM SCHEDULED FOR GPS OPTICOM SYSTEM INSTALLATION.
2. FOR EACH GPS OPTICOM SYSTEM INSTALLATION, FURNISH:
  - A. A GTT MODEL 3100 GPS DETECTOR AS CALLED FOR IN PLANS.
  - B. AN ASTRO-MINI-BRAC, MODEL AB-0163-SS-L, AS MANUFACTURED BY PELCO PRODUCTS OR AN APPROVED EQUAL.
3. MOUNT DETECTORS PER MANUFACTURER RECOMMENDATIONS. DRILL A 1 INCH HOLE IN THE TOP DEAD CENTER OF THE MAST ARM AT THE LOCATION PRE-APPROVED BY THE ENGINEER. ASSEMBLE AND TIGHTEN THE PARTS AND LOCKNUTS AS SHOWN ON THIS SHEET.
4. INSTALL OPTICOM MODEL 1070 GPS INSTALLATION CABLE BETWEEN THE SIGNAL CABINET AND THE GPS UNIT PER MANUFACTURER RECOMMENDATIONS. LEAVE APPROXIMATELY 10 FEET OF THE MODEL 1070 CABLE SPOOLED IN THE TRAFFIC CONTROLLER CABINET.
5. PREEMPTION EMITTERS SHALL BE ASSIGNED ID NUMBERS BY JURISDICTION AS SHOWN IN VEHICLE EMITTER TABLE.



PARTS LIST FOR EACH GPS OPTICOM DETECTOR INSTALLED

GTT OPTICOM MODEL 3100 RADIO/GPS UNIT AS SHOWN FROM PARTS BELOW

PART NO.	PART TYPE	LIGHT KIT QUANTITY
1	3/4" LOCKNUT	2
2	GPS OPTICOM UNIT	1
3	3/4" X 6" NIPPLE	1

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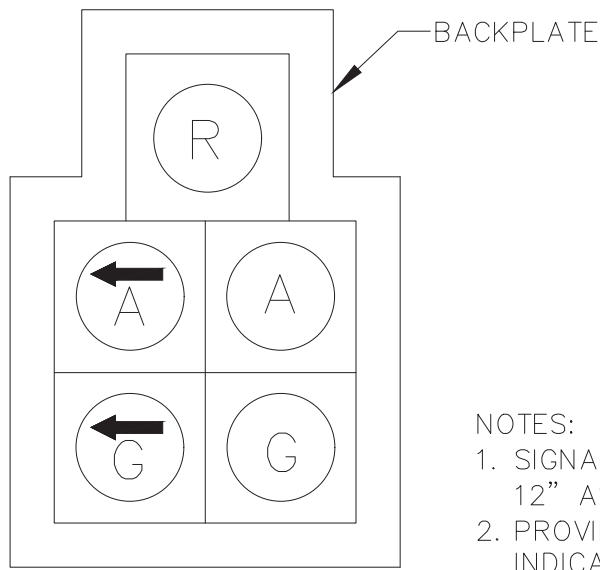
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REVISED:  
2/24

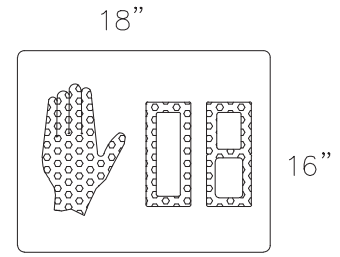
# GPS OPTICOM DETECTOR INSTALLATION DETAILS

SECTION #  
80.18

DETAIL #  
80-55B



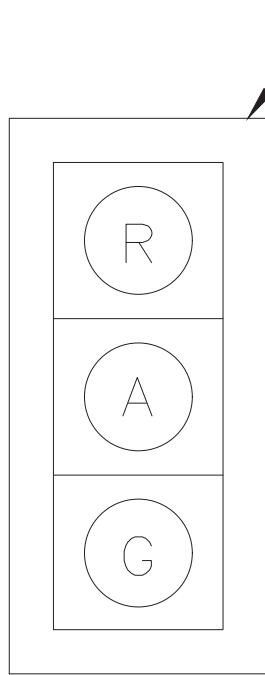
5-LENS HEAD



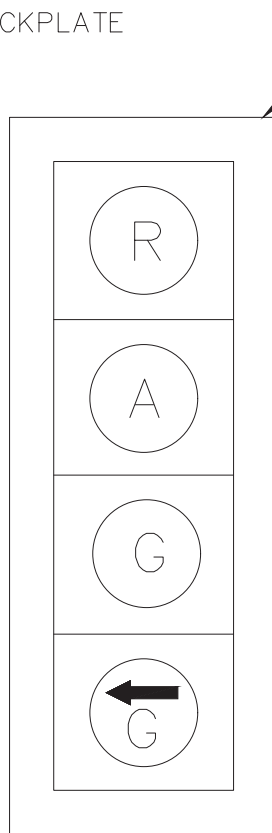
PEDESTRIAN HEAD

NOTES:

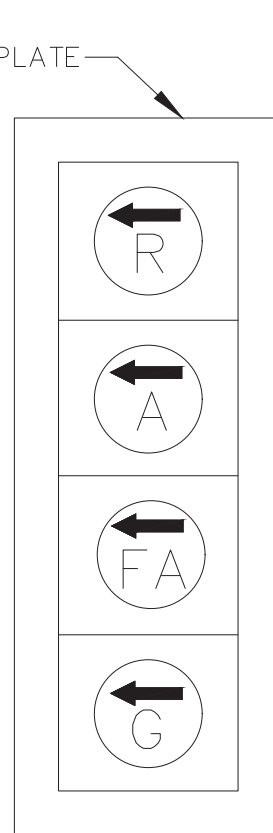
1. SIGNAL FACE DIMENSIONS ARE 8" OR 12" AS SPECIFIED IN THE DRAWINGS.
2. PROVIDE LEFT/RIGHT ARROW INDICATIONS, AS INDICATED IN THE CONTRACT DOCUMENTS.
3. ALL VEHICLE SIGNALS SHALL HAVE BACKPLATES.



3-LENS HEAD



4-LENS HEAD



FLASHING YELLOW HEAD

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MUNICIPALITY



OF ANCHORAGE

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# SIGNAL HEADS

SECTION #  
80.19 &  
80.20

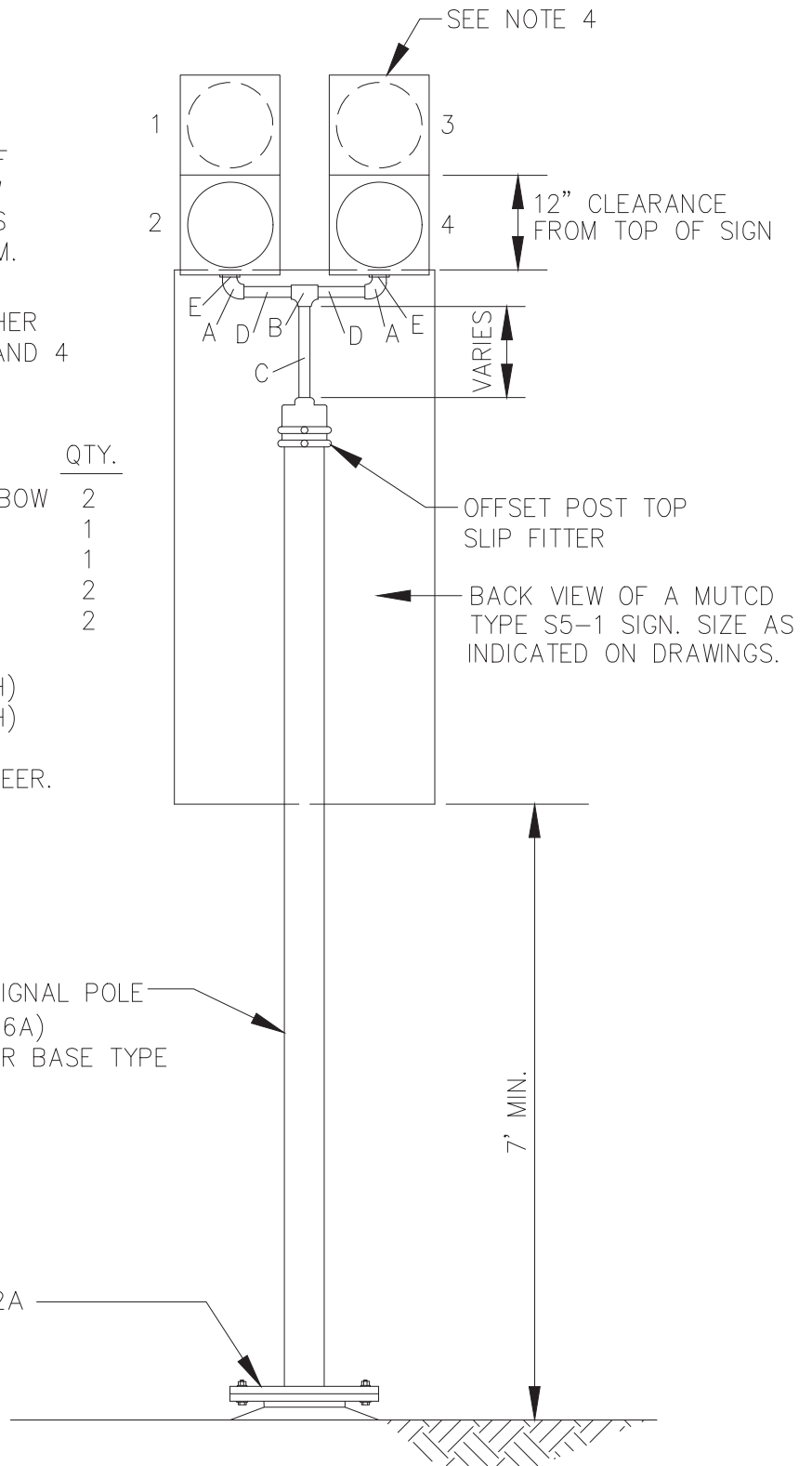
DETAIL #  
80-56

SCHOOL FLASHER NOTES:

1. EACH FLASHER SHALL CONSIST OF FOUR SIGNAL FACES WITH YELLOW LENSES AND TUNNEL TYPE VISORS WITH OPEN SLOTS AT THE BOTTOM.
2. THE CONTRACTOR SHALL WIRE SIGNAL FACES 1 AND 2 ON FLASHER CIRCUIT 1 AND SIGNAL FACES 3 AND 4 ON FLASHER CIRCUIT 2.
3. BEACON FRAMEWORK

ITEM NO.	IDENTIFICATION	QTY.
A	1-1/2" 90° SERRATED ELBOW	2
B	1-1/2" TEE	1
C	1-1/2" x VARIES NIPPLE	1
D	1-1/2" x VARIES NIPPLE	2
E	1-1/2" LOCK NIPPLE	2

4. YELLOW SIGNAL FACE:  
 12" (POSTED SPEEDS ≥ 40 MPH)  
 8" (POSTED SPEEDS ≤ 30 MPH)  
 FOR 35 mph SIGNAL FACE SIZE REQUIRES DISCRETION OF ENGINEER.



10' BREAKAWAY SIGNAL POLE  
 (SEE DETAIL 80-16A)  
 SEE DRAWINGS FOR BASE TYPE

SEE DETAIL 80-12A  
 FOR FOUNDATION

7' MIN.

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OF ANCHORAGE

SCALE:  
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APPROVED:

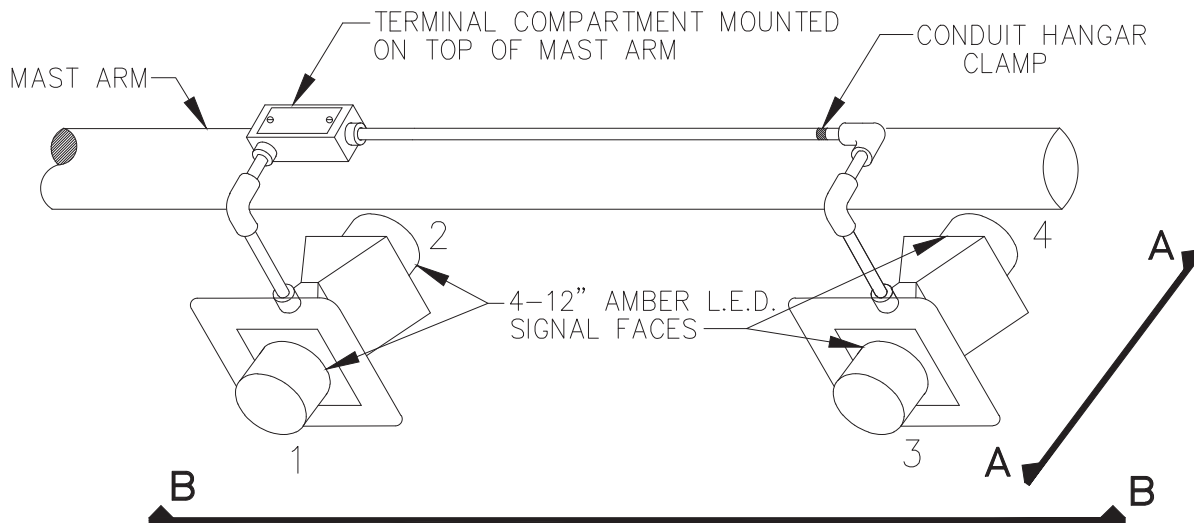
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**SPEED LIMIT SIGN BEACON**

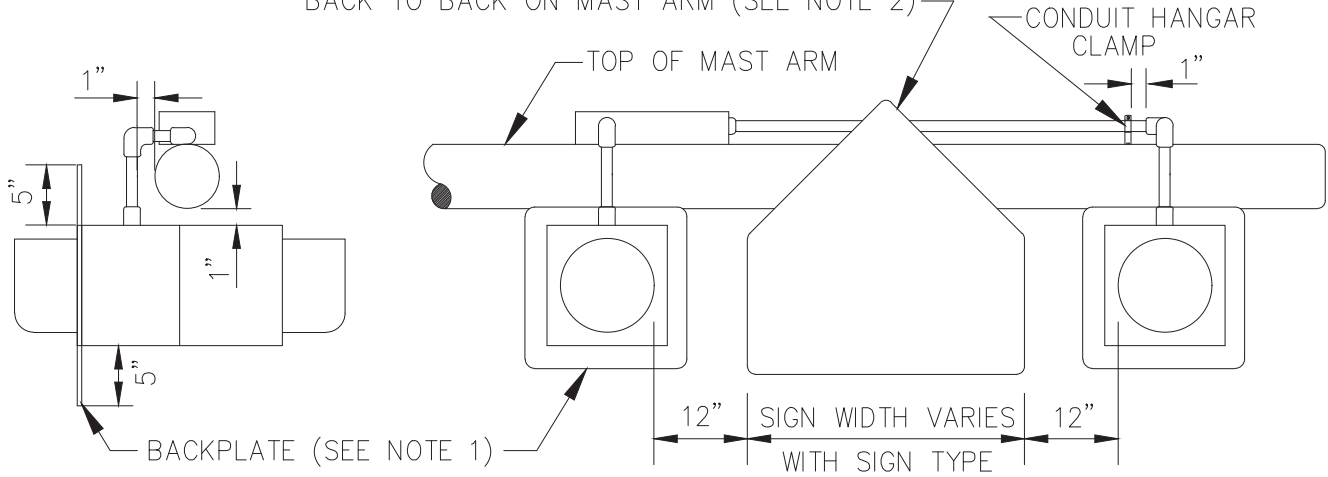
SECTION #  
 80.22

DETAIL #  
 80-57





TWO NON-ILLUMINATED SIGNS, MOUNTED BACK TO BACK ON MAST ARM (SEE NOTE 2)



**SECTION AA**

**SECTION BB**

NOTES:

1. PROVIDE ALL SIGNAL HEADS WITH 5" BACKPLATES.
2. CONTACT MOA SIGN SHOP FOR MOUNTING METHOD.
3. PROVIDE MINIMUM VERTICAL CLEARANCE OF 18' FROM ROADWAY TO BOTTOM OF SIGNAL HEAD HOUSING OR BOTTOM OF SIGN.
4. WIRE SIGNAL FACES 1 AND 2 ON FLASHER CIRCUIT 1 AND SIGNAL FACES 3 AND 4 ON FLASHER CIRCUIT 2.
5. EACH UNIT SHALL CONSIST OF FOUR 12-INCH AMBER L.E.D. SIGNAL FACES AND TUNNEL TYPE VISORS WITH OPEN SLOTS AT THE BOTTOM.

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# MAST ARM MOUNTED SIGN BEACONS

SECTION #  
80.22

DETAIL #  
80-58

12-INCH YELLOW SIGNAL FACE WITH  
YELLOW LENS AND TUNNEL TYPE VISOR  
WITH OPEN SLOT AT THE BOTTOM

1-1/2" x VARIES NIPPLE

1.0'  
MIN.

VARIES

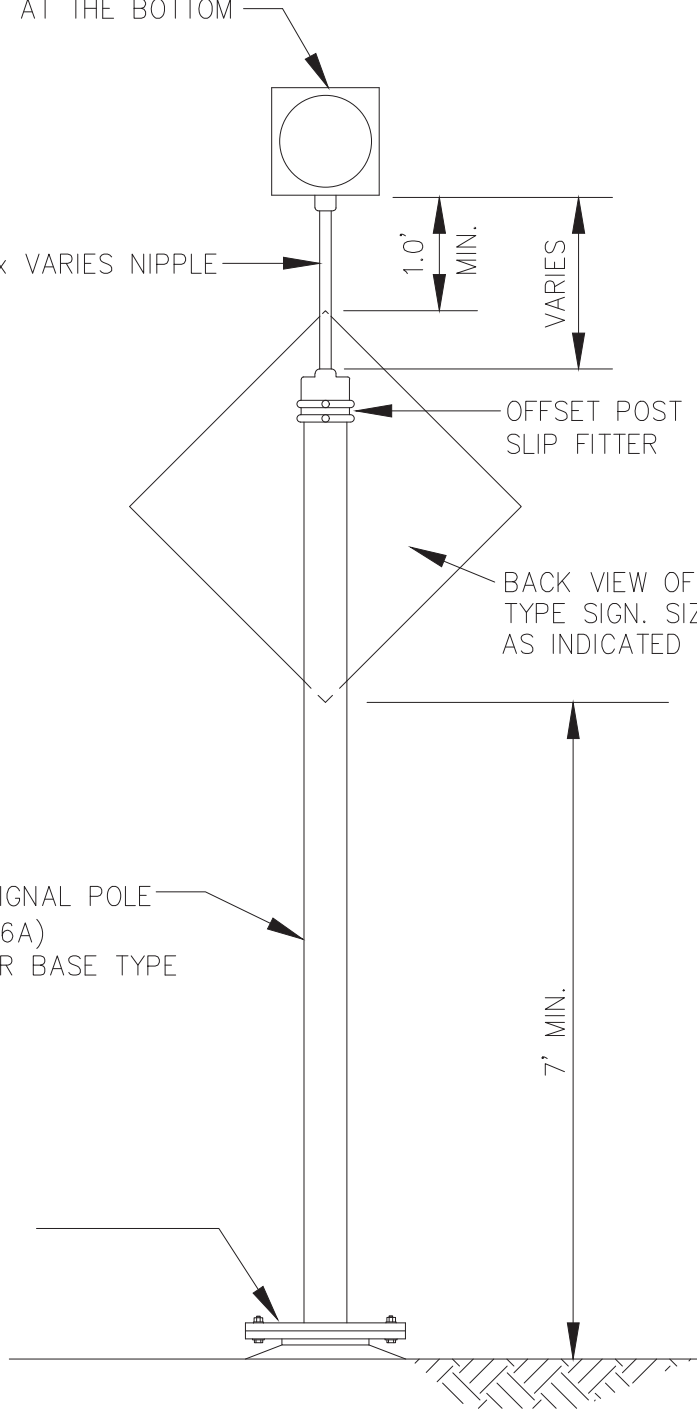
OFFSET POST TOP  
SLIP FITTER

BACK VIEW OF A MUTCD  
TYPE SIGN. SIZE AND TYPE  
AS INDICATED ON DRAWINGS.

10' BREAKAWAY SIGNAL POLE  
(SEE DETAIL 80-16A)  
SEE DRAWINGS FOR BASE TYPE

7' MIN.

SEE DETAIL 80-12A  
FOR FOUNDATION



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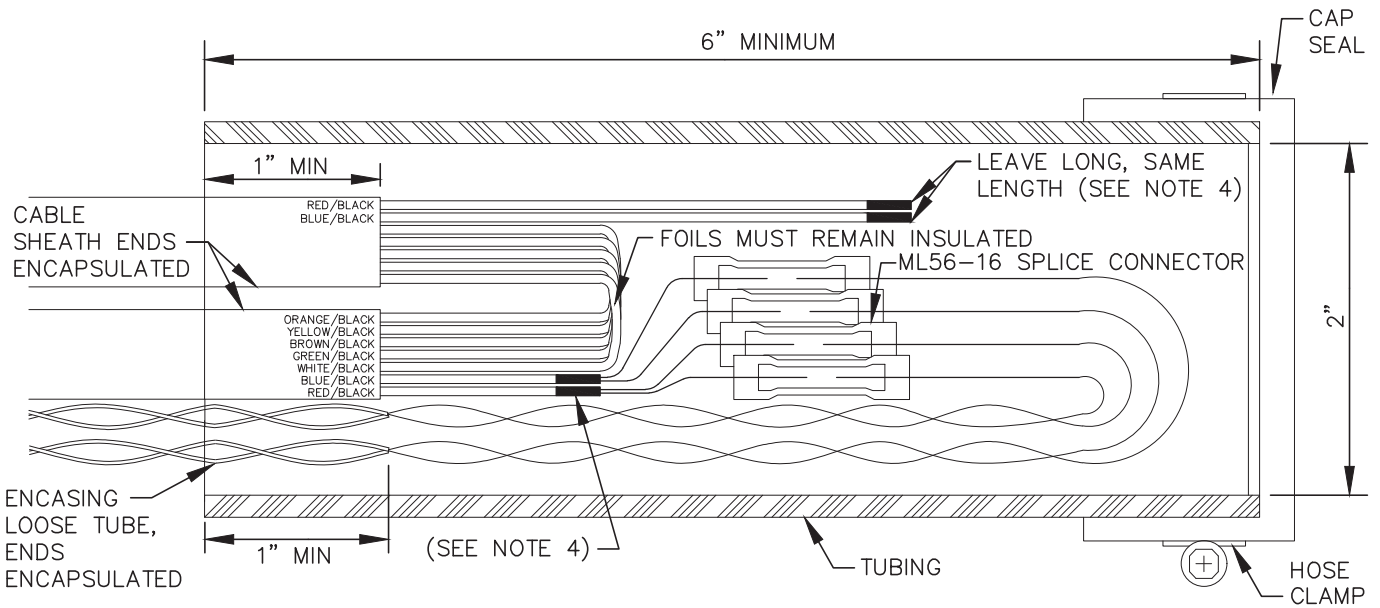
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# WARNING SIGN BEACON

SECTION #  
80.22

DETAIL #  
80-59



MATERIAL PROPERTIES	
LOOP LEAD-IN SPLICE	
TUBING	2" HDPE FLEXIBLE CORRUGATED CONDUIT
CAP SEAL	FERNCO QWIK CAP #QC-102
HOSE CLAMP	STAINLESS STEEL
SPLICE CONNECTOR	MULTILINK ML56-16 OR APPROVED EQUAL
COMPOUND	RE-ENTERABLE ENCAPSULATION

NOTES:

1. FABRICATE LOOP LEAD-IN SPLICE IN THE FIELD AS SHOWN.
2. CAP SEAL ONE END AND COMPLETELY FILL OPEN END WITH RE-ENTERABLE ENCAPSULATION COMPOUND TO EDGE OF CORRUGATED CONDUIT.
3. LEAVE A MINIMUM OF 1/2" CLEARANCE BETWEEN THE ENCLOSURE AND THE SPLICE AT BOTH ENDS OF THE CORE FLOW.
4. EXPOSED FOIL AND DRAIN WIRES, SEAL WITH HEAT SHRINK TUBING (TYP).
5. SECURE CABLE/CONDUCTOR BUNDLE WITH NYLON CABLE TIES.

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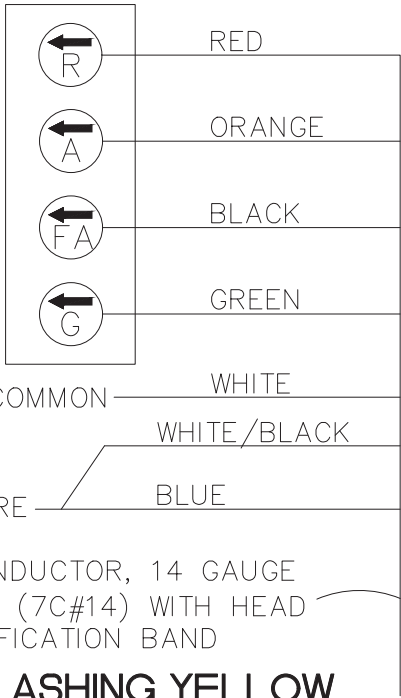
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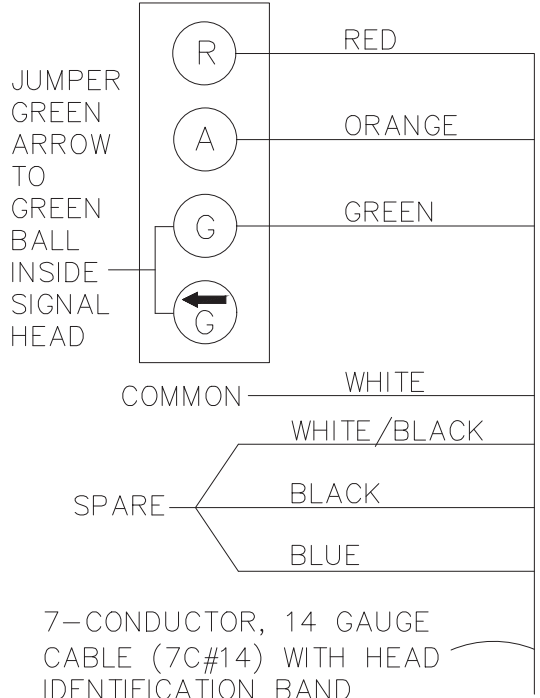
# SPLICE DETAIL LOOP DETECTOR LEADS

SECTION #  
80.48  
 DETAIL #  
80-60

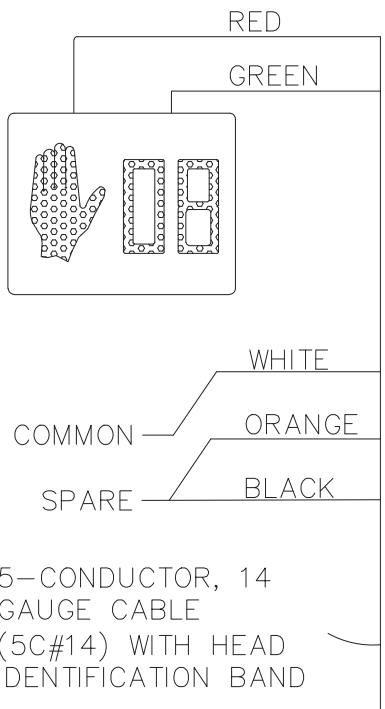
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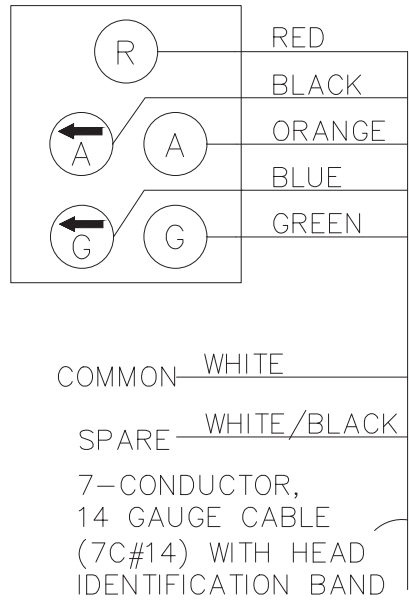
**FLASHING YELLOW HEAD**



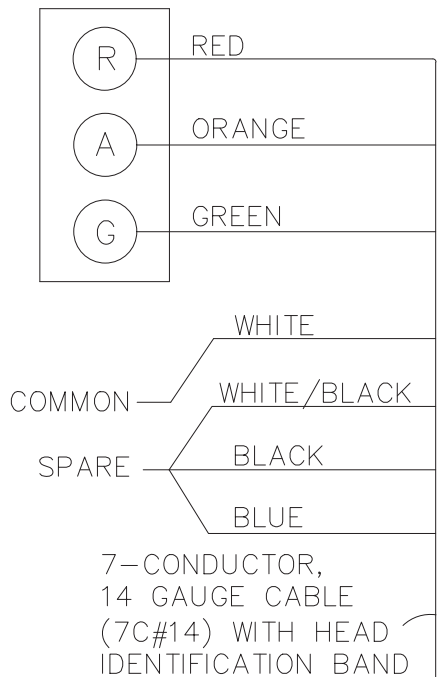
**4 SECTION HEAD**



**PEDESTRIAN HEAD**



**5 SECTION HEAD**



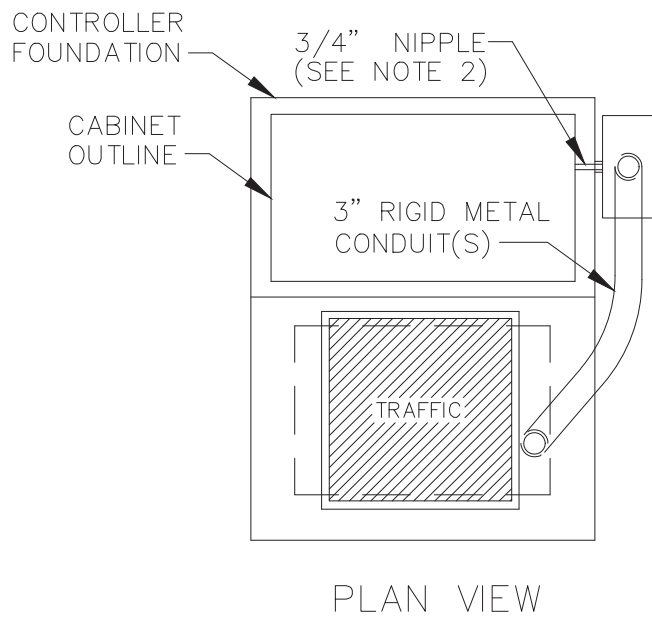
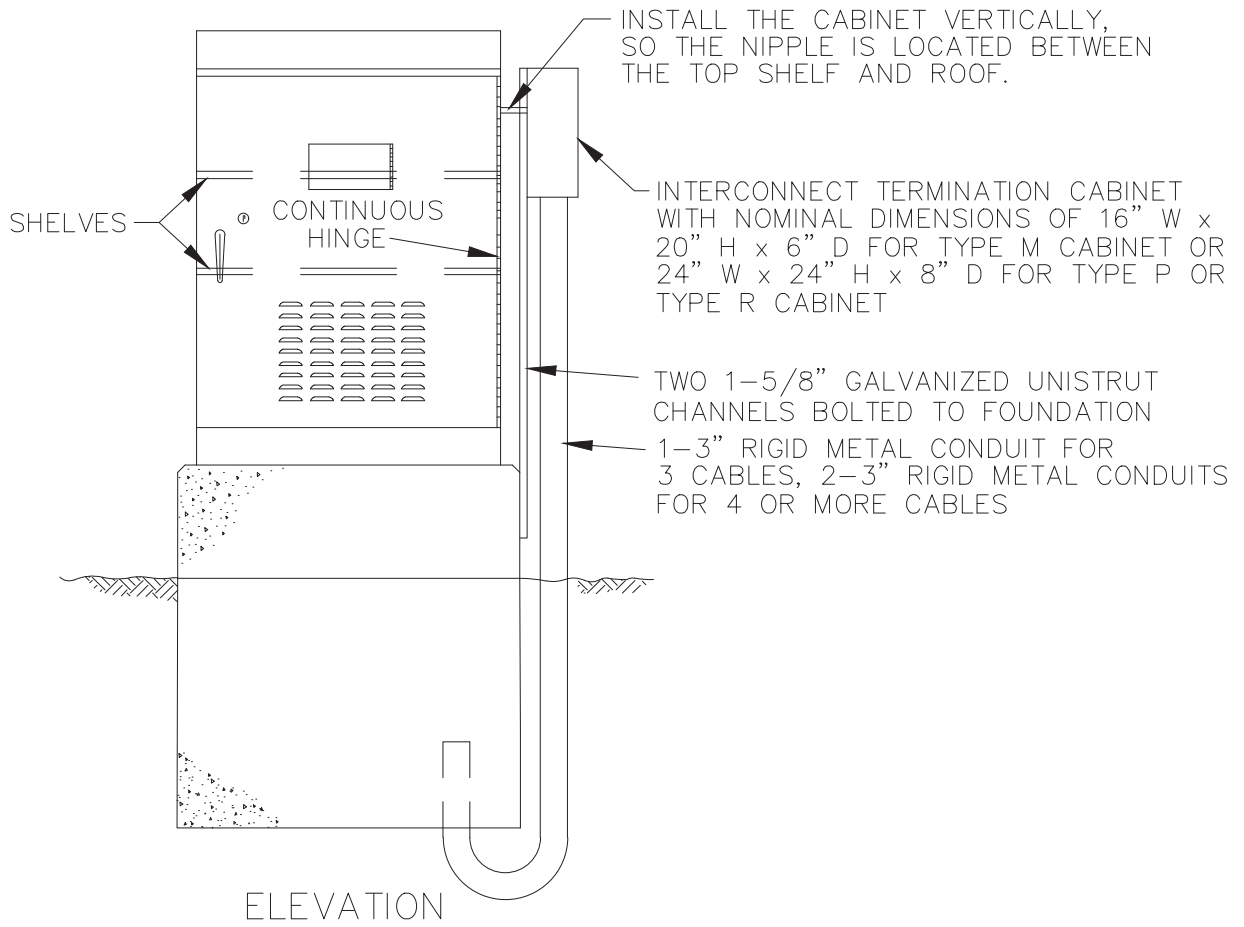
**3 SECTION HEAD**



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**SIGNAL HEAD WIRING DETAILS**

SECTION # 80.19 & 80.20  
 DETAIL # 80-61



NOTES:

1. INSTALL THE INTERCONNECT CABLE TERMINATION CABINET WHEN CALLED FOR IN THE DRAWINGS.
2. COORDINATE INSTALLATION LOCATION OF 3/4" NIPPLE WITH MOA TRAFFIC SIGNAL ELECTRONICS, PRIOR TO DRILLING HOLE IN CABINETS.
3. SEE DRAWINGS TO DETERMINE WHETHER TO INSTALL ON RIGHT OR LEFT SIDE WALL OF CONTROLLER CABINET.
4. DRILL HOLE IN STANDOFF MOUNTED BACK PANEL TO PROVIDE UNIMPEDED ACCESS TO NIPPLE FOR CABLE ROUTING. COORDINATE LOCATION WITH MOA TRAFFIC SIGNAL ELECTRONICS PRIOR TO DRILLING HOLE.

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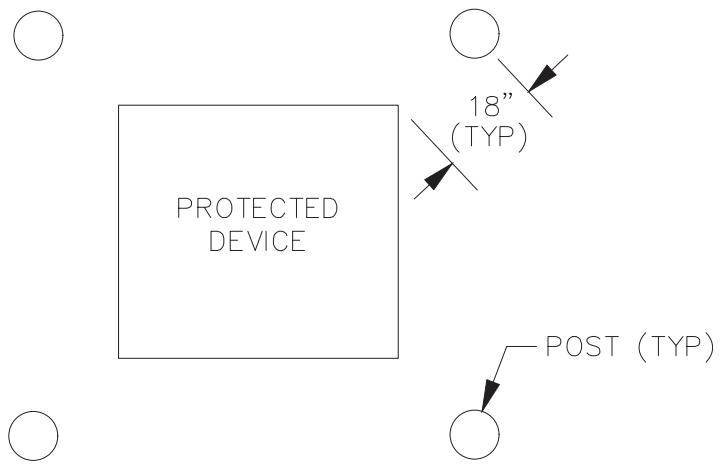
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# INTERCONNECT CABLE TERMINATION CABINET

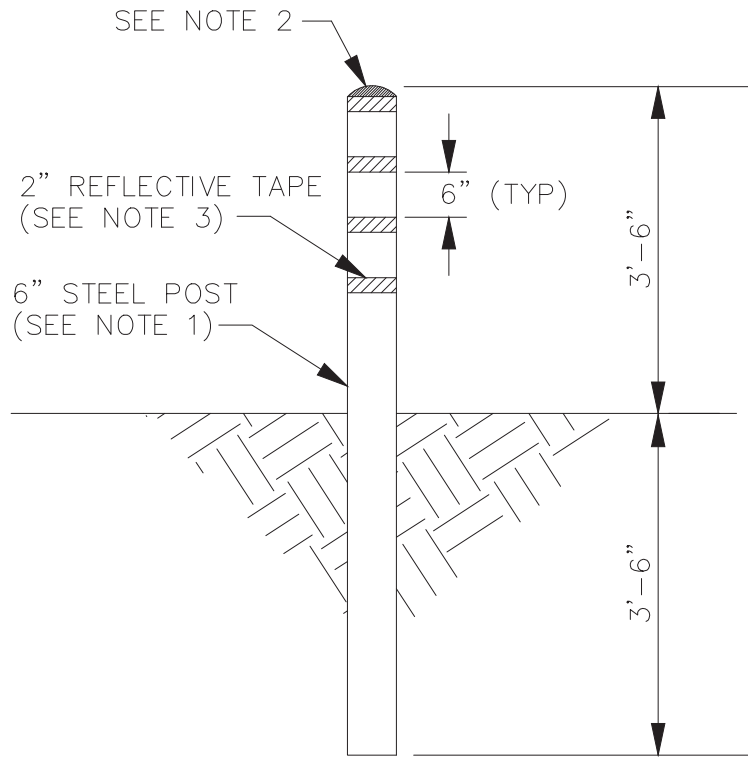
SECTION #  
80.26

DETAIL #  
80-62



PLAN

LOCATE POSTS AS SHOWN



POST DETAIL

NOTES:

1. PROVIDE 6" STEEL, SCHEDULE #40 PIPE, FILLED WITH CONCRETE.
2. ROUND CONCRETE AT TOP OF POST SMOOTH AND PAINT YELLOW.
3. INSTALL 4-2" BANDS OF YELLOW REFLECTIVE TAPE AS SHOWN.
4. LOCATION AND QUANTITY OF POSTS AS INDICATED ON DRAWINGS.

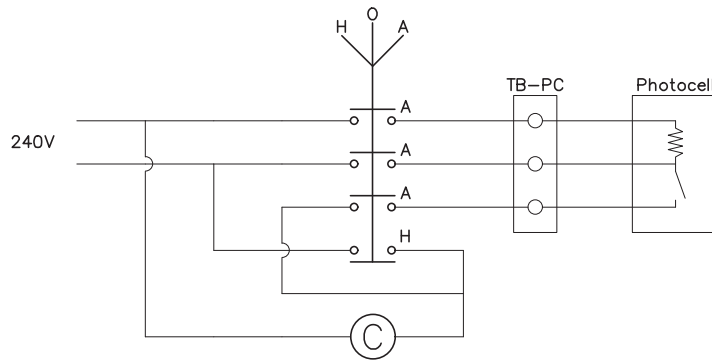
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**PROTECTIVE POST  
ASSEMBLY**

SECTION #  
80.27  
DETAIL #  
80-63



LIGHTING CONTACTOR CONTROL SCHEMATIC

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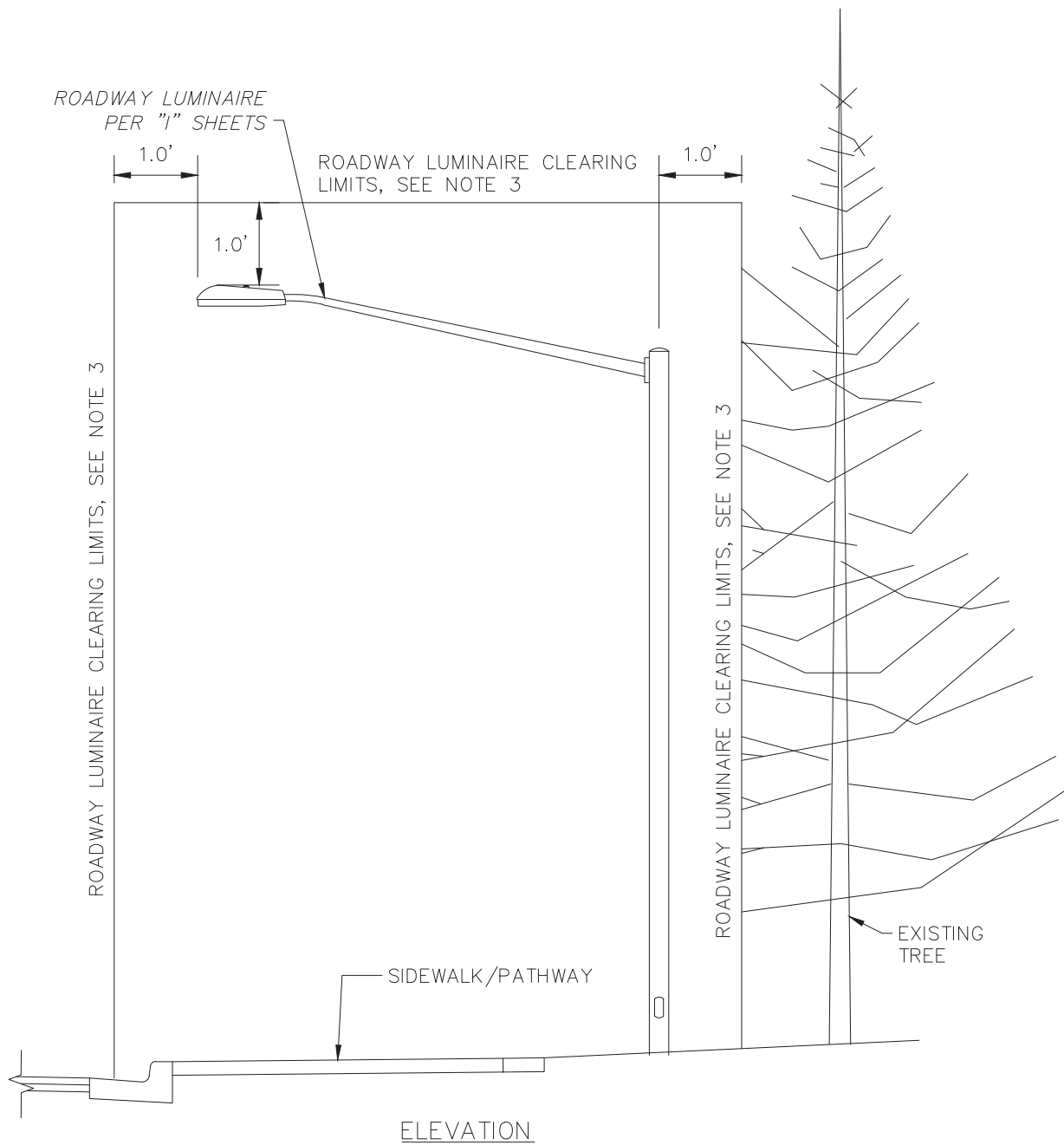
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# ILLUMINATION CONTROL, PHOTOCELL

SECTION #  
80.14

DETAIL #  
80-64



NOTES:

1. ROADWAY LUMINAIRE CLEARING SHALL BE INCIDENTAL TO SECTION 20.04 CLEARING AND GRUBBING PAY ITEM AND NO SEPARATE PAYMENT SHALL BE MADE.
2. MAINTAIN CLEARING LIMITS WITHIN AVAILABLE RIGHT-OF-WAY OR TCP.
3. ROADWAY LUMINAIRE CLEARING LIMITS SHALL INCLUDE 20 FEET UP STATION AND DOWN STATION ALONG THE ROADWAY.
4. ALL CLEARING ACTIVITIES SHALL BE PERFORMED BY AN ISA CERTIFIED ARBORIST AND FOLLOW ANSI A300, PART 1, STANDARD PRACTICES AND ANSI Z133.1, ARBORICULTURAL OPERATIONS SAFETY.

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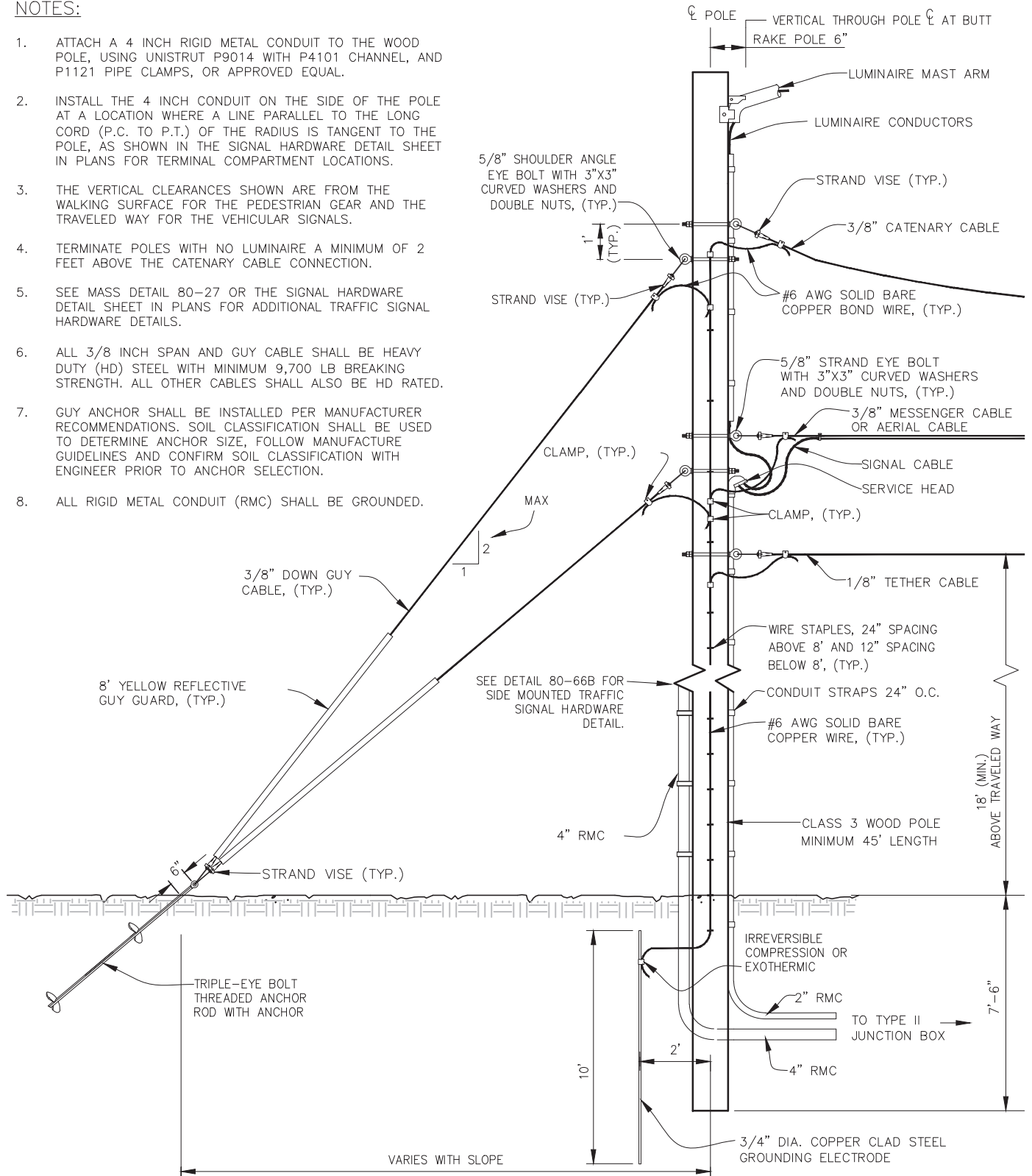
# ROADWAY LUMINAIRE CLEARING DETAIL

SECTION #  
N/A  
 DETAIL #  
80-65



**NOTES:**

1. ATTACH A 4 INCH RIGID METAL CONDUIT TO THE WOOD POLE, USING UNISTRUT P9014 WITH P4101 CHANNEL, AND P1121 PIPE CLAMPS, OR APPROVED EQUAL.
2. INSTALL THE 4 INCH CONDUIT ON THE SIDE OF THE POLE AT A LOCATION WHERE A LINE PARALLEL TO THE LONG CORD (P.C. TO P.T.) OF THE RADIUS IS TANGENT TO THE POLE, AS SHOWN IN THE SIGNAL HARDWARE DETAIL SHEET IN PLANS FOR TERMINAL COMPARTMENT LOCATIONS.
3. THE VERTICAL CLEARANCES SHOWN ARE FROM THE WALKING SURFACE FOR THE PEDESTRIAN GEAR AND THE TRAVELED WAY FOR THE VEHICULAR SIGNALS.
4. TERMINATE POLES WITH NO LUMINAIRE A MINIMUM OF 2 FEET ABOVE THE CATENARY CABLE CONNECTION.
5. SEE MASS DETAIL 80-27 OR THE SIGNAL HARDWARE DETAIL SHEET IN PLANS FOR ADDITIONAL TRAFFIC SIGNAL HARDWARE DETAILS.
6. ALL 3/8 INCH SPAN AND GUY CABLE SHALL BE HEAVY DUTY (HD) STEEL WITH MINIMUM 9,700 LB BREAKING STRENGTH. ALL OTHER CABLES SHALL ALSO BE HD RATED.
7. GUY ANCHOR SHALL BE INSTALLED PER MANUFACTURER RECOMMENDATIONS. SOIL CLASSIFICATION SHALL BE USED TO DETERMINE ANCHOR SIZE, FOLLOW MANUFACTURE GUIDELINES AND CONFIRM SOIL CLASSIFICATION WITH ENGINEER PRIOR TO ANCHOR SELECTION.
8. ALL RIGID METAL CONDUIT (RMC) SHALL BE GROUNDED.



**WOOD TRAFFIC POLE DETAIL**  
 NTS  
 (SINGLE SPAN ATTACHMENT SHOWN)

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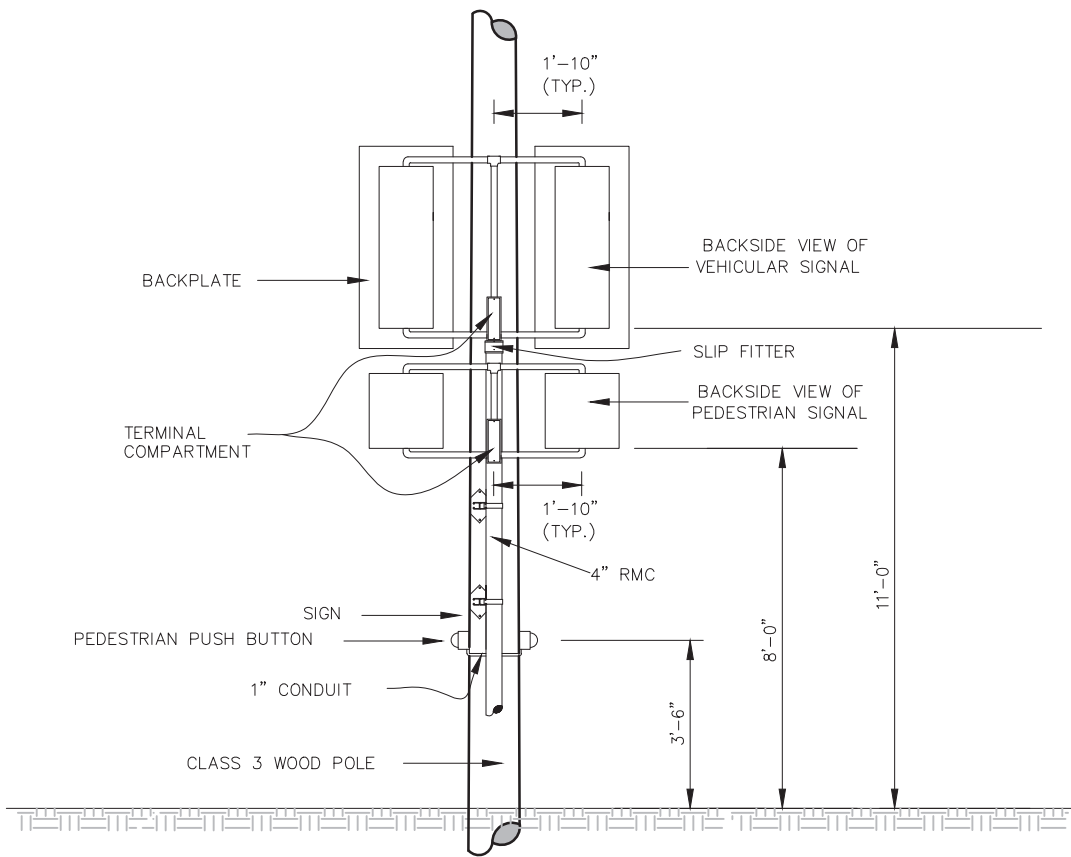
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 2/24

**TEMPORARY WOOD SIGNAL  
 POLE DETAILS  
 (UNDERGROUND SERVICE)**

SECTION #  
 80.19  
 DETAIL #  
 80-66A

NOTES:

1. ATTACH A 4 INCH RIGID METAL CONDUIT TO THE WOOD POLE, USING UNISTRUT P9014 WITH P4101 CHANNEL, AND P1121 PIPE CLAMPS, OR APPROVED EQUAL.
2. INSTALL THE 4 INCH CONDUIT ON THE SIDE OF THE POLE AT A LOCATION WHERE A LINE PARALLEL TO THE LONG CORD (P.C. TO P.T.) OF THE RADIUS IS TANGENT TO THE POLE, AS SHOWN IN THE SIGNAL HARDWARE DETAIL SHEET IN PLANS FOR TERMINAL COMPARTMENT LOCATIONS.
3. USE POST TOP SIGNAL FRAMES WITH TERMINAL COMPARTMENTS TO INSTALL THE VEHICULAR SIGNAL HEADS ON TOP OF THE 4 INCH CONDUIT.
4. USE SIDE MOUNTED SIGNAL FRAMES WITH TERMINAL COMPARTMENTS TO INSTALL THE PEDESTRIAN SIGNAL HEADS ON THE 4 INCH CONDUIT.
5. THE VERTICAL CLEARANCES SHOWN ARE FROM THE WALKING SURFACE FOR THE PEDESTRIAN GEAR AND THE TRAVELED WAY FOR THE VEHICULAR SIGNALS.
6. SEE MASS DETAIL 80-27 OR THE SIGNAL HARDWARE DETAIL SHEET IN PLANS FOR ADDITIONAL TRAFFIC SIGNAL HARDWARE DETAILS.
7. ALL RIGID METAL CONDUIT (RMC) SHALL BE GROUNDED.



SIDE MOUNTED TRAFFIC SIGNAL HARDWARE

NTS

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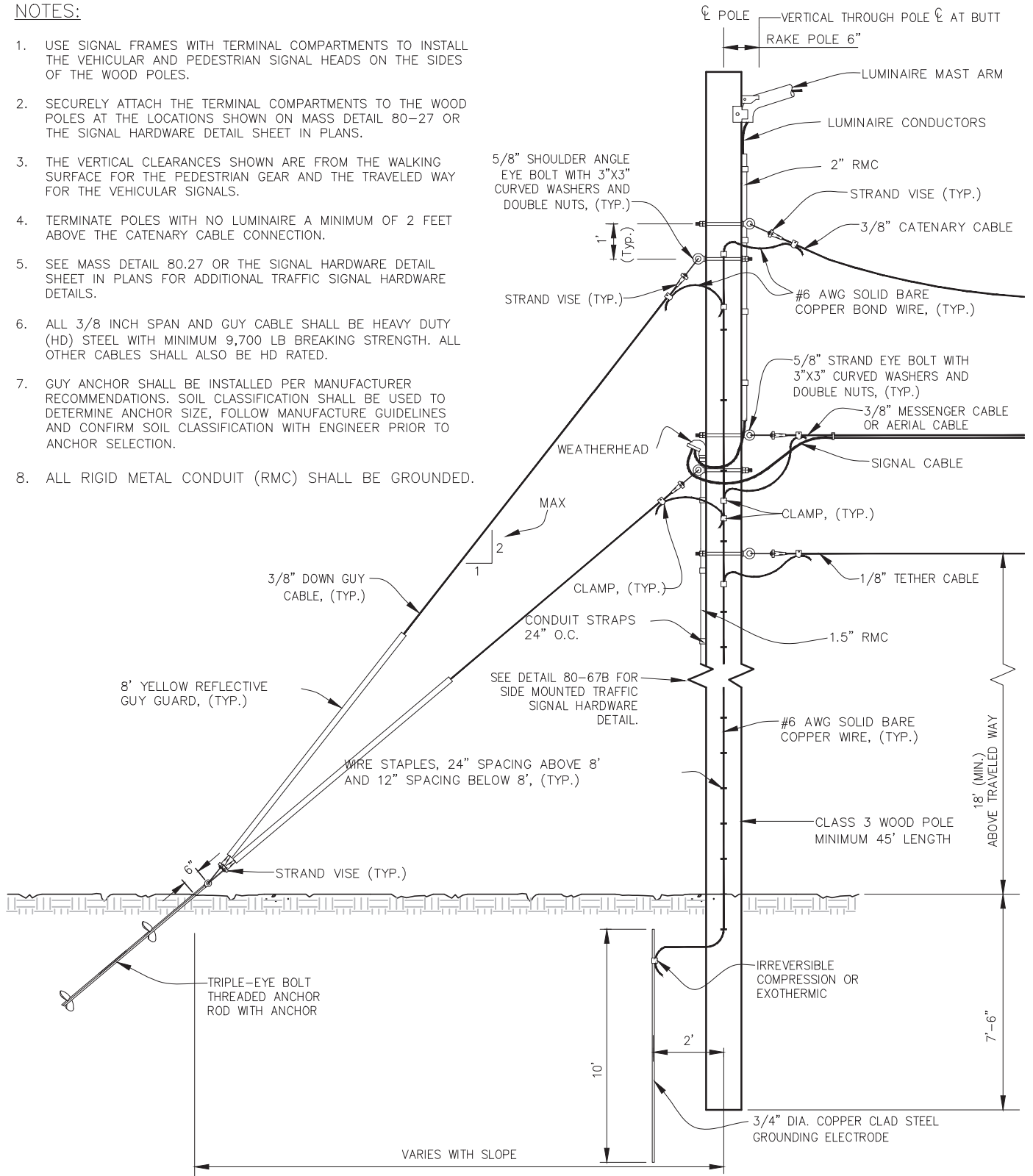
# TEMPORARY SIDE MOUNTED TRAFFIC SIGNAL HARDWARE (UNDERGROUND SERVICE)

SECTION #  
80.19

DETAIL #  
80-66B

**NOTES:**

1. USE SIGNAL FRAMES WITH TERMINAL COMPARTMENTS TO INSTALL THE VEHICULAR AND PEDESTRIAN SIGNAL HEADS ON THE SIDES OF THE WOOD POLES.
2. SECURELY ATTACH THE TERMINAL COMPARTMENTS TO THE WOOD POLES AT THE LOCATIONS SHOWN ON MASS DETAIL 80-27 OR THE SIGNAL HARDWARE DETAIL SHEET IN PLANS.
3. THE VERTICAL CLEARANCES SHOWN ARE FROM THE WALKING SURFACE FOR THE PEDESTRIAN GEAR AND THE TRAVELED WAY FOR THE VEHICULAR SIGNALS.
4. TERMINATE POLES WITH NO LUMINAIRE A MINIMUM OF 2 FEET ABOVE THE CATENARY CABLE CONNECTION.
5. SEE MASS DETAIL 80.27 OR THE SIGNAL HARDWARE DETAIL SHEET IN PLANS FOR ADDITIONAL TRAFFIC SIGNAL HARDWARE DETAILS.
6. ALL 3/8 INCH SPAN AND GUY CABLE SHALL BE HEAVY DUTY (HD) STEEL WITH MINIMUM 9,700 LB BREAKING STRENGTH. ALL OTHER CABLES SHALL ALSO BE HD RATED.
7. GUY ANCHOR SHALL BE INSTALLED PER MANUFACTURER RECOMMENDATIONS. SOIL CLASSIFICATION SHALL BE USED TO DETERMINE ANCHOR SIZE, FOLLOW MANUFACTURE GUIDELINES AND CONFIRM SOIL CLASSIFICATION WITH ENGINEER PRIOR TO ANCHOR SELECTION.
8. ALL RIGID METAL CONDUIT (RMC) SHALL BE GROUNDED.



**WOOD TRAFFIC POLE DETAIL**  
 NTS  
 (SINGLE SPAN ATTACHMENT SHOWN)

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY  
  
 OF ANCHORAGE

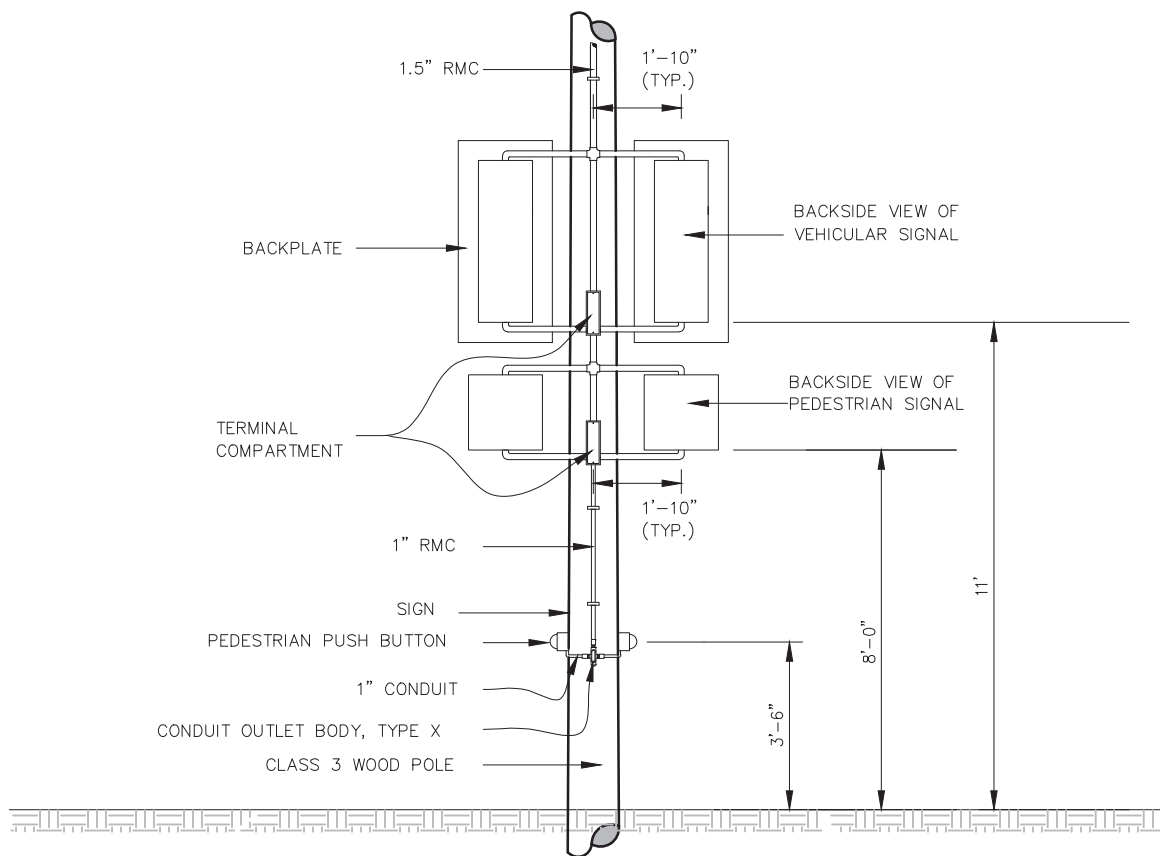
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 APPROVED:  
 REVISED:  
 2/24

**TEMPORARY WOOD  
 SIGNAL POLE DETAILS  
 (OVERHEAD SERVICE)**

SECTION #  
 80.19  
 DETAIL #  
 80-67A

NOTES:

1. USE SIGNAL FRAMES WITH TERMINAL COMPARTMENTS TO INSTALL THE VEHICULAR AND PEDESTRIAN SIGNAL HEADS ON THE SIDES OF THE WOOD POLES.
2. SECURELY ATTACH THE TERMINAL COMPARTMENTS TO THE WOOD POLES AT THE LOCATIONS SHOWN ON MASS DETAIL 80-27 OR THE SIGNAL HARDWARE DETAIL SHEET IN PLANS.
3. THE VERTICAL CLEARANCES SHOWN ARE FROM THE WALKING SURFACE FOR THE PEDESTRIAN GEAR AND THE TRAVELED WAY FOR THE VEHICULAR SIGNALS.
4. SEE MASS DETAIL 80.27 OR THE SIGNAL HARDWARE DETAIL SHEET IN PLANS FOR ADDITIONAL TRAFFIC SIGNAL HARDWARE DETAILS.
5. ALL RIGID METAL CONDUIT (RMC) SHALL BE GROUNDED.



SIDE MOUNTED TRAFFIC SIGNAL HARDWARE  
NTS

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY  
  
 OF ANCHORAGE

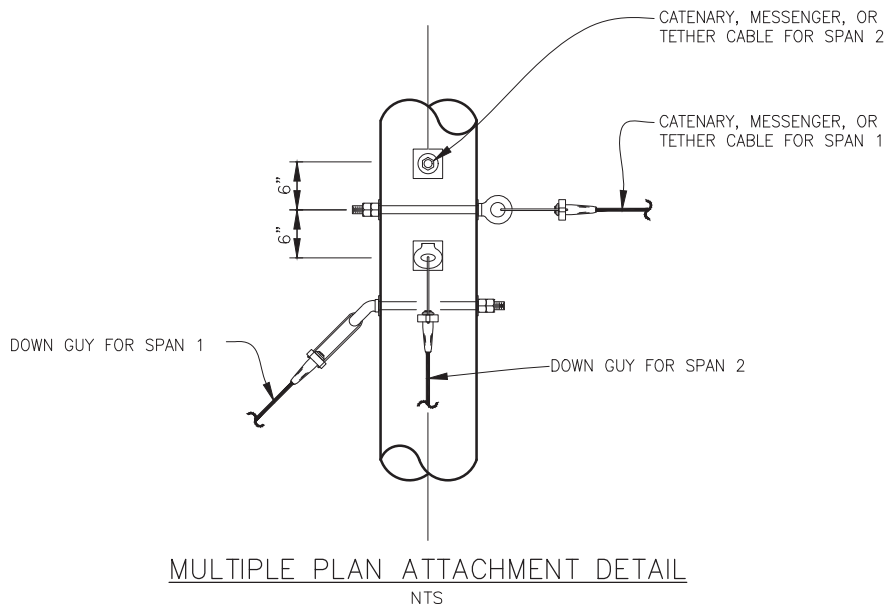
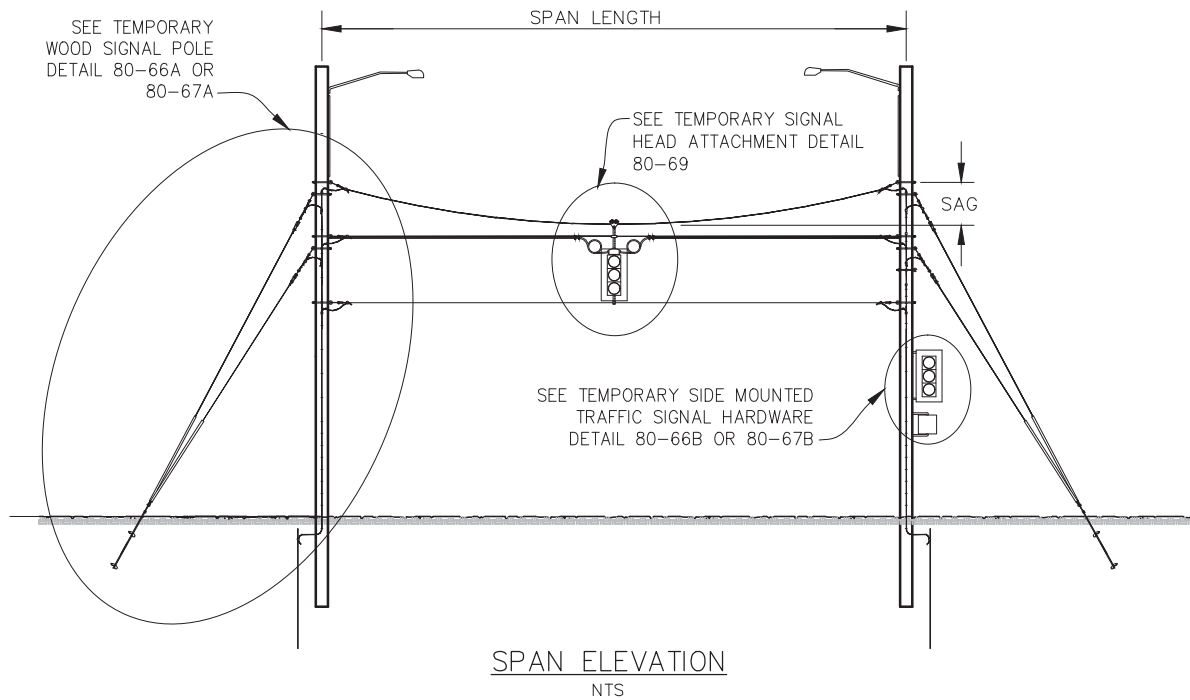
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 REVISED:  
2/24

# TEMPORARY SIDE MOUNTED TRAFFIC SIGNAL HARDWARE (OVERHEAD SERVICE)

SECTION #  
80.19  
 DETAIL #  
80-67B

NOTES:

1. SAG=4% TO 5% OF SPAN LENGTH.



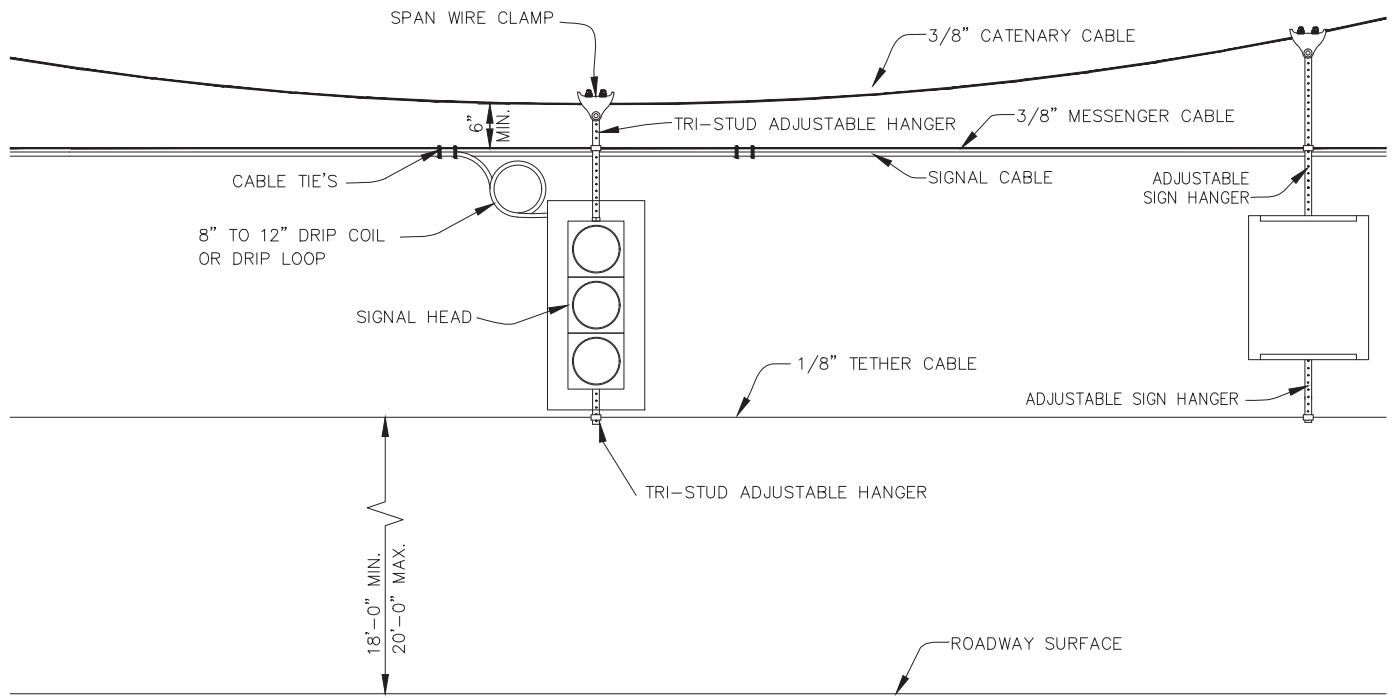
REVISION: 2024 M.A.S.S. UPDATE



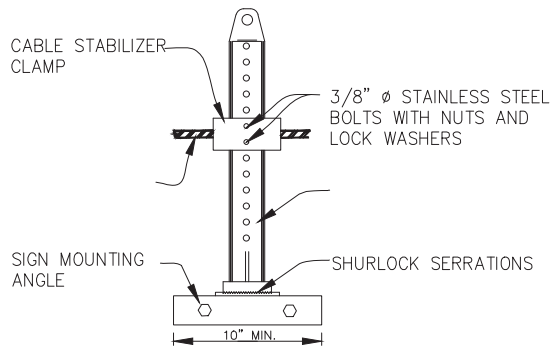
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APPROVED:  
REVISED:  
2/24

**TEMPORARY TRAFFIC SIGNAL  
SPAN WIRE DETAILS**

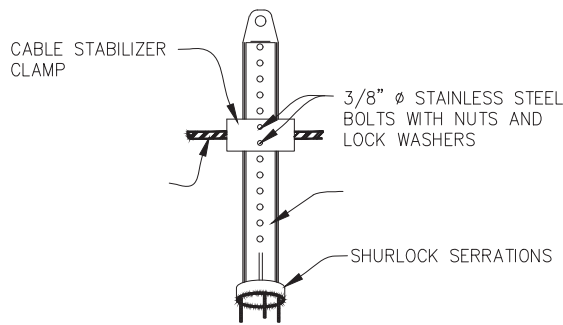
SECTION #  
80.19  
DETAIL #  
80-68



SIGNAL HEAD AND SIGN ATTACHMENT DETAIL  
NTS



ADJUSTABLE HANGER FOR SIGN MOUNTING  
NTS



TRI-STUD ADJUSTABLE HANGER  
NTS

NOTES:

1. ATTACH ADJUSTABLE HANGERS TO THE MESSENGER AND TETHER CABLES WITH CABLE STABILIZER CLAMPS.
2. ATTACH SIGNAL CABLES TO MESSENGER CABLE EVERY 1' USING 3M HEAVY DUTY BLACK CABLE TIES OR APPROVED EQUAL. CABLE TIES SHALL BE WEATHER RESISTANT BLACK NYLON GREATER THAN 0.065" THICK, HAVE A TENSILE STRENGTH GREATER THAN 110LBS, AND HAVE A TEMPERATURE RANGE BETTER THAN -35°F TO 180°F. USE TWO TIES BEFORE/AFTER DRIP LOOPS. CABLE TIES SHALL BE ATTACHED "SNUG TIGHT", DO NOT OVER TIGHTEN.
3. INSTALL SIGNS SO THAT THE BOTTOM EDGES ARE AT APPROXIMATELY THE SAME ELEVATION.
4. SAG=4% TO 5% OF SPAN LENGTH.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

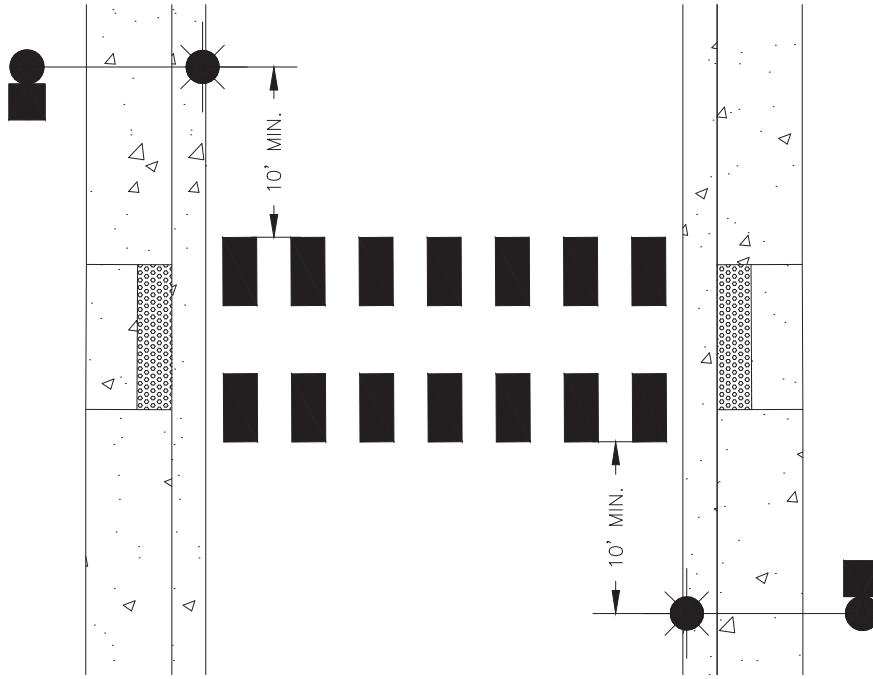
APPROVED:

REVISED:  
2/24

# TEMPORARY SIGNAL HEAD ATTACHMENT DETAILS

SECTION #  
80.19

DETAIL #  
80-69



**MIDBLOCK CROSSWALK LUMINAIRE LAYOUT**  
NTS

RECOMMENDED MIDBLOCK CROSSWALK VERTICAL ILLUMINANCE	
PEDESTRIAN CONFLICT AREA	AVERAGE VERTICAL ILLUMINANCE (FC)*
HIGH	3.7
MEDIUM	2.8
LOW	1.9

\*PER ANSI/IES RP-8-22

NOTES:

1. PLACE LUMINAIRES IN ADVANCE OF THE CROSSWALK ON EACH SIDE OF THE ROAD TO PROVIDE POSITIVE CONTRAST LIGHTING TO ONCOMING TRAFFIC AS SHOWN ABOVE.
2. SELECT LUMEN OUTPUT, DISTRIBUTION AND THE LOCATIONS OF THE LUMINAIRES ON EITHER SIDE OF THE CROSSWALK TO MEET MINIMUM AVERAGE VERTICAL ILLUMINANCE SHOWN IN THE TABLE ABOVE.
3. ILLUMINATE THE ROADWAY AND PEDESTRIAN FACILITIES ON EITHER SIDE OF THE CROSSWALK PER THE REQUIREMENTS OF CHAPTER 5 OF THE PM&E DESIGN CRITERIA MANUAL.

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MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
N.T.S.  
 APPROVED:  
 REVISED:  
2/24

**MIDBLOCK CROSSWALK  
LUMINAIRE LAYOUT**

SECTION #  
80.23  
 DETAIL #  
80-70





**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 85  
TRAFFIC CONTROL DEVICES**



**STANDARD CONSTRUCTION SPECIFICATIONS  
TRAFFIC CONTROL DEVICES  
DIVISION 85  
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**STANDARD CONSTRUCTION SPECIFICATIONS  
TRAFFIC CONTROL DEVICES  
DIVISION 85**

**SECTION 85.01 GENERAL**

**Article 1.1 Scope of Work**

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, materials, transportation, handling and storage, and performing all operations in connection with traffic control devices as provided in this Division.

**Article 1.2 Applicable Standards**

The latest revision of the following standards of the American Society for Testing and Materials (ASTM) and the American Association of State Highway and Transportation Officials (AASHTO) are hereby made a part of these Specifications.

ASTM A1	Specification for Carbon Steel Tee Rails
ASTM A36	Specification for Carbon Structural Steel
ASTM A153	Specification for Zinc-Coated (Hot Dip) on Iron and Steel Hardware
ASTM A307	Specification for Low-Carbon Steel Externally and Internally Threaded Standard Fasteners
ASTM A653	Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM B209	Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B449	Specification for Chromates on Aluminum
ASTM B921	Specification for Non-hexavalent Chromium Conversion Coatings on Aluminum and Aluminum Alloys
ASTM D4956	Specification for Retroreflective Sheeting for Traffic Control
ASTM E303	Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
AASHTO M 133	Specification for Preservatives and Pressure Treatment Processes for Timber
AASHTO M 180	Specification for Corrugated Sheet Steel Beams for Highway Guardrail

## **SECTION 85.02 RESET PARKING METERS**

### **Article 2.1 General**

The Work under this Section consists of performing all operations pertaining to furnishing all equipment, materials, and personnel to remove and reset existing parking meter post assemblies.

### **Article 2.2 Construction**

All posts shall be placed in excavated holes. Depth of embedment shall be as shown on Drawings, unless otherwise directed.

Surplus excavated material shall be disposed of by the Contractor and shall be incidental to this bid item.

All materials and finished parking meter installations are subject to inspection and acceptance in place by the Anchorage Parking Authority. Contact the Anchorage Parking Authority twenty-four (24) hours prior to removal.

### **Article 2.3 Measurement**

Removal and resetting of existing parking meters shall be measured per each parking meter post assembly, reset and accepted in final position. Parking meter and post components damaged or destroyed due to the Contractor's operation shall be replaced by the Contractor at no additional expense to the Owner. One post equipped with two or more parking meters shall be considered a single parking meter assembly.

### **Article 2.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Remove and Reset Parking Meter	Each

## **SECTION 85.03 TRAFFIC MARKINGS**

### **Article 3.1 General**

The Work under this Section shall consist of performing all operations pertaining to furnishing all materials; placing painted and methyl methacrylate traffic markings, anti-skid aggregate, and applying glass spheres thereto; and retroreflective preformed patterned pavement tape traffic markings. Contractor shall provide all Work in accordance with these specifications; at the locations shown on the Drawings; the Manual of Uniform Traffic Control Devices (MUTCD), and the Alaska Traffic Manual.

This work shall include applying markings to curb and median nose at locations shown on the Drawings.

### **Article 3.2 Materials**

#### **A. Paint for Traffic Markings - General Requirements**

1. The Contractor shall furnish the name of the company that will manufacture the paint and the location of the plant from where shipments will be made. No material shall be shipped by the manufacturer until it has been sampled, tested, and approved.
2. Traffic Lane Paint shall conform to the current State Specifications.

#### **B. Anti-Skid Aggregate**

Anti-skid aggregate shall conform to the current State Specifications.

#### **C. Glass Spheres for Reflectorizing Highway Pavement Markings**

Reflective Glass Beads shall conform to the current State Specifications, and shall be supplied with a moisture-resistant coating.

#### **D. Methyl Methacrylate Pavement Markings**

1. General Requirements:
  - a. Contractor shall furnish Methyl methacrylate traffic markings which are manufactured and formulated from new material and are free from defects and imperfections that might adversely affect the serviceability of the finished product. Contractor shall furnish Traffic markings free from dirt and other foreign material such as, but not limited to, surface oils or existing road marking material, and shall cure to a tough serviceable film within the time specified by the manufacturer.
  - b. Methyl methacrylate traffic markings which are a spray-applied, ambient temperature curing, 2-component system for application on either asphalt or cement concrete surfaces. Traffic markings shall be composed of a Part "A" methyl methacrylate based resin and Part "B" benzoyl peroxide in liquid plasticizer. The mix ratio shall be four (4) parts of "A" to one (1) part of "B."
  - c. Methyl methacrylate traffic markings for extruded application shall be formulated with factory intermixed beads and anti-skid aggregate, and application of additional surface beads.





path of the test line laid without glass spheres, place a weighted sheet of aluminum foil eighteen by eleven inches (18" x 11"), thumbtacked to a three-quarter inch (3/4") plywood board. Immediately after the motorized striper (spraying a four inch (4") strip along the eighteen inch (18") dimension of aluminum foil) passes over the aluminum foil, quickly roll it up, slip an elastic band over the roll, and weigh it to the nearest 0.1 gram within thirty (30) seconds from the net weight of paint on the foil and the weight per gallon of the sample, calculate the film thickness using the following formula:

$$\begin{aligned} \text{Film thickness, in} &= \frac{A \times 231}{453.6 \times 18 \times 4 \times B} && \text{Where: } A = \text{Weight of paint} \\ & && \text{on foil in grams.} \\ &= \frac{A \times 0.007073}{B} && B = \text{Weight per gallon} \\ & && \text{of sample in pounds.} \end{aligned}$$

- c. Curb markings shall be defined as colored markings on the curb that denote parking restrictions. Marking material shall be applied to the top and face of curb, but not to the gutter.

## 2. Glass Beads

Glass beads shall be applied over the wet painted stripes in a uniform pattern at the rate of five pounds (5 lbs) of glass beads per gallon of paint. The bead dispensers shall be of a type that will mechanically and automatically give such performance. Glass beads shall be applied to all painted traffic markings by the drop-on method.

## 3. Methyl Methacrylate

- a. Contractor shall prepare the roadway areas to receive the methyl methacrylate pavement markings in accordance with this Section and the manufacturer's recommendations. Contractor shall submit a current copy of manufacturer's recommendations at least 5 working days prior to application of traffic markings.
- b. Contractor shall apply methyl methacrylate pavement markings as identified in the Contract Documents. The thickness is measured without glass beads.
- c. Contractor shall provide a manufacturer's representative to be present on the first day of striping for each type (sprayed or extruded) and additional days as required by the Engineer.
- d. Contractor shall not apply striping to new asphalt/P.C.C. until the asphalt/P.C.C. has cured to the satisfaction of manufacturer's representative or the Engineer.
- e. The minimum application rate of beading on sprayed markings is twenty pounds (20 lbs) of beads per gallon and twelve pounds (12 lbs) of beads per one hundred (100) square feet for extruded markings.
- f. During marking material application, anti-skid aggregate will be evenly distributed and visible throughout the top 20 mils of the marking material mixture, and after the application, in the surface of the cured material.

- g. The surface temperature of the roadway shall be in the range of 30° to 105° Fahrenheit for stripe application. Contractor shall thoroughly clean and dry the roadway surface.
- h. Contractor shall apply methyl methacrylate stripe material with equipment designed and capable of properly mixing at the point and time of application in accordance with the manufacturer's recommendations.

#### G. Pavement Marking Removal

Pavement markings shall be removed to the fullest extent possible from the pavement by any method that does not materially damage the surface or texture of the pavement or surfacing. Sand or other material deposited on the pavement as a result of removing traffic stripes and markings shall be removed as the Work progresses. Accumulations of sand or other material which might interfere with drainage or might constitute a hazard to traffic are not permitted.

Pavement markings no longer applicable which may create confusion in the minds of motorists shall be removed or obliterated before any change is made in the traffic pattern. Painting over markings is prohibited.

When the removal of any portion of a crosswalk marking is required, the entire crosswalk marking for the full width of the roadway shall be removed and replaced with the same material and depth identified in the drawings.

Pavement markings shall be removed by such methods that will cause the least possible damage to the pavement or surfacing. Any damage to the pavement or surfacing caused by pavement marking removal shall be repaired by the Contractor at their expense by acceptable methods.

Where blast cleaning is used for the removal of pavement markings or for removal of objectionable material, and such removal operation is being performed within ten feet (10') of a lane occupied by public traffic, the residue, including dust shall be removed immediately after contact between the sand and the surface being treated. Such removal shall be by a vacuum attachment operating concurrently with the blast cleaning operation, or by other approved methods.

#### H. Preliminary Spotting

The Contractor will provide the necessary pavement marking control points at 50 foot intervals and all changes of direction or changes in basic configuration. These points shall be used in preliminary spotting of lines before striping is commenced. The Contractor shall be responsible for preliminary spotting of pavement markings and must obtain approval from the Engineer before work on permanent pavement markings may begin. Examples of pavement markings subject to spotting include, but are not limited to, longitudinal lines, crosswalks, stop bars, symbols, and letters.

#### I. Inlaid Protected Markings

Apply with certified extrusion equipment. Grind the slot to the depth indicated in the Contract Documents and the dimensions specified, using a grinder capable of grinding the slot to the specified depth and width in a single pass. After grinding, obtain approval before placing marking material.

Dispose of asphalt grinding according to applicable federal, state, and local regulations.

Thickness of Inlaid Marking Material. Fill inlay area completely from the bottom of the inlay to the surface of the pavement. Do not overfill the slots.

Install markings in the same work shift as the grooving operation. Markings will be measured flush with the pavement surface, unless otherwise approved by the Project Inspector and Traffic Engineer.

#### J. Tolerances of Lane Striping

The Contractor shall keep their work within the following allowable tolerances:

1. Length of Stripe. The longitudinal error within a forty foot (40') length of lane line shall not be more than plus or minus six inches ( $\pm 6''$ ).
2. Width of Stripe. The width of stripe shall not vary more than plus or minus one-half inch ( $\pm 1/2''$ ).
3. Lane Width. The width of lanes shall not vary more than plus or minus four inches ( $\pm 4''$ ) from the widths shown on the Drawings, measured from the edge of pavement or edge of traveled way to center of lane line or between the centers of adjacent lane lines.
4. Stripes on Tangents. Stripes on tangents shall not vary more than plus or minus one inch (1'') laterally within a distance of one hundred feet (100') when using the edge of the stripe as reference.
5. Stripes on Curves. Stripes on curves shall be uniform in alignment with no apparent deviations from the true curvature.
6. All Stripes. All stripes shall remain within four inches (4'') from the planed alignment when measured to the center of the stripe.
7. Depth of Inlay Slot. Depth of material shall be measured from the peaks created by the grooves to the visible surface of the markings. Minimum depth shall be as identified in the Contract Documents with a nominal variation not to exceed forty (40) mils.

Traffic markings not within the above tolerances will be considered unacceptable under this Section and shall be replaced by the Contractor at no additional cost to the Municipality.

### **Article 3.4 Measurement**

Traffic markings shall be measured by linear foot of traffic marking of the specified width and color complete in place and accepted. Traffic markings consisting of words, symbols, and curb nose markings shall be paid per item complete in place and accepted.

Removal of traffic stripes and pavement markings as well as repair of any damaged pavement or surfacing caused by the pavement marking removal operations shall be incidental to other items of Work.

Payment for traffic markings is full compensation for preparing and cleaning of pavement, application of painted traffic markings, applying anti-skid aggregate, and

applying glass beads or spheres thereto, furnishing paint, anti-skid aggregate, glass beads, and all other material and equipment necessary to complete the Work described in this Section.

**Article 3.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Traffic Markings (Type) (width)	Linear Foot
Traffic Markings (Type) (words & symbols)	Each
Inlaid Traffic Markings (Type) (width) (depth)	Linear Foot
Inlaid Traffic Markings (Type) (words & symbols) (depth)	Each
Curb Markings (Type)	Linear Foot
Curb Nose Markings (Type)	Each

## **SECTION 85.04 STANDARD SIGNS**

### **Article 4.1 General**

This Work shall consist of furnishing and installing signs, guide markers, object markers and mileposts. The sign location and type of installation will be as shown on the Drawings or as directed by the Engineer. Work under this Section shall also include removal and relocation, as well as removal and disposal of existing signs, mileposts, and markers. Work under this Section shall also include removal and resetting of sign post assemblies to original location or as directed by the Engineer.

### **Article 4.2 Materials**

Fabricate all standard regulatory, warning, and guide signs for permanent installation with Type XI reflective sheetings that conform to ASTM D4956 and single-span aluminum panel substrates, unless designated otherwise on the Drawings.

All orange construction and maintenance signs shall be fabricated with Type XI (encapsulated lens) reflective sheeting.

All new standard signs for permanent installation shall be of new materials. All sign layouts shall be in accordance with "Alaska Sign Design Specifications." Any sign delivered or installed which does not conform to these specifications shall be replaced by the Contractor at no additional cost to the Municipality.

Concrete for sign post foundations shall conform to Class B-3 per Division 30, Section 30.01, Article 1.4 - Mix.

In the following specifications, a sign's height and width refers to an installed sign's vertical and horizontal dimensions, respectively, and to the length of the sides for diamond shaped signs.

#### **A. Aluminum Sheet**

Contractor shall provide sheet aluminum sign panels in one of the following alloys: 6061-T6, 5052-H36, or 5052-H38 that conform to ASTM B209. The thickness of the aluminum sheet shall be 0.125 inches unless otherwise specified. Alloy and temper designations shall be verified by mill certification.

Treat the aluminum base metal sheets with a conversion coating for aluminum conforming to ASTM B921 or ASTM B449, Class 2 standards. The cleaned and coated base metal shall be handled only by mechanical device or by operators wearing clean cotton or rubber gloves. After the cleaning and coating operation, the panels shall be protected at all times from contact or exposure to greases, oils, dust, or other contaminants.

Use single piece sign panels for all signs up to 48 inches by 72 inches. For signs with one or both dimensions larger than the base 48 inch by 72 inch sign panel, assemble multiple single-piece sign panels according to the following:

Use single piece sign panels for all signs 72 inches or less in the horizontal direction. For larger signs, assemble multiple piece sign panels with vertical seams only. Horizontal seams are only permitted when the height of the panel exceeds 72 inches.

## B. Sheet Reflective Materials

Use reflective sheetings that are part of a matched component system made by a single manufacturer. The system shall include the sheetings, process colors, clear coatings, sealants, electronically cuttable films, protective overlay films, and recommended application equipment.

The sheetings shall also pass all performance requirements specified in ASTM D4956 for type XI reflective sheetings, when tested according to the methods specified therein, including the supplementary fungus resistance requirement.

The sheeting manufacturer shall furnish third party test results that verify their sheeting materials meet all performance requirements of ASTM D4956. If the results of the accelerated outdoor weathering test are not yet available, furnish the results of the supplementary artificially accelerated weathering test and provide the date the regular test results will be available.

Furnish reflective sheetings with a class 1 adhesive backing that meets the requirements of ASTM D4956.

Fabricate signs according to the manufacturer's written recommendations, using the process colors, coatings, sealants, and films made by the manufacturer of the reflective sheetings, and the application equipment recommended by the sheeting manufacturer.

Apply the reflective sheetings with no splices to those aluminum panels that can be oriented to fit on a rectangle with the smaller dimension equal to or less than forty-eight inches (48"). For all other sign panels, apply the reflective sheetings to form butt splices oriented to most efficiently utilize the sheeting material, except no splices are allowed within two inches (2") of the edge of a sign and in the length of reflective sheetings.

When making the butt splices, match the adjacent pieces as recommended by the manufacturer to assure uniform day color and night appearance. Provide a gap up to one-sixteenth inch (1/16") wide between the pieces of reflective sheeting.

Use single piece reflective sheeting on sign panels 48 inches or less in height or width. For larger signs, butt splicing of reflective sheeting is permitted except that splices are not permitted within two inches of the edge of the sign panel.

## C. Letters, Numerals, Arrows, Symbols, Border

Letters, numerals, arrows, symbols, border, and other features of the sign messages shall be of the type, size, and series as specified by the Alaska Traffic Manual, the Anchorage Traffic Manual Addendum, or the Alaska Sign Design Specifications.

Completed letters, numerals, and other units shall be formed to provide continuous stroke width with smooth edges and shall present a flat surface free of warp, blisters, wrinkles, burrs, and splinters.

Fabricate the legend on signs using one of the following processes. For signs fabricated using the two screened processes, apply a clear coat over the entire face of each sign using a manufacturer recommended product.

For signs with a black legend, apply opaque black ink to form the legend on the reflective sheeting using the silk screened process.

For signs with a white legend on a colored background, apply transparent ink to all areas of the white reflective sheeting, except the legend, to form the background using the reverse silk screened process.

Apply electronically cut colored films that include adhesive to the reflective sheeting, similar to 1 and 2.

Cut the legends from the requisite color of type XI reflective sheetings and apply them to the reflective sheeting. Orient all elements of the legend in the same direction on the reflective sheeting before cutting them out.

#### D. Frames

All rectangular signs, over forty-eight inches (48") measured along the horizontal axis, and all diamond shape signs with a long edge forty-eight inches (48") or larger shall be framed unless otherwise specified. The frames shall be constructed of aluminum as indicated on the Drawings. All framing dimensions shall have a one-eighth inch (1/8") tolerance unless otherwise specified. The frame shall be affixed to the sign with three-sixteenth inch (3/16") diameter aluminum rivets. The maximum rivet spacing shall be twelve inches (12") on centers. No rivets shall be placed closer than three-eighths inch (3/8") from the edge of the aluminum face sheet.

Use framing members made from aluminum alloy 6061-T6. All joints of the aluminum frame may be welded with an inert gas shielded - arc welding process using 4043 electrode filling wire in accordance with good shop practice. The width of the fillet shall be equal to the wall thickness of the smallest framing member being welded.

#### E. Test Procedures and Inspections

##### 1. Adherence

The test panel, after a 72-hour curing time, shall be immersed in 95°F. +3° water for a period of 24 hours. Immediately after removal from the bath, the reflective sheeting shall be sufficiently bonded so that it cannot be readily removed from the aluminum surface with a one inch (1") round nose spatula. If the sheeting can be peeled rather than chipped from the surface, the bond is considered unsatisfactory.

##### 2. Solvent Resistance

Test shall be in accordance with Federal Specification L-S300B 4.3.6

##### 3. Accelerated Weathering

Test shall be in accordance with Federal Specification L-S 300B 4.3.9.

##### 4. Resistance to Heat, Cold, and Humidity

Test shall be in accordance with Federal Specification L-S-300B 4.3.10.

##### 5. Tensile Strength and Elongation

Test shall be in accordance with Federal Specification L-S 300B 4.3.15.

## F. Post Materials

Provide sign posts that conform to the following specifications for installing the post mounted signs specified in the Drawings.

Perforated Steel Posts.

1. For sign posts, install perforated steel tubes that conform to ASTM A653. Provide tubes fabricated from 0.105 inch thick (12 U.S. Standard Gauge) sheet steel zinc coated on both sides to minimum coating thickness designation G-90. Furnish tubes formed with square cross sections and sheet steels rolled from structural grade steel with 50 ksi yield strength.
2. All tubes shall be perforated along the centerline of each side for their entire length with seven-sixteenth inch (7/16") diameter holes on one inch (1") centers. All perforations shall be free from burrs.
3. Furnish perforated tubes that are straight and feature a smooth, uniform finish without splices. Consecutive one-quarter inch (1/4") size tubes shall telescope freely for a minimum length of ten feet.
4. Furnish the tube sizes specified in the Drawings in lengths that will provide one-piece sign posts when the signs are installed according to the Standard Details that apply, regardless of ground cross section.

### Article 4.3 Construction

All sign post foundations shall be cast in excavated holes. Depth of embedment shall be as shown on the Standard Details unless otherwise directed by the Engineer.

Contractor shall dispose of surplus excavated material in accordance with Division 10, Section 10.04, Article 4.9 - Disposal Sites.

Concrete sign post shall be plumb to the ground after the concrete has fully cured.

Cut each perforated tube to provide the sign mounting-height specified in the Section 85 detail that applies. Adjust each tube length to account for the height of the signs, the difference in elevation between the mounting height reference and the top of the foundation, and the one foot length inserted into the foundation. Remove all burrs from the cut end.

Guide Marker reflectors shall be installed after the posts have been set in place.

Sign panels shall be attached to posts, electroliers, traffic signal standards, bridge rails, piers, and abutments with fastening hardware of the types and sizes shown on the Standard Details. On non-frame mounted signs attached to signal pole mast arms the Contractor shall install two inch (2") diameter wind washers, colored to match the sign face, between the fastener head and the sign. Use rust-resistant washers fabricated from a material equal in strength to the sign blank. All fastening hardware shall be furnished by the Contractor. All signs shall be mounted so that they are level.

Attach a label to the back of all standard signs in the lower right corner. Make the label at least 15 square inches and show the year the sign was installed by the Contractor. Show the last two digits of the year in clear and bold numbers. Make the label from ASTM D4956 Type I or brighter retroreflective sheeting. Use background and legend colors meeting the following table.



<b>YEAR</b>	<b>BACKGROUND COLOR</b>	<b>LEGEND COLOR</b>
XXX1	Yellow	Black
XXX2	Red	White
XXX3	Blue	White
XXX4	Green	White
XXX5	Brown	White
XXX6	Orange	Black
XXX7	Black	White
XXX8	White	Black
XXX9	Purple	White
XXX0	Strong Yellow-Green	Black

*Central Values and tolerance limits for each color, as referenced in the MUTCD, are available from the Federal Highway Administration, (HHS-30), 400 7th St. SW, Washington, D.C. 20590*

Contractor shall prune overhanging limbs and other vegetation to ensure visibility of signs as shown on Standard Detail 85-31. All clearing activities shall be performed by an arborist in accordance with Section 20.05 Clearing.

Removed and relocated existing signs and mile posts shall be placed on a new sign post foundation base and shall conform to the Drawings or as directed by the Engineer.

Sign post foundation bases from removed or salvaged signs shall be removed and the ground restored to match the surrounding area. Restoration is considered incidental to the sign bid item.

Contractor shall salvage and deliver signs, posts, and associated hardware designated on the Drawings for Salvage to the Municipal Traffic Sign Shop, 343-4384. Contractor shall remove sign from post before removal and delivery to the Municipal Traffic Sign Shop. Contractor shall remove the sign(s) and associated hardware without damaging the post or sign face. Contractor shall replace sign components damaged or destroyed due to Contractor's operations at no cost to the Municipality.

Inspection: All materials and finished signs are subject to inspection and acceptance in place. All surfaces exposed to weathering shall be free of any defects in the coating that may impair the serviceability or detract from the general appearance or color match. The finished signs shall be clean and free from all chatter marks, burrs, sharp edges, loose rivets, delaminated reflective sheeting, and aluminum marks. No repairs shall be made to the face sheet. All signs not conforming to these Specifications shall be rejected and shall be replaced by the Contractor at no additional expense to the Municipality.

**Article 4.4 Measurement**

The quantity of Standard Regulatory, Warning, and Guide Signs for permanent installation to be paid for shall be the total square footage of each face of legend bearing sign and panel erected in place, including all posts, bases, and all hardware necessary to install the sign(s) at the designated location. No deductions in quantity for corner rounding shall be made. Nominal dimensions for sign sizes indicated on the Drawings shall be used for the purpose of calculating sign pay quantities.

Clearing for signs shall be incidental to work under this Section unless specifically identified for payment under a separate bid item.

Removal and relocation of existing signs, posts, bases, and all hardware necessary to install the sign at the designated location shall be measured per each sign, completed and accepted in final position. Sign components damaged or destroyed due to the Contractor's operation shall be replaced by the Contractor at no additional expense to the Owner. Object Markers and Guide Markers shall be measured per each, complete in place. One post equipped with two reflectors shall be considered a single marker. One signpost equipped with two or more signs is a single sign assembly.

Salvage of existing signs, posts, bases, and all associated hardware and delivery to the Sign Shop shall be incidental to the Contract unless the bid item "Salvage Sign" is provided in the Bid Proposal.

**Article 4.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment will be made under the following units:

ITEM	UNIT
Standard Sign	Square Foot
Remove and Relocate Signs	Each
Remove and Relocate Mile Posts	Each
Salvage Sign	Each

## **SECTION 85.05 TRAFFIC MAINTENANCE**

### **Article 5.1 General**

The Work under this Section consists of performing all the necessary measures to protect and control traffic during the life of the individual project including, but not limited to, furnishing, erecting, maintaining, replacing, cleaning, moving and removing the traffic control devices, construction signs, portable concrete barriers, safety fences, and flagging required to safeguard the traveling public and all administrative responsibilities necessary to implement this Work.

The Contractor shall maintain all roadways, pedestrian, transit, and bicycle facilities within the project limits, and construct and maintain such approaches, crossings, intersections, and other features as may be necessary throughout the life of the Contract. The Contractor shall also have a powered broom (pick-up sweeper type) and water truck with high-pressure capabilities to clean the paved surfaces and along the haul routes.

A Traffic Control Plan (TCP) is required for this project. The Contractor shall provide a TCP approved by the Traffic Engineer or their designee, and when the project limits include State right-of-way, the Alaska Department of Transportation and Public Facilities (ADOT&PF) Regional Traffic Engineer prior to commencement of this project in accordance with the provisions of Division 10, Section 10.04, Article 4.13 - Traffic Control Plan. The Contractor may submit approved amendments to the TCP prior to commencement of the project. All approvals shall be obtained by the Contractor and shall be considered incidental to the Contract and no separate payment shall be made. When the project limits include state right-of-way, the Contractor shall notify ADOT&PF at least 48 hours before commencing construction.

The Contractor is required to have at least one International Municipal Signal Association (I.M.S.A.) or American Traffic Safety Services Association (A.T.S.S.A.) certified person on the job site during working hours for traffic control and implementation. The person designated will supply the Traffic Engineer with a 24-hour emergency telephone number.

All traffic channelization, detours, lane closures and/or street closures shall conform to the TCP and Division 10, Section 10.04, Article 4.13 - Traffic Control Plan.

### **Article 5.2 Traffic Control Plan**

A TCP is a graphic/text plan that describes traffic control to be used to assist road and non-motorized facility users (drivers, bicyclists, and pedestrians, which include people with disabilities) through a temporary traffic control zone or an incident area. The degree of detail in the TCP depends on the nature and complexity of the project. The TCP may include, but not be limited to, such items as signs, portable concrete barriers, barricades, traffic cones, special signs, warning lights, portable changeable message board signs, flaggers, pilot cars, work zone pavement markings, temporary roadways, and all other items required to direct traffic through or around the construction zone in accordance with these specifications, the Manual on Uniform Traffic Control Devices (MUTCD), published by the US Department of Transportation, the State of Alaska Traffic Manual (ATM), and the Alaska Sign Design Specifications (ASDS). These TCPs shall also address placement of traffic control devices including location, size, mounting

height, and type. The details shown for signs shall include the code designation, size, and legend in accordance with the ATM and the Alaska Sign Design Specifications (ASDS). The TCP shall also indicate the method of safely routing pedestrian and bicycle traffic through or around the construction zone.

If any part of the Contractor's project impacts on-street parking in the Central Business District (the boundaries of which are defined in the Anchorage Municipal Code) from Monday through Saturday, the Contractor must apply for a Parking Meter Hood Contract from EasyPark (or Successor entity). Proof of parking meter rental agreement must be provided to the Traffic Engineer prior to issuance of an approved TCP.

The Contractor shall submit a TCP for the project prepared and signed by a certified traffic control designer. The TCP shall be approved by the Traffic Engineer and, if the Traffic Engineer determines that a state route is affected by the TCP, approved by the State of Alaska, Department of Transportation and Public Facilities Regional Traffic Engineer. The Contractor shall respond and make field changes as the Traffic Engineer directs.

In cases of emergency road closures or excavations, the Contractor may commence work without an approved TCP. All traffic control for the emergency work shall be done in compliance with all applicable federal, state, and municipal rules and regulations. The Contractor shall secure a permit and approved traffic control plan on the next working day after implementation of emergency traffic control.

No Work shall occur within rights-of-way or easements for public streets, highways, or other public improvement projects until the Contractor has implemented an approved TCP for the Work proposed. The number of signs indicated on the TCP is a minimum. If unsafe conditions occur, the Traffic Engineer may require additional signs/devices at no additional cost to the Owner.

### **Article 5.3 Pedestrian Traffic**

The Contractor shall provide pedestrian access in accordance with the requirements of Division 10, Section 10.04, Article 4.10 - Protection of Persons, Property and Environment, and Article 4.12 - Public Convenience and Access, and the current Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG).

The Contractor shall provide and maintain a pedestrian traffic route through and/or around the Project for the duration of the Project or until a permanent pedestrian walkway has been completed. The route shall be signed and delineated such that it is obvious and recognizable to the pedestrian and include proximity actuated audible signs or other non-visual means of conveying information on the signs. The route shall be established in a location within or near the Project limits, at a distance which will help to eliminate interference between pedestrians and construction operations. The location of the route may change throughout the duration of the project, depending on locations of construction operations, and each location shall be approved by the Traffic Engineer. 4-foot high construction orange safety fencing shall be required along the pedestrian route as necessary to separate work zone from the pedestrian route.

## **Article 5.4 Work Site Traffic Supervisor**

The Contractor shall provide a Work Site Traffic Supervisor whom shall be responsible for the Contractor's maintenance of traffic operations on a 24-hour basis. The Work Site Traffic Supervisor shall meet the following minimum requirements:

1. Is currently certified as a Work Site Traffic Supervisor by the American Traffic Safety Services Association (A.T.S.S.A.); or
2. Is currently certified as a Work Zone Traffic Safety Specialist or a Work Zone Safety Specialist by the International Municipal Signal Association (I.M.S.A.); or
3. Is currently certified as a Work Site Traffic Technician by A.T.S.S.A.

If the individual is certified under Items 2 or 3 above, the Contractor shall submit, prior to Work requiring traffic control, documentation that the individual has also obtained:

1. A minimum of 12 months of supervisory level work in Work Site Traffic Control; or
2. One year of having been in responsible charge of such Work. The term "in responsible charge" shall be construed to mean having been in a position of accountability for the selection of devices and for their placement in the traffic control system, or for the continued operation of the system. Having persons that actually perform the labor under one's control would satisfy this requirement. Provide at least one reference, including current address and telephone number, for each project which "in responsible charge" experience is claimed.

The Work Site Traffic Supervisor's duties shall include the following:

1. Understand the requirements of the ATM, the Drawings, and the Specifications.
2. Prepare the TCPs and public notices and coordinate traffic maintenance operations with the Traffic Engineer.
3. Inspect the condition and position of all traffic control devices in use on the Project and ensure that all traffic control devices are in proper working order, clean, visible, and conform to the approved TCP in use. The inspection shall occur daily on smaller projects and more frequently on more complex projects. All devices shall be inspected during hours of darkness so that effectiveness of the device placement can be evaluated and adjustments made, if required, to afford maximum nighttime visibility and delineation. These inspections shall be documented in a bound field book. The field book shall be made available to the Engineer for review on a daily basis and shall become the property of the Engineer upon completion of the Work.
4. Supervise the repair or replacement of damaged or missing traffic control devices.
5. Review and anticipate appropriate traffic maintenance needs and ensure that the proper traffic control devices necessary for safe and efficient traffic movement are available.

6. Hold weekly traffic safety meetings with the superintendents and foremen of the Contractor and subcontractors prior to beginning construction. The Contractor shall provide the Traffic Engineer the opportunity to attend these meetings.

## **Article 5.5 Materials**

Materials for traffic control devices shall conform to the requirements set forth below:

1. Signs. Permanent Construction Signs, Construction Signs, and Special Construction Signs including sign supports shall conform to the requirements of Section 85.04 - Standard Signs, ADOT&PF Standard Specifications for Highway Construction; the ATM; and the Alaska Sign Design Specifications (ASDS).
2. Proximity Actuated Audible Signs. Contractor shall provide proximity actuated audible signs conforming to the requirements of PROWAG for conveying information of alternate pedestrian access routes in advance of decision points to pedestrians with visual disabilities.
3. Portable Sign Supports. Contractor shall provide portable sign supports that are wind resistant with no external ballasting and capable of supporting a forty-eight by forty-eight inch (48" x 48") traffic control sign such that the height of the sign above the adjacent roadway surface conforms to the ATM. The sign support shall support the traffic control sign vertically.
4. Barricades and Vertical Panels. Contractor shall provide barricades and vertical panels that are constructed of wood, metal, or plastic, and conform to the requirements of the ATM. Type III barricades shall have a minimum width of eight feet (8'). Contractor shall equip barricades with warning lights.
5. Warning Lights. Contractor shall provide Type A (low intensity flashing), Type B (high intensity flashing), or Type C (steady burn) warning lights conforming to the requirements of the ATM.
6. Drums. Contractor shall provide plastic drums conforming to the requirements of the ATM.
7. Traffic Cones. Contractor shall provide traffic cones and/or tubular markers conforming to the requirements of the ATM. The minimum height is twenty-eight inches (28"). All cones and tubular markers shall be reflectorized.
8. Portable Changeable Message Board Signs. Contractor shall provide portable, truck- or trailer-mounted, changeable message board signs with a self-contained power supply for the sign that has the following features:
  - a. Message sign panel large enough to display three lines of nine inch (9") high characters.
  - b. Eight-character display per message line.
  - c. Message modules containing at least 36 different preprogrammed messages (three line displays) to be selected by the Traffic Engineer.
  - d. The capacity to create, preview, and display new messages and message sequences.

- e. A waterproof, lockable cover for the controller keyboard.
  - f. An operator's manual, a service manual, and wiring diagram.
  - g. Quick release attachments on display panel cover.
  - h. Variable flash and sequence rates.
  - i. Manual and automatic dimming capability on lamp bulb matrix models.
  - j. Variable mounting height of at least seven feet (7') from the pavement to the bottom of the message sign panel.
  - k. The capacity to operate with a battery pack for two hours under full load.
9. Portable Concrete Barriers. Portable concrete barriers shall conform to the requirements of ADOT&PF Standard Plan G-47. Portable concrete barriers shall be equipped with warning lights.
  10. Work Zone Pavement Markings. Work zone pavement markings shall be either painted with glass beads or preformed marking tape (removable or non-removable).

#### **Article 5.6 Public Notice**

The Work Site Traffic Supervisor shall give notices of changes, delays, or lane/road closures to the following local officials and transportation organizations including, but not necessarily limited to:

1. Alaska Trucking Association
2. Alaska State Troopers
3. Alaska Court System
4. Anchorage Police Department
5. Anchorage Fire Department
6. Local Emergency Medical Services
7. Anchorage Public Transportation
8. ASD Student Transportation
9. U.S. Postal Service
10. Local Schools and Universities
11. MOA Parks and Recreation
12. Local Solid Waste Utilities
13. Alaska Railroad (where applicable)
14. Major Tour Operators

The Contractor shall also provide the Alaska State Troopers, Anchorage Police Department, and Anchorage Fire Department with a list of radio frequencies and cellular telephone numbers used on the project, and the 24-hour telephone numbers of the Work Site Traffic Supervisor and the Project Superintendent. This contact information shall be for alerting the Contractor of emergencies which will require passage of

emergency vehicles through the project. When so notified, the Contractor shall use all equipment and effort necessary to expedite rapid passage.

Contractor shall provide proper notification to residents of impending construction activities for all projects. Contractor shall provide residents with contact name(s) and phone number(s) for Contractor personnel with responsibility to inform and coordinate with residents. The Contractor shall give written notice to the residents of any adjacent property having direct driveway or parking access to the project area, 48 hours in advance of installing curb and gutter, sidewalk, or approach aprons across the driveway, or driveways serving the adjacent property.

Advertisement and/or public notice requirements for closures shall be based on roadway classification in the Official Streets and Highways Plan (OSHP) for the Municipality of Anchorage.

On streets listed as minor arterials and higher, the Contractor shall provide a minimum advertised public notice of seven (7) days in advance of the closure and seventy-two (72) hours of "on site" notice. The notice shall contain the days, times, and locations of the closure. The Contractor shall advertise the closure through the Municipality of Anchorage's construction project and road closure website ([www.anchorageroads.org](http://www.anchorageroads.org)).

On streets listed as collectors, Contractor shall provide a minimum of seventy-two (72) hours of "on site" notice prior to the closure.

No published advertisement is required on other streets.

The published advertisement shall be displayed through the [www.anchorageroads.org](http://www.anchorageroads.org) website. The Contractor shall provide the Traffic Engineer with the Contractor's name, effective dates and times of the closure, and detailed traffic information. The Traffic Department may publish the information electronically on a weekly basis until the completion of the project. The "on site" advertisement shall consist of changeable message boards or similar approved notification to motorists and pedestrians. Contractor shall promptly cancel advertisements after the closure is completed or the traffic control is removed.

## **Article 5.7 Traffic Control Devices**

Prior to the start of construction operations, the Contractor shall erect such permanent and temporary traffic control devices as may be required by the approved Traffic Control Plan (TCP). Traffic control devices shall be operated only when they are needed and only those devices that apply to conditions that exist shall be used. Advisory speeds, when necessary, shall be provided in the TCP and approved by the Traffic Engineer.

Following the completion of Work in a closure area, all traffic control devices relating to the closure shall be removed. Sign panels that are not removed shall be entirely covered with either metal or plywood sheeting.

The Traffic Engineer may require a different TCP specifically for winter shutdowns.

Contractor shall keep clean reflective sheeting on signs, drums, barricades, and other devices. Contractor shall promptly replace any devices with scratches, rips, or tears in the sheeting deemed unacceptable by the Engineer at no additional expense to the Owner.



## **Article 5.8 Authority of the Engineer**

When, in the opinion of the Engineer, conditions are such that the safety and/or convenience of the traveling public are adversely affected, the Engineer will immediately notify the Contractor in writing. The notice will state the defects, the corrective actions required, and the time required to complete such actions. In no case shall this time exceed twenty-four (24) hours. In the event that the Contractor fails to take the corrective actions within the specified time, (a) the Engineer will immediately direct that the offending operations cease until the defects are corrected, and (b) the Engineer reserves the right to order the corrective actions be accomplished by outside forces. The Engineer will deduct the cost of Work by outside forces from any moneys due or that may become due under the terms of this Contract.

## **Article 5.9 Execution**

The Contractor shall maintain traffic control in accordance with the approved Traffic Control Plan (TCP). The Contractor shall submit a new TCP each time traffic control is revised. Approval of each new TCP is required.

The Contractor shall furnish all traffic control devices necessary to fulfill the requirements of this specification, including construction signs, barricades, portable concrete barriers, safety fence, and flaggers. Said traffic control devices are considered incidental to this item. All such devices shall conform to the Alaska Traffic Manual (ATM). Paved road detours and gravel pedestrian detours are also incidental to this item.

The Contractor shall protect and adequately delineate open trenches, ditches, pavement edge drop-offs, and other excavations and hazardous areas with barricades as required by OSHA. Open trenches with drops of two feet (2') or greater adjacent to the roadway shall have portable concrete barriers installed with sloping end(s). All barricades and portable concrete barriers in place at night shall have warning lights installed in accordance with the ATM.

Unless otherwise provided hereinafter, the Contractor shall maintain all roadways open to traffic. Temporary closure of residential, commercial, or street approaches requires prior approval of the Engineer. The Contractor shall provide access through and around the project for emergency vehicles. Contractor shall properly sign and/or flag all locations requiring redirection or stopping of the traveling public.

The Contractor's equipment shall stop at all points of intersection with the traveling public unless satisfactory traffic control measures, approved in writing by the Engineer, are installed and maintained by the Contractor.

Where required on the Drawings, the Contractor shall bypass traffic over a paved detour route. When no longer required, the detour shall be removed and the approaches obliterated. Construction of the detour will be considered incidental to bid item "Traffic Maintenance."

The Contractor shall provide flagger(s) any time operations may affect safety, or as directed by the ATM or the Engineer. Unless approved by the Traffic Engineer on the TCP, flagger(s) are required at all times when one-lane traffic is in effect. All flagging operations shall conform to the procedures outlined in the ATM.

**Article 5.10 Measurement**

All Work in this Section is measured by lump sum and shall consist of all labor, materials, and equipment required to provide the Work Site Traffic Supervisor, all TCPs and TCP revisions, public notices, paved traffic detours, pedestrian and bicycle detours, and all traffic control devices. Work and materials required to provide temporary asphalt surfacing and temporary painted traffic markings shall not be paid separately and shall be considered incidental to the Work described in this Section.

**Article 5.11 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Traffic Maintenance	Lump Sum

## **SECTION 85.06 REMOVE GUARDRAIL**

### **Article 6.1 General**

The Work under this Section consists of providing all operations and furnishing all equipment and materials pertaining to the removal and disposal of guardrail designated for removal on the Drawings or as directed by the Engineer.

### **Article 6.2 Construction**

Contractor shall remove the guardrail, bolts, and supporting posts and deliver them to a location as directed by the Engineer. If guardrail and supporting posts are not salvaged, Contractor shall provide a disposal site for the removed guardrail, bolts, and supporting posts in accordance with the provisions of Division 10, Section 10.04, Article 4.9 - Disposal Sites.

Excavation and backfill required in the removal of the guardrail, bolts, and supporting posts is incidental to the bid item. Contractor shall backfill the excavation with native non organic material.

### **Article 6.3 Measurement**

Removal and salvage or disposal of the guardrail, bolts, and supporting posts is measured per linear foot along the face of the guardrail. Delivery of guardrail and associated components to Engineer-designated location or disposal at Contractor furnished disposal site is incidental to the pay item and no additional payment will be made.

### **Article 6.4 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and will include full payment for all Work as described in this Section.

Payment is made under the following unit:

ITEM	UNIT
Remove Guardrail	Linear Foot

## **SECTION 85.07 GUARDRAIL**

### **Article 7.1 General**

The Work under this Section consists of providing all operations pertaining to the construction of guardrails.

Only one type of material shall be used on any one specific guardrail installation, unless otherwise approved by the Engineer.

### **Article 7.2 Material**

- A. Steel rail elements shall conform to the requirements of AASHTO M 180, Class B, unless a lighter weight rail is specifically called for on the Drawings or in the Specifications. Terminal sections shall not be less than twelve (12) gauge.
- B. The bolts and nuts shall be galvanized steel and shall conform to the requirement of ASTM A153, Class C and ASTM A307.
- C. Guardrail posts shall be of either wood or steel as specified.
  - 1. Wood posts shall be grade posts and timbers, or better, as rated by the West Coast Lumber Inspection Bureau, and shall be fabricated from one of the following timber species, unless otherwise approved: a) Douglas Fir; b) Western Pine; c) Larch, or; d) Hemlock. The length and cross-section of the posts shall be as shown on the Standard Details unless otherwise noted. Timber posts shall be treated with one of the following preservative treatments: a) Pentachlorophenol; b) Creosote Oil; c) Creosote-coal tar solution; or d) Creosote-petroleum solution. Preservative treatments for wood shall conform to the applicable requirements of AASHTO M 133.
  - 2. Steel posts shall be of the section and length as specified or as shown on the Drawings. They shall be of copper bearing steel when so specified. Steel shall conform to the requirements of ASTM A36 for the grade specified, or, for new railroad rail posts, of ASTM A1 for the unit weight of rail specified.

The posts shall be galvanized or shop painted as specified.

### **Article 7.3 Construction**

The construction of guardrails shall be in conformance with the manufacturer's recommendations, the Standard Details, and as directed by the Engineer.

### **Article 7.4 Measurement**

Guardrails will be measured per linear foot along the face of the rail, including end sections.

### **Article 7.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Guardrail (Gauge)	Linear Foot

## **SECTION 85.08 TEMPORARY GROUP MAILBOXES**

### **Article 8.1 General**

The Work under this Section consists of performing all operations pertaining to constructing and maintaining a temporary group of mailboxes for the duration of construction.

### **Article 8.2 Materials**

Contractor shall furnish nails, staples, fastening wires, lumber, and all materials required for construction of the mailboxes.

### **Article 8.3 Construction**

The temporary group mailboxes shall be provided by the Contractor prior to pavement removal. Temporary group mailboxes shall conform to current U.S. Postal Service standards.

### **Article 8.4 Measurement**

Temporary group mailboxes shall be measured by lump sum.

### **Article 8.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Temporary Group Mailboxes	Lump Sum

## **SECTION 85.09 RELOCATE MAILBOX**

### **Article 9.1 General**

The Work covered under this Section consists of performing all operations pertaining to the removal and resetting of mailbox(es) and cluster mailbox(es) affected by construction of this project, and shall include providing temporary mailbox(es). The Engineer will designate which mailbox(es) is/are affected. The term "mailbox" shall include cluster mailbox units and parcel boxes. Multiple cluster mailbox units or parcel boxes on one concrete pad shall be considered one cluster mailbox unit.

### **Article 9.2 Materials**

Contractor shall salvage, from the existing mailbox(es), all reusable materials. Contractor shall replace materials that cannot be salvaged or are damaged by Contractor's operations, at Contractor's expense, with new materials, which as nearly as possible duplicate the kind, quality, and capacity of the original installation. USPS may request to replace existing cluster mailbox units or parcel boxes scheduled for relocation at USPS's expense, as coordinated with the Engineer in the field.

Contractor shall furnish nails, staples, fastening wires or devices, and all materials required for the construction of such anchors, posts, concrete pads, or other portions of the mailbox, which can be replaced more efficiently than they can be moved.

If the property owner elects to replace any of the existing mailbox materials with other materials in better condition, they will be responsible for furnishing and delivering such materials to the site of the Work.

### **Article 9.3 Construction**

Contractor shall provide temporary mailbox placement and access. Contractor shall set the mailbox(es) in reasonably close conformity to its original location with respect to access points or as the Engineer directs. Contractor shall set posts and anchors at the same depth as in the original mailbox(es) or as directed by the Engineer. Contractor shall replace by equivalent construction permanent anchors, posts, or other parts that cannot be economically moved. Contractor shall paint new materials requiring painting. Contractor shall paint the entire mailbox and support if the paint on the new items does not adequately match or does not meet the satisfaction of the Engineer. Contractor shall place the relocated mailbox(es) in at least as good condition as the existing mailbox(es) before they were moved, behind the curb and gutter in accordance with postal regulations, or as the Engineer directs. Contractor shall place the face of the mailbox(es) forty-one to forty-five inches (41" to 45") above the roadway surface, behind the curb and gutter, or in an alternate location approved by the U.S. Post Office. Contractor shall install the cluster mailboxes in accordance with the manufactures instructions and the information provided in the plans.

### **Article 9.4 Measurement**

Relocating mailboxes shall be measured per unit permanently relocated and complete in place. Each unit shall consist of a stand having a single mailbox or a variable number of mailboxes. No payment shall be made for temporary mailbox placement or relocation.

Relocating cluster mailbox units and parcel boxes shall be measured per unit permanently relocated and complete in place including all excavation, backfill, compaction, and grading necessary for construction. Multiple cluster mailbox units or parcel boxes on one concrete pad shall be considered one cluster mailbox unit and no separate payment shall be made. Concrete mailbox base and concrete backing curbs including rebar associated with cluster mailboxes and parcel boxes shall be measured in accordance with bid item 30.08 P.C.C. Cluster Mailbox Base.

**Article 9.5 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Relocate Cluster Mailbox	Each
Relocate Mailbox	Each

## **SECTION 85.10 FLEXIBLE DELINEATORS**

### **Article 10.1 General**

The Work covered under this Section consists of providing all labor, materials, equipment, and transportation required for complete installation of Flexible Delineators.

### **Article 10.2 Submittals**

Contractor shall submit three copies of manufacturer's product data for approval by the Engineer.

### **Article 10.3 Materials**

The Flexible Delineators shall be made of composite material certified to withstand multiple vehicle impacts at high speeds, perform within the temperature extremes of the project location, be resistant to UV light and vandalism. The Delineator shall consist of a corrosion-resistant drivable ground anchor and replaceable tubular composite post, color as indicated in the plans, with reflective sheeting for nighttime visibility. Minimum outside diameter of the post shall be 2", minimum height 42".

The Delineator shall be a Carsonite Composites, Newberry, South Carolina, Model Utility Sentry CIP2 – round, or approved equal. To be considered equal, Delineators must be flexible, replaceable, and have the specified physical properties, dimensions, and color.

### **Article 10.4 Construction**

Contractor shall install Delineators in accordance with the manufacturer's recommendations. Where anchors are embedded in concrete, the Contractor shall install the anchor so that the top of the anchor is flush with the concrete surface.

### **Article 10.5 Measurement**

Delineators shall be measured as complete installations including the drivable ground anchor, replaceable composite post, and all labor required for the installation.

### **Article 10.6 Basis of Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 - Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Furnish and Install Flexible Delineator	Each



## **SECTION 85.11 PERMANENT VERTICAL TRAFFIC CALMING DEVICES**

### **Article 11.1 General**

The Work under this section shall consist of furnishing all materials and performing all operations necessary to construct permanent vertical traffic calming devices on paved surfaces.

### **Article 11.2 Cross Section Template**

Prior to construction, the Contractor shall submit two (2) cross-section templates for each type of device for approval by Engineer. One template shall be for the Contractor's quality assurance use, and the other shall be utilized by the Inspector. The Contractor shall construct templates of rigid materials such as wood or steel to match the vertical traffic calming device cross-section as shown on the Standard Details. The template will be used for checking the device cross-section for compliance during construction, and for final acceptance upon completion. The template shall be manually moved laterally down the length of the device to verify that the vertical traffic calming device matches the specified cross-section. Because the template will be used manually, it must be light weight but rigid enough to retain the specified cross-section shape during transport and use.

### **Article 11.3 Material**

The vertical traffic calming devices shall be constructed of Class D asphalt pavement material as specified in M.A.S.S. Section 40.06 – Asphalt Concrete Pavement.

### **Article 11.4 Construction**

Construct vertical traffic calming devices in accordance with M.A.S.S. Section 40.06 – Asphalt Concrete Pavement and the dimensions as detailed in the Drawings.

Equipment used in the construction shall conform to M.A.S.S. Section 40.06 – Asphalt Concrete Pavement.

Density and surface requirements shall conform to M.A.S.S. Section 40.06 – Asphalt Concrete Pavement.

Prior to constructing the traffic calming device, Contractor shall apply a layer of Tack Coat to the existing surface in accordance with M.A.S.S. Section 40.04 – Tack Coat.

The compacted pavement surface shall be within plus or minus one-fourth inch ( $\pm 1/4"$ ) as shown in the plans. Non-conforming surfaces shall be subject to rejection by the Engineer.

### **Article 11.5 Measurement**

The vertical traffic calming devices shall be measured per each complete device accepted in place, in accordance with Section 11.4 – Construction maximum and minimum tolerances, and as shown on the Standard Details. No separate measurement or payment will be made for asphalt, tack coat, pavement markings, templates, or other material required to construct each vertical traffic calming device as they are incidental to this Work item.

**Article 11.6 Basis of Payment**

Payment for this Work shall be in accordance with M.A.S.S. Division 10, Section 10.07 – Measurement and Payment, and shall include full payment for all Work described in this Section.

Payment shall be made under the following unit:

ITEM	UNIT
Sinusoidal Speed Hump	Each
Asphalt Flat Top Speed Hump	Each
Asphalt Speed Cushion	Each

## **SECTION 85.12 MULTI-MODAL COUNTERS**

### **Article 12.1 General**

The Work under this Section consists of the performance of all operations pertaining to furnishing and installing multi-modal pathway and sidewalk counters. The counter must differentiate between pedestrians and cyclists bi-directionally.

### **Article 12.2 Material**

#### **A. Multi-Modal Counter**

Multi-Modal Counters shall consist of infrared sensors (located in posts), induction loops, conduit, and equipment housing, if required.

Contractor shall provide Urban MULTI Evo counter for sidewalk multi-modal counter installations and MULTI Evo Nature counter for pathway multi-modal counter installations, manufactured by:

Eco-Counter Canada/USA  
604-3981 St-Laurent Boulevard  
Montreal Quebec H2W1Y5, Canada  
Phone: 1-866-518-4404  
Website: <https://www.eco-counter.com/>

or an approved equal.

### **Article 12.3 Construction**

#### **A. Preparation**

Prep work shall be coordinated with and overseen by the Traffic Department. Contact the Traffic Department (343-8053 or 343-8421) seven (7) working days prior to planned field installations.

##### **1. Induction Loops:**

- a. Check pre-formed induction loops to ensure there are no wire or housing defects.
- b. The Traffic Department shall perform induction loop test prior to installation. Inductance shall read between 100 and 150 microhenries ( $\mu\text{H}$ ).

##### **2. Post:**

- a. Install conduit, post housing, and anchor base at least one (1) day prior to placement of post. Ensure anchor base is level and bolt pattern is correct for infrared sensor alignment and operation.

## B. Field Installation

1. The Traffic Department shall be on-site for coordination and field installations. Provide Traffic Department twenty-four (24) hour notice of actual installations. Failure to notify the Traffic Department may result in delay of work and withholding of payment. The Owner may withhold from any progress payment the sum of \$500 per day as Liquidated Damages for each and every calendar day that the Contractor delays notification to the Traffic Department.

a. Contractor shall install:

- Post
- Base, including sonotube and PVC conduit
- Equipment housing, if required
- Conduit Runs
- Concrete
- Prepare the surface for installation of the induction loops and trench for conduit runs
- Induction loops
- Infrared sensor
- Communications
- Logger
- Induction loop sensor
- Battery pack

b. Traffic Department shall test:

- Induction loops
- Infrared sensor
- Communications
- Logger
- Induction loop sensor
- Battery pack

2. Post

a. Install per the manufacturer's recommendations.

3. Equipment Housing, if required

a. Install per the manufacturer's recommendations.

b. Prior to installation, verify groundwater level. If groundwater is encountered within the excavation limits, contact the Engineer.

- c. The entire bottom of the equipment housing shall be bedded in coarse aggregate material to a minimum depth of 18 inches.
- 4. Infrared Sensors
  - a. Install per the manufacturer's recommendations.
  - b. Infrared sensor(s) must operate in tandem with the induction loops.
- 5. Induction Loops
  - a. Location shown on the Contract Drawings is estimated; prior to installation, the Contractor shall meet with the Traffic Department to determine actual locations. The induction loops shall be located within one five-foot (5') panel. The Contractor shall mark the actual location.
  - b. Contractor shall prepare the surface in accordance with Section 30.03 – Portland Cement Concrete Sidewalks or Section 40.06 Asphalt Concrete Pavement. The area identified for placement of the induction loops shall be graded flat and relatively free of debris.
  - c. Contractor shall create trench to hold encased induction loop tail.
  - d. Contractor shall install induction loops on the prepared surface and the Traffic Department shall test the induction loops.
  - e. Surface Treatment Installation
    - i. Concrete Sidewalk Installation -Contractor shall carefully spread concrete over the induction loops and finish the concrete in accordance with Section 30.03 – Portland Cement Concrete Sidewalks. Contractor shall replace any damaged components at Contractors expense.
    - ii. Asphalt Pathway Installation -Contractor shall carefully spread and compact asphalt concrete over the induction loops in accordance with Section 40.06 – Asphalt Concrete Pavement. Contractor shall replace any damaged components at Contractors expense.
  - f. After installation, the Traffic Department shall perform a final induction loop test, ensuring read is between 100 to 150 microhenries ( $\mu\text{H}$ ). Coordinate test with the Traffic Department.
- 6. Encased induction loop tail shall be run from the induction loops to the post or equipment housing, if required. Contractor shall install the loop tail runs. The Traffic Department shall test the runs to ensure they operate as expected.
- 7. Electrical termination shall be installed by the Contractor and tested by the Traffic Department.
- 8. The Traffic Department shall test all communications of the Multi-Modal Counter.

**Article 12.4 Measurement**

Measurement of Multi-Modal Counter shall be per each, complete and in place, including all coordination, labor, equipment, specified materials, and miscellaneous materials to provide a complete unit accepted by the Traffic Department.

**Article 12.5 Payment**

Payment for this Work shall be in accordance with Division 10, Section 10.07 – Measurement and Payment and shall include full payment for all Work described in this Section.

Payment shall be made on the following unit:

ITEM	UNIT
Multi-Modal Pathway Counter	Each
Multi-Modal Sidewalk Counter	Each

**MUNICIPALITY OF ANCHORAGE  
STANDARD SPECIFICATIONS**

**DIVISION 85  
TRAFFIC CONTROL DEVICES  
STANDARD DETAILS**

**STANDARD CONSTRUCTION SPECIFICATIONS  
DIVISION 85  
INDEX OF STANDARD DETAILS**

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85-2	Intersection Approach Striping
85-3	Left-Turn Pocket Approach Striping
85-4	Raised Median Approach and Two Lanes Drive to Right Striping
85-5	Left-Turn Pocket Approach from Two Way Center Left-Turn Lane Striping
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85-42	Multi-Modal Pathway Counter
85-43	Multi-Modal Sidewalk Counter



GENERAL NOTES:

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1. ALL ONLYS, ARROWS, CROSSWALKS, STOP BARS AND OTHER MARKINGS SHALL BE AS INDICATED IN THE DRAWINGS AND SPECIFICATIONS.
2. DUAL-TURN LANE, TURN POCKET REVERSAL AND CENTERLINE DOUBLE LINES SHALL BE TWO 4" YELLOW LINES SEPARATED BY A 4" SPACE.
3. REGULAR LANE LINES SHALL BE A WHITE 4" WIDE LINE. SKIP LINE SPACING SHALL BE A 10' LINE AND A 30' SPACE.
4. MEDIAN NOSE AND THE TOP AND FACE OF CURB OF ALL MEDIAN ISLAND NOSING SHALL BE YELLOW A MINIMUM OF 5' BACK FROM THE FLOWLINE.
5. "W" IS THE WIDTH OF THE LANE MEASURED FROM CENTER LANE LINE TO CENTER LANE LINE OR FROM CENTER LANE LINE TO EDGE OF PAVEMENT.
6. "L" IS TAPER LENGTH. "L" IS DETERMINED BY TAKING THE SPEED LIMIT (M.P.H.) TIMES THE OFFSET WIDTH IN FEET OR AS INDICATED ON DRAWINGS. MINIMUM "L" IS 100'.
7. "D" IS THE LANE REVERSAL DISTANCE. A RATIO OF 8:1 FOR THE ENTRANCE TAPER IS DESIRABLE WITH A MINIMUM RATIO OF 3:1.
8. "S" IS THE SHY DISTANCE MEASURED FROM THE FACE OF CURB TO THE CENTER OF THE OUTSIDE YELLOW LINE. "S" IS 18" OR AS SHOWN ON THE DRAWINGS.
9. THESE NOTES APPLY TO STANDARD DETAILS 85-2 THROUGH 85-11.

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MUNICIPALITY



OF ANCHORAGE

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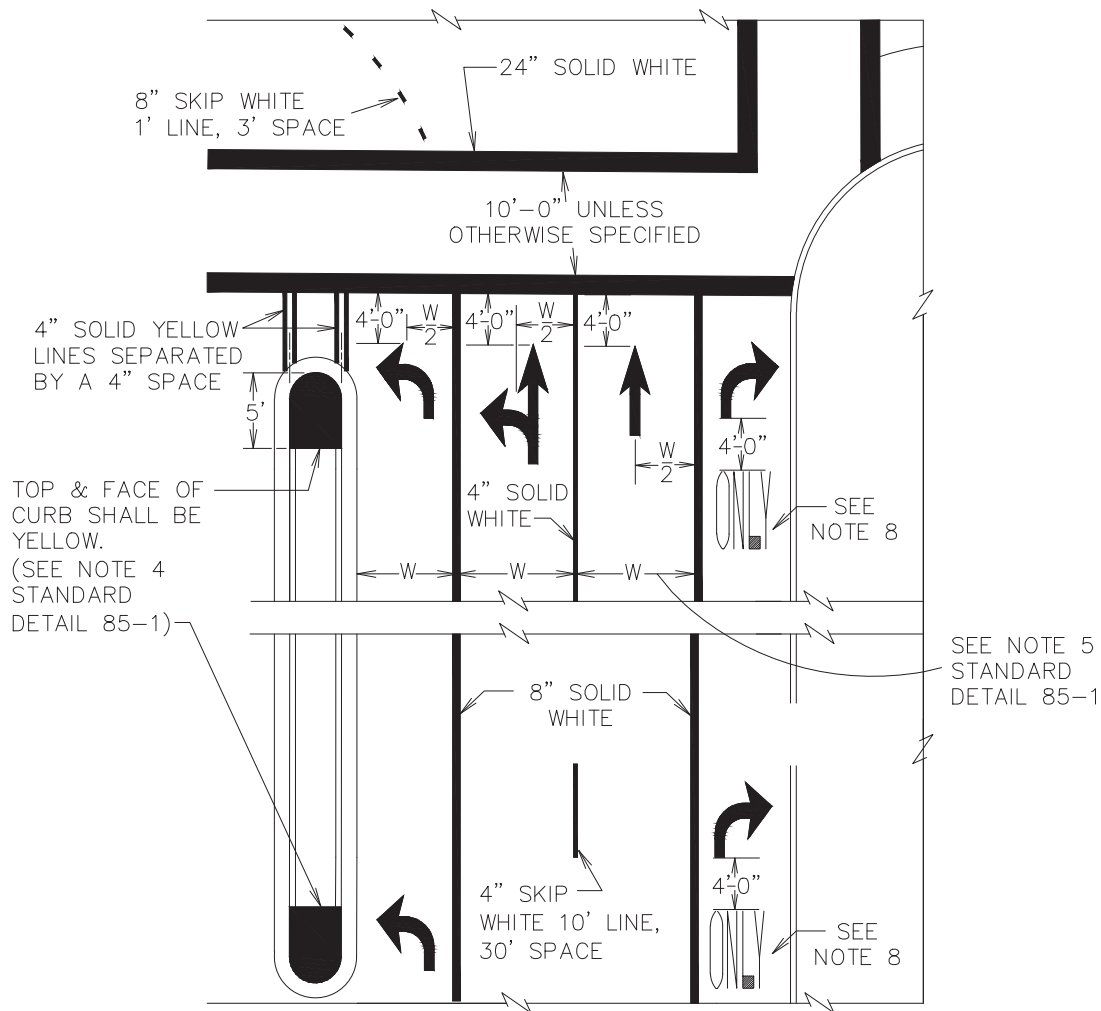
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REVISED:  
2/24

## STRIPING NOTES

SECTION #  
85.03

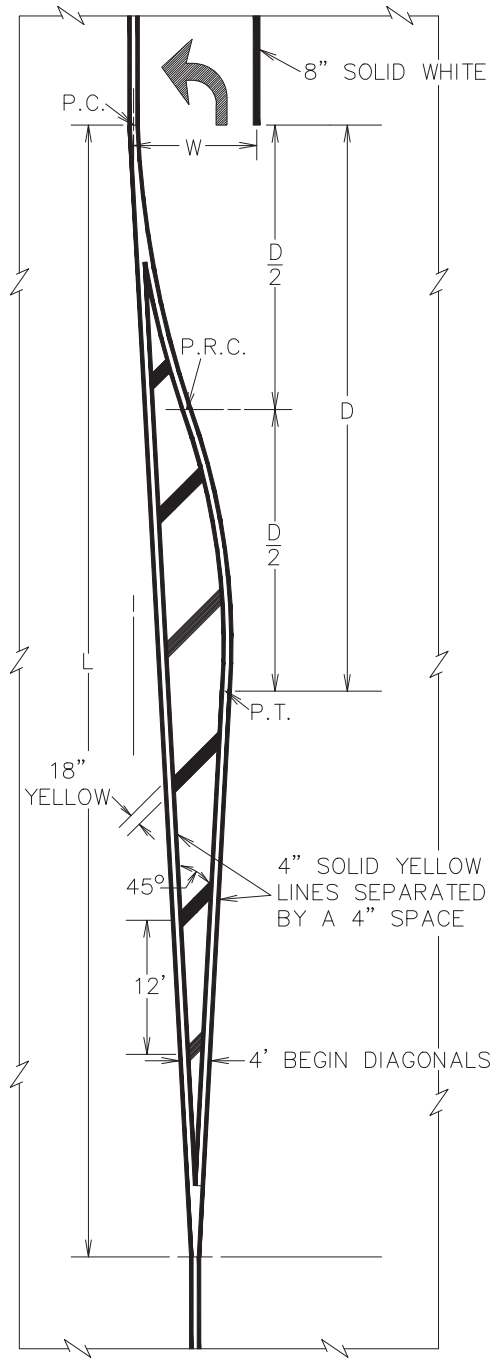
DETAIL #  
85-1



## APPROACH TO INTERSECTION

1. ARROW MARKINGS SHALL BE PLACED AT THE START OF AND AT THE INTERSECTION OF AUXILIARY TURN LANES. ADDITIONAL ARROW MARKINGS SHALL BE PLACED AND SPACED PROPORTIONATELY WHEN AUXILIARY TURN LANES EXCEED 150'.
2. REGULAR LANE LINES SHALL BE A SOLID WHITE 4" LINE.
3. LEFT AND RIGHT TURN DELINEATOR LINES SHALL BE A SOLID WHITE 8" LINE.
4. 4" SOLID WHITE LINES APPROACHING INTERSECTIONS ARE 100' IN LENGTH MINIMUM.
5. 4" SOLID WHITE LINES DEPARTING INTERSECTIONS ARE 50' IN LENGTH PLUS THE PARTIAL SKIP CYCLE LENGTH.
6. DOTTED GUIDELINES USED FOR DUAL TURN LANES SHALL BE 8" WHITE SKIP WITH A 1' LINE AND A 3' SPACE.
7. STRAIGHT AHEAD AND COMBINATION ARROWS SHALL BE USED ONLY WHEN INDICATED ON DRAWINGS.
8. "ONLY" WORD MARKINGS ARE USED ONLY WHEN A THROUGH LANE TERMINATES AS A TURN.





## LEFT-TURN POCKET APPROACH

SEE STANDARD DETAIL 85-1 FOR GENERAL STRIPING NOTES

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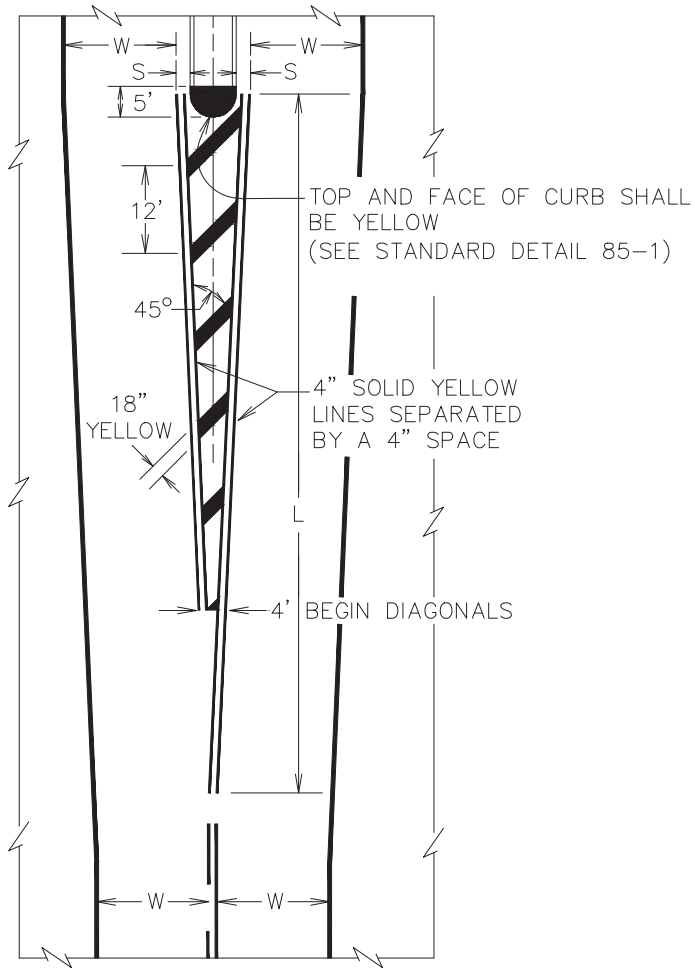
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2/24

# LEFT-TURN POCKET APPROACH STRIPING

SECTION #  
85.03

DETAIL #  
85-3



## RAISED MEDIAN APPROACH

SEE STANDARD DETAIL 85-1 FOR GENERAL STRIPING NOTES

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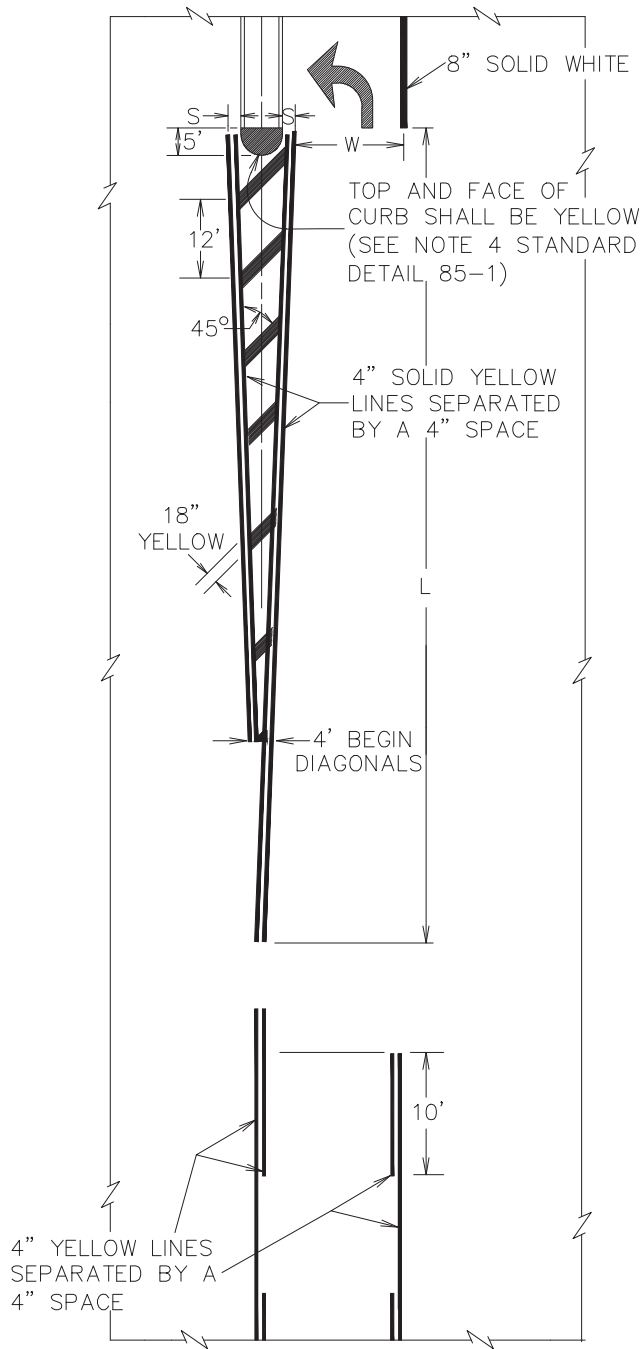
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2/24

# RAISED MEDIAN APPROACH AND TWO LANES DRIVE TO RIGHT STRIPING

SECTION #  
85.03

DETAIL #  
85-4



**LEFT-TURN POCKET APPROACH FROM TWO WAY CENTER LEFT-TURN LANE**

SEE STANDARD DETAIL 85-1 FOR GENERAL STRIPING NOTES

REVISION: 2024 M.A.S.S. UPDATE

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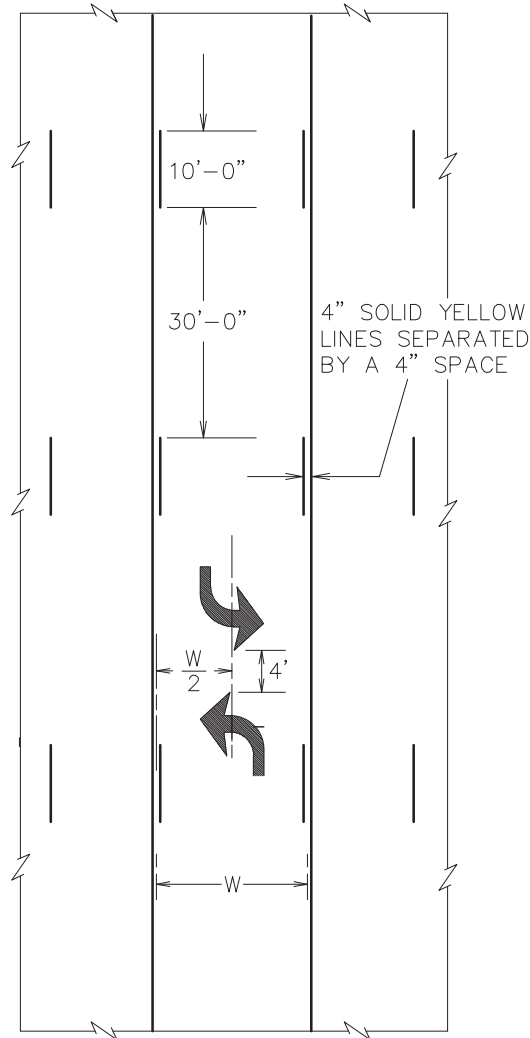
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**LEFT-TURN POCKET APPROACH  
FROM TWO WAY CENTER  
LEFT-TURN LANE STRIPING**

SECTION #  
85.03

DETAIL #  
85-5



## TWO WAY CENTER LEFT TURN LANE

1. INSTALL DUAL TURN LANE ARROWS EVERY 200', UNLESS OTHERWISE SPECIFIED.

MUNICIPALITY



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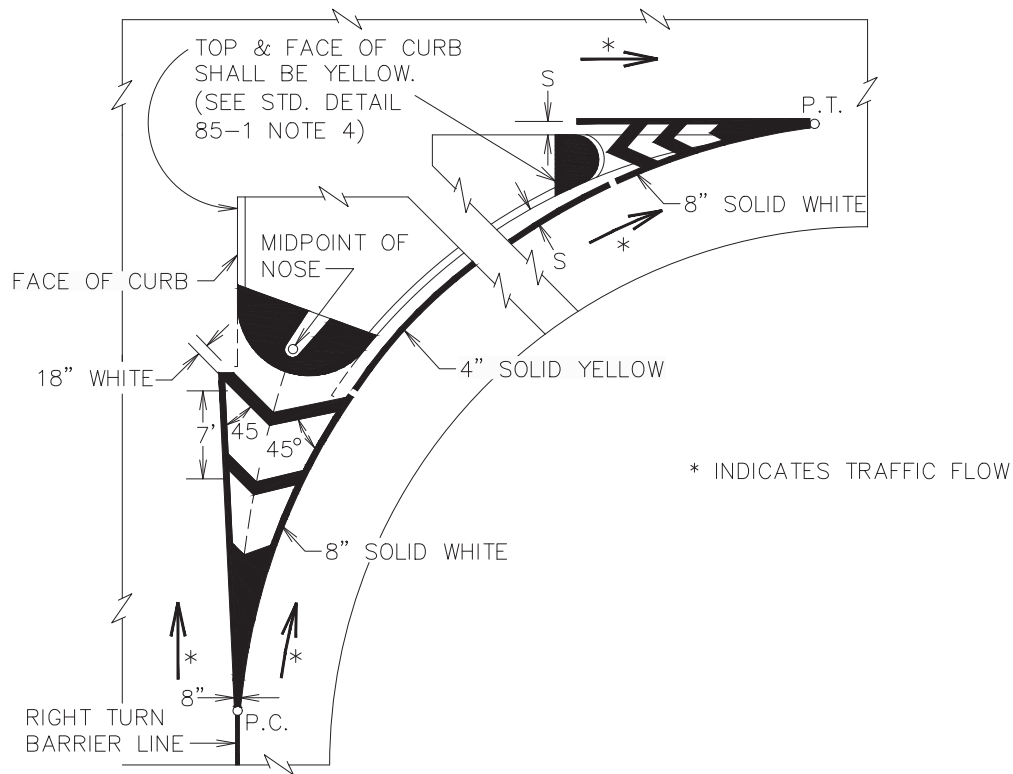
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## TWO WAY CENTER LEFT TURN LANE STRIPING

SECTION #  
85.03

DETAIL #  
85-6



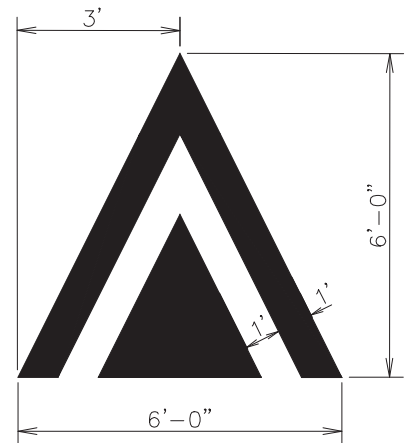
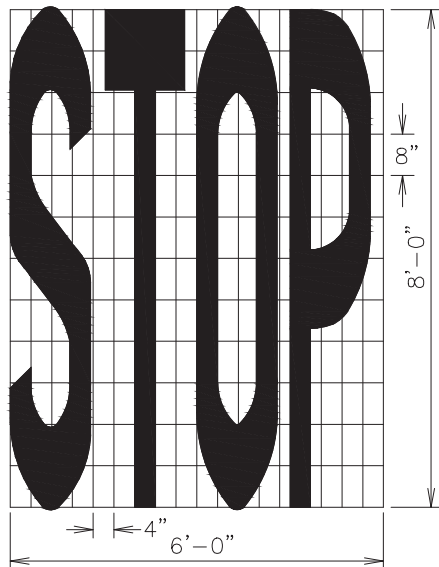
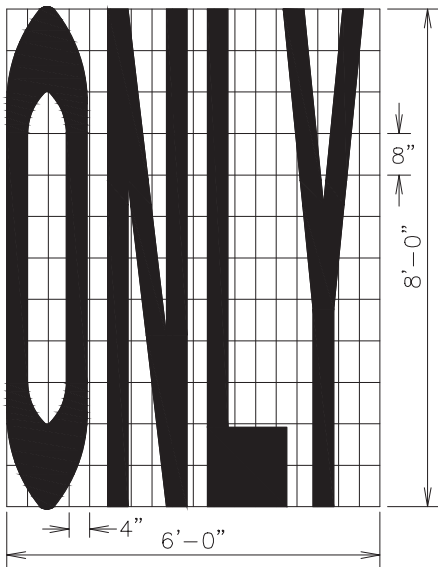
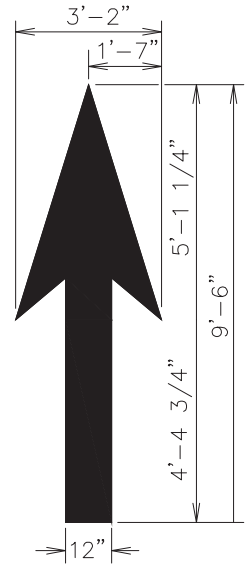
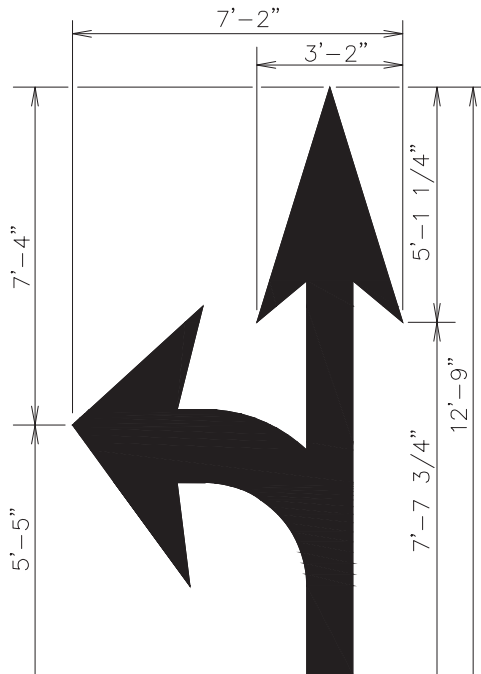
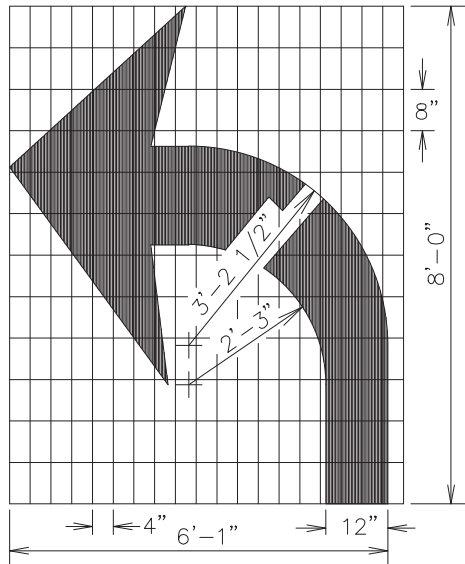


## PASSING ON BOTH SIDES OF A RIGHT HAND SIDE OBSTRUCTION

SEE STANDARD DETAIL 85-1 FOR GENERAL STRIPING NOTES

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h1 style="margin: 0;">PASSING ON BOTH SIDES OF A RIGHT HAND SIDE OBSTRUCTION</h1>	SECTION # 85.03  DETAIL # 85-7
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### LAYOUT TEMPLATES FOR STENCILS

1. ALL SYMBOLS SHOWN SHALL BE WHITE AND REFLECTORIZED.
2. RIGHT AND LEFT TURN AUXILIARY LANE MARKINGS ARE IDENTICAL BUT REVERSED.

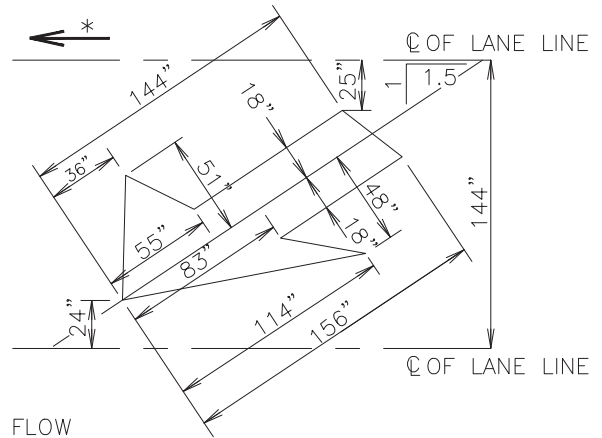
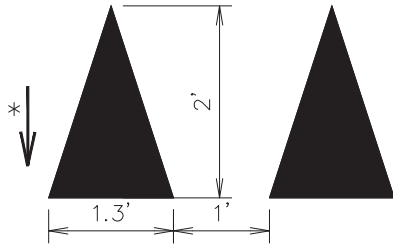
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 OF ANCHORAGE

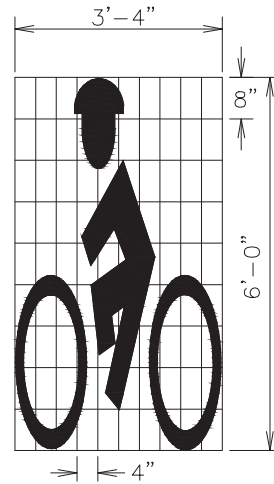
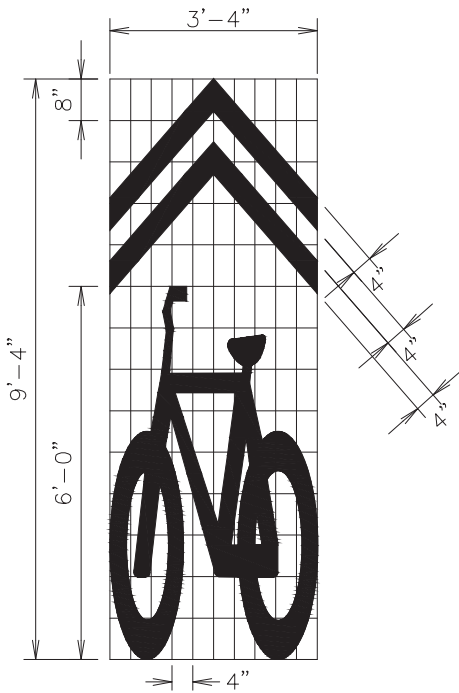
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 APPROVED:  
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2/24

# LAYOUT TEMPLATES FOR STENCILS PART 1

SECTION #  
85.03  
 DETAIL #  
85-8A



\* INDICATES TRAFFIC FLOW



## LAYOUT TEMPLATES FOR STENCILS

1. ALL SYMBOLS SHOWN SHALL BE WHITE AND REFLECTORIZED.
2. RIGHT AND LEFT TURN AUXILIARY LANE MARKINGS ARE IDENTICAL BUT REVERSED.

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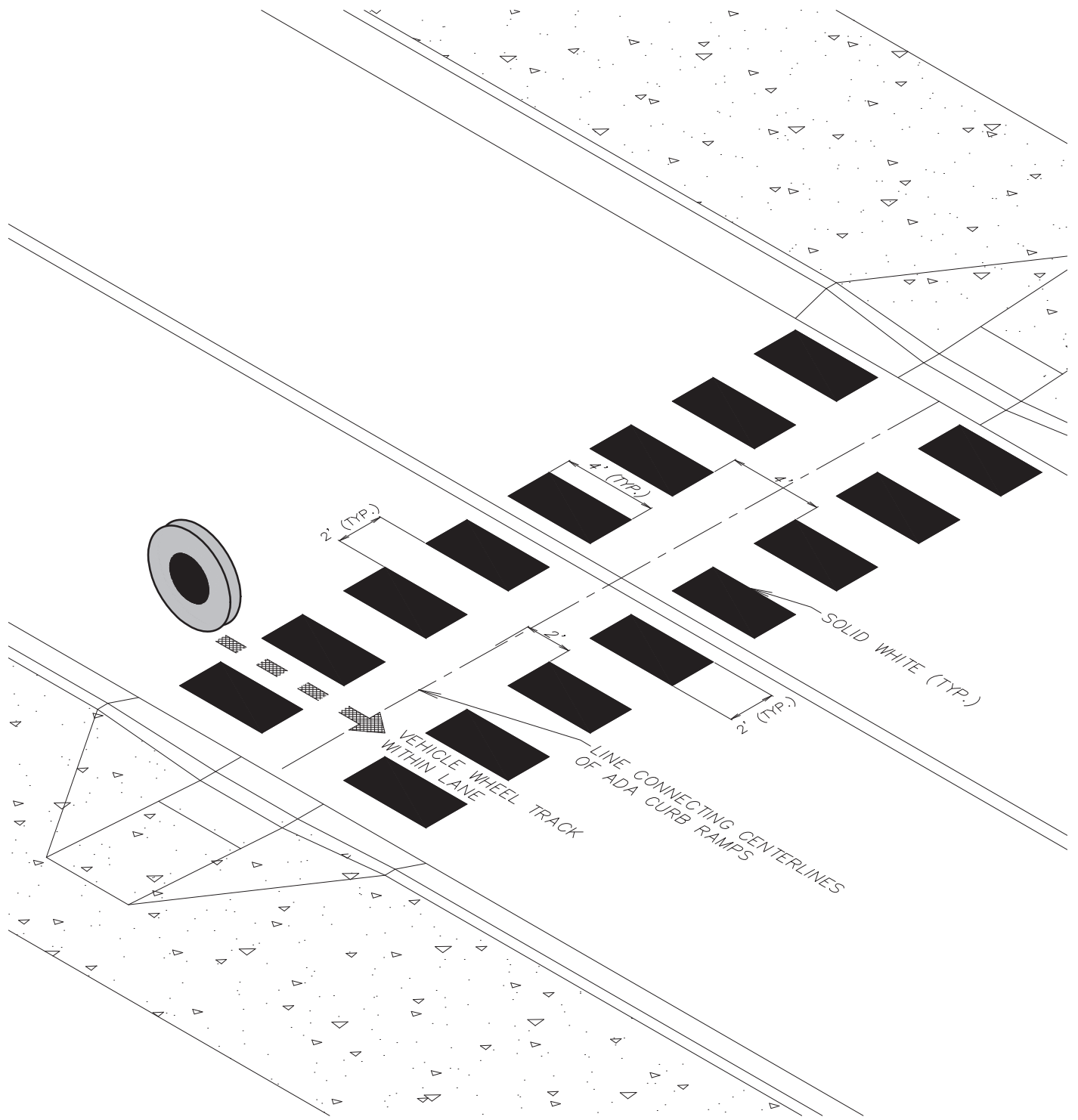


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# LAYOUT TEMPLATES FOR STENCILS PART 2

SECTION #  
85.03

DETAIL #  
85-8B



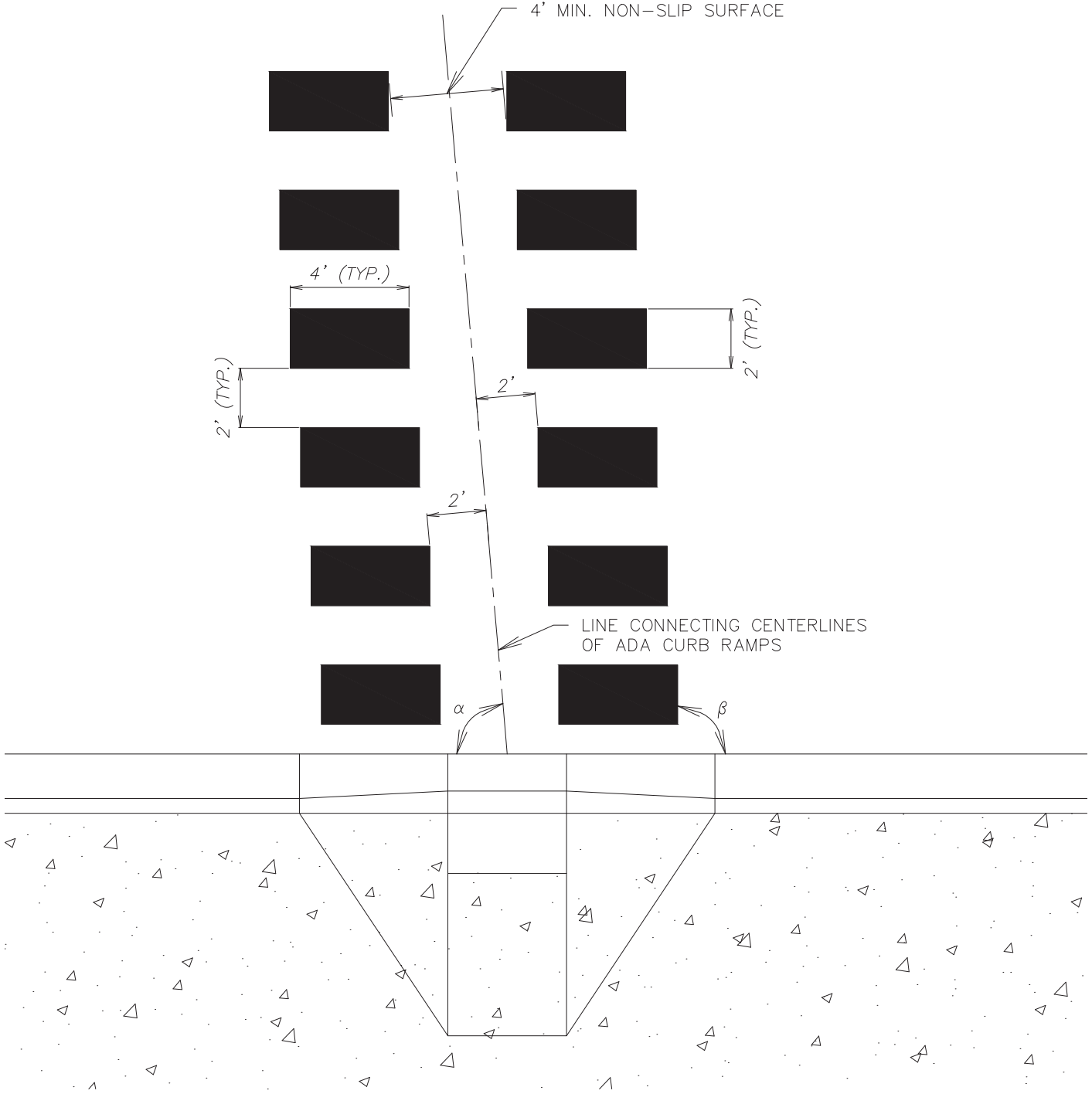
## GAP LADDER CROSSWALK STRIPING

**NOTES:**

1. SEE DETAIL 85-10 FOR SKEWED LAYOUT

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h1 style="margin: 0;">GAP LADDER CROSSWALK STRIPING</h1>	SECTION # 85.03  DETAIL # 85-9
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**SKewed GAP LADDER CROSSWALK STRIPING**

NOTES:

1.  $75^\circ < \alpha < 90^\circ$
2.  $\beta = 90^\circ$  RELATIVE TO LINE CONNECTING CURB AND GUTTER

REVISION: 2024 M.A.S.S. UPDATE



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REVISD:  
2/24

**SKewed GAP LADDER  
CROSSWALK STRIPING**

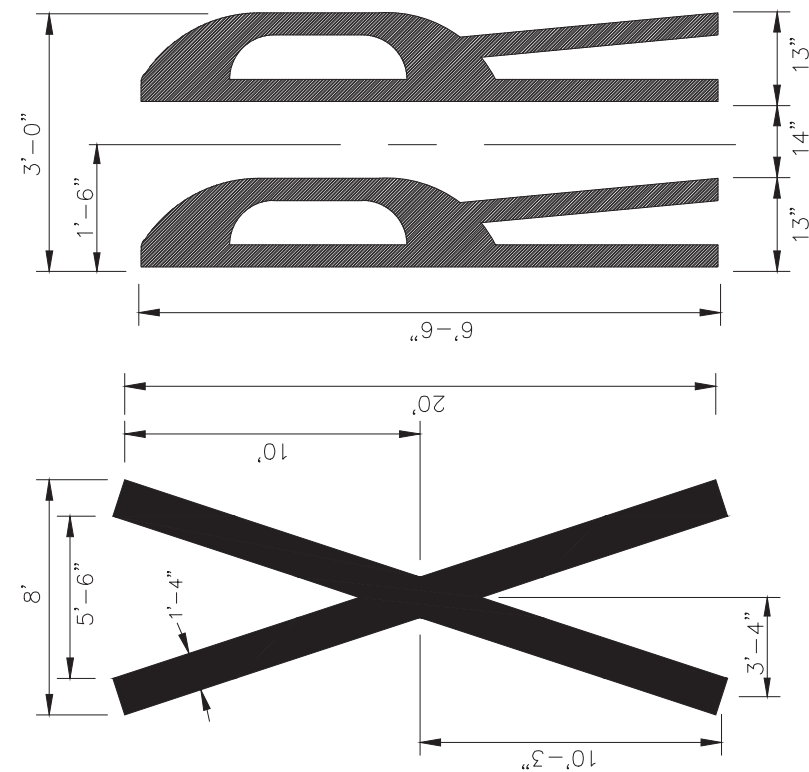
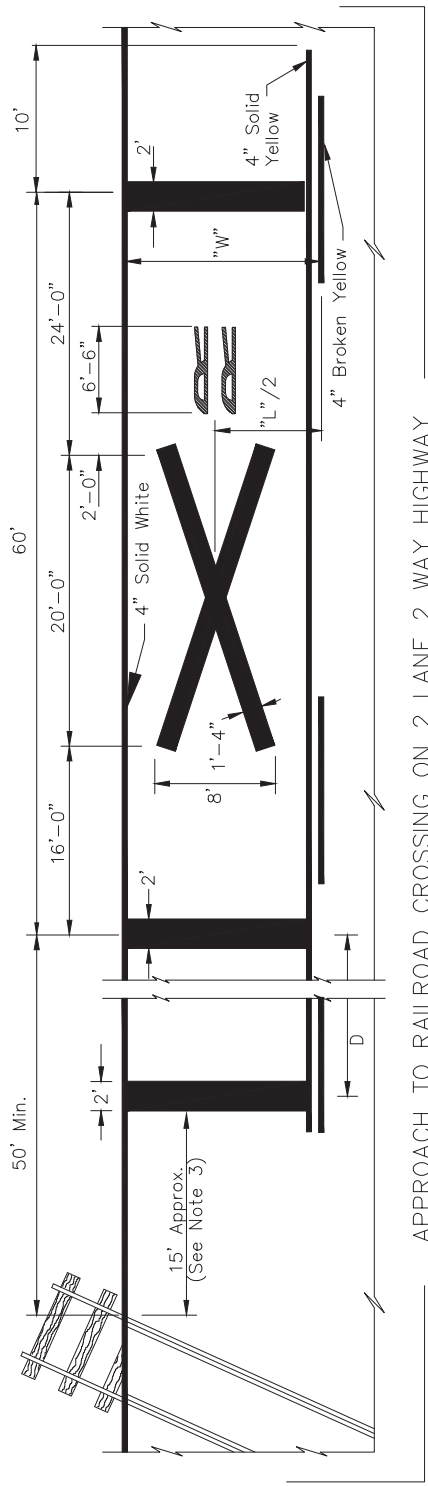
SECTION #  
85.03  
DETAIL #  
85-10



SCALE:  
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APPROVED:  
REVISED:  
2/24

# APPROACH TO RAILROAD CROSSING ON 2 LANE 2 WAY HIGHWAY

SECTION #  
85.03  
DETAIL #  
85-11



- NOTES:
- ALL MARKINGS SOLID WHITE UNLESS INDICATED OTHERWISE.
  - ON 4-LANE ROADWAYS THE RAILROAD CROSSING APPROACH MARKING SHALL BE PLACED IN EACH LANE OF THE APPROACH.
  - LOCATE STOP BAR 15' FROM RAILROAD TRACK OR 8' FROM GATE, IF PRESENT.
  - EDGE LINES AND LANE LINES ON A UNI-DIRECTIONAL APPROACH SHALL BE PLACED IN A NORMAL MANNER EXCEPT THAT THE LANE LINE(S) SHALL BE SOLID 4" WHITE IN LIEU OF BROKEN FOR A DISTANCE = (D+60') IN ADVANCE OF THE STOP BANDS.

POSTED LIMIT	D
30 M.P.H.	225'
40	350'
50	475'
60	625'

## RAILROAD CROSSING SYMBOLS

MUNICIPALITY



OF ANCHORAGE

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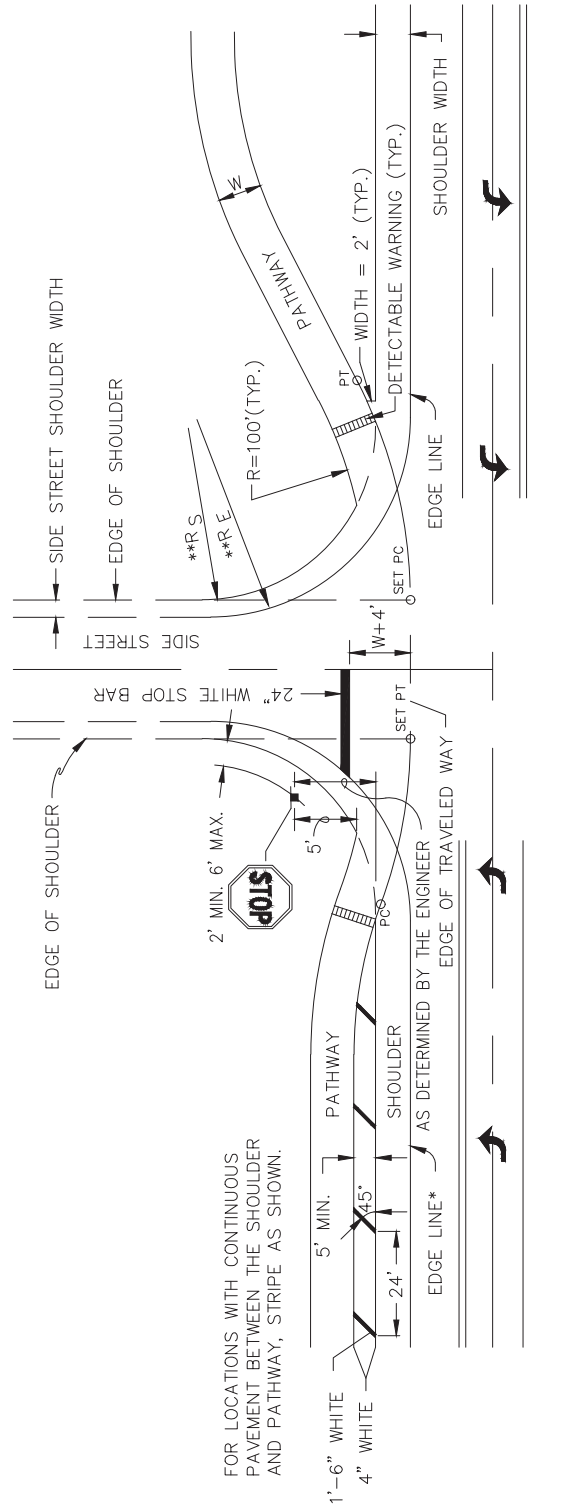
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REVISED:  
2/24

# TYPICAL UNCURBED RETURN WITH PATHWAY

SECTION #  
85.03

DETAIL #  
85-12

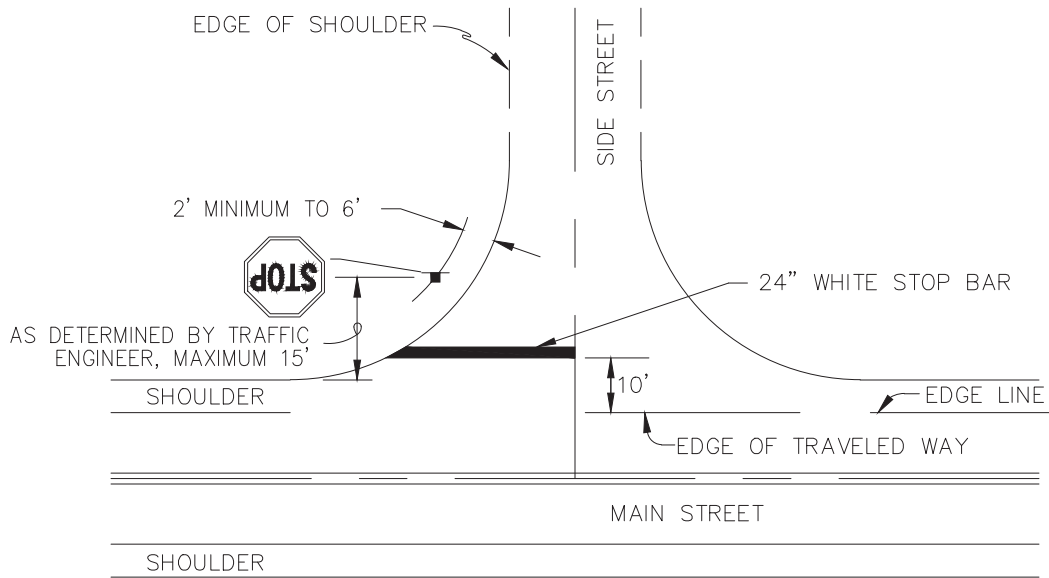


\* EDGE LINES DEFINE THE EDGE OF TRAVELED WAY

\*\*R S = SHOULDER RADIUS  
\*\*R E = EDGE LINE RADIUS

## TYPICAL UNCURBED RETURN WITH PATHWAY

1. WHEN THE SIDE STREET LACKS EDGE LINES, BEGIN AND END THE MAIN STREET EDGE LINES AT THE MAIN STREET PAVEMENT RETURNS AND EXTEND THE STOP BAR TO THE EDGE OF PAVEMENT AS SHOWN IN THE *UNCURBED RETURN WITHOUT PATHWAY* DETAIL.
2. INSTALL DETECTABLE WARNING TILES IN PATHWAYS AT THE LOCATIONS SHOWN. INSTALL ACCORDING TO THE MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS.
3. BREAK THE MAIN STREET CENTERLINE MARKINGS AT SIDE STREET INTERSECTIONS ONLY WHEN LEFT TURN LANES ARE PROVIDED.
4. CONTINUE CENTERLINE STRIPING THROUGH INTERSECTIONS WITH CENTER TWO-WAY-LEFT-TURN-ONLY LANES OR WHEN THERE ARE NO MAINLINE LEFT TURN LANES.
5. LOCATE STOP SIGNS SO THEY ARE:
  - A. VISIBLE TO APPROACHING TRAFFIC AND
  - B. AS NEAR TO THE STOP BAR AS PRACTICABLE.
6. CONTINUE LANE "SKIP" STRIPING THROUGH INTERSECTIONS.
7. DELETE OUTERMOST EDGE OF TRAVELED WAY STRIPING AT INTERSECTIONS OR WRAP STRIPING TO SIDE STREET.
8. MATCH SIDE STREET STRIPING IF STRIPING IS PRESENT.



## TYPICAL UNCURBED RETURN WITHOUT PATHWAY

NOTES:

1. BREAK THE MAIN STREET CENTERLINE MARKINGS AT SIDE STREET INTERSECTIONS ONLY WHEN LEFT TURN LANES ARE PROVIDED.
2. CONTINUE CENTERLINE STRIPING THROUGH INTERSECTIONS WITH CENTER TWO-WAY-LEFT-TURN-ONLY LANES OR WHEN THERE ARE NO MAINLINE LEFT TURN LANES.
3. LOCATE STOP SIGNS SO THEY ARE:
  - A. VISIBLE TO APPROACHING TRAFFIC AND
  - B. AS NEAR TO THE STOP BAR AS PRACTICABLE.
4. CONTINUE LANE "SKIP" STRIPING THROUGH INTERSECTIONS.
5. DELETE OUTERMOST EDGE OF TRAVELED WAY STRIPING AT INTERSECTIONS OR WRAP STRIPING TO SIDE STREET.
6. MATCH SIDE STREET STRIPING IF STRIPING IS PRESENT.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

## TYPICAL UNCURBED RETURN WITHOUT PATHWAY

SECTION #  
85.03

DETAIL #  
85-13



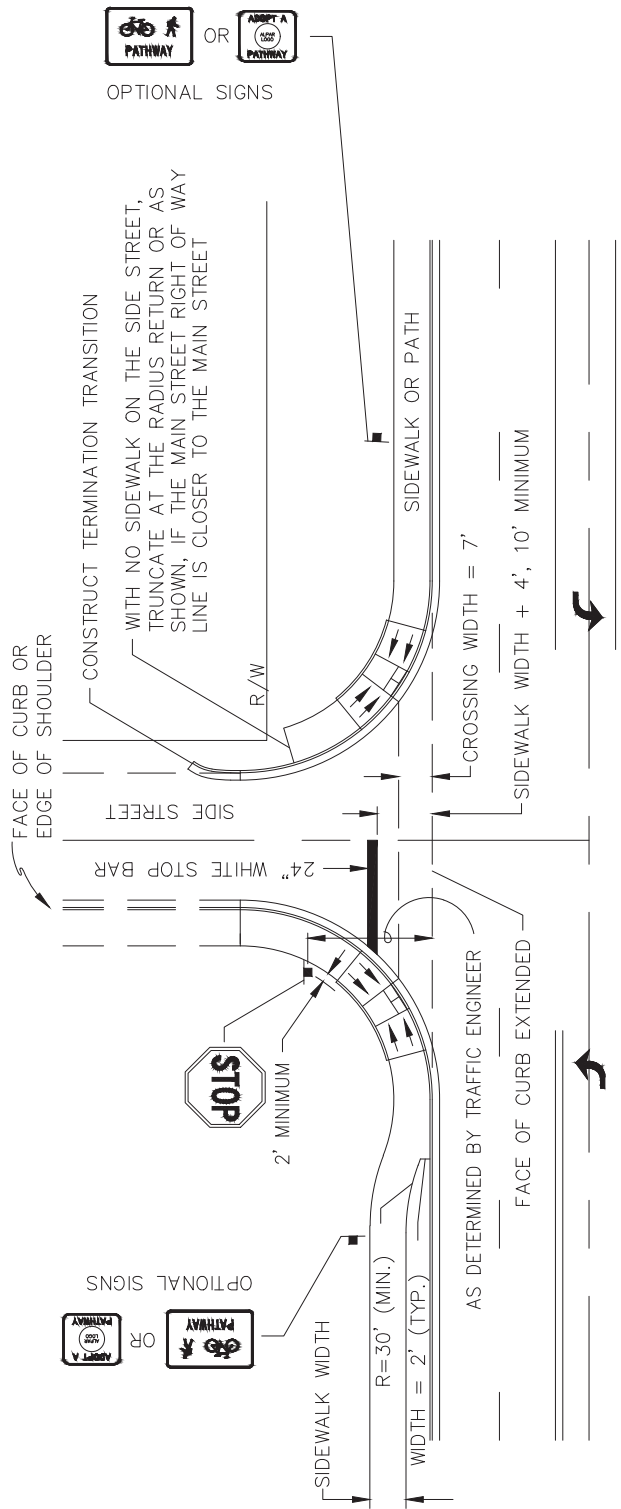


SCALE:  
N.T.S.  
APPROVED:  
REVISED:  
2/24

# TYPICAL CURB RETURN WITH SIDEWALK

SECTION #  
85.03

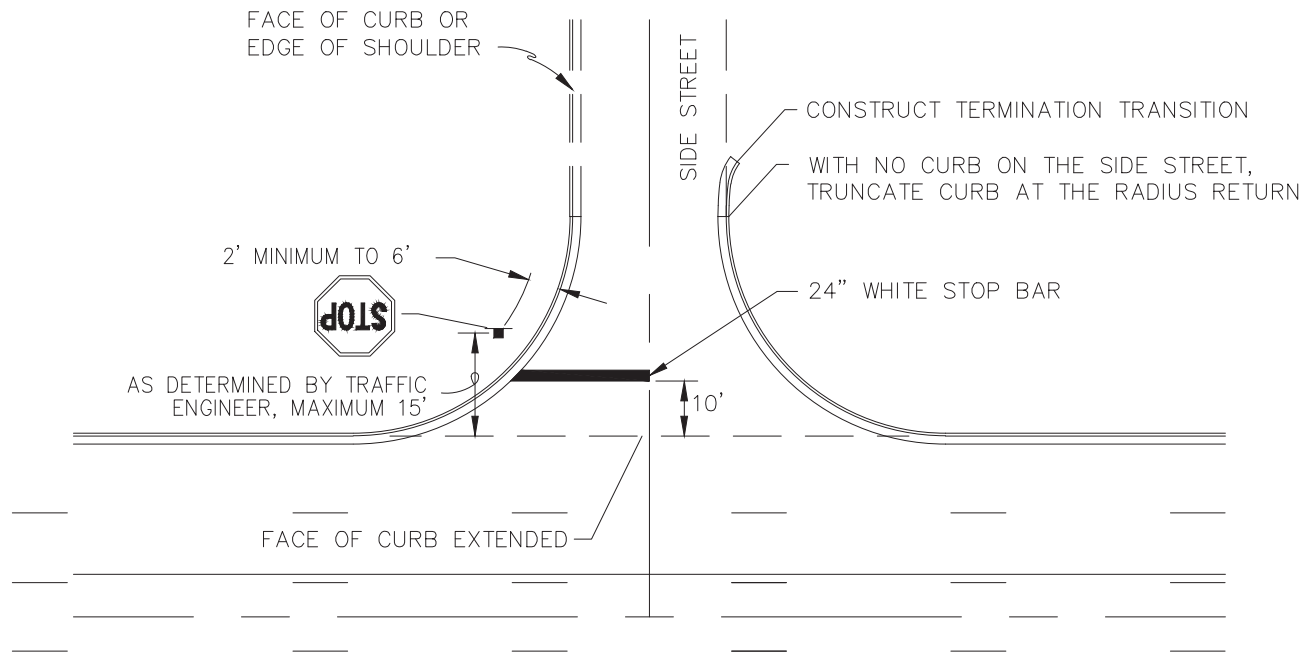
DETAIL #  
85-14



## TYPICAL CURBED RETURN WITH SIDEWALK

NOTES:

1. WHEN SIDEWALKS ARE SEPARATED FROM THE BACK OF CURB, JOIN THE TWO AS SHOWN USING A REVERSE CURVE WITH A MINIMUM RADIUS OF 30'.
2. BREAK THE MAIN STREET CENTERLINE MARKINGS AT SIDE STREET INTERSECTIONS ONLY WHEN LEFT TURN LANES ARE PROVIDED.
3. CONTINUE CENTERLINE STRIPING THROUGH INTERSECTIONS WITH CENTER TWO-WAY-LEFT-TURN-ONLY LANES OR WHEN THERE ARE NO MAINLINE LEFT TURN LANES.
4. CONTINUE LANE "SKIP" STRIPING THROUGH INTERSECTIONS.
5. DELETE OUTERMOST EDGE OF TRAVELED WAY STRIPING AT INTERSECTIONS OR WRAP STRIPING TO SIDE STREET.
6. MATCH SIDE STREET STRIPING IF STRIPING IS PRESENT.



## TYPICAL CURBED RETURN WITHOUT SIDEWALK

NOTES:

1. BREAK THE MAIN STREET CENTERLINE MARKINGS AT SIDE STREET INTERSECTIONS ONLY WHEN LEFT TURN LANES ARE PROVIDED.
2. CONTINUE CENTERLINE STRIPING THROUGH INTERSECTIONS WITH CENTER TWO-WAY-LEFT-TURN-ONLY LANES OR WHEN THERE ARE NO MAINLINE LEFT TURN LANES.
3. LOCATE STOP SIGNS SO THEY ARE:
  - A. VISIBLE TO APPROACHING TRAFFIC
  - B. AS NEAR TO THE STOP BAR AS PRACTICABLE.
4. CONTINUE LANE "SKIP" STRIPING THROUGH INTERSECTIONS.
5. DELETE OUTERMOST EDGE OF TRAVELED WAY STRIPING AT INTERSECTIONS OR WRAP STRIPING TO SIDE STREET.
6. MATCH SIDE STREET STRIPING IF STRIPING IS PRESENT.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h1 style="margin: 0;">TYPICAL CURB RETURN WITHOUT SIDEWALK</h1>	SECTION # 85.03  DETAIL # 85-15
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PENDING

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

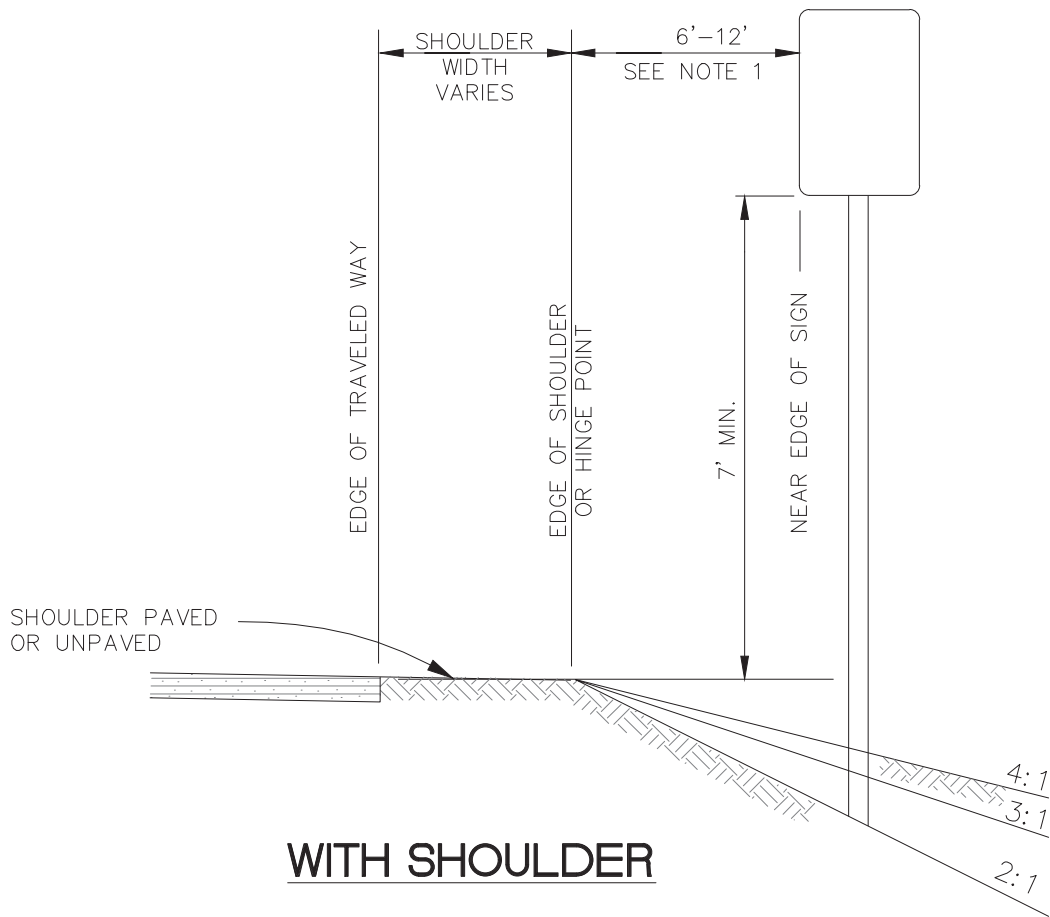
APPROVED:

REVISED:  
2/24

**COMPACT ROUNDABOUT  
ARROW MARKINGS**

SECTION #  
85.03

DETAIL #  
85-16



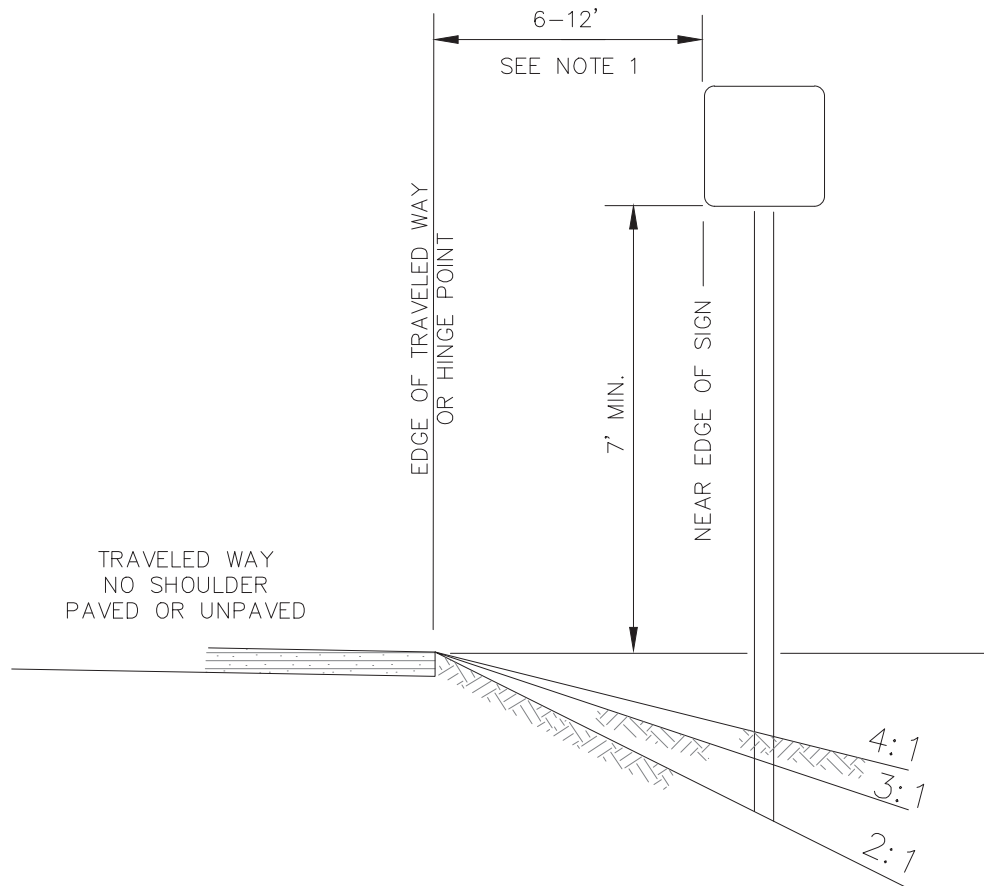
**WITH SHOULDER**

NOTES:

1. UNLESS SHOWN OTHERWISE ON THE DRAWINGS, THE STANDARD SIGN OFFSET IS 12'. THE MINIMUM IS 6'.
2. IF SIGNS EXTEND OVER SIDEWALKS, THE MINIMUM VERTICAL CLEARANCE IS 7'-0".
3. ADD 6" TO MOUNTING HEIGHT ON UNPAVED ROADS.
4. IF SIGNS EXTEND OVER BIKE PATHS, THE MINIMUM VERTICAL CLEARANCE IS 8'-0".
5. PAINT ALL SIGN MOUNTING FASTENERS ON SIGN FACE A COLOR MATCHING THE SIGN FACE.
6. ATTACH ALL SIGN FRAMING AND BRACES MOUNTED TO THE POSTS WITH 5/16" BOLTS WITH SELF-LOCKING NUTS.

REVISION: 2024 M.A.S.S. UPDATE

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>POST MOUNTED SIGN WITH SHOULDER</b></p>	<p>SECTION # 85.04</p> <p>DETAIL # 85-17</p>
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## NO SHOULDER

NOTES:

1. UNLESS SHOWN OTHERWISE ON THE DRAWINGS, THE STANDARD SIGN OFFSET IS 12'. THE MINIMUM IS 6'.
2. IF SIGNS EXTEND OVER SIDEWALKS, THE MINIMUM VERTICAL CLEARANCE IS 7'-0".
3. ADD 6" TO MOUNTING HEIGHT ON UNPAVED ROADS.
4. IF SIGNS EXTEND OVER BIKE PATHS, THE MINIMUM VERTICAL CLEARANCE IS 8'-0".
5. PAINT ALL SIGN MOUNTING FASTENERS ON SIGN FACE A COLOR MATCHING THE SIGN FACE.
6. ATTACH ALL SIGN FRAMING AND BRACES MOUNTED TO THE POSTS WITH 5/16" BOLTS WITH SELF-LOCKING NUTS.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

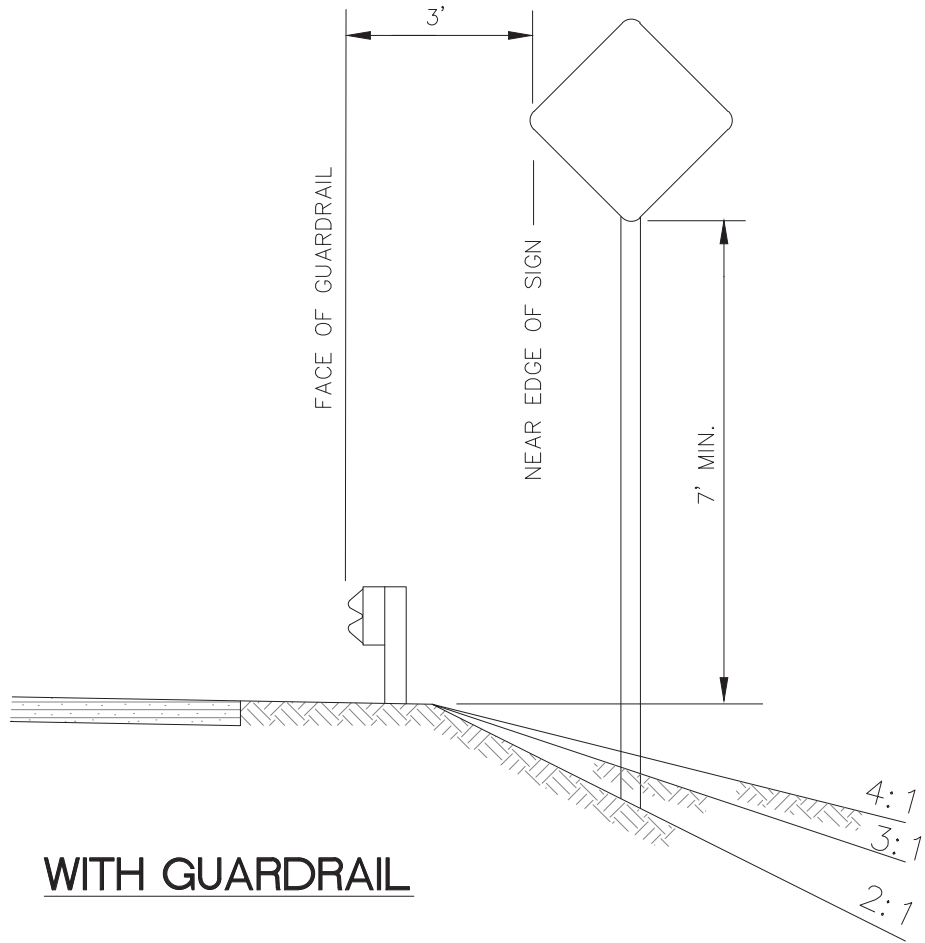
APPROVED:

REVISED:  
2/24

# POST MOUNTED SIGN WITH NO SHOULDER

SECTION #  
85.04

DETAIL #  
85-18



**WITH GUARDRAIL**

NOTES:

1. IF SIGNS EXTEND OVER SIDEWALKS, THE MINIMUM VERTICAL CLEARANCE IS 7'-0".
2. ADD 6" TO MOUNTING HEIGHT ON UNPAVED ROADS.
3. IF SIGNS EXTEND OVER BIKE PATHS, THE MINIMUM VERTICAL CLEARANCE IS 8'-0".
4. PAINT ALL SIGN MOUNTING FASTENERS ON SIGN FACE A COLOR MATCHING THE SIGN FACE.
5. ATTACH ALL SIGN FRAMING AND BRACES MOUNTED TO THE POSTS WITH 5/16" BOLTS WITH SELF-LOCKING NUTS.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

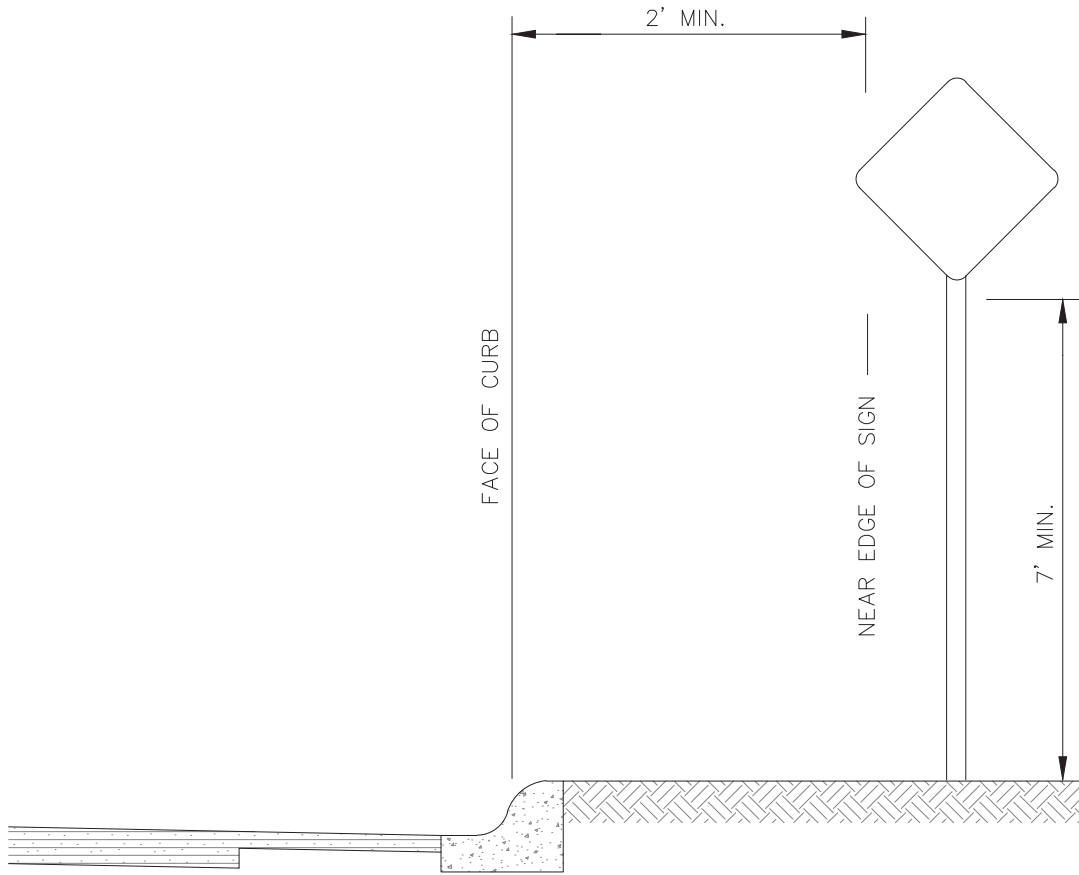
APPROVED:

REVISED:  
2/24

**POST MOUNTED SIGN  
WITH GUARDRAIL**

SECTION #  
85.04

DETAIL #  
85-19



## CURB WITHOUT SIDEWALK

NOTES:

1. PAINT ALL SIGN MOUNTING FASTENERS ON SIGN FACE A COLOR MATCHING THE SIGN FACE.
2. ATTACH ALL SIGN FRAMING AND BRACES MOUNTED TO THE POSTS WITH 5/16" BOLTS WITH SELF-LOCKING NUTS.

REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

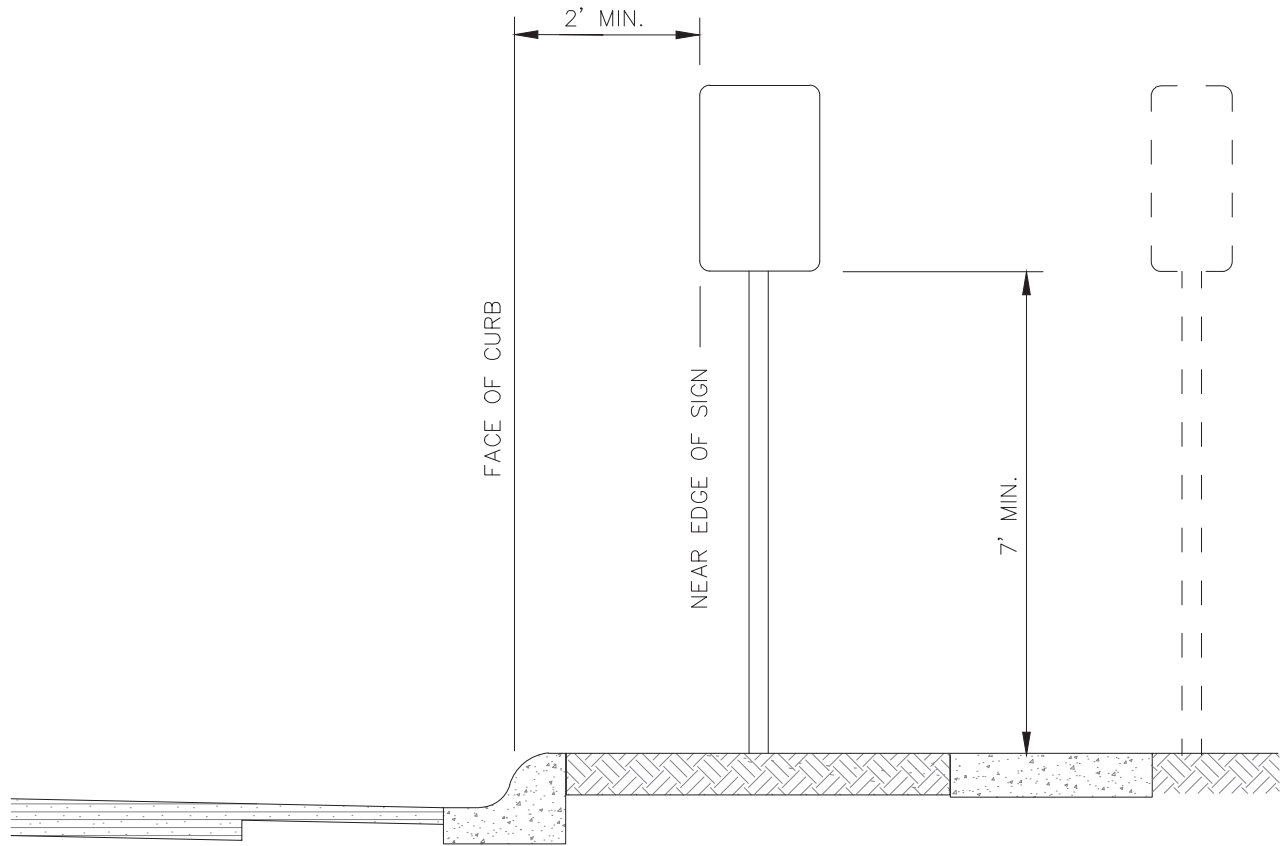
APPROVED:

REVISED:  
2/24

## POST MOUNTED SIGN CURB WITHOUT SIDEWALK

SECTION #  
85.04

DETAIL #  
85-20



## CURB WITH PARKWAY AND SIDEWALK

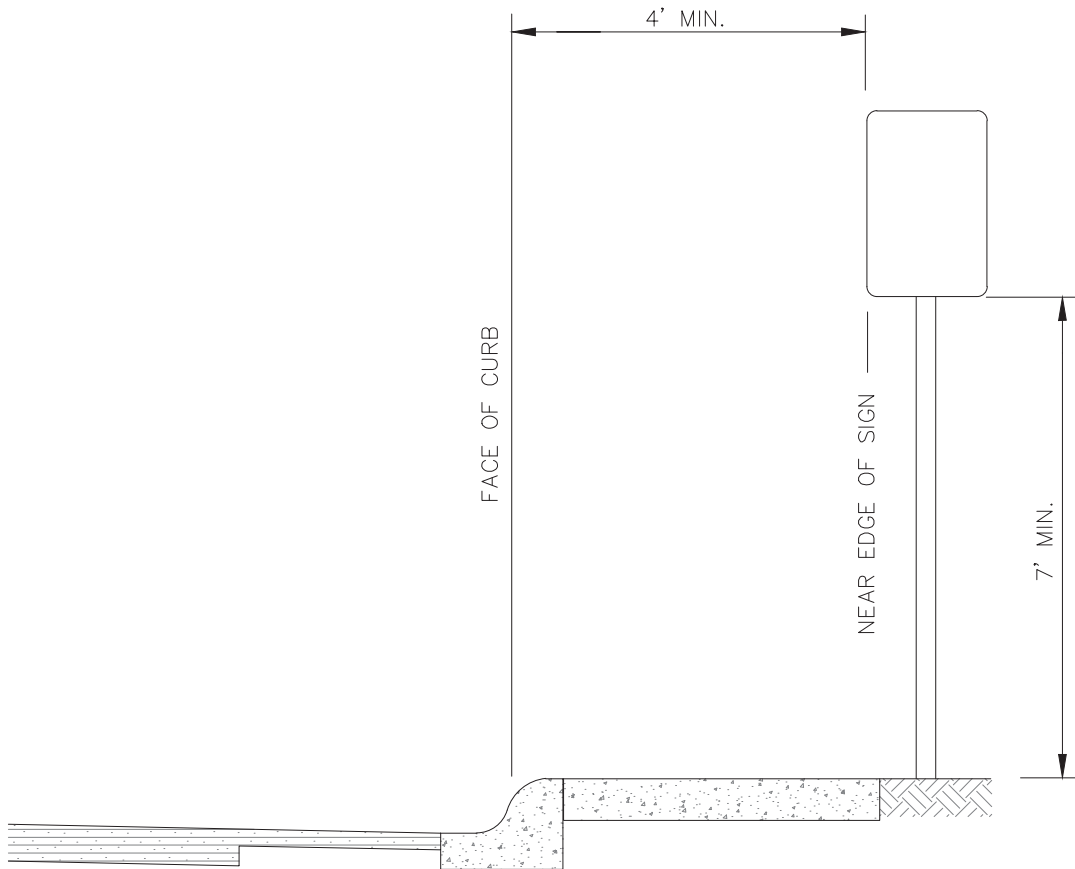
**NOTES:**

1. IF PARKWAY IS LESS THAN 5', SIGNS SHOULD BE PLACED BEHIND SIDEWALK.
2. IF SIGNS EXTEND OVER SIDEWALKS, THE MINIMUM VERTICAL CLEARANCE IS 7'-0".
3. IF SIGNS EXTEND OVER BIKE PATHS, THE MINIMUM VERTICAL CLEARANCE IS 8'-0".
4. PAINT ALL SIGN MOUNTING FASTENERS ON SIGN FACE A COLOR MATCHING THE SIGN FACE.
5. ATTACH ALL SIGN FRAMING AND BRACES MOUNTED TO THE POSTS WITH 5/16" BOLTS WITH SELF-LOCKING NUTS.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h1 style="margin: 0;">POST MOUNTED SIGN CURB WITH PARKWAY AND SIDEWALK</h1>	SECTION # 85.04  DETAIL # 85-21
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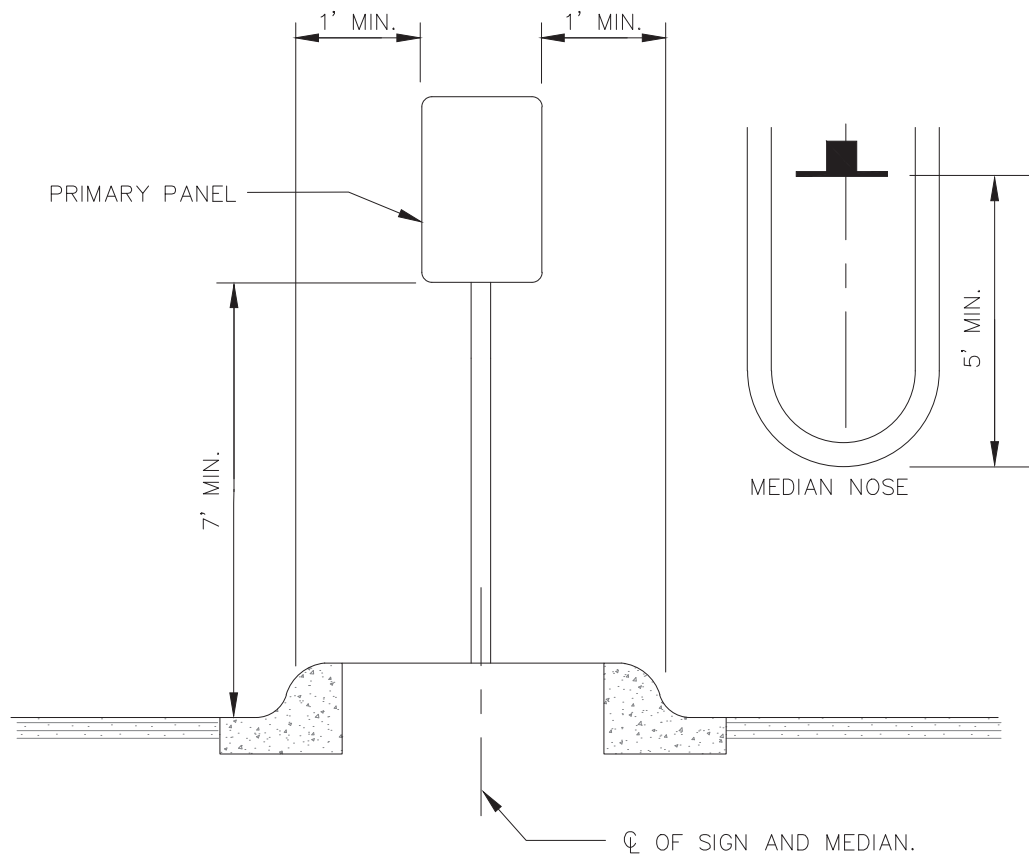
## CURB WITH ATTACHED SIDEWALK

**NOTE:**

1. SIGN FACE SHALL BE PLACED OUTSIDE SIDEWALK EXCEPT WHEN ROW LIMITATIONS EXIST; FOR EXAMPLE IN THE CENTRAL BUSINESS DISTRICT OR OTHER SIMILAR DISTRICTS.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h1 style="margin: 0;">POST MOUNTED SIGN CURB WITH SIDEWALK WITHOUT PARKWAY</h1>	SECTION # 85.04  DETAIL # 85-22
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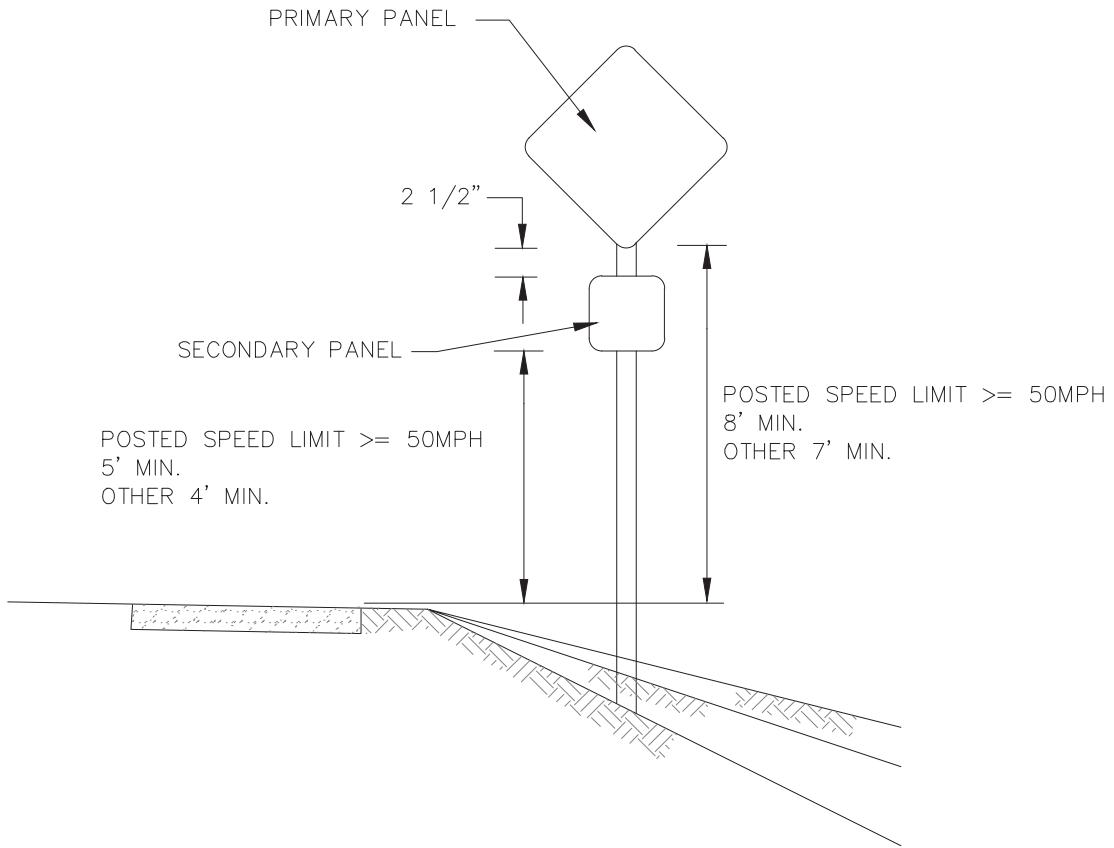
## RAISED MEDIAN

NOTE:

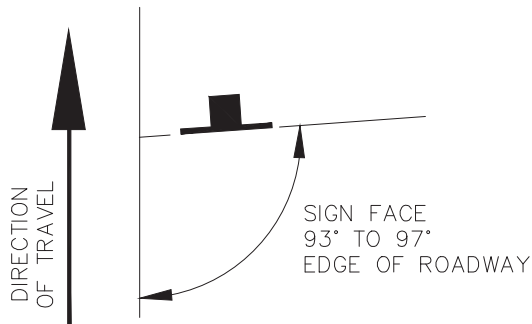
IF AN OBJECT MARKER IS REQUIRED BY THE TRAFFIC ENGINEER, THE SIGN SHALL HAVE A MINIMUM FOUR FOOT (4') CLEARANCE FROM THE TOP OF MEDIAN TO THE BOTTOM OF SIGN.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h1 style="margin: 0;">POST MOUNTED SIGN RAISED MEDIANS</h1>	SECTION # 85.04  DETAIL # 85-23
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**SECONDARY PANEL HEIGHT  
ALL TWO PANEL MOUNTING**



**SIGN POSITIONING**

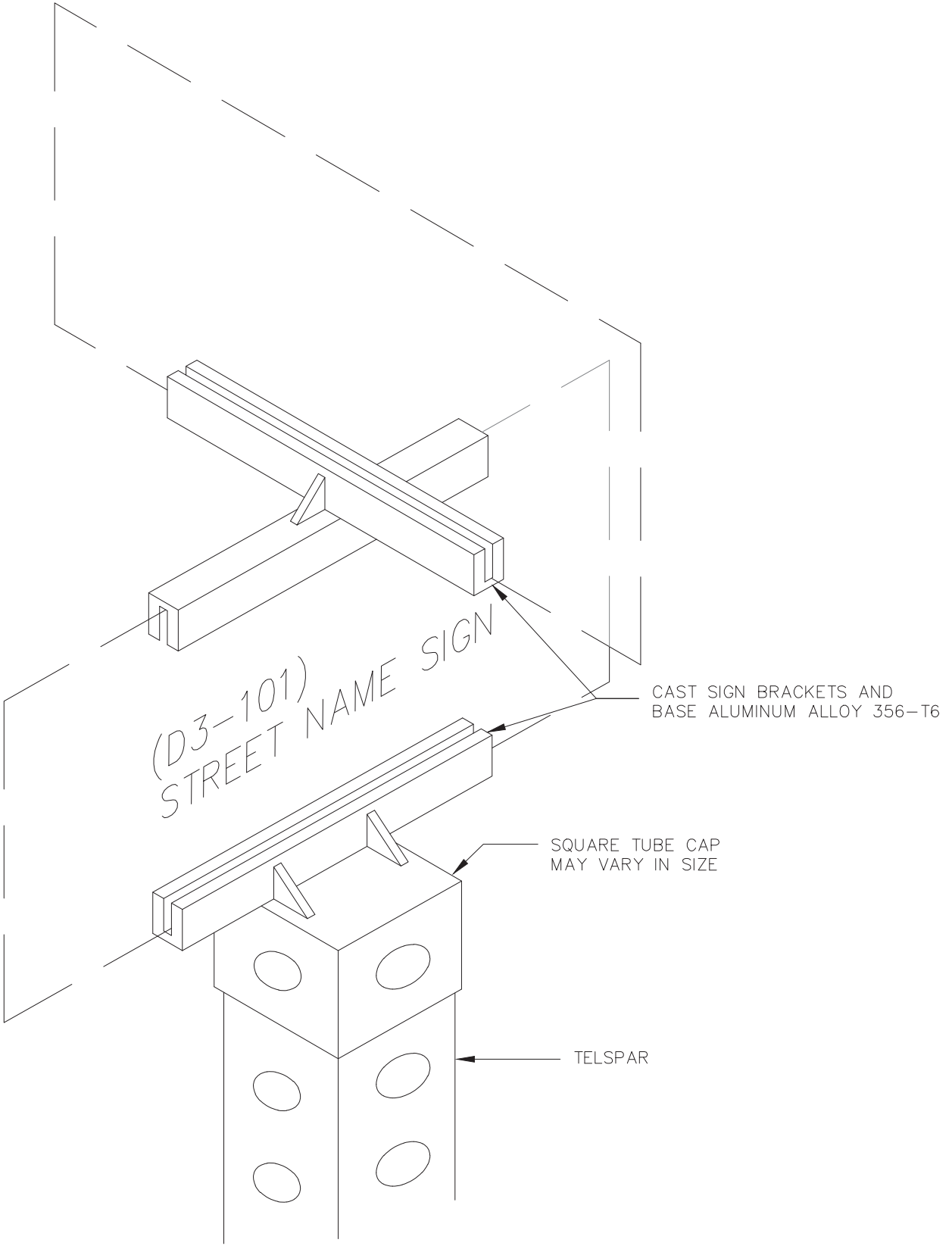
REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY  
  
 OF ANCHORAGE

SCALE:  
N.T.S.  
 APPROVED:  
 REVISED:  
2/24

**POST MOUNTED SIGN  
SECONDARY PANEL HEIGHT  
AND SIGN POSITIONING**

SECTION #  
85.04  
 DETAIL #  
85-24



REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

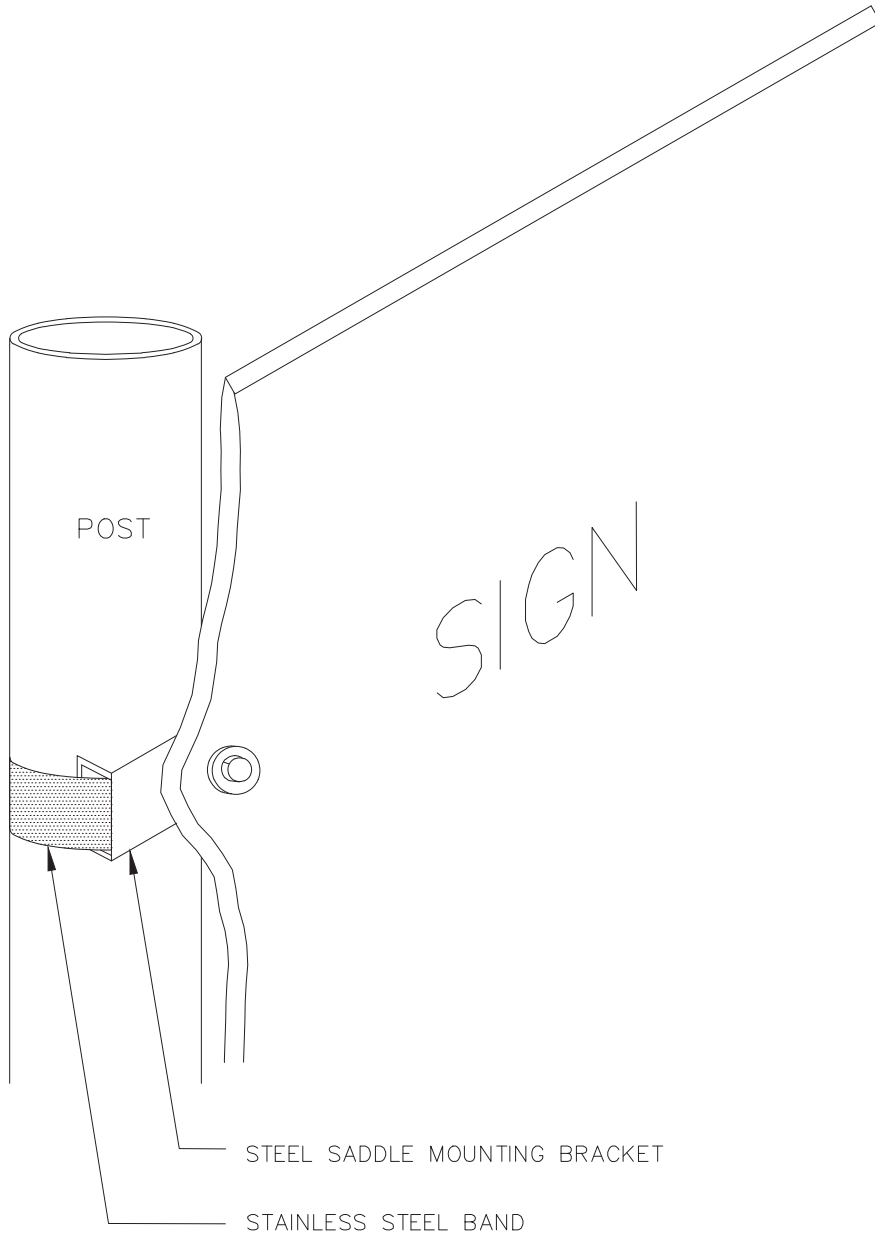
APPROVED:

REVISED:  
2/24

# STREET NAME SIGNS

SECTION #  
85.04

DETAIL #  
85-25



REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

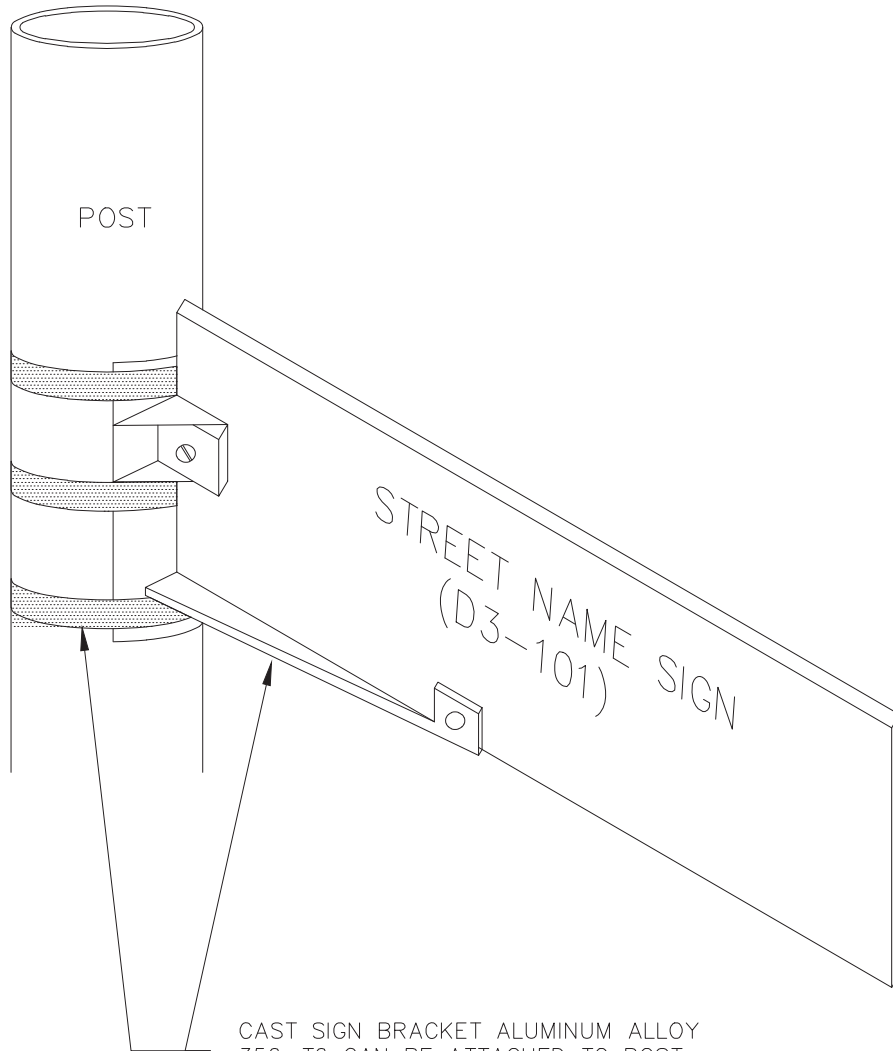
APPROVED:

REVISED:  
2/24

# SIGN ON ROUND POST

SECTION #  
85.04

DETAIL #  
85-26



CAST SIGN BRACKET ALUMINUM ALLOY  
356-T6 CAN BE ATTACHED TO POST  
WITH STAINLESS STEEL STRAPS.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

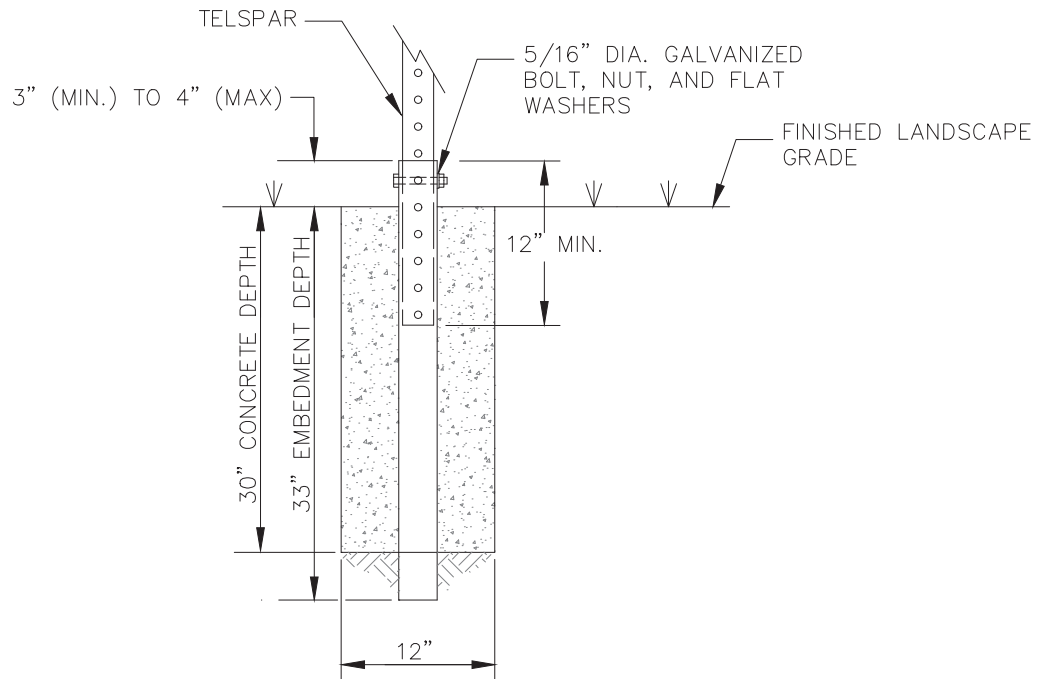
APPROVED:

REVISED:  
2/24

# STREET NAME ON ROUND POST

SECTION #  
85.04

DETAIL #  
85-27



## CONCRETE FOUNDATION FOR SIGN POST

NOTES:

1. TELSPAR SHALL BE 2 ½" X 2 ½" PERFORATED STEEL TUBES (P.S.T.), (12ga.-.105 WALL THICKNESS).
2. EMBEDDED DEPTHS 33", CONCRETE DEPTH 30"
3. SEPARATE SIGN INSTALLATIONS ARE NOT PERMITTED WITHIN 7' OF EACH OTHER.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

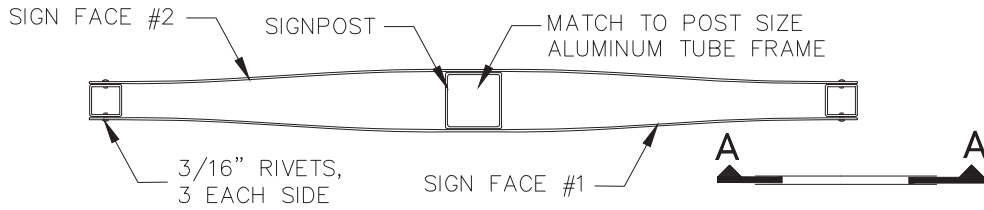
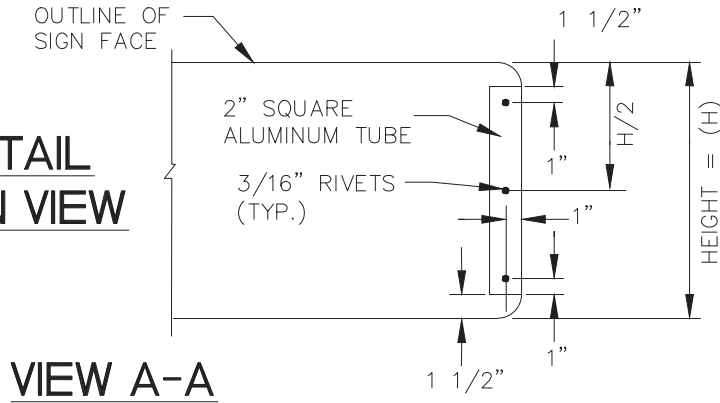
REVISED:  
2/24

## CONCRETE FOUNDATION FOR SIGN POST

SECTION #  
85.04

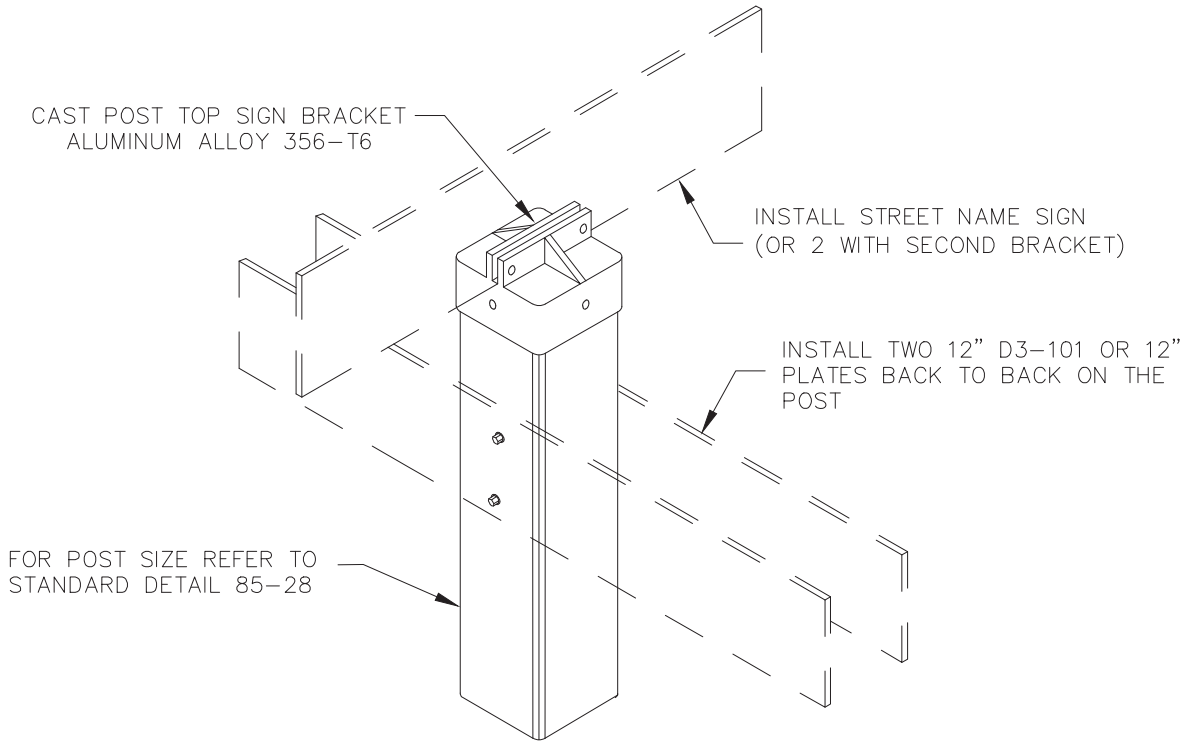
DETAIL #  
85-28

# RIVET DETAIL ELEVATION VIEW



# PLAN VIEW

## 12" SIGNS/PLATES 36" OR GREATER IN LENGTH BRACING DETAIL



REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

# 12" PLATE INSTALLATION DETAIL WITH SUPPLEMENTAL 8" D3-101 SIGNS

SECTION #  
85.04

DETAIL #  
85-29



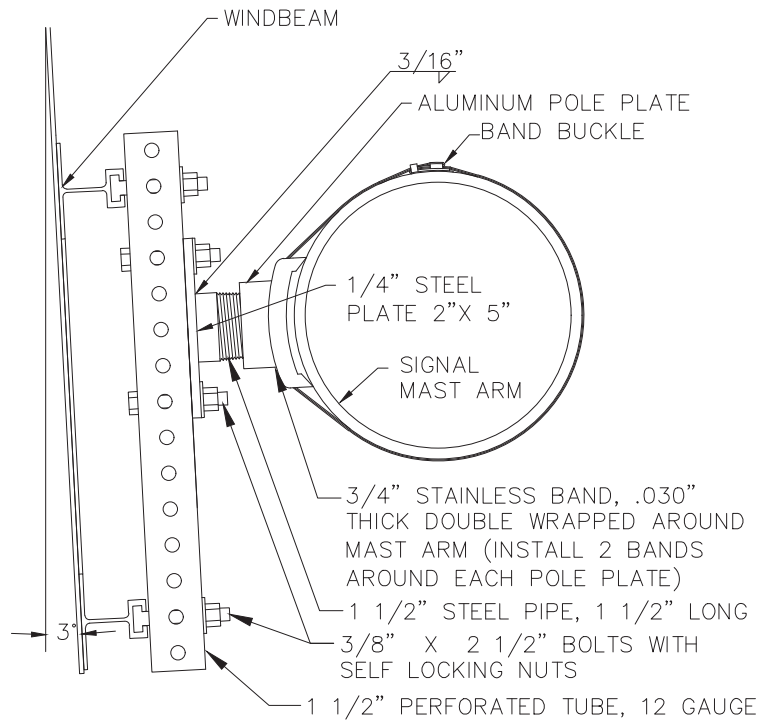


TABLE 1

POLE PLATE SPACING

NO. OF POLE PLATES	OVERHANG	BETWEEN POLE PLATES	OVERHANG
2	0.2W	1 SPACE AT 0.6W 2	0.2W
3	0.15W	SPACES AT 0.35W 3	0.15W
4	0.125W	SPACES AT 0.25W 1	0.125W
5	0.2W	SPACE AT 0.6W	0.2W

NOTES:

1. USE POLE PLATE ASSEMBLIES TO INSTALL SIGNS ON TAPERED MAST ARMS AND SIGNS REQUIRING FRAMING ON LIGHT POLES.
2. FOR SIGNS ON MAST ARMS INSTALL A MINIMUM OF TWO POLE PLATES FOR EACH SIGN. INSTALL AN ADDITIONAL POLE PLATE PER 10 SQUARE FEET OF SIGN.
3. FOR SIGNS ON MAST ARMS MAINTAIN MINIMUM 18' UNDER CLEARANCE FROM THE VEHICULAR TRAVELED WAY.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

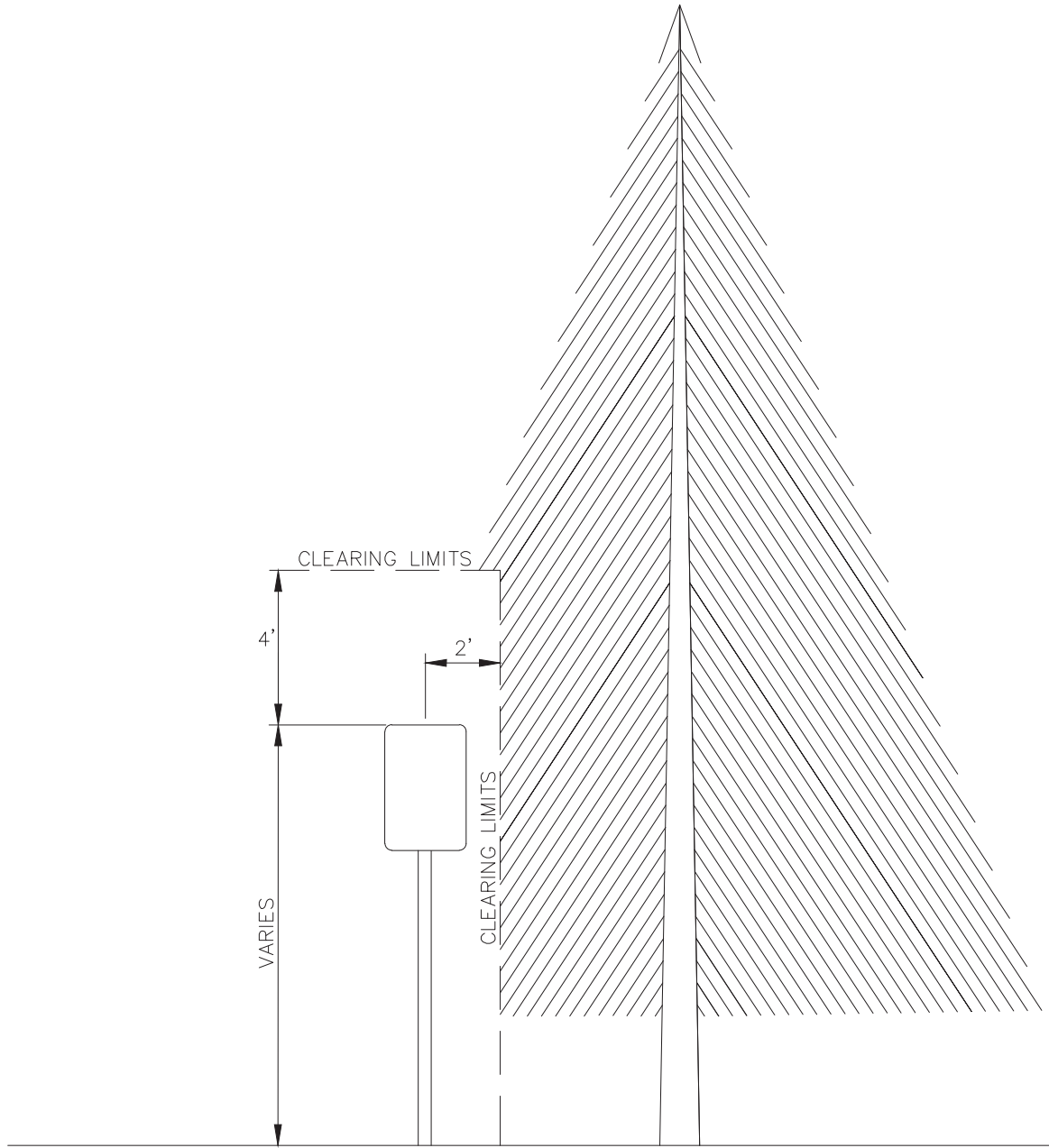
APPROVED:

REVISED:  
2/24

# SIGNAL POLE MAST ARM SIGN MOUNTING

SECTION #  
85.04

DETAIL #  
85-30

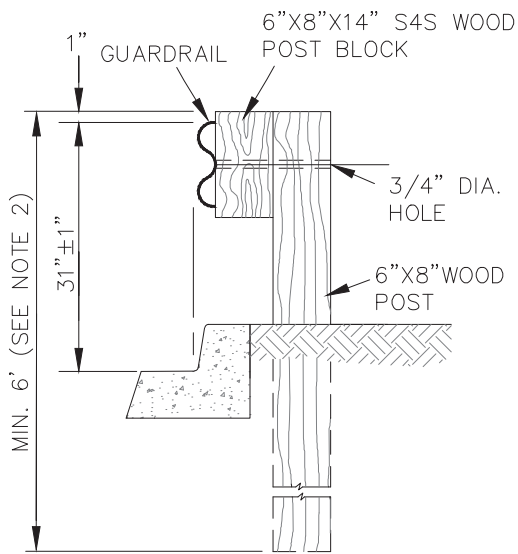
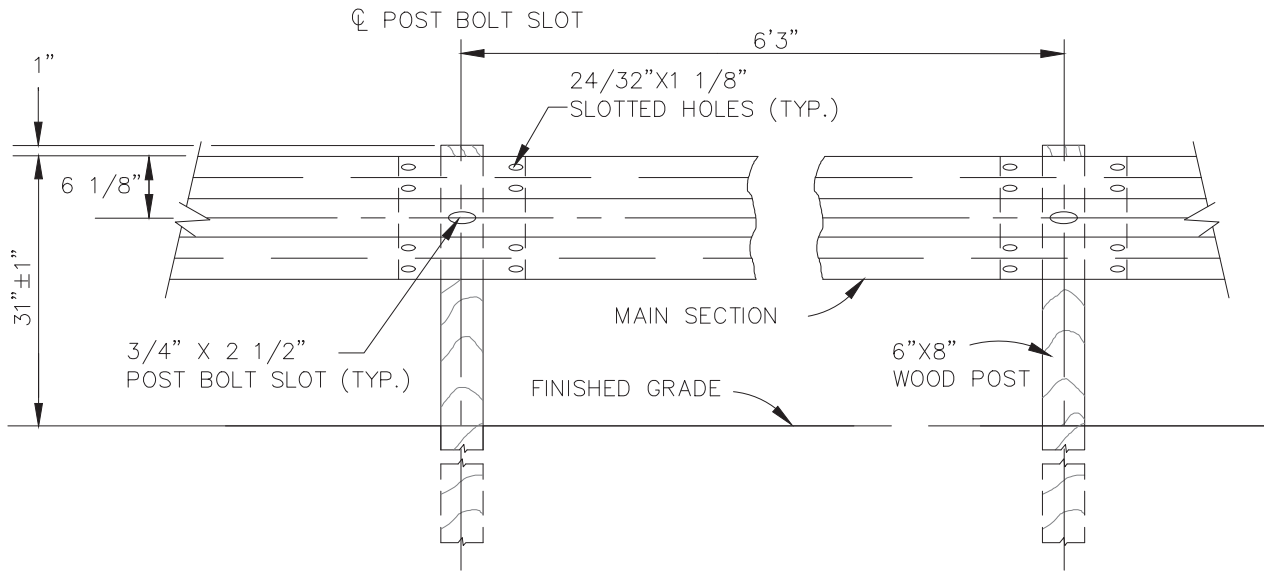


## CLEARING FOR SIGNS

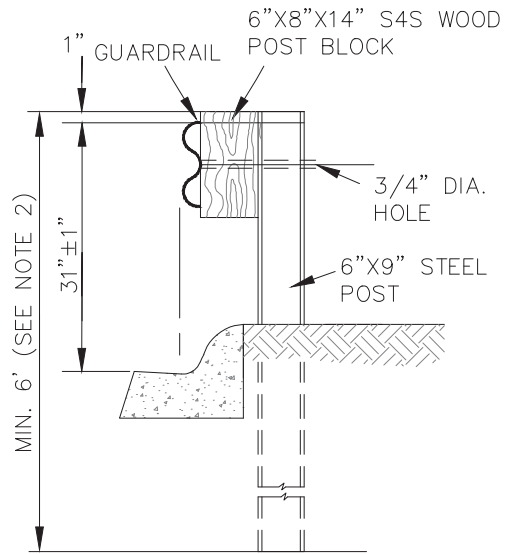
1. MAINTAIN CLEARING LIMITS WITHIN AVAILABLE RIGHT OF WAY.
2. ALL CLEARING ACTIVITIES SHALL BE PERFORMED BY AN ARBORIST IN ACCORDANCE WITH SECTION 20.05 CLEARING.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	<h1 style="margin: 0;">CLEARING FOR SIGNS</h1>	SECTION # 85.04  DETAIL # 85-31
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**WOOD POST**



**STEEL POST**

NOTES:

1. PROVIDE GUARDRAIL OF TYPE AND GAUGE SPECIFIED IN THE CONTRACT DOCUMENTS.
2. WHEN INFORMATION IS NOT INCLUDED IN THE CONTRACT DOCUMENTS, SEE ADOT&PF STANDARD PLAN G-10 FOR GUARDRAIL POST LENGTHS CORRESPONDING TO COMBINATIONS OF SLOPE AND BEHIND-POST EMBANKMENT WIDTHS.
3. WHEN INFORMATION IS NOT INCLUDED IN THE CONTRACT DOCUMENTS, SEE ADOT&PF STANDARD PLANS G-14 AND G-20 FOR GUARDRAIL END TREATMENT DETAILS.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

SCALE:  
N.T.S.

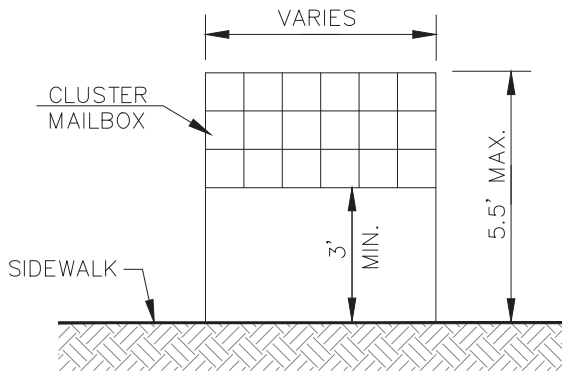
APPROVED:

REVISED:  
2/24

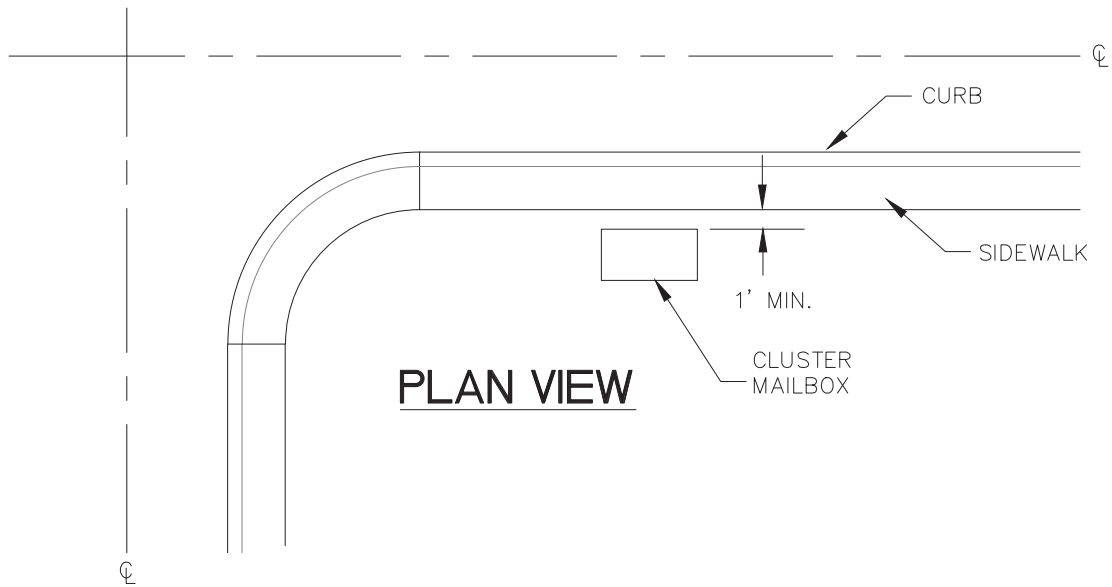
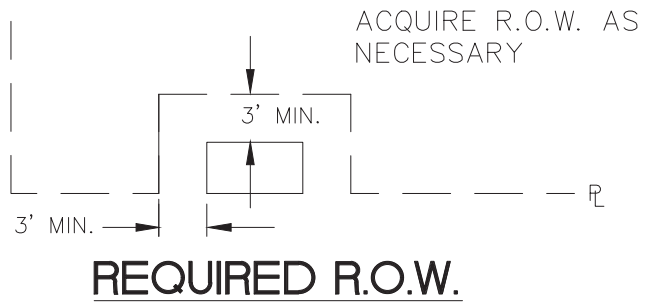
**GUARDRAIL DETAIL**

SECTION #  
85.07

DETAIL #  
85-32



**FRONT VIEW**



**NOTE:**

1. COORDINATE WITH LOCAL POSTAL AUTHORITIES TO DETERMINE LOCATIONS OF CLUSTER MAILBOXES. IF CLUSTERING OR SPECIAL LOCATIONS ARE SPECIFIED, PROVISIONS SHALL BE INCLUDED IN THE CONTRACT DOCUMENTS.

REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

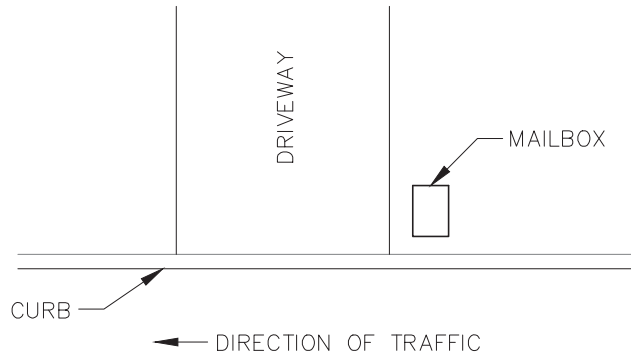
APPROVED:

REVISED:  
2/24

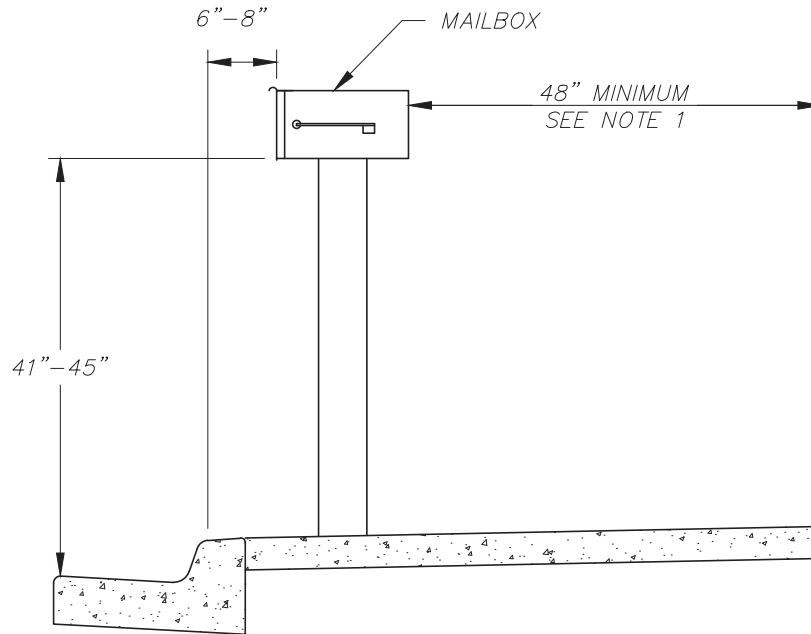
**CLUSTER MAILBOX LOCATION**

SECTION #  
85.08,  
85.09

DETAIL #  
85-33



**PLAN VIEW**



**MAILBOX LOCATION**

NOTES:

1. WHERE MAILBOX IS LOCATED WITHIN SIDEWALK, PROVIDE 4 FOOT MINIMUM WIDE CLEAR PEDESTRIAN ACCESS ROUTE.
2. COORDINATE WITH LOCAL POSTAL AUTHORITIES TO DETERMINE LOCATION OF MAILBOX. IF SPECIAL LOCATION IS SPECIFIED, PROVISIONS SHALL BE INCLUDED IN THE CONTRACT DOCUMENTS.

REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

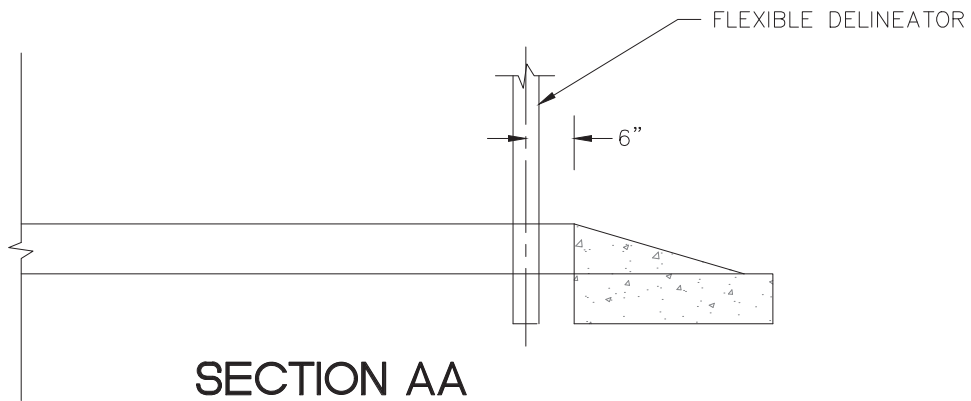
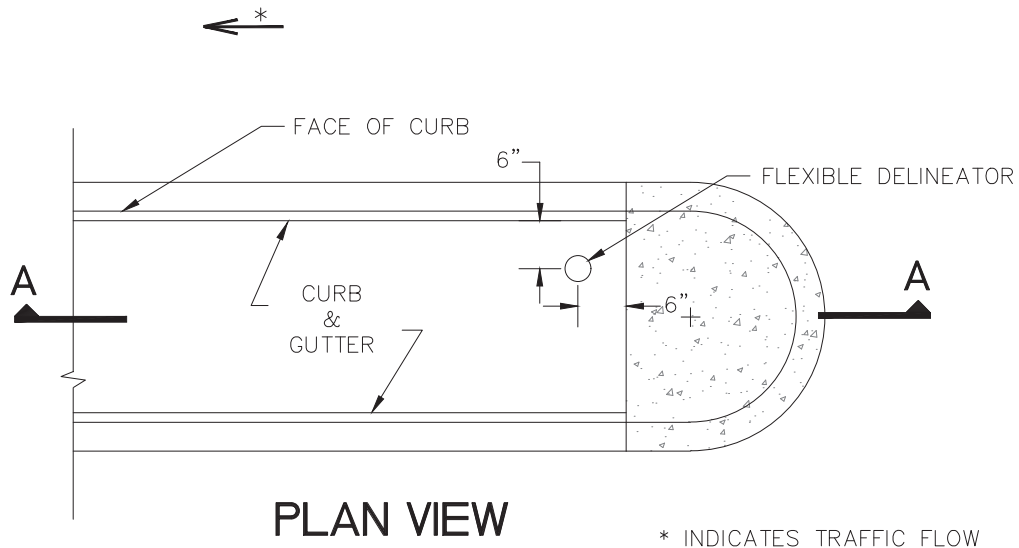
APPROVED:

REVISED:  
2/24

**MAILBOX LOCATION**

SECTION #  
85.09

DETAIL #  
85-34



**FLEXIBLE DELINEATOR**

SEE DETAIL 30-4 FOR MEDIAN/CURB NOSE DETAILS.

REVISION: 2024 M.A.S.S. UPDATE



SCALE:  
N.T.S.

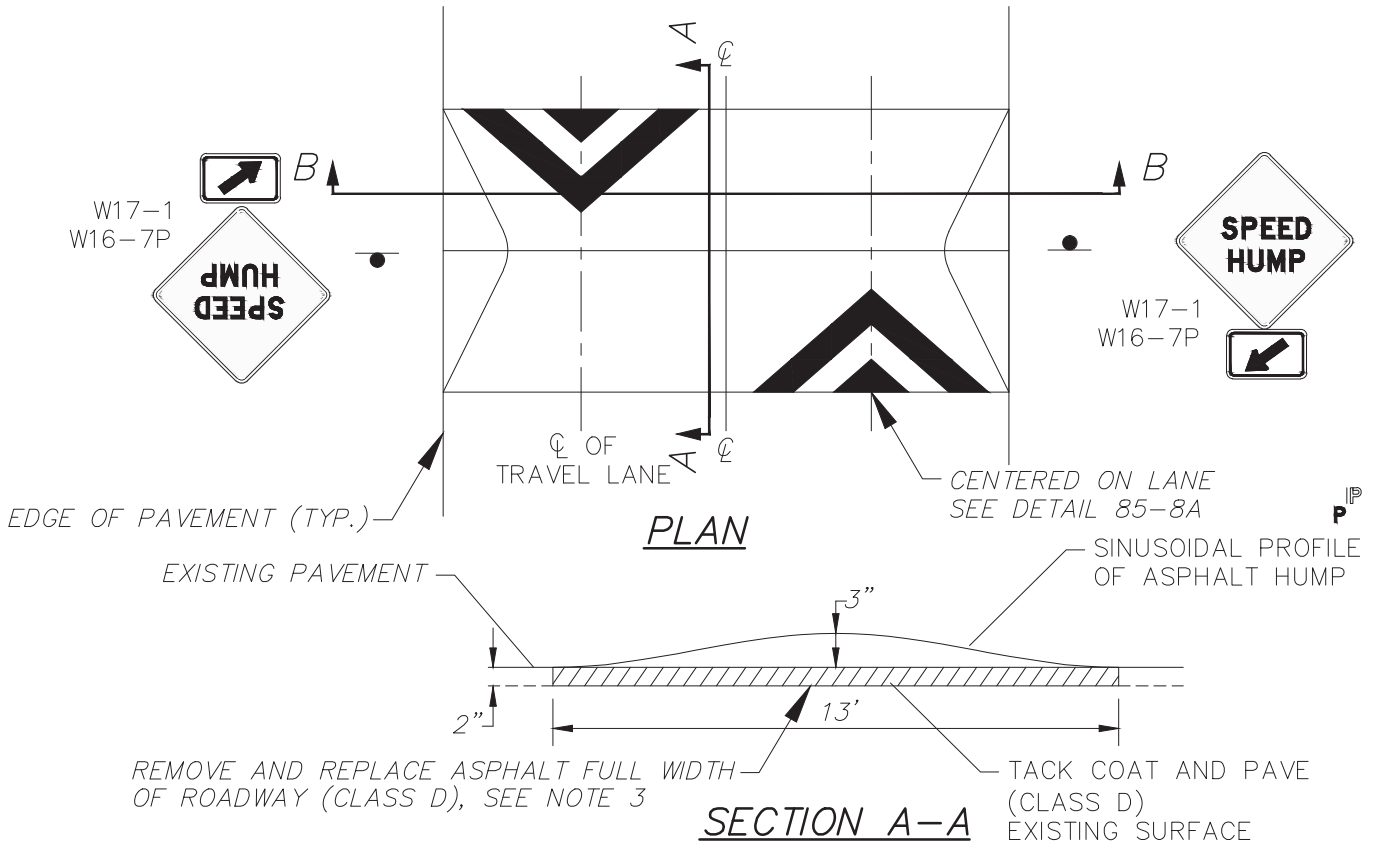
APPROVED:

REVISED:  
2/24

**FLEXIBLE DELINEATOR**

SECTION #  
85.10

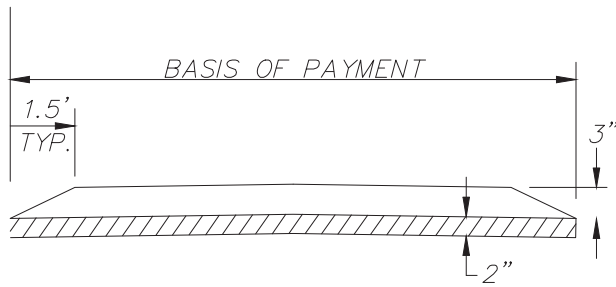
DETAIL #  
85-35



**SPEED HUMP NOTES:**

1. CONTRACTOR SHALL CONSTRUCT SPEED HUMPS AS SHOWN IN SECTION BB TO ENSURE THAT DRAINAGE IS NOT OBSTRUCTED ALONG THE EDGE OF THE ROADWAY.
2. ASPHALT THICKNESS SHALL BE WITHIN PLUS OR MINUS 0.25" OF THICKNESS SHOWN.
3. SPEED HUMP STRIPING SHALL BE 90 MIL INLAID METHYL METHACRYLATE. SPEED HUMP STRIPING SHALL BE INCIDENTAL TO THE CONSTRUCTION OF THE SPEED HUMP AND NO ADDITIONAL PAYMENT SHALL BE MADE.
4. IF SINUSOIDAL SPEED HUMP ARE INSTALLED WITHIN 15 DAYS OF ROADWAY ASPHALT PLACEMENT, THE NEWLY PAVED SURFACE IS NOT REQUIRED TO BE REMOVED AND REPLACED. TACK COAT SHALL BE APPLIED BETWEEN THE NEWLY PAVED SURFACE AND THE FLAT TOP SPEED HUMP.

LIP OF GUTTER OR EDGE OF PAVEMENT



**SINUSOIDAL PROFILE OF SPEED HUMP**

DISTANCE (ft)	0.00	0.41	0.82	1.23	1.64	2.05	2.46	2.87
FINISHED HEIGHT (in)	0.00	0.04	0.12	0.26	0.47	0.71	0.98	1.26
DISTANCE (ft)	3.69	4.10	4.51	4.92	5.33	5.74	6.00	6.50
FINISHED HEIGHT (in)	1.89	2.17	2.44	2.68	2.87	2.95	3.00	3.00

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SCALE:  
N.T.S.

APPROVED:

REVISED:  
2/24

**SINUSOIDAL SPEED HUMP**

SECTION #  
85.11

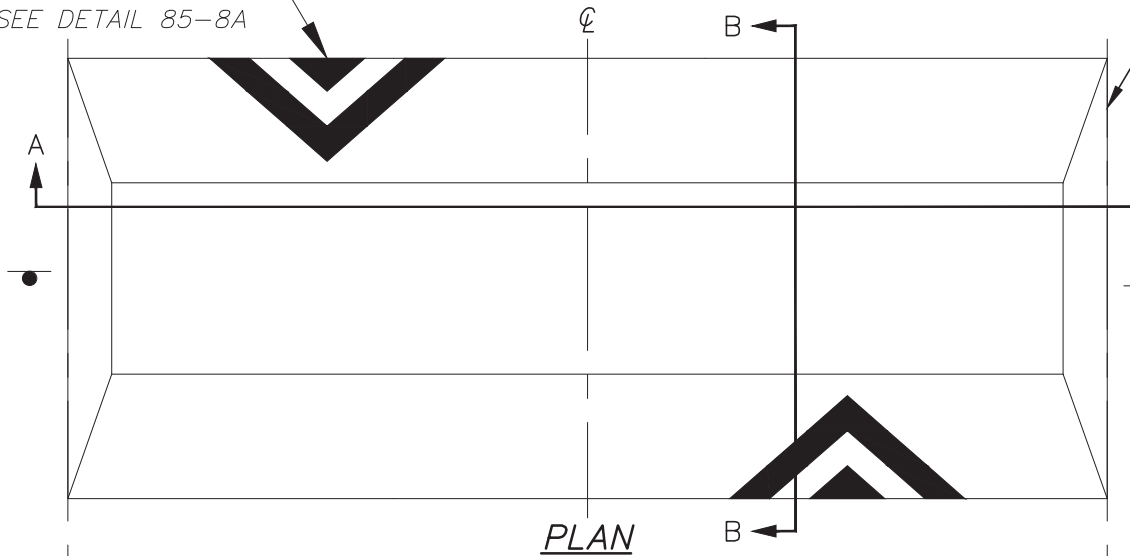
DETAIL #  
85-36

CENTERED ON LANE  
SEE DETAIL 85-8A

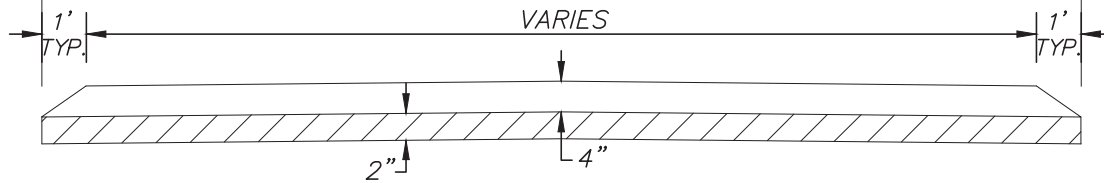
LIP OF  
GUTTER OR  
EDGE OF  
PAVEMENT,  
TYP.



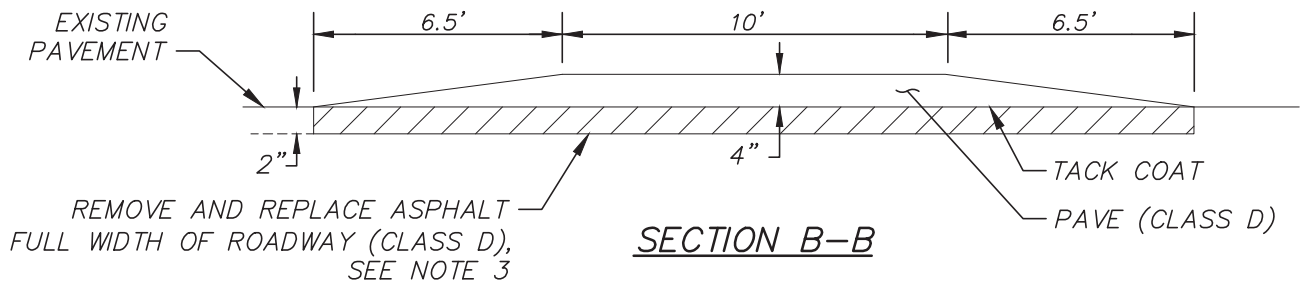
W17-1  
W16-7P



PLAN



SECTION A-A



SECTION B-B

REMOVE AND REPLACE ASPHALT  
FULL WIDTH OF ROADWAY (CLASS D),  
SEE NOTE 3

**ASPHALT FLAT TOP SPEED HUMP NOTES:**

1. CONSTRUCT FLAT TOP SPEED HUMPS AS SHOWN IN SECTION A-A TO ENSURE THAT DRAINAGE IS NOT OBSTRUCTED ALONG THE EDGE OF THE ROADWAY.
2. ASPHALT THICKNESS SHALL BE WITHIN PLUS OR MINUS 0.25" OF THICKNESS SHOWN.
3. IF ASPHALT FLAT TOP SPEED HUMP ARE INSTALLED WITHIN 15 DAYS OF ROADWAY ASPHALT PLACEMENT, THE NEWLY PAVED SURFACE IS NOT REQUIRED TO BE REMOVED AND REPLACED. TACK COAT SHALL BE APPLIED BETWEEN THE NEWLY PAVED SURFACE AND THE FLAT TOP SPEED HUMP.
4. ASPHALT FLAT TOP SPEED HUMP STRIPING SHALL BE 90 MIL INLAID MMA. ASPHALT FLAT TOP SPEED HUMP SYMBOLS SHALL BE INCIDENTAL TO THE CONSTRUCTION OF THE ASPHALT FLAT TOP SPEED HUMP AND NO ADDITIONAL PAYMENT SHALL BE MADE.
5. PLACE ARROW SYMBOLS IN CENTER OF LANE. VERIFY WITH THE ENGINEER PRIOR TO PLACEMENT.

REVISION: 2024 M.A.S.S. UPDATE

MUNICIPALITY



OF ANCHORAGE

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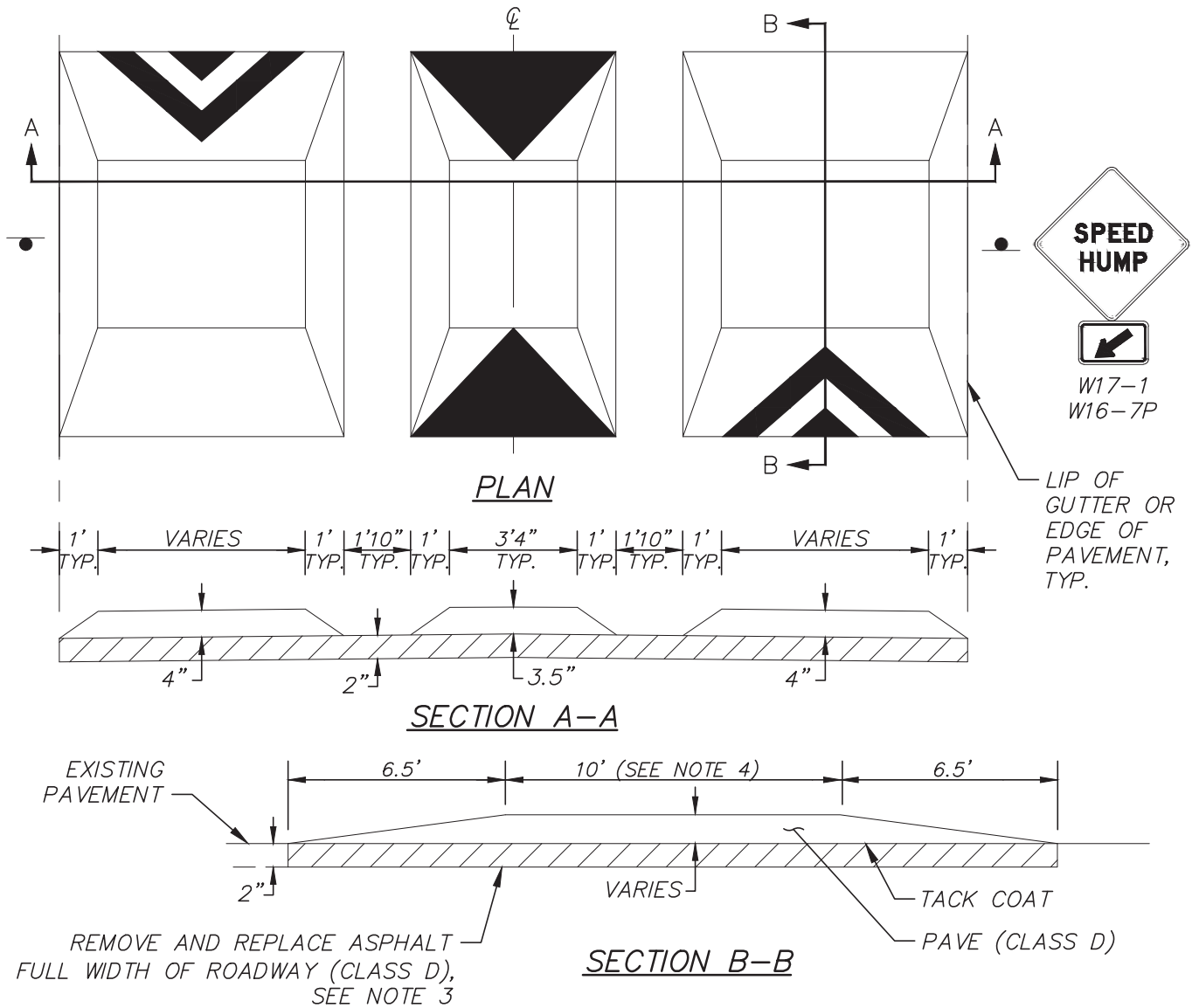
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**ASPHALT FLAT TOP  
SPEED HUMP**

SECTION #  
85.11

DETAIL #  
85-37



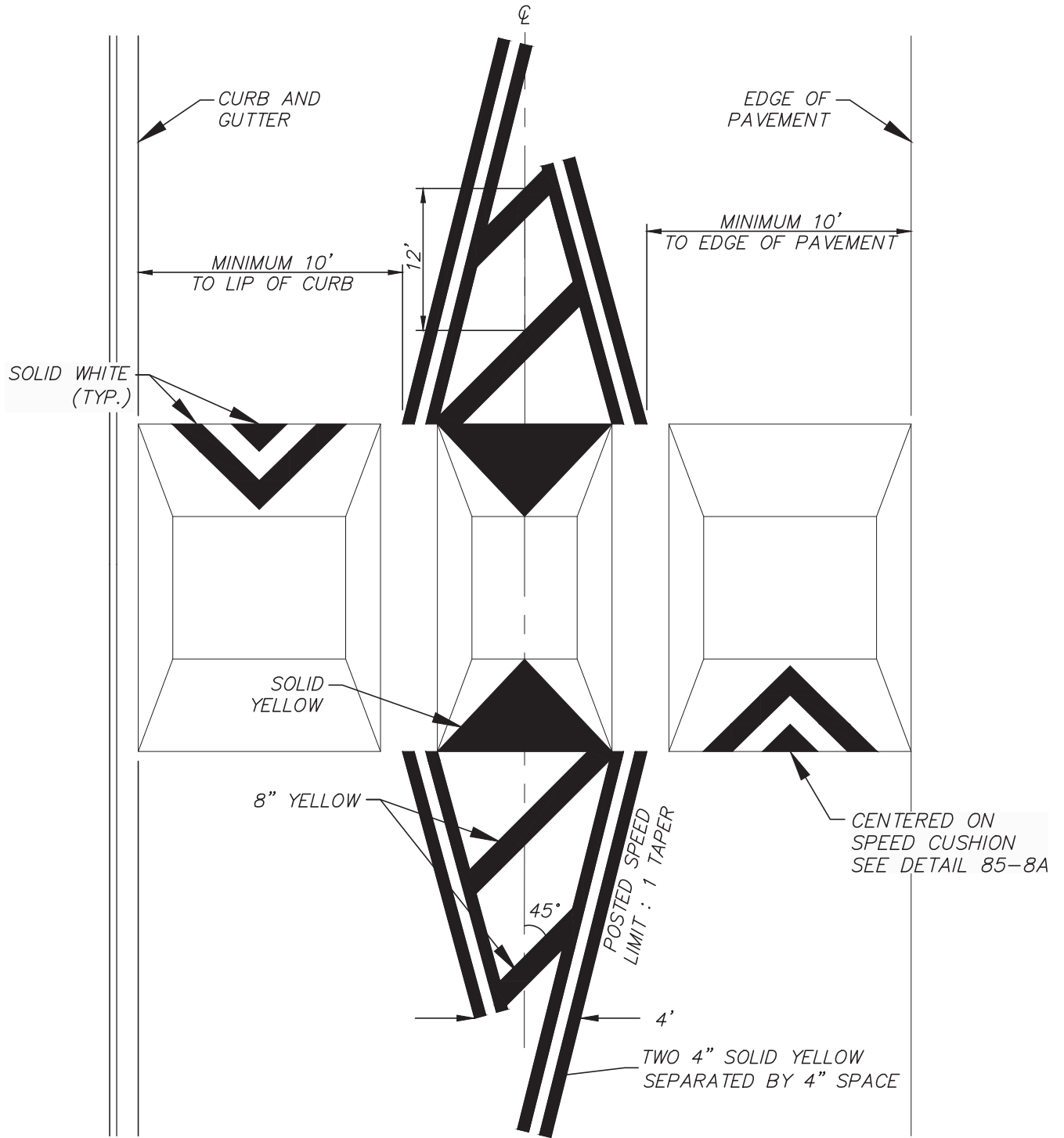


**ASPHALT SPEED CUSHION NOTES:**

1. CONSTRUCT SPEED CUSHIONS AS SHOWN IN SECTION A-A TO ENSURE THAT DRAINAGE IS NOT OBSTRUCTED ALONG THE EDGE OF THE ROADWAY.
2. ASPHALT THICKNESS SHALL BE WITHIN PLUS OR MINUS 0.25" OF THICKNESS SHOWN.
3. IF ASPHALT SPEED CUSHIONS ARE INSTALLED WITHIN 15 DAYS OF ROADWAY ASPHALT PLACEMENT, THE NEWLY PAVED SURFACE IS NOT REQUIRED TO BE REMOVED AND REPLACED. TACK COAT SHALL BE APPLIED BETWEEN THE NEWLY PAVED SURFACE AND THE SPEED CUSHIONS.
4. THE LENGTH OF THE FLAT TOP SECTION MAY BE REDUCED TO 8' WITH THE APPROVAL FROM THE TRAFFIC ENGINEER.
5. ASPHALT SPEED CUSHIONS SHALL NOT BE PLACED ON ROADWAYS LESS THAN 27.5' WIDE OR GRADES GREATER THAN 5.0%.
6. SEE M.A.S.S. SECTION 85.11 DETAIL 85-39 FOR SPEED CUSHION STRIPING.

REVISION: 2024 M.A.S.S. UPDATE

 MUNICIPALITY OF ANCHORAGE	SCALE: N.T.S.  APPROVED:   REVISED: 2/24	ASPHALT SPEED CUSHION	SECTION # 85.11  DETAIL # 85-38
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**ASPHALT SPEED CUSHION STRIPING NOTES:**

1. ASPHALT SPEED CUSHION STRIPING SHALL BE 90 MIL INLAID MMA. SYMBOLS LOCATED ON THE SPEED CUSHION SHALL BE INCIDENTAL TO THE CONSTRUCTION OF THE ASPHALT SPEED CUSHION AND NO ADDITIONAL PAYMENT SHALL BE MADE.
2. TAPER LENGTH MAY BE REDUCED WITH APPROVAL FROM THE ENGINEER.

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MUNICIPALITY  
  
 OF ANCHORAGE

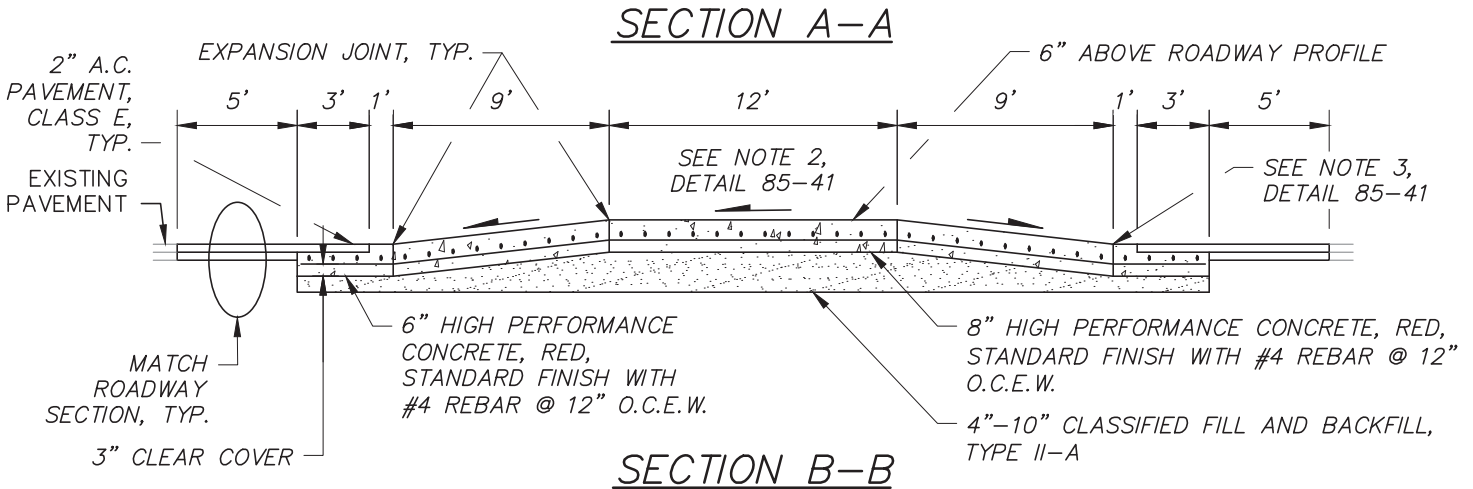
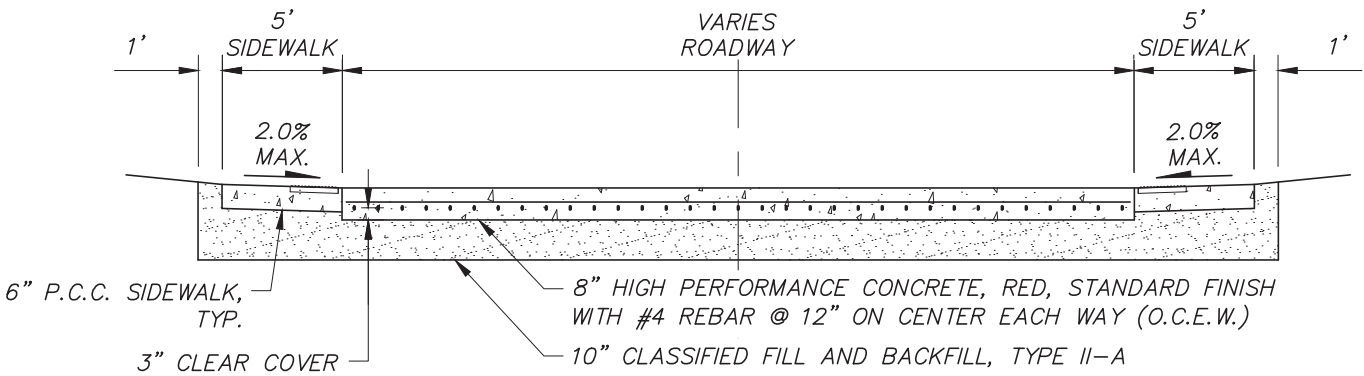
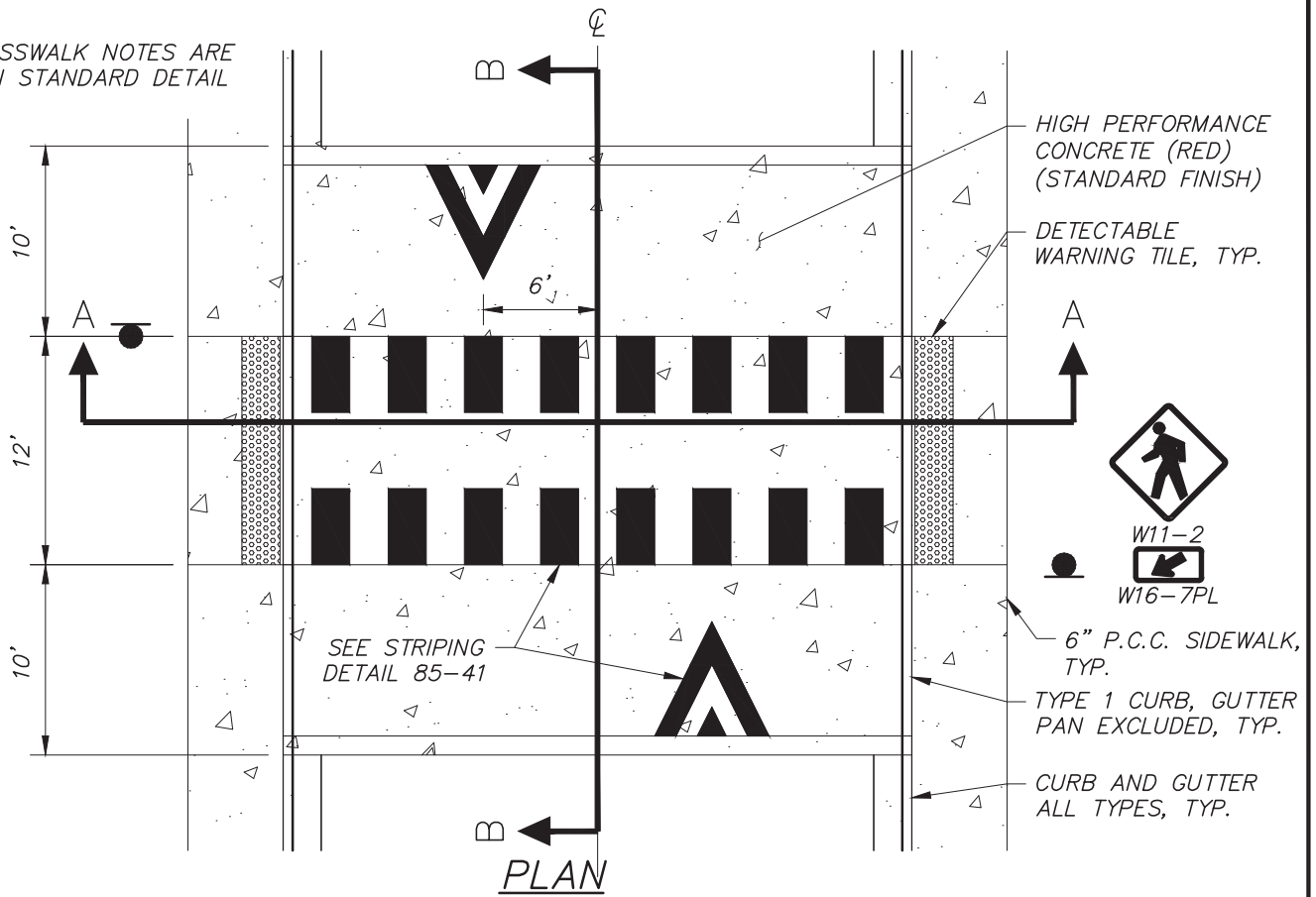
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 REVISED:  
2/24

**ASPHALT SPEED CUSHION  
STRIPING**

SECTION #  
85.11  
 DETAIL #  
85-39

NOTES:

1. RAISED CROSSWALK NOTES ARE PROVIDED IN STANDARD DETAIL 85-41



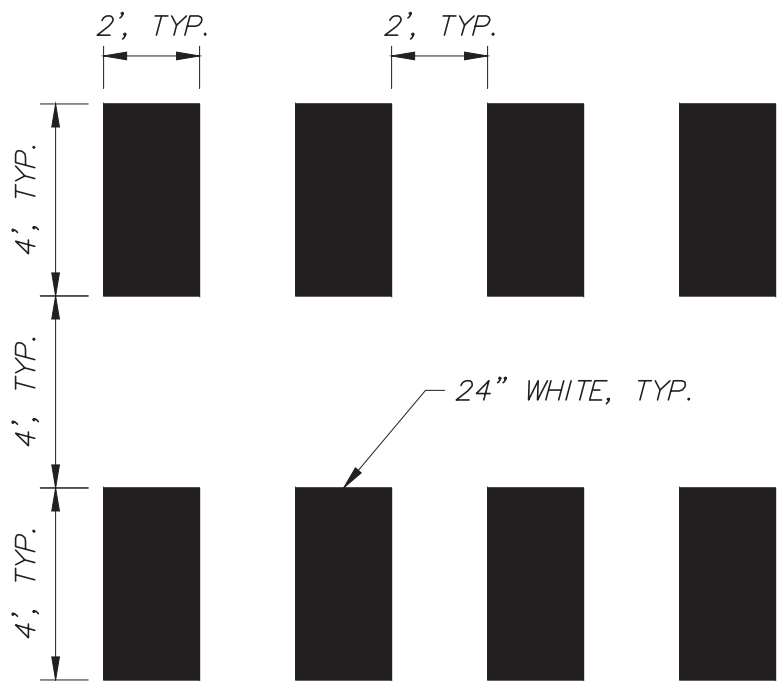
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 APPROVED:  
 REVISED: 2/24

# TYPE A RAISED CROSSWALK

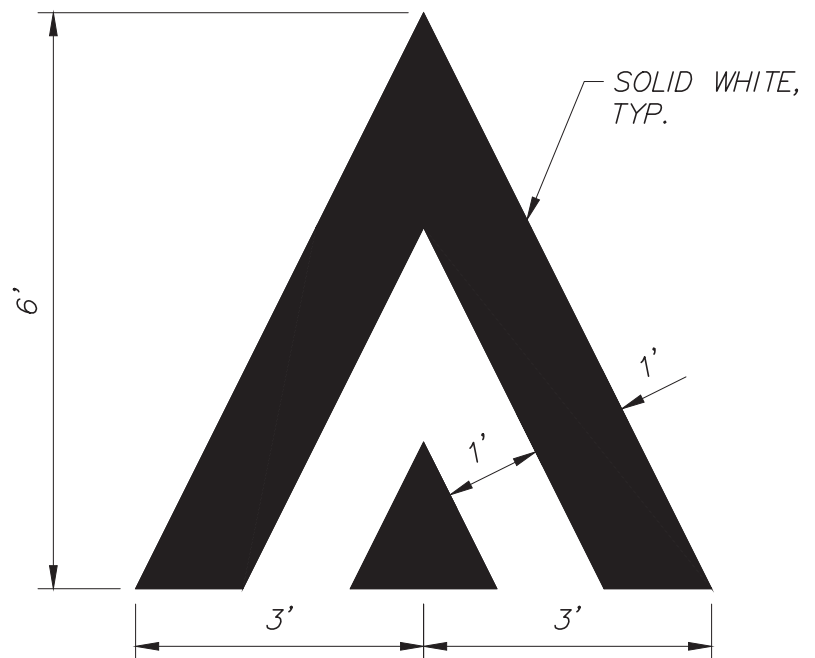
SECTION # DIV 85  
 DETAIL # 85-40

GENERAL NOTES:

1. RAISED CROSSWALKS SHALL BE CONSTRUCTED PRIOR TO PLACEMENT OF TOP LIFT OF PAVEMENT.
2. RAISED CROSSWALK SLOPES SHALL BE:
  - A. 1.5% MAXIMUM AT YIELD OR STOP CONTROLLED INTERSECTIONS;
  - B. 4.5% MAXIMUM AT UNCONTROLLED INTERSECTIONS;
  - C. MATCH EXISTING STREET GRADE AT MID-BLOCK LOCATIONS.
3. CHANGE IN GRADE BETWEEN RAMP RUNS AND ROADWAY SHALL BE:
  - A. 5.5% FOR RAISED CROSSWALKS FOR ROADS  $\leq$  25 MPH WITH A  $\pm 0.5\%$  TOLERANCE;
  - B. 4.5% FOR RAISED CROSSWALKS FOR ROADS  $>$  25 MPH  $\pm 0.5\%$  TOLERANCE.
4. RAISED CROSSWALKS SHALL NOT BE PLACED ON ROADS WITH GRADES GREATER THAN 8.0%.
5. RAISED CROSSWALK STRIPING SHALL BE 250 MIL INLAID METHYL METHACRYLATE.
6. PLACE ARROW SYMBOLS IN CENTER OF LANE. VERIFY WITH THE ENGINEER PRIOR TO PLACEMENT.
7. RAISED CROSSWALKS FOR ROADS  $>$  25 MPH SHALL ONLY BE CONSTRUCTED WITH THE APPROVAL OF THE MUNICIPAL ENGINEER AND/OR THE TRAFFIC ENGINEER.

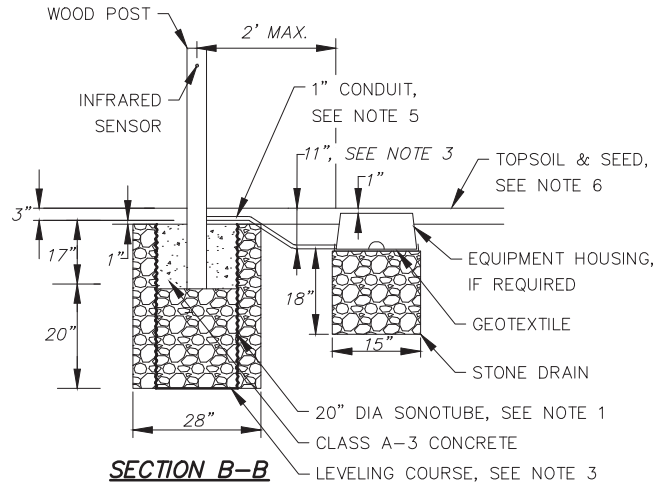
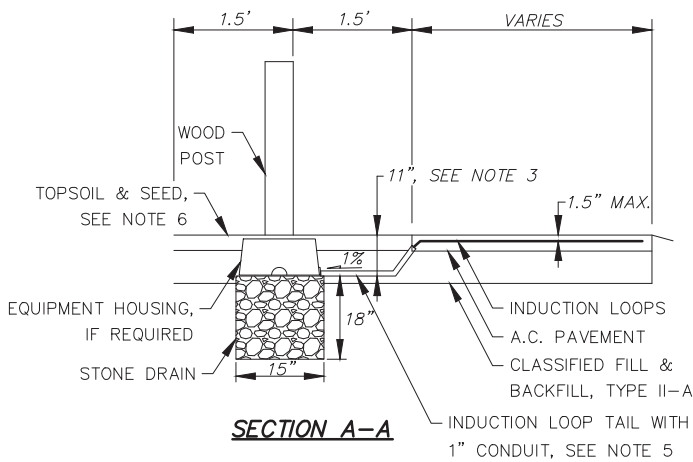
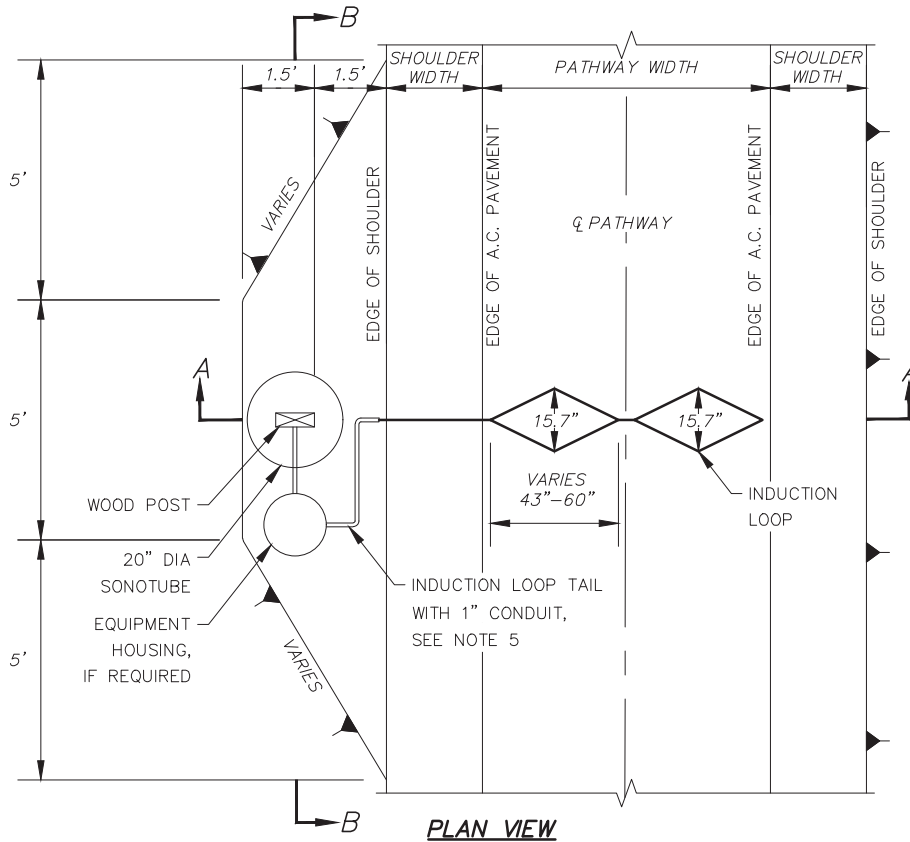


CROSSWALK STRIPING DETAIL



CROSSWALK MARKING DETAIL

 <p>MUNICIPALITY OF ANCHORAGE</p>	<p>SCALE: N.T.S.</p> <p>APPROVED:</p> <p>REVISED: 2/24</p>	<p><b>RAISED CROSSWALK STRIPING AND NOTES</b></p>	<p>SECTION # DIV 85</p> <p>DETAIL # 85-41</p>
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**MULTI-MODAL PATHWAY COUNTER NOTES:**

1. TOP OF CONCRETE SHALL BE 1 INCH BELOW INDUCTION LOOP TAIL INTAKE.
2. IF GROUNDWATER IS ENCOUNTERED, RAISE DEPTH OF INDUCTION LOOP TAIL. CONTACT ENGINEER.
3. SURROUND SONOTUBE WITH LEVELING COURSE FOR STABILITY. FILL SONOTUBE WITH LEVELING COURSE TO CORRECT CLEARANCES. COMPACT BY HAND TAMPING.
4. ENSURE POST IS PLUMB TO THE GROUND, WITH THE INFRARED SENSOR PERPENDICULAR TO THE PATHWAY. A.C. PAVEMENT SHALL BE AT FINISH GRADE.
5. EQUIPMENT HOUSING, IF REQUIRED, SHALL INCLUDE INDUCTION LOOP SENSOR, LOGGER, COMMUNICATIONS, AND BATTERY. IF ALL COMPONENTS ARE ENCASED IN POST, RUN INDUCTION TAIL DIRECTLY FROM INDUCTION LOOPS TO POST.
6. COVER EQUIPMENT HOUSING WITH 1 INCH OF TOPSOIL & SEED.

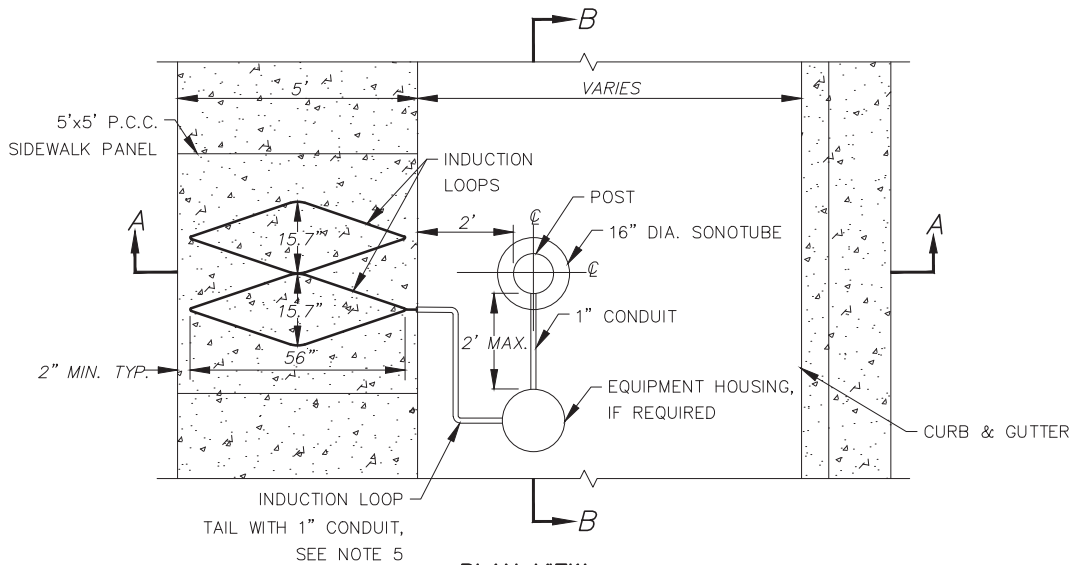
REVISION: 2024 M.A.S.S. UPDATE



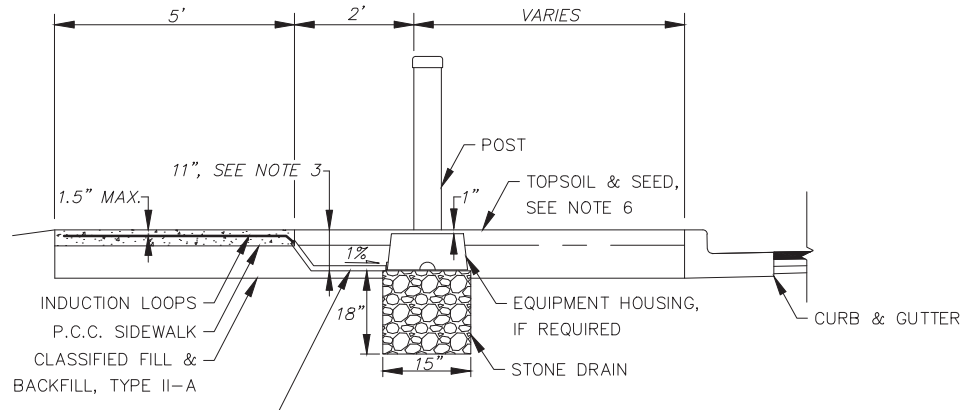
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REVISD:  
2/24

# MULTI-MODAL PATHWAY COUNTER

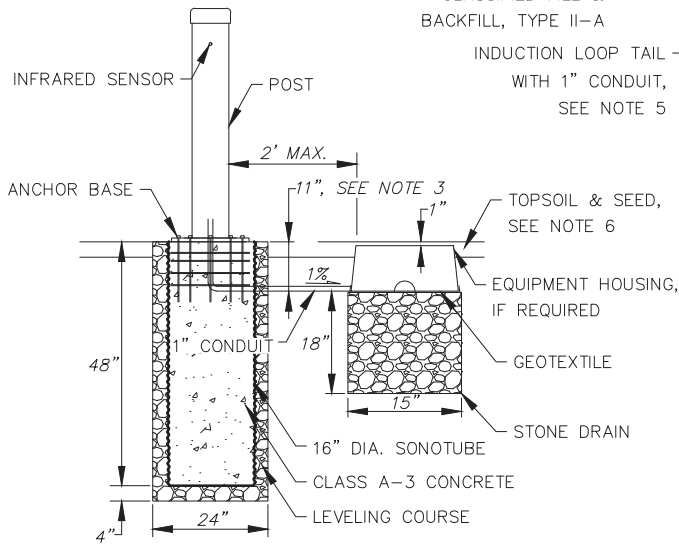
SECTION #  
85.12  
DETAIL #  
85-42



**PLAN VIEW**



**SECTION A-A**



**SECTION B-B**

**MULTI-MODAL SIDEWALK COUNTER NOTES:**

1. INDUCTION LOOPS SHALL BE LOCATED WITHIN 1 P.C.C. SIDEWALK PANEL.
2. SURROUND SONOTUBE WITH LEVELING COURSE FOR STABILITY.
3. IF GROUNDWATER IS ENCOUNTERED, RAISE DEPTH OF INDUCTION LOOP TAIL. CONTACT ENGINEER.
4. ENSURE POST IS PLUMB TO THE GROUND, WITH THE INFRARED SENSOR PERPENDICULAR TO THE SIDEWALK. CONCRETE SURFACE SHALL BE AT FINISHED GRADE.
5. EQUIPMENT HOUSING, IF REQUIRED, SHALL INCLUDE INDUCTION LOOP SENSOR, LOGGER, COMMUNICATIONS, AND BATTERY. IF ALL COMPONENTS ARE ENCASED IN POST, RUN INDUCTION LOOP TAIL DIRECTLY FROM INDUCTION LOOPS TO POST.
6. COVER EQUIPMENT HOUSING WITH 1 INCH OF TOPSOIL & SEED.

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N.T.S.  
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REVISED:  
2/24

**MULTI-MODAL  
SIDEWALK COUNTER**

SECTION #  
85.12

DETAIL #  
85-43