DESIGN CRITERIA MANUAL

CHAPTER 1 STREETS

MUNICIPALITY OF ANCHORAGE

PUBLIC WORKS DEPARTMENT
PROJECT MANAGEMENT & ENGINEERING DIVISION

D-R-A-F-T

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DESIGN CRITERIA MANUAL
REVISION LOG

Chapter 1 - Streets

Rev. No.	Date Executed	Description	Sections Revised or Added	New/*Revised* Template
1.	July 2006	Technical & editorial updates; minor corrections throughout chapter; some figures re-numbered; Appendix 1C replaced with new requirements. Chapter 1 re-issued.		
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		Subsequent tables renumbered.	1.9	
3.	December 2014	Draft published. Technical & editorial updates based on DCM review Committee input; additions and corrections throughout chapter.	All	

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ACRONYMS AND ABBREVIATIONS

AASHTO ..... American Association of State Highway and Transportation Officials
AC .....asphalt concrete
ADA..... Americans with Disabilities Act
ADAAG .....Americans with Disabilities Act Accessibility Guidelines
ADEC ..... Alaska Department of Environmental Conservation
ADOT&PF ..... Alaska Department of Transportation and Public Facilities
ADT .....average daily traffic
AMC .....Anchorage Municipal Code
AMCR .....Anchorage Municipal Code Regulation
ASPLS ..... Alaska Society of Professional Land Surveyors
ASTM ..... American Society for Testing and Materials
AWWU……..……Anchorage Water & Wastewater Utility
℄..... center line
CBD .....Central Business District
CTWLTL..... center-two-way-left-turn-lane
DCM..... Design Criteria Manual
ft.....feet
GPS .....global positioning system
HDP ..... Hillside District Plan
HI ..... height of instrument
ITE .....Institute of Transportation Engineers
K..... Percent of ADT in PHT
M.A.S.S. .....Municipality of Anchorage Standard Specifications
MOA.....Municipality of Anchorage
MPH ..... miles per hour
MUT1D..... Multilayer User-friendly Thermal Model in 1 Dimension
NCEES..... National Council of Examiners for Engineering and Surveying
NCHRP ..... National Cooperative Highway Research Program
OS&HP .....Official Streets and Highways Plan
P/L..... property line
PC ..... Point of Curve
PGDHS ..... AASHTO *A Policy on the Geometric Design of Highways and Streets*
PHT..... peak hour traffic
PM&E.....Project Management and Engineering
PMM……Project Management Manual
PT .....Point of Tangency
R ..... radius
RAP..... recycled asphalt pavement
ROW .....right-of-way
TIA .....Traffic Impact Analysis

SECTION 1.1 OBJECTIVES

As the Municipality of Anchorage has evolved from a rural area to an urban community so has the importance of properly designed streets. In order to meet the present and projected transportation needs, clear design objectives have been identified to meet specific goals for safety, functionality, constructability, and durability.

Because of climate, geology, and topography, street design in the Municipality of Anchorage can be complex. The design standards outlined in this manual generally follow standards established and used nationwide, with particular emphasis on northern climate design techniques.

The purpose of this manual is to provide traveled ways that are consistent, predictable, safe, and reliable, through the range of private development, municipal, and state roads. Meeting this purpose will serve to seamlessly integrate past, present and future vehicular ways, pedestrian and bicycle ways, drainage, traffic operations, maintenance, and enforcement.

In addition to achieving uniform design goals, standardized design criteria provide other benefits. Furnishing clear direction and rationale to the engineer results in economy of scale and uniformity, which reduces costs associated with design, construction, maintenance and operations. The engineer is, therefore, able to more effectively approach the design effort in a manner that is compatible with the desires of the Municipality and in conformance with the various adopted municipal comprehensive plans, the *Official Streets and Highways Plan* (OS&HP), Title 21, and other planning documents. The standards also ensure that safety concerns are addressed consistently and adequately. Consistency in all areas of the design effort results in a more cohesive road system within the Municipality.

All reference documents, which are incorporated or incorporated by reference in this Design Criteria Manual (DCM), shall be the latest edition, unless otherwise noted.

END OF SECTION 1.1

SECTION 1.2 PLANNING & DESIGN DOCUMENTS

1.2 A Objectives

Street design within Anchorage encompasses (1) Municipal projects; (2) state projects; (3) Municipal/state projects (federally funded); and, (4) projects completed by private developers. The codes, standards, and permits discussed in this section do not apply to state construction projects within state right-of-way (ROW). However, they do apply to other public and private road designs in the Municipal ROW, whether done by the Municipality or private companies. Projects designed and constructed jointly by the Municipality and state will adhere to the design criteria in this manual as well as to appropriate criteria (mandated by federal laws) contained in state manuals. Consult with the Municipal Engineer for resolution of conflicts among local, state, and federal standards.

1.2 B Codes and Regulations

Street design in Anchorage is subject to local, state, and federal regulations, standards, and guidelines. As no single document can ultimately define complete design standards, users of this manual are cautioned to obtain and carefully read codes and other Municipal documents referenced herein to ensure comprehensive design compliance. If conflict appears to exist among the various codes, Municipal policies, this manual, or other Municipal documents, consult with the Municipal Engineer for resolution of these conflicts.

Titles 21 and 24 of the Anchorage Municipal Code (AMC) specifically define local regulations for street construction in Anchorage.

1.2 C Title 21 Land Use Planning

A listing of adopted Planning documents can be found in Table 21.01-1, *Comprehensive Plan Elements*. The following sections of Title 21 are pertinent to road design, although this list is not all-inclusive.

AMC 21.01.080 *Comprehensive Plan* adopts the OS&HP as a part of the comprehensive plan for Anchorage. The OS&HP establishes street classifications for existing and proposed primary roads, and these classifications directly relate to the design criteria established for each particular type of street. All transportation projects are required to follow guidelines presented in *A Strategy for Developing Context Transportation Projects* as adopted by the MOA in October 2008.

AMC 21.03.190 *Street and Trail Review* identifies “any street of collector or greater capacity” as defined by the OS&HP as a "public facility." Plans for such road projects are required to follow a review process by the Planning and Zoning Commission as indicated in Table 21.03-4.

AMC 21.08.030 *Subdivision Standards: Design Standards* and AMC 21.08.040, *Subdivision Standards: Dedication* establish design standards for building streets in new subdivisions. In particular it establishes dedication of ROW and street design standards for alignment, grade, snow storage, screening landscaping, and intersection angles.

AMC 21.08.050, *Subdivision Standards: Improvements* establishes design and construction standards for streets constructed as a part of private land development under subdivision agreements. In particular, Tables 21.08 -3, 04, and -5 establish minimum standards for streets.

AMC 21.14, *Rules of Construction and Definitions* establishes terminology and definitions for developing subdivisions.

1.2 D Official Streets and Highways Plan

The OS&HP provides a mechanism for the community to prepare for future development by establishing the location, classification, and minimum ROW of the streets and highways needed to accommodate the future transportation needs of the community. It implements the recommendations contained within the community's Long Range Transportation Plan and the Comprehensive Plan.

1.2 E Policies

As a rule, codes and regulations do not include specific design criteria. For example, AMC Title 24 only states that construction in the ROW shall conform to Municipal standards and specifications. The design standards contained in this DCM and the specifications contained in the *Municipality of Anchorage Standard Specifications* (M.A.S.S.), latest edition, establish the particular standards and specifications referenced in the code. Both the DCM and M.A.S.S. are periodically updated and amended by the Municipal Engineer with concurrence from various Departments in the Municipality.

Project Management and Engineering (PM&E) also maintains written policies that are applicable to design activities. The policies pertaining to this chapter are presented in Appendix 1A and are as follows:

- P&P #16 – Restoration of Private Improvements as Part of a Capital Project
- PM&E 2012-45 – Construction of Interim Emergency Access Roadway (IEAR) Improvements in Public Places

The above list is not all inclusive and the designer should determine if any other policies apply to their project. Copies of applicable policies may be obtained from PM&E.

1.2 F Permits

Requirements for obtaining permits are mandated by local, state, and federal laws. Permit conditions can substantially impact the project design. Identification of permits needed and coordination with each agency must begin early in the design process (reference Project Management Manual, available on the PM&E webpage). The engineer is responsible for determining the necessity for permits and acquiring such permits in a timely manner.

Following is a partial list of permits that may be required.

ROW Permit. AMC Title 24.30 requires that any construction within a street ROW must be done under this permit, obtained from the Community Development, Development Services Division.

Flood Hazard Permit. AMC Title 21.60 requires that a flood hazard permit be obtained prior to any development within a flood hazard district. Flood hazard areas are those within the limit of the boundary of the base 100-year flood, the highest extreme tide, or a designated special hazard area. Flood maps and flood hazard permit applications are available from the Department of Public Works, Project Management and Engineering Division, Watershed Management Section.

Wetlands Fill Permit. Federal regulations require that a wetlands permit be obtained for any fill placement in wetlands. The Corps of Engineers issues permits and regulates permits for the placement of fill into wetlands classified as "A" or "B". The Municipality, with permission of the Corps of Engineers, regulates placement of fill into wetlands classified as "C". These General Permits are verified and administered by

the Long-range Planning Section. Permit applications are available at the Department of Community Development, Planning Division, Long-range Planning Section.

Title 41 Fish Habitat Permit. This permit is required whenever work is proposed in or adjacent to a waterway identified by the State of Alaska Department of Natural Resources, Office of Habitat Management and Permitting, as supporting anadromous or resident fish. The engineer shall contact that department for additional information.

Grading, Excavation and Fill Permit. A Grading, Excavation and Fill Permit is required whenever material is to be moved unless exempted by the requirements of the permit. Exemptions are noted on the permit application which is available at the Department of Community Development, Development Services Section.

1.2 G Design Variances

Designers, whether Municipal or private, shall adhere to the criteria established in this DCM and other referenced documents, unless compliance with such will compromise their judgment as professional engineers with regard to safety, project impacts, and/or practicality. In such cases, a written variance request of the appropriate standard may be requested from the Municipal Engineer.

Variance(s) should be considered a solution(s) of last resort, and should not be used as a standard practice. The maximum or minimum criteria value should only be used occasionally.

Written variance requests shall be submitted through the municipal project manager or private development manager for a determination by the Municipal Engineer. Variance requests should contain supporting information, justification and alternate solutions considered.

Design variances should be identified in the design study or project planning phase, and detailed variance requests should be submitted not later than the 65 percent stage of project design.

Variance request(s) should not be based solely on the difficulty and/or cost of implementing such criteria and must include:

- alternate solutions considered, and discussion on why they are not practical or achievable;
- justification explaining why proposed alternate solution(s) is/are equivalent;
- explanation of why proposed alternative solution is the right solution, and is in the best interest of the public and the Municipality of Anchorage.

In addition to the criteria presented in this manual, the Municipal Engineer may impose additional standards and criteria at his/her sole discretion when deemed appropriate to protect the safety and welfare of the public.

END OF SECTION 1.2

SECTION 1.3 FUNCTIONAL CLASSIFICATIONS

1.3 A General

The role that a roadway serves within the overall transportation network defines its function. Some roads serve travel over extended distances while others channel traffic to centers of community activity. Other roads primarily provide access to abutting properties. Classification establishes a hierarchy of road function and the mobility versus access character. Classification is typically used to determine road design standards and roadside development restrictions. This is depicted in Figure 1-1.

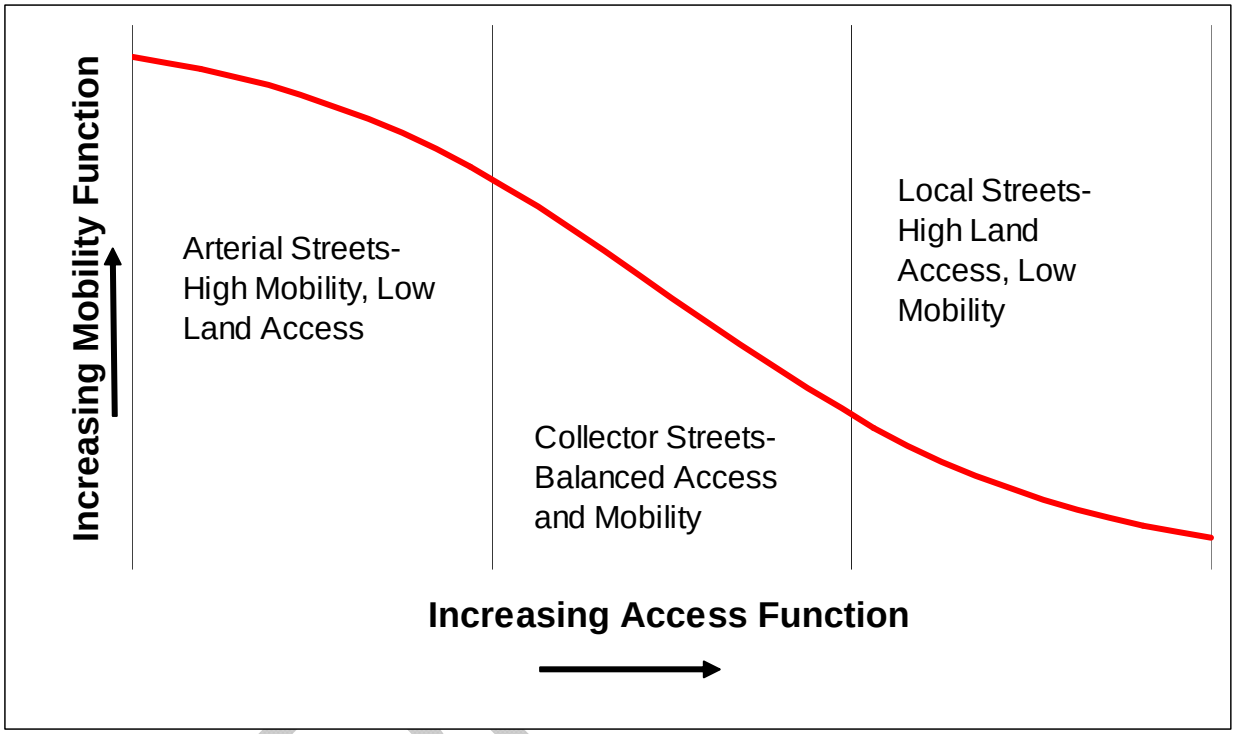
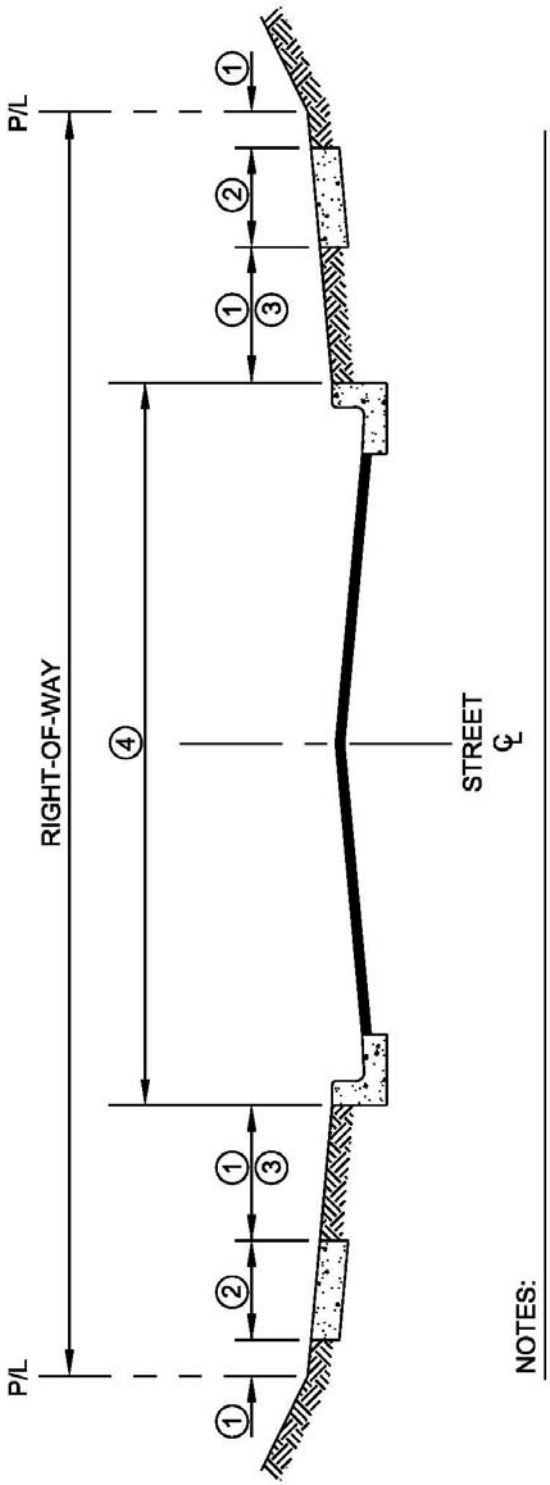


FIGURE 1-1 STREET CLASS MOBILITY AND ACCESS FUNCTIONS

Street cross-section characteristics are determined by the classification of a specific street in the OS&HP and origin-destination data, traffic volume counts, and street inventories. For discussion purposes in this manual, street classifications are divided into primary and secondary streets. Primary streets are those identified as having collector or greater designations, and include freeways, expressways, arterial streets and highways, and collector streets. Secondary streets are all local streets and country lanes. Secondary streets have lower traffic volumes and speeds and serve smaller areas.

The template shown on Figure 1-2 illustrates the typical cross section for primary transportation corridors and their ROW development. These primary transportation corridors are reflected by their functional classification in the OS&HP. The four classifications are Freeway, Expressway, Arterial, and Collector.



TYPICAL RIGHT-OF-WAY DEVELOPMENT

NOTES:

① LANDSCAPING: REF. AMC 21.04, AMC 24, AND CHAPTER 3 DESIGN CRITERIA MANUAL.

② SIDEWALKS & PATHWAYS: REF. THE ANCHORAGE PEDESTRIAN PLAN, ANCHORAGE BICYCLE PLAN, ANCHORAGE TRAILS PLAN, AMC 21.08, CHAPTER 4 DESIGN CRITERIA MANUAL.

③ SIDEWALK SEPARATION BUFFER / SNOW STORAGE AREA / UTILITY CORRIDOR: REF. UTILITY CORRIDOR PLAN, AMC 21.07.050, AMC 21.08, CHAPTER 4 DESIGN CRITERIA MANUAL.

④ ROADWAY (PAVEMENT AND DRAINAGE): REF. DESIGN CRITERIA MANUAL, AASHTO's POLICY ON GEOMETRIC DESIGN OF HIGHWAYS AND STREETS, AND M.A.S.S.

FIGURE 1-2 TYPICAL RIGHT-OF-WAY DEVELOPMENT

The template illustrates the required uses that need to be included in any development or redevelopment of a ROW. The ROW should include enough space to incorporate the following segments of use: landscaping, sidewalks and/or multi-use/bike paths, utility strips/snow storage areas, and roadway (pavement and drainage). Each segment may vary depending on the roadway functional classification. In addition to this DCM, other documents such as the *Areawide Trails Plan, Anchorage Bicycle Plan, Anchorage Pedestrian Plan,* and the OS&HP shall be reviewed when designing the ROW. In reconstruction of existing streets, the goal should be to meet or exceed current design standards. Sometimes conditions, such as limited ROW, may prevent the practical application of all design standards. In such cases, an approved design variance from the Municipal Engineer is required for variances from the current design standards (see section 1.2H Design Variances).

Roadway design shall conform to the proposed alignments in the OS&HP, with deviation from planned locations approved by the Municipal Engineer. Additional ROW acquisition is often required, especially in roadway reconstruction projects, to provide for cut/fill slopes, utility relocations, intersection channelization, and landscaping.

1.3 B Primary Streets

1. Freeways and Expressways

   A freeway is typically a limited access, high-speed roadway with grade-separated interchanges. An expressway is commonly defined as a divided arterial highway for through traffic with full or partial control of access.

   Since those functional classifications have only been applied to State routes in Anchorage, they are not addressed further in DCM.

2. Arterial

   Arterials move large volumes of vehicles and goods. Access to adjacent lands should be a secondary consideration for an arterial. Arterials may be classified further as major and minor, as follows:

   Major arterials provide for long, through trips between large generators. A major arterial has intersections at grade and provides direct access to freeways, arterials, collector streets, and major traffic generators.

   Minor arterials provide for medium length trips to service commercial and residential generators. A minor arterial has intersections at grade and may provide direct access to abutting property.

3. Collector

   Collector streets have a primary function to form a grid that collects traffic from local streets and carries it to the arterial system. Collectors are low-speed streets that may provide access to abutting properties. On collector roads with higher traffic volumes, mobility serves a higher priority, and, as such, local streets should provide direct access if feasible, with direct access to individual lots being discouraged.

1.3 C Secondary Streets

Streets not identified by the OS&HP are considered secondary (local) streets. Secondary streets usually have lower speeds and traffic volumes, typically less than 2000 trips per day, and provide more direct

access to adjacent properties than primary streets. These streets are more dependent on specific land use needs and the types of users than primary streets. The appropriate secondary street section is determined by considering projected traffic volumes and use (residential, industrial, or commercial).

1.3 D Country Lanes

Country lanes are a special type of local or collector street having unique scenic attributes. Typically, the character of the surrounding area is aesthetically pleasing, containing natural settings or landscaping. Generally speaking, country lanes are paved roads with relatively light traffic volumes.

The OS&HP Map identifies country lanes within the Anchorage Bowl. In the Turnagain Arm area and Chugiak-Eagle River area, the appropriate governing road board determines on a case-by-case basis which roads to classify as country lanes. This determination will be made prior to upgrades or improvements of local or collector roads.

When country lanes are improved, every effort should be made to minimize disturbances. Clearing should be done within the ROW only as necessary to assure adequate snow storage, sight distance, and roadway associated drainage. Ditches, where necessary, should be the minimum width and depth required for drainage of the roadway and adjacent development. Landscaping shall be used to restore the area to a natural condition as quickly as possible after construction disturbances. Where illumination is deemed necessary, country lanes should be equipped with low-profile, low-density illumination lamps of a design that is compatible with the surrounding natural environment.

1.3 E Private Roads or Streets

Private roads or streets are defined as a roadway located on private property typically for multi-unit developments on a single lot or tract. Private roads and streets exist on private property as opposed to dedicated ROW and are not eligible for municipal maintenance. Private roads and streets shall be designed and constructed according to municipal standards. Private Roads and Streets shall include, but not be limited to, the improvements identified in Table 1-1. The improvements listed in Table 1-1 shall be included in the design, unless otherwise directed by the Municipal Engineer.

The developer is responsible for planning, designing, and constructing all elements of private roads within a development to meet or exceed municipal public road standards. Approval of an engineered road construction plan, quality control plan, and verification the developer has retained the services of a professional engineer licensed in the State of Alaska, for inspection of the private road construction shall be required prior to obtaining building or land use permits from Building Safety. Certified as-built/record drawings and a compilation of weekly inspection and test reports for all private road construction shall be submitted to Building Safety prior to issuance of any Certificates of Occupancy for the development.

1.3 F Traffic Volume Determination

Determine trip generation from methods established in the Institute of Transportation Engineers (ITE), Trip Generation Manual or AMC 21, as applicable. A Traffic Impact Analysis (TIA) may be required as part of a private development project. Consult with the Traffic Department's Traffic Engineering Division to determine if a TIA is required and what information must be included in the analysis. Also, consult with the Traffic Department's Data Section to determine if traffic counts are available.

END OF SECTION 1.3

SECTION 1.4 ADJACENT ZONING OR NEIGHBORHOOD

1.4 A General

Area development patterns also affect street design. The surrounding development, whether rural or urban, dictates the appropriate minimum standards for each roadway design. As a general rule, secondary streets in rural areas shall have paved roads and ditches for drainage, whereas urban streets shall have paved roads and curb and gutter with storm drain systems for drainage. Refer to AMC 21.08.050.B *Improvement Areas Defined, and* AMC 21.08.050.C *Improvement Requirements by Improvement Area*.

AMC 21 determines, based on zoning, whether the area served is rural or urban to determine improvement requirements for private development projects. The subdivision agreement usually defines the requirements for improving access, peripheral streets, or interior streets. Definitions of area types are found in AMC 21.08.050.C *Improvement Requirements by Improvement Area.*

1.4 B Urban

Urban Streets, defined as Class A streets in Title 21, are those streets within or adjacent to zoning districts considered part of the urban area. Table 1-1 lists the amenities to be included when designing urban streets.

1.4 C Rural

Rural streets, defined as Class B streets in Title 21, are within or adjacent to the zoning districts considered part of the rural area. Table 1-1 lists the amenities to be included when designing rural streets.

1.4 D Public Lands and Institutions (PLI)

Streets in subdivisions zoned PLI shall be built to either urban or rural standards based upon direction from the Platting Authority. The Platting Authority will base the decision upon the improvement area it finds to be most compatible with the proposed use of the parcel and the zoning classifications of the surrounding area.

1.4 E Summary

Following is a summary of the secondary (local) road improvements that may be required in urban and rural zoning and private road districts:

TABLE 1-1 SUMMARY OF IMPROVEMENTS

	Urban	Rural
Paved street surface	X	X
Curb and gutter	X	
Sidewalks	X	
Walkways	X	X
Trails	X	X
Streetlights	X	
Traffic control devices	X	X
Street signs	X	X

Landscaping	X	X
Storm drain*	X	

*with stub-outs to proposed structures for foundation or footing drain connections.

Improvements identified in the table above should be included in the roadway design. In some urban areas, alleys may be required for service access.

END OF SECTION 1.4

SECTION 1.5 DESIGN ELEMENTS

1.5 A General

Design elements are the building blocks of road composition. As roads serve different purposes, depending on their location and surrounding development, they should be designed appropriately for their function and location.

1.5 B Lane

Travel lanes may vary in width between 10 to 12 feet. The lane width influences the safety and comfort of driving. Narrow lanes force drivers to operate their vehicles closer laterally than would otherwise be desired and can have a negative impact on capacity. Wider lanes provide desirable clearances between wider commercial vehicles traveling in opposing directions. Many urban roads see little truck traffic, and, as such, lanes narrower than 12 feet may be appropriate within many developments. While narrow lanes may reduce capacity, they do provide additional ROW for snow storage and other improvements. Narrow lanes may also have a positive impact on reducing vehicle speeds.

1.5 C Shoulder

Shoulders are the portions of the roadway adjacent to and on the outside edge of traveled lanes. Shoulder provide

- space for disabled vehicles and refuge for vehicles that momentarily stop (mail, maintenance, buses, delivery, provide clearance for emergency service vehicle passage);
- space for evasive maneuvers to avoid encroachment accidents;
- improved corner sight-distance at intersections and in horizontal curves;
- improved capacity by allowing uninterrupted flow;
- temporary snow storage;
- space for commuter bicyclists;
- space for pedestrian separation when there is inadequate ROW to detach pedestrian facilities from back of curb;
- on-street parking.

Shoulders can vary in width from 2-feet on minor rural roads to 12-feet on major high-speed highways with significant truck traffic. Where bicyclists and pedestrians are to be accommodated, the designer should refer to the American Association of State Highway and Transportation Officials (AASHTO) publication, *Guide for the Development of Bicycle Facilities*, for additional guidance.

1.5 D Curb

The type and location of curbs affects driver parking behavior and thus will have impacts on the safety and utility of a roadway. Curbs serve the following purposes:

- Drainage control
- Roadway edge delineation
- Delineation of pedestrian walkways
- Assistance in orderly roadside development
- Access control

Curbs take the place of roadside ditches, which allows the roadway cross-section width to be reduced. Curbs are used extensively along low-speed urban roadways, but caution should be exercised in the installation of curbs along high-speed roadways.

1.5 E Design & Posted Speed

The objective in design of any engineered facility used by the public is to satisfy the public's demand for service in a safe and economical manner for all users. Therefore, the facility should accommodate nearly all demands with reasonable adequacy and also should not fail under severe or extreme traffic demands. Roadways should thus be designed to operate at a speed that satisfies the need of the users. It is important that the design speed slightly exceed the posted speed on collector and arterial streets and roads as this will provide a margin of safety for drivers driving at the speed limit in unfavorable conditions such as inclement weather. Design and posted speeds will vary depending on the purpose of the facility. The difference between design and posted speeds will also vary depending on the type of facility; the difference typically varies from 5 to 10 miles per hour (MPH). Design and posted speeds are noted in Tables 1-2 through 1-7 in Section 1.6.

1.5 F Buffer

While a roadway shoulder does provide pedestrian separation from vehicles, it is preferred that additional separation is provided behind the curb. The sidewalk should be separated from the road by 7 feet or more to allow for snow storage without covering the walkway, to provide additional buffer between the pedestrian and the roadway, and to improve the visual appearance of the roadway using a narrower unbroken width of pavement including roadway and sidewalk. The buffer provides a more comfortable and pleasant pedestrian environment along streets. Separations provide buffer from immediate vehicle noise, exhaust, dust, and backsplash, and allow sidewalks to be clear of roadway snow storage and glaciation during winter. For these reasons, separations are an important factor in the level of use and the functionality of the public facility. This is especially important where the collector is on a school-walking route, and special efforts are made to keep the path clear of snow. The ability to provide adequate buffer is sometimes hampered by lack of adequate ROW.

1.5 G Pedestrian Facilities

Pedestrian facilities should be installed on both sides of arterials and collectors, on local streets as specified in AMC 21, and along the frontage of new development or redevelopment. The exception to this requirement is local streets in developments where the minimum lot size is 40,000 square feet or greater. The minimum width of pedestrian facilities is 5 feet; this provides a comfortable width for side-by-side walkers and accommodates a pedestrian-wheelchair passing.

1.5 H Landscaping

Landscaping is an important aspect of every project and is typically noticed more than any other aspect of design. Landscaping should be installed in accordance with Chapter 3 of this DCM for all primary streets.

Most landscaping amenities should be installed behind pedestrian improvements to ensure they are not damaged during maintenance operations, particularly snow removal. Where landscaping is installed between the back of curb and the pedestrian facility, the minimum maintainable width for turf is 3 feet and for plantings is 7 feet. Greater width may further prolong the life of vegetation. It is important that landscaping enhancements involve stakeholder input to ensure that improvements fit the character of the area.

END OF SECTION 1.5

SECTION 1.6 ROADWAY REQUIREMENTS

1.6 A General

There are three broad functional classes: arterials, collectors and local streets. Arterials are designed to carry large volumes of traffic at an efficient speed. Local streets serve the terminal ends of a trip. Collector streets gather and distribute trips between local streets and the arterial. This can be further broken down by saying that the arterial's main function is mobility, the local street's main function is access, and that collectors offer a balance of access and mobility. Street class mobility and access functions are shown in Figure 1-1.

A good street system encourages a hierarchy of movement. The local street is at the bottom of the hierarchy, and the arterial is at the top. A traveler moves up and down the street hierarchy to spend as little time as possible in the lower levels and the most time possible at the arterial level. An exception to this rule is internal neighborhood traffic that should only be advanced to the collector level before being redistributed to the local destination. By encouraging hierarchical movement, the trip is most efficient, and impacts to the lower level local and collector streets are reduced. Therefore, a good system provides a collector street in close proximity to local streets and frequent enough connections to arterials so that the collector doesn't operate over capacity. The trip movement hierarchy concept is presented in Figure 1-3.

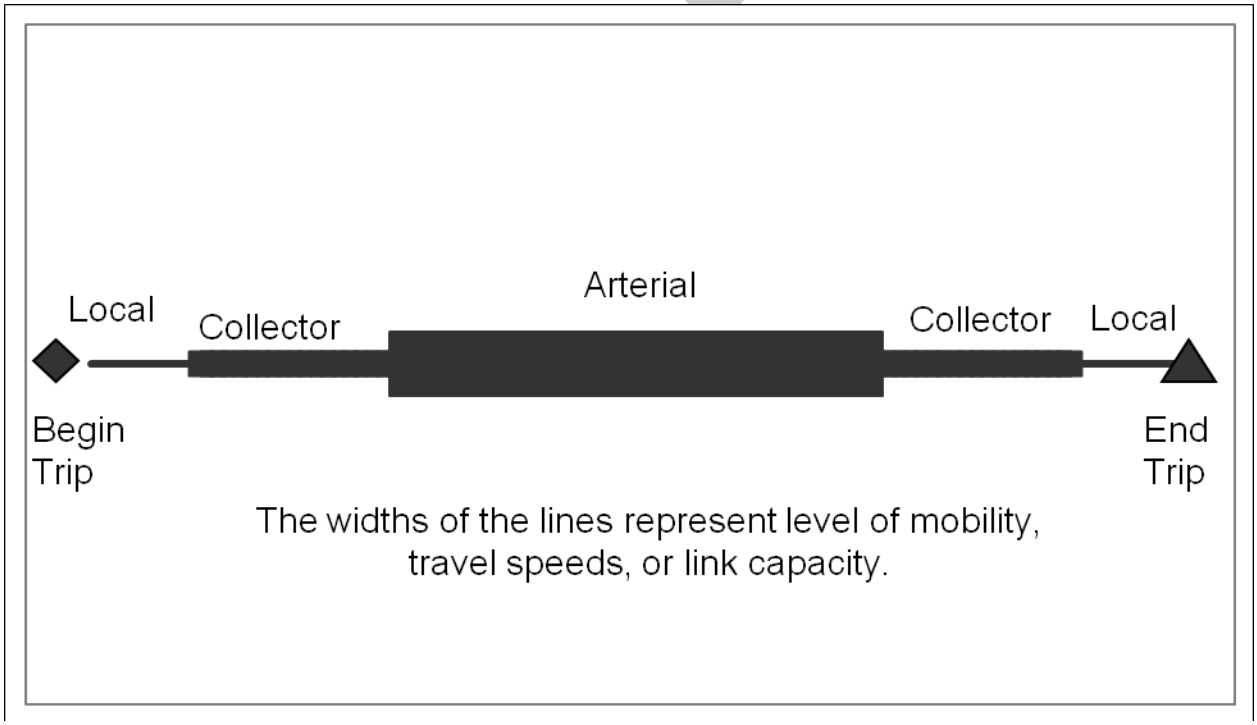


FIGURE 1-3 TRIP MOVEMENT HIERARCHY (KINNEY ENGINEERING, OCT 2003)

1.6 B Arterials

1. Discussion

The main function of arterials is to move large volumes of vehicles and commodities. They typically accommodate longer trips, and access to adjacent property is a lesser consideration. In addition to serving large volumes of traffic, arterials also serve as major utility corridors and provide access to open space. They should be landscaped (in accordance with Chapter 3) and include provisions for access control. Access control is necessary to reduce conflicting movements and increase their capacity. The *Areawide Trails Plan* and the *Anchorage Bicycle Plan* indicate that some arterials within the MOA have planned bicycle routes along their length. As these arterials are rehabilitated or reconstructed, accommodation of the bicycle routes should be incorporated as part the design process.

2. Types

a) Major Arterials

Major arterials are intended to move large volumes of inter-area traffic, typically in excess of 20,000 vehicles per day, and for moving traffic to and from freeway and expressway systems. Major arterials also provide major parallel traffic routes to supplement freeway systems. Future subdivisions along major arterials should be designed to prevent direct access from residential lots or small clusters of lots. Access to commercial and industrial areas should be carefully controlled. They should provide direct linkage between major employment and activity centers and connect these areas with large residential areas. Major arterials should have little to no direct land access. Major arterials should not separate the community such that large residential areas are isolated from major service facilities. Pedestrian access to major facilities from major residential areas must be safely provided for.

(1) Class III/IIIA Divided

The principle advantages of dividing a multilane arterial are increased safety, comfort, and ease of operation. A median will result in a significant reduction of head-on collisions which are typically serious and can result in major injuries or fatalities. Where the median is wide enough to provide for turn pockets, a reduction of rear-end collisions and increased capacity will result as through-vehicles will not be impeded. Medians in divided arterials may also provide important safety benefits for pedestrians. They can decrease the crossing distance by breaking a crossing into two segments, thus decreasing pedestrian exposure time, and allowing pedestrians to focus on only one stream of traffic. With a wide enough median, it can also serve as a pedestrian refuge, so pedestrians have a safe place to wait before crossing the next traffic stream. The primary characteristics of major divided arterials are shown in Table 1-2, and the typical sections are shown on Figures 1-4 and 1-5.

(2) Class IIIB/C Undivided

The characteristics of undivided major arterials are shown in Table 1-2, and the typical section is shown on Figure 1-6.

TABLE 1-2 PRIMARY STREETS: MAJOR ARTERIALS ROADWAY CHARACTERISTICS

Characteristics	Divided		Undivided
	Class III Figure 1-4	Class IIIA Figure 1-5	Class IIIC[3] Figure 1-6
Lane Width	12′	12′	12′
Median Width[4]	15’ Desirable, 4′ Min.	15’ Desirable, 4′ Min.	N/A
Design Speed	55 MPH	55 MPH	55 MPH
Posted Speed	45 MPH	45 MPH	45 MPH
Intersections	At-Grade	At-Grade	At-Grade
ADT[1]	>20,000	>20,000	>20,000
No. of Lanes	4	4-6	4
Transit Stops	Permitted	Permitted	Permitted
Parking	Prohibited	Prohibited	May be allowed
Pedestrian Facilities	Separated	Separated	Separated
Bicycle Facilities	Separated multi-use trail	Separated multi-use trail	Shared with Traffic

[1] Average Daily Traffic

[2] OS&HP-classified Class IIIB Major Arterial not currently used

[3] This classification applicable only in area bounded by and including: L Street to Medfra Street, East Whitney Road to 15th Avenue

[4] Raised median width measured back-to-back of curb.

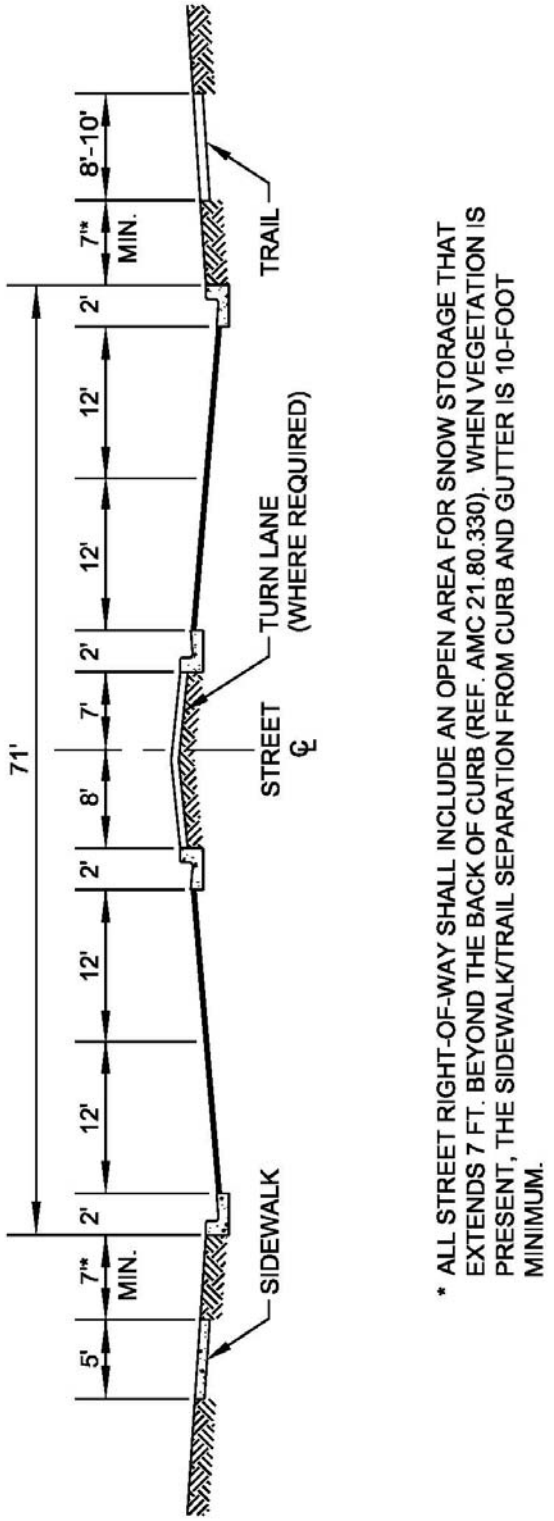


FIGURE 1-4 CLASS III MAJOR DIVIDED ARTERIAL

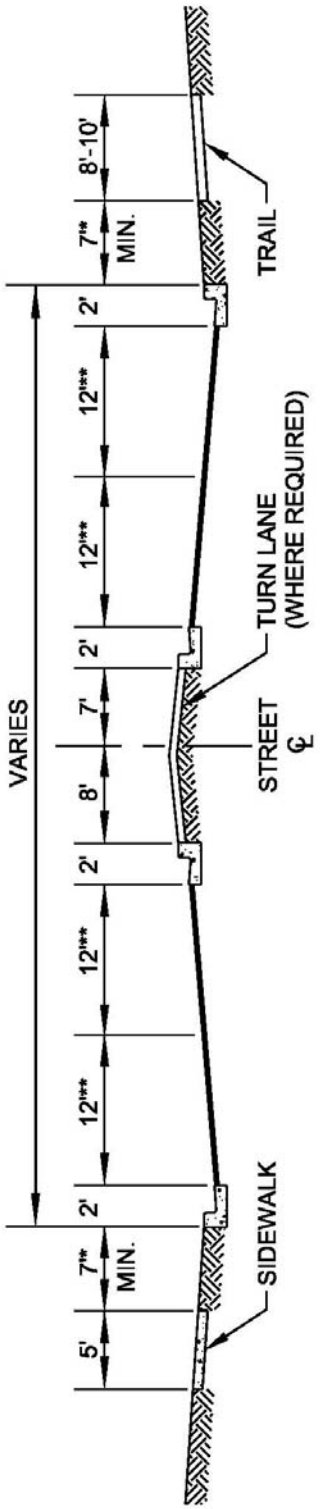


FIGURE 1-5 CLASS IIIA MAJOR DIVIDED ARTERIAL

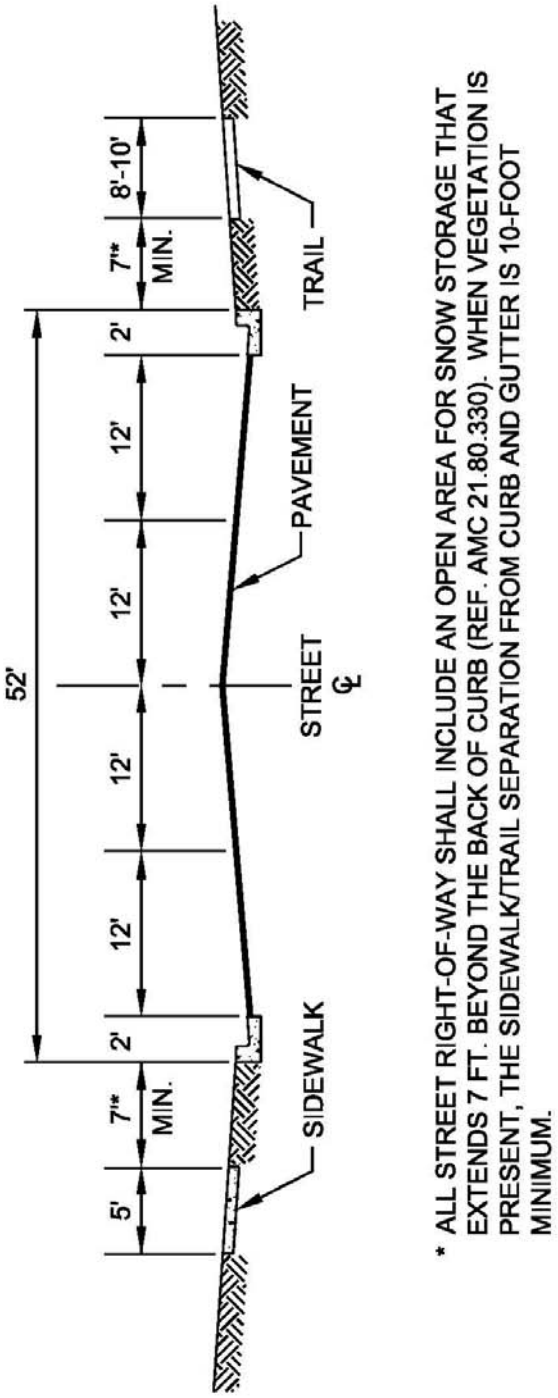


FIGURE 1-6 CLASS IIIC MAJOR UNDIVIDED ARTERIAL

1.6 B Arterials (Cont'd)

b) Minor Arterials

Minor arterials typically carry 10,000 to 20,000 vehicles per day. While minor arterials are primarily intended to move traffic, they also carry traffic parallel to or connecting with major arterials, thus supplementing the flow on the major system. Minor arterials serve as the distribution link between major arterials and lower classification streets such as collectors and local streets. They connect smaller residential areas in addition to connecting the residential areas with facilities such as schools, neighborhood business areas, and recreational facilities. They should not divide neighboring residential areas, but instead connect them with safe pedestrian access.

(1) Class IIA Central Business District (CBD)

Minor arterials through a central business district may allow parking and will have a higher concentration of pedestrian activity than rural or urban arterials. As a result, they are typically designed for lower speeds, have narrower lanes, and should provide a greater degree of access control. Because ROW within a CBD is limited, it is often necessary to attach pedestrian facilities to the back of curb and provide for bicycle facilities that share the roadway with vehicles. Landscaping will be more important in the central business district to provide aesthetics and attract pedestrians to the area. The roadway characteristics are shown in Table 1-3 and the typical section on Figure 1-7.

(2) Class II Urban

Urban minor arterials provide access through corridors where more pedestrians will be present than do rural minor arterials. To promote safer conditions for pedestrians and the additional activity within an urban corridor, urban minor arterials should have posted speed limits lower than those for rural minor arterials. The roadway characteristics are shown in Table 1-3 and the typical section on Figure 1-8.

(3) Class II Rural

Rural minor arterials carry vehicles through less developed areas than urban and CBD minor arterials. As such, they are typically designed and posted for higher speeds to increase efficiency. Because of the higher travel speeds, they should be designed with wider lanes to provide a better level of comfort for drivers. The roadway characteristics are shown in Table 1-3 and the typical section on Figure 1-9.

TABLE 1-3 PRIMARY STREETS: MINOR ARTERIALS ROADWAY CHARACTERISTICS			
Characteristics	**CBD (Class IIA)[2] Figure 1-7**	**Urban (Class II) Figure 1-8**	**Rural (Class II) Figure 1-9**
Lane Width	11'	11'	12’
Shoulders Width	3’-5’- as desirable	3’-5’- as desirable	6’
Median Width	11′ (2-Way Left Turn Lane)	14′ (2-Way Left Turn Lane)	14′ (2-Way Left Turn Lane)
Design Speed	35 MPH	45 MPH	45 MPH
Posted Speed	30 MPH	35 MPH	40 MPH
Intersections	At-Grade	At-Grade	At-Grade
ADT[1]	10,000 – 20,000	10,000 – 20,000	10,000 – 20,000
No. of Lanes	2 – 4	2 – 4	2
Transit Stops	Permitted	Permitted	Permitted
Parking	May be allowed	Prohibited	Prohibited
Pedestrian Facilities	Back of Curb	Separated	Separated
Bicycle Facilities	Shared with traffic	Separated	Separated

[1] Average Daily Traffic

[2] This classification applicable only in area bounded by and including L Street to Medfra Street, East Whitney Road to 15th Avenue

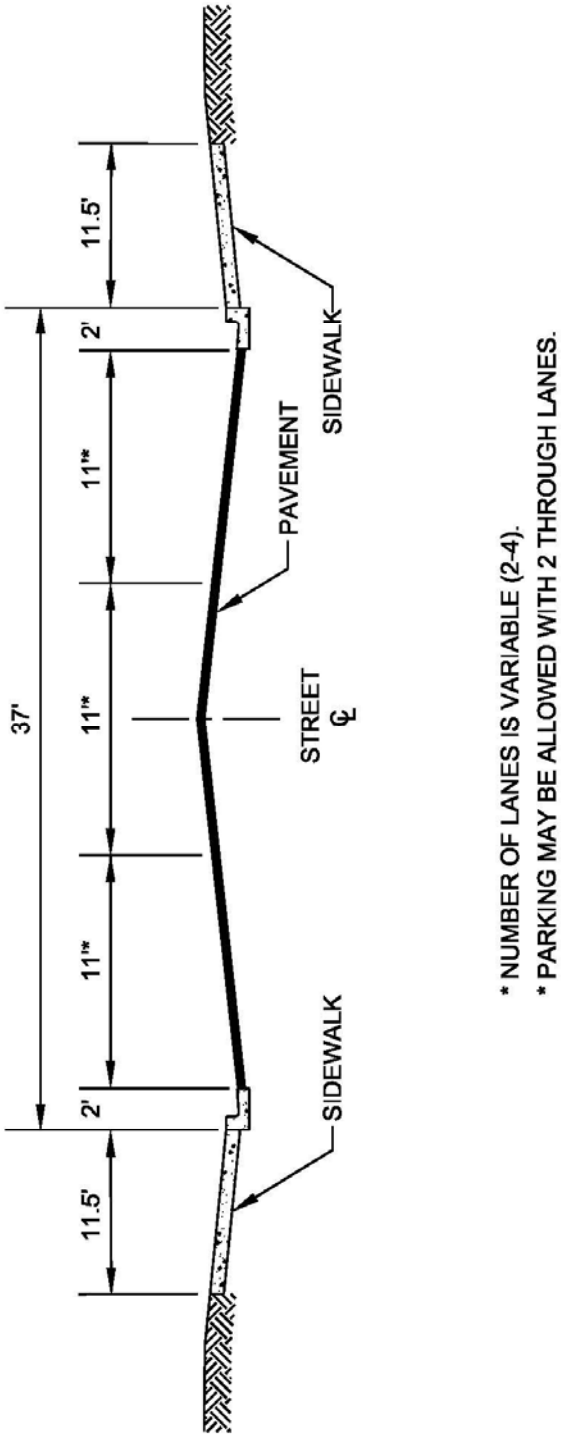


FIGURE 1-7 CLASS IIA MINOR ARTERIAL

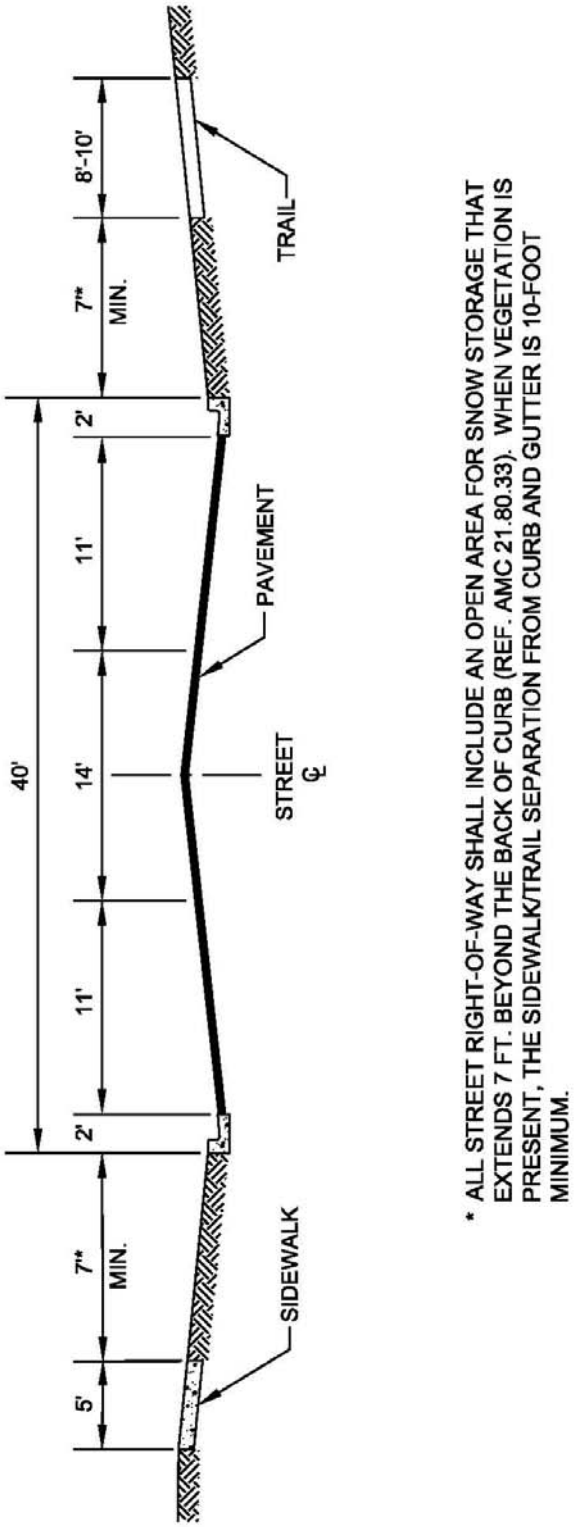
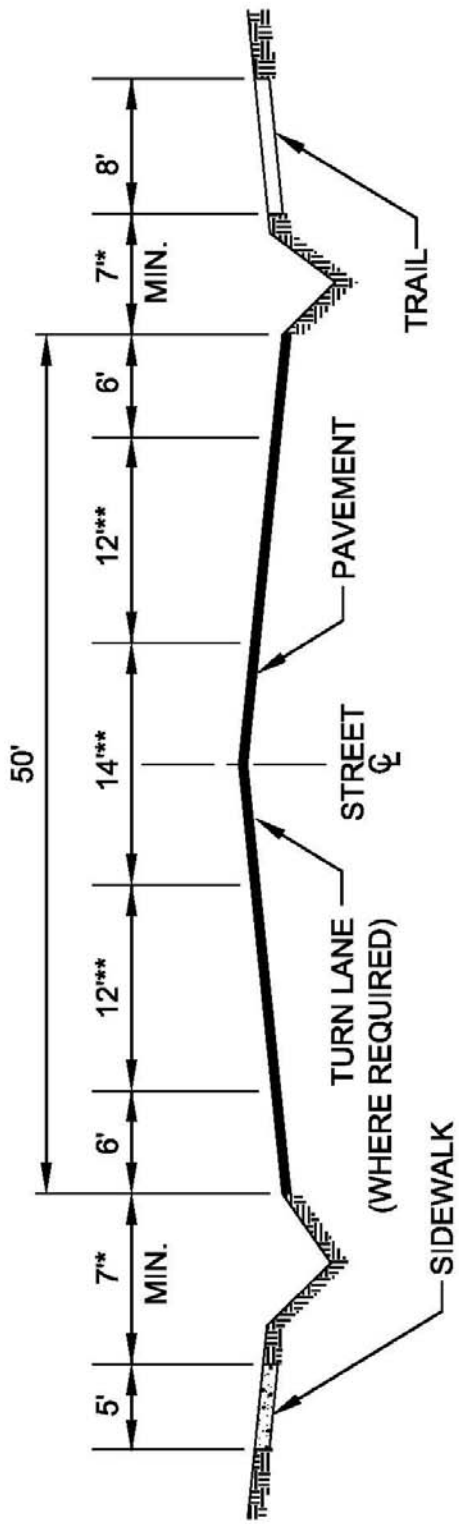


FIGURE 1-8 CLASS II URBAN MINOR ARTERIAL



* ALL STREET RIGHT-OF-WAY SHALL INCLUDE AN OPEN AREA FOR SNOW STORAGE THAT EXTENDS 7 FT. BEYOND THE EDGE OF PAVEMENT (REF. AMC 21.80.330). WHEN VEGETATION IS PRESENT, THE SIDEWALK/TRAIL SEPARATION FROM CURB AND GUTTER IS 10-FOOT MINIMUM.

** NUMBER OF LANES IS VARIABLE (2-4)

FIGURE 1-9 CLASS II RURAL MINOR ARTERIAL

1.6 C Collectors

1. Discussion

Collector streets primarily form a grid that collects traffic from local streets and carries it to the arterial system. As such, they must balance the mobility and access functions of a roadway. Collectors are relatively low-speed streets that may provide access to abutting properties. On collector roads where mobility serves higher priority than access, direct access to individual lots should be limited. Collector streets should be landscaped in accordance with Chapter 3.

Collectors are an important and necessary part of the urban street system. By bridging arterials and local streets, the collector enables each of these to maximize the performance of its intended function. Collectors also facilitate internal neighborhood local-to-local trips. Because of their positioning in the street hierarchy, collectors must provide a balance of both mobility and access, and collector design standards must consider both of these functions. Unbalancing these functions will force the collector to function as a local street or arterial (depending upon the shift) and creates problems throughout the system.

Where collectors are not in place, the trip movement hierarchy is violated, functions begin to overlap, and the system degrades. Local streets that connect directly to an arterial are often constrained by the main road volumes and speeds so that only certain movements, usually right-turns, are possible. Furthermore, ingress and egress movements at streets and driveways reduce the arterial's mobility function. Another problem that surfaces in absence of a collector is that travelers use the local residential street system as de facto collectors. A neighborhood typically has a permeable street system that can be traveled from side to side. Without the collector level, the motorist may be forced to use other local streets, adding unwanted traffic volumes to local streets that travel at higher speeds than desirable.

The MOA has a roadway classification system with sub-classes that address specific needs. Although it is more complex than the simplified concepts discussed above, the system still uses the same general hierarchy.

Streets designated as Class I Collectors in the OSHP, with minimal fronting residences, have design speeds up to 45 mph (AASHTO's upper limit for low-speed streets) with posted speeds of 35 to 40 mph. Class IA Industrial-Commercial collectors also have design speeds up to 45 mph with posted speed of 35 to 40 mph. It is recommended that those streets designated as Class IB or IC Neighborhood Collectors be designed with a 35 mph design speed and posted at 30 mph. Travel speeds in the upper range are high enough that a motorist would recognize the benefit of using the collector instead of traveling on local streets. This encourages the motorist to maintain the trip hierarchy discussed above.

Table 1-4 describes roadway characteristics of collector roads, but actual sizing is determined on a case-by-case basis.

	TABLE 1-4 PRIMARY STREETS: COLLECTOR'S ROADWAY CHARACTERISTICS			
Characteristics	**Class I Figure 1-10**	**Class IA Industrial/ Commercial Figure 1-10**	**Class IB/IC Neighborhood Figure 1-10**	**Class ID Rural Figure 1-12**
Lane Width[1]	10'-11'	11'-12'	10'-11'	10'-11'
Shoulder Width[2]	3.5'-5'[3]	3.5' -5'[3]	3.5'-5'[3]	4'
Median Width	N/A	N/A	N/A	N/A
Design Speed	45 MPH	45 MPH	35 MPH	35 MPH
Posted Speed	35-40 MPH	35-40 MPH	30 MPH	30 MPH
Intersections	At-Grade	At-Grade	At-Grade	At-Grade
Average Daily Traffic	2,000 – 10,000	2,000 – 10,000	2,000 – 10,000	400 – 10,000
No. of Lanes	2	As required to meet traffic operations.	2	2
Transit Stops	Permitted	Permitted	Permitted	Permitted
Parking[2,4]	One or Two Sides	One or Two Sides	One or Two Sides	N/A
Sidewalk/Path Buffer[5]	0'-7'	0'-7'	0'-7'	N/A
Sidewalk/Multi-Use Paths Width	5' / 8'	5' / 8'	5' / 8'	8'

[1] To determine lane width use graph in Figure 1-11.

[2] When a parking lane is provided, the lane width shall be 9' in the CBD and 7' elsewhere.

[3] For 7-foot sidewalk/pathway buffer, provide min. 3.5-foot shoulder, varies to 5-foot shoulder for adjacent sidewalk pathway.

[4] When allowed.

[5] From back of curb.

Where appropriate, collectors can be signed and striped for bicycle use. Where bicycle use is indicated, the paved shoulders should be at least 5 feet wide.

2. Types

a) Class I Collector

The main function of a Class I Collector is to conduct traffic from local residential areas to arterials. Land access should be a secondary function and both curb cuts and driveway access should be discouraged except at those locations where traffic movement patterns may be effectively controlled. Class I Collectors emphasize a higher degree of mobility than Class IB/IC Neighborhood Collectors. Limiting direct access to the roadway and providing 11-foot lanes attain a higher degree of mobility. Because of the increased emphasis on mobility, greater separation between vehicles and pedestrians should be provided, if feasible.

b) Class IA Industrial/Commercial Collector

The main function of an industrial/commercial collector is to conduct traffic from industrial and commercial businesses that experience significant truck traffic to arterials. Land access is a higher function of industrial/commercial collectors than of other collectors. Because of the significant amount of truck traffic industrial/commercial collectors' experience, they should be designed with lane widths of 12 feet. Design speeds should be appropriate for the surrounding land use but should not exceed 45 mph.

c) Class IB/IC Neighborhood Collector

A neighborhood collector serves both access and mobility functions, but places a slightly higher emphasis on the access function. As such, a neighborhood collector will have more lots fronting it and it is likely to see more pedestrian and bicycle activity than a Class I Collector. A neighborhood collector design should include landscaping and a streetscape that will maintain the feel of the existing neighborhood. Traffic calming techniques (see *Traffic Calming Protocol Manual*, MOA Traffic Department, March 2001) may be considered as appropriate to promote proper driver behavior relative to speed, but should be minimized on primary emergency response and transit routes.

d) Class ID Rural Collectors

Rural collectors are similar to their urban counterparts in that they provide a balance between the access and mobility functions for both vehicles and pedestrians. The rural collector classification is to be implemented in rural residential developments in areas such as Chugiak, Birchwood, Eagle River, and Anchorage hillside. The primary benefits of this collector class are the addition of pedestrian facilities in rural areas where no provisions were previously provided and the addition of shoulders. As development continues, it is important to consider and provide for all roadway users.

The typical section selection criteria for rural collector roads are based on volume criteria. Where projected volumes are 2,000 vehicles per day or less, 10-foot travel lanes shall be used. Where the projected volumes typically are in excess of 2,000 vehicles per day, provide 11-foot travel lanes. Where 10-foot travel lanes are appropriate, some additional snow storage space will be available

behind the pathway. If projected volumes exceed 6,000 vehicles per day, consider lengthening the ditch fore slope by 3 feet to provide sufficient clear zone for the roadway.

Because development in rural areas tends to make use of larger lot sizes, providing pedestrian facilities on only one side of the roadway is appropriate. However, because pedestrian facilities will only be provided on one side, they should be able to accommodate all potential users. Typical sections for rural collector travel lane widths are shown in Figure 1-12.

The typical section for rural collectors exceeds conventional 70-foot collector ROW widths. Additional ROW or easement widths may be necessary.

e) Typical Sections

The typical section shown on Figure 1-10 describes the range of collector roadways. Lane widths for Class I Collectors and Class IA Industrial/Commercial Collectors should be on the upper end of the range shown in Figure 1-10 to provide the proper Level-of-Service, depending on the roadway traffic conditions.

(1) Neighborhood Collector Typical Section Selection

The minimum lane width for a neighborhood collector is 10 feet, with higher traffic volumes requiring 11 feet. Figure 1-11 presents a graphical selection tool that, with given traffic conditions of average daily traffic (ADT) and peak hour traffic (PHT), will allow the engineer to select the lane widths for a neighborhood collector. The line within the graph represents a 5% chance of two trucks meeting at the given intersecting ADT and percent ADT in PHT (K).

This lane selection method is a rational approach for design. It has limitations in that trucks should be no more than 3% of the traffic stream. Higher percentages of truck traffic would require 11-foot lanes regardless of K or ADT.

Traffic information may be obtained from traffic counts conducted by the Alaska Department of Transportation and Public Facilities (ADOT&PF) or MOA. For new developments, Institute of Transportation Engineer's (ITE) *Trip Generation* may be used to estimate ADT. The K factor may also be determined from ITE's *Trip Generation* publication. Where no information is available on K, a default of 9 percent may be assumed, yielding a maximum ADT of 3,750 for 10-foot lanes.

The minimum shoulder width for neighborhood collectors is 3.5 feet. This satisfies the minimum bike lane width established by AASHTO. In addition, the shoulder, in conjunction with a minimum lane width of 10 feet will provide minimum passage area around disabled vehicles and adequate width for emergency vehicle passage. The shoulders also provide temporary snow storage in the winter. This allows the roadway functions to be maintained when snow and ice accumulation encroaches onto the roadway and typically narrows each side of the roadway.

The shoulder width should be increased to 5 feet when the pathway or sidewalk is directly attached to the back of the curb. This provides more appropriate separation between the pedestrian and vehicles and also provides additional space for temporary snow storage in the winter.

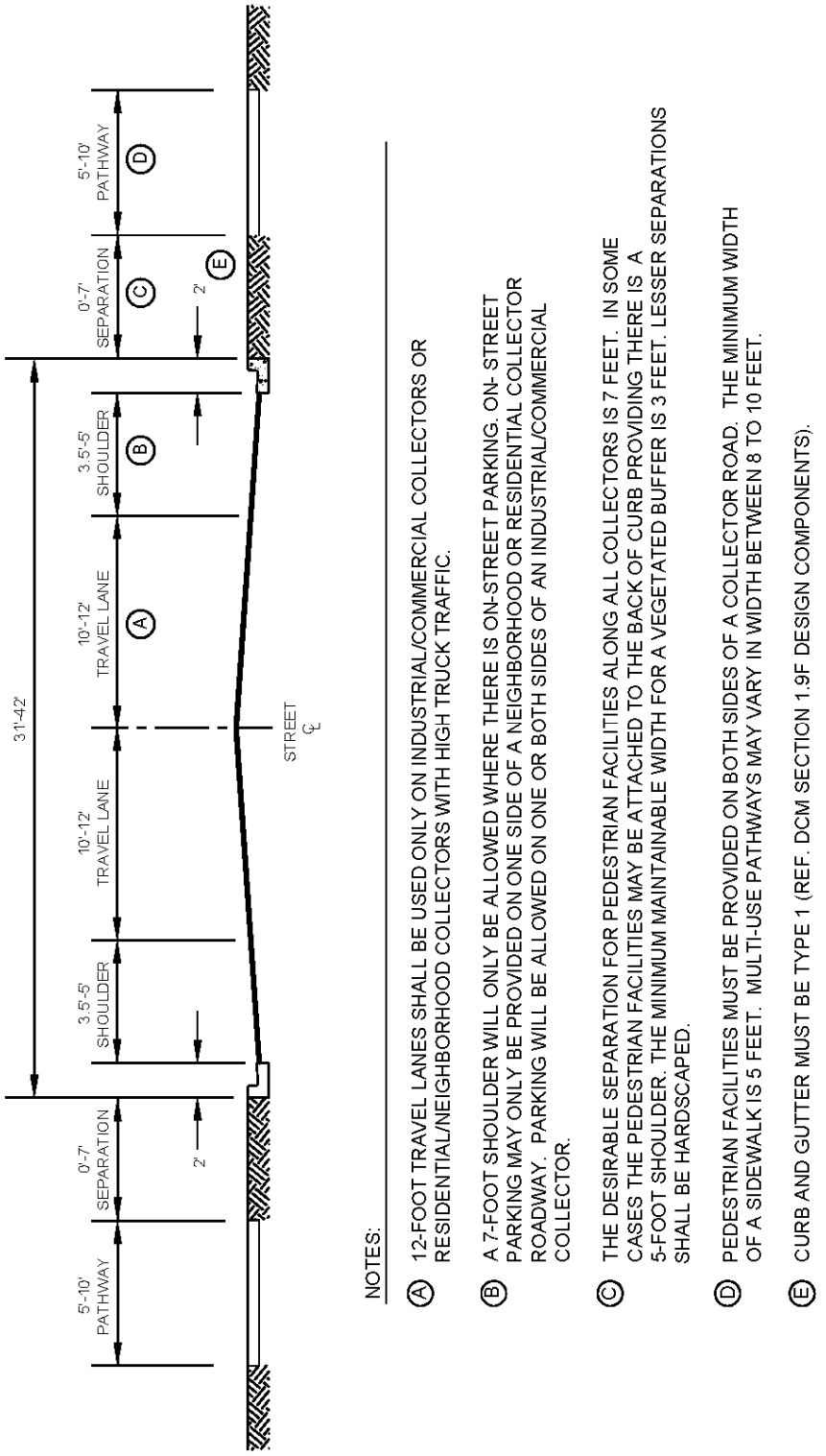


FIGURE 1-10 COLLECTOR ROAD TYPICAL SECTION

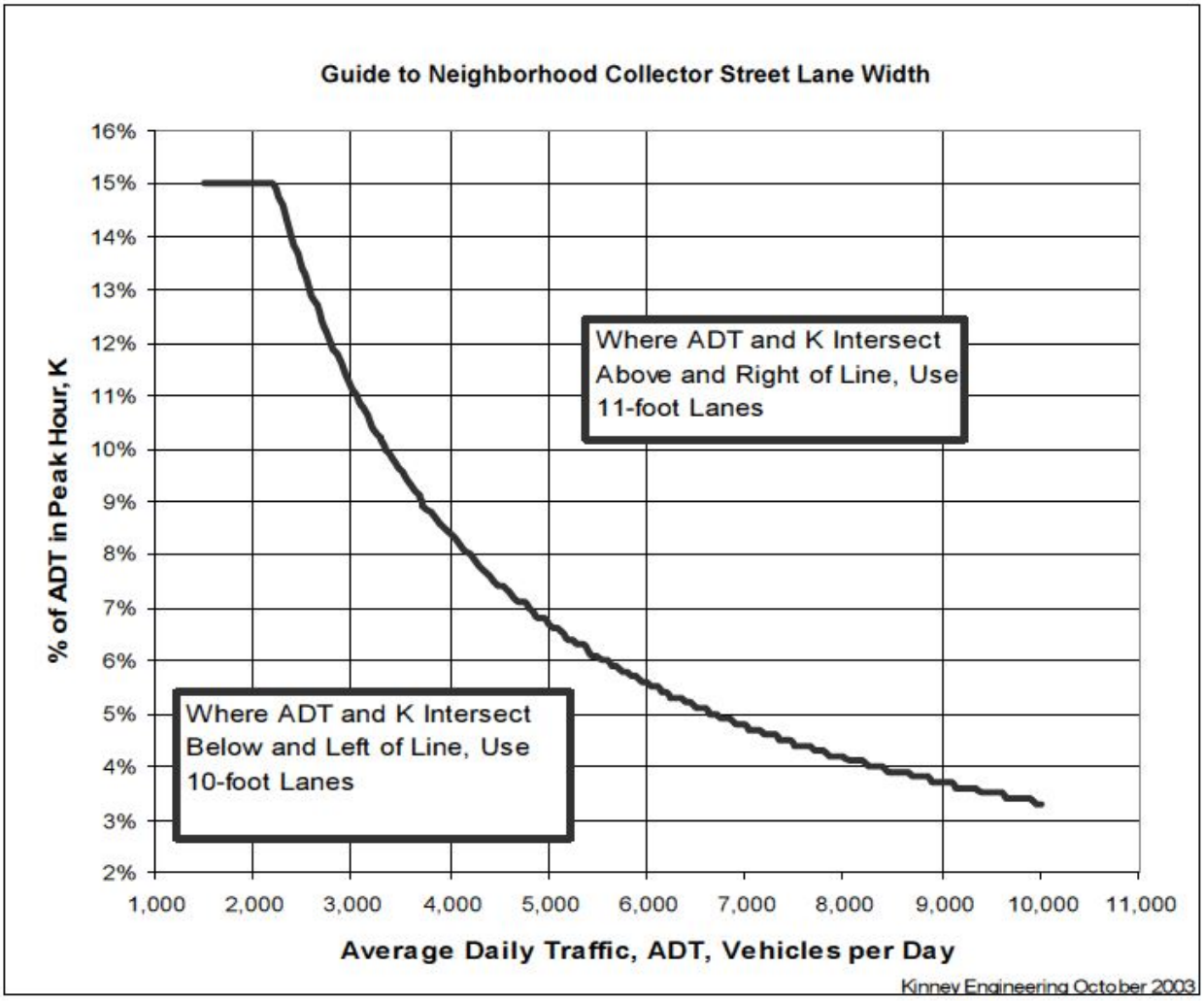


FIGURE 1-11 NEIGHBORHOOD COLLECTOR LANE WIDTH GUIDE

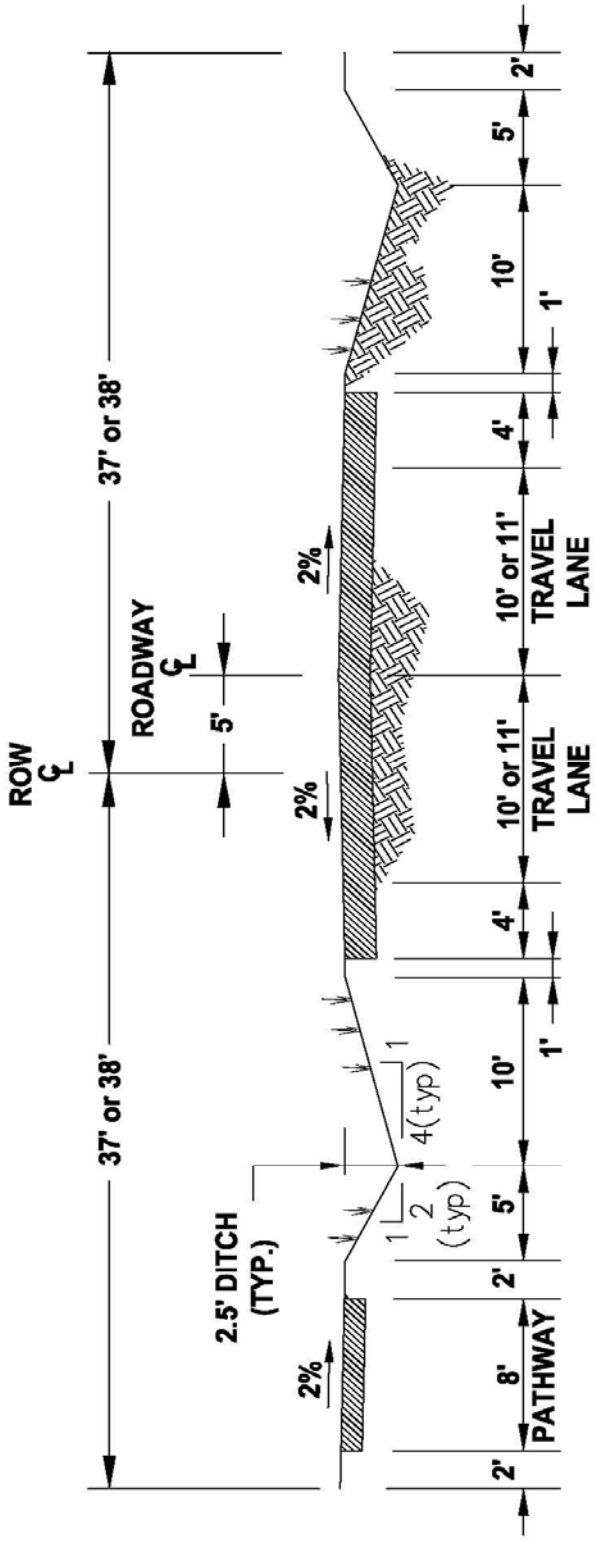


FIGURE 1-12 RURAL COLLECTOR

1.6 D Local

1. Discussion

As noted in Section 1.3 C, local streets typically have lower traffic volumes and design speeds, and provide more direct access to adjacent properties. These streets are more dependent on specific land use needs and the types of users than primary streets. The appropriate secondary street section is determined by considering projected traffic volumes and use (residential, industrial, or commercial). In some urban areas, alleys are also required for service access.

Local streets exhibit the greatest amount of variation resulting from the type of development being served and the physical characteristics of the land. On hillsides and other areas of sensitive terrain, consideration must be given to achieving a balance between providing local accesses and designing a road that will least impact adjacent properties and natural features.

2. Types

a) Commercial/Industrial Local

Commercial and industrial local streets are low volume, low speed streets where access to fronting businesses, not mobility, is the main function. They will typically consist of two travel lanes and, where appropriate, a center-two-way-left-turn-lane (CTWLTL). In rural areas, commercial and industrial local streets typically will not have curb and gutter; in urban areas, they will. Shoulders will be wider on commercial and industrial local streets than residential streets to accommodate the larger vehicles that the roadway services and to provide on-street parking where appropriate.

Table 1-5 describes roadway characteristics of commercial and industrial local roads, but actual sizing is determined on a case-by-case basis.

b) Urban Residential Local

Urban residential local streets, like rural residential streets, are low volume, low speed streets that primarily provide access to fronting residences. They are curbed streets and may provide space for parking on one or both sides of the roadway. As with rural local streets, it is also likely that urban residential streets will have a higher percentage of pedestrians and bicyclists sharing the ROW with vehicles.

The minimum lane width for an urban residential street is 10-feet. Streets with higher traffic, truck, and transit volumes may warrant 11-foot lanes. Table 1-6 describes roadway characteristics of urban residential local roads, but actual sizing is determined on a case-by-case basis.

The municipal engineer or the platting authority may require road improvements to “half street” standards if underground utilities will be installed before street construction. Minimum pavement width on a half-street is twenty-four (24) feet.

c) Rural Local

Rural local streets are low volume, low speed streets without curb and gutter and minimum shoulders, where access to residences, not mobility, is the primary function. Residences will

primarily front the road, and there may be a high percentage of pedestrians and bicyclists, particularly children, sharing the ROW with vehicles. Lane widths can vary depending on the amount of available ROW and the ADT the roadway receives.

Table 1-7 describes roadway characteristics of rural local roads, but actual sizing is determined on a case-by-case basis.

d) Alleys
In some urban areas, alleys provide a secondary means of service access to abutting properties. A typical alley section is found in M.A.S.S. Division 20 Standard Details.

e) Typical Sections

Figures 1-13 and 1-14 show the typical sections for urban and rural streets, respectively. Figure 1-15 shows the typical section for urban half-streets.

END OF SECTION 1.6

TABLE 1-5 SECONDARY STREETS: COMMERCIAL AND INDUSTRIAL STANDARDS[1]

Street Width[1,2] (Feet)	Number of Lanes and Lane Width (Feet)		Shoulder Width (Feet)	Design Speed (mph)	Application
	Moving	Parking			
33’	2–11’	Prohibited[4]	3.5’	30	No on-street parking
40’	2–11’	2 – 7’[3]	3.5’[3]	30	Commercial/Industrial/Urban Streets
47’	2–11’, 1–14’ (turn lane)[5]	Prohibited[4]	3.5’	35	Major Commercial/Industrial Urban Streets where turn lane required

[1]Street widths and sections specified in assembly-adopted plans and regulations will generally take precedence over street widths and sections in this table.
[2]Street width is measured from back of curb.
[3]The platting authority may allow off-street parking (AMC 21.85.060). When off-street parking is utilized, the parking lane may be eliminated and the street width reduced. Minimum 3.5-ft shoulder sections are required if parking is eliminated.
[4]Off-street parking must be provided.
[5]May reduce width of turn lane to 12’ if median not constructed.

TABLE 1-6 SECONDARY STREETS: URBAN RESIDENTIAL STANDARDS[1]

ADT[4]	Street Width[1,2] (Feet)	Number of Lanes		Shoulder Width (feet)	Design Speed (mph)	Application
		Moving	Parking[3]			
0 – 300	31’	2’-10’	1- 7’	3.5’	25	Residential Minor streets, cul-de-sacs and small loops
301 – 1,000	33’	2’-11’	1-7’	3.5’	25	Residential Major streets, loop streets, high-volume cul-de-sacs
>1,000	38’	2’-10’	2[5]-7’	3.5’	30	Residential Sub connector

[1]Street widths and sections specified in assembly-adopted plans and regulations will generally take precedence over street widths and sections in this table.
[2]Street width is measured from back of curb.
[3]The platting authority may allow off-street parking (AMC 21.85.060). When off-street parking is utilized, the parking lane may be eliminated and the street width reduced. Minimum 3.5-ft shoulder sections are required if parking is eliminated.
[4]See Section 1.3 F to determine Average Daily Traffic (ADT).
[5]For single-loaded streets (houses on one side only), may replace one parking lane with shoulder section.

TABLE 1-7 SECONDARY STREETS: RURAL RESIDENTIAL STANDARDS[1]
(Strip Paved Streets)

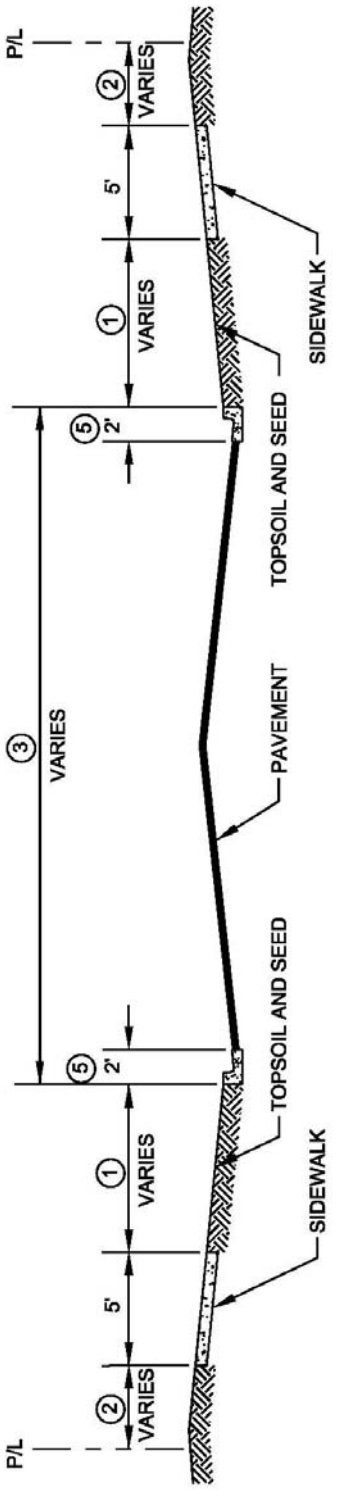
ADT[4]	Street Width[1,2,3] (Feet)	Number of Lanes		Shoulder Width (Feet)	Design Speed (mph)	Application
		Moving	Parking			
0 - 500	20’	2-10’	Prohibited	2’	20	Residential Loop streets, rural peripheral/access roads
501 – 1,000	24’	2-12’	Prohibited	2’	25	Residential Loop streets, peripheral/access roads
1,001 – 2,000	24’	2-12’	Prohibited	4’	25	Major Residential streets

[1] Street widths and sections specified in assembly-adopted plans and regulations will generally take precedence over street widths and sections in this table.

[2]Street width is measured from edge of pavement, or future pavement in the case of gravel streets.

[3]Minimum street width is 26 feet, exclusive of shoulders, within 20 feet of fire hydrants.

[4] See Section 1.3 F to determine Average Daily Traffic (ADT).



NOTES:

① SIDEWALK REQUIREMENTS AND SEPARATION FROM CURB AND GUTTER IS DISCUSSED IN CHAPTER 4.

② SIDEWALK SEPARATION FROM PROPERTY LINE VARIES WITH THE WIDTHS OF RIGHT-OF-WAY AND PROPOSED STREET SECTION.

③ PAVEMENT WIDTHS VARY WITH TRAFFIC VOLUMES AND TYPES AS LISTED IN TABLES 1-5 AND 1-6.

④ SEE SECTION 1.3F FOR INFORMATION ON AVERAGE DAILY TRIPS DETERMINATION.

⑤ CURB AND GUTTER SHALL BE TYPE 1 (REF. DCM SECTION 1.9G DESIGN COMPONENTS).

FIGURE 1-13 URBAN SECONDARY STREET

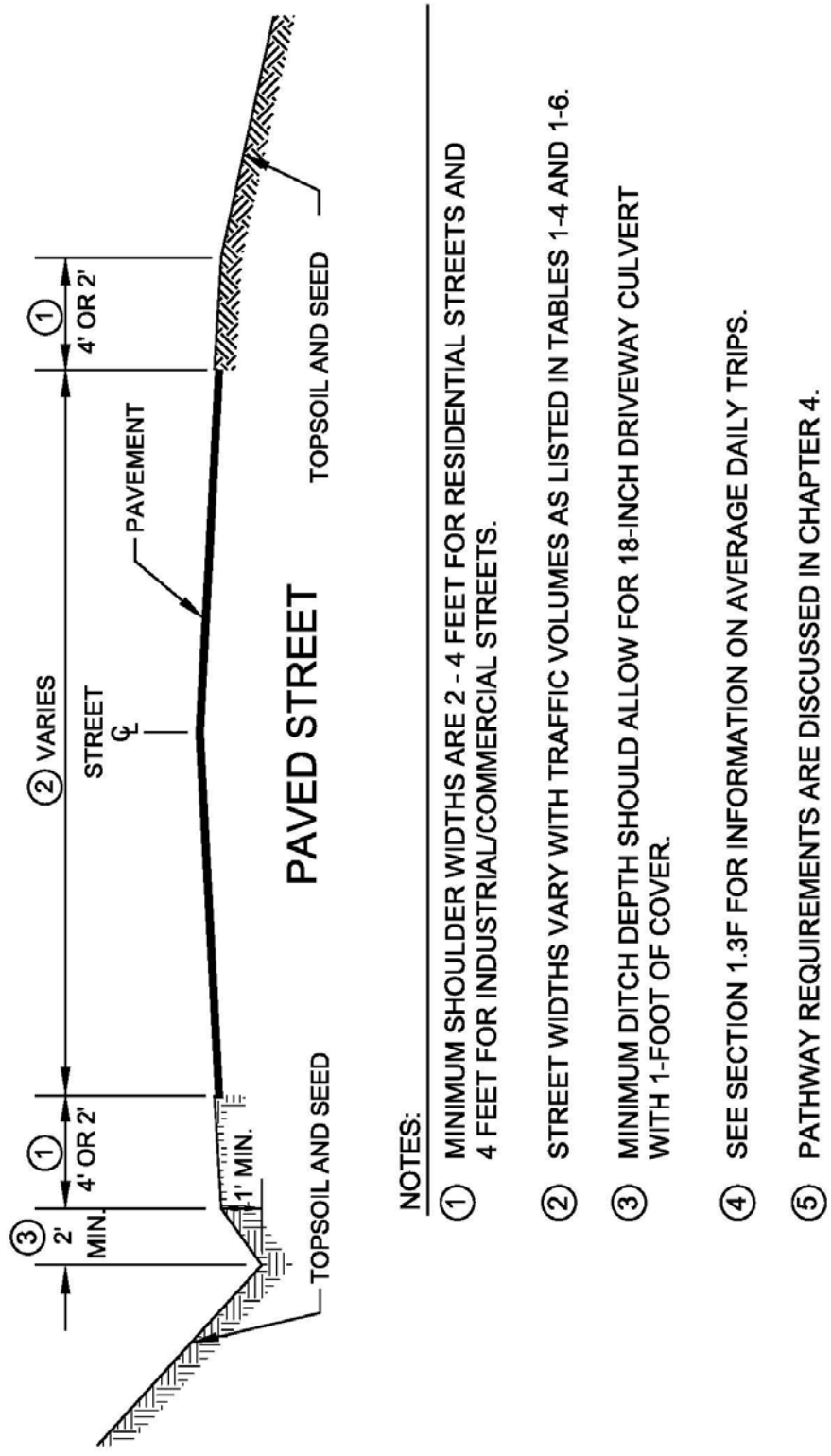
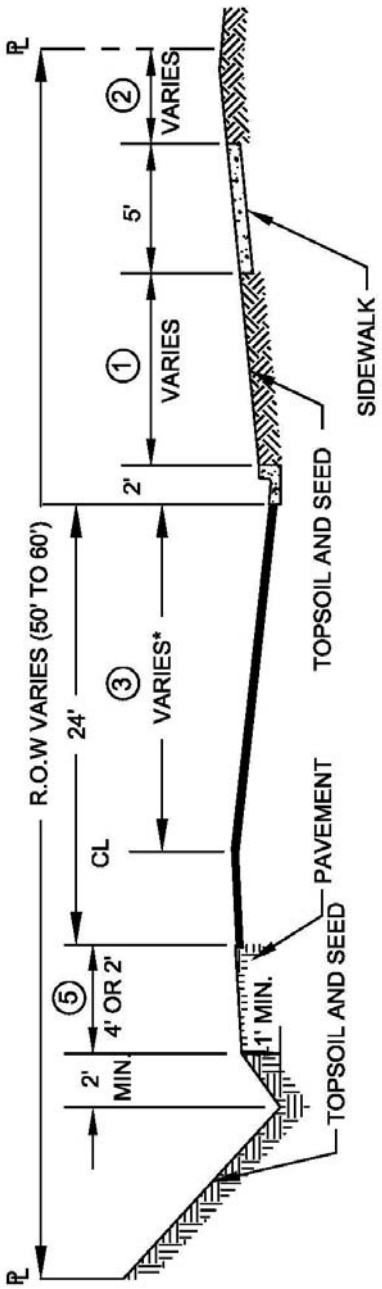


FIGURE 1-14 RURAL SECONDARY STREETS



NOTES:

① SIDEWALK SEPARATION FROM CURB AND GUTTER IS DISCUSSED IN CHAPTER 4.

② SIDEWALK SEPARATION FROM PROPERTY LINE VARIES WITH THE WIDTHS OF RIGHT-OF-WAY AND PROPOSED STREET SECTION.

③ PAVEMENT WIDTHS VARY WITH TRAFFIC VOLUMES AND TYPES AS LISTED BELOW :

ADT [4]	PAVEMENT WIDTH (FT.)*	
	RESIDENTIAL	COMMERCIAL
0-300	13.5'	SEE TABLE 1-6
300-1000	14.5'	SEE TABLE 1-6
1000-2000	17'	SEE TABLE 1-6

④ SEE SECTION 1.3F FOR INFORMATION ON AVERAGE DAILY TRIPS (ADT) DETERMINATION.

⑤ MINIMUM SHOULDER WIDTHS ARE 2 FT. FOR RESIDENTIAL STREETS AND 4 FT. FOR INDUSTRIAL / COMMERCIAL STREETS.

FIGURE 1-15 HALF STREETS

SECTION 1.7 SOIL INVESTIGATION STANDARDS

1.7 A Objective

A subsurface soils investigation shall be performed on all road, drainage, and development projects within the MOA. The primary purpose of a soils investigation is to provide the engineer with information on the engineering properties of the subsurface soils, water table, and moisture conditions throughout the project. Soils data are also helpful to the construction engineer and contractor in determining constructability and costs.

Soil investigation in sub-arctic regions is a significant design concern due to the potential of frost heave and its damaging effects on road and utility systems. Because frost action is to a great degree dependent on soils types and moisture content, the engineer must have adequate information on both of these items to design durable roads. These issues are critical because of the extreme geological variations in soils stratigraphy and water tables found in the Anchorage area. The objective of this section is to assist the engineer in determining what soils information is necessary in a subsurface investigative report and outlining a format for presentation of the report to PM&E.

In addition, when the subject site is known or suspected to be on or near a former fill or dump site, or when the previous use of the land is suspected to have potentially caused soil or groundwater contamination, test holes at a greater frequency as well as outside of the existing or proposed project limits may be required to ensure that construction does not occur on poor or contaminated soils.

1.7 B Test Holes

Test holes may consist of drilled borings or excavated test pits. The spacing and depth requirements for test holes must be determined based on existing site conditions and project needs. Each project shall be examined carefully to determine adequate spacing requirements. As a rule, test borings shall not be spaced more than 200 feet apart; a closer spacing may be appropriate due to varying conditions. Throughout the project length, the offset location of test holes shall be varied relative to the street centerline.

Test holes shall be advanced outside of utility trenches. Test hole depth shall be a minimum of 15 feet and should be at least four feet deeper than utility improvements. Additional depths are required where organic materials are encountered or the engineer suspects the presence of permafrost. When organic material is present or encountered, the test hole shall be extended a minimum of 4 feet below the bottom of the organic layer. When permafrost is expected or encountered, the test hole depth shall be extended at least as deep as 40 feet. In both cases, the recommendations of a qualified geotechnical engineer shall be obtained to determine the minimum depth requirements.

If two test pits within any 900 linear feet of the alignment cannot be advanced to at least 15 feet, the exploratory program must be supplemented with replacement borings to at least 15 feet in depth.

As long as test holes have been advanced that meet the minimum spacing and depth requirements, additional test holes are not required to be deeper than needed to accomplish the purpose of the test hole (e.g. identifying depth of organics, changes in soil regime, etc.).

The test hole spacing and depth requirements should be considered carefully because soil strata can be discontinuous over short distances in some situations. The PM&E Materials Supervisor shall be contacted to obtain existing soils log data and further information about test hole depths and spacing.

Soil samples shall be retrieved at maximum 2.5-foot intervals to 10-feet below the ground surface. Subsequent samples shall be taken at 5-foot intervals or less to characterize soil stratigraphy.

For investigations in existing roadways, obtain representative bulk samples from the existing subbase material.

Record groundwater level(s) encountered while drilling. Monitor groundwater levels again after 24 hours; record depth(s) and date on the soils log. If no groundwater is encountered during the drilling operations, record this finding on the log. In addition, measure and record groundwater depths again in May and September.

Provide and record Photo Ionization Detector field screening of test hole cuttings and samples.

1.7 C Testing Standards

Soil and rock sampling and identification procedures must be conducted in general accordance with American Society for Testing and Materials (ASTM) D-420, *Standard Guide for Investigating and Sampling Soil and Rock*. Mechanical analyses for each typical soils unit group must be performed, and the soils must be classified in general accordance with ASTM D-2487, *Unified Soil Classification System*. In addition, gradations must be performed on bulk samples in the upper 5 feet of test holes with obvious FILL material of significant quantity (1-foot or more) being recorded and analyzed. Moisture content shall be determined on recovered samples. The test hole number and depth of sample on each mechanical analysis shall be noted. Information from mechanical analysis shall be attached to the test hole log and shall be included in the soils investigation report.

Visual and aromatic observations for the presence of petroleum hydrocarbons shall be conducted. Test hole samples shall be field screened through the use of a Photo Ionization Detector. If petroleum hydrocarbon contamination is indicated or suspected, complete the appropriate soils and/or groundwater testing and analysis to quantitatively establish the presence or absence of petroleum constituents.

1.7 D Soils Investigation Report

A soils investigation report is required for every road, drainage, and development project, including private roadways, to document the investigative process and soils conditions. Two major components must be included in the report: (1) a text section that describes the soil investigation process, and (2) the actual test hole logs containing field and laboratory results.

Soils investigation reports shall bear the stamp and signature of a professional engineer licensed in the State of Alaska.

1. Report Text

   The text of a soils report should contain, but is not limited to, the following information:

   a) Map of the project location and description of the local topography

   b) Brief geologic review of the local vicinity

   c) Synopsis of the exploration methodology and equipment, including sampling, testing, and drilling equipment

   d) Brief description of the laboratory and field-testing program, including the name of the testing agency

e) Descriptions of the subsurface soils properties, including classification in accordance with the latest edition of ASTM D-2487; grouping of soils into major types; distribution of soil types; frost classification, frost penetration if exploration was conducted during the freezing period; and the location and nature of any permafrost encountered

f) Notation of encountered depth of groundwater and estimated seasonal groundwater fluctuations

g) Narrative about conclusions and recommendations pertinent to the design of the proposed improvements, including the effects of freezing and thawing of the soils

h) Report Photo Ionization Detector readings that are beyond natural background levels and suspicious or if there is evidence of possible petroleum hydrocarbons noted during field investigations

2. Test Hole Logs

Visual logs are required for each test hole. Prepare the logs similar to the format shown in Figure 1-16. The following information describes the minimum detail required on each log:

a) Date of test hole, test hole number, horizontal location (stationing and centerline offset), and elevation

b) Record groundwater level(s) while or after drilling. If no groundwater is encountered report this finding on the log

c) Top and bottom of each stratum, measured from the existing surface. For each test hole, the termination depth, refusal, or both must be depicted

d) Soil moisture content (percentage) determined at each sampling interval

e) Frost classification of each stratum (by soils type). All samples shall be extracted through undisturbed methods, when possible, and the standard penetration tests shall be recorded on the log

f) Presence of petroleum hydrocarbons, if applicable. Photo Ionization Detector readings derived from procedures established in DCM 1.7 C. Testing standards of this manual shall be recorded and depicted in the appropriate location of each respective Test Hole Log

g) For samples on which gradations are determined, percent passing the # 200 sieve.

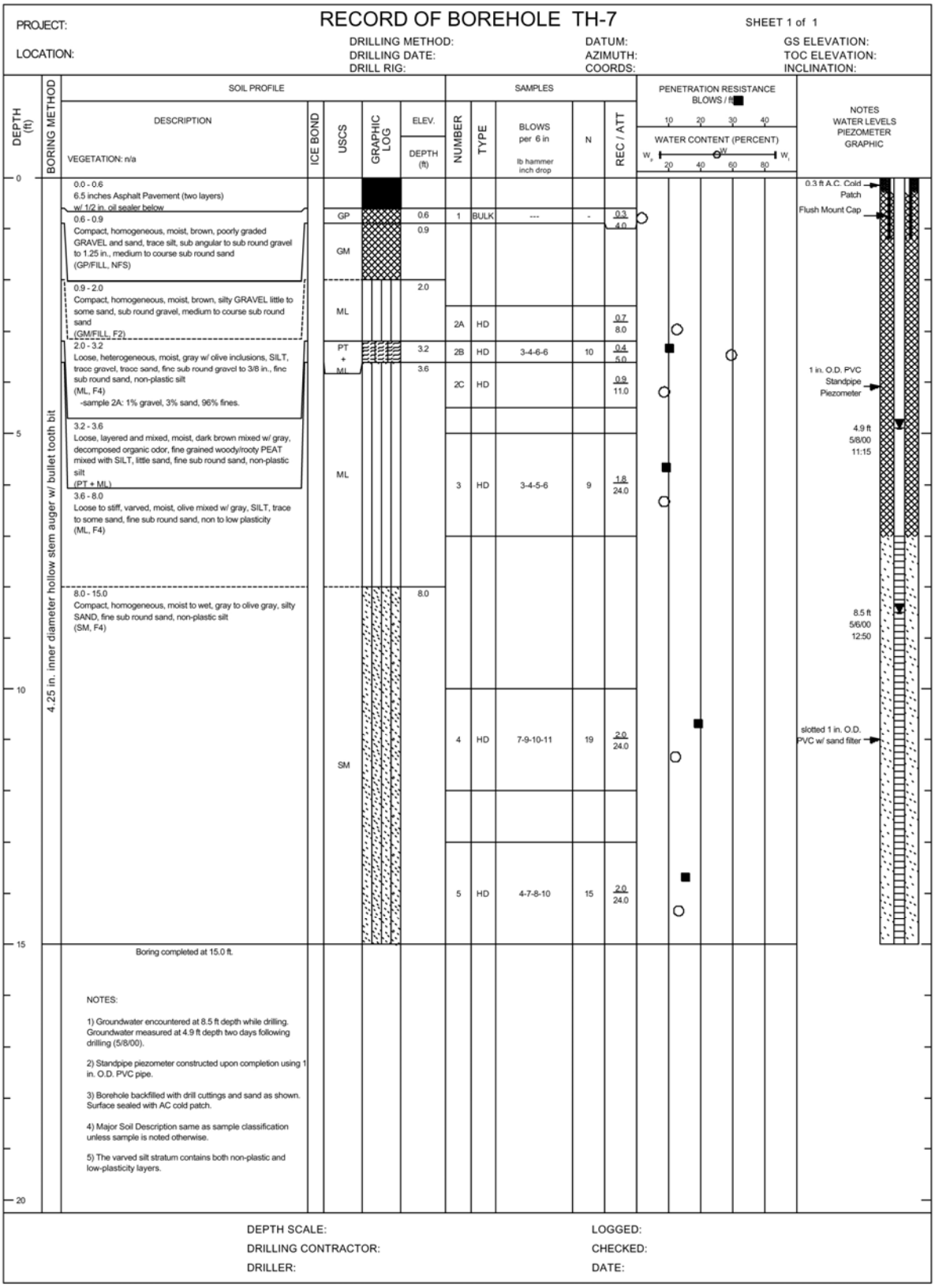


FIGURE 1-16 SOILS TEST HOLE LOG

END OF SECTION 1.7

SECTION 1.8 DESIGN SURVEY SPECIFICATIONS

1.8 A General

The design survey establishes horizontal and vertical control to facilitate gathering of topographic mapping features and develop plan view and profile sheets. Survey work shall be performed under the direction of a Professional Land Surveyor currently registered in Alaska. The surveyor shall seal and sign the original field notes on the title page of each field book. The surveyor shall also seal and sign the survey control drawings.

The original field book notes with survey values reduced to final format shall be submitted with the preliminary project submittal. A computer printout listing coordinate points, stations, offsets, elevation, and point descriptions shall be included. Produce a plan view and profile sheet and a survey control drawing based on the field book data collection.

The submittal of all design survey computer products shall consist of a CD-ROM in AutoCAD drawing file format. All drawing files must conform to standards detailed in Chapter 8 of the DCM.

The survey specifications described in this section have been developed for street construction projects. The level of detail for other types of projects, such as trails, lighting, traffic control, drainage, snow disposal sites, parks, etc., may be modified as necessary by the engineer or designer with the concurrence of the Municipal Surveyor.

1.8 B Horizontal Control

As applicable, the legal centerline of ROW, street intersections, and subdivision lot boundary lines shall be determined for all projects. Plats of record and other documents of record shall be used to establish the location of the ROW. Survey measurements must meet the horizontal control standards of the National Council of Examiners for Engineering and Surveying (NCEES) minimum standards adopted by the Alaska Society of Professional Land Surveyors (ASPLS) and published in the ASPLS *Standards of Practice for Professional Land Surveyors* (latest revised edition).

The horizontal control must be established and referenced to allow the contractor to use the design horizontal control during construction. During the design survey, #5 rebar, 18 inches long with a 1.5-inch aluminum cap shall be installed at all project termini intersections, Point of Curve (PC), Point of Tangency (PT), and angle points of the ROW centerline and/or centerline of the construction control line, if the two centerlines are not the same.

Typically, the origin of horizontal stationing is the cadastral section lines with stationing increasing to the north or east. The southwest corner of the section shall be Station 0+00N and Station 0+00E. The center section corner shall be Station 26+40N and 26+40E. Approval of the PM&E Project Manager for PM&E projects or the Private Development Manager for private projects under subdivision agreements must be obtained for exceptions to the above stationing standards.

Horizontal project control shall be referenced to the ADOT&PF BOWL 2000 coordinate network unless modified by the Municipal Surveyor. The control shall be established by the global positioning system (GPS) method in conformance with ADOT&PF standards for GPS surveys. Beginning and ending points of survey shall be determined by GPS. Project coordinates shall be in BOWL 2000 (current adjustment). BOWL 2000 coordinates can be accessed on the ADOT&PF FTP site: ftp://ftp.cadastral.info/dot-cadastralhighway.

1.8 C Vertical Control

The MOA Bench Mark Network shall be used as the origin of datum for establishment of vertical control. The accuracy of all level circuits to establish temporary benchmarks (TBM) shall be no less than the value computed by the equation:

$$0.03 \text{ feet} \sqrt{\text{distance of level loop run, in miles}}$$

All foresight and backsight shots must be balanced. A maximum sighting distance of 300 feet should not be exceeded when establishing control level loops and benchmarks. All leveling circuits establishing TBMs shall be adjusted with the use of recognized standard surveying adjustment methods. Side shots shall not be used to establish elevations on TBMs. A minimum of two MOA Bench Marks shall be used to establish TBMs. A sufficient number of TBMs shall be set to control a project with a maximum spacing of 800 feet between vertical control points. Benchmarks and TBMs in the vertical control field book must be accurately described. Only benchmarks used to establish elevation control shall be listed on the project plan sheets.

1.8 D Profiles

Profile elevations shall be provided at 50-foot stations and at all significant grade breaks or stationing agreed upon by the PM&E Project Manager or Private Development Manager. Elevation shots shall be observed to the nearest 0.10 foot, except on pavement and concrete, flow lines, drainage structures, and the top back of curb. Elevations on these critical shots shall be observed to the nearest 0.01 foot.

1.8 E Topographic Survey

All natural and man-made topographic features shall be located within the identified design survey limits that affect project design. All features shall be referenced to the ROW centerline/baseline stationing at perpendicular offsets to the centerline/baseline. Topographic features shall be located radially from the radii of curves. All features shall be located to an accuracy of the nearest 0.10-foot. Radial topographic detail acquired by electronic data collection methods shall meet the standards described in Section 1.8 G of this chapter. Typical items such as, but not limited to, the following shall be located in the survey: buildings, culverts, mailboxes, meters, poles and lines, line heights, fences, utilities, septic systems, wells, sidewalks, driveways, garages, trees, shrubs, retaining walls, rock gardens, curbs and gutters, large boulders, signs, luminaires, trunks and canopies for shrubs, ornamental and other landscape features. All pole features shall be located at center of pole. Four corners of pedestals and pads larger than 4 feet by 4 feet shall be acquired. A sketch of each manhole and catch basin shall be included and shall note the direction of cone eccentricity and the horizontal and vertical location of each associated pipe. The general condition and type of storm drain pipes shall also be inspected and noted. All valves and key boxes, even if buried, shall be searched for and located. All existing wells within 100 feet of the proposed back of curb shall be located if a storm drain or sanitary sewer is proposed. The types of trees and shrubs shall be indicated. If originally specified to do so, the sizes of trees and shrubs also should be indicated. A search shall be conducted for all existing property corner monumentation in the identified design survey limits. A record shall be made in the survey field book to locate property corner monumentation with respect to the project's survey control. Topographic survey information shall conform with AMCR 21.90 and shall extend a minimum of 25 feet into all adjacent properties to demonstrate that existing drainage patterns are maintained or that post-development drainage patterns shall not cause adverse impacts.

1.8 F Cross Sections

The design survey shall provide cross sections obtained at 50-foot stations, significant grade breaks, low spots where ponding could likely occur, and ROW lines on cross streets. The sections shall be extended to 25 feet beyond the ROW, unless otherwise directed by the PM&E Project Manager or Private Development Manager. Cross section elevations shall be observed to within 0.10 foot on unpaved surfaces and 0.01 foot on paved and concrete surfaces.

1.8 G Electronic Data Collection for Public Capital Projects

Topographic detail gathered by electronic data collection methods shall be recorded in a standard field book provided by the PM&E Project Manager. The following information is required:

1. Horizontal control diagram in the field book showing monumentation used to establish the centerline of ROW, property lines, or survey traverse line used as the baseline. Subdivision property lines and ROW lines shall be shown in relation to the survey control. Survey control points and centerline of ROW points found and set shall be identified. Appropriate stationing for each point shall be shown.

   All street intersections and project termini shall be established and referenced in accordance with Section 1.8 B.

2. Established vertical control as discussed in Section 1.8 C. All benchmark elevations or TBM elevations used to establish a height of instrument (HI) for the instrument shall be verified by taking a check shot on another known elevation point before the instrument is moved to another station. Documentation of all turning points and check shots shall be included.

3. Identification of the backsight for each instrument set up in the field book and documentation of a horizontal and vertical check shot, along with the shot number. Details should include all instrument HIs and rod/target heights at the beginning of survey, when the heights are changed due to raising or lowering of the target, and when the instrument is moved to a new station.

4. Known points established before data collection shall be observed to periodically check the instrument position and HI. Documentation should include performance of this check shot after every fiftieth consecutive shot throughout the survey or more often on the judgment of the survey party chief.

5. Sketch of the topographic detail, including the instrument station and backsight, property lines, lot numbers, streets and alleys, street names, major structures in the project limit, visible utilities, and all other objects identified through data collection. A data collector point number shall be identified for each shot, and record every twentieth shot in the field book along with a description of the point.

   Data collection should always conclude with a check shot on a previously determined point with known elevation and horizontal position.

   The choice of codes used in the data collector to identify the topographic features is left to the discretion of the firm providing the surveying services; however, a key to codes shall be provided upon request by the PM&E Project Manager.

   Project information shall be delivered in adjusted final value format. The following media and products are required for delivery:

a) CD-ROM providing the information in AutoCAD in the version specified by the Municipal Surveyor, drawing file format

b) Hard copy consisting of computer printouts of the survey data containing the point number, coordinates, elevation, station and offset from the baseline, and a description of the point for each point contained in the drawing file

c) At the request of the PM&E Project Manager, a point plot on mylar showing all survey shots acquired and identified by point number. The plot shall be produced at a scale of 1 inch equals 50 feet, unless specified otherwise.

d) Survey control drawing showing the following: horizontal and vertical control/monumentation found or established to control the survey, record plat/boundary document measurements, field survey measured data, survey points with bearings and distances, property lines, ROW information, lot numbers, block numbers, subdivision names, and any existing easements on the control drawing. The drawing shall be produced at a scale of 1 inch equals 50 feet, unless specified otherwise. The control drawing sheet shall be sealed and signed by the licensed surveyor responsible for the survey.

e) Plot of the plan view and profile drawing on mylar containing all the topographic features collected by the survey. Items shown shall include all lot lines, lot numbers, subdivision names, street names, ROW widths, alleys, easements, street centerline, utility lines and structures, centerline stationing, curb and gutter, and pavement, etc. The plot shall be produced at the scale of 1 inch equals 50 feet, unless specified otherwise by the PM&E Project Manager.

f) All drawings shall be prepared in conformance to the AutoCAD layering scheme and drafting standards approved by PM&E.

1.8 H Design Utilizing Aerial Photo Interpretation

The following survey elements are required to ensure accuracy of the design for projects that are designed with the use of aerial photography.

1. Horizontal control survey to control the photos used for the design. The control shall be based on monumentation found or established at legally recognized cadastral locations. A drawing shall be prepared showing the basis of bearings, measured distances between control points, and the relationship between the control and the proposed alignment. A horizontal control survey shall be conducted to control the photos used for the alignment. The survey must meet the accuracy standards identified in Section 1.8 B of this Chapter.

2. Established vertical control, according to the specifications described in Section 1.8 C of this Chapter.

3. Verification of design information by conducting an actual ground survey to check horizontal and vertical accuracy of existing conditions derived from photographs. The exact number and location of checkpoints shall be agreed upon with the PM&E Project Manager or Municipal Surveyor during contract negotiations. Items to be verified along the alignment are as follows: proposed culvert locations, ditch or swale flow lines, top back of curb elevations, random profile elevations, water surfaces, pavement crossings, curb inlets, and shots more densely located in the vicinity of important structures.

4. Verification that building locations are corrected for roof overhangs

The engineer has the professional responsibility to determine when the information derived from photo interpretation is not within acceptable tolerances to ensure the accuracy of the design. The standards in this section of the manual are guidelines and do not supplant the Professional Land Surveyor's responsibility to acquire accurate information to produce a design.

1.8 I Field Notes and Books

On all MOA-funded projects, the Municipal Surveyor shall provide the engineer with MOA field books for recording all survey information. All notes shall be recorded in non-smudging pencil directly in the MOA-supplied field books. Notes must be neat, legible, precise, and adequately detailed to convey their intent to a person not familiar with the project. Stationing shall increase from the bottom to the top of the page. Each book shall be indexed, and its contents shall be referenced by page number. The beginning of each day's notes shall show the date, weather conditions, and survey crew personnel. The specific project for which the survey is being performed shall be identified.

Erasures in field books are not acceptable. A line shall be drawn through errors, leaving the original note legible, and the correction shall be noted above the original entry. If data revisions are made at a later time, indicate the date the correction was made as well as the initials of the individual making the correction.

All field notes shall be reduced and submitted in a final format. All field books are the property of the MOA. Field books are a part of the engineer's product to be submitted to the PM&E Project Manager upon completion of the work.

1.8 J Project Coordination

All work shall be organized by and coordinated through the PM&E Project Manager. During an initial meeting, before the survey work begins, requests for information or determination concerning the project shall be submitted in writing to the PM&E Project Manager.

1.8 K Right Of Way Survey & Mapping Criteria

The primary reason for conducting the Right Of Way survey is to identify and locate the Municipality's land rights prior to design for construction. It is the intent of the Municipality to determine its legal right of way boundaries and to construct all improvements within those rights of way. Land title research is an essential part of the initial right of way identification process in order to determine the legal working area available for the project improvements.

It is important to note that not all municipal projects will require the same level of right of way mapping and production of acquisition documents. As a minimum, each design plan set shall contain a survey control drawing and a right of way map. Contact the Municipal Surveyor prior to beginning a project to determine whether some or all of the criteria will apply to a specific project.

The process and development of associated mapping documents described herein fall under the definition of Land Surveying and will be accomplished by or under the direct supervision of a Professional Land Surveyor who is currently registered in the State of Alaska.

The following is an outline of the required survey and mapping process to delineate the R.O.W. for municipal capital improvement projects:

1. Research – Monument Control & Boundary Resource Information

   a) Plats on file at the Recorder's Office.

   b) Title reports obtained for all parcels. Title reports will be obtained by the Municipal Surveyor.

   c) Recorded deeds obtained from the Recorder's Office.

   d) Control surveys to determine required monumentation ties.

2. Pre-field Survey Computations (not always needed)

   Develop search coordinates for control monuments and property corners.

3. Conduct Horizontal Control Survey

   a) Horizontal - Ties the project to published control (Bowl 2000).

   b) Establish secondary project control points to be used to tie property corners and execute design survey tasks.

4. Conduct Boundary Survey

   Recover and tie monumentation required to establish the Right of Way.

5. Prepare Survey Control Drawing

   a) Show monumentation recovered that will be used to control the project.

   b) Input record property line work.

   c) Input easements that may be impacted by the project (utilize plats and title reports).

   d) Reconcile plats with field measurements.

   e) Submit Preliminary R.O.W. Map to MOA for review.

   f) Sealed and signed by the Alaska Licensed Professional Land Surveyor.

6. Prepare Preliminary R.O.W. Map

   This is a complete base map of the existing project R.O.W. with cover sheet, borders, title blocks, etc. It will evolve into the Final R.O.W. Map as the project progresses.

The steps previously outlined shall be completed prior to the beginning of design in order to provide the design engineer with a clear understanding of the existing R.O.W. limits that will affect various design alternatives.

7. Preliminary Design Begins

   a) Project centerline is finalized.

b) The preliminary R.O.W. Map is modified to show project centerline, footprint (cut/fill limits and/or limits of impact) in relation to existing R.O.W.

c) Submit preliminary R.O.W. Map to MOA for review.

8. Prepare Preliminary Parcel Maps and Written Metes and Bounds Descriptions

a) Design is at 65% complete.

b) Parcel Map sizes (8-1/2x11 or 8-1/2x14) are determined by Municipal Surveyor. See Appendix 1.C Parcel Map requirements.

c) Submit Preliminary Parcel Maps and Descriptions to MOA for review.

9. Prepare Final Parcel Maps

a) Revise Parcel Maps In accordance with MOA comments and design changes.

b) Negotiations for property acquisition are started.

10. Prepare Final R.O.W. Map

a) Preliminary R.O.W. Map is revised to reflect changes in acquisition needs and is submitted to MOA for approval and included in final plan set.

b) Sealed and signed by the Alaska Licensed Professional Land Surveyor.

Final R.O.W. Map may also be modified to be submitted as the R.O.W. Acquisition Plat in cases where there is fee acquisition or condemnation. The Final R.O.W. Map can serve as the Record of Survey to be filed at the State Recorder's Office.

11. Prepare Record Of Survey (R.O.S.)

a) Survey newly established project monumentation.

b) Develop R.O.S. (based on the final R.O.W. Map) showing:

(1) New Acquisition limits.

(2) Vesting Documents – Recorder Serial #, Grantor, & Rights transferred.

(3) Coordinate Position of monuments before construction.

(4) Coordinate Position of new monuments.

c) The R.O.S. may not be required for all projects and is not required where the final R.O.W. Map becomes a R.O.W. Acquisition Plat. Contact the Municipal Surveyor to determine whether or not a R.O.S is required.

12. Project Survey and Mapping Products Required For R.O.W. Identification

a) Survey control drawing included in construction document plan set.

b) Preliminary R.O.W. map.

c) Parcel maps and written descriptions.

d) Final R.O.W. Map included in construction document plan set.

e) Record Of Survey or Right Of Way Acquisition Plat, if applicable.

1.8 L Right Of Way Acquisition Parcel Map Requirements

ROW acquisition on Municipal projects requires written legal descriptions and parcel map drawings to be prepared by the design engineer for acquisition purposes and public recording of the acquired land rights on the project. The specification establishes a standard format for parcel maps prepared by the design engineer to meet the needs of the ROW acquisition function on Municipal improvement projects.

See Appendix 1.C for ROW Acquisitions Parcel Map Requirements and a sample parcel map.

END OF SECTION 1.8

SECTION 1.9 STREET DESIGN CRITERIA

1.9 A Objective

The ultimate goal in the design of streets is to construct roads that are safe, functional, and durable. The criteria identified in this section are intended to guide the engineer in meeting these objectives. Specific areas of street design that are discussed include design speeds, lane widths, vertical design requirements, horizontal design requirements, and structural fill requirements. Adherence to these standards as well as those of the AASHTO is required.

1.9 B Lane Widths

Lane widths for primary and secondary streets and alleys are provided in Section 1.6 Roadway Requirements.

1.9 C Design Speed

Section 1.3 Functional Classifications defines primary and secondary streets. Design speeds for primary and secondary streets are provided in Section 1.5 Design Elements. It should be noted that the design speed is not usually the posted speed.

Design speed is a tool used to correlate and coordinate the various geometric design features of the road or street to produce a uniform operation consistent with the operating environment. The selected design speed should be high enough that an appropriate regulatory speed limit will be less.

1.9 D Stopping Sight Distance

Stopping sight distance (SSD) is the length of roadway ahead that is visible to the driver. Available sight distance on the roadway should be sufficiently long to enable a vehicle traveling at or near design speed to stop before reaching a stationary object in its path. SSD is shown on Table 1-8.

TABLE 1-8 STOPPING SIGHT DISTANCE	
Design Speed (MPH)	**Stopping Sight Distance (SSD)**
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645

Because most drivers are unable to judge the effect of steep grades on stopping distances, their normal reaction may be in error at a critical time. Accordingly, stopping sight distances should be adjusted on grades greater than three percent.

1.9 E Vertical Design Standards

Vertical design standards must be carefully considered to ensure safety concerns for stopping sight distance and winter road conditions. Vertical design standards are established for grades, vertical curves, cross slopes, cut slopes, and fill slopes.

1. Objectives

Vertical design objectives are intended to achieve the following:

a) Provide adequate stopping sight distances for design speeds

b) Provide safe street grades

c) Provide safe driveway grades

d) Provide for adequate road drainage while minimizing storm drain structures

e) Minimize retaining structure costs

f) Maintain standard cross slopes

g) Minimize slope easement or ROW acquisition costs

h) Minimize project costs while maintaining consistency with other design objectives

i) Provide adequate cover over utilities

j) Minimize use of valley gutters

k) Avoid costly utility relocations

Vertical design criteria detailed in this section must be adhered to on all street design projects within Anchorage, including both public and private-sector work.

2. Street Grades

The maximum design grade should be used only infrequently. In most cases, grades should be less than the maximum design grade. Long or fairly steep grades should be avoided as drivers tend to travel faster in downgrade direction than normal (2011 AASHTO).

The following design criteria shall be used for street grades.

a) The minimum street grade is 0.5 percent for streets with curbs and gutters.

b) The maximum street grade should rarely exceed 6.0 percent.

   (1) For streets or roads with 2000 or greater projected Average Daily Traffic (ADT), the maximum road grade is 8.0 percent.

   (2) For streets or roads with less than 2000 projected ADT, the maximum road grade is 10.0 percent.

c) The minimum grade for an alley with an AC swale is 1%.

d) The minimum street grade is 1% for rural streets; however, 0.5% is allowed if soils are consistently F-2 or better as discussed in Section 1.10 D.

e) For streets or roads with less than 1000 projected ADT occasional road grades between 10.0 and 12.0 percent may be allowed on short sections not exceeding 250 feet in length provided that no horizontal curve radii is less than that specified in Table 1-10 Minimum Horizontal Curve Radii. However, grades exceeding 10.0 percent are not permitted in intersection approaches within 150 feet of intersection centerlines.

f) For variance-approved radius of curvature less than specified in Table 1-10 Minimum Horizontal Curve Radii:

   (1) the maximum grade through the horizontal curve is 5.0 percent, and only with the installation of appropriate signs.

   (2) the maximum road grade uphill from a horizontal curve with radius less than specified in Table 1-10 Minimum Horizontal Curve Radii is 5.0 percent for at least 250 feet beyond the point of curvature/tangency to allow for acceleration and braking operations.

g) The maximum grade on cul-de-sac bulbs, measured in any direction, is 5.0 percent.

h) For the purposes of street grades at intersections, major and minor streets are based on the greater or lesser traffic volumes, respectively.

i) The maximum grade of the street carrying the greatest traffic volume through an intersection is 5.0 percent.

j) The maximum grade of the street carrying the lower traffic volume at an intersection is 4.0 percent within a distance of 30 feet from the back of curb or the edge of shoulder line of the fully developed higher traffic volume street.

k) The minimum grade around a curb is 0.50 percent.

l) The minimum Portland cement concrete valley gutter grade is 0.50 percent.

m) The minimum asphalt concrete valley gutter grade is 1.0 percent.

n) The minimum grade in the curb and gutter along eyebrows and cul-de-sacs is 0.5 percent.

o) On intersecting local or secondary streets, match the intersecting centerline crowns.

p) Match street grades for a local or secondary street intersecting a primary or higher volume street to the edge of pavement or valley gutter on the primary street.

q) In the case of intersecting primary streets, give preference or primacy in street grades to the street with the higher designation in accordance with the OS&HP, or to the street with the higher traffic volume when the streets have the same functional classification.

r) Driveways shall conform to the Traffic Division's "Policy on Driveway Standards" attached at Appendix 1D.

(1) Drainage. Driveways shall not drain onto the high side of superelevated or "tipped" road sections.

(2) Pedestrian facilities. Cross slopes of sidewalks through a driveway shall be ADA compliant.

3. Cross Slopes

The primary function of a cross slope on a street section is to direct drainage to the edge of a street. In most cases, a street is crowned in the middle and slopes to the outside edge. The standard cross slope is 2.0 percent for paved streets and 3.0 percent for recycled asphalt pavement (RAP) streets. Slope alleys toward an inverted-crown in the center of the cross section as shown in M.A.S.S.

When superelevations are being considered, the design guidelines established by AASHTO with a maximum cross slope of 6.0 percent shall be applied.

When standard cross sections do not allow street grade objectives to be met, the engineer may utilize a tipped street cross section. However, the maximum cross slope on tipped streets is 4.0 percent because of potential safety hazards related to icing conditions. Tipped street sections should receive careful consideration with respect to drainage.

4. Vertical Curves

Grade breaks are only acceptable when the algebraic difference between the varying street grades is 1.0 percent or less. Vertical curves shall be used for transitions when the change between varying street grades exceeds 1.0 percent or on high-speed streets and roads. High-speed streets are defined as having a speed limit greater than or equal to 50 MPH.

The design of vertical curves shall use the design speeds established in the Section 1.5 Design Elements, and the vertical curve charts provided in Figures 1-17 and 1-18. Vertical curves should be separated by a tangent grade of at least 25 feet.

Provided that the entire vertical curve is illuminated in accordance with Chapter 5 of this manual, sag vertical curves may be shortened using the factor equation:

$$L=\frac{AV^2}{46.5}$$

Where L = length of vertical curve, (feet);

A = algebraic grade difference, percent; and,

V = design speed, mph.

Vertical curves are only allowed through intersections when they meet the street grade design objectives provided in Section 1.9 D1.

To minimize drainage problems, the length and location of a vertical curve shall be selected to eliminate or minimize areas with flat or shallow grades. Curb grades at catch basins shall be adjusted as necessary to maintain positive drainage and to avoid flat ground.

5. Cut and Fill Slopes

In many cases, road construction requires substantial cut and fill slopes adjacent to the road. The primary concerns on cut and fill slopes are stability and safe access to adjacent property. Driveway grade standards are provided in Appendix 1D.

In evaluating cut and fill slopes, the maintenance of the slope in terms of mowing and snow removal shall be considered. In some cases, a low retaining wall or sidewalk retaining wall may be preferable to extensive property re-sloping, particularly if landscaping, fences, or structures would be disturbed.

Only after access to adjacent properties is adequately addressed in accordance with the driveway standards in Appendix 1D may the engineer consider cut and fill slopes that exceed driveway maximums. As a rule, cut and fill slopes shall not exceed 2.0-foot horizontal to 1.0-foot vertical. For all cut and fill slopes, appropriate erosion and sediment control measures such as topsoil, seeding, erosion control matting or other control measures must be provided. Use of adequate erosion and sediment control measures on both public and private projects is required. Erosion and sediment control concerns are addressed in more detail in Chapter 2.

On MOA funded projects, when cut and fill slopes fall outside of the ROW, a slope easement is required to construct the slope. On federally funded projects, a permanent right of use is required for all cut and fill slopes that fall outside of the ROW.

When groundwater seeps from embankments or cut slopes are observed during the course of project development, whether during design or construction, the contractor and engineer shall ensure they are properly handled. Controls shall be implemented to prevent erosion and sloughing of the slopes. Increased ditch capacity shall be provided in the drainage design to prevent glaciation issues during the winter months, including, but not limited to, drainage and encroachment into the roadway.

6. Street Reconstruction

Certain streets in Anchorage were constructed prior to the adoption of current minimum and maximum grade criteria. In some cases, it may not be feasible to reconstruct existing streets to meet the minimum or maximum grade criteria listed in this manual. Reasons may include:

- ROW impacts;
- ADA compliance requirements;
- Drainage issues;
- Utility impacts; and
- Overall project cost would not be proportionate to the identified problems and project goals (i.e., life cycle maintenance costs, accident history).

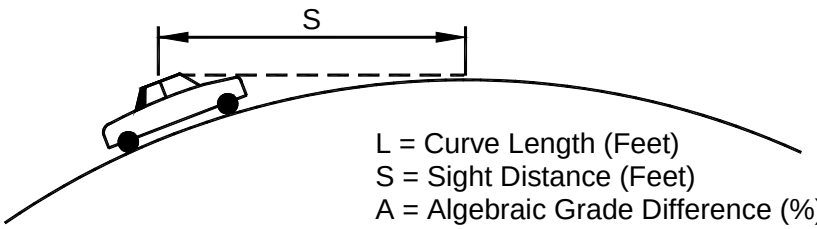
The impacts caused by regrading to meet minimum and maximum criteria are typically justified on projects where the purpose is to add lanes, upgrade a collector to an arterial, etc. Excessive impacts are not justified when the purpose is to merely reconstruct the existing street and when:

- The safety record has not been negatively affected by the existing street grades;
- Traffic volumes are not expected to substantially grow;
- Maintenance costs have not been determined to be sufficiently excessive;
- Significant non-motorized transportation needs do not exist or are not negatively impacted by the street grades; and
- There is not a concurrent window of opportunity to regrade the street with reduced costs or impacts due to utility projects in adjacent land use, etc.

Prior to investing substantial design effort, a brief evaluation of whether the costs and impacts of regrading the street is warranted with respect to project goals and issues identified. Designers should consult with the Municipal Engineer, (Traffic Engineer, and Street Maintenance to resolve issues during this evaluation.

In the absence of identified problems that warrant larger costs and impacts, reconstructing an existing, previously constructed urban street, at the existing grades may be acceptable. Designers should move towards compliance with current minimum and maximum grade criteria.

HEIGHT OF EYE = 3.5 Feet
HEIGHT OF OBJECT = 2.0 Feet



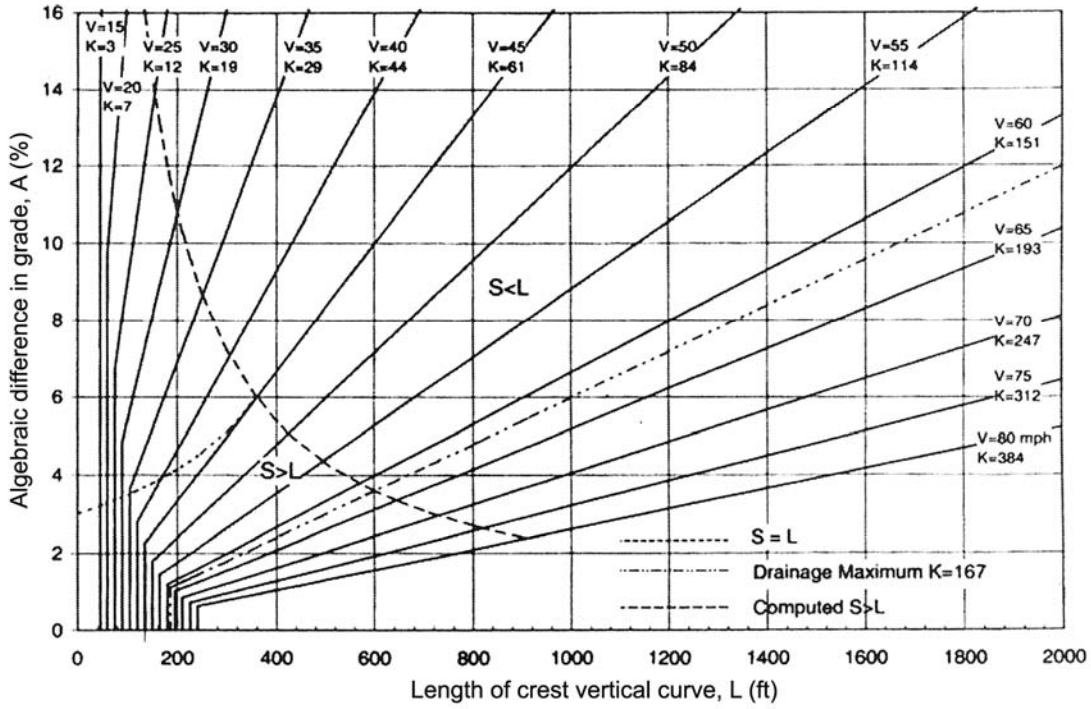
L = Curve Length (Feet)
S = Sight Distance (Feet)
A = Algebraic Grade Difference (%)
V = Design Speed (MPH for "S")
K = L/A

DESIGN SPEED (MPH)	STOPPING SIGHT DISTANCE (FEET)
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645

When S>L, $L = 2S - \frac{2158}{A}$

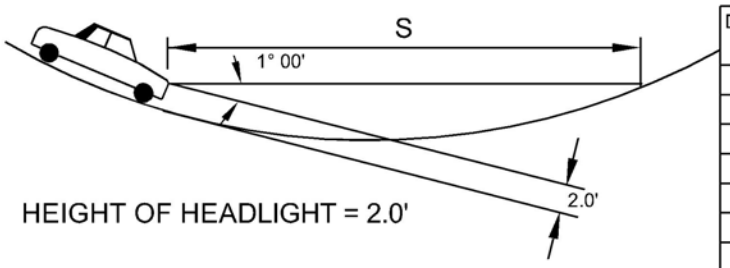
When S< L, $L = \frac{AS^2}{2158}$

US CUSTOMARY



(Adapted from AASHTO)

FIGURE 1-17 CREST VERTICAL CURVE LENGTHS

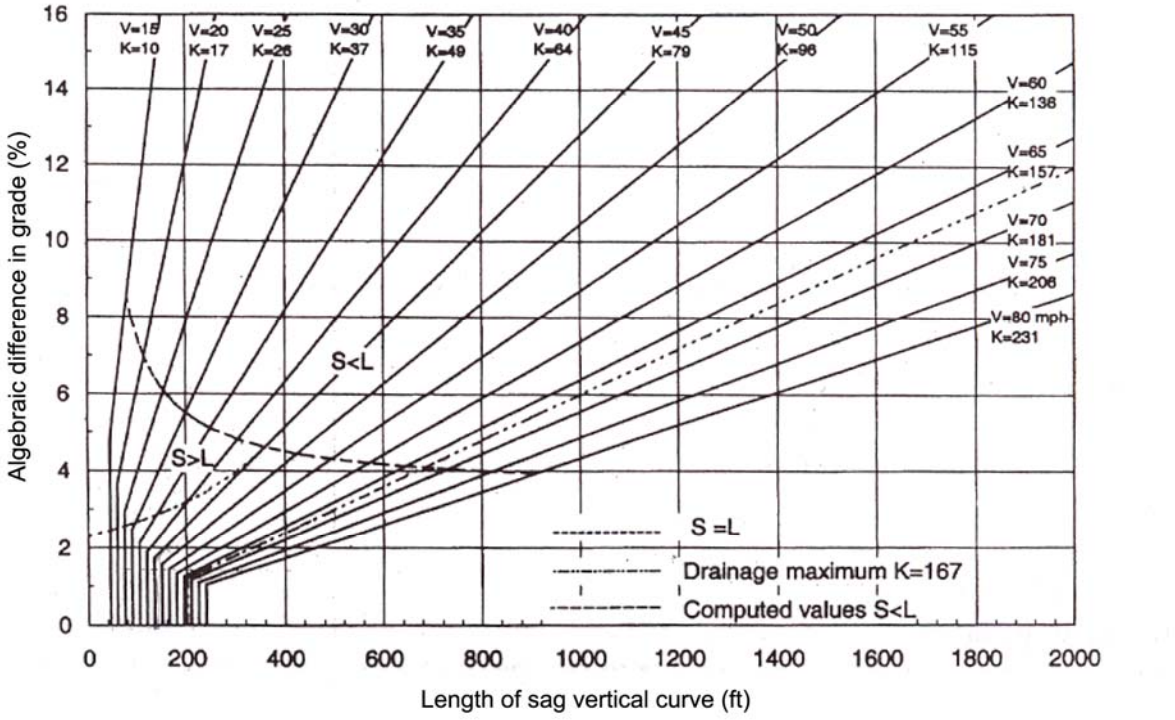


DESIGN SPEED (MPH)	STOPPING SIGHT DISTANCE (FEET)
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645

L - Curve Length (Feet)
S - Sight Distance (Feet)
A - Algebraic Grade Difference (%)
V - Design Speed (MPH for "S")
K - L/A

When S>L, $L = 2S - \frac{400 + 3.5\,S}{A}$ When S<L, $L = \frac{AS^2}{400 + 3.5\,S}$

US CUSTOMARY



(Adapted from AASHTO)

FIGURE 1-18 SAG VERTICAL CURVE LENGTHS

1.9 F Horizontal Design Standards

1. Objectives

Because of ROW constraints, the flexibility in horizontal alignment is often limited. However, the designer should strive to meet the following prioritized horizontal alignment design objectives when preparing plans.

a) Satisfy AASHTO stopping sight distance standards for design speeds;

b) Provide clear visibility triangles at street intersections;

c) Provide 90-degree intersection angles but in no event less than 75 degrees;

d) Provide a minimum distance of 150 feet between street intersection centerlines;

e) Reduce utility relocation costs;

f) Minimize slope easement or ROW acquisition costs;

g) Match existing property grades to provide a safe access and reduce property impacts;

h) Reduce or minimize construction costs associated with retaining structures;

i) Locate the construction centerline on the ROW centerline where feasible;

j) Protect existing site features such as trees or wildlife habitat where feasible;

k) Minimize the project costs while maintaining consistency with other design objectives

2. Horizontal Curves

The guidelines established by the AASHTO manual, *A Policy on Geometric Design of Highways and Streets (PGDHS)*, also known as the "Green Book", should be used when the project cannot meet all the horizontal design objectives specified herein. Minimum horizontal curve centerline radii are provided in Table 1-10.

TABLE 1-9 MINIMUM HORIZONTAL CURVE RADII

Arterial street	800 feet
Collector street	600 feet
Secondary street	150 feet

The PGDHS provides the engineer with information on the use of superelevated curves that may reduce the required radii. (See Table 1-11.) The maximum cross slope on a superelevated curve is 6 percent. Transitions into superelevations shall conform with recommendations of the PGDHS. The impacts of the superelevation on drainage and access shall also be carefully considered.

TABLE 1-10 MINIMUM RADIUS OF CURVE WITH SUPERELEVATION

Design Speed (MPH)	Maximum e[1]	Minimum Radius (ft) (Rounded)
20[2]	.06	115
30[2]	.06	275
40[2]	.06	510
50	.06	835
60	.06	1,340

[1]e = rate of roadway superelevation in ft/ft.

[2] With design speeds of 30 MPH or less, conditions may warrant elimination of superelevation. Superelevation is generally not used when design speeds are less than 40 mph. Problems such as drainage, ice formation, driveways, pedestrian crossings, cross streets, and the effect on developed property must be recognized when superelevation is considered.
Source: AASHTO *A Policy on Geometric Design of Highways and Streets*

3. Visibility Triangles

When designing streets, impairment of the visibility of motorists at intersections must not be allowed. To prevent motorist sight impairment, clear vision areas and visibility triangles have been established in AMC 21.030C.8, AMC 24.70.020, and AMC 20.70.040. AASHTO establishes minimum approach and departure sight triangles for the travelled way.

Although desirable at high volume intersections, approach sight triangles are typically not needed at stop- or signal- controlled intersections. Since most intersections in Anchorage are at least stop-controlled, only departure sight triangles are addressed herein.

Departure sight triangles are illustrated in Figure 1-20. Limited improvements, such as street light or signal poles may encroach into these areas if the Municipal Traffic Engineer approves the variation. Figure 1-21 provides methods for calculating visibility sight lines on horizontal curves.

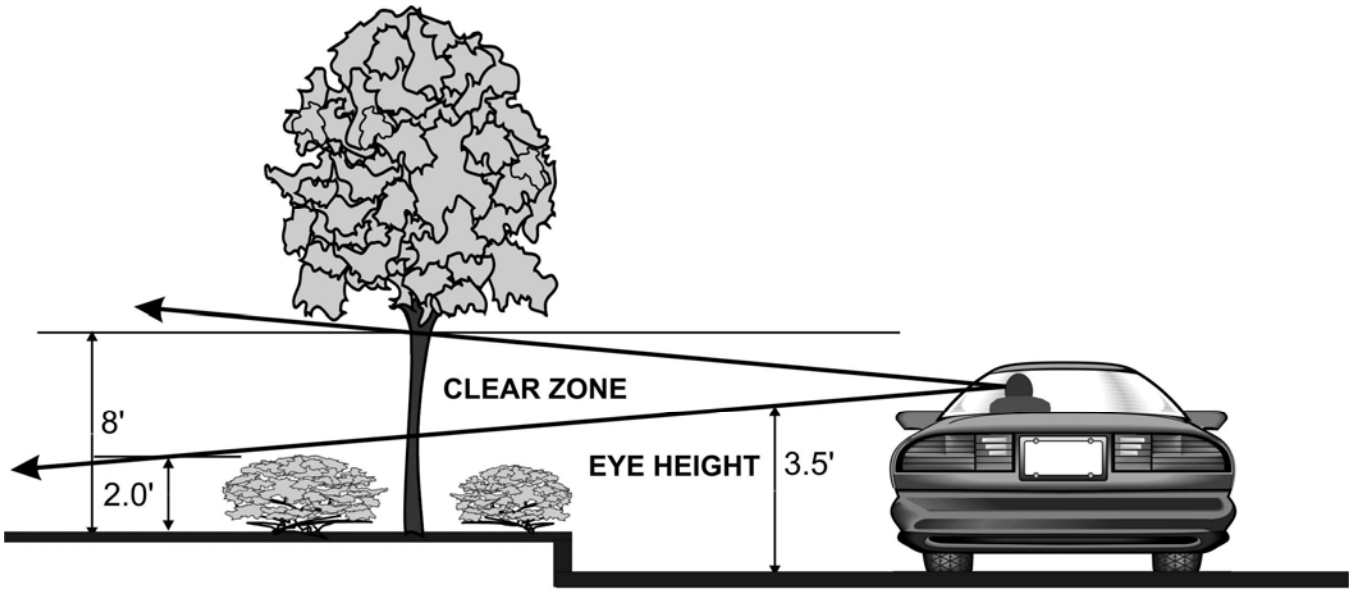
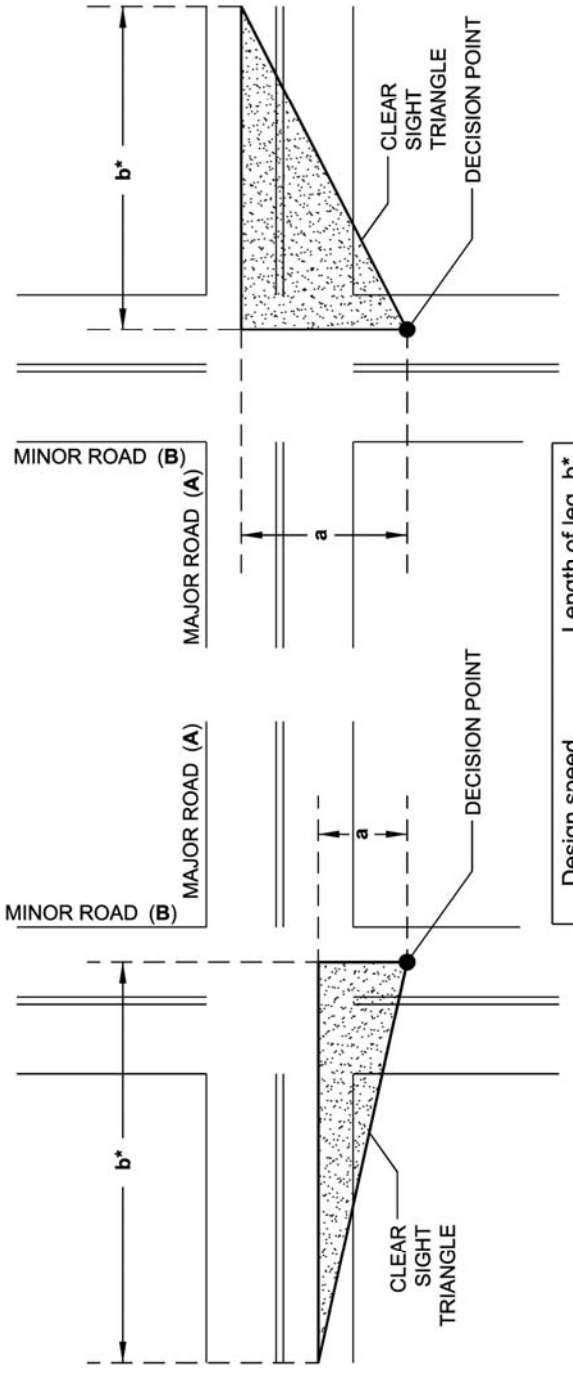


FIGURE 1-19 VERTICAL CLEAR ZONES AT INTERSECTIONS



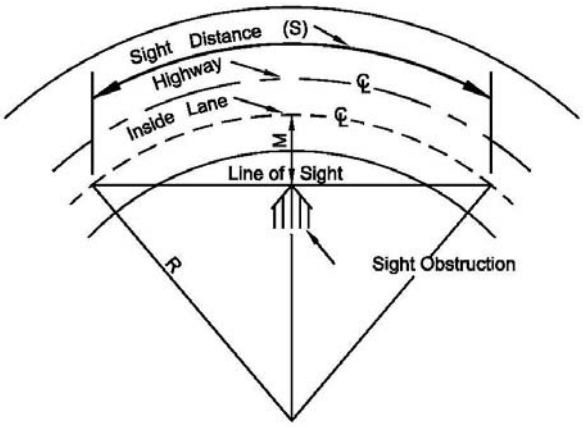
Design speed (MPH)	Length of leg, b* (ft)
15	170
20	225
25	280
30	335
35	390
40	445
45	500
50	555
55	610

a = The distance from the driver's eye at the decision point to the center of the lane opposing traffic. The driver's eye location shall be a minimum of 15 feet from the edge of the near traveled way.

b = Length of Sight Triangle Leg*

* Assumes minor road vehicle is a passenger car. See AASHTO for adjustments for grades greater than 3%, major road greater than 2 lanes, and substantial truck volumes.
(Adapted from AASHTO)

FIGURE 1-20 INTERSECTION DEPARTURE SIGHT TRIANGLES (STOP CONTROL)



Height of eye = 3.5 feet

Height of object = 2.0 feet

Line of sight is 2.75 feet above CL inside lane at point of obstruction

Design Speed (MPH)	Stopping Distance Sight Distance (ft)
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645

S = Stopping sight distance (ft)

R = Radius of CL inside lane (ft)

M = Middle ordinate (ft)

Angle is expressed in degrees.

$$M = R\left[\left(1 - COS\frac{(28.65)S}{R}\right)\right]$$

Formula applies only when S is equal to or less than length of curve.

(ADAPTED FROM AASHTO)

FIGURE 1-21 HORIZONTAL CURVE VISIBILITY SIGHT LINES

To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major roadway. DCM Figure 1-20 provides desirable sight distances at stop-controlled intersections sufficient for a stopped driver on the minor road approach to depart from the intersection and enter the major road. Figure 1-20 intersection sight distances are based on the following conditions:

- time gaps in major road traffic
- left turns from the minor road
- passenger-car design vehicle
- 2-lane major road with no median, and
- grades 3 percent or less

In no case should the intersection sight distance be less than the stopping sight distance. For other conditions or different types of traffic control, the engineer should consult the latest edition of AASHTO's PGDHS.

4. Switchback Curves

Switchback curves, sometimes referred to as hairpin turns, are defined as being horizontal curves with a delta angle greater than 120 degrees and radius less than 100 feet.

Switchback curves are not a desirable road feature and should be avoided since they result in high site disturbance due to large excavations. Switchbacks will only be permitted on very low volume roads with projected average daily traffic of 400 vehicles per day or less.

The minimum criteria for a switchback shall include the following:

a) minimum centerline radius is 60 feet;

b) maximum centerline grade within 25 feet and throughout switchback curve shall not exceed four percent;

c) curve widening for vehicle off tracking is required;

d) adequate site distance shall be provided;

e) adequate snow storage shall be provided; and

f) cut and fill slopes are stabilized with best management erosion control practices.

Switchback curves will only be permitted on a case by case basis on collector roads. Switchback curves are not permitted for arterials.

5. Snow Storage

An open area is required to extend 7 feet beyond the back of curb or road shoulder in accordance with AMC 21.08.030.F 3, as a snow storage area. This area may include bicycle/pedestrian facilities, street signs and driveways. Inclusion of street lights, fire hydrants, and landscaping will be evaluated on a case by case basis by Street Maintenance. Driveway widths and locations shall conform with

Appendix 1D of this Chapter. Type and placement of landscaping shall conform with Chapter 3, Section 3.5 of this manual.

Mailbox locations shall be coordinated with the Post Office and Street Maintenance, and should be generally consistent with the AASHTO Roadside Design Guide and with the following:

a) New developments – cluster mailboxes, coordinate location with the Postmaster.

b) Existing mailboxes without pedestrian facilities – individual or group mailboxes with the face at the curbline and post setback to provide snow storage. Mailboxes should be located "upstream" of driveways.

c) Existing mailboxes with pedestrian facilities attached to the back of curb – mailbox shall have the face at curbline and the post confined to the space immediately beneath the mailbox.

Snow storage and removal shall always be considered in designing streets. Methods of snow disposal vary depending on the location of the street. The Street Maintenance Division shall be contacted to resolve snow-removal issues relative to design with PM&E concurrence.

6. Clear Zone

The clear zone is the unobstructed, traversable area provided beyond the edge of the through traveled way for the recovery of errant vehicles. The clear zone includes shoulders, bike lanes, and auxiliary lanes, except those auxiliary lanes that function like through lanes. The desired width of the clear zone is dependent on the traffic volumes, design speed, and roadside geometry. The clear zone width shall be determined in accordance with AASHTO's Roadside Design Guide (latest edition).

1.9 G Design Components

Streets consist of many separate components. The design standards for street components listed below shall be used unless a variance is received from the MOA. More specific technical information on items, such as pavement composition, is found in the M.A.S.S. Additional information on drainage, landscaping, pathways, street lighting, and traffic control, is available in other chapters of this manual.

1. Curb and Gutter

The primary functions of curbs and gutters are to provide adequate drainage and access control. Six primary types of curb are installed in Anchorage with one variation; Cross sections of each type of curb and gutter are provided in Figure 1-22.

2. Curb Returns

Because the potential for pedestrian and vehicle conflicts is particularly high at street intersections, reduction of potential hazards shall be given careful consideration. In particular, the size of the curb return radius and the length and location of pedestrian crossings must be addressed.

A curb return radius is a function of road classification and design vehicle type (Figure 1-23). No curb return radius shall exceed 40 feet, except on designated truck routes where the curb returns shall be designed to accommodate the specified design vehicle.

Local residential curb returns shall be designed to have a 20-foot radius from the edge of pavement or back of curb.

Where an arterial street intersects a collector street, or a collector street intersects a residential street, a 30-foot radius from edge of pavement or back of curb shall be provided for all intersections.

When an arterial street intersects with another arterial street, a 40-foot radius from the edge of pavement or back of curb shall be provided.

To accommodate larger vehicles in areas zoned commercial or industrial, the above specified curb radii shall be increased to the next higher classification up to 40 feet maximum. In areas of reconstruction where the existing curb radii do not conform to the above criteria and additional ROW is required to conform, the PM&E Project Manager shall be contacted to determine a design preference.

The location of pedestrian crossings at intersections is dictated by the presence of pathways or sidewalks and by federal requirements under the Americans with Disabilities Act (ADA). The curb return shall be designed to provide pedestrian safety that meets the ADA requirements. (See ADA Checklist, Appendix 1E). Curb returns shall accommodate pedestrian needs to the extent practical. Where pedestrian needs conflict with the design vehicle, the Municipal Traffic Engineer and the PM&E Project Manager shall be contacted to resolve the conflict and determine the design preference.

3. Driveways

Driveways are necessary whenever vehicle access to property is desired. The size and location of a driveway are functions of street or road classification, type of local use, and the location of existing structures on adjacent property. Driveways must be designed in accordance with the latest version of the Traffic Department's *Policy on Driveway Standards* in Appendix 1D.

4. Medians

The primary function of roadway medians is to separate opposing traffic movements and control left-turn movements. Medians are allowed on streets classified as collectors or greater and are usually installed in conjunction with signalized intersections. The use of medians should be evaluated on a case-by-case basis by the MOA Traffic Division. Chapter 6, Traffic Control, of this manual contains an in-depth discussion on the use of medians.

The following criteria apply to median design:

a) The minimum width of a raised median is 4 feet from face of curb to face of curb.

b) Vertical curbs should not be used along high-speed arterials (design speeds greater than 45 MPH). Raised medians shall be constructed of Type 5 or 6 Expressway curb and gutter.

c) The noses of medians shall be depressed and anchored to reduce safety hazards for oncoming traffic and to safely accommodate maintenance vehicle movements.

d) A raised median that separates a left-turn lane from the opposing traffic shall extend the full length of the left turn pocket.

e) The standards established in Chapter 3 of this manual shall be conformed to when installing landscaping within medians. Sight distances at intersections an on crest vertical curves should be checked.

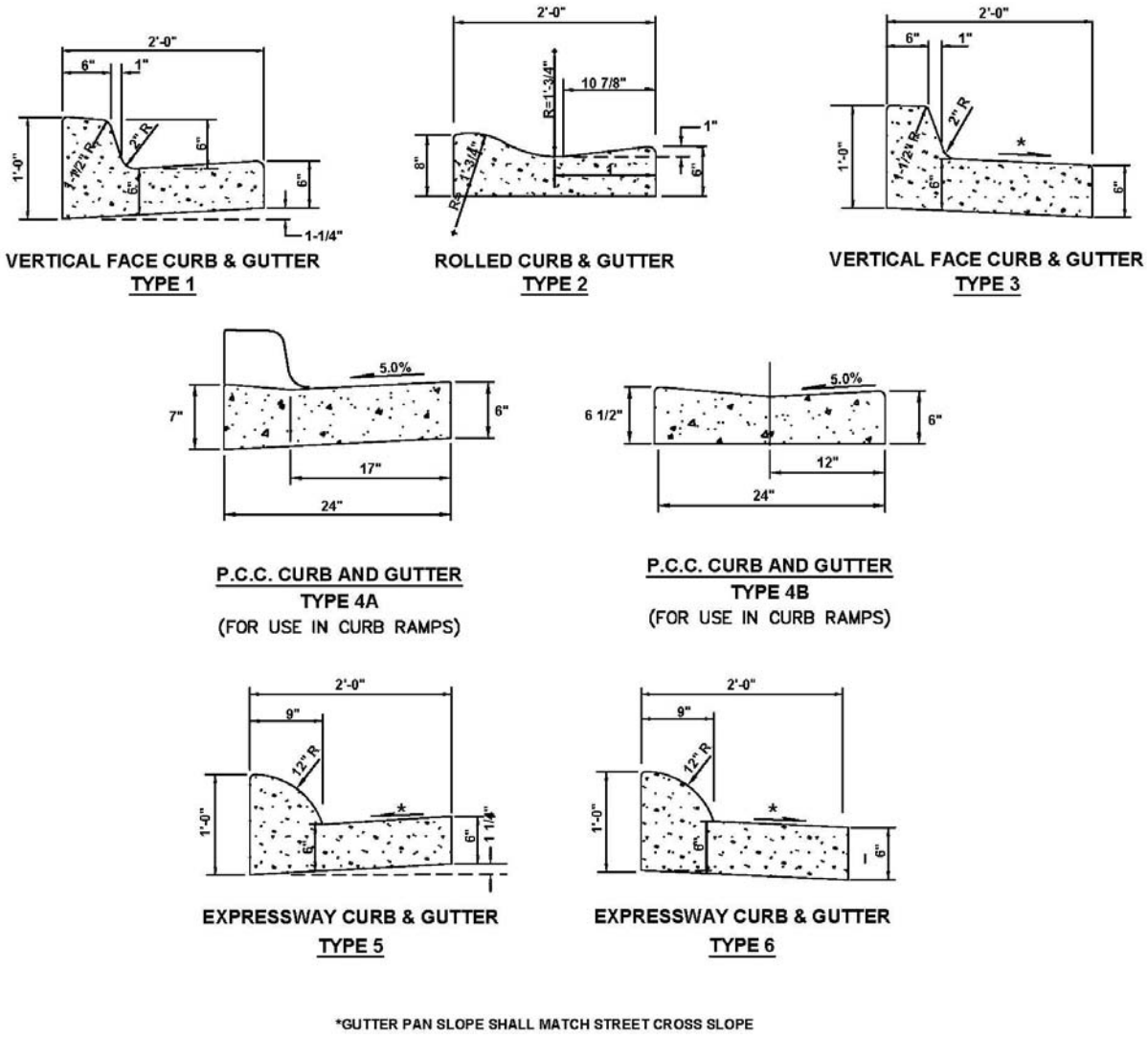
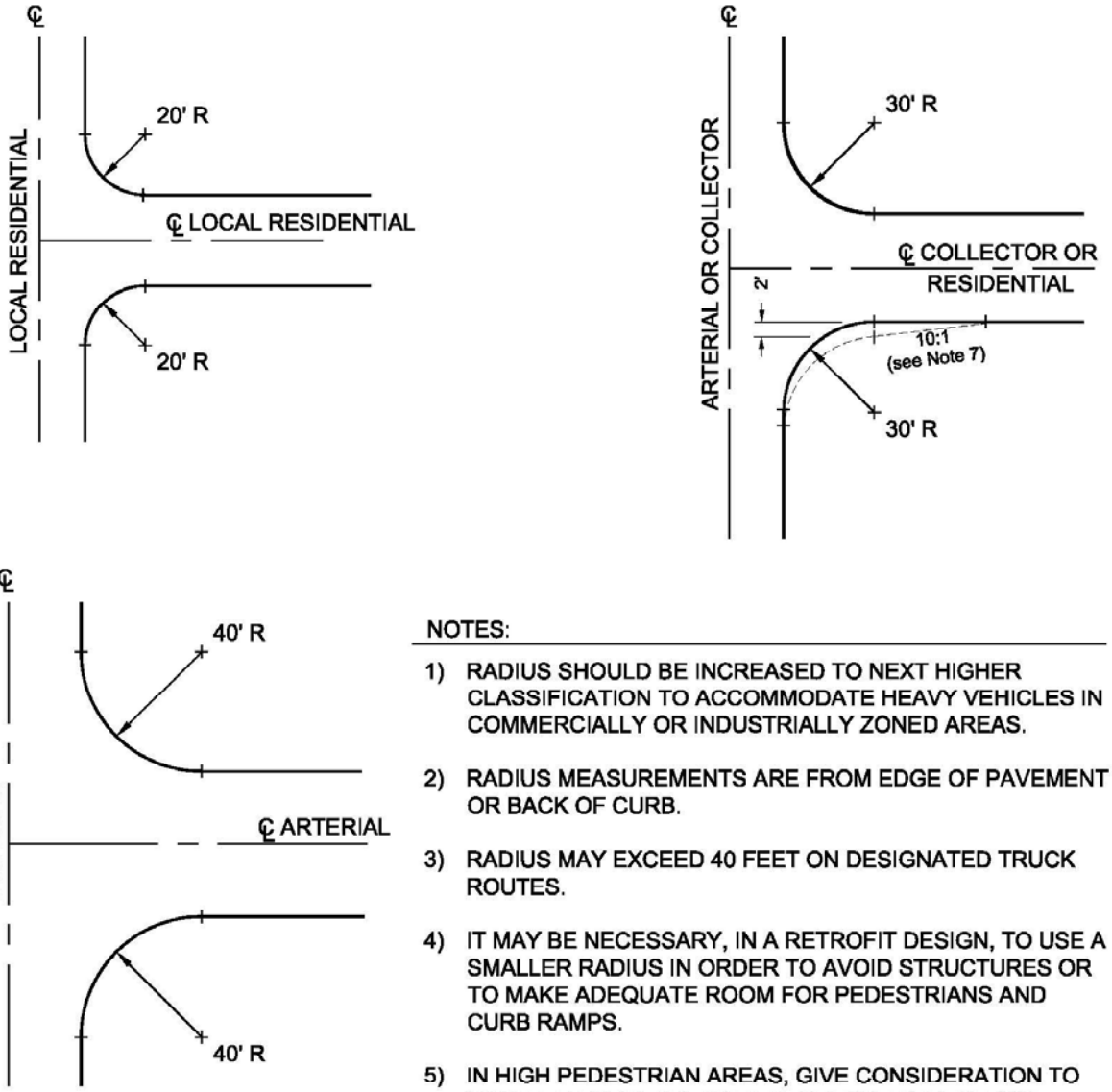


FIGURE 1-22 CURB AND GUTTER CROSS SECTIONS



NOTES:

1) RADIUS SHOULD BE INCREASED TO NEXT HIGHER CLASSIFICATION TO ACCOMMODATE HEAVY VEHICLES IN COMMERCIALLY OR INDUSTRIALLY ZONED AREAS.

2) RADIUS MEASUREMENTS ARE FROM EDGE OF PAVEMENT OR BACK OF CURB.

3) RADIUS MAY EXCEED 40 FEET ON DESIGNATED TRUCK ROUTES.

4) IT MAY BE NECESSARY, IN A RETROFIT DESIGN, TO USE A SMALLER RADIUS IN ORDER TO AVOID STRUCTURES OR TO MAKE ADEQUATE ROOM FOR PEDESTRIANS AND CURB RAMPS.

5) IN HIGH PEDESTRIAN AREAS, GIVE CONSIDERATION TO SMALLER RADII THAT WILL DECREASE PEDESTRIAN EXPOSURE, INCREASE SIZE OF PEDESTRIAN QUEUING AREA, AND CALM TURNING TRAFFIC.

6) A 5-FOOT RETURN RADIUS SHOULD BE USED WHERE TURNING MOVEMENTS ARE PROHIBITED, SUCH AS ON SOME ONE-WAY STREET CORNERS.

7) A 2-FOOT OFFSET WITH 10:1 TAPER MAY BE USED WHERE WARRANTED, TO MITIGATE IMPACT(S) OF A LARGER RETURN RADII.

FIGURE 1-23 STANDARD CURB RETURN RADII

5. Utilities

In the early stages of project design, all utility companies must be contacted to determine existing and proposed facility locations. When existing utility facilities conflict with proposed road improvements, the engineer must analyze the alternatives available for resolving the conflict early in the design study or preliminary design efforts. If the analysis indicates the need for relocation, the relocation efforts shall be accomplished in accordance with AMC 21.07.050 and AMC 24.60.120.

When relocation costs are determined to be excessive, the horizontal design objectives found in Section 1.9 E must be considered to evaluate the cost effectiveness of the relocation versus alternative approaches to the roadway design. The PM&E Project Manager shall be advised about the utility conflicts and the result of the utility relocation analysis at the earliest time possible in the design effort. This will allow resolution of relocation design issues with the appropriate utility before the final design-phase activities proceed. Approval of the Municipal Engineer shall be obtained through the variance process for any proposed deviation from standard road improvement locations for utilities, as established in the M.A.S.S.

For many projects, new utility improvements are needed to fully serve adjacent properties. These improvements usually include water, sewer, and natural gas services, as well as conduit placement for electric, telephone, cable services, or footing/roof drains. These needs shall be thoroughly investigated to minimize future pavement cuts. The size and location of required services shall be coordinated with each utility, and installation of the services from the utility main line to the property line shall be provided.

6. Guardrails

Guardrails are installed to separate vehicles from hazardous situations such as steep embankments and other hazards and to minimize the potential for vehicular collisions with fixed objects along the roadway. Guardrails shall not be used where they present a hazard equal to or greater than the obstacle that prompted consideration of the guardrail.

Guardrails should generally be placed as far from the edge of the traveled way as possible to maximize response time for motorists. However, for urban streets with curb and gutter, the guardrail face should either be aligned with the face of the curb or placed a minimum of eight feet behind the face of the curb.

For end treatment of guardrails or other guardrail placement along primary streets, or other considerations, the designer should refer to AASHTO's Roadside Design Guide or other standards for guidance.

7. Retaining Structures

In some cases, roadway design cannot avoid use of retaining structures to support the road base or a cut/fill bank. All available design alternatives to reduce the necessity for installing retaining structures shall be considered. Where no alternative solutions exist, materials that are resistant to deterioration and provide for cost-effective construction shall be incorporated into the design. Approval shall be obtained from the PM&E Project Manager or Private Development Manager for aesthetic and visual presentation of the retaining structure.

When a retaining structure has a height exceeding 4 feet, a registered engineer shall prepare and stamp the design. Adequate drainage must be provided behind the structure. For minor retaining structures used to avoid slope encroachment or to protect adjacent structures, applicable M.A.S.S. retaining wall details may be used or a site-specific design shall be developed.

8. Cul-de-sacs

When topography and traffic circulation permit, a cul-de-sac street may be designed to provide vehicular turnaround for a dead-end street. A street terminating as a cul-de-sac is only allowed when the length of the street from the centerline of the intersecting through street to the radius point of the cul-de-sac bulb does not exceed the distance specified in AMC 21 in urban, suburban, and rural areas, respectively.

A residential cul-de-sac street shall be terminated with a turnaround that has a minimum radius of 41.5 feet (measured to back of curb) and a minimum return radius of 50 feet. A minimum radius of 57.5 feet and a minimum return radius of 50 feet shall be used for a commercial/industrial cul-de-sac.

Cul-de-sacs shall be designed in accordance with Figure 1-24.

In accordance with AMC 21.08.030 F.6, Design Standards for Cul-de-sacs, the platting authority may permit a cul-de-sac street to terminate with a T- or Y-shaped turnaround when such a design is required by extreme environmental or topographical conditions, or unusual or irregularly shaped tract boundaries.

9. Driving Surfaces

The material and thickness requirements for a street surface are dependent on the volume and type of traffic. Secondary streets will be paved in urban and rural areas. A minimum asphalt pavement thickness of 2 inches shall be used on secondary streets.

Primary streets, such as collectors or arterials, should receive a minimum pavement thickness of 3½ and 4 inches, respectively. Any deviations will require submittal of structural pavement design calculations to substantiate the minimum thickness of the driving surface.

10. Restoration of Private Improvements in Public ROW

The ROW extends from property line to property line and includes both the improved and unimproved areas. Private improvements encroaching into the public ROW shall be restored in accordance with Director's Policy Number 16, as amended (Appendix 1A).

11. Pedestrian Facilities

Pedestrian facilities shall be provided in accordance with Chapter 4 of the DCM.

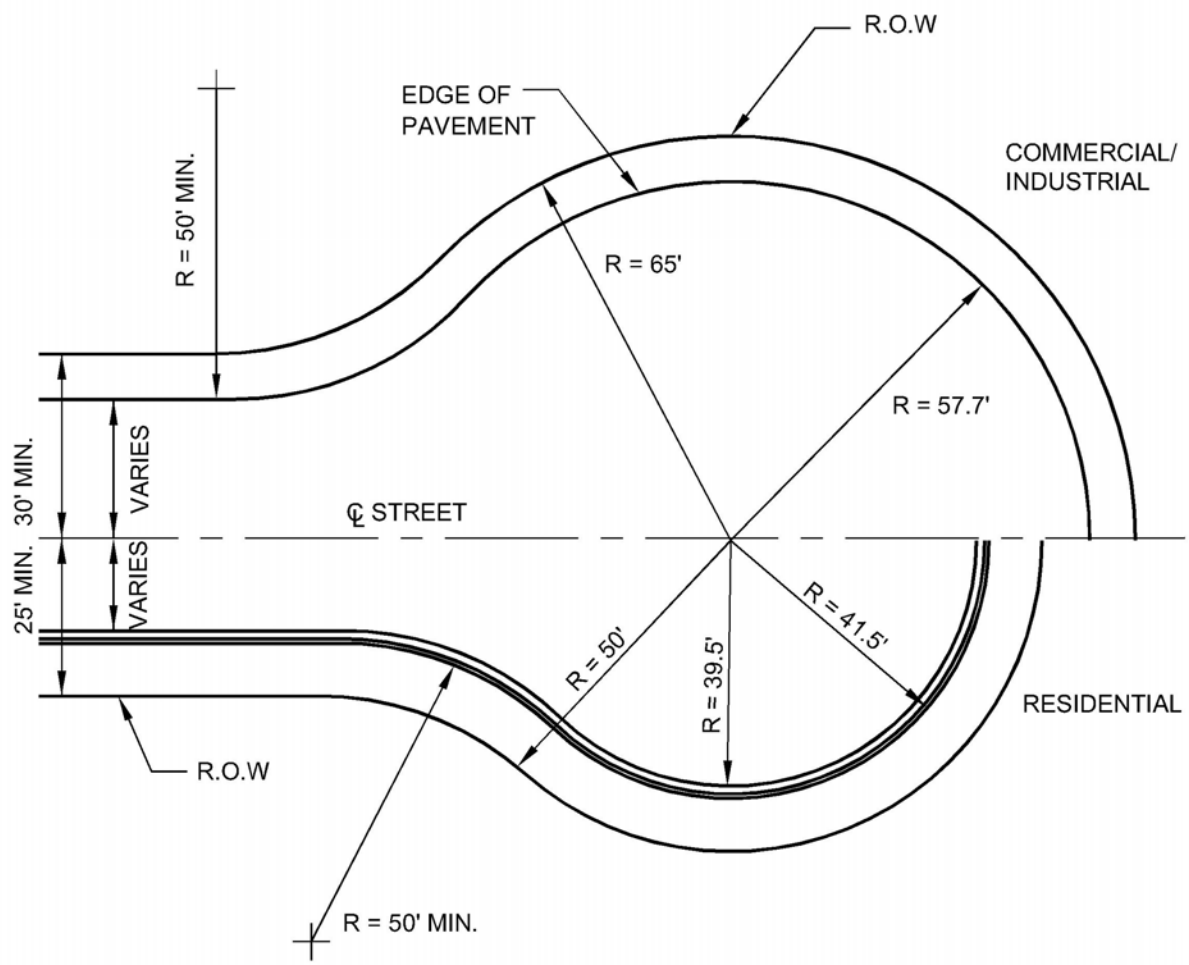


FIGURE 1-24 CUL-DE-SAC DESIGN

1.9 H Private Roadways

Roads and streets not constructed in dedicated ROW shall be designed and constructed in conformance to municipal standards.

1.9 I Access

1. State Highways

Access to state highways is regulated by ADOT&PF. Encroachment permits for access to state highways are available from ADOT&PF, and it is the responsibility of the developer to obtain permits whenever construction within ADOT&PF ROW is anticipated.

2. Municipal Streets

a) All construction to connect driveways to MOA streets must first be authorized by a valid Building Safety ROW Permit (formerly an Encroachment Permit) with the MOA. The number of access points must be kept to a minimum. No access points are approved without an acceptable project site plan. Refer to Section 1.9 I.2.b.(3).

The MOA must approve the design, number, and location of access points when the use of any property or its access operation is changed.

A change of use is defined as, but is not limited to, structural modifications, remodeling, change in type of business, expansion of an existing business, change in zoning, or change in property division creating new parcels. It does not include modification in advertising, landscaping, general maintenance, or aesthetics that do not affect internal or external traffic flow or safety.

For a change in property use that results in change in the type of access operation, the MOA may require reconstruction, relocation, or conformance of the access to meet MOA standards.

The following changes require that the Building Safety ROW Permit be revised:

(1) The use of the access increases in actual or proposed vehicular volume by 20 percent, as determined by the MOA

(2) A particular directional characteristic (such as left turns) increases by 20 percent, as determined by the MOA

(3) The change in use of the property or modification to the property causes the flow of vehicles entering the property to be restricted or to queue or hesitate on the highway, creating a hazard

(4) The use of the access by vehicles exceeding 30,000 pounds gross vehicle weight increases by 20 percent or by 10 vehicles per day, as determined by the MOA

(5) If a parcel of land with direct road access has been in a state of non-use for more than 4 years, recommencement of access use is considered a change in use. If the renewed use of the access exceeds its design limitations or is non-conforming to the current MOA standards, a new permit may be required.

b) Access Points

Access points are not approved for parking or loading areas that require backing maneuvers in a public street ROW, except for single family or duplex residential uses on local residential streets.

(1) Provision of access

If a property has frontage on more than one street, access is permitted only on those street frontages where standards contained in this manual and other MOA regulations can be met (referenced 1.9 H.2.b.3).

If a property cannot be served by any access point meeting these standards, the MOA Traffic Engineer designates one or more access points based on traffic safety, operational needs, and conformance to as many of the requirements of these guidelines as possible.

(2) Restriction of Turning Movements

Where necessary for the safe and efficient movement of traffic, the MOA may require that access points be geometrically designed to provide for only limited turning movements.

(3) Number of Access Points

One access point per property ownership is permitted, unless a project site plan or circulation plan is provided to and approved by the Municipal Traffic Engineer. The circulation plan must indicate that more than one access is required to adequately handle driveway volumes and that additional driveways are not detrimental to traffic flow on adjacent public roads.

Where a property has access to more than one road, access is generally limited to the lower volume road where the impacts of a new access would be minimized. Access on other higher volume roads may be denied.

Temporary access may be granted to undeveloped property before a final development plan is prepared if access is needed for construction or preliminary site access. Temporary accesses are subject to removal, relocation, or redesign after final development plan approval. Secondary access for emergency vehicles shall be provided for all developments.

To facilitate snow removal operations, driveways fronting municipally maintained roads must be separated by a minimum 35-foot clear space for snow storage. The maximum frontage of any driveway shall be in accordance with AMC Title 21.

3. Criteria for Requiring Speed Change Lanes

Speed change lanes are required according to the National Cooperative Highway Research Program (NCHRP) Report 279.

END OF SECTION 1.9

SECTION 1.10 ROAD STRUCTURAL FILL DESIGN

1.10 A Objectives

In sub-arctic environments such as Anchorage, the primary consideration in the structural design of a road is the potential impact of freezing and thawing on the road surface. The material in the subgrade (existing ground beneath the road's structural section) is considered frost susceptible when it is likely to develop detrimental ice segregation. The adverse impacts associated with ice lens formation can be significant. The degree of impact is also influenced by the amount of moisture in the subgrade. The primary goal in the structural design of a road is to reduce freezing and thawing impacts to a level that allows for the desired roadway life. Reduction of these impacts is best accomplished by providing an adequate classified structural fill above the subgrade as well as adequate drainage facilities in order to minimize frost heave.

In general, finer-grained soils potentially may contain amounts of unfrozen water at subfreezing temperatures that are larger than the amounts in coarser soils. Because of this, the higher the content of fine-grained soils the greater the likelihood of adverse ice lens development and the higher the frost susceptibility. Materials containing, by weight, more than 3 percent finer than 0.02 millimeters in diameter are generally considered frost susceptible. The degree of ice lens development is also related to the size range of the soil voids. For example, some uniform sandy soils may contain as much as 10 percent finer than 0.02 millimeters without being frost susceptible.

The classified fill types described in the M.A.S.S. and the classified fill uses identified in Section 1.10 B have been developed to address these concerns. The following criteria are mandatory design objectives when frost-susceptible material is encountered in the subgrade:

1. Thermally induced capillary action is the upward migration or drawing of moisture that is created by the generation of negative pore pressures within the freezing zone of frost-susceptible soil. This excess moisture is detrimental to the structural embankment and manifests itself in the form of ice lenses in a frost-susceptible subgrade beneath the structural fill (subbase) when subjected to freezing temperatures. The adverse impacts of these ice lenses is a non-uniform heaving of pavement surface during the winter months and a loss of strength of effected soils during the spring thaw-weakened period. Ice segregation has demonstrated the ability to contaminate classified fill over the long term. The formation of ice lenses must be mitigated by limiting the frost penetration into frost-susceptible subgrade. This is best accomplished by providing an adequate depth of classified fill or the combination of classified fill and insulation.

2. The upward migration of fine-grained materials from a highly frost-susceptible subgrade into the classified fill, or pumping, must be prevented. This can be accomplished through the installation of geotextile fabric or other engineered system. The structural fill section(s) (subbase) must be of sufficient depth to distribute and minimize tire pressure over thaw-weakened soils.

3. Differential frost heaving must be minimized by providing extended transitions between structural fill sections of varying depths and/or structural fill and insulated sections. Underground utility trench excavation sidewall angles may be no steeper than 1-½ horizontal to 1 vertical (1-1/2:1).

1.10 B Classified Fill Usage

In the M.A.S.S., construction specifications for various types of classified fill are established for work within MOA ROW. In this section, general guidelines are provided for the use of each classified fill type. A typical road structural section is shown in Figure 1-25.

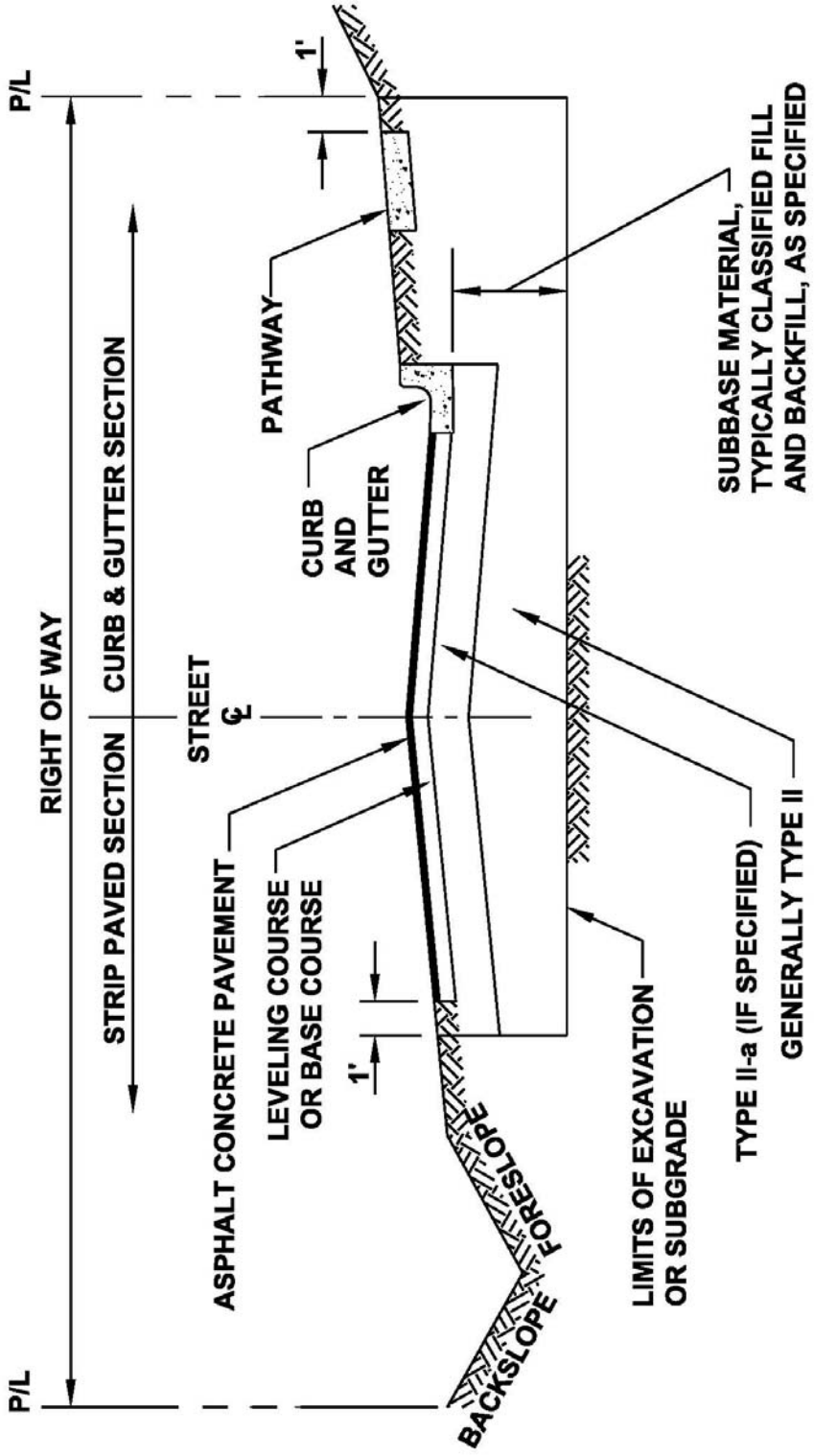


FIGURE 1-25 TYPICAL ROAD STRUCTURAL SECTION

Leveling Course (base course) consists of crushed aggregate and is intended for use as a base just below the asphalt concrete (AC) pavement and above the structural fill. Its function is to provide a more uniform surface for pavement placement by eliminating material 1.0 inch in diameter or larger.

Type II classified fill and backfill is the primary structural fill, or subbase, material for developing road structure values. This material is generally used in the minimum structural fill depths provided in Section 1.10 D.

Type II-a was designed to reduce irregularities in the top of the structural fill and to reduce the potential upward movement of large rocks into the leveling course and pavement. This material is specified as the top 6 inches of structural fill directly under the leveling course for many projects, but may increase to 18 inches when placed over insulation board.

Type III classified fill and backfill provides the engineer some flexibility in the use of native material as usable excavation in the subbase. However, this material allows for higher contents of fines and can be frost susceptible. Therefore, it is primarily used in the lower regions of a road prism such as in utility and storm drain trenches. Type III classified fill may be approved as a primary structural material if the data clearly demonstrate that structural and frost action concerns have been adequately addressed in the design.

Type IV classified fill and backfill is for use in areas outside the structural fill of a road. When moisture levels in the Type IV material are above the optimum moisture content, this material is difficult to compact in accordance with the M.A.S.S. specifications. Furthermore, when Type IV is placed in an area where the subgrade moisture content is above the optimum level, the ability of the material to maintain structural properties is also reduced. However, when moisture content can be adequately controlled and adequate compaction can be obtained, Type IV may be used in the lower regions of a road prism.

1.10 C Design in Organic Soils

All organic material must be removed from the road subgrade. As a rule, when removing organic materials from beneath a road surface the lateral extent of the excavation beyond the back of curb (or edge of shoulder for strip paved roads) shall be roughly equivalent to the depth of unsuitable materials removed. (i.e., if 10 feet of organics are removed from below a road way, the horizontal extent of the excavation beyond back of curb shall be 10 feet). Failure to excavate outside of the pavement footprint may result in a spreading road base fill that will eventually lead to pavement distress. Prior to placement of classified fill the contractor must provide an as-built survey showing the excavation of unsuitable material has been extended sufficiently beyond the edge of the road improvements.

1.10 D Road Structural Section Design Methods

The depth of structural fill is primarily a function of the frost classification of the underlying soil. Descriptions of these classifications are provided in Table 1-12. Structural fill depths (subbase) are exclusive of the pavement and base course. Additional depth of subbase may also be required if there is a high water table, presence of loose or a near-saturated soil condition.

TABLE 1-11 FROST DESIGN SOIL CLASSIFICATION

Frost Group	Soil Type	Percentage Finer Than 0.02 Millimeter by Weight	Typical Soil Types Under Unified Soil Classification System
NFS	a. Gravels	0 to 3	GW, GP
	b. Sands	0 to 3	SW, SP
F-1	Gravelly soils	3 to 10	GW,GP,GW-GM,GP-GM
F-2	a. Gravelly soils	10 to 20	GM, GW-GM, GP-GM
	b. Sands	3 to 15	SW, SP, SM, SW-SM, SP
F-3	a. Gravelly soils	Over 20	GM, GC
	b. Sands, except very fine silty sands	Over 15	SM, SC
	c. Clays, PI>12	--	CL, CH
F-4	a. All silts	--	ML, MH
	b. Very fine silty sands	Over 15	SM
	c. Clays, PI<12	--	CL, CL-ML
	d. Varved clays and other fine-grained, banded sediments	-- --	CL, CL-ML CL, CH, ML, SM

Required structural fill depths:

1. When the underlying soil type is frost group F-1, the minimum depth of structural fill shall be 1.75 feet.

2. When the underlying soil is continuously F-2 to a depth of eight feet below finish grade, has a moisture content of less than 6%, has less than 15% material passing the #200 sieve, and a water table depth of eight feet or more below finished grade, the minimum depth of structural fill is 2.0 feet.

3. When the underlying soil type is F-2 not meeting the above criteria, F-3, or F-4, a four-foot insulated structural section shall be constructed in general accordance with Figure 1-26.

Alternate structural sections:

Two analysis methods that may be used for alternate sections are:

1. Complete Protection Method

2. Limited Subgrade Frost Penetration Method

The Complete Protection Method involves the removal of all frost-susceptible materials within the subbase down to the calculated frost penetration depth and replacement of the frost-susceptible material with the appropriate classified fill and backfill.

There are two circumstances in which the calculated depth of the classified fill and backfill subbase depth may be modified: (1) significant quantities of usable non-frost susceptible material exist within the excavation that may be supplemented for classified fill and backfill, and (2) the embedment of insulation board in the subbase of the structural section is determined to reduce the required depth of classified fill and backfill sufficiently to make it a more cost-effective design.

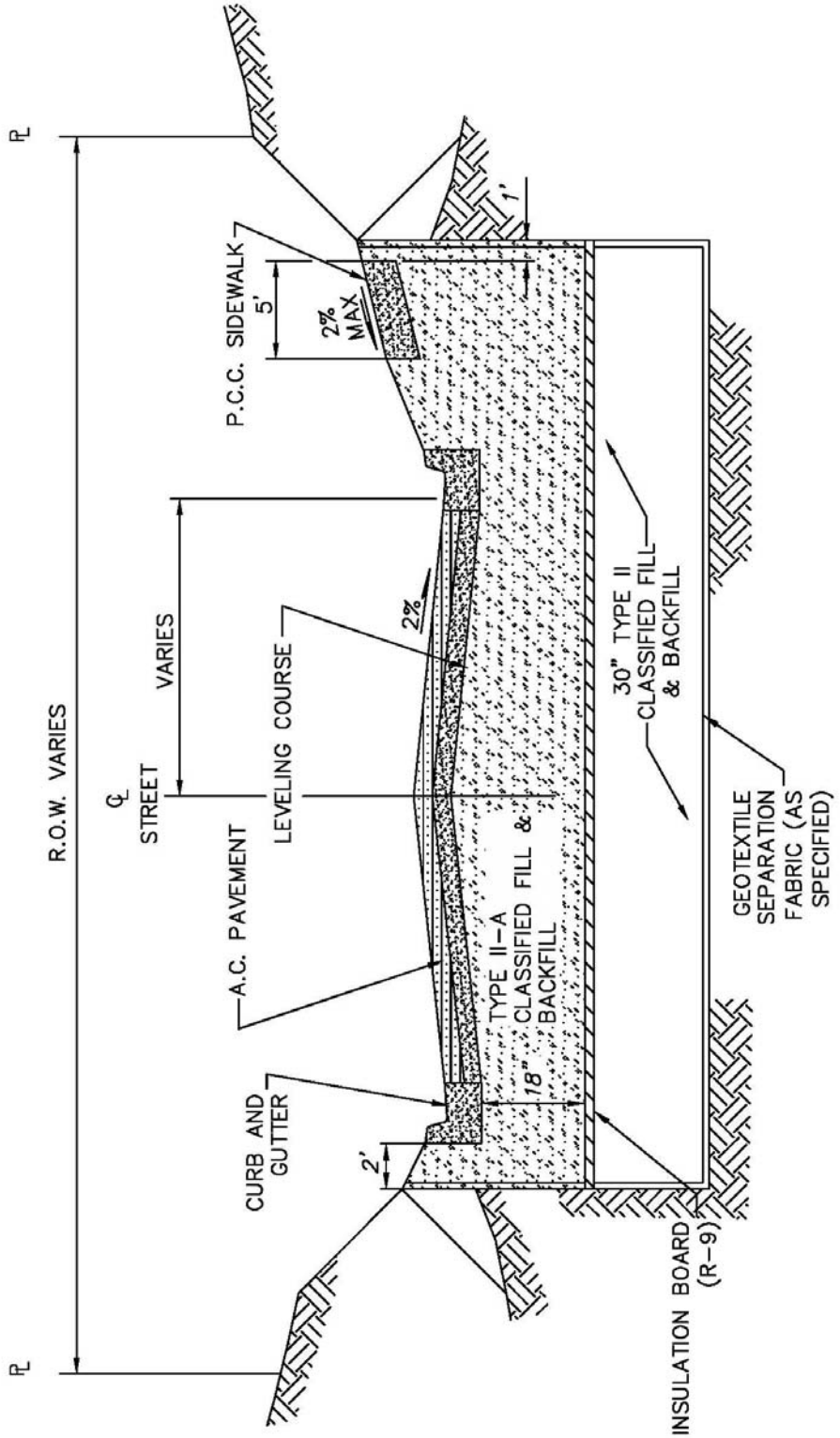


FIGURE 1-26 TYPICAL INSULATED STRUCTURAL SECTION

In both cases, these materials may be factored into the calculation of classified fill and backfill depth.

The Limited Subgrade Frost Penetration Method may be used in lieu of the Complete Protection Method. The Limited Subgrade Frost Penetration Method attempts to restrict surface movements to levels that will not adversely affect road surface life or quality.

For the Limited Subgrade Frost Penetration method, the depth of structural fill shall be calculated based on a maximum frost penetration into the subgrade of 10 percent of the overall pavement structural section (pavement, base course, and subbase classified fill). The calculated maximum freeze/thaw depths used to develop the structural section must be provided along with all supporting documentation. Care should be taken to use the most accurate soil properties and realistic moisture contents possible.

Computer models such as: TEMP/W from GeoStudio (http://www.geo-slope.com), SVHeat from SoilVision (http.//soilvision.com), BERG 2 or another program approved by PM&E shall be used to calculate the total frost depth. Use of insulation approved for roadway use is discussed in Section 1.10 F.

Other factors, such as the interception and removal of water by a drainage system, (i.e. subdrain or fin drain), are also important and are covered in Chapter 2 of this manual.

1.10 E Geotextile Fabrics

An engineer faced with the task of designing a street in an area with frost-susceptible soils and high moisture content can reap many benefits from use of geotextile fabric in the design. Where high soil moisture content occurs in F-2, F-3 and F-4 soils, geotextile fabric shall be incorporated into the structural design section to separate structural fill from frost-susceptible soils.

The first step in selecting an appropriate fabric from the many available is definition of application requirements. Geotextile fabrics can be used for the following reasons in street designs:

1. Separation – acts as a separator to prevent the pumping of frost-susceptible subgrade material into the gravel backfill, minimizing the contamination of gravel backfill and maintaining its support strength

2. Load Distribution – provides structural strength to a soft, weak, and frequently wet subgrade. The fabric helps mitigate pavement and subgrade deformation caused by wheel loading and works to extend the service life of the pavement.
3. Confinement – maintains the original shear strength of the compacted gravel by confining the gravel backfill, which allows the subgrade to support the wheel loads placed on it.

Specifications for geotextile fabrics are contained in the M.A.S.S.

1.10 F Insulation

1. General

Insulation may be used in the construction of streets where the subgrade is determined to be frost-susceptible and reduction in the depth of the gravel backfill required by the Limited Frost Penetration Method is desired for economic reasons. The use of insulation is not intended to prevent the freezing front from reaching the subgrade; it is intended to minimize the depth of subgrade freezing below the classified fill by providing partial thermal protection and a more uniform freezing depth

The M.A.S.S. establishes standard construction specifications for improvements that use insulation within the street ROW. M.A.S.S. requires that the specified R-value will be based on manufacturer's warrantied R-value and accepts products that meet or exceed the specified R-values. Therefore, designers should exercise care to specify thermal resistance (R-value) for insulation board that is based on manufacturer's warrantied thermal resistance.

2. Specifying Insulation Board

M.A.S.S. requires that the specific R-value will be based on manufacturer's warranties R=values and accepts products that meet or exceed the specified R-values.

Therefore, designers should exercise care to specify therman resistance (R-value) for insulation board that is based on manufacturer's warrantied thermal resistance.

Research conducted by the MOA and ADOT&PF has shown the following to be acceptable guidelines for the use of rigid insulation:

1. Use of only high-density polystyrene board with a minimum compressive strength of 60 pounds per square inch and a maximum water absorption of 0.30 by volume;

2. Placement of a minimum cover of 18 inches of gravel fill over the insulation to protect the insulation from heavy wheel loads during construction and to minimize frost formation on the pavement surface;

3. Extending the limits of the insulated section adequately beyond the heave zone to avoid causing bumps where the frost-susceptible material is not insulated. In addition, if more than one layer of boards is used, insulation thickness shall be gradually stepped down.

END OF SECTION 1.10

SECTION 1.11 ACCESSIBILITY

Applicability

Section 1.11 applies to the MOA ROW. Accessibility compliance on land that is not within the MOA ROW is addressed by the Americans with Disabilities Act (ADA).

The complete Americans with Disabilities Act Accessibility Guidelines (ADAAG), which is part of the regulations enforcing ADA, is available online from the U.S. Architectural and Transportation Barriers Compliance Board (Access Board) at www.access-board.gov.

Evolving Requirements

The following criteria may require refinement to match future changes in the ADAAG and other references. It is the designer's responsibility to verify citations in this Section or guidance documents at the time designs are completed.

Requirements for MOA ROW

All new construction and alterations within the MOA ROW must be designed to comply with ADA. The following are examples of some design elements covered under current ADAAG or that have been determined in federal court to apply:

1. New or widened road (all pedestrian elements, including curb ramps, sidewalk cross slope, driveway cross slope, clearance around utilities, pedestrian access to adjacent commercial properties, and accessible pedestrian construction detours)
2. Bus stop (pad size, curb ramp at nearest cross street, bench style, protruding object restrictions, and connection to sidewalk)
3. Surface rehabilitation only (new and complying curb ramp for every street and alley crossing that has both sidewalk and curb, unless there is an existing curb ramp that meets all ADA standards)

Exceptions

Exceptions to full compliance with ADAAG shall only be those exceptions written within ADAAG itself and exceptions shall be limited as described within ADAAG.

ADAAG incorporates exceptions that are explicitly defined and more broadly defined exceptions that include terms such as "technically infeasible" or "impracticable."

Examples of an explicit exception is a 15-foot length limitation for curb ramp slopes as shown in Proposed Guidelines for Pedestrian Facilities in the Pubic Right-of Way (PROWAG), July 2011, Sections 304.2.2 and 304.3.2), or that 10:1 slopes may be used for alterations when the height of the ramp does not exceed 6 inches [ADAAG 4.1.6(3)(a)].

An example of a more broadly defined exception is (PROWAG R202):

> *"Where existing physical constraints make it impracticable for altered elements, spaces, or facilities to fully comply with new construction requirements, compliance is required to the extent practicable within the scope of the project. Existing physical constraints include, but are not limited to, underlying terrain, right-of-way availability, underground structures, adjacent developed facilities, drainage, or the presence of a notable natural or historic feature."*

It is within the designer's discretion to incorporate explicitly defined exceptions as needed to produce a feasible design. However, the use of such exceptions shall be clearly documented.

For broadly defined exceptions, the technical elements of each exception shall be documented in a Statement of Technical Infeasibility for review and approval by the Municipal Engineer. *(See Appendix 1E)*.

Conflicts

Where the DCM is in disagreement with ADAAG, the most restrictive standard shall apply.

Guidance Documents

The ADAAG Manual: *A Guide to the Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities* (most current adopted version), (ADAAG) applies to many situations, governing "accessible routes", parking and passenger loading zones, curb ramps, stairs, and signage. In particular, it should be consulted for the access along the fronts of buildings, within parking areas, and for sidewalks interior to a site development project.

Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (July 2011), also referred to as PROWAG, addresses access to newly constructed and altered public streets and sidewalks covered by ADA. The guidelines cover pedestrian features in new or altered public rights-of-ways, including sidewalks and other pedestrian ways, street crossings, medians and traffic islands, overpasses, under passes and bridges. The guidelines apply to both permanent and temporary facilities. A design guide titled *Accessible Public Rights-of-Way: Planning and Designing for Alterations (*July 2007) is available to provide guidance to State and local governments on how to design and construct accessible public pedestrian facilities. At the time that this update to the DCM was published, the guidelines are still awaiting adoption. When the guidelines are adopted, with or without additions and/or modifications, compliance with the accessibility standards will be mandatory.

PROWAG presents an evolving set of design criteria. Design Study Reports should address the current standard to which facilities will be designed. Typically, the most current guidelines that are issued, whether as part of the final rule or not, represent the recommended practices within a field and shall be given careful consideration as to their applicability to a project.

Checklist

For information purposes, a design checklist for accessible sidewalks and street crossings is included in Appendix 1E. This checklist does not cover all requirements, and the designer should become familiar with the ADA and the latest available ADAAG.

END OF SECTION 1.11

APPENDIX 1A

Director's Policy Number 16 (December 7, 1990)

RESTORATION OF PRIVATE IMPROVEMENTS AS PART OF A CAPITAL PROJECT

MUNICIPALITY OF ANCHORAGE
DEPARTMENT OF PUBLIC WORKS

DIRECTOR'S POLICY NUMBER: 16	EFFECTIVE DATE: December 7, 1990
SUBJECT: RESTORATION OF PRIVATE IMPROVEMENTS AS PART OF A CAPITAL PROJECT	APPLICABLE UNITS/DIVISIONS: ALL

DEFINITIONS:

Private Improvements can consist of fences, walks, steps, paved or unpaved driveways, parking lots, retaining walls, lawns, flowers, shrubbery and the like.

Public Improvements, are street improvements, walkways, drainage features, utilities and bike trails.

PURPOSE:

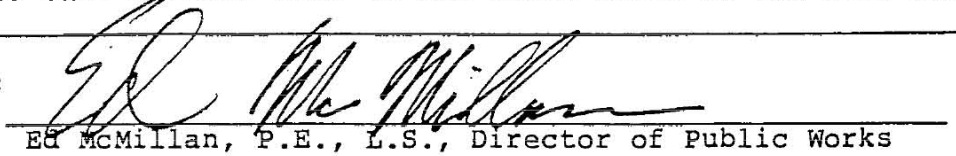
The purpose of this policy is to provide consistency in the restoration of private improvements when they have been removed for the construction or reconstruction of public improvements in Municipal Rights-of-Way.

POLICY:

The right-of-way extends from property line to property line and includes both improved and unimproved areas. Private improvements encroaching into public rights-of-way which are moved during construction will be restored only as noted below unless it is a condition of a specific easement.

1. Mailboxes will be installed in the location approved by the U.S. Post Office. Clustering of mailboxes may be implemented if required by the U.S. Post Office.

2. Existing paved driveways within the right-of-way will be repaved to connect to the new improvement. The Municipality will only grade the existing material and replace that portion disturbed with the same type of material in the existing driveway. All existing unpaved driveways will be paved with asphalt from the property line to connect to the new improvements. Driveways will be paved to match widths of the existing driveway to a maximum of 24' wide (equivalent to a double wide driveway) or in the case of curb cuts to the total width of the curb cut for

APPROVED: 

Ed McMillan, P.E., L.S., Director of Public Works

DPW P&P # 16 Restoration of Private Improvements as part of a Capitol Project	Page 2 of 2

that property. If the property owner desires anything different they will be required to pay the difference from what the Municipality is obligated to construct and what they request.

Where existing paved driveways must be removed on property to provide reasonable access, the Municipality with the property owners permission will remove the pavement, regrade the driveway to provide reasonable access and repave the driveway as stated above. Any grading desired by the property owner beyond that required for reasonable access shall be at the property owners responsibility.

3. Private improvements excluding driveways, parking lots and landscaping removed during construction within the right-of-way will be replaced a minimum of 5' behind the public improvement. Private improvements may be replaced further back than 5' from the improvement if its necessary depending on terrain, sight distance, safety and any other necessary concerns. Any betterment to private improvements requested by the property owner shall be at their expense. The Municipality and their contractor shall make every attempt to salvage all materials when the improvement is removed. If these materials cannot be salvaged, the property owner, at their expense and within a reasonable time, will supply substitute materials. An encroachment permit will be issued to the property owner by the Department of Public Works. Private improvements that are reset and encroaching into the Municipality Right-of-Way shall be the responsibility of the property owners. The repair of any damage to these improvements whether caused by Municipal maintenance forces during normal operation or other individuals shall be the responsibility of the individual property owners and not the Municipality.

4. Landscaping within the Municipality's Right-Of-Way that is removed shall not be replaced by the Municipality or its contractor, with the exception of top soil and seeding per current Municipality of Anchorage Standard Specification. Plants, shrubbery and other kinds of landscaping that are removed within the Municipal Right-of-way shall be placed on the owner's property. Replacement or disposal of these materials shall be the responsibility of the property owners.

APPENDIX 1B

AMCR 21.90 Multiple Dwelling Unit Residential Development on Single Lot or Tract

Regulation 21.90 IS CURRENTLY BEING REWORKED BY PLANNING

APPENDIX 1C

ROW ACQUISITION PARCEL MAP REQUIREMENTS AND SAMPLE PARCEL MAP

Municipality of Anchorage
Project Management & Engineering Department

MEMORANDUM

DATE: January 17, 2006

TO: Distribution

FROM: Vicki Gerken, Right of Way Acquisition Assistant

SUBJECT: **Request for Right of Way Acquisition**
Revised Document Requirements

The Request for Acquisition of Real Property or Interest in Real Property (RARPI) form is attached for your use.

Also attached is the revised Items to be Submitted with Acquisition Request, which details the requirements for each of the following documents that must be submitted to us with the RARPI form for all project acquisitions; samples are also attached.

1) Acquisition Summary
2) Legal & Easement Description
3) Parcel Map Drawing Requirements

Please provide a copy of this correspondence to consultants or engineers who may be preparing design or construction documents. These documents are accessible at G:\Pm&e\Sf\ROW\MISCELLANEOUS\RARPI Requirements\For Engineers Use or let me know and I can email them to you.

Please call Tom Knox, Municipal Surveyor at 343-8116 or me at 343-8187 if you have any questions.

Attachments

Distribution:

Tom Knox, P.L.S., Muni Surveyor
Christine Neal, SR/WA, Realty Officer III
J. W. Hansen, Deputy Director
Steve Gillette, Project Manager
John Smith, Project Manager
Russell Oswald, Project Manager
Duane Maney, Project Administrator
Robert Palmer, Project Administrator
Dave Gardner, Project Administrator
Jennifer Noffke, Project Administrator
Steve Shrader, Technical Support Supervisor
Paul LaFrance, Project Engineer
Lori Schanche, P.L.A., Municipal Trails Coordinator
Jacques Boutet, The Boutet Company

ROW File # _____
SURVEY/ROW Work Authorization # _____
Database # _____

Municipality Of Anchorage
Project Management & Engineering Department
RIGHT OF WAY ACQUISITION Request Form

REQUEST FOR ACQUISITION OF REAL PROPERTY OR INTEREST IN REAL PROPERTY (RARPI)

Date: _____ To: Project Management & Engineering/R.O.W. Land Acquisition

From: _____ Phone # _____

1. Project Name, Project # and description of project or acquisition (include TCP/Easement info):

   _____

2. What is the purpose of this acquisition? Date required? (Please be specific.)

   _____

3. Required attachments: (check appropriate lines)

   _____ Area map 100 scale grid # _____
   _____ Detailed construction prints (ROW)
   _____ Legal description(s) _____ Parcel plat(s)
   _____ Title Report ($250 each property, if ordered by ROW)

4. **(REQUIRED FOR ALL REQUESTS)**

   Funding Type: (check appropriate lines)

   _____ Federal Municipal Funding No: _____
   _____ State Municipal Funding No: _____
   _____ Local Municipal Funding No: _____

   _____ Other, please specify Billing Information:

   Contact: _____
   Company: _____
   Address: _____

5. Interest(s) required: (check appropriate lines)

   _____ Fee acquisition _____ State DOT Permit(s)
   _____ Lease acquisition _____ Alaska Railroad Permit(s)
   _____ Easement(s) _____ Other
   _____ Temporary Construction Permit(s)

6. Are any other municipal agencies involved in this project? Yes _____ No_____

   If yes, please indicate agency and contract person:
   Agency: _____
   Contact: _____ Phone # _____

7. Project Management Contacts:

   Project Manager: _____ Phone # _____
   Project Engineer: _____ Phone # _____

REQUEST AUTHORIZED BY:

_____ Date: _____
Department/Division Manager

cc: Tom Knox, SR/WA, Municipal Surveyor
Christine M. Neal, SR/WA, Realty Officer III
Larry Ison, Engineering Technician III
Bob Moore, Principal Admin Officer
Sue Turner, Jr. Admin Officer

MUNICIPALITY OF ANCHORAGE
Project Management & Engineering Department

RIGHT OF WAY ACQUISITION

ITEMS TO BE SUBMITTED WITH (RARPI form)
ACQUISITION REQUESTS

1. Acquisition Summary – A spreadsheet with specific property information identifying the following:
    - Current Date
    - Parcel Number
    - Tax Identification Number
    - Owner name (if possible)
    - Legal Description: Lot, Block, Subdivision or Aliquot part
    - Plat Number
    - Lot Size
    - Type of acquisition requested:
        - Temporary Construction Permit (TCP) Mutual Benefit
        - Temporary Construction Easement (TCE)
        - Public Use Easement (PUE)
        - Slope Easement (SE)
        - Telecommunications & Electrical (T&E)
        - Intragovernmental Use Permit (IGP) (Municipal Owned Property)
    - Purpose of the acquisition
    - Existing Improvements within the Acquisition Area/Comments
2. Legal & Easement Description – The legal description of the property, including Plat number, type of easement, current date, square footage of easement area to be acquired, and a complete legal description of the acquisition area. Descriptions are to be submitted on 8 ½ x 11 size paper, dated and also transmitted electronically via WORD document to ROW Acquisition Section. If the descriptions are revised, the date should be revised (Use attached sample).
3. Parcel Drawing – please follow PM&E's Parcel Map Requirements, dated 1/10/06. Drawings should be submitted on 8 ½ x 11 size paper as well as transmitted electronically via PDF file to ROW Acquisition Section (Use attached sample).
4. Right of Way Map – to be submitted to ROW Acquisition Section when complete.

Project Name & Number

Acquisition Summary

Parcel No.	Tax ID	Owner Name	Legal Description	Plat No.	Lot Size (SF)	Acquisition Take Area (SF)					Easement Purpose	Existing Improvements within Acq. Area/Comments
						PUE (*IGP)	SE (*ISP)	DE (*IDP)	TCE	TCP (*ITCP)		
1	014-252-42	Clark & Counts	Lot 1, Block 2, Atkins	69-142	10,800	54	0	0	0	0	Sidewalk	Fence
						0	306	0	0	0	Cut Slope	sign
						0	0	425		0	Storm Drain Outfall	
						0	0	0	840		Relocate Driveway	Tree
										3,835	Driveway Reconstruction	
2	014-252-21	MOA, Anchorage School District	Section 9, T12N R3W (Abbott Loop School Site)	71-40	383,482	0	0			840	Relocate Driveway	Tree
								50			Field Inlet	
3	014-252-25	Imm & Hylton	Lot 3, Block 1, King	67-87	22,960	0	0	0	120		Relocate Retaining Wall	retaining wall
										200	Relocate Driveway	
4	014-251-18	Santillan, Joe & Nubia	Lot 3, Dora	79-41	6,120	no take (existing PUE)	0	0	0	0	Construction of Nadine Place	

PUE Public Use Easement
DE Drainage Easement
SE Slope Easement
TCP Temporary Construction Permit
TCE Temporary Construction Easement

*** Used for Municipal Owned Property**
*IGP Intragovernmental Use Permit
*IDP Intragovernmental Drainage Permit
*ISP Intragovernmental Slope Permit
*ITCP Intragovernmental Temporary Construction Permit

Legal & Easement Description Sample

Project: **Project Name** MOA Project No:

Parcel No: **131**

Legal Info	Lot: 5	Block:
Subdivision: Bryant	Plat No: 70-231	Area (sf): 9,789
Owner Info	Name:	
Danielle M. Jones		
Public Use Easement	Mod. Date: 7/10/05	Area (sf): 50

A Public Use Easement within Lot 5 of Bryant Subdivision, according to Plat 70-231, filed in the Anchorage Recording District, Third Judicial District, State of Alaska, as described below.

Beginning at the southwest corner of said Lot, thence N00°07'00"W adjoining the west property line a distance of 10.00 feet to the Point of Beginning, thence N00°07'00"W a distance of 6.00 feet , thence S38°03'08"E to a point on the south property line a distance of 20.33 feet, thence N89°57'00"W adjoining said property line a distance of 2.50 feet, thence N45°02'00"W adjoining existing easement a distance of 14.16 feet more or less to the Point of Beginning, containing 50 square feet more or less.

Slope Easement	Mod. Date:	Area (sf):
Temp Const. Permit	Mod. Date: 3/11/05	Area (sf): 125

A Temporary Construction Permit within Lot 5 of Bryant Subdivision, according to Plat 70-231, filed in the Anchorage Recording District, Third Judicial District, State of Alaska, as described below.

Beginning at the southwest corner of said Lot, thence N00°07'00"W adjoining the west property line a distance of 11.00 feet to the Point of Beginning, thence N00°07'00"W adjoining said property line a distance of 25.00 feet, thence S89°57'00"E a distance of 5.00 feet, thence S00°07'00"E a distance of 25.00 feet, thence N89°57'00"W to a point on the west property line a distance of 5.00 feet more or less to the Point of Beginning, containing 125 square feet more or less.

Other Easement	Mod. Date: 7/10/05	Area (sf): 77

A Drainage Easement within Lot 5 of Bryant Subdivision, according to Plat 70-231, filed in the Anchorage Recording District, Third Judicial District, State of Alaska, as described below.

Beginning at the southwest corner of said Lot, thence S89°57'00"E a distance of 12.64 feet to the Point of Beginning, thence N00°07'00"W a distance of 7.00 feet , thence S89°57'00"E a distance of 11.00 feet, thence S00°07'00"E to a point on the south property line a distance of 7.00 feet, thence N89°57'00"W adjoining said property line a distance of 11.00 feet more or less to the Point of Beginning, containing 77 square feet more or less.

MUNICIPALITY OF ANCHORAGE
Project Management & Engineering Department

RIGHT OF WAY ACQUISITION
PARCEL MAP REQUIREMENTS

1. Document Size – typically the parcel map shall be produced on 8 ½ x 11 size paper with a border.
2. The drawing shall contain the following information:

   Title block - separated into specific information blocks identifying the following:

   - Project Management and Engineering Department Office of the Municipal Engineer, or in the case of a Federally Funded projects, "State of Alaska Department of Transportation & Public Facilities";
   - Project Name and Project Number;
   - The type of acquisition being acquired:

     Acquisition Type _____ (TCP, TCE, PUE, SLOPE, ELEC, TEL, IGP)
     Acquisition Area _____ sf

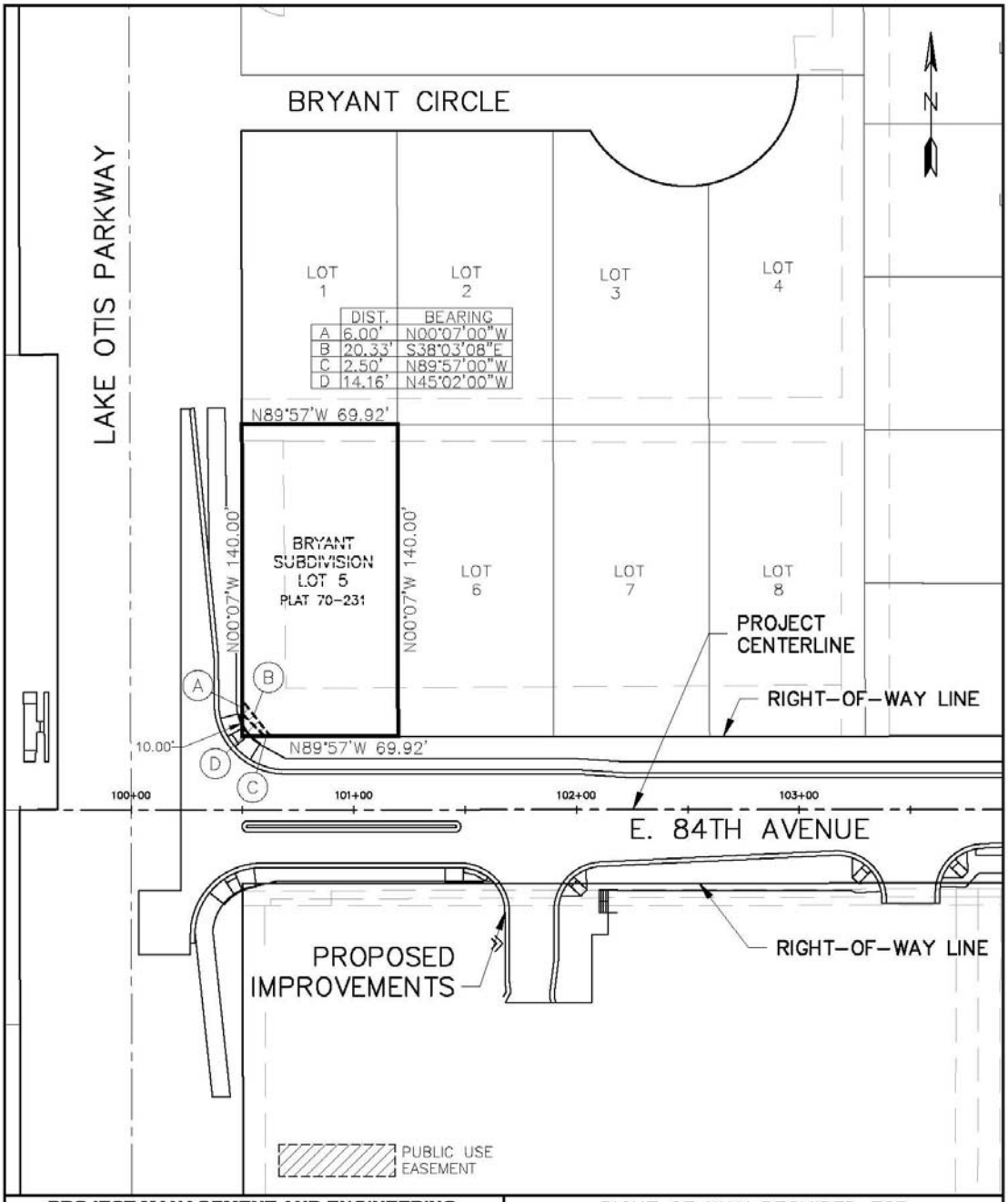
   - Scale of drawing;
   - Date of the drawing;
   - Parcel number;
   - Owner's Initials;
   - Exhibit or Attached To in the case of federal funding;
   - Page ____ Of ____ Dated _____
3. Drawing Contents – the drawing shall display:
   - A north arrow;
   - The subject lot and portions of the lots adjoining it on all applicable sides with the lot lines drawn in solid lines that display the bearing and distance of the lines.
   - The legal description of the parcel, including the plat name and filing number, lot number or tract designation, Subdivision name, block number if appropriate;
   - All easements shown in dashed lines and screened back;

- Parcel improvements screened back from the rest of the drawing to include building footprints whether permanent or temporary, driveways, sidewalks, fencing, landscaping, lighting, trees, signs, mailboxes, water hydrants, electric pedestals, telephone and cable boxes, underground tank vent pipes, storage tanks, retaining walls, etc. to show the present use of the property and the likely impact an acquisition will have on the parcel.
- Street improvements currently existing in a screened back display with proposed project improvements in dark lines consistent with proposed project plan view drawing symbols. This includes streets, curbs, sidewalks and paths, retaining walls, lighting, utilities, slope limits, etc.
- Show the proposed acquisition area in dark lines that include the dimensions of the acquisition that are described by bearing and distance for irregular shapes and distances for rectangular shapes. Sometimes a table may identify the acquisition more conveniently. Locate the acquisition in relation to the lot lines with dimensions (generally expressed in feet). Highlighting the acquisition area may be desirable in some situations and is left to the discretion of the parcel map preparer.
- Show the street names and dimensions of the right of way fronting or affecting the parcel and show the project centerline stationing as well for ease of location when referring to the construction plans.
- Utilize descriptors with location arrows to identify features and uses such as slope limits, drainage direction, dimensioning, etc.

A written legal description with current date shall accompany the parcel map and the descriptor information shall mirror the acquisition information shown on the parcel map.

A parcel map drawing example is included with this specification displaying the Project Management and Engineering required format for use when preparing parcel maps for project acquisition needs. There are no exceptions to the format without receiving prior approval from the Municipal Surveyor.

Revisions to parcel map and legal description should always include the current date of the revision.


BRYANT CIRCLE
LAKE OTIS PARKWAY
N
LOT 1
LOT 2
LOT 3
LOT 4
DIST. BEARING
A 6.00' N00°07'00"W
B 20.33' S38°03'08"E
C 2.50' N89°57'00"W
D 14.16' N45°02'00"W
N89°57'W 69.92'
BRYANT SUBDIVISION LOT 5 PLAT 70-231
N00°07'W 140.00'
N00°07'W 140.00'
LOT 6
LOT 7
LOT 8
PROJECT CENTERLINE
RIGHT-OF-WAY LINE
A
B
C
D
10.00'
N89°57'W 69.92'
100+00
101+00
102+00
103+00
E. 84TH AVENUE
PROPOSED IMPROVEMENTS
RIGHT-OF-WAY LINE
PUBLIC USE EASEMENT
PROJECT MANAGEMENT AND ENGINEERING DEPARTMENT
OFFICE OF THE MUNICIPAL ENGINEER
RIGHT OF WAY REQUIRED FOR
84TH AVENUE & SPRUCE STREET IMPROVEMENTS
MOA PM&E NOS. 02-02 & 02-08
OWNER'S INITIAL
EXHIBIT
PAGE ___ OF ___ DATED
ROW ACQUISITION TYPE PUE
ROW ACQUISITION AREA 50 S.F.
SCALE 1"=60' DATE July 10, 2005
PARCEL NO. 131

APPENDIX 1D

Municipality of Anchorage Driveway Standards

Appendix 1D
Municipality of Anchorage Driveway Standards
Foreword

The Municipality of Anchorage (MOA) has adopted the following memorandum, "Policy for Driveway Standards," as minimum MOA standards for the location and design of driveway access points. These standards apply to all driveway permits and encroachment permits issued upon MOA rights-of-way. They apply to all MOA development-related approvals, including rezoning, subdivision development, conditional uses, and public and private facility design.

Included herein for informational purposes is the "Policy for Driveways Standards" memorandum as adopted by MOA in December 2006, which may not be the most current version. The latest version of the standards as revised or amended by MOA shall be used. Contact the Traffic Department for the latest version.

MUNICIPALITY OF ANCHORAGE
Traffic Department

MEMORANDUM

DATE: **December 11, 2006**

TO: **Anchorage Contractors, Builders, Designers, and Land Owners**

FROM: **Robert E. Kniefel, P.E., Municipal Traffic Engineer**

SUBJECT: **Municipal Driveway Standards**

Pursuant to AMC Title 21.45.080.X.4.h the Traffic Engineer has the authority to set driveway standards. Many factors are weighed when dealing with driveway location and design. Residential driveways, for example, would have very different design criteria than a commercial or industrial driveway. The location and design of driveways is based upon many factors including:

- land use,
- location of individual property lines,
- available street frontage,
- on-street parking,
- requirements of internal site design,
- number of vehicles expected to use the driveway,
- vehicle volumes on the street,
- functional class of the roadway, and
- traffic safety.

The purpose of this standard is to detail the parameters to be used for the design of driveways within the Municipality of Anchorage Right of Way. The permittee should contact the Alaska Department of Transportation and Public Facilities (ADOT) for driveway permits on State of Alaska Right of Way. The ADOT has established driveway standards in *Chapter 1190 Preconstruction Manual.* (A copy can be found at http://www.dot.state.ak.us/stwddes/dcspubs/manuals.shtml#)

Driveway standards found in ADOT Preconstruction Manual Chapter 1190 are hereby adopted for the design of driveways within the Municipality of Anchorage. Following is a summary of some of the requirements as well as some minor additions/changes from the ADOT requirements including:

- curb return requirements (required under certain conditions),
- driveway widths (wider under certain conditions),
- driveway profiles (more restrictive grades),
- sight distance (more restrictive).

Driveway Standards 11-6-06.doc

1. Functional Classification:

1.a. Highways, roads, and streets are classified according to their intended function as shown in the Municipality of Anchorage *Official Streets and Highways Plan* (OSHP). Functional classification is an important factor when considering driveway access on arterials, collectors, or local roads.

- ***Arterials*** are primarily for moving large volumes of vehicles and goods along the roadway. For safety and efficiency, arterials should have few, if any, private driveways.
- ***Collectors*** serve as a bridge between arterials and the local road system providing only limited access to abutting property.
- ***Local roads*** are primarily to provide access to the public road system from the property adjacent to the roadway.

1.b. Driveways will not be allowed on arterials if other access is available.

1.c. If driveways directly accessing the arterials are necessary, then, due to concerns of safety and the need to move through traffic efficiently, their number, location, and design will be strictly controlled to minimize the effect on the movement of through traffic and goods.

2. Curb Cuts and Curb Returns:

2.a. **Driveways for single family up to 7-plex residential use** may provide curb returns or curb cuts. If curb returns are used, they will use the following radius:

- Single Family and Duplex – 5'
- Triplex through 7-plex – 15'

2.b. **Driveways for commercial structures (including 8-plex and greater)** shall provide curb return driveways as follows:

- Low volume residential/commercial developments – 5' up to 15' curb returns.
- Large volume commercial developments – 15' curb returns (Large-truck traffic may require larger radii to accommodate truck base turning radius for largest vehicle required to use the driveway.)

3. Driveway Widths (up to 7-plex):

3.a. 14' – 20' maximum curb cuts

3.b. 21' – 28' widths are allowed if:

- The driveway width is less than 2/5 of the lot frontage, and snow storage is available within the right-of-way (in the direction of anticipated snow removal) and is equal to the driveway width.
- The availability of snow storage area can be determined in one of two ways:

  3.b..1. Snow storage equal or greater than the driveway width is available in the right-of-way associated with the property; or

  3.b..2. Snow storage equal to or greater than the driveway width is available beyond the driveway within the right-of-way associated with the adjacent property, excluding driveways, mailboxes or other permitted uses within the right-of-way.

3.b..3. These two determinations can only be applied when the driveway of the adjacent property (in the direction of anticipated snow removal) has been permitted and constructed.

4. Driveway Widths – Rural farm:

4.a. 14' – 24' maximum width.

5. Driveway Widths – Commercial/Residential (8-plexes or greater):

5.a. 24' – 34' maximum width.

6. Driveway Angle:

6.a. The driveway angle should be 90 degrees, and should not be less than 60 degrees except where designed as a one-way right-turn in only.

7. Driveway Profile:

7.a. **Residential** – Maximum grade of ±10%.

7.b. **Commercial** – Maximum grade of ±8%.

- Algebraic difference of ≤6% - transition curve is optional.
- Algebraic difference of >6% - transition curve is required.

8. Landing Grades:

8.a. **Residential** – for passenger cars a minimum 12 foot long landing area where the driveway intersects with the roadway must be provided with a ±2% maximum grade.

- Where hillside lots exceed the maximum grade of ±10%, the required parking spaces will be provided adjacent to the ±2% landing grade.

8.b. **Commercial** – Provide a 20 foot long landing area of ±2% maximum grade where the driveway intersects with the roadway. For semi-tractors or trailers, provide a 30 foot long landing area of ±2% maximum grade where the driveway intersects with the roadway.

9. Number of Driveways:

9.a. Frontages of 50 feet or less – 1 driveway

9.b. Frontages of 50 feet to 1000 feet – 2 driveways (refer to *Distances Between Driveways*)

9.c. Frontages over 1000 feet – 2+ driveways (refer to *Distances Between Driveways*)

10. Distance Between Driveways:

10.a. The minimum distance between two adjacent driveways, on the same parcel, measured along the right-of-way line between the adjacent edges of the driveways, should conform to the following table (Trip rates are found in the Institute of Transportation Engineers – *Trip Generation Manual,* latest edition):

Hourly Volume > 10 vph			
Speed (mph)	Rural Arterial and Collector Roads (feet)	Urban Arterial and Collector Roads (feet)	Urban and Rural Local Streets and Roads (feet)
25	350	150	150
30	370	200	200
35	400	260	250
40	440	340	310
45	540	430	390
50	690	510	490

Hourly Volume ≤ 10 vph	
Functional Classification	Distance (feet)
Arterial Roadways	75
Collector Roadways	50
Local Roadways	35

11. Corner Clearance:

11.a. The minimum distance from the nearest face of curb, or nearest edge of traveled way for uncurbed roadways, of an intersecting public roadway to the nearest edge of driveway should conform to the following table:

Hourly Volume > 10 vhp			
Speed (mph)	Major Generator >250 vph (feet)	Medium Generator 100-250 vph (feet)	Small Generator <100 vph (feet)
25	150	120	60
30	200	150	80
35	260	210	110
40	330	260	150
45	390	310	180
50	460	340	230

Hourly Volume ≤ 10 vhp			
Functional Classification	Curbed Crossroad (feet)	Uncurbed Crossroad	
		Urban (feet)	Rural (feet)
Arterial Roadways	60	70	100
Collector roadways	50	60	60
Local Roadways	40	50	60

12. Sight Distance:

12.a. Figure 1 illustrates the unobstructed sight distance along the public roadway which must be provided at all streets, driveways, or allies for motorist entering the roadway.

- Please note, Mugo Pine, or other landscaping plant that requires aggressive maintenance, cannot be placed where it will obstruct sight distance.

12.b. ***Definition:*** The term "sight distance triangle" refers to the roadway area visible to the driver. The required length is the distance necessary to allow **safe vehicular egress from a street, driveway, or alley to a major street.**

12.c. ***Criteria:*** The sight triangle is shown in Figure 1 and described as follows:

- Point A is located on the minor approach 14.5 feet back from the edge of the major road travelway with no sidewalk, or 12 feet from edge of back of sidewalk;
- Point B_1 is located in the center of lane 1;
- Point B_2 is located in the center of lane 2;
- Point C_1 and C_2 are located based on design speed of the major road and is the distance shown in Table 1;
- Point A is connected to Points C_1 and C_2 by a straight line.

Figure 1

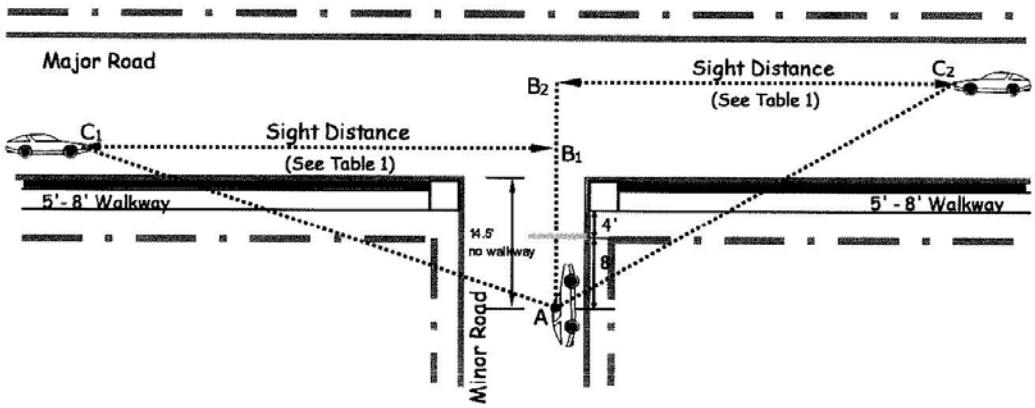


Table 1

Posted Speed (mph)	Sight Distance (feet)
65	720
60	665
55	610
50	555
45	500
40	445
35	390
30	335
25	280
20	225

12.d. ***Note:*** Sight distance is measured from height of eye of 3.5 feet on minor road and height of object of 3.5 feet on the major road. Trees in the sight triangle are acceptable if trunk is less than 4 inches in diameter at maturity and branches are trimmed within 2.5 feet to 8 feet per AASHTO – *A Policy on the Geometric Design of Highways and Streets, 2004* (or latest edition).

12.e. ***Note:*** Sight distance shown is for a stopped passenger car to turn left onto a two-lane roadway with no median and grades of 3% or less. For other conditions and vehicle types (trucks), the time gap must be adjusted and required sight distance recalculated per AASHTO – *A Policy on the Geometric Design of Highways and Streets, 2004* (or latest edition).

Robert E. Kniefel, P.E.
Municipal Traffic Engineer
Date: 12-12-06

Driveway Standards 11-6-06.doc

APPENDIX 1E

ADA Checklist

Statement of Technical Infeasibility

CHECKLIST FOR ACCESSIBLE SIDEWALKS AND STREET CROSSINGS

The Americans with Disabilities Act (ADA) requires that new and altered public sidewalks and street crossings be accessible so that people with disabilities can use the pedestrian routes that connect buildings, facilities, and transportation modes. Title II of the ADA covers new sidewalks and streets constructed by or on behalf of a State or local government. The Department of Justice (DOJ) Title II regulation specifically requires that curb ramps be provided when sidewalks or streets are newly constructed or altered. Sidewalks and curb ramps covered by Title II should comply with the technical standards in ADAAG, UFAS (the 1984 standard for Federal construction), or other accessibility code that meets or exceeds the level of accessibility required under the ADA. Many of the same provisions that govern the accessible route on a building site or within a building, as specified in the ADA Accessibility Guidelines (ADAAG, sections 1-10), can also be applied to public sidewalks. Additional requirements for existing pedestrian networks not otherwise being altered are also included in the DOJ regulation.

As of this printing of the DCM, the Americans with Disabilities Act Accessibility Guidelines (ADAAG) were last updated on July 23, 2004. Draft Guidelines for Accessible Public Right-of-Way (PROWAG) were released for public comment most recently on July 26, 2011,, and have yet to be adopted by the Federal Access Board. It is anticipated that the final rule for Guidelines for Accessible Public Right-of-Way will be published as ADAAG Section 14. The ADAAG and the draft Guidelines for Accessible Public Right-of-Way (PROWAG) are available at: http://www.access-board.gov/.

The Access Board is expected to prepare a proposed rule based on its review of the comments received in the near future. The proposed rule will also be made available for public comment.

CURB RAMPS

- A curb ramp or other sloped area is required wherever a new or altered pedestrian walkway crosses a curb or other barrier to a street, road, or highway. Similarly, a curb ramp is required wherever a new or altered street intersects a pedestrian walkway. A curb ramp may be perpendicular to the curb it cuts or parallel with the sidewalk. Other designs may also comply, including sidewalks that ramp down to a lesser curb height, combined with a short perpendicular curb ramp at the street.

- The running slope of a new curb ramp should not exceed 1 in 12 (8.33%) maximum or be less than 1 in 20 (5%) minimum. Curb ramps in alterations where it is technically infeasible to meet new construction requirements may have a maximum slope of 1 in 10 (10%), but only for a maximum 3-inch rise.

- Construct new curb ramps at least 5 feet wide with no obstructions, protrusions or utility lids. A minimum 4-foot by 4-foot landing should be provided at the top and bottom of curb ramps. A curb ramp must connect to a travel route that is at least 48 inches wide and has a cross slope of no more than 1:48 (2%). If a curb ramp is located where pedestrians must walk across the ramp, or where not protected by handrails or guardrails, it shall have flared sides. Maximum slope of the flare shall be 1:10 (1%)

- The transition from curb ramp to gutter should be flush. Lips are not permitted. Adjacent counterslopes in the line of travel should not exceed 1 in 20 (5%) and should connect smoothly with other elements of the pedestrian network.

- The foot of a curb ramp should be contained within the crosswalk markings. Pedestrians who use wheelchairs should not be directed outside the crosswalk or into an active travel lane in order to cross stopped traffic. If a diagonal ramp is used, the 48-inch long bottom landing should be fully contained within the space between the curb radius and curb line extensions.

- When repaving or reconstructing an intersection, provide each crosswalk with a separate curb ramp, if feasible.

- When constructing or reconstructing intersections, construct crosswalks at least 8 feet wide with a maximum 5% running slope and a maximum 2% cross slope. This may require widening intersections.

SIDEWALKS

- A new sidewalk should be wider than the minimum accessible travel width of 48 inches. Maneuvering space is necessary for a pedestrian using a wheelchair to turn, to pass by other pedestrians, to operate and pass through an entrance door, to use a sidewalk telephone or to activate a pedestrian crossing button. A 60-inch minimum width can accommodate turns and passing space and is recommended for sidewalks adjacent to curbs in order to provide travel width away from the drop-off at the street edge.

- The cross slope of a sidewalk should not exceed 1:50 (2%). Excessive cross slope tends to direct wheelchair users into the street. At driveways there should be a 36-inch wide passage with a cross slope of no more than 1:50 (2%). Corners at intersections should comply in both directions, since the running slope of one walkway will be the cross slope of another.

- Street furniture, plantings, and other fixed items should not protrude into travel routes. Items protruding more than 4 inches into the pedestrian envelope, between 27 inches and 80 inches high, including signs, landscaping, wall hydrants, trash receptacles, staircases, post-mounted j-boxes, street vendor awnings, etc., are not cane detectable. They must be marked with a curb, post or other clue as to their existence. Protrusions may not reduce the clear width required for pedestrian access route.

STREET CROSSINGS

- Consider the information needs of blind and low-vision pedestrians at intersections. Street crossing design should ensure that the boundary between the sidewalk and the street is detectable. Pedestrian crossing information should be available to all users.

- Insufficient crossing time may be a barrier for some pedestrians. Every pedestrian group should be expected to contain some walkers whose rate of travel is 3.0 feet per second.

TEMPORARY WORK

- Temporary work should be accessible. Where construction blocks a public sidewalk for more than a short time, an alternate route that includes curb ramps and other accessible features should be provided. Temporary events and facilities, such as street fairs, parades, and vending carts should also meet accessibility criteria. Temporary road signage and fencing should not encroach on accessible passage or headroom.

OTHER PEDESTRIAN FEATURES

- Pedestrian facilities on and along sidewalks must be accessible. Signal actuating buttons, drinking fountains, telephones, kiosks, and other pedestrian elements should meet accessibility criteria for approach and maneuvering space, reach range, and controls and operation.