

**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 dairy 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.

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

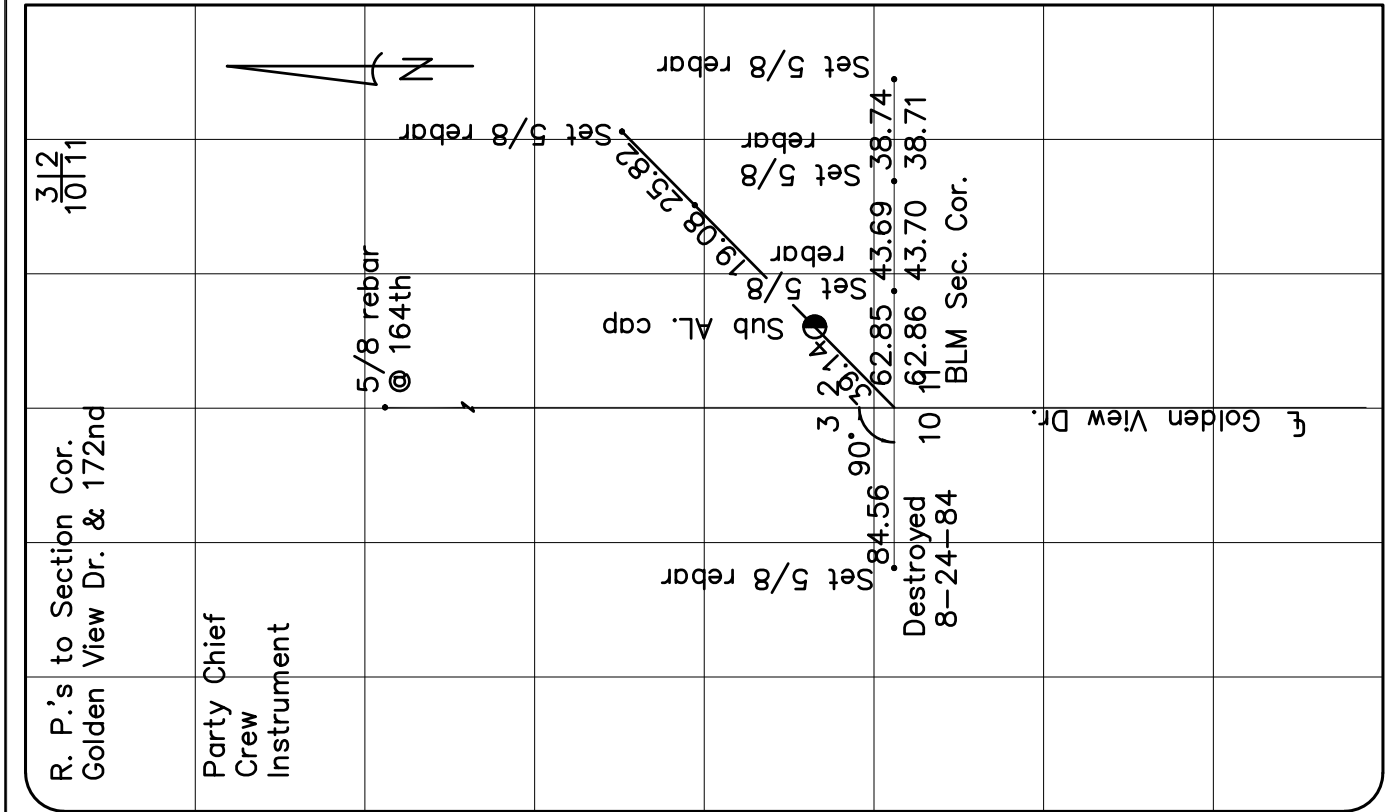
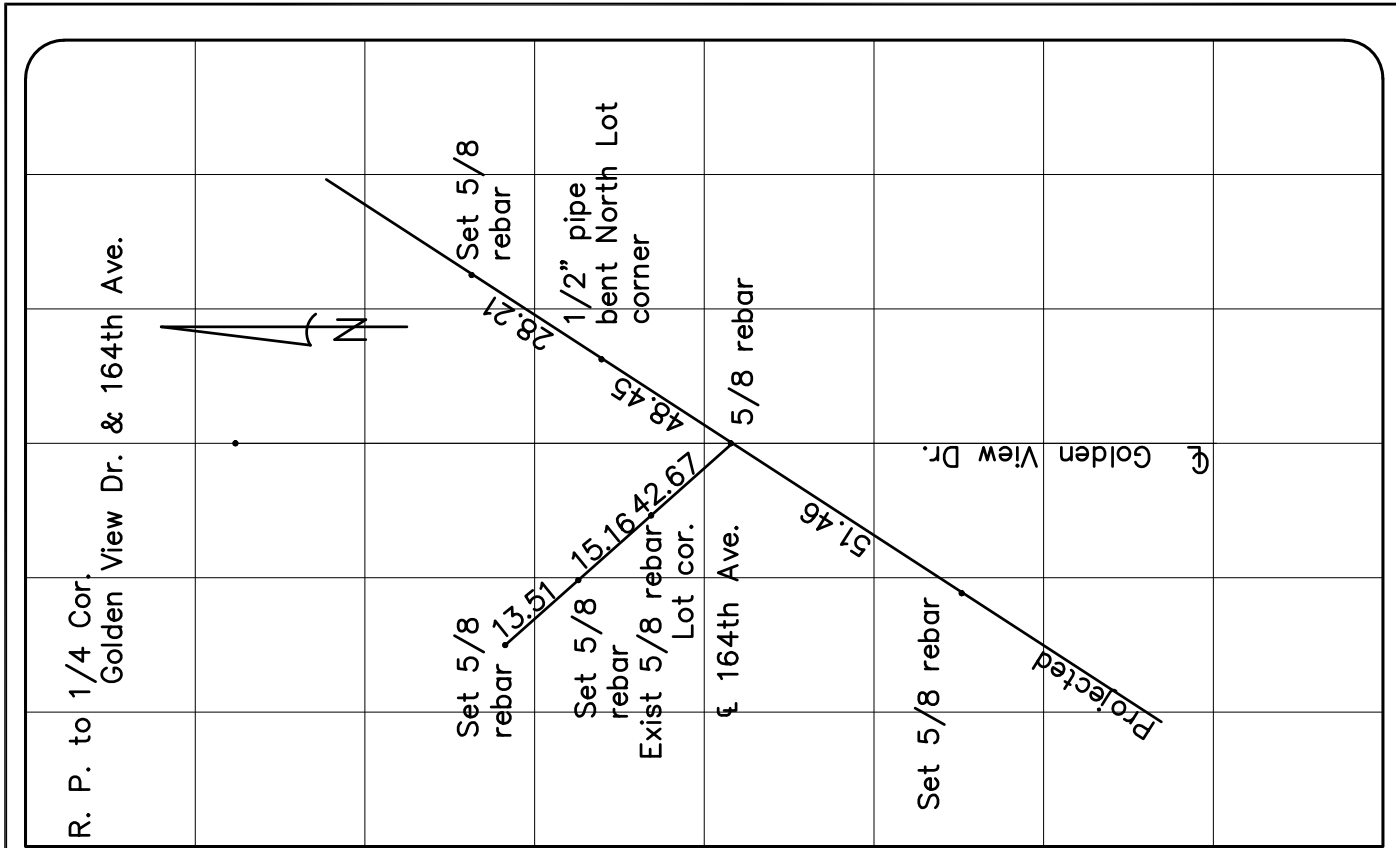
INDEX



SCALE:
NTS
APPROVED:
REVISED:
10/07

FIELD BOOK INDEX

SECTION #
65.02
DETAIL #
65-1



MUNICIPALITY



OF ANCHORAGE

SCALE:
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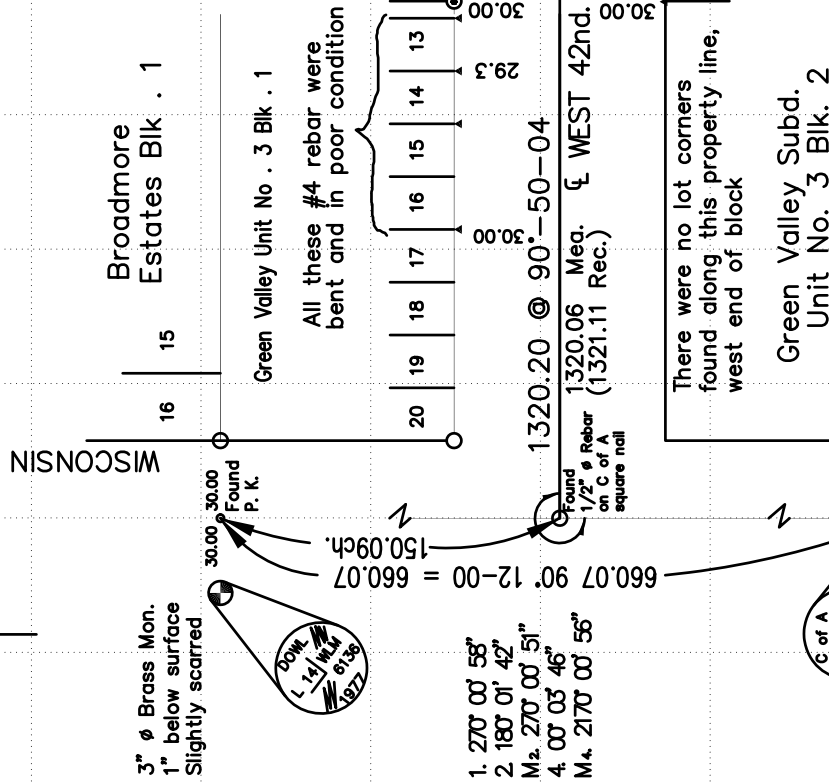
CONTROL REFERENCE POINTS

SECTION #
65.02

DETAIL #
65-2

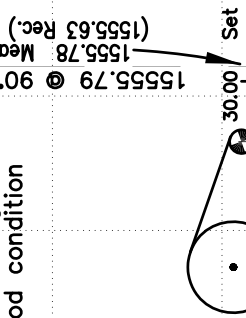
2058 52

West 42nd. Ave. (Place)
 Horizontal Control
 Nov. 13, 2020 Clear±30°F
 Party Chief
 Crew
 Instrumentation



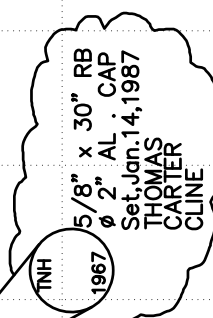
Broadmore Estates Add No. 2
 P.O. 1972
 3" # Brass mon. 02 above ground, good condition

Found C of A square nail resembles 1/8" # rebar



LEGEND:

- ▲ #4 Rebar
- ◎ #5 Rebar



MUNICIPALITY OF ANCHORAGE
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 REVISED: 10/23

MONUMENT RECOVERY AND HORIZONTAL CONTROL

SECTION # 65.02
 DETAIL # 65-3

MUNICIPALITY



OF ANCHORAGE

SCALE:
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APPROVED:

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10/23

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 NA⁹ #502261

Sta	+	Hi	-	ELEV
TP	0.30	27 68	—	27 38
TP	3.21	39 68	12.30	36 47
TP	1.43	43 98	7.51	42 55
TP	1.74	57 02	14.47	55 28
TP	5.51	61 96	6.68	56 45
GAAB 39	4.20	66.40	9.95	62 22
TP	7.11	66 37	4.15	59 26
TP	3.79	61 75	2.49	57 96
TP	0.02	67 00	9.04	66 98
TP	0.23	77 32	10.34	77 09
TP	6.50	82 90	5.81	76 40
TNH15	5.03	81 88	5.48	

2058 52

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

2026 04

5/29/20
Sunny 60°F
Party Chief
Crew
RT & Prism
100' Rag Tape

45+00 20⁰ 20⁰
46+00 20⁰ 20⁰
47+00 20⁰ 20⁰
48+00 20⁰ 20⁰
49+00 20⁰ 20⁰
50+00 20⁰ 20⁰
50+50 20⁰ 20⁰
51+00 20⁰ 20⁰
52+00 20⁰ 20⁰
52+50 20⁰ 20⁰
52+70 20⁰ 20⁰
End Exc.

UNIVERSITY DRIVE
STAKE EXCAVATION LIMITS

EXCAVATION LIMITS (FROM ϕ)

Station	Lt	Rt.
34+78	30 ⁰	30 ⁰
Begin Exc.		
35+35	29 ²	39 ⁰
36+00	29 ¹	34 ⁸
36+50	28 ⁷	27 ⁰
37+00	58 ²	27 ⁰
37+50	57 ⁹	27 ⁰
38+00	27 ⁵	27 ⁰
38+50	27 ⁹	-
38+63.2	-	30 ⁸
39+00	27 ⁰	27 ⁰
39+13.2	27 ⁰	27 ⁰
40+00	27 ⁰	27 ⁰
41+00	27 ⁰	27 ⁰
41+50	27 ⁰	27 ⁰
42+00	25 ⁶	25 ⁶
43+00	22 ⁸	22 ⁸
44+00	20 ⁰	20 ⁰
Station	Lt	Rt.

MUNICIPALITY



OF ANCHORAGE

SCALE:
NTS

APPROVED:

REVISED:
10/23

CLEARING LIMITS

SECTION #
65.02

DETAIL #
65-5

1958 015

5/24/19
Party Chief
Crew
Instrument

671 ³	671 ⁸	671 ⁶	671 ²	672 ⁵	672 ⁹⁴	C-0 ³
62	5 ⁹	6 ³	6 ³	5 ⁰	4 ⁵³	5 ⁰
ϕ	10	19	24	26	30	C-2 ¹
	ER		TOE			1½:1
						3 ²
						C-0 ⁶
						6 ²
						C-0 ⁵
						20 ²

674 ⁴	675 ⁰	674 ⁸	674 ⁹	676 ¹	677 ⁰⁶	C-1 ³
3 ¹	3 ⁵	2 ⁷	2 ⁶	1 ⁴	0 ⁴¹	5 ⁰
ϕ	11	19	23	28	30	C-2 ⁸
	ER					1½:1
						4 ²
						C-1 ³
						7 ²
						C-1 ²
						21 ²

X-SECTIONS BEFORE EXCAVATION/GRADE STAKES
GOLDENVIEW DRIVE
CLOUDY 58'

STA. + HI - ELEV.

26+00	670 ⁴	670 ¹	669 ⁸	670 ⁹	ER
ϕ Sub.	7 ¹	7 ⁴	7 ⁴	6 ⁶	
670.92	25	13	10	6	
	30				
	FO ¹⁶				
	670 ²⁶				
	6 ²¹				
	C-1 ⁰				
	1 ²				

25+50	673 ⁵	673 ⁵	672 ⁹	674 ⁰	ER
ϕ Sub.	4 ⁰	4 ⁰	4 ⁶	3 ⁵	
673.23	26	17	10	6	
	30				
	C-0 ⁸				
	5 ⁰				
	C-2 ²				
	3 ²⁹				
	1½:1				
	3 ⁵				
	C-0 ⁷				
	6 ³				
	C-0 ⁵				
	28 ³				
	2 ⁹				
	2 ²				

TP
2.03 677.47
687.3011.86 675.44

MUNICIPALITY



OF ANCHORAGE

SCALE:
NTS

APPROVED:

REVISED:
10/23

X-SECTIONS/SLOPE STAKES

SECTION #
65.02

DETAIL #
65-6

MUNICIPALITY



OF ANCHORAGE

SCALE:
NTS

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10/23

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 ζ Rd RT. ⁵⁷⁹
142⁵¹ ✓
270

39+13.2

No B.TOP ζ Rd C-1⁰ FG ⁵⁶⁶
142⁶⁴ ✓
270

39+00

270 ζ Rd No B.TOP

38+50

272 ζ Rd No B.TOP

T.P. ζ UNIV. 4.69 RT. 148.30 RT 6.04 RT. 143.59
at 38+00

143.61

Elev. from Pg. 11

38+00

272 ζ Rd No B.TOP
C-0⁴ FG ^{6 15}
272 ζ Rd 143⁴⁸ ✓
270

37+50

149.63 RT.

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.

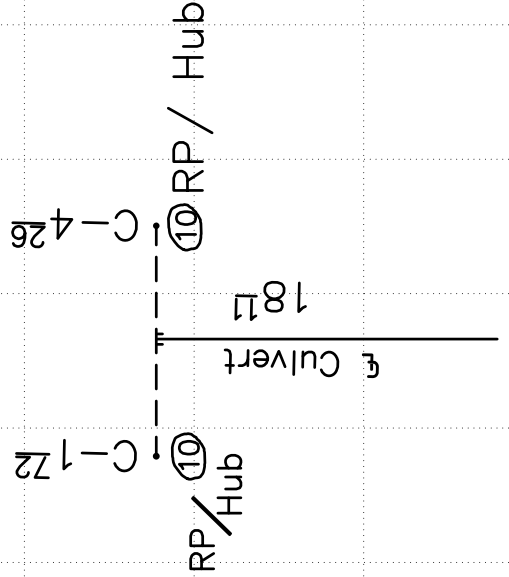
STA + HI - ELEV.

TBM 489.42 8.08 481.34 481.35 Rec.

8⁰ 481.4 at outfall
 Exist. Ditch
 9¹ 480.3 Bottom⁵
 Exist. Ditch

0+67⁵ N
 2+03² E
 RP (10)S 7.60 481.82
 RP (10)N 5.06 484.36
 489.42
 RP (10)S Inv Grade 480.10

N. Rim MH at NW cor. E. R. Rd & Wildwood
 Page 65



MUNICIPALITY



OF ANCHORAGE

SCALE:
 NTS

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 10/23

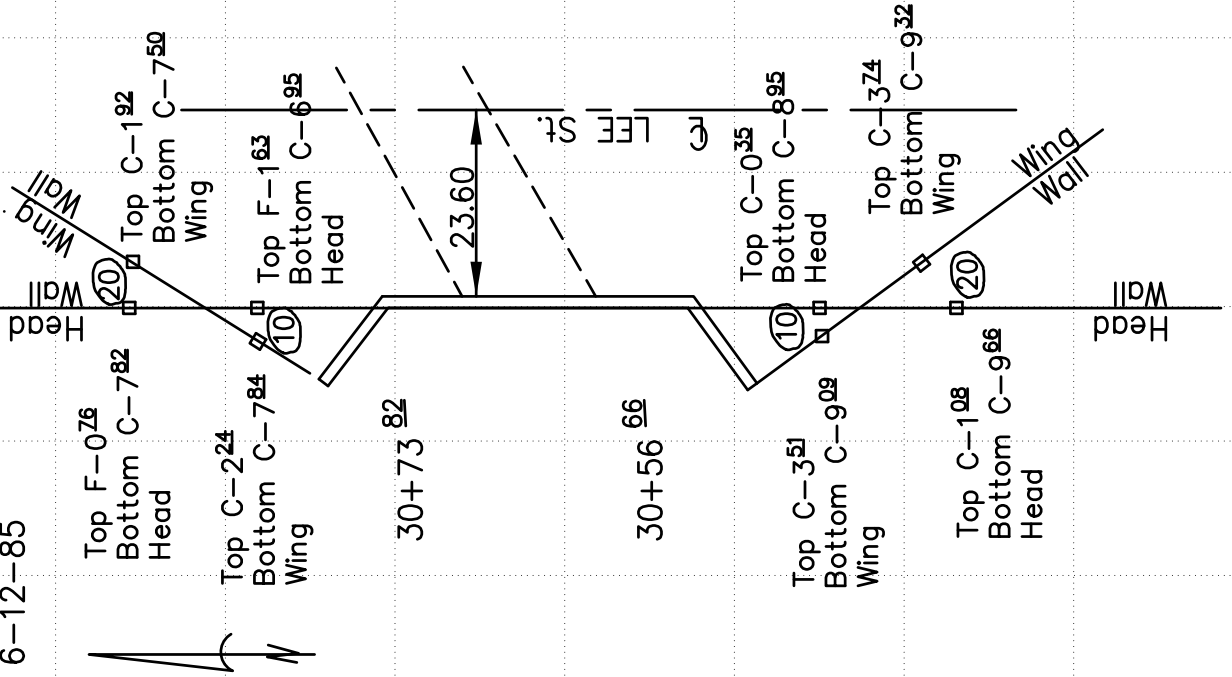
DRAINAGE STRUCTURES

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

MUNICIPALITY



OF ANCHORAGE

SCALE:
NTS

APPROVED:

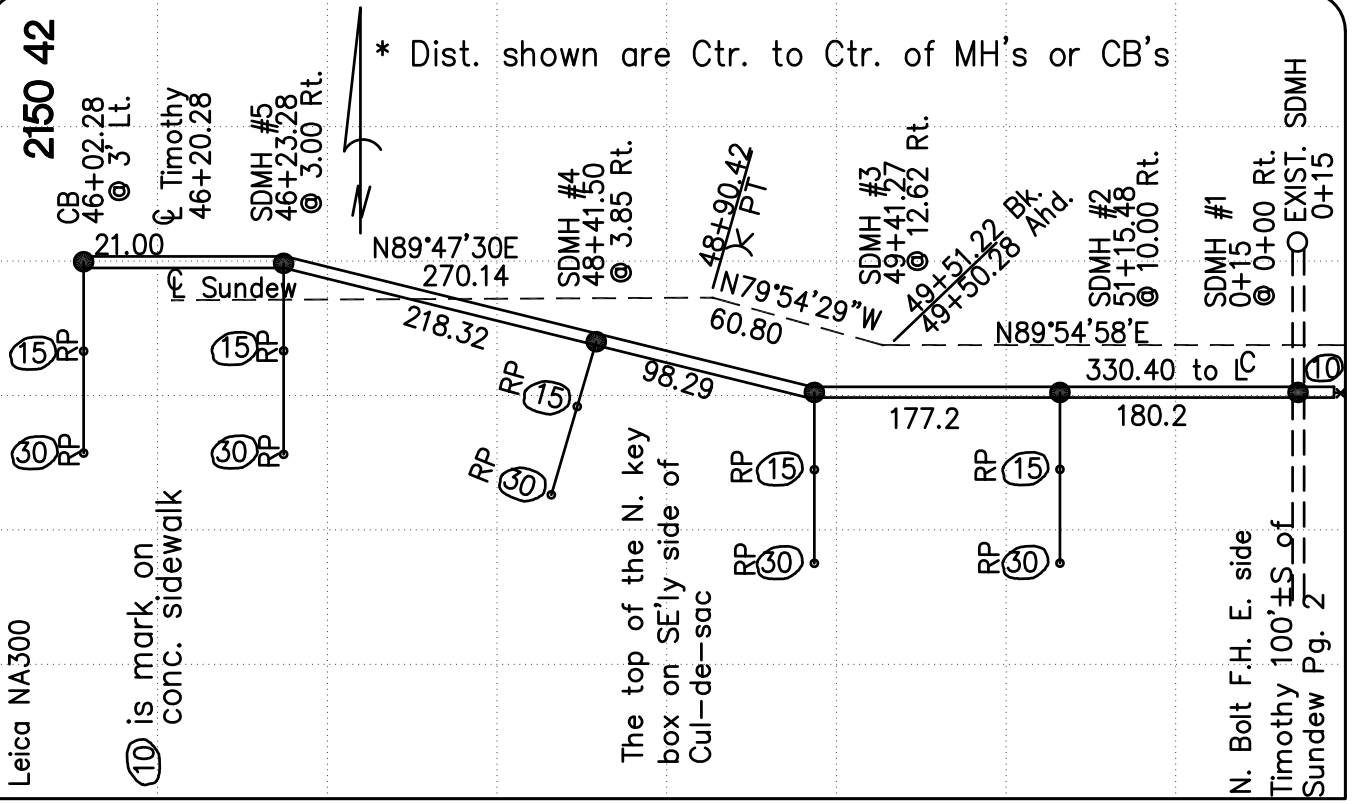
REVISED:
10/23

RETAINING WALL STRUCTURES

SECTION #
65.02

DETAIL #
65-9

2150 42



Leica NA300

⓫ is mark on conc. sidewalk

The top of the N. key box on SE'y side of Cul-de-sac

N. Bolt F.H. E. side
Timothy 100'± S of Sundew Pg. 2

STAKE STORM SEWER SUNDEW CIRCLE	Sept. 2, 2020 Cldy 55: Party Chief Crew	STATION	HI	ELEV.
0 + 15 SDMH #1	80.07	4.85	80.07	
51+15.48 SDMH #2	81.10	4.82	81.10	
49+41.27 SDMH #3	81.44	3.48	81.44	
TP	81.30	10.29	81.30	
48+41.50	77.52	14.07	77.52	
46+23.28 SDMH #5	86.28	5.31	86.28	
46+02.28 CB	85.08	6.51	85.08	
TBM STA.	87.38	4.21	91.59	87.38

MUNICIPALITY



OF ANCHORAGE

SCALE: NTS
APPROVED:
REVISED: 10/23

STORM SEWER LAYOUT

SECTION # 65.02
DETAIL # 65-10

3111 966

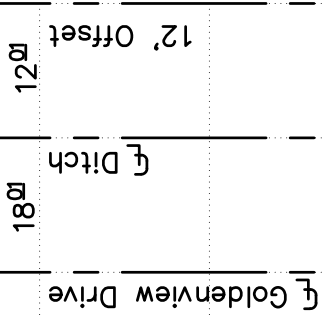
CONSTRUCTION STAKES

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	2.07		668.54	
STA	+	HI	-	ELEV.
				FINISH GRADE

C-5⁷⁶

C-4³¹

C-3²⁹

Spike in PP A-256-A B9 page 7
DESCRIPTION

MUNICIPALITY



OF ANCHORAGE

SCALE:
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10/23

DRAINAGE STAKES

SECTION #
65.02

DETAIL #
65-11

MUNICIPALITY



OF ANCHORAGE

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10/23

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

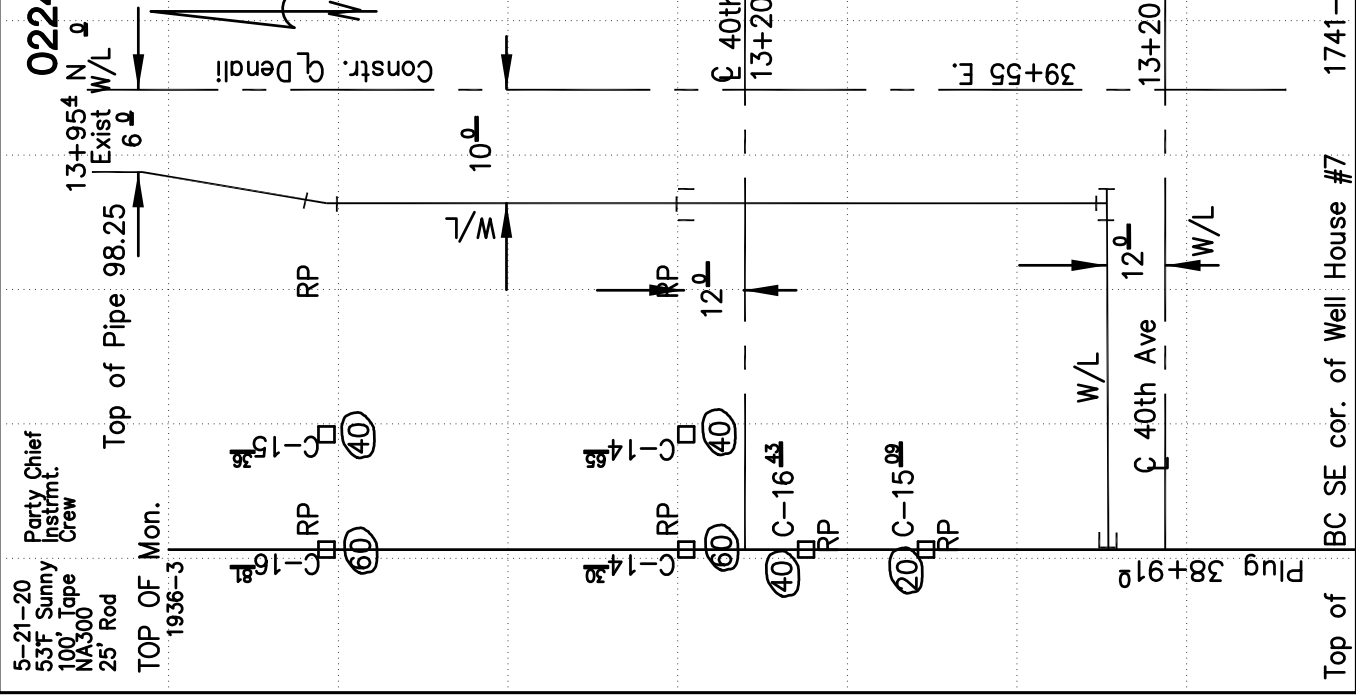
$\frac{7.26}{18'}$

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
22'30" Bend		60 3.47	110.81	
13+77± N	114.28	4.92	109.36	94.00
12 x 16 Tee		60 5.98	108.30	BOP
39+45 E		40 5.63	108.65	94.00
13+32 N	114.28			
38+91 ⁰ Plug	114.28	40 4.30	109.98	BOP
		60 5.64	108.64	93.55
STA	1.32	114.28	112.96	FINISH GRADE
	+	HI	ELEV.	



MUNICIPALITY OF ANCHORAGE
 SCALE: NTS
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WATER LINE LAYOUT

SECTION # 65.02
 DETAIL # 65-13

Top of BC SE cor. of Well House #7 1741-31

West 32nd. Ave. Storm Drain
Upgrades PM&E 00-13



SCALE:
NTS
APPROVED:
REVISED:
10/23

STATIC GPS
HORIZONTAL CONTROL

SECTION #
65.02
DETAIL #
65-14

Horizontal Control
Static GPS Observations

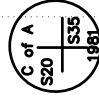
Point	RCVR/UNIT	HI:	START:	STOP:	FILE#:
15	TRIUMPH #546	5.58F (1.700m)	3:15PM ADT	5:40PM	05270515a
16	TRIUMPH #527	5.29F (1.612m)	3:50PM ADT	5:46PM	05460515a
101	TRIUMPH #527	5.29F (1.612m)	3:50PM ADT	5:46PM	05460515a

2058 52

Month Day, 2021
Clear ±30°F
Party Chief
Crew
Instrument



Cap Detail



Point

15
Description
Found 3" ø Brass Mon.
1" below surface
Slightly scarred

16
Description
Found 3 1/4" B. C.
0.25 Below Asphalt 6"
I. D. Case
GOOD CONDITION

101
Description
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

MUNICIPALITY



OF ANCHORAGE

SCALE:
NTS

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REVISED:
10/23

STATIC GPS HORIZONTAL CONTROL

SECTION #
65.02

DETAIL #
65-15

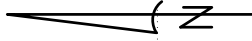
75TH Avenue— Rovenna Wade
PM&E No. 10-20

Horizontal Control
Static GPS Observations

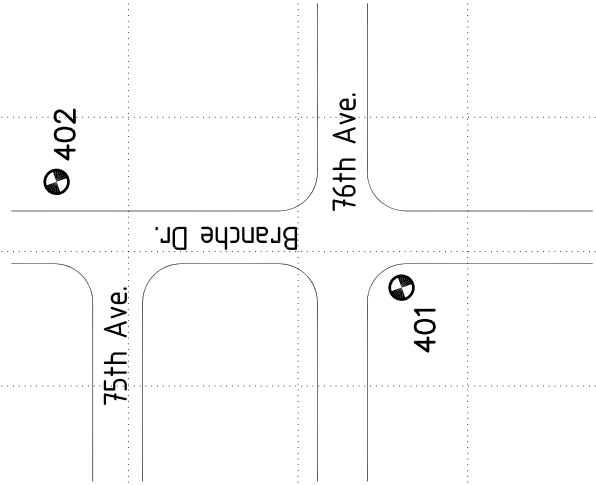
Point	UNIT	HT	ANT O/S	LOCAL TIME
401	STS55A-10	1.293M 4.245F	AX01206G 0.360M	16:17 16:32
402	STS55A-11	3.675M 1.117F	AX01206G 0.360M	16:17 16:32

2058 53

Month, Day, 2019
Clear±30°F
Party Chief
Crew
Instrument



Point	Description
401	Set magnet 5' north of stop sign 15' SW of a LP, 1' E of the W. curb
402	Set magnet 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

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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.