Alaska Department of Transportation and Public Facilities

Alaska Highway Preconstruction Manual

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Alaska Highway Preconstruction Manual

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100. Abbreviations, Acronyms, and Glossary

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100.1. Abbreviations and Acronyms

3R: Resurfacing, Restoration, and Rehabilitation

AAA: Authority to Appraise and Acquire

AAC: Alaska Administrative Code

AADT: Average Annual Daily Traffic

AASHTO: American Association of State Highway and Transportation Officials

ABSM: Alaska Bridges and Structures Manual

ADA: Americans with Disabilities Act

ADF&G: Alaska Department of Fish and Game

ADT: Average Daily Traffic

AHDM: Alaska Highway Drainage Manual

AKFPDM: Alaska Flexible Pavement Design Manual

ALBDS: AASHTO LRFD Bridge Design Specifications

AO: Administrative Order

APDES: Alaska Pollution and Discharge Elimination System

ARRC: Alaska Railroad Corporation

AS: Alaska Statute

ATA: Authority to Advertise

ATM: Alaska Traffic Manual (MUTCD with Alaska Supplement)

ATP: Authority to Proceed

B/C: Benefit/Cost

BMP: Best Management Practices

CA: Certification Acceptance

CCO: Chief Contracts Officer

CEA: Cost-Effective Analysis

CE: Categorical Exclusion

CFR: Code of Federal Regulations

CGP: Construction General Permit

CIP: Capital Improvement Program

CL: Centerline

COA: Class of Action

CR: Constructability Review

CRO: Civil Rights Office

CSS: Context Sensitive Solutions

CWA: Clean Water Act

CZ: Clear Zone

DBE: Disadvantaged Business Enterprise

DD: Decisional Document

DEC: Department of Environmental Conservation

DEIS: Draft Environmental Impact Statement

DHV: Design Hourly Volume

DNR: Department of Natural Resources

DOL: Department of Labor

DOT&PF: Alaska Department of Transportation and Public Facilities

DPDR: Department Procedures and Regulations

DPOL: Department Policy

DSR: Design Study Report

EA: Environmental Assessment

EEO: Equal Employment Opportunity

EFH: Essential Fish Habitat

EIS: Environmental Impact Statement

EO: Executive Order

EPA: Environmental Protection Agency

EPM: NEPA Assignment Program Environmental Procedures Manual

ESA: Endangered Species Act

ESC: Erosion and Sediment Control

ESCP: Erosion and Sediment Control Plan

FAA: Federal Aviation Administration

FAHP: Federal-Aid Highway Program

FAST Act: Fixing America's Surface Transportation Act

FEIS: Final Environmental Impact Statement

FHPM: Federal Highway Program Manual

FHWA: Federal Highway Administration

FONSI: Finding of No Significant Impact

FTA: Federal Transit Administration

GB: Green Book. More specifically, the *AASHTO A Policy on Geometric Design of Highways and Streets*

GDVLVLR: *Guidelines for Geometric Design of Very Low-Volume Local Roads (AASHTO)*

GPS: Global Positioning System

HCM: Highway Capacity Manual

HEC-22: *Urban Drainage Design Manual*, Hydraulic Engineering Circular, No. 22

HOV: High Occupancy Vehicle

HPCM: Alaska Highway Preconstruction Manual

HSIP: Highway Safety Improvement Program

ITE: Institute of Transportation Engineers

ITS: Intelligent Transportation System

LA: Legislative Authority

LON: Length of Need

LOS: Level of Service

LPA: Local Public Agency

MAP-21: Moving Ahead for Progress in the 21st Century Act

MASH: Manual for Assessing Safety Hardware

MCL: Materials Certification List

MMCL: Master Materials Certification List

MMPA: Marine Mammal Protection Act

MOA: Memorandum of Agreement

MOU: Memorandum of Understanding

mph: Miles Per Hour

MPO: Metropolitan Planning Organization

MRS: Management Reporting System

MUTCD: Manual on Uniform Traffic Control Devices

MVM: Million Vehicle Miles

NCHRP: National Cooperative Highway Research Program

NEPA: National Environmental Policy Act

NHS: National Highway System

NMFS: National Marine Fisheries Service

NOC: Notice of Cancellation

NOI: Notice of Intent

NTP: Notice to Proceed

P&P: Policy and Procedure

PDA: Project Development Authorization

PE: Preliminary Engineering

PID: Project Information Document

PIF: Public Interest Finding

PIH: Plans in Hand

PIP: Public Involvement Plan

PL: Public Law

PM: Preventive Maintenance

PMP: Project Management Plan

PoDI: Projects of Division Interest

PS&E: Plans, Specifications, and Estimate

PSA: Professional Services Agreement

RDG: Roadside Design Guide

REM: Regional Environmental Manager

RIP: Roadway Information Portal

RLDG: Roadside Lighting Design Guide

ROD: Record of Decision

ROW: Right-of-Way

RPRL: Recommended Practice for Roadway Lighting (RP-8-14)

RSAP: Roadside Safety Analysis Program

RTSE: Regional Traffic and Safety Engineer

R/W: Right-of-Way

SAFETEA-LU: Safe, Accountable, Flexible, Efficient Transportation Equality Act: A Legacy for Users

SD: Sight Distance

SE: Systems Engineering

SEA: Systems Engineering Analysis

SEO: Statewide Environmental Office

SHPO: Statewide Historic Preservation Office

SNTB: Special Notice to Bidders

SOA: Stewardship and Oversight Agreement

SSD: Stopping Sight Distance

SSHC: Alaska Standard Specifications for Highway Construction

STIP: Statewide Transportation Improvement Program

SWPPP: Storm Water Pollution Prevention Plan

T&M: Time and Materials

TAP: Transportation Alternatives Program

TCP: Traffic Control Plan

TL-3: Test Level 3

TMDL: Total Maximum Daily Load

TOP: Traffic Operation Plan

TRB: Transportation Research Board

T/W: Traveled Way

US: United States

USACE: United States Army Corps of Engineers

USC: United States Code

USCG: United States Coast Guard

USFWS: US Fish and Wildlife Service

V: Design Speed (expressed in miles per hour, unless otherwise noted)

VE: Value Engineering

VLVLR: Very Low-Volume Local Road

vpd: Vehicles per Day

VSL: Value of Statistical Life

100.2. Glossary

6004: Section 6004(a) of SAFETEA-LU, which allows DOT&PF to assume responsibility for determining whether certain designated activities are included within classes of action that are categorically excluded from requirements for Environmental Assessments or Environmental Impact Statements.

85th Percentile Speed: The 85th percentile of the distribution of observed speeds.

AASHTO Bike Guide: The American Association of State Highway and Transportation Officials *Guide for the Development of Bicycle Facilities*.

Adjacent Path: A path alignment that closely parallels the main roadway corridor.

Administrative Order (AO): An order issued by The Governor to take certain corrective action, or to refrain from an activity. A list of AOs is found here:

https://gov.alaska.gov/admin-orders/index.php

Alaska Administrative Code (AAC): The regulations implementing state law, referred to by title, chapter, and section e.g., 17 AAC 15.011.

http://www.legis.state.ak.us/basis/aac.asp

Alaska Statutes (AS): Usually referred to by title, chapter, and section, e.g., AS 36.30.100.

http://www.legis.state.ak.us/basis/folio.asp

Americans with Disabilities Act (ADA): Section 504 of the Rehabilitation Act of 1973 (Public Law 93-112, amended by PL 516 and PL95-602) requires federally funded facilities and programs to be accessible to people with disabilities. A federal law (#103-366) enacted on July 26, 1990 that prohibits discrimination against people with disabilities regarding access to programs, activities, or facilities provided by state and local governments. Also includes companion regulations in 28 CFR parts 35, 36, 37, and 36 CFR part 1191.

Annual Average Daily Traffic (AADT): The total volume of traffic passing a point or segment of a highway facility in both directions for one year divided by the number of days in the year.

Arterial Highway: That portion of the road system which provides a high-volume, higher speed network for travel between major points in both rural and urban areas.

At-grade Intersection: An intersection where all roadways join or cross at the same level.

Authority to Advertise (ATA): DOT&PF approval to advertise a project for bids, requested in a standardized memo format. ATA is granted when all signatures are obtained and any limiting conditions or exceptions are satisfied.

Authority to Proceed (ATP): FHWA or DOT&PF approval to proceed with the initial, or next stage of project development.

Auxiliary Lane: The portion of the roadway adjoining the through-traveled way for speed change, turning, storage for turning, weaving, truck climbing, or other purposes supplementary to through-traffic movement.

Average Daily Traffic (ADT): The total volume during a given time period (in whole days), greater than one day and less than one year, divided by the number of days in that time period.

Average Running Speed: The sum of the distances traveled by vehicles on a highway section during a specified time period divided by the sum of their running times.

Average Travel Speed: the length of the highway segment divided by the average travel time of all vehicles traversing the segment, including all stopped delay times.

Backfill: Material used to replace or the act of replacing material removed during construction. Also may denote material placed or the act of placing material adjacent to structures.

Bicycle Facility: A general term denoting improvements and provisions to accommodate or encourage bicycling, including parking and storage facilities, and shared roadways not specifically defined for bicycle use.

Bicycle Lane: A portion of roadway that has been designated for preferential or exclusive use by bicyclists by pavement markings and, if used, signs. It is intended for one-way travel, usually in the same direction as the adjacent traffic lanes, unless designated as a contra-flow lane.

Borrow: An approved material required for embankments or for other portions of the work, and obtained from sources outside the right-of-way limits for the project.

Bus: A self-propelled, rubber-tired road vehicle designed to carry a substantial number of passengers (at least 16) and commonly operated on streets and highways.

Capacity: The maximum sustainable hourly flow rate at which persons or vehicles reasonably can be expected to traverse a point or a uniform segment of a lane or roadway during a given time period under prevailing roadway, environmental, traffic, and control conditions.

Capital Improvement Plan (CIP): The Department's plan for project activities spanning the next six federal fiscal years.

Categorical Exclusion (CE): A type of environmental classification used on federal-aid highway projects when there are no significant environmental impacts, as described in Section 430.4.2.

Certification Acceptance (CA): Certification Acceptance. A program agreement with the FHWA contained in the Stewardship and Oversight Agreement (SOA) that grants the Department authority to administer certain federally funded roadway projects.

Clear Runout Area: The additional clear zone space that is needed because a portion of the suggested clear zone falls on a non-recoverable slope. The width of the clear runout area is equal to portion of the clear zone distance that is located on the non-recoverable slope.

Clear Zone (CZ): 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.

Code of Federal Regulations (CFR): Regulations that implement federal law, referred to by title, part, and section, e.g., 23 CFR 630.114. Title 23 covers Highways.

https://www.ecfr.gov/cgi-bin/text-idx?tpl=%2Findex.tpl

Collector Road: A road collecting traffic from local roads and channeling it to the arterial system.

Collector-Distributor Road: A continuous roadway without local access provided parallel to a freeway mainline through one or more interchanges for the purpose of removing weaving movements or closely spaced merges and diverges from the mainline.

Collector Street: A public highway, usually serving moderate traffic volumes. Collector streets serve a dual function: collecting traffic for movement between arterial streets and local roads, and providing access to abutting properties. Collector streets link neighborhoods or areas of homogenous land use with the arterial street systems. These streets not only serve traffic movements between arterials and local streets, but also serve through traffic within local areas.

Commissioner: The Commissioner of the Alaska Department of Transportation and Public Facilities.

Construction: Defined in AS 19.59.001(2) as construction, reconstruction, alteration, improvement, or major repair.

Construction is also defined in 23 USC 101(a)(4) as it applies to most FHWA funded projects. This definition is particularly important in the context of a project's eligibility for FHWA funding.

https://www.gpo.gov/fdsys/pkg/USCODE-2016-title23/pdf/USCODE-2016-title23-chap1-sec101.pdf

Context Sensitive Solutions (CSS): A collaborative interdisciplinary approach that involves interested stakeholders in developing a transportation facility that, to the extent practical, maintains or enhances mobility, provides a high level of safety, fits its physical setting and preserves scenic, aesthetic, historic, cultural and environmental values and resources. CSS is an approach that considers the total context within which a transportation improvement project exists.

Controlling Design Criteria: Design criteria identified by FHWA as having substantial importance to the operational and safety performance of any highway such that special attention should be paid to them in design decisions. See Section 1100.3.2. for a listing.

Cross-slope: The slope across the traveled way, auxiliary lane, or shoulder of a roadway. Usually expressed in percentage of fall in feet of the roadway per foot of width.

Cul-de-sac Street: A local street open at one end only. A cul-de-sac should have a special turning area at the closed end.

Department: The Alaska Department of Transportation and Public Facilities (DOT&PF).

Design Criteria: Minimum dimensional values or ranges of values for various elements of the three-dimensional design features of a highway.

Design Exception: A documented approval to design a highway element or segment(s) of a highway project using a criterion that does not meet standards when that criterion is one of the controlling criteria adopted by FHWA. See Section 1100.3.2.

Design Hourly Volume (DHV): The DHV used in design is generally the 30th highest hourly volume of the year, abbreviated as 30 HV, which is typically about 15 percent of the ADT on rural roads.

Design Speed (V): A selected speed used to determine the various geometric design features of the roadway. The assumed design speed should be a logical one with respect to the topography, anticipated operating speed, the adjacent land use, and the functional classification of highway.

Design Standards: Design criteria, typically from published policies or guidelines, that are adopted by regulation or included in Table 1100-1. Design standards establish a uniform set of values to use as the basis for project design.

Design Study Report (DSR): A formal report that documents the preferred design solution. Approval of the DSR constitutes Design Approval. See Section 450.5.1.

Design Vehicle: A selected motor vehicle, the weight, dimensions, and operating characteristics of which are used in highway design.

Design Waiver: A documented approval to design a highway element or a segment(s) of a highway project using a design criterion that does not meet standards, when that criterion is not one of the FHWA controlling criteria. See Section 1100.3.2.

Disadvantaged Business Enterprise (DBE): A for-profit business concern that: (1) is at least 51 percent owned by one or more individuals who are both socially and economically disadvantaged or, in the case of a corporation, in which 51 percent of the stock is owned by one or more such individuals; and (2) Whose management and daily business operations are controlled by one or more of the socially and economically disadvantaged individuals who own it.

Ditch: A channel cut in the surface of the ground for drainage purposes. Usually parallel and adjacent to the roadway.

Divided Highway: A highway with separated roadways for traffic in opposite directions.

DOT&PF: The Alaska Department of Transportation and Public Facilities. Also referred to in this manual as the Department.

DPDR: Department Procedures and Regulations. See also P&P.

DPOL: Department Policy. See also P&P.

Embankment: A structure of soil, soil-aggregate, or broken rock between the embankment foundation and the subgrade.

Environmental Document: A report required on all federal-aid capital projects because of the National Environmental Policy Act (NEPA). It summarizes the alternative courses of action, evaluates their potential environmental effects, commits to measures necessary to mitigate adverse impacts, and includes agency coordination and public involvement. The type of document (classification), as defined in 23 CFR 771.115, depends on the project's environmental impact. It may be an EIS, CE, or EA, as described in Section 430.4.2. An environmental document may also be necessary on a state-funded project that requires action by a federal agency, such as federal permits or clearances.

Environmental Assessment (EA): A type of environmental classification used on federal-aid highway projects when the extent of environmental impacts is uncertain. The EA results in either a Finding of No Significant Impact (FONSI) or a decision to develop an Environmental Impact Statement (EIS), as described in Section 430.4.2.

Environmental Impact Statement (EIS): A type of environmental classification used on highway projects when a significant environmental impact is anticipated, as described in Section 430.4.2. The concluding action on an EIS results in a Record of Decision (ROD) through the federal agency with jurisdiction.

Executive Order (EO): Legally binding orders given by the President of the United States to federal agencies.

Expressway: A high-speed divided arterial highway for through traffic with access partially or fully controlled and grade-separations at major intersections

FAST Act: Fixing America's Surface Transportation Act of Dec. 4, 2015.

Federal-Aid Highway Program Policy and Guidance Center (PGC): A web-based searchable source of official FAHP policy and guidance documents.

https://www.fhwa.dot.gov/pgc/

Federal-Aid Policy Guide (FAPG): The collection of policies, procedures, and directives from the FHWA for administering the federal-aid program. The FAPG has been terminated and guidance is now found at the Federal-Aid Highway and Program Policy and Guidance Center.

Federal Aviation Administration (FAA): Usually refers to the Alaska Region offices in Anchorage.

Federal Highway Administration (FHWA): Usually refers to the Alaska Division offices in Juneau.

Federal Transit Administration (FTA): Sister agency to the FHWA and FAA, administrating the federal transit program. The regional office is located in Seattle, Washington.

Final Plans, Specifications, and Estimate (PS&E): The final PS&E assembly, with corrections made from the PS&E review, ready for advertisement.

Finding of no Significant Impact (FONSI): An environmental assessment conclusion, as described in Section 430.4.2, signed by the federal agency with jurisdiction.

Freeway: An expressway with fully controlled access.

Frontage Road: A local road auxiliary to and located adjacent to the side of an arterial highway for service to abutting property and adjacent areas and for control of access.

Functional Group: Same as Support Group.

Gore: The area immediately beyond the divergence of two roadways bounded by the edges of those roadways.

Grade: The level or elevation of something, or the longitudinal slope of an alignment.

Grade-Separation: A crossing of two highways, or a highway and a railroad, at different levels.

Gravel to Pavement Project: A road construction project with the primary purpose of reducing maintenance costs and improving roadway driving characteristics by hard surfacing gravel roads in accordance with the guidance provided in Section 1160.4 of this manual.

Green Book (GB): *AASHTO A Policy on Geometric Design of Highways and Streets.*

Highway: A highway (whether included in primary or secondary systems), road, street, trail, walk, bridge, tunnel, drainage structure and other similar or related structure or facility, and right-of-way thereof, and further includes a ferry system, whether operated solely inside the state or to connect with a Canadian highway, and any such related facility. Defined in AS 19.59.001(8).

Highway Safety Improvement Program (HSIP): A federally-mandated program to identify, evaluate, prioritize, and fund highway safety improvements. The HSIP focuses on reducing or eliminating fatal and serious injury crashes on all public roads.

Highway, Street, or Road: Recommended usage: In urban areas – highway or street. In rural areas – highway or road.

- Highway: A general term denoting a public way for vehicular travel, including the entire area within the right-of-way.
- Road: A general term usually denoting a rural public way for vehicular travel, including the entire area within the right-of-way.
- Street: A general term for an urban or suburban public way for vehicles, including the entire area within the right-of-way.

See Section 1.3 of the Green Book for definitions of urban and rural areas.

Horizontal Clearance: The horizontal distance from the edge of traveled way to a roadside object or feature.

Interchange: A system of interconnecting roadways in conjunction with one or more grade-separations, providing for the movement of traffic between two or more roadways on different levels.

Intersection: The general area where two or more highways join or cross, which includes the roadway and roadside facilities for traffic in that area. Where separate right-turn roadways are provided through use of curbed or unpaved islands, the intersections of the turning roadway with the other highways are considered separate intersections.

Interstate: Interstate is the highest level of principal arterial, primarily rural. Interstates connect large population centers.

Island: A defined area between traffic lanes for control of vehicle movements or for pedestrian refuge. Within an intersection, a median or an outer separation is considered an island. A right-turn lane created with a painted island is not considered a separate turning roadway.

Intelligent Transportation System (ITS): Electronics, communications, or information processing used to improve the efficiency or safety of a surface transportation system.

Intelligent Transportation System (ITS) Project: Any project that in whole or in part funds the acquisition of technologies that provide or significantly contribute to the provision of one or more ITS user services as defined in the National ITS Architecture.

Legislative Authority (LA): Approval given by the Alaska Legislature to the Executive Branch to spend state or federal funds towards a specific project. A legislative authority citation is given as ww.xx.yy.zz, where ww is the chapter, xx is the year, yy is the page, and zz is the line.

Length of Need (LON): Total length of a longitudinal barrier needed to shield an area of concern. The length of need point for a given system is usually confirmed by successfully passing a redirection crash test with impact at the length of need point.

Level of Service (LOS): A quantitative stratification of a performance measure or measures that represent a quality of service, measured on an A - F scale, with LOS A representing the best operating conditions from the traveler's perspective and LOS F the worst.

Local Road: A road primarily for access to homes, businesses, or other abutting property.

Local Street: A street primarily for access to homes, businesses, or other abutting property.

Maintenance: The preservation of each type of highway, roadside structure, and facility as nearly as possible to its original condition as constructed, or as subsequently improved, and the operation of highway facilities and services to provide satisfactory and safe highways. Defined in AS 19.59.001(9). See also Preventive Maintenance and Routine Maintenance.

Major Highway: An arterial highway, with intersections at-grade and direct access to abutting property, on which geometric design and traffic control measures are used to improve the safety of the movement of through traffic.

MAP-21: The Moving Ahead for Progress in the 21st Century Act (P.L. 112-141) enacted on July 6, 2012 that funds surface transportation programs.

Markings: All lines, patterns, words, colors, or other devices, except signs, set into the surface of, applied on, or attached to the pavement or curbing or to objects within or adjacent to the roadway, officially placed for regulating, warning, or guiding traffic.

Median: The portion of a divided highway separating the traveled ways of opposing traffic.

Median Opening: A gap in a median provided for crossing and/or turning traffic

Metropolitan Planning Organization (MPO): An MPO carries out transportation planning for urban areas with a population greater than 50,000 people. Defined in Federal Regulation 23 USC Sec. 134 (b) through (d). This includes Anchorage and Fairbanks.

Mid-block Crossing: Intersections formed when paths or sidewalks cross other transportation facilities at locations other than roadway-to-roadway intersections.

Mid-Design Period ADT: The projected ADT that occurs at a point in time equal to one-half the project design life.

National Highway System (NHS): The NHS includes the Interstate System; Congressional High Priority Routes; National Defense Roads (i.e. the Strategic Highway Network); and principal arterial routes or other routes that connect intermodal facilities.

National Environmental Policy Act (NEPA) Assignment Program: The surface transportation project delivery program established in 23 U.S.C. 327 allows DOT&PF to assume FHWA's responsibilities under NEPA.

New Construction: A major highway improvement that constructs a roadway, on new alignment, to the design requirements of the Green Book, and the *Alaska Highway Preconstruction Manual.*

New Construction - Reconstruction: A major highway improvement that completely rebuilds an existing roadway or constructs a roadway on new alignment, to the contemporary design requirements

of the Green Book, and the *Alaska Highway Preconstruction Manual*.

Non-Motorized Transportation: Transportation by human power, including bicycling, walking, in-line skating, skiing, and other methods.

Non-NHS: A term used to designate roads other than those on the NHS. Non-NHS roads are to be designed, constructed, operated, and maintained in accordance with state laws, regulations, directives, safety standards, design standards, and construction standards.

Non-recoverable Slope: A slope that is considered traversable but on which the errant vehicle will continue on to the bottom. Embankment slopes between 3:1 and 4:1 may be considered traversable but non-recoverable if they are smooth and free of fixed objects.

Notice of Intent (NOI): The official notification that a federal agency is beginning the process to prepare an Environmental Impact Statement (EIS).

Operating Speed: The speed at which drivers are observed operating their vehicles during free-flow conditions. The 85th percentile of the distribution of observed speeds is the most frequently used measure of the operating speed associated with a particular location or geometric feature. This speed may be higher or lower than posted or legislated speed limits or nominal design speeds where alignment, surface, roadside development, or other features affect vehicle operations.

Overpass: A grade-separation where the subject roadway, railroad, or pedestrian facility passes over the subject highway.

Parked Vehicle: A vehicle stopped for temporary storage.

Passenger Car: A motor vehicle, except motorcycles, designed for carrying a limited number of passengers and used for the transportation of people.

Path: An improved facility, greater than or equal to 8 feet in width, physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. Bicyclists, pedestrians, skaters, wheelchair (both self- and electric-powered) users, joggers, skiers, and other non-motorized users may use paths.

Pavement Replacement: The replacement of the entire existing pavement structure by the placement of new pavement structure.

Pavement replacement may utilize either new or recycled materials incorporated into the materials used for the replacement of the existing pavement section. Pavement replacement is required when a pavement has either failed or has become functionally obsolete.

Pavement Rehabilitation: Structural enhancements that extend the service life of an existing pavement and/or improve its load carrying capacity. Rehabilitation techniques include restoration treatments and structural overlays.

Pavement Structure: The combination of select material, subbase, base, and surface course placed on a subgrade to support the traffic load and distribute it to the roadbed (42 inches below the asphalt concrete layer).

Phase: Refers to project programming phase as it appears in the STIP.

Phase 1 – Unprogrammed Legislative Authority
Phase 2 – Preliminary Engineering
Phase 3 – ROW
Phase 4 – Construction
Phase 7 – Utility Relocation
Phase 8 – Planning & Research
Phase 9 – Other

Policy & Procedures (P&P): Synonymous with DPOL (Department Policy) and DPDR (Department Procedures and Department Regulations). Policies and Procedures are found at:

http://www.dot.state.ak.us/admsvc/pnp/policy_and_procedures.shtml

Posted Speed: The regulatory speed conveyed on a traffic sign.

Preliminary Engineering (PE): Preliminary engineering includes preliminary and final design, both defined in 23 CFR 636.103, and other project-related work leading to physical construction. This includes costs to perform studies needed to address requirements of the National Environmental Policy Act (NEPA) and other environmental laws. It may include advertising and other pre-award work such

as bid analysis, although it is also acceptable to include this work as construction engineering cost.

Preservation: Preservation consists of work that is planned and performed to improve or sustain the condition of the transportation facility in a state of good repair. Preservation activities generally do not add capacity or structural value, but do restore the overall condition of the transportation facility.

Preventive Maintenance (PM): A cost-effective means of extending the useful life of highways. PM slows or delays future deterioration and maintains or improves the functional condition of highway facilities without increasing structural capacity.

Preventive Maintenance (PM) Project: A project that is a cost-effective means of extending the useful life of Alaska's highways. A PM project slows or delays future deterioration and maintains or improves the functional condition of highway facilities without increasing structural capacity. A PM project is a proactive approach to maintaining highway facilities while they are still in relatively good condition and is performed before the onset of serious damage, delays or eliminates the need for major rehabilitation or reconstruction. See Section 1140 for further information on this type of project.

Professional Services Agreement (PSA): A contract between the professional service provider (consultant) and the Department. The PSA Manual is found here:

http://www.dot.alaska.gov/procurement/prosvcs/assets/Prosvcs_PSAManualComplete.pdf

Program Year: Refers to the federal fiscal year running from October 1 to September 30. Generally used in the context of STIP funding of project phases.

Project Certification: A document required at the completion of project design and before a project is advertised for construction bids. It attests that the Department has performed environmental, design, right-of-way, and utility work in accordance with the terms of the certification. See Subsections 470.3 and 490.4 for further information on project certifications.

Project Design Criteria: The project specific design criteria as designated on the Project Design Criteria form. The project design criteria values may not meet design standards due to project specific considerations. See Section 1100 (ref: Figure 1100-2).

Project Development Authorization (PDA): A Department programming document requesting funding and showing funding sources and levels in each phase of a project.

Project Information Document (PID): A standardized form prepared by the engineering manager or project control and signed by the engineering manager and the regional environmental manager. It provides project and environmental status information.

Project Management Plan (PMP): A plan outlining and establishing scope, activities, support group involvement, schedule, and budget for a project.

Project of Division Interest (PoDI): Project of interest to the Alaska Division of FHWA. These projects are identified and updated on an annual basis. See Section 497 for further information.

Public Interest Finding (PIF): Documentation used to satisfy a "findings-of-fact" and "State's best interest" requirement on certain types of construction related work. See P&P 10.02.013.

Public Involvement Plan (PIP): A plan to inform and gather input from agencies and the public.

Railroad Grade Crossing: The area where a highway and a railroad cross at the same level, which includes the railroad, roadway, and roadside facilities for traffic.

Reconstruction: A major highway improvement that completely rebuilds an existing roadway, on a new alignment over a significant portion of the project length, to the design requirements of the Green Book, and the *Alaska Highway Preconstruction Manual*.

Record of Decision (ROD): The concluding action on an Environmental Impact Statement, as described in Section 430.4.8.

Recoverable Slope: A slope on which a motorist may, to a greater or lesser extent, retain or regain control of a vehicle. Slopes flatter than 4:1 are generally considered recoverable.

Region: Typically refers to one of the three organizational units of the Department (Central,

Northern, and Southcoast) having authority for highway program development.

Resurfacing, Restoration, and Rehabilitation (3R): Restoring the structural integrity of the existing roadway. Additionally, enhancing safety and capacity, if required. See Section 1160.

Road: A general term usually denoting a rural or village public way for vehicular travel, including the entire area within the right-of-way.

Roadside: A general term for the area adjoining the outer edge of the roadway. Extensive areas between the roadways of a divided highway may also be considered roadside.

Roadway: The portion of a highway, including shoulders, for vehicular use. A divided highway has two or more roadways.

Roadway Information Portal (RIP): A web application for accessing information on roadway characteristics for Alaska roads.

Rock Excavation: Excavation of igneous, metamorphic, and sedimentary rock that cannot be excavated without blasting or the use of rippers.

Roundabout: A confluence of three or more intersection legs at which traffic merges into and emerges from a one-way roadway counterclockwise around a central area.

Routine Maintenance: Work performed in reaction to an event, season, or over all deterioration of the transportation asset. This work requires regular reoccurring attention. Routine maintenance is not eligible for federal-aid funding.

Rules of the Road: Regulations in the State of Alaska Administrative Code that govern the operation of motorized and non-motorized use of transportation facilities.

Safe, Accountable, Efficient Transportation Act: A Legacy for Users (SAFETEA-LU): A surface transportation funding and authorization bill signed into law on August 10, 2005 and expiring September 30, 2009. It was replaced with MAP-21 in 2012.

Shared Use Path: See "Path".

Shoulder: The portion of a highway contiguous to any traveled way for accommodation of bicycles, pedestrians, and vehicles stopped for emergencies, and for lateral support of base and surface courses.

Shy Distance: The distance from the edge of the traveled way beyond which a roadside object will not be perceived as an obstacle by the typical driver to the extent that the driver will change the vehicle's placement or speed.

Sidewalk: The portion of a road, street, or highway between the curb lines of a roadway and the adjacent property lines, typically elevated and hard-surfaced, intended for pedestrian use.

Slope: The inclination of a surface with respect to the horizontal, expressed as a number of horizontal units to one vertical unit (e.g., 2:1, 4:1, 6:1).

> **Backslope:** On a roadway section in a cut (where the original ground has been excavated), the portion of the plane cross-section from the bottom of the roadside ditch to the top of cut. Also known as a cut slope.
>
> **Foreslope:** On a roadway section, the portion of the roadside that slopes down and away from the roadway. Also referred to as a fill slope.
>
> **Sideslope**: Aggregate term encompassing backslopes and foreslopes along a roadway.

Small Community: Topographically concentrated, unincorporated population areas large enough to support a nearby post office or local school.

Special Provisions: An addition or revision that amends or supersedes the Standard Specifications or Standard Modification, and is applicable to an individual project.

Specifications: A general term applied to all contract terms, conditions, directions, provisions, and requirements.

Speed: The rate of vehicular movement, generally expressed in miles per hour.

Speed Change Lane: An auxiliary lane, including tapered areas, primarily for the acceleration or deceleration of vehicles entering or leaving the through-traffic lanes.

Stage: A subdivision of a phase with respect to level or degree of development.

Standard Modification: An addition or revision that amends or supersedes the Standard Specification, and is approved by the Department for general application and repetitive use.

Standard Specifications: The Alaska Department of Transportation and Public Facilities Standard Specifications for Highway Construction.

State Highway: Any highway owned by the State of Alaska.

Statewide Transportation Improvement Program (STIP): The Department's plan for initiating federal-aid highway projects, by phase, for a given fiscal year of the Capital Improvement Program. Projects must be included in the STIP and approved by the FHWA (and, in the case of urban area [MPO] projects, the Federal Transit Authority), before a PDA is issued.

Stewardship and Oversight Agreement (SOA): The Joint Stewardship and Oversight Agreement between the FHWA Alaska Division and DOT&PF. It formalizes the roles and responsibilities of the two parties in administering the Federal-Aid Highway Program, outlines authorities, and assures accountability.

Street: A general term for an urban or suburban public way for vehicles, including the entire area within the right-of-way.

Superelevation: The cross-slope at right angles to the centerline, across the roadway from the inside to the outside edge of a curve. Usually denoted as a percentage or by foot of rise of the roadway per foot of width.

Support Group: Groups other than engineering that play a role in project development. These include:

1. Bridge Design
2. Civil Rights
3. Construction
4. Contracts
5. Drafting
6. Environmental
7. Foundations
8. Geotechnical
9. Hydraulics/Hydrology
10. Planning
11. Project Control
12. Right-of-Way
13. Surveying
14. Traffic and Safety
15. Utilities

Traffic Control Device: A sign, signal, marking, or other device used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, private road, open to public travel, pedestrian facility, or shared-use path by authority of a public agency or official having jurisdiction, or, in the case of a private road open to public travel, by authority of the private owner or private official having jurisdiction.

Traffic Control Plan (TCP): A drawing of one or more specific plans that detail the routing of pedestrians and/or vehicles through or around a construction area, including the location of all traffic control devices.

Traffic Control Signal: Any device—operated manually, electrically, or mechanically—that alternately directs traffic to stop and permits it to proceed.

Traffic Lane: The portion of a traveled way for the movement of a single line of vehicles.

Traffic Operation Plan (TOP): A program designed to improve the use of a highway, street, or highway and street network, through the principles of traffic engineering.

Traffic Sign: A device mounted on a fixed or portable support that conveys a message with words or symbols, officially erected for regulating, warning, or guiding traffic.

Traffic Signal: A power-operated traffic control device that regulates or warns traffic, or alternately directs traffic to take actions.

Trail: An unpaved or unimproved route, which may serve non-motorized or motorized off-road uses.

Trailer: A vehicle designed for carrying people or property and drawn by a motor vehicle, which carries no part of the weight or load of the trailer.

Transportation Alternatives Program (TAP): A program that provides for a variety of transportation alternative projects. The TAP program replaces the funding from pre-MAP-21 programs including Transportation Enhancements, Recreational Trails, and Safe Routes to School, wrapping them into a single funding source.

Traveled Way (T/W): The portion of a roadway for the movement of vehicles, exclusive of shoulders.

Traversable Slope: A slope from which a motorist will be unlikely to steer back to the roadway but may be able to slow and stop safely. Slopes between 3:1 and 4:1 generally fall into this category.

Truck: A heavy vehicle engaged primarily in the transport of goods and materials or services other than public transportation.

Turning Movement: The traffic making a designated turn at an intersection.

Turning Path: The path of a designated point on a vehicle making a specified turn.

Turning Roadway: A connecting roadway for traffic turning between two intersection legs.

Underpass: A grade-separation where the subject roadway, railroad, or pedestrian facility passes under the subject highway.

United States Code (USC): Federal laws, usually referred to by title and section, e.g., 23 USC 109.

https://www.gpo.gov/fdsys/browse/collectionUScode.action?selectedYearFrom=-1&go=Go

Value Engineering (VE): The systematic application of recognized analytical techniques by a multi-disciplined team, which identifies the function of a product or service, establishes a monetary value, generates alternatives, and reliably provides the function at the lowest life-cycle cost consistent with performance, maintainability, safety, and aesthetics.

Van: A vehicle designed to carry passengers (less than 16) or cargo, or both.

Vertical Clearance: The distance from the top of the roadway surface to the lowest part of an overhead facility or obstruction.

Very Low-Volume Local Road (VLVLR): A road that is functionally classified as a local road and has a design average daily traffic volume of 400 vehicles per day or less.

Volume: The total number of vehicles or other roadway users that pass over a given point or section of a lane or roadway during a given time interval, often 1 hour.

Warrants: The criteria by which the need for a safety treatment or improvement can be determined.

Weaving: The crossing of two or more traffic streams traveling in the same direction along a significant length of highway, without the aid of traffic control devices (except for sign guides).

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2. Organization

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200. Design and Engineering Services Organization

200.1. Introduction
200.2. Statutory Authority

200.1. Introduction

The primary concern of this manual is with the design and engineering of highway facilities. The Commissioner establishes the organization of the Department that performs design. The three regions and Statewide Design and Engineering Services (D&ES) staff share responsibility for these functions. The three regions are Southcoast, Central, and Northern (see Figure 2-1). The regions perform the direct design functions while the Statewide staff provides support in policy and statewide standards. The Chief Engineer at Statewide provides overall design management.

200.2. Statutory Authority

Sec. 44.42.010. Commissioner of transportation and public facilities: This section establishes the commissioner as the principal executive officer of DOT&PF. (E.O. No. 39, § 2 (1977))

Sec. 44.42.020. Powers and duties: The Department shall:

1. Plan, design, construct, and maintain all state modes of transportation and transportation facilities and all docks, floats, breakwaters, buildings, and similar facilities;
2. Study existing transportation modes and facilities in the state to determine how they might be improved or whether they should continue to be maintained;
3. Study alternative means of improving transportation in the state with regard to the economic costs of each alternative and its environmental and social effects;
4. Develop a comprehensive, long range intermodal transportation plan for the state;
5. Study alternatives to existing modes of transportation in urban areas and develop plans to improve urban transportation;
6. Cooperate and coordinate with and enter into agreements with federal, state, and local government agencies and private entities in exercising its powers and duties;
7. Manage, operate, and maintain state transportation facilities and all docks, floats, breakwaters and buildings, including all state highways, vessels, railroads, pipelines, airports, and aviation facilities;
8. Study alternative means of transportation in the state, considering the economic, social, and environmental effects of each alternative;
9. Coordinate and develop state and regional transportation systems, considering deletions, additions, and the absence of alterations;
10. Develop facility program plans for transportation and state buildings, docks, and breakwaters required to implement the duties in this section, including but not limited to functional performance criteria and schedules for completion;
11. Supervise and maintain all state automotive and mechanical equipment, aircraft, and vessels, except vessels and aircraft used by the Department of Fish and Game or the Department of Public Safety; for state vehicles maintained by the department, the department shall, every five years, evaluate the cost, efficiency, and commercial availability of alternative fuels for automotive purposes, and the purpose for which the vehicles are intended to be used, and convert vehicles to use alternative fuels or purchase energy efficient vehicles whenever practicable, the department may participate in joint ventures with public or private partners that will foster the availability of alternative fuels for all automotive fuel consumers;
12. Supervise aeronautics inside the state, under AS 02.10;
13. Implement the safety and financial responsibility requirements for air carriers under AS 02.40;
14. Inspect weights and measures;

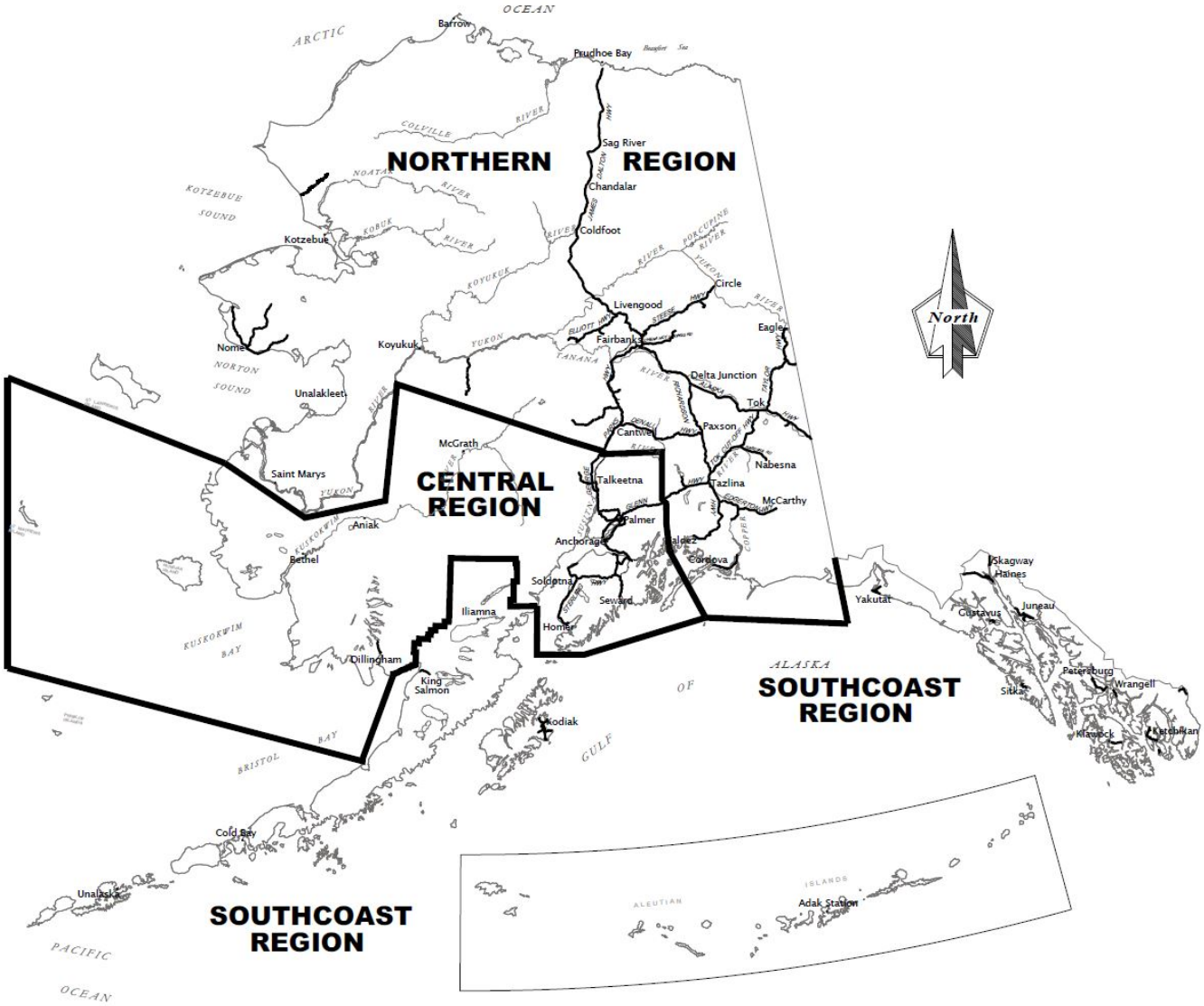
15. At least every four years, study alternatives available to finance transportation systems in order to provide an adequate level of funding to sustain and improve the state's transportation system;

The Department may:

1. Engage in experimental projects relating to available or future modes of transportation and any means of improving existing transportation facilities and service;
2. Exercise the power of eminent domain, including the declaration of taking as provided in AS 09.55;
3. Publish plans, schedules, directories, guides, and manuals for distribution, with or without charge, to private or public entities or people;
4. Operate state housing in support of the department's statutory responsibilities and charge rent that is consistent with applicable collective bargaining agreements, or, if no collective bargaining agreement is applicable, competitive with market conditions;
5. Charge reasonable fees to cover the costs of issuing easements, licenses, and permits and to cover the costs of reproduction, printing, mailing, and distribution of contract and bid documents and design and construction standards manuals;
6. Charge and collect fees for training services and technical assistance provided by department personnel;

Citations: E.O. No. 39 § 2 (1977); am § 13 ch 168 SLA 1978; am § 12 ch 83 SLA 1980; am E.O. No. 50, § 10 (1981); am § 77 ch 138 SLA 1986; am § 62 ch 36 SLA 1990; am §2 ch 122 SLA 1994; E.O. No. 98 § 8 (1997); am §2 ch 39 SLA 2005; am §16 ch 83 SLA 2010.

Sec. 44.42.040. Departmental organization: The commissioner establishes regions within the state. The functions of the Department within each region shall be performed, to the maximum extent feasible, through a regional office. A regional transportation and public facilities director, appointed by the commissioner, directs each regional office. (E.O. No. 39, § 2 [1977]).



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400. Introduction

400.1. Purpose
400.2. Responsibility
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400.4. Process Flow Charts

400.1. Purpose

This chapter establishes procedures and guidance for use in developing federal-aid and state-funded highway capital improvement projects from project development authorization to construction contract award.

This chapter applies to both federal-aid and state-funded projects. It stipulates minimum requirements and provides references to the sources of those requirements. Additional steps may be appropriate to address the particulars of a given project. Section 490 of this manual covers state-funded projects and notes differences in project development and design procedures.

Minor regional variations in processes or delegation of tasks and functions that are consistent with state and federal laws and regulations are allowed. This chapter will generally not note these variations.

400.2. Responsibility

The three regions (Central, Northern and Southcoast) are responsible for program development.

Engineering managers are responsible for developing projects in accordance with applicable federal, state, and local laws and regulations, and departmental policies and procedures.

In this chapter, the use of position titles refers to levels of authority rather than specific position names.

400.3. Reserved

400.4. Process Flow Charts

Project development process flow charts for federal funding approval actions are shown in Figures 400-1 and 400-2.

Some variation from these charts may be granted by FHWA Order 6640.1a – *FHWA Policy on Permissible Project Related Activities During the NEPA Process* – which allows advancement of certain project-related activities prior to the conclusion of the NEPA process.

This FHWA order is found here:

http://www.fhwa.dot.gov/legsregs/directives/orders/6640 1a.htm

Flow Chart For Processing Federal-Aid Projects
Preliminary Engineering to ATP through Final PS&E
(Typical Process - Some Minor Variations May Occur)

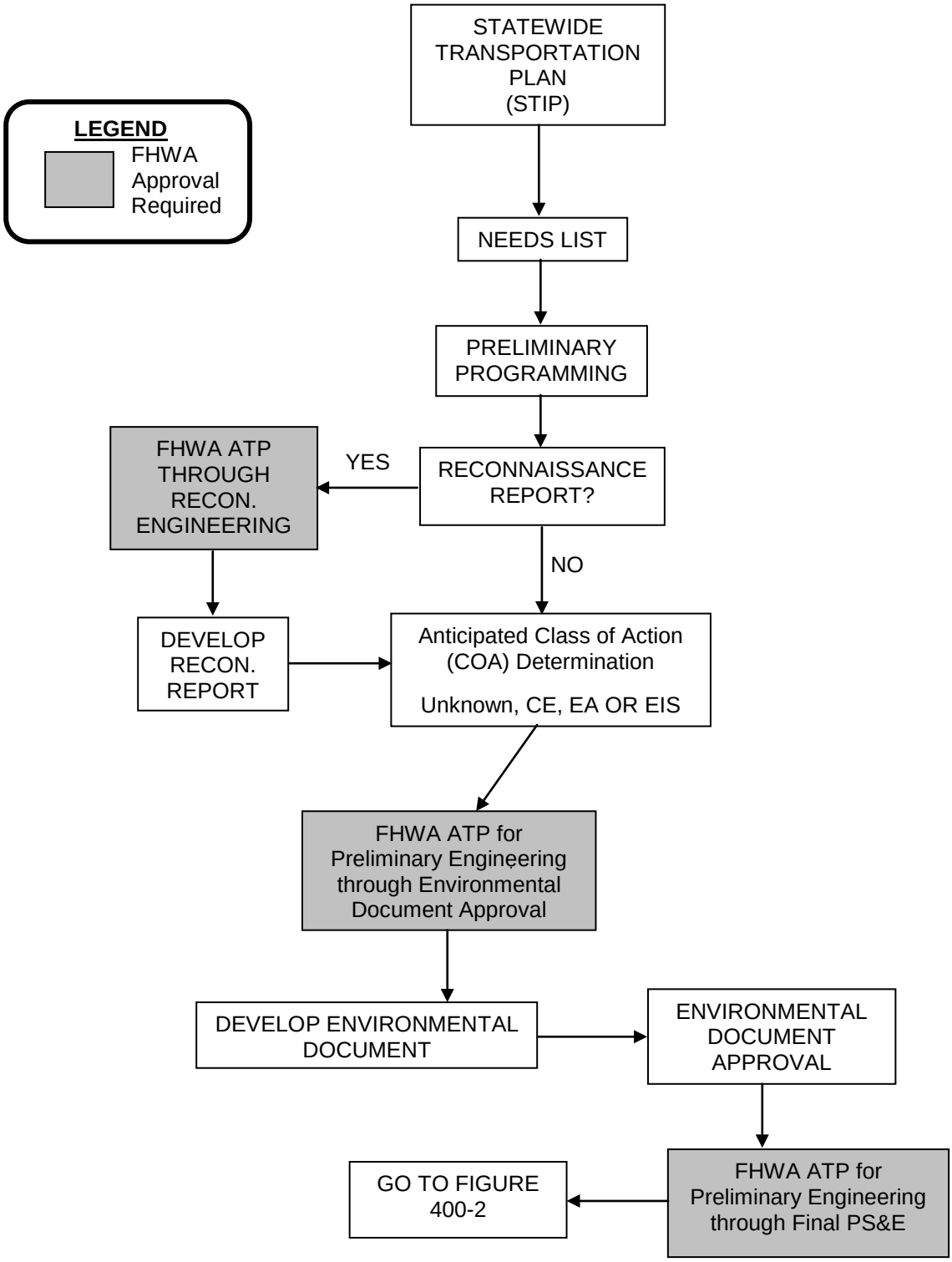

Figure 400-1

Flow Chart for Processing Federal-Aid Projects
ATP Through Final PS&E
(Typical Process - Some Variations May Occur)

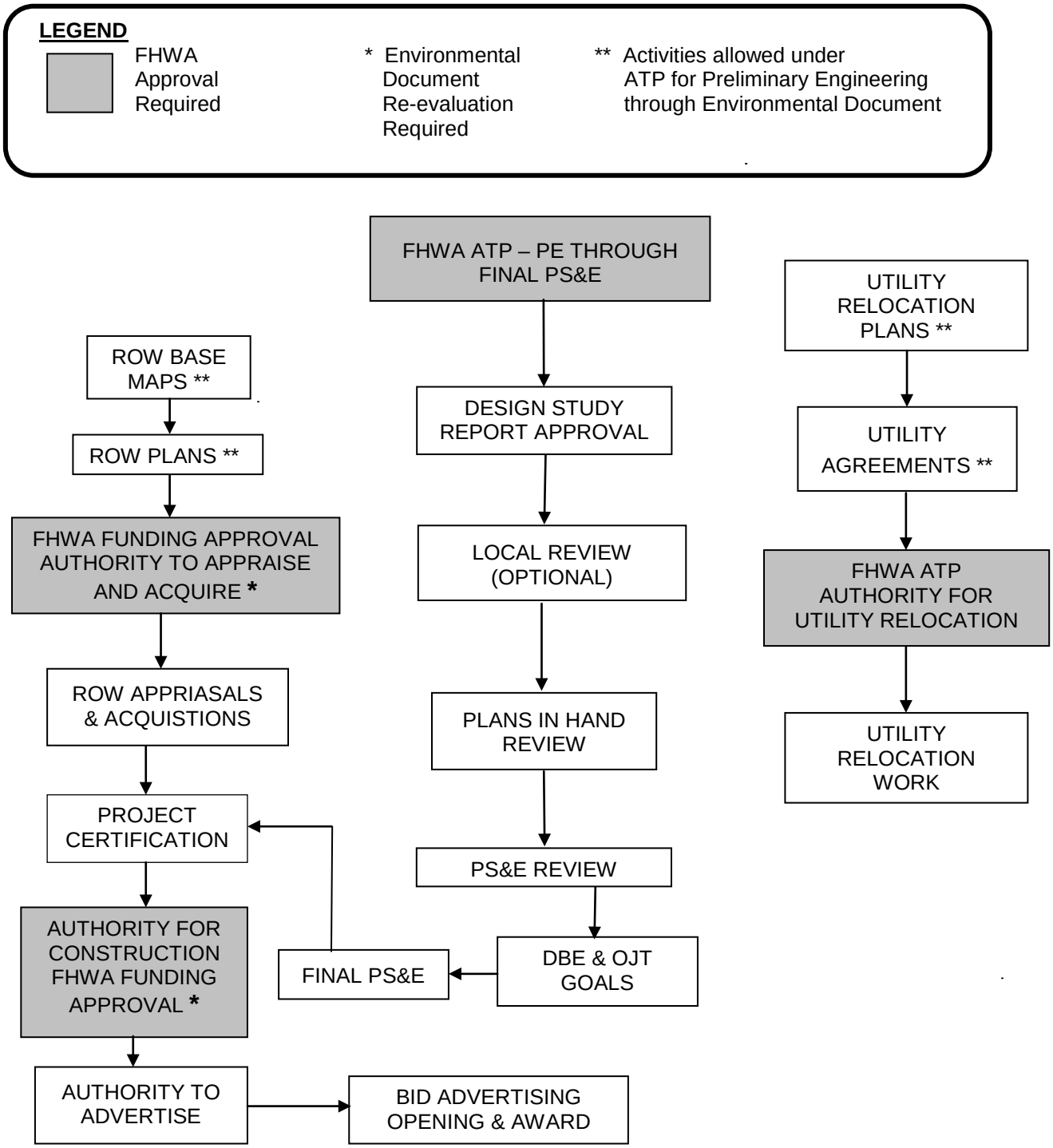

Figure 400-2

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410. Project Oversight

410.1. General
410.2 Projects of Division Interest (PoDIs)

410.1. General

Section 106 of Title 23 USC requires that FHWA and DOT&PF form an agreement documenting those responsibilities that the Department will assume from FHWA. This agreement is referred to as the Stewardship and Oversight Agreement (SOA), and is found here:

http://www.dot.state.ak.us/stwddes/dcsaboutus/resources.shtml

For all federal aid-eligible projects, including NHS and non-NHS projects, DOT&PF assumes FHWA responsibility under Title 23 for the following:

- Design
- PS&E
- Right of Way Certification
- Contract Awards
- Inspection and final acceptance of projects

This responsibility does not extend to other federal actions required outside of Title 23, for example, the Civil Rights Program. Environmental approvals under NEPA have been assumed under other agreements pursuant to 23 USC 327.

The general requirements of Title 23, such as metropolitan and statewide planning, procurement of services or contracts, disadvantaged business enterprises, wage rates, etc., continue to apply to projects where DOT&PF has assumed the noted responsibilities.

410.2. Projects of Division Interest

The SOA between the FHWA and DOT&PF provides that FHWA may retain project level approval authorities otherwise delegated to the state at the program level. These projects are known as Projects of Division Interest (PoDIs). Each PoDI has an individual Stewardship and Oversight Plan that outlines the specific approval authorities retained by FHWA. DOT&PF is responsible for requesting FHWA approval prior to advancing the project beyond an approval that is outlined in the Individual Stewardship and Oversight Plan.

See Section 497 of this manual for more on PoDIs.

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420. Administration

420.1. Project Authorization
420.2. Professional Services
420.3. Local Public Agency Agreements and Oversight
420.4. Records
420.5. Maintenance Agreements
420.6. Project Status Meetings
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420.1. Project Authorization

The Department must obtain an authorization to proceed from FHWA before beginning any work on a federal-aid project (23 CFR 630.106). Also, a project must be in the federally-approved STIP and have legislative authorization prior to initiating project development.

420.1.1 Project Development Authorization

An approved Project Development Authorization (PDA) and Authority to Proceed (ATP) are required before commencing project development activities.

Develop the initial project PDA request based on input from Planning, Design, and Environmental sections. Planning provides an explanation of the nature and extent of the project, project purpose, vicinity map, and the funding source and amount authorized by the Legislature. Prepare the initial project funding request with the requested ATP level (see Section 420.1.2) funding requirements by phase and year, and the following items:

1. A Project Information Document (PID) is prepared by the engineering manager and signed by both the Regional Environmental Manager (REM) and the engineering manager. The electronic system for preparing and processing PIDs is called eWorX and is accessed here:

   https://portal.eworx.com/

   Regional Project Control establishes user access to this system.

2. A project map showing the limits and approximate total length of the project.
3. A detailed budget for the authorization request.
4. A project milestone schedule so that ATP end dates can be established.

For projects requiring a local match, the local match agreement must be executed in accordance with P&P 09.01.040 before the initial ATP request.

The PDA establishes the authorized funding levels by project phase. The engineering manager initiates subsequent PDAs either within the existing ATP or in conjunction with a funding request and ATP to the next project development level. A PDA requesting additional funding within an existing ATP is used when more money is needed or the scope of the project changes materially beyond that in the initial PDA or the STIP. An updated PID may be required for scope changes. Engineering managers should charge their time in preparing the initial PDA and PID as directed by the regional preconstruction engineer.

Project phases are categorized as follows:

Phase 1 – Unprogrammed Legislative Authority

Phase 2 – Preliminary Engineering (PE): This includes reconnaissance studies, pre-environmental document work, and post-environmental document work through Final PS&E. The engineering manager determines how much of the total Phase 2 money is needed to complete the environmental document and how much is needed to complete the Final PS&E.

Phase 3 – ROW: This phase includes appraisal and acquisition of ROW.

Phase 4 – Construction

Phase 7 – Utility Relocation

Phase 8 – Planning & Research

Phase 9 - Other

420.1.2 Authority to Proceed (ATP)

The Department must obtain ATP from FHWA before beginning work on any federal-aid project (per 23 CFR 630.106) and before beginning work on specific phases of a project.

The different ATP authorizations are listed in the following paragraphs.

Preliminary Engineering through Reconnaissance Study: This ATP level authorizes a reconnaissance

engineering study and writing of a reconnaissance engineering report (Phase 2).

Preliminary Engineering through Environmental Document Approval: This ATP level authorizes project development work through the environmental document (Phase 2).

The following ROW activities are permitted under this Phase 2 ATP:

- ROW base mapping
- Estimates of the probable number of parcels and their acquisition and relocation costs for alternatives under consideration
- Assessment of the socio-economic effects of residential and commercial relocations
- Conceptual stage relocation studies
- Title searches *
- Other ROW work necessary to support the environmental document
- Appraisals *
- Appraisal reviews *
- Waiver value preparation *
- Property map preparation *
- Preliminary relocation planning activities *

Note: those activities denoted with an asterisk (*) are considered preliminary acquisition activities under 23 CFR 710.203(a)(3) and may be undertaken prior to completion of the environmental document. These preliminary acquisition activities require approval from the Preconstruction Engineer. Keep documentation of this approval in the project files.

These utility relocation activities are permitted under this Phase 2 ATP:

- Reviewing and determining probable utility conflicts and developing cost estimates for alternatives under consideration in the environmental document phase
- Developing draft utility relocation agreements

Preliminary Engineering through Final PS&E: ATP through final PS&E authorizes work necessary to complete the final PS&E.

This ATP is used for a project after the environmental document is approved.

Development of ROW and utility relocation plans, are allowable under Phase 2.

Right-of-Way through Appraisals and Acquisitions: This ATP level authorizes appraisals and acquisition of ROW necessary to construct a project (Phase 3).

Right-of-Way through Utility Relocation: This ATP level authorizes relocating utilities in accordance with the executed utility relocation agreement(s) (Phase 7).

Construction: This ATP level authorizes advertisement, award, and construction of a project (Phase 4).

Highway Planning and Research: This ATP level is only for Statewide Planning and Research funded projects (Phase 8).

Other: This ATP level is for non-construction, non-design, other management, or non-Statewide Planning and Research funded projects that do not lead directly to a physical construction project (Phase 9).

420.2. Professional Services

420.2.1 General

Use professional service providers (consultants) to balance Department workloads or when the Department lacks expertise. The *Professional Services Agreement (PSA) Manuals* provide guidance for solicitation, selection, award, and administration of construction-related PSAs. The PSA manuals are online at:

http://www.dot.state.ak.us/procurement/prosvcs/index.shtml

420.3. Local Public Agency Agreements and Oversight

The current SOA does not allow Local Public Agency administered projects. The Department administers all federal-aid projects.

420.4. Records

See Subsection 450.21 of this manual.

420.5. Maintenance Agreements

The Department has maintenance responsibility for all projects constructed with federal-aid funding (23 CFR 633.208).

For projects owned by a municipality, or owned by the Department but maintained by a municipality, execute a written agreement with the municipal administrator stating the municipality's maintenance responsibility.

In the event of a request to take over maintenance or operations on a portion, or all, of a roadway, ensure compliance with P&P 07.05.095, which in found here:

http://www.dot.state.ak.us/edocs_code/edocs_document_relay_nativefile_bydocname.cfm?inline=1&ddocname=DOT-JNU_123356

The Department will not assume any additional maintenance and operations responsibilities without written approval by the Deputy Commissioner and with necessary funding appropriated.

Ensure maintenance agreements are executed before submitting the initial Phase 2 PDA.

420.6. Project Status Meetings

The preconstruction engineer calls regularly scheduled status meetings to review the status or technical aspects of projects. These meetings may encompass all projects under development or be limited, for example, to projects that have encountered problems.

These meetings keep management and support groups informed, and allow management to be involved in identifying and resolving problems in scheduling or funding commitments. The meetings are not necessarily limited to discussions of project status and may include policy, procedures, problem areas, public involvement, and special topics.

420.7. Project Status Reports

The engineering manager and support groups enter project status information into DOT&PF Management Reporting System (MRS) as updated information becomes available. The MRS is a living, dynamic system accessed by various department employees to view the current status and information pertaining to projects currently under development.

The MRS is a web-based program accessed on the DOT&PF intranet site at:

http://web.dot.state.ak.us/status.d/project_status.html?

A username and password are required for data input. A user guide is available from the link posted above.

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430. Preliminary Engineering through Environmental Document Approval

430.1. Introduction
430.2. Project Management Plan
430.3. Project Purpose, Need and Scope
430.4. Reconnaissance Engineering Study
430.5. Environmental Process
430.6. Preliminary Engineering to Develop and Support the Environmental Document Process

430.1. Introduction

The Preliminary Engineering through Environmental Document approval phase includes all activities from initiating project development authorization to environmental document approval.

430.2. Project Management Plan

The Project Management Plan (PMP) establishes the activities, budget, resources, and schedule for project development.

The engineering manager develops the PMP through one or more project scoping meetings and direct coordination with support groups. Include the following in the PMP:

1. Project purpose and need, scope, schedule (program year), and funding;
2. Work plan showing activities, durations, work force, and budget necessary to complete the project;
3. Identify studies, reports, permits, and clearances anticipated during the design development cycle;
4. Public Involvement Plan outlining the level of public involvement and schedule for such activities;
5. Determination of whether the project will be developed as design-build or lump sum, or utilize alternative contracting;
   a) Design-build procedures are available at:

      www.dot.alaska.gov/designbuild

   b) Lump sum procedures are available at:

      http://www.dot.state.ak.us/stwddes/dcsmisc/assets/pdf/lumpsum/lumpsum0103.pdf)

Consider FHWA Order 6640.1a in developing the PMP in the context of expediting project delivery.

An example PMP format is available under the Preconstruction Forms heading at:

http://www.dot.state.ak.us/stwddes/dcsprecon/preconmanual.shtml

430.3. Project Purpose, Need, and Scope

Purpose and Need

The purpose and need statement identifies the objective of and necessity for a project.

A project purpose and need statement is normally found in the planning documentation. If not, it should be in the project nomination package.

Project purpose and need is fundamental in developing, analyzing, and evaluating alternatives and may require refinement during project development and design.

Project Scope

Project scope has legal significance and should reflect the context and intent of the legislative authorization.

Project scope is detailed in a number of different project documents, for example:

- PDA
- PID
- PMP
- Environmental document
- Federal-aid agreements
- Status reports

The initial project scope for the PDA for design (Phase 2) should be based on the STIP and other budgetary/planning documents. The Project Information Document (PID) instructions (see Section 420.1.1) provides guidance on the level of scope needed. The PID provides scope information that populates the federal-aid agreement, which is approved by FHWA.

On Highway Safety Improvement Program (HSIP) projects, the project scope is limited to that work specifically approved by the Chief Engineer in the HSIP funding program.

The scope may change during the course of project development. Coordinate project scope changes with the Project Control and Environmental Sections. FHWA and the preconstruction engineer must approve changes to the project scope. The PDA and PID are mechanisms used to change project scope and modify federal-aid agreements.

The final project design scope (Phase 2) must match the PDA scope for construction (Phase 4)

Schedule

In this context, "schedule" refers to placement, by phase, within the STIP. This information should be found in the CIP package prepared by regional planning. Immediately inform the preconstruction engineer of any necessary schedule changes because they can affect fiscal year spending plans.

Authorized Funding

Authorized funding levels are shown by project phase on the PDA. As with scope and schedule, the engineering manager is responsible for monitoring the project budget and expenditures.

430.3.1. Work Plan

The engineering manager prepares a work plan, comprised of a detailed project development schedule and budget, after consultation with each affected support group. The work plan is a graphic and/or tabular summary of the activities, durations, work force, and budget to develop the project through Final PS&E. The work plan is included in the PMP.

For an Environmental Impact Statement (EIS), the initial work plan covers all work anticipated through the final EIS only.

Consult with support groups to review and update schedule, cost, and budget information regularly, and at major project development milestones.

430.3.2. Public Involvement Plan

Prepare the Public Involvement Plan (PIP) in accordance with Chapter 5 of this manual, Chapter 7 of the EPM, and 23 CFR 771.111.

The purpose of the PIP is to establish a plan for engaging and informing the public and to ensure that all reasonable alternatives are identified and public and agency concerns are identified, considered, and addressed before committing to a preferred action. Public involvement activities should assure interested parties of the necessity for the project and provide a process for identifying potential problems and impacts.

430.4. Reconnaissance Engineering Study

Some projects are authorized only for Preliminary Engineering through Reconnaissance Engineering Study. A reconnaissance study involves describing the problems to be solved, identifying and analyzing alternative solutions, and providing comparisons of the alternatives.

Project development for a Reconnaissance Engineering Study is similar to projects with ATP for PE through environmental document, except that there is no formal environmental process, and public involvement may be limited. An environmental analysis is usually completed to determine the environmental impacts and issues that would need to be addressed if the project advances beyond the reconnaissance stage.

A Reconnaissance Engineering Study is typically performed as follows:

- Identify and review the problem or deficiency to be resolved, and formulate a purpose and need statement.
- Obtain support group input on the problem and their data needs.
- Research and acquire existing data.
- Make a site visit.
- Identify preliminary alternatives and discuss with each support group. Provide a sketch map and data for each alternative to initiate their studies and evaluation.
- Begin public involvement activities as outlined in the PIP.
- Request needed air photos and mapping, and request traffic projections and design designations.
- Sufficiently develop those alternatives that appear feasible so that they can be compared according to alignment, grade, width, length, cost, level of service, access control, soils conditions, erosion and sediment control, drainage, availability of construction materials, maintenance, snow and icing problems, right-of-way and utilities considerations, services to existing communities, development and potential development areas within communities, location of hazardous waste

sites, wetlands, cultural and historical sites, and other environmental issues.

- Prepare schematic plans as necessary to convey information to support groups, agencies, and the public.

The discussion of alternatives should consider the "no build" action, Transportation Management Systems (TMS), alternative transportation options (such as transit) where appropriate, and all reasonable "build" alternatives.

Obtain additional surveys, mapping, and traffic projections as needed. Coordinate with support groups for public involvement, local government input, and project development.

The result of the Reconnaissance Engineering Study is a written report. It contains a description of the project's purpose and need, and a discussion of all technically feasible alternative solutions with comparisons of their engineering characteristics, environmental impacts, and costs.

This report should target a general audience, so it is easily incorporated later into the project's environmental document.

The Reconnaissance Engineering Study may conclude with a recommendation to proceed, not proceed, or proceed later with further project development.

The formal report is signed by the preparer and the engineering manager and approved by the regional preconstruction engineer.

430.5. Environmental Process

430.5.1. Introduction

All projects require an evaluation of their environmental impacts. This section focuses on federally-funded projects. The process for evaluating the environmental impacts of a state-funded project is covered in Section 490.7.

On federally funded projects, the environmental process follows:

- National Environmental Policy Act (NEPA),
- 23 CFR Part 771 – Environmental Impact and Related Procedures, and
- NEPA Assignment Program Memorandum of Understanding (MOU)
- The *Alaska DOT&PF Environmental Procedures Manual (DOT&PF EPM*). This manual applies to projects that are assignable under the NEPA Assignment Program Memorandum of Understanding (MOU).
- The *Alaska FHWA Program Environmental Procedures Manual (FHWA EPM)*. This manual applies to projects that are not assignable under the NEPA Assignment Program Memorandum of Understanding (MOU).

The goal of the environmental process is to complete an approved environmental document in a timely and efficient manner. Completion of the environmental document is on the critical path of nearly all projects.

All projects generally require the following:

1. Purpose and need statement
2. Project scope
3. Identification and development of alternatives
4. Evaluation of environmental impacts
5. Coordination with local governments and other agencies, including federally recognized tribes
6. Public involvement (except as noted in 430.5.4)
7. Selection of a preferred alternative and proposed action
8. A complete and approved environmental document
9. Acquisition or completion of required environmental approvals, authorizations, clearances, consultations, permits, and reviews as necessary

Work closely with DOT&PF environmental staff throughout project development to ensure that the environmental impacts of all project alternatives are considered.

For more information on the Department's environmental policies and procedures, refer to the appropriate environmental procedures manual and the Statewide Environmental Office's website:

http://dot.alaska.gov/stwddes/desenviron

When the acronym EPM is used in the remainder of this subsection, it refers to either the DOT&PF EPM

or the FHWA EPM, depending on which appropriately applies to the project.

430.5.2. Environmental Classification

Under the NEPA regulations, there are three environmental classes of action, each having different documentation and compliance requirements. The classes of action are:

- Class I – Environmental Impact Statements,
- Class II – Categorical Exclusions, and
- Class III – Environmental Assessments

For federally funded projects, the class of action is a major factor in determining the level of preliminary design development required and the project schedule.

Class of Action Determination

The class of action (COA) is determined based on the scope of the project and assessment of the probable impacts of the project's action. The initial COA determination is based on information provided to the regional environmental manager (REM), which may include scope provided in planning documents and PID.

The REM forwards the initial COA recommendation to the NEPA Program Manager for approval (see Chapter 2 of the *EPM*). The REM documents the appropriate COA on the PID. If the initial COA is unknown, the REM will indicate this on the environmental page of the initial PID.

The completed PID is included in the initial PDA request.

Class I: Environmental Impact Statement

If a project is expected to have a significant impact on the environment, it requires an EIS.

The EIS process is described in detail in Chapter 5 of the *EPM* and summarized in Section 430.5.8. of this manual. The EIS process can take 5-10 years.

Class II: Categorical Exclusion

A Categorical Exclusion (CE) project has no significant individual or cumulative impact on the environment.

Examples of CE project types are listed in 23 CFR 771.117. The CE process is described in detail in Chapter 3 of the EPM and is summarized in Section 430.5.8.

CEs can take 6-18 months to complete.

Class III: Environmental Assessment

An Environmental Assessment (EA) is appropriate if the effects of a project on the environment are not apparent.

The EA process-is described in detail in the *EPM* and summarized in Section 430.5.8. The EA process can take 2-5 years.

Other Considerations

For any document type, complex resource investigations such as hazardous materials investigations, indirect and cumulative impacts, air quality issues, cultural resource studies, etc., can significantly extend the time required to develop an approved environmental document.

Consult with the REM before releasing draft or final environmental documents.

430.5.3. Identification of Environmental Issues

All projects should strive to avoid important or sensitive cultural, social, and environmental resources to the extent feasible. Initial environmental work for projects typically consists of identifying areas or issues within the project limits, such as:

- Wetlands and other water resources
- Essential fish habitat
- Threatened and endangered species habitat
- Contaminated soils
- Water bodies, including floodplains
- Cultural and historical resources
- Wildlife resources
- Anadromous fish streams, including fish passage issues
- Section 4(f) land
  - Parks
  - Recreation areas
  - Wildlife and Waterfowl refuges
  - Historic sites
- Section 6(f)
- Existing land use or municipal transportation plans
- ROW acquisition or relocation
- Air quality
- Noise

- Materials sites
- Disposal sites
- Environmental justice
- Invasive species

Work with environmental staff to identify boundaries of sensitive environmental features as early as possible to determine whether an alternative affects them and whether impacts can be avoided or minimized, or if mitigation will be required. Identification can consist of researching and reviewing existing data and field reconnaissance.

Evaluating existing physical and environmental features requires qualitative and quantitative analysis. For features that do not present unusual or substantive constraints, a general discussion of their presence is adequate in an EA or EIS. More significant features may require greater effort.

Certain investigations, such as noise studies, archaeological surveys, or soil/water contamination, may require technical expertise beyond that of the Department's environmental staff, requiring the assistance of consultants.

CEs still require some environmental reconnaissance work even though they are, by definition, not likely to have any significant or cumulative environmental effect.

430.5.4. Agency Coordination, Tribal Consultation and Public Involvement

Early coordination with local, state, and federal agencies and federally recognized tribes helps determine the type and scope of the environmental document required. Work with the REM to initiate this (see Chapter 5 of this manual and Chapter 7 of the EPM). Agency and tribal consultation are also part of other coordination processes, such as Section 106 (see Chapter 10 of the EPM).

Chapter 5 of this manual and the approved PIP will detail the necessary public involvement requirements. FHWA-funded projects require some level of public involvement, especially if ROW is required or a protected resource is involved. CEs may not require public involvement if they have minimal impacts, do not require ROW, do not affect protected resources, and are not controversial.

Tribal consultation may be focused on government-to-government (G2G) consultation, defined here as between the federal government (FHWA) and federally recognized tribes (FRT), or may consist of project communication and consultation between the DOT&PF and tribes.

While DOT&PF is authorized to consult with tribes under the Section 106 process, for example, FHWA retains responsibility for direct government-to-government consultation with tribes in accordance with 36 CFR 800.2(c)(2)(ii)(C) and (D), and Part 3.1.3 of the NEPA Assignment Program MOU. Contact with any FRT should only be done after consultation and in coordination with the REM and Professionally Qualified Individual (PQI).

430.5.5. Environmental Analysis

Environmental staff analyze and quantify environmental impacts and, if necessary, determine appropriate mitigation measures. The analysis is documented in the appropriate environmental document

Evaluate the reasonable alternatives in detail to determine their direct, indirect, and cumulative impacts to cultural, economic, environmental, and social resources. In judging the significance of impacts, consider both context and sensitivity.

These impacts are used to help select a preferred alternative, but are not necessarily the primary decision-making factor.

Environmental staff will review all alternatives under consideration and will evaluate their impacts on the human and natural environment. These impacts are transmitted to the engineering manager for consideration in identifying a preferred alternative (See Section 430.6.6.).

430.5.6. Approvals, Authorizations, Clearances, Consultations, Permits, and Reviews

The environmental analysis and documentation process identifies what approvals, authorizations, clearances, consultations, permits, and reviews are required for the project. Many of these are listed in the following discussion. This is not a complete list of all approvals, authorizations, clearances, consultations, permits, and reviews that may be required for a project.

Items marked with a single asterisk (*) may be obtained concurrently with the Environmental Document approval provided the design of the

proposed action is detailed enough to quantify the impacts accurately.

Items marked with a double asterisk (**) must be obtained as part of the NEPA process.

- U.S. Army Corps of Engineers (USACE) Section 10 Permit.*

  A USACE Section 10 Permit is required by the River and Harbor Act of 1899. It is applicable to the placement/removal of structures, work involving dredging, disposal of dredged material, filling, excavation, or any other disturbance of soils/sediments or modification of a navigable waterway of the U.S.

- USACE Section 103 Permit*.

  A USACE Section 103 Permit is required under the Marine Protection, Research, and Sanctuary Act of 1972. It applies to the transportation of dredged material for disposal in the ocean.

- USACE Section 404 Permit*

  Under the Clean Water Act of 1972, a Section 404 Permit is required for construction, placement, or discharge of dredged or fill materials into waters of the U.S., including wetlands.

  The design should be defined in enough detail to quantify the areas and volumes of fill in wetlands or waters of the U.S. in order to obtain a USACE permit in the environmental phase. These quantities can be fine-tuned in the final design.

  Wetland use as a vegetative buffer strip requires approval from the USACE. Include the use of wetlands as a buffer strip in the narrative of the project's USACE 404 permit.

- Department of Environmental Conservation (DEC) Wastewater Disposal Permit

  Any plans that construct, alter, install, modify, or operate any part of a nondomestic wastewater treatment works or disposal system require written approval or waiver from the DEC (18 AAC 72.600).

  Storm water runoff from a highway is considered nondomestic wastewater as defined by DEC.

  Consult with DEC and submit plans, if required, for approval of the storm water collection and disposal systems, including storm sewers and treatment facilities.

- DEC Water or Sewer System Plan Approval

  Sewer and water systems must receive design plan approval before construction. Water systems must receive a *Certificate to Construct* before installation. Submit the Final PS&E plans to DEC for review and approval.

- DEC 401 Certificate of Reasonable Assurance*

  DEC issues a 401 Certificate to accompany any federal permit pursuant to the EPA Clean Water Act (e.g. USACE Section 404 and USCG Section 9 permits). Certification is issued after state review of the permit and a request for certification is published with the permit application.

- Department of Natural Resources (DNR) Tidelands Lease

- DNR Tidelands Permit

- DNR Land Use Permit

- DNR Temporary Water Use Permit

  A temporary water use permit may be required when taking fresh water on a temporary basis from any surface or subsurface source on all lands regardless of ownership. This permit would be necessary for activities that use water such as dust control, compaction of soils, potable water at construction camps, hydro-seeding, or drilling.

- DNR Water Rights Permit/Certificate

- Section 4(f) & 6(f) **

  Section 4(f) applies to public parks, recreations areas, wildlife and waterfowl refuges, and significant historic sites. Section 6(f) pertains to land acquired with Land and Water Conservation Act funds. Projects that may affect Section 4(f) or Section 6(f) protected properties must consult with a NEPA Program Manager.

- DNR Section 106 Review (State Historic Preservation Officer [SHPO])**

  Section 106 consultation is required for federal-aid projects that may affect historic properties and state projects requiring federal permits. The National Historic Preservation Act of 1966, as amended, mandates this review. The DOT&PF or

lead federal agency determines whether properties are eligible for the National Register of Historic Places, and asks the SHPO to concur. If historic properties are identified, the lead federal agency determines the effect, and asks the SHPO to concur. Under NEPA Assignment, DOT&PF acts as the lead federal agency in nearly all cases. If historic properties will be adversely affected, a Memorandum of Agreement is required to resolve adverse effects.

The Section 106 review ensures that historic properties will not be adversely affected without due consideration, and ensures all possible agency planning to avoid, minimize, or mitigate adverse effects in compliance with Section 106.

- Alaska Department of Fish & Game (ADF&G) Title 16 (Fish Habitat) Permit*

  An ADF&G Title 16 Permit applies to construction or other activities in, or over, anadromous streams or that block fish passage in streams with resident fish.

  Title 16 does not normally apply to activities in the marine environment; however, if a project will affect the mouth of a stream, a fish habitat permit is required.

- ADF&G Special Area Permit

  An ADF&G Special Area Permit is required for construction, continuing use, or other activity in state game refuges, critical habitat areas, or sanctuaries.

- U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) consultations. **

  Section 7 consultations with USFWS and NMFS are required by the Endangered Species Act of 1973 and must be performed for any activities that may affect threatened or endangered species, or critical habitat. These agencies will provide a list of the endangered species in the project area. A "take" authorization may be required when a project will impact a threatened or endangered species.

- NMFS Marine Mammal Protection Act Consultation**

  Under Section 101(a)(5) of the Marine Mammal Protection Act (MMPA), a consultation is required for any action that might affect marine mammals such as whales, sea lions, et al. A "take" authorization may be required when a project will impact a marine mammal species. Where the effected marine mammal species is also listed under the Endangered Species Act (ESA), incidental take under both ESA and MMPA may need to be authorized. In these cases, MMPA compliance is integrated into the ESA Section 7 consultation process.

- NMFS Essential Fish Habitat Consultation**

  Essential Fish Habitat (EFH) is a provision of the Magnuson-Stevens Fisheries Conservation Act (50 CFR 900.20). EFH is considered "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Therefore, if a project or activity affects intertidal or subtidal areas, or anadromous fish streams, it may affect EFH.

  If the project may adversely affect EFH, consultation with NMFS and an EFH assessment that documents the resource, the potential adverse effects, and the proposed measures to minimize or mitigate them are required.

- USFWS Eagle Permit

  Under the Bald and Golden Eagle Protection Act of 1940, a permit is required where project activities will "take" (i.e. wound, kill, capture, trap, destroy, molest or disturb) an eagle or an eagle nest.

- U.S. Coast Guard (USCG) Section 9 Permit*

  Under Section 9 of the River and Harbor Act of 1899 and the General Bridge Act of 1946, The U.S. Coast Guard (USCG) must approve plans to construct or alter bridges and causeways across navigable waters of the U.S. before the start of construction. This applies to any overhead crossing except for electrical transmission lines.

  There are three categories of bridges under this agreement:

  <u>Category 1:</u>

  a) Projects crossing streams on which there is no existing or expected use by interstate or foreign commerce

  b) Projects meeting the USCG definition of minor repairs or replacement of parts in kind

Category 2:

Projects crossing waterways on which the only existing or expected commerce is the use of small crafts such as kayaks, canoes, rafts, and small motorboats (less than 21 feet). The bridge and approaches of the project must be identified as not creating an impact that, in itself, would require elevation to an EA or EIS level.

Category 3:

Projects not identified in Category 1 or 2.

The engineering manager must provide the environmental analyst with the following minimum information to initiate the USCG review process:

1. An 8.5" x 11" simple line drawing of the proposed structure with dimensions of the navigational opening – e.g. the height between ordinary high water and "low steel" and the clear width between bridge piers
2. Description of anticipated construction method, including temporary construction or access bridge
3. Upstream and downstream photos at the crossing location
4. Aerial photos, if available
5. A location/vicinity map

USCG may require other information in the permit application process. Refer to the USCG bridge permit application process and checklist documents available at the statewide environmental website:

http://www.dot.state.ak.us/stwddes/desenviron/resources/waters.shtml

- USCG Application for Private Aids to Navigation

  A USCG permit is required for installation of private aids to navigation on man-made structures in or over navigable waters of the U.S. if they deem the structure an obstruction to navigation.

- Floodplain Management Consultation

  Consult local water resource and floodplain management agencies if the proposed action will encroach into a floodplain or support base floodplain development. Cities and boroughs that have floodplain management include Anchorage, Fairbanks, Kenai Peninsula, Juneau, and the Matanuska-Susitna.

  A Location Hydraulic Study for floodplain encroachments is required under 23 CFR 650.111. Forward this study to the local floodplain management agency for review and comment, and attach the study to the environmental document.

Most of these approvals, authorizations, clearances, permits, and reviews are sought after environmental document approval, except as noted above. Further discussion of these is found in the *EPM*.

430.5.7. Environmental Commitments and Mitigation Measures

The environmental staff will identify any environmental commitments or mitigation measures required for the proposed action. Include these in the environmental document and in the final design and construction of the project.

430.5.8. Environmental Document Preparation and Approval

Environmental staff completes the appropriate environmental documentation (EIS, CE, or EA) as identified in the approved COA. (See Section 430.5.2. of this manual and Chapter 2 of the *EPM*).

The environmental documentation contains the analysis of the environmental impacts and identifies, if necessary, any appropriate mitigation measures.

The environmental document contains the analysis of the environmental impacts and provides documentation that the NEPA process has been followed. The environmental document also identifies mitigation measures, if necessary.

Environmental Impact Statement (EIS)

A Notice of Intent (NOI), Final EIS (FEIS) or a Final Supplemental EIS and a Record of Decision (ROD) are the required environmental documentation for this class of action. Any EIS with an NOI dated after August 10, 2005, must follow the "Efficient Environmental Review Process," codified at 23 USC 139. Title 23 USC 139 environmental review process requirements include the following:

- For NEPA Assignment projects, DOT&PF is the lead agency pursuant to 23 USC 139(a)(4).

- The lead agency must invite all federal, state, local and tribal government agencies that may have an interest in the project to be participating agencies.
- Agencies defined as participating and cooperating agencies are required to carry out their obligations under other applicable laws concurrently and in conjunction with their NEPA review in a timely and environmentally responsible manner.
- To the maximum extent practicable, all permits and reviews for a transportation project are to rely on a single NEPA document developed by the lead agency; that NEPA document is to be sufficient to satisfy the requirements for any federal approval or other federal action for the project including federal agency permits.
- The lead agency must develop a coordination plan for public and agency participation and comment during the environmental review process; the plan must include a schedule.
- Participating agencies and the public must be given an opportunity for input in the development of the project purpose and need and the range of alternatives to be considered.
- The lead agency is to collaborate with the participating agencies on the appropriate methodologies to be used and the level of detail for the analysis of project alternatives.
- The lead agency and participating agencies are to work cooperatively to identify and resolve issues that could delay the completion of the environmental review process or result in the denial of any approvals required for the project under applicable laws. Title 23 USC 139(h) provides an issue identification and resolution process, including referral to the CEQ and imposing financial penalties.
- There is a 150-day statute of limitations for project judicial review, provided that a notice of final agency action is published in the Federal Register.
- A single document that includes both the Final EIS and the ROD should be used, unless:
    - The Final EIS makes substantial changes to the proposed project relevant to environmental or safety concerns, or
    - There are significant new circumstances or information relevant to environmental concerns that bears on the proposed project or impacts of the proposed project.

Additional information on complying with the 23 USC 139 environmental review process can be found in Chapter 5 of the *EPM*. In general, the EIS process is completed in the following ordered steps: NOI, coordination plan and Draft EIS, FEIS, and ROD.

When a decision is made to prepare an EIS, the region prepares and submits a draft NOI to the Statewide Environmental Office (SEO) for publishing in the Federal Register as the lead federal agency to initiate the process. Guidelines for preparation of these notices are given in FHWA Technical Advisory T6640.8A, dated October 30, 1987.

Scoping begins after the NOI publication. Invitation letters to participating agencies are required to be sent within 45 days of NOI publication and are to include a deadline for response, which is typically 30 days. A coordination plan must be in place within 90 days of NOI publication detailing how the DOT&PF will engage agencies and the public in the project environmental review. A Draft EIS (DEIS) is prepared for review and approval by the regional preconstruction engineer and the regional director, and submitted to SEO for review.

After document revisions to address SEO comments, the SEO approves the DEIS for public distribution. The region prepares and submits a draft Notice of Availability to SEO for publication in the Federal Register. The Notice of Availability identifies the comment period for the EIS which will not be less than 45 days and not more than 60 days. FHWA's public involvement requirements (23 CFR 771.111(h)) dictate that one or more public hearings be offered during the Draft EIS public comment period. Whenever a public hearing is held, the Draft EIS shall be available at the public hearing and for a minimum of 15 days in advance of the public hearing. If any subsequent changes to the project result in significant environmental impacts not identified in the earlier Draft EIS, a Draft Supplemental EIS is required.

Public and agency comments on the Draft EIS, and DOT&PF responses, are included in the FEIS. The FEIS is only prepared after the preferred alternative is selected. The FEIS is reviewed and approved by the preconstruction engineer and regional director prior to submittal of the document to the Statewide Environmental Program Manager for review and approval.

After approval, the REM may prepare a draft ROD for Statewide Environmental Program Manager review and approval. The ROD is a separate document with separate signature approvals from a DEIS and FEIS. The ROD may be signed no earlier than 30 days after publication of the FEIS notice in the Federal Register or 90 days after the publication of a notice for Draft EIS, whichever is later. The approved ROD is published to notify the public and appropriate agencies of the environmental decision. The region will prepare a draft notice of availability for Statewide Environmental Program Manager approval prior to publishing the ROD.

The EIS process is considered complete after the Statewide Environmental Program Manager signs the FEIS and ROD. The ROD is returned to the regional preconstruction engineer. Chapter 5 of the *EPM* details the procedures for developing an EIS.

Categorical Exclusions (CE)

The documentation required for a CE either consists of a CE Documentation Form or an Expedited CE Form (where certain conditions are met), and any required supporting documentation necessary to consider and evaluate possible impacts. The forms document project activities, identify protected resources affected, and identify any environmental impacts or unusual circumstances. They also lists the issues raised by the public and agencies and the manner in which they were resolved. The CE is not distributed for public/agency review and comment.

There are two approval scenarios for CEs:

- The REM approves Programmatic CE determinations,
- The NEPA Program Manager approves non-Programmatic CE determinations.

Refer to Chapter 3 of the *EPM* for documentation and approval requirements for CEs.

Environmental Assessment (EA)

The EA and subsequent Finding of No Significant Impact (FONSI) are the environmental documentation for this class of action.

The EA is prepared by regional environmental staff. The preconstruction engineer reviews and approves submittal of the document to the SEO. After document revisions to address SEO comments, SEO approves the EA for public circulation. Public and agency comments on the EA, and DOT&PF responses, are included in a Revised EA, or errata appended to the EA. The preconstruction engineer reviews and approves submittal of the document to SEO for approval. After approval, the REM may prepare a draft FONSI for SEO review and approval.

A FONSI is a separate document with separate signature approvals from an EA or Revised EA, and is only prepared when the SEO determines that the project will not have a significant impact on the environment. The approved FONSI is published to notify the public and appropriate agencies of the environmental decision. The region will prepare a draft notice of availability for SEO approval prior to publishing the FONSI.

An EA process is considered complete when the Statewide Environmental Program Manager or a NEPA Program Manager has signed the FONSI. The FONSI is returned to the REM. Chapter 4 of the *EPM* details the procedures for developing an EA.

430.6. Preliminary Engineering to Develop and Support the Environmental Document

430.6.1. General

Preliminary engineering is all engineering and support group work necessary to develop and support completion of the environmental document.

The duration and level of engineering required depends on the environmental document classification, the complexity of the project, and the environmental issues and impacts present.

Context Sensitive Solutions (CSS)

FHWA mandates the use of Context Sensitive Solutions for all federally funded projects. The Department embraces a CSS approach when developing all projects, regardless of funding source. Scale the level of CSS to the complexity of the project and the environmental issues.

430.6.2. Field Reconnaissance

Field reconnaissance is desirable whenever possible as it allows the engineering, environmental, and support group staff to examine the existing conditions. It may also assist in determining additional necessary data.

Assessment of existing conditions should produce an inventory of physical, environmental, cultural, and social features within the study area.

Maintenance is responsible for many recurrent and costly tasks such as snow removal, ditch cleaning, etc., on completed projects, so include the local maintenance foreman in the on-site field reconnaissance. If a field reconnaissance is not conducted, request that the local maintenance foreman provide video or photos of the project as necessary to illustrate conditions and specific concerns. Solicit their comments and coordinate with them to resolve any conflicts with design/construction interests. If conflicts cannot be resolved, elevate the issue to the regional preconstruction and maintenance engineers.

430.6.3. Development of Alternatives

The development of alternatives depends on the environmental class of action. Consider the existing environment as a baseline to measure the impacts and benefits of the other alternatives. The "no-build" alternative must be carried throughout the process for EA and EIS. It represents the no-action alternative through the same design year as the other build alternatives.

In addition, all classes of environmental actions must consider avoiding or minimizing impacts if wetlands or floodplains are affected (E.O. 11990 & 11988).

Consider ideas and innovative solutions proposed by stakeholders. Seek to develop alternatives that balance the project goals for safety, mobility, community, and environment.

Environmental Impact Statement (EIS)

For an EIS, develop preliminary alternatives. Key factors to consider include:

- Purpose and need for the project
- Public comments and concerns
- Avoidance of sensitive environmental, social, and cultural resources
- Avoidance of protected resources
- Avoidance of other physical features that require complex or costly engineering solutions
- Alternative transportation modes or Transportation Systems Management

Once a range of preliminary alternatives has been identified, use a screening process to narrow the list to include only reasonable and feasible alternatives. The screening process normally uses objective criteria and quantitative analysis to eliminate nonviable or inferior alternatives.

Carry the reasonable and feasible alternatives forward and develop them to a similar level of detail.

Categorical Exclusion (CE)

Consider the preferred alternative. The no-build and other alternatives may be discussed as necessary.

Environmental Assessment (EA)

Consider the following alternatives on an EA project:

- No-build
- Preferred alternative
- Additional build alternative(s) (optional)
- Avoidance/minimization alternative(s) if the proposed action affects protected resources such as wetlands or floodplains

430.6.4. Design of Alternatives

Design staff develops reasonable and feasible alternatives to the extent necessary to evaluate environmental impacts and develop cost estimates.

Develop a typical section(s) for the improvement based on the approved Design Designation and Project Design Criteria (Figures 1100-1 and 1100-2 in Chapter 11).

On EISs and some EAs, it is necessary to partially design the alternatives using Computer Aided Design and Drafting (CADD) software so that the proposed features, slope limits, and ROW lines can be drawn with a sufficient level of accuracy to evaluate the environmental, ROW, and utility impacts. The partial design using CADD also allows for better graphical representation of the project and its impacts.

For EAs and EISs, strive for accurate and concise plans that the public can easily understand. Consider visual communication techniques such as:

- Maps of design concepts superimposed on aerial images
- 3-D models
- Traffic simulations
- Drive-through video simulations

On CEs where no ROW or protected resources are involved, plan development can be minimal. If they

are involved, develop the alternative plans to visually represent or quantify these effects.

Estimate cost for each alternative and itemize as follows:

- Preliminary Engineering [Design] (Phase 2)
- ROW (Phase 3)
- Construction (Phase 4)
- Utility Relocation (Phase 7)

430.6.5. Support Group Activities

Scheduling and coordinating design activity and project development with support groups is addressed in the PMP. The engineering manager needs to know what information is required by the support groups and when it is needed.

The level of effort and detail of analysis required by the support groups should be commensurate with the level of environmental analysis required. EISs will require more work, while CEs will require less.

Any work necessary to prepare or support the environmental document is considered eligible for FHWA reimbursement.

The listing of support groups is presented in alphabetical order.

Bridge

The Bridge Section typically designs highway and pedestrian bridges, but is also involved in the design of other structures, such as retaining walls.

The engineering manager informs the chief bridge engineer when the ATP through environmental document is obtained on any project that involves bridge design. The engineering manager also provides a copy of the PMP.

Provide the Bridge Section with a start-up package so they can begin the preliminary bridge layout, type selection, and cost estimates needed for the bridge type selection process. The start-up Package includes:

- Proposed roadway plan & profile data
- Topographic data in the vicinity of the bridge site including a bridge site survey in accordance with Section 1120.5.4 of this manual
- Roadway typical section
- Right-of-way limits
- Utility locations and utilities to be carried on the new bridge
- Environmental design criteria and commitments
- Preliminary hydraulic and geotechnical recommendations, when available

The Bridge Section will provide a general layout drawing, site plan drawing, and preliminary estimate for each alternative under consideration in the environmental analysis.

Civil Rights

It is the policy of the Department that no person shall be excluded from participation in, or be denied benefits of any and all programs or activities we provide based on race, color, national origin, gender, age, income, or disability regardless of the funding source. This includes Federal Transit Administration, Federal Aviation Administration, Federal Highway Administration, Federal Motor Carrier Safety Association and State of Alaska funds.

Title VI provides that no person shall on the grounds of race, color, religion, sex, national origin, marital status, handicap, or family composition be excluded from participation in, denied the benefits of, or otherwise discriminated against under any program of the federal, state, or local government.

The Department has a Title VI/Nondiscrimination Program Plan to ensure compliance with federal civil rights laws and regulations. Each region has civil rights Title VI/Nondiscrimination liaisons.

Title VIII of the Civil Rights Act of 1968 prohibits discrimination in real estate transactions for housing. Housing accommodations made as a result of a highway or airport project must be fair and equitable, without regard to race, color, religion, or national origin.

Executive Order 12898 on Environmental Justice (as well as other DOT and FHWA orders) requires public consultation for projects that affect a predominantly low-income area or minority community. The purpose is to identify and address disproportionately high and adverse human health or environmental effects of the project on minority populations and low-income populations.

Executive Order 13166 on improving access to services for persons with limited English proficiency

(LEP) requires communicating the elements of proposed projects, for all phases dedicated to public consultation, in languages other than English. It is important to conduct a thorough demographic analysis for the project study area to determine if there is a non-English speaking population. There is no population threshold for required LEP actions.

When a project is located within 50 miles of a community with a federally recognized tribe, there is a separate requirement for government-to-government consultations as required by 23 USC 135(d)(3) & (e), Executive Orders 13007 & 13175, and P&P 01.03.010. In some areas of Alaska, this consultation may need to be conducted in the native language of the community. The Civil Rights Office has a current list of federally recognized tribes in Alaska.

For all public meetings in the preliminary engineering project development processes, the Department and its consultants will document -attendance by race, color and gender by using the Public Meeting Sign-in Sheet found here (race, color and gender are provided on a voluntary basis by attendees):

http://www.dot.alaska.gov/cvlrts/forms/titlevipublicsigninsheet.pdf

The quarterly and annual reporting requirements that arise from preliminary engineering activities are as follows:

- For each consultant contract administered by Design, the contract manager will report to a Title VI/Nondiscrimination liaison using a copy of the contract's Record of Negotiation and Selection (RONS) for Professional Services Agreements. The Title VI/Nondiscrimination liaison will keep and compile these forms for the Annual Title VI/Nondiscrimination Update.
- For each public meeting where the engineering manager determines that there are no Title VI issues, the engineering manager will document this finding and send it to the Title VI/Nondiscrimination liaison for the Annual Title VI/Nondiscrimination Update using the Title VI Public Meeting Report form.
- For each public hearing where the engineering manager determines there are Title VI issues, the Title VI/Nondiscrimination liaison will document them. The Title VI/Nondiscrimination liaison will also document: 1) how these issues were dealt with in the meeting, and; 2) the final resolution of the Title VI issues in the project development process using the Title VI Public Meeting Report form, and compile this information for the Annual Title VI/Nondiscrimination Update.
- For each project where there is a citizen advisory group and the engineering manager has identified Title VI issues, the engineering manager will complete the citizen advisory group board breakdown portion of the Title VI Public Meeting Report form and transmit it to the Title VI/Nondiscrimination liaison. The Title VI/Nondiscrimination liaison will keep and compile these forms for the Annual Title VI/Nondiscrimination Update.
- For the Department's annual Title VI/Nondiscrimination Update to FHWA, the following is required: 1) a list of all EAs and EISs that found no Title VI impacts, and; 2) for all EISs and EAs that did identify Title VI impacts, a short summary of the issues and how the issues were resolved consistent with Title VI.

EAs and EISs must document consideration of impacts on minorities and other groups under the Civil Rights Acts of 1964. They must contain the following standard certification statement:

> *"This project has been developed in accordance with the Civil Rights Act of 1964 and EO 12898."*

Civil rights forms are found here:

http://www.dot.state.ak.us/cvlrts/forms.shtml

Construction

Involve the Construction Section early in project development. Give them the opportunity to provide input on:

- Selection of alternatives
- Constructability of alternatives
- Construction timing and phasing restrictions
- Selection of the preferred alternative

Geotechnical/Materials

Depending on the scope, some projects may require an extensive geotechnical investigation. Others may require only an examination of the performance of the existing facility and a review of the as-builts, construction records, and previous geotechnical reports. Geotechnical and materials site investigations are normally performed with regional staff.

The engineering manager should convey initial information on alternatives under consideration so the regional engineering geologist and materials engineer can evaluate it. There may be sufficient information for a reasonable comparison of the alternatives; however, it may be necessary to obtain additional geotechnical data.

If a geotechnical investigation is warranted, perform it in accordance with the Department's *Geotechnical Procedures Manual.* This manual is online at:

http://www.dot.state.ak.us/stwddes/desmaterials/mat_geology/pop_geotechman.shtml

A draft geotechnical memorandum with preliminary recommendations for design of the project may be prepared. This memorandum supplies information to the Design Section, but is not intended for publication.

Foundations

Statewide personnel perform foundation investigations. A foundation investigation is normally required for a highway bridge or other significant structure.

The investigation is similar to a geotechnical investigation and is in accordance with the *Geotechnical Procedures Manual*. Preliminary recommendations may be made in the pre-environmental document phase.

Hydrology & Hydraulics

Determine the need for the hydraulics engineer's involvement early in the project scoping. Consider these issues when deciding:

- Is there a bridge proposed on the project? (Note: a culvert installation with a total width of 20 feet or greater, measured along centerline of the roadway, is considered a bridge.)
- Is fill or other physical modification proposed in a floodplain or waters of the U.S?
- Does a decision or cost effective analysis need to be made on whether to use a bridge or culvert?
- Are there any new, replaced, or retrofitted culverts proposed on fish streams, or are there any other known fish passage problems that need to be evaluated?*

*** Note:** Refer to the DOT&PF/ADF&G Memorandum of Agreement (MOA) for Design, Permitting and Construction of Culvert for Fish Passage (11/21/02) for specific issues. A copy of this MOA is found at:

http://dot.alaska.gov/stwddes/desenviron/assets/pdf/procedures/dot_adfg_fishpass080301.pdf

For any environmental alternative that encroaches on a floodplain or supports base floodplain development, a Location Hydraulic Study is required per 23 CFR 650.111. Include this study in the environmental review documents.

Fish passage structures can have a significant bearing on project costs and on the significance of environmental impacts. Many fish passage problems are avoided by considering hydraulic factors early in the project development.

In most cases, specific survey data is needed to perform the required hydraulic analysis. Section 1120.5.4 covers the requirements for a hydraulic site survey.

Preliminary hydraulic analysis or recommendations may be necessary to complete the environmental analysis.

Maintenance and Operations (M&O)

Involve the M&O Section early in project development and give them an opportunity to provide input on:

- Existing M&O problems and concerns
- Development of alternatives
- M&O considerations on alternatives
- Selection of the preferred alternative

Planning

In the Central and Northern regions, the Planning Section performs the traffic data collection and forecasting functions. In Southcoast region, the Traffic and Safety Section performs these functions.

The design designation should be requested early in the project development process. The engineering manager requests a design designation for the project from traffic data collection staff. The regional preconstruction engineer approves it.

An approved design designation is necessary to establish project design criteria. See Figure 1100-1 for an example of a design designation form.

Right-of-Way

During the environmental process, the engineering manager provides ROW staff with preliminary plans for each alternative under consideration. ROW prepares base maps and estimates the probable number of parcels needed and their acquisition and relocation costs for each alternative.

Each alternative is also assessed in terms of the number and socio-economic effects of residential and business relocations it causes. The results are reported in a Relocation Study, often in memo format, which is included in the project's environmental document.

If there is a public hearing or open house on the project, ROW presents information from the Relocation Study and discusses the acquisition and relocation processes required by the *Alaska Right-of-Way Manual.*

Surveying

The engineering design staff should research the availability of any existing surveys, as-builts, mapping, or imagery that would be helpful in developing the preliminary alternatives.

Depending on the scope of the work (e.g. new construction or 3R) the engineering manager should determine and convey the survey requirements to the surveying staff. In most cases, a full design survey will be performed during the PE through Environmental Document phase, with additional work during design as needed.

Traffic and Safety

Consult with the Traffic and Safety Section to:

1. Evaluate existing traffic control devices within the project limits and determine whether to include upgrading those devices in the project development, if not previously identified.
2. Review crashes and propose cost-effective measures to address correctable crashes.
3. Review historical safety requests from the general public and agencies for consideration of implementing cost-effective mitigation measures.

The Traffic and Safety Section assists in the following tasks:

- Traffic data collection and forecasting*
- Accident analysis
- Capacity analysis
- Safety analysis
- Signal warrant analysis**
- Intersection analysis
- Signalized intersection traffic simulations
- Lighting

* **Note:** Support group function for this task varies by region.

** **Note:** The Roundabout First Policy requires that a single lane roundabout be considered at all locations where a new traffic signal is being considered. Justification for not installing a roundabout needs to be included in the Design Study Report (See Section 450.5.1).

Utilities

For each alternative under consideration, the engineering manager furnishes plans to the utilities engineer that show line, grade, slope limits, and clear zone widths. The utilities engineer will verify adjustments or relocations necessary for each alternative and rough cost estimates. Consider environmental impacts of utility relocation work.

If additional right-of-way is necessary to accommodate utility relocation, the engineering manager should forward the request to the ROW Section for inclusion into the ROW cost estimates.

Utility agreements may be drafted in the PE through Environmental Document phase.

430.6.6. Evaluation of Alternatives

For an EIS, the engineering manager works closely with the REM to determine which alternatives require evaluation. Factors to consider include, but are not limited to:

- Ability to satisfy purpose and need
- Direct and indirect impacts to sensitive cultural, economic, environmental, and social resources and to protected resources
- Avoidance of sensitive and protected resources
- Total cost
- Safety

The alternatives under consideration should be given an interdisciplinary review to ensure that all direct and

indirect environmental impacts are identified for each alternative. In analyzing the significance of impacts, consider the context and intensity of each impact and the cumulative effect of all the impacts.

Evaluate and compare alternatives with each other and with the no-build alternative. You may use a decision matrix or other decision making process to evaluate and select a preferred alternative. For any level of environmental document, the engineering manager will select a preferred alternative for approval. This recommendation is approved in accordance with regional policy.

Once the preferred alternative is approved, the engineering manager must notify all affected support groups.

450. Preliminary Engineering through Final PS&E

450.1. Introduction
450.2. Authority to Proceed
450.3. Update PMP and PIP
450.4. Reserved
450.5. Design Study
450.6. Reserved
450.7. Design Engineering
450.8. Reserved
450.9. Support Group Activities
450.10. Material sources
450.11. Material Disposal Sites
450.12. Driveway and Approach Road Design and Permitting
450.13. Reserved
450.14. Local Review
450.15. Plans in Hand Review
450.16. Value Engineering
450.17. Local Concurrence
450.18. Constructability Review
450.19. PS&E Review
450.20. Final PS&E
450.21. Retention of Project Development and Design Files

450.1. Introduction

The Preliminary Engineering through Final PS&E stage begins after approval of the environmental document and receipt of the Authority to Proceed. It proceeds into a study and selection of a preferred design alternative, then design of that alternative, and concludes with a bid-ready set of contract documents.

Support group activities include:

- Topographic and ROW surveying
- Design of bridges, retaining walls, or other significant structures.
- Environmental re-evaluation and permitting
- Geotechnical and foundation investigations
- Hydraulic or hydrologic investigation or design
- ROW plans, appraisals, acquisitions, and relocations
- Traffic signal and illumination design
- Utility relocation

Many tasks or work products require sealing and signing by licensed professionals. These may include:

- Design plans
- Bridge plans
- Traffic signal plans
- Signing and striping plans
- Traffic control plans (TCPs) *
- Erosion and sediment control plans (ESCPs) **
- Lighting plans
- Geotechnical memorandums and reports
- Hydraulic and hydrologic reports or studies
- Property or ROW surveys and plats

* See Chapter 14 for requirements of sealing and signing TCPs.

** See Section 1120.7 for requirements of sealing and signing ESCPs

Alaska law (AS 08.48.221, 12 AAC 36.185) requires sealing and signing of engineering drawings, surveys, plats, and engineering reports by licensed professionals.

Designs of power supply (electric utility service connections, step down transformers, and electric load centers) for highway lighting systems (including parking, mooring and docking areas) and traffic signal systems must be sealed and signed by an Alaska licensed professional electrical engineer.

Designs for highway lighting systems and traffic signal systems “electrically downstream” of load centers must be signed and sealed by an Alaska licensed professional civil engineer.

450.2. Authority to Proceed

Once an approved environmental document is obtained, submit a PDA requesting ATP for PE through Final PS&E (see Section 420.1of this manual for further information). Final design may begin once FHWA has issued the ATP.

450.3. Update PMP and PIP

Update the PMP and PIP using feedback from appropriate support groups.

Once the schedule is updated and ATP to Final PS&E is approved, notify all affected support groups and provide them with the current project schedule.

450.4. Reserved

450.5. Design Study

The design study process further refines the proposed action chosen in the environmental document and selects the preferred design solution.

Develop feasible design alternatives and compare significant parameters, such as typical section, horizontal and vertical alignment, right-of-way requirements, cost, and safety, and document them in the Design Study Report.

450.5.1 Design Study Report (DSR)

The DSR is a formal report that documents the selection of a preferred design alternative.

Include the following sections in the DSR:

1. Description of project location and existing facilities, and purpose and need for proposed project
2. Design standards to be used, including project design criteria and design designation
3. Descriptions and comparative differences of the design alternatives
4. Discussion of the preferred design alternative
5. Typical sections, including shoulder treatment
6. General horizontal and vertical alignment, including location of bridges and other structures
7. Erosion and sediment control
8. Drainage
9. Soil conditions
10. Access control features
11. Traffic analysis. Discuss the traffic analyses done to support the need for specific project features such as:
    - Addition of turn lanes
    - Widening of shoulders, or
    - Installation of traffic signals

    Analyses can include:

    - Signal warrants
    - Capacity analysis, or
    - Roundabout analysis

    Include a discussion of the existing and projected traffic volumes and patterns as well. Discuss reported crashes as appropriate.
12. Safety improvements. Discuss project specific safety improvement features included that will reduce known or potential safety deficiencies. If the project is an HSIP project, include the original project nomination.
13. Right-of-way requirements
14. Pedestrian and bicycle accommodations, including provision for accessibility by people with disabilities
15. Utility relocation and coordination
16. Preliminary work zone traffic control for the preferred design alternative including any probable detour routes and impacts along those detour routes. Provide determination of whether the project is *"significant"* per Section 1400.2. of this manual.
17. Pavement design, including life-cycle cost analysis
18. Updated cost estimate for all phases (PE, ROW, Utility Relocation, and Construction)
19. Environmental commitments and mitigation measures. This section should include a summary of all environmental commitments.
20. Preliminary bridge layout
21. Identification and justification of design exceptions and design waivers
22. Maintenance considerations
23. ITS Features. Discuss ITS elements to be incorporated into the project.

Appendices to the DSR should include the following items if completed or available:

- Approved design criteria and design designation
- Approved design exceptions and design waivers
- Traffic analyses (signal warrants, capacity analysis, roundabout analysis, etc.) and speed studies
- Resurfacing, Restoration, and Rehabilitation (3R) analysis
- Systems Engineering Analysis (SEA)
- FWHA concurrence documentation for non-significant ITS project determinations
- Approved environmental document
- VE consideration

Be objective and factual when preparing a DSR. Avoid subjective wording such as "inadequate," "unsafe," "dangerous," "deficient," "insufficient," or "substandard." For example:

Don't write: "The shoulder width is insufficient."

Do write: "The shoulder width does not meet current standards for new construction."

Don't write: "The horizontal curve is dangerous."

Do write: "The 5-year accident history of this horizontal curve indicates 11 major injuries and 1 fatality."

Prepare a draft DSR and circulate for in-house review and comment.

The final DSR is sealed and signed by a professional engineer, signed by the preparer, concurred by the engineering manager and design group chief, and approved by the regional preconstruction engineer.

3R Analysis

On 3R projects, perform a 3R analysis in accordance with Section 1160 of this manual and include a discussion of the following in the appendix to the DSR:

- All existing horizontal and crest vertical curves not meeting minimum design requirements for new construction
- Design speed determination
- Lane and shoulder widths, sideslopes, and clear zones selection
- Horizontal and vertical curve treatments, and lane width determination
- Bridge features requiring improvement
- Accidents at intersections and countermeasures to address correctable accidents

Preventive Maintenance (PM) Projects

Refer to Table 450-1 for modified DSR requirements on PM projects.

Systems Engineering Analysis

All significant ITS projects require a Systems Engineering Analysis (SEA). Non-significant ITS projects do not require an SEA. See Section 485 for how to distinguish between the two and procedures for developing an SEA. Include the SEA as an appendix to the DSR.

450.5.2 Design Approval

Approval of the DSR constitutes design approval.

Upon receipt of the signed title page, distribute copies of the approved final DSR in accordance with regional policy.

The regional preconstruction engineer may waive design approval for advanced ROW acquisitions, utility-only project, or other similar projects.

450.6. Reserved

Table 450-1
Modified DSR Requirements for PM Projects

DSR Section	Section Title	Instructions (n/c = no change)
1	Project location, existing facilities, and purpose and need for project	n/c
2	Design standards	Comply with 1140.3. Design Designation and Design Criteria forms are not required. ESALs are needed for pavement design. Project design life = pavement design life
3	Design Alternatives analysis	Not required
4	Discussion of preferred design alternative	Not required
5	Typical sections	n/c
6	General horizontal and vertical alignment	Not required
7	Erosion and sediment control	n/c
8	Drainage	Only consider drainage maintenance or improvements necessary to preserve the structural pavement section.
9	Soil conditions	Not required
10	Access control features	Not required
11	Traffic analysis	Not required
12	Safety improvements	Comply with 1140.3.
13	ROW requirements	n/c
14	Pedestrian and bike accommodations, including provisions for accessibility.	Discuss ADA improvements.
15	Utility relocation and coordination	n/c
16	Preliminary work zone traffic control	n/c
17	Pavement design	Follow modified pavement design per Section 1140.3.
18	Cost estimate	n/c
19	Environmental commitments and mitigation	n/c
20	Preliminary bridge layout	Not required
21	Design exceptions and design waivers	A design exception is required for Vertical Clearance. All others not required per Section 1100.3
22	Maintenance considerations	n/c
23	ITS features	n/c
Appdx	Design exception and waiver approval memos.	n/c
Appdx	ITS systems engineering analysis or FHWA concurrence for a non-significant ITS project determination	n/c
Appdx	Approved environmental document	n/c

450.7. Design Engineering

Once the DSR is approved, final design engineering can begin.

Designers should strive for a context sensitive final design that, to the extent practicable, is in harmony with the community it is located in, and preserves environmental, scenic, aesthetic, historic, and natural resource values of the project area.

450.7.1 Typical Section, Geometrics, and Design Cross Sections

The typical section and geometrics for a project is established from the preferred design alternative selected in the DSR. The final design effort may fine-tune the alignment to minimize environmental and ROW impacts.

Design work is usually done with computer aided design and drafting software adopted by each region. The alignment and design cross sections are very important as they establish the slope limits for the project. The slope limits, in turn, control environmental impacts, ROW acquisitions, and utility relocations.

450.7.2 Plan Set

Develop the content and organization of plan sets according to regional policy and procedure. Produce final record drawings on reproducible sheets and have them sealed and signed by the engineer(s) of record. Show environmentally sensitive and restricted work areas in the plans.

Erosion and Sediment Control Plan (ESCP)
Develop an ESCP for all projects, regardless of funding, with disturbed ground that meet either of the following conditions:

- Owned by the Department
- Designed (or design administered by) and constructed (or construction administered) by the Department

See Section 1120.7 for guidance on ESCP preparation.

Traffic Control Plan (TCP)
Develop a TCP to address the safety of motorists, pedestrians, and construction workers on all federal-aid construction projects per 23 CFR 630.

Guidance for developing TCPs is found in Chapter 14.

450.7.3 Alaska Standard Plans (ASPs)

Alaska Standard Plans show commonly used plans and details approved by the Department and FHWA for use on projects. ASPs are contained in the *Alaska Standard Plans Manual* available online at:

http://www.dot.state.ak.us/stwddes/dcsprecon/stddwgeng.shtml

In accordance with guidance in Chief Engineer's Directive (CED) of January 25, 2019, titled *Alaska Standard Plans, Development and Incorporation*, Standard Plans are not signed and sealed by a professional engineer (PE). This CED is available here:

http://dot.alaska.gov/stwddes/dcspubs/directives.shtml

Standard Plans are adapted from detail drawings that are treated as final drawings and are signed and sealed by a PE in accordance with 12 AAC 36.185. The final drawings are archived at the Statewide Design and Construction Standards office. By sealing the final drawing, the PE certifies their responsible charge for the technical development of the detail drawing used as the basis for the ASP.

The Chief Engineer approves ASPs for use by the Department.

Each ASP has an associated technical report, called the Standard Plan Development Report (SPDR), prepared by a PE. The SPDR provides background and guidance on the selection, application, restrictions, and qualifying conditions for use of the associated ASP. SPDRs are found here:

http://dot.alaska.gov/stwddes/dcsprecon/stddwgeng.shtml

Plans should list the standard drawings that apply to a specific project on the project cover sheet, project index sheet, or individual plan sheet. The PE signing and sealing the project plans takes responsibility for their selection and application.

450.7.4 Specifications

Specifications consist of the Standard Specifications, Standard Modifications, and Special Provisions. Specifications describe the material and construction requirements, method of measurement, and basis of payment for the work shown in the plans.

The Alaska DOT&PF Standard Specifications for Highway Construction (SSHC) are approved by the Department and FHWA for general application and repetitive use and are available online at:

http://www.dot.state.ak.us/stwddes/dcsspecs/index.shtml

Statewide Standard Modifications are additions or revisions to the Standard Specifications and supersede the Standard Specifications. In most cases, Standard Modifications exist to correct errata or deficiencies in the Standard Specifications. A list of current Statewide Standard Modifications is available at the website noted above. Include all Standard Modifications that apply to the work – none are optional. Standard Modifications that do not apply to the work, or that will be overridden by a Special Provision do not need inclusion. If it is uncertain whether a specific Standard Modification applies to the work, include it.

Special Provisions are additions or modifications to the Standard Specifications or Standard Modifications and cover conditions specific to an individual project. Special Provisions supersede Standard Specifications, Standard Modifications, and the plans. Special Provisions can be statewide, regional, or project-specific. A list of current Statewide Special Provisions is available at the website listed above. Each region develops and maintains its own Regional Special Provisions. Choose which Special Provisions to include in the specifications based on the specific requirements of the project.

Open Competition

In accordance with 2 CFR 200.319, specifications for construction contracts must provide for full and open competition. Incorporate a clear and accurate description of the technical requirements for the materials, products, or services required in the construction contract. Such descriptions must not contain language that unduly restrict competition. The description may include a statement of the qualitative nature of the material, product, or service and, when necessary, must set forth those minimum essential characteristics and standards to which it must conform to satisfy its intended use.

Named Brand Products

It is a best practice to avoid the use of brand (trade) name projects in specifications. When it is impractical or uneconomical to make a clear and accurate description of the technical requirements, a "brand name product or equal" specification may be used. The FHWA Alaska Division has indicated that using a "brand name product or equal" specification provides for sufficient competition; however, the salient features of the named brand product that must be met by the "or equal" product need to be clearly stated.

Special circumstances may require restriction of products to a single brand name:

- The named brand product must match an existing item or system to facilitate operation, maintenance or continuity
- The named brand products is the only one that will perform the required function

When only one named brand product will meet the Department's need under one of the conditions above, a written determination must be approved by the Contracting Officer prior to advertising the construction contract. See P&P 10.02.050 for further information.

Warranty Clauses

Warranty clauses may be used on federal-aid construction contracts in accordance with 23 CFR 635.413. See the following link for FHWA guidance:

https://www.fhwa.dot.gov/construction/cqit/warranty.cfm

Warranty clauses must be for a specific product or feature. General warranties for an entire project are not acceptable, unless the project in question is design-build.

Warranty clauses may not cover work that would be otherwise ineligible for federal-aid participation, including routine maintenance. Warranty clauses may not cover damage caused by others – a contractor cannot be required to warrant items over which the contractor has no control.

Specialty Items

Identify Specialty Items in the Special Provisions in the description of work. A Specialty Item is defined in the SSHC as "a contract item identified in the contract that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid on the contract.

450.7.5 Estimates

Estimates are prepared by the engineering design staff and checked by the engineering manager. The estimate preparer and engineering manager should sign the estimate included in the Final PS&E.

Depending on whether the contract will be unit price, lump sum, or a combination thereof, the design staff will select the appropriate pay items for the project and determine the quantities.

For unit price estimates, the design engineering staff should construct the estimate using standard pay items from the SSHC whenever possible. If a non-standard pay item is used, a special provision will be required for establishing the new pay item, a method of measurement, and a basis of payment. If no historical data exists or the pay item is non-standard, use engineering experience and judgment. Unit price contracts may use lump sum items.

Coordinate with the appropriate construction staff to determine if construction engineering costs may be reduced by the use of lump sum items. When lump sum items are used, provide an associated unit quantity when possible.

The engineer's estimate is the final estimate used for contract bidding and programming of construction funding. In addition, the engineer's estimate includes Indirect Cost Allocation Program (ICAP) and construction engineering costs.

Use AASHTOWare Project software to develop engineer's estimates.

The bid estimating program generates the following when the project goes to advertise and award:

- DBE goals worksheet
- bid schedule
- federal-aid agreement
- coding backup
- compilation of bids and bid-analysis reports

AASHTOWare Project software is also used to archive the bid results for reference in generating future estimates.

The final engineer's estimate must be coded and submitted to the regional project control staff. The estimate must be coded before the PDA for construction funding is submitted to FHWA for approval. Consult with the project control staff for guidance on coding estimates.

Lump Sum Projects

The engineering manager, in consultation with the construction project manager, should consider whether an entire project could be developed as a lump sum, fixed-price contract. This allows for reduced contract administration effort in measuring and verifying quantities and allows staff to spend more time on inspecting the work. Consider lump sum contracting on projects with:

- A well-defined scope
- A low risk of unforeseen conditions
- A low possibility for changes
- Limited opportunity for contractors to provide less than the required quantity

Further guidance on lump sum contracting is found in the "Lump Sum Project Guidelines":

http://www.dot.state.ak.us/stwddes/dcsmisc/assets/pdf/lumpsum/lumpsum0103.pdf

450.7.6 Bidding and Contract Documents

The regional Contracts Section usually prepares bidding and contract documents. The engineering manager should provide the Final PS&E package along with the signed ATA, project bidding description, subcontractable items list, and DBE goal. All necessary construction contract forms are available at the Design and Construction Standards webpage:

http://www.dot.state.ak.us/stwddes/dcsconst/pop_constforms.shtml

The Contracts Section will assemble a contract bid package and put the project out to bid per Section 470.

450.8. Reserved

450.9. Support Group Activities

It is the engineering manager's responsibility to continuously coordinate and schedule design activities with support groups through the Final PS&E stage of project development.

450.9.1 Bridge Design

The engineering manager informs the chief bridge engineer that the environmental document is approved and ATP through final PS&E have been obtained. The engineering manager confirms the preferred bridge alternative (alignment, profile and typical section) and design schedule.

If a local review is conducted, use the general layout and site plan drawings from the environmental document in the local review plan set.

For PIH reviews, the Bridge Section provides a refined general layout, site plan, and cost estimate.

The Bridge Section provides 90 percent complete bridge plans for the PS&E review. They also include the draft special provisions, preliminary bid items, quantities, and cost estimate.

Refer to the Alaska Bridges and Structures Manual for procedures related to the preliminary and final structural foundation engineering report.

Bridge provides sealed and signed drawings, special provisions, bid items, quantities, and cost estimate for the final PS&E.

450.9.2 Civil Rights

Numerous state and federal laws and regulations pertain to civil rights. Contact the Civil Rights Office (CRO) for specific guidance and information not contained in this manual. Provisions to implement these laws are included in various contract "boilerplate" forms and in the specifications. Provisions for state-funded and federal-aid contracts are similar, but not identical.

Disadvantaged Business Enterprise (DBE) Program

The purpose of the DBE program is to provide an equal opportunity to participate in construction contracts and subcontracts for businesses owned and controlled by persons who are socially and economically disadvantaged. The requirement for DBE on federal-aid projects is covered in 49 CFR Part 26.

For all federal-aid projects, provide a copy of the final engineer's estimate to the Construction Section at least one week prior to the anticipated advertising date. The Construction Section will prepare the DBE Goals Worksheet and submit it to the CRO for approval. The CRO will finalize the DBE Goals Worksheet and prepare the DBE Goal memo and Form 25A-324 DBE - Subcontractable Items list. They will transmit these documents to the Construction Section for review and concurrence. If acceptable, Construction will transmit to the engineering manager and the Contracts Section.

The goal must be refreshed if the project is not advertised within three months of the goal set or if there is a change in the engineer's estimate.

On-the-Job Training (OJT) Program

The purpose of the OJT Program is to train and employ minorities and women in the construction industry. The requirement for an OJT Program is covered in 23 CFR 230.111.

On all federal-aid projects, coordinate with the Construction Section in preparation of the OJT Goal(s) at least one week prior to the anticipated advertisement date. Submit the final engineer's estimate to the Construction Section who will calculate the goal(s) based on the basic bid and will then submit it to the CRO for approval. Once approved, the CRO will issue the OJT Goal via memo to the Construction Section. Upon review and acceptance, Construction will transmit the memo to the engineering manager and Contracts Section. The goal(s) must be refreshed if the project is not advertised within three months of the goal set, or there is a change in the engineer's estimate.

The CRO establishes and approves OJT goals on federal-aid highway projects that can support this program. The OJT goal is then added to the contract documents before advertising. Include provisions for Section 645 -Training Program - in the specifications.

Title VI

Pursuant to the Civil Rights Act of 1964, the Department has prepared a Title VI/Nondiscrimination Program Plan to ensure compliance with federal civil rights laws and regulations. The Program Plan stipulates clauses to be included in construction contracts, professional

service agreements, and property actions. It also places coordination and reporting requirements on engineering managers during the project development and public involvement processes.

Copies of the Work Plan may be obtained from the Civil Rights Office.

450.9.3 Construction

Include construction staff in all plans reviews. They provide commentary on constructability, materials, scheduling, specifications, and cost issues. In some cases, it is advisable to consult with construction on any environmental permit stipulations, commitments, or construction restrictions to ensure that it can be built without violations.

450.9.4 Contracts

The Contracts Section will assist in compiling, copying, and distributing plan review sets. This usually includes inserting the necessary contract boilerplate language into the PS&E review set.

They also compile the final PS&E and incorporate it into a bid package that goes out for advertisement.

450.9.5 Environmental

The Environmental Section typically performs several functions during the PE through final PS&E phase, including obtaining all required approvals, authorizations, clearances, permits, and reviews; re-evaluation of the environmental document, checking that all necessary environmental commitment and mitigation measures are incorporated into the plans; and assisting design with any special environmental details, plans, or specifications that may be required.

Each of these functions will be covered separately.

Approvals, Authorizations, Clearances, Consultations, Permits, and Reviews

Some approvals, authorizations, clearances, consultations, permits, and reviews must be obtained during the NEPA process. Most of these will be obtained after environmental document approval. Work with environmental staff to ensure that the appropriate information and plan sets are submitted as required by resource agencies for their review and approval. Refer to Section 430.5.6 for more detailed information.

Environmental Document Re-evaluations

The purpose of an environmental re-evaluation is to determine if the environmental document (EA/FONSI, EIS/ROD) or CE designation is still valid before proceeding with a major project approval or authorization.

A re-evaluation is required per 23 CFR 771.129 prior to requesting the following ATPs:

- PE Through final PS&E
- Appraisals and Acquisitions
- Construction

After a project has received an approved environmental document, there are other circumstances that trigger the need for a re-evaluation:

- When a major step to advance a project has not occurred within three years;
- When there is an appreciable change in the scope or design that could result in revised conditions
- When there is new information on the project's effects

Coordinate with the REM regarding re-evaluations. The REM will determine what effects any project changes or changes in the effected environment may have on the validity of the environmental document and consult with the NEPA Program Manager. Procedures for re-evaluations are covered in Chapter 6 of the EPM.

Environmental Commitments and Mitigation

Environmental commitments and mitigation measures detailed in the approved environmental document and necessary permits are incorporated into the project plans and specifications.

Environmental staff may also help develop project specific Best Management Practices (BMPs), recommend erosion and sediment control measures, and review erosion and sediment control plans.

450.9.6 Geotechnical Investigations (Centerline, Materials Source, and Foundation)

A geotechnical, foundation, or material source investigation can be initiated during the design phase, or may be initiated in the preliminary project development phase as a reconnaissance investigation and continue into the design phase.

Geotechnical engineers or licensed geologists from the regional materials staff, statewide materials staff, or consultants conduct geotechnical investigations and prepare a final geotechnical report, in accordance with the *Alaska Geotechnical Procedures Manual* and the *AASHTO Manual on Subsurface Investigations.*

The purpose of the geotechnical investigation is:

1. To determine the nature of the geotechnical characteristics of the project site, including the surface conditions, geological hazards, and the underlying earth materials along the alignment
2. To assess foundation conditions at the site of structures
3. To recommend structural design parameters for earthwork and foundations
4. To estimate the availability and characteristics of construction materials
5. To identify and make recommendations for resolving special geotechnical problems such as soft ground, slope stability, thaw-unstable permafrost, and rock excavation

Centerline/Material Source Investigations

Centerline investigations are normally completed in support of design of the preferred design alternative, and consist of both centerline and material source investigations (see Section 450.10 for a discussion of material sources) including test borings, test pits, mapping, sample analyses, and preparation of a final report with recommendations for design. Limited centerline and material source investigations may also be completed to assist in evaluation of project alternatives.

To support the field investigation, the engineering manager provides:

- Line and grade data (existing and proposed)
- Cut and fill locations
- Earthwork quantity estimates
- Anticipated drainage provisions

Generally, for centerline investigations, the alignment is staked and stationed in the field or provided in an electronic format from which the geologist prepares an exploration plan for the regional materials engineer's and engineering manager's approval.

The engineering manager or principal designer should accompany the geologist on a field review of the alignment before beginning the field investigation. The engineering manager or principal designer may return for firsthand review of problem areas during field investigations.

As soon as the results of the field investigation are analyzed, the regional materials engineer submits a memorandum with interim design recommendations and a preliminary report to the engineering manager.

The final geotechnical report is normally completed by the geotechnical engineer or certified professional geologist that conducted the investigation after the final alignment, grade, and geometry have been selected. The report should describe surface characteristics and soil and rock conditions, and make design recommendations. The report is submitted to the engineering manager upon completion.

Foundation Investigations

Perform foundation investigations where structures such as bridges, buildings, or retaining walls are planned.

Foundation investigations are directed by the state foundation engineer, statewide or regional geotechnical engineer or licensed geologist, or geotechnical engineering consultants.

Foundation investigations look at surface and subsurface site conditions at the location of foundation units. The purpose of the investigation is to provide the designer with information on the engineering properties of the natural material for use in the foundation design.

The foundation engineer provides an exploration plan for the foundation investigation. The plan is based on the preliminary layout of the structure, which is normally completed before undertaking the investigation. Provide structure site map and plan/profile information to the foundation engineer for use in developing an exploration plan.

Complete the foundation investigation and geotechnical report in accordance with the *Alaska Geotechnical Procedures Manual* and the *AASHTO Manual on Subsurface Investigations.*

The final foundation report is normally completed after selection of the final structure location and then submitted to the engineering manager.

450.9.7 Hydrology & Hydraulics

The statewide or regional hydraulics engineer may remain involved in a project into the design phase if there are any of the following issues:

1. Culverts 48 inches or larger, or a bridge structure. In this case a hydraulic and hydrologic summary is required per Section 1120.5.6. Cross culverts 48 inches in height, or greater, should be evaluated for failure due to hydrostatic and hydrodynamic forces, erosion, saturated soils, or plugging by debris per Section 1120.5.1
2. Floodplain analysis. Generally, the Location Hydraulic Study (see Section 430.6.5 Hydrology & Hydraulics) is completed during the environmental document phase, but final analysis may continue in design
3. Riprap slopes in bodies of water
4. Fish passage design

The statewide hydraulics engineer is responsible for the hydrologic and hydraulic designs of all bridge projects. Regional hydraulics engineers are responsible for all single and multiple culvert installations not considered bridges (e.g. spans of less than 20 feet, measured parallel to centerline of roadway and out-to-out of culverts) and other drainage designs requiring a report.

All hydrologic and hydraulic reports must be sealed and signed by a professional engineer. If a hydrologic or hydraulic report is prepared by a consultant, the hydraulics engineer will review it and provide comments to the engineering manager prior to the report's finalization. The engineering manager will provide responses to all comments made by the hydraulics engineer.

The hydraulics engineer should review all changes or addenda related to hydraulic designs prior to the start of construction.

Some hydraulic designs may be prepared by the design staff and then checked by the regional hydraulics engineer.

450.9.8 Maintenance & Operations (M&O)

Consult M&O staff early in the final PS&E phase and include them in all plan reviews.

M&O will comment on any design, maintenance, or operational problems with an existing facility and should comment on features that lower M&O costs. Designers should always remember to include M&O costs in life cycle and benefit-cost analyses.

450.9.9 Right-of-Way (ROW)

The ROW section in each region obtains and manages the land interests necessary for construction, operations, and maintenance of capital projects, in accordance with the *Alaska Right-of-Way Manual*. This process involves:

1. Identifying real property and land interests based on design plans
2. Researching titles to properties to be acquired
3. Preparing right-of-way plans, with measurements of areas needed
4. Appraising the fair market value of lands needed, including affected improvements (The receipt of the Authority to Appraise and Acquire [AAA] starts the appraisal process)
5. Negotiating property acquisitions
6. Relocating any displaced families and businesses
7. Certifying the Department's ownership or land interest
8. Controlling encroachments and disposing of lands no longer necessary for public use
9. Preparing programming requests for the engineering manager's approval

ROW tasks 1-3 may begin in the preliminary project development and are completed during the design phase.

ROW task 4 may be done during preliminary design prior to completion of the Environmental Document – see Subsection 420.1.2.

After environmental document approval and ATP for PE through final PS&E, ATP for AAA may be requested from FHWA. The receipt of AAA starts the appraisal and acquisition process.

Design plans serve as the basis for the ROW plans. Closely coordinate design changes affecting the amount or location of required land with ROW and other support groups.

Designers need to give special consideration to access and space necessary to construct the project. Obtain

temporary construction permits or temporary easements for any work space needed beyond the ROW and easement lines.

Property owners may request that construction items be added to the plans. The negotiator submits such requests for engineering manager approval, on a Memorandum of Agreement (MOA), or a Memorandum of Understanding (MOU), form. If negotiations are successful, ROW processes the legal and payment documents, arranges for clearing the acquired right-of-way of any improvements, and manages any relocation of families or businesses.

Hazardous Materials
The presence of hazardous materials or hazardous waste can significantly affect appraisals. It is important that suspect parcels be identified and investigated early in the project development process, usually as part of environmental activities, so that any problems can be quantified and managed in time to minimize delay in the appraisal process.

Eminent Domain
If negotiations fail or title complications exist, and if administrative settlement at a higher-than-market price is imprudent or unsuccessful, initiate eminent domain proceedings through the Department of Law (DOL).

Approval to proceed with acquisition through condemnation is reserved for the preconstruction engineer. The DOL handles subsequent proceedings. These proceedings significantly affect project schedules and budgets. The proposed taking must be for the greatest public good and the least private injury.

If an eminent domain action is probable, the engineering manager needs to prepare a decisional document (DD). This DD explains to the landowner and DOL the basis for the Department's decision to acquire property and documents that DOT&PF has selected the project location most compatible with the greatest public good and the least private injury. In the DD, include the following:

1. Summary of relevant project background information
2. Studies that discuss the design alternatives and impacts
3. The public benefit and private loss of the property acquisition
4. A discussion of the necessity of acquiring the property through eminent domain

DNR Land Issues

A DNR ***Tidelands Lease*** may be required for permanent placement of fill or structures on state tidelands.

A DNR ***Tidelands Permit*** may be required for certain activities of a temporary nature on state tidelands.

A DNR ***Land Use Permit*** may be required for constructing projects on state-owned lands or crossing state-owned lands for access. Because the state owns most land below the ordinary high water line of navigable streams and lakes, this permit is required for most activities in waters of larger streams.

ROW Certification
When all the right-of-way is acquired or right of entry obtained, the chief right-of-way agent certifies the project and signs the project certification form when circulated by the engineering manager before requesting construction authority.

Send a copy of the ROW certification to FHWA. If there are relocations, certification cannot be made until the requirements of the Uniform Relocation and Real Property Acquisition Act have been fulfilled.

If specifically listed on the invitation for bids, make ROW information available to bidders.

450.9.10 Surveying
Additional topographic or boundary surveying may be required in support of the preferred design alternative or determination of the ROW lines. The engineering manager should alert the Survey Section of any additional pick-up work as soon as possible so that the work is scheduled.

450.9.11 Traffic and Safety
The Traffic and Safety Section may continue to work on those items noted in Section 430.6.5. In addition, they may work on or assist in preparing plans, specifications, and estimates for:

1. Traffic control
2. Roadside barrier analysis and design
3. Signing and striping

4. Signals systems
5. Illumination systems
6. Cost-effective crash and historical safety request mitigation measures identified during preliminary engineering work

450.9.12 Utilities

The engineering manager furnishes plans to the utilities engineer showing line, grade, slope limits, and clear zone widths. These plans are given to each affected utility company. The utility determines the adjustments and relocations necessary to avoid conflict with the project (which may warrant revising design plans), designs the changes to its facilities, and prepares plans and cost estimates to support the relocation agreement. In some cases, DOT&PF or a consultant performs the utility relocation design for relocation work to be included in the contract.

The utility engineer drafts relocation agreements for all affected utilities. All of the utility relocation design work and drafting of utility relocation agreements may be done under Phase 2.

If additional ROW is necessary to accommodate utility relocation and if it is to be acquired by the utility company, departmental approval is necessary before authorizing the utility company to begin appraisal and acquisition.

Prepare and submit a PDA for Utility Relocation. (See Section 420.1.1) Approval and execution of utility agreements is required before utility relocation work begins.

Relocation may be performed by the utility company, by a contractor managed by a utility or the Department, or as part of the Department's highway contract.

450.10. Materials Sources

A material source is a location where sand, gravel, rock, or other material may be extracted for use on a project. These types of materials may come from an existing commercial source, but when no commercial source is available, or in order to provide competitive bidding when only a single commercial source is available, DOT&PF may want to consider making a Department-furnished site available for use.

Table 450-2 provides a matrix defining responsibility for obtaining rights to material sources.

Table 450-2
Material Source Responsibility Matrix

	Contractor-Furnished Source	**Mandatory Source**	**Designated Source**	**Available Source**
Who owns the subsurface rights?	It depends, see narrative	The Department must obtain rights	The Department must obtain rights	The Department must obtain rights
Who obtains permits?	Contractor	Department	Department	Department or Contractor
Materials Report Req'd?	No	Yes	Yes	See below
Who prepares mining and reclamation plan?	Contractor – acceptable to Dept.	Department	Contractor	Contractor

The following definitions of the various types of material sources are derived from Section 106-1.02 of the SSHC:

- **Contractor-Furnished Source:** A material source that is from a commercial plant or any material source that is not identified in the bulleted list below.
- **Mandatory Source:** A material source required for use by the Department. A PIF is required to designate a material source as mandatory (See P&P 10.02.013 and 23 CFR 635.407).
  Designated Source: A material source that is made available to the contractor, but is not required for use.

- **Available Source:** A material source identified as available for use to the contractor. The Department makes no guarantee as to the quality or quantity of material available. Provide any available information as supplemental information and note its availability in the Notice to Bidders. The contractor is responsible for making their own determination of the quality and quantity of material available.
- **Excluded Material Source:** A material source that is excluded from use. It may be considered by the contractor as a contractor-furnished source, unless it is identified in the contract as an excluded materials source.

To use data from a materials report for a mandatory or designated material source, it must be a project specific report.

The permits necessary for a material source can be numerous and may include:

- Wetlands
- Floodplain
- SHPO
- Conditional use permit
- Noise

Obtain rights to use or otherwise develop a material source prior to advertising a project when it is the responsibility of the Department as indicated in Table 450-1.

Address permits to be obtained by the Department in the ATP through Final PS&E stage. Permits to be obtained by the contractor and the mining and reclamation plan will be obtained in the construction phase.

450.11. Material Disposal Sites

Many projects will generate unusable or excess materials such as clearing, grubbing, unsuitable unclassified excavation, and excess unclassified excavation.

Cleared and grubbed material may be burned, buried, or otherwise disposed. The contractor will comply with local laws pertaining to open burning and obtain a DEC air quality permit when required.

Unusable or excess materials can be buried in non-structural fill sections indicated on the plans

Disposal of unusable or excess material can be accomplished on-site with a state-furnished disposal site or off-site with a state or contractor furnished disposal site or a commercial landfill.

450.11.1 State-Furnished

Designers should consider non-environmentally sensitive upland areas within the right-of-way limits for material disposal. Also consider slope flattening on adjacent segments of roadway.

These areas should be accounted for in the environmental document process and the plans should indicate their locations and the conditions for wasting the material such as vegetating, etc.

450.11.2 Contractor-Furnished

If no State-furnished material disposal areas are made available or they are not adequately sized, the contractor will either secure his own material disposal site or use a commercial landfill.

450.12. Driveway and Approach Road Design and Permitting

The Department has adopted regulations (17 AAC 10) pertaining to the legal requirements for driveways and approach roads placed within its highway right-of-ways. Those portions of the driveway within the right-of-way are considered encroachments, and the property of the state, but construction, maintenance, and liability are at the expense of the lands served.

450.12.1 Driveway and Approach Road Design Standards

Section 1190, presents Department standards for driveway and approach road design on highways, streets, and roads it administers or maintains.

Section 1190 applies to all new driveway and approach roads designed and constructed by the Department.

Section 1190, as published in December 1998, applies to:

- All existing driveways and approach roads
- Design and construction of all new private driveways and approach roads applied for and built by the permit applicant

- All existing driveways and approach roads reconstructed or modified by a Department highway or road project

Driveways with permits (considered encroachment permits by state law) issued prior to April 1, 1986, are not required to conform to the standards presented in Section 1190 unless the Department determines the driveway must be changed or relocated for public safety. A new permit is required if a landowner changes the land use, relocates the driveway or approach road, or changes the geometry.

All driveways or approach roads upgraded or constructed on, or after April 1, 1986, must conform to the requirements of Section 1190 , as published in December 1998 version of the HPCM, unless the Department makes an exception in writing through a design waiver. This exception is for project related driveways and is not for new driveway applications.

450.12.2 Driveway Permit Procedures

Do not acquire driveway permits as part of the project development and construction process.

Existing driveways and approach roads (herein referred to as an approach) should be located and noted on the project plans. At existing driveways and approach where there is no record of a permit:

1. Determine if the driveway or approach creates an unsafe condition or a traffic operations issue (both considered a "problem").
2. If a problem exists, the driveway or approach should be removed subject to the extent that a permit would not be issued for it "as-is." Notify the Permits Officer so that an attempt can be made to contact the property owner and to determine whether the property owner intends to apply for a permit for an alternate access location. If an alternate access location is approved, construct it as part of the project.
3. If it doesn't create a problem, reconstruct it as part of the project.
4. If the driveway or approach has no permit and appears recently constructed (e.g. after project development commencement) but does not create a problem, then notify the Permits Officer so that the property owner can be contacted and advised of the permit application process requirements. If a permit application is submitted and approved, include reconstruction of it in the project plans. If a permit application is not submitted or approved, it is considered an unauthorized encroachment per AS 19.25.220-250.

450.12.3 Driveways in the Project Plans and As-Builts

Existing driveways and approach roads onto state roads and highways shall be shown in the project plans and noted for removal, relocation, improvement or retention as-is.

Include supplemental information (milepost, street address, GPS coordinates, etc.) in the driveway summary in the project plans to help identify the specific property being served.

The as-built plans and driveway summary constitutes a valid driveway permit for all driveways and approaches reconstructed or allowed to remain as part of the project, whether or not there was a prior permit, unless otherwise noted. Provide a copy of the as-built driveway summary to the regional Permits Officer.

A driveway permit obtained via the construction as-built plans satisfies the landowner's requirement for permitting. The landowner is not required to take additional steps to permit the improvement unless they wish to:

- Change the land use of the property served by the driveway or approach
- Change the location of a driveway or approach
- Otherwise modify the existing driveway or approach

If any of the aforementioned changes occur, the landowner is required to obtain a new driveway permit.

450.13. Reserved

450.14. Local Review

When a design is between 30 and 50 percent developed, the engineering manager may hold a local review to ensure consistency with project scope and adequate coordination between the involved support groups.

By this time, existing and proposed line, grade, typical section and slope limits, preliminary soils report, and rough estimates of the earthwork quantities and costs should be available.

This is an informal review by personnel involved with the various aspects of development (Bridge, Design, Construction, Environmental, Maintenance, Materials, Planning, Right-of-Way, Traffic and Safety, Utilities, etc.).

Comments should be pertinent to the purpose of the review and appropriate for the level of design development.

For all major urban projects with an EA- or EIS-level environmental document, submit plans to the municipal director of planning for review and comment.

450.15. Plans-in-Hand (PIH) Review

Plans-in-Hand review consists of an office review of the approximately 75-percent-completed plans, specifications, and cost estimate, and a field review of the proposed project site. The PIH review:

- Ensures conformity with project scope and the approved project design criteria
- Verifies environmental conditions and impacts
- Reviews design details and verifies technical recommendations
- Assesses the cost-effectiveness of the design and accuracy of the construction cost estimate
- Evaluates the quality of the product

All projects will undergo a PIH review. Some smaller projects may have a combined PIH and PS&E review if approved by the regional preconstruction engineer. The engineering manager allows a sufficient time for review of the plans, and then schedules a meeting to discuss the PIH package.

Distribution of review assemblies for all projects (PIH & PS&E) is generally to the following:

- Design
- Bridge
- Construction
- Statewide Materials
- Regional Planning
- Right-of-Way
- Environmental
- Regional Materials
- City or municipality having local planning authority
- Utilities
- Borough
- Surveying/Locations
- Traffic & Safety
- Review engineer
- Maintenance and Operations
- Other involved state/federal agencies
- Consultant(s) (if used)

450.16. Value Engineering (VE)

Department policy requires that all projects with a total estimated value equal to or greater than $40 million be considered for a VE analysis. For those projects, document the decision to use or not use value engineering in the DSR.

A VE analysis is required for bridge projects on the NHS with an estimated cost of $40 million or more; for all other projects on the NHS, an analysis is required when the estimated total cost is $50 million or greater, per 23 CFR 627.5.

The total estimated value of a project includes costs for:

- Preliminary Engineering
- Right of Way
- Construction
- Utility Relocation

A value engineering analysis is best performed as early as practicable in the design stage. On projects selected for a VE analysis, consult with the regional VE coordinator and follow procedures specified in P&P 05.01.030.

450.17. Local Concurrence

AS 35.30 requires coordination of projects with municipalities, communities, and villages within, or near, the project limits.

Municipalities

Except as noted later, submit plans and specifications for all state facility construction projects within a municipality and all municipal facility projects to the planning commission along with a formal letter requesting they take the following action:

- Review and comment on the plans and specifications
- Complete a specific review to address compliance with municipal planning and zoning ordinances, and other regulations

Maintenance projects are excluded from this requirement.

A template letter for this purpose is shown in Figure 450-1 of this section. An electronic version of this is found on the Preconstruction Resources webpage:

http://dot.alaska.gov/stwddes/dcsprecon/index.shtml

Submit the plans and specifications at the earliest time they are sufficiently developed for review of compliance with local planning and zoning ordinances and other regulations.

If the municipality fails to comment within 90 days, the Department may proceed with the project.

For written comments received within the 90 day period, the Department will:

- Bring the project into compliance with planning and zoning ordinances or other regulations per AS 35.30.020, or seek a waiver from municipal planning authority.
- Consider comments to the extent practicable and provide written responses.

AS 35.30.010 states that prior approval by a municipal planning commission is not required before the construction of a highway or local service road if:

1. The Department and the municipality have entered into agreement for the planning of the project under AS 19.20.060 or 19.20.070 and the plans for the project are completed in accordance with the terms of that agreement;
2. The municipality has adopted a municipal master highway plan under AS 19.20.080 and the highway or local service road is consistent with the plan adopted; or,
3. The Department has entered into agreement with the municipality for the planning of transportation corridors under AS 19.20.015 and the plans for the project are completed in accordance with the provisions of that agreement.

For maintenance projects within a municipality to be completed using private contractors, send a letter stating the project scope and estimated advertising date to the municipality's planning director.

Communities with a Community Council

For projects located within one-half mile of the boundary of an area represented by a community council established by municipal charter or ordinance, send a formal letter to the community council requesting that they review and comment on the project plans and specifications.

A template letter for this purpose is shown in Figure 450-2. An electronic version of this is found on the Preconstruction Resources webpage.

Villages

For projects located within two miles of a village, send a formal letter to the community council requesting that they review and comment on the project plans.

A template letter for this purpose is shown in Figure 450-3. An electronic version of this is found on the Preconstruction Resources webpage.

450.18. Constructability Review

A Constructability Review (CR) is a design review involving those with construction expertise. A CR is performed by the Construction Section. When a design review (local, PIH, or PS&E) set is distributed, the Construction Section is responsible for determining the appropriate level of CR and for assigning personnel with adequate construction expertise.

The purpose of a CR is to transfer construction knowledge, to ensure the project is biddable and buildable; that the contract documents clearly define when, where, and what work is to be performed; what restrictions exist; and how the contract work will be accepted and paid for.
Additionally, CRs look at:

- Coordination of contract documents
- Construction phasing and scheduling
- Traffic control
- Ease of construction
- Design consistent with field conditions
- Environmental Considerations
    - Erosion and sediment control
    - Timing restrictions

- Permit conditions and stipulations

Comments from a CR review are handled the same as other plan review comments. CR personnel should participate in plan review meetings as appropriate.

450.19. Plans Specifications and Estimate (PS&E) Review

Perform a PS&E review on all projects, unless waived by the Preconstruction Engineer. This is the final review of the completed plans, specifications, and estimate (PS&E), packaged in a format to include the Bid Schedule, Invitation for Bids, and other project-specific contract documents: a final contract mock-up.

Distribution of review assemblies is similar to the list for PIH Review, adding the project control chief and planning chief. You may combine the PIH review with the PS&E review subject to regional policy and procedure.

Distribute PS&E assemblies externally (e.g. FHWA, local agencies, municipalities, etc.) in accordance with regional policy.

As with the PIH review, it is important that comments receive objective consideration. Regional policy will adjudicate outstanding issues.

Provide reviewers a response to their comments, and provide a copy of all comments and responses to the Construction Section.

450.20. Final PS&E

Upon completion of changes from the PS&E review, the original, reproducible plan sheets are sealed, signed, and dated in ink by the registered engineer(s) responsible for their preparation, in accordance with P&P 70-1003, AS 08.48.221 and 12 AAC 36.185, and the cover sheet is signed by the person(s) delegated by regional authority. Submit the original plans, a copy of the final specifications and estimate, and any other information necessary for advertising to the Contracts Section.

Plans may include private contractor (company) or public agency names to identify and acknowledge their contribution to a project. No contractor or public agency logos apart from the DOT&PF logo are allowed anywhere in the plans. Other public agency logos are permitted when that agency provides a majority of funding for the project.

Identify contractors or other public agencies involved in the development of plans for the Department by including the company or agency name on the plan sheets in accordance with regional policy and 12 AAC 36.185. Use lettering that is 1/16” or less in height as printed on 11” x 17” plan sheets, and use the same font as other lettering of similar size on the plan sheet.

Production of the final PS&E completes the design stage. The project is ready for advertising once the Project Certification and Authority to Advertised are obtained (see Section 470).

Buy America Provisions

FHWA’s Buy America policy (see 23 CFR 635.410) requires a domestic manufacturing process for all steel or iron products permanently incorporated in a federal-aid highway construction project. Federal regulations allow an exemption for minor quantities (0.1% of the total contract amount or $2,500, whichever is greater) of non-domestic steel or iron products.

When a product manufactured predominantly of steel or iron material is identified in the contract by name and/or manufacturer, determine whether the product is, or is not, manufactured in the United States.

Include Statewide Special Provision HSP18-1 to indicate whether a predominantly steel or iron product called for in the contract by name and/or manufacturer is manufactured in the United States. If unable to determine whether or not a product is manufactured in the U.S., list the product as not manufactured in the U.S.

A waiver to this policy may be requested from the Alaska Division of FHWA in accordance with 23 CFR 635.410(c). Further guidance on Buy America waivers is found here:

https://www.fhwa.dot.gov/construction/contracts/buyam_qa.cfm

450.21. Retention of Project Development and Design Files

After contract award, consolidate records pertaining to project development as much as possible.

On federal aid highway construction projects, retain project records at least three years after FHWA pays the final voucher.

On state-funded projects, the three-year retention begins when the state issues the letter of acceptance to the contractor. The retention is automatically extended through resolution of any outstanding litigation, claims, or audits, and it may be extended by specific retention schedules or regional policy.

Make records available for public inspection at reasonable times and places in accordance with AS 40.25.110 and with prior coordination with the Department's attorney. This does not include records deemed confidential and exempt from disclosure under the Freedom of Information Act (see 49 CFR Part 7).

Examples of confidential records include attorney-client correspondence, records pertaining to pending claims or litigation, and personnel matters (AS 09.25.110 and AS 09.25.120).

THE STATE of ALASKA
GOVERNOR MIKE DUNLEAVY

Department of Transportation and Public Facilities

Section
DOT&PF Engineering Manager

Address 1
Address 2
Phone
Fax

Date

Re: *Project name, number, and location*

Certified Mail #: _____
Return Receipt Requested

Name and Mailing Address of Planning Commission

Dear *Planning Commission,*

The enclosed plans are submitted for your review and comment, and for determination of compliance with local planning and zoning ordinances. Under AS 35.30.020, the Department must comply with local planning and zoning ordinances and other regulations in the same manner and to the same extent as other landowners. If you believe the Department's construction of this project would result in a violation of planning, zoning, or other regulations generally applicable to landowners, please identify the portions of the project that would be in violation, and the specific planning, zoning, or other regulations that you believe would be violated.

Pursuant to AS 35.30.010, you have 90 days from delivery of the plans to provide comments on the project and to notify the Department whether the project violates any planning, zoning, or other regulations. If comments are not received within this time frame, the Department is authorized to proceed with the project.

Thank you for attention to this matter.

Respectfully,

DOT&PF Engineering Manager

Enclosure: Project Plans

"Keep Alaska Moving through service and infrastructure."

Figure 450-1
Example Letter to Planning Commission

THE STATE of ALASKA

GOVERNOR MIKE DUNLEAVY

Department of Transportation and Public Facilities

Section
DOT&PF Engineering Manager

Address 1
Address 2
Phone
Fax

Date

Re: *Project name, number, and location*

Certified Mail #: _____
Return Receipt Requested

Name and Mailing Address of Community Council

Dear *Community Council,*

The enclosed plans are submitted for your review and comment in accordance with AS 35.30.010.

You have 90 days from the delivery of the plans for your review and to offer any comments on the project and plans. Failure to provide comments within this time period will result in the Department moving forward with the project without taking your comments into consideration.

Thank you for your attention to this matter.

Respectfully,

DOT&PF Engineering Manager

Enclosure: Project Plans

"Keep Alaska Moving through service and infrastructure."

Figure 450-2
Example Letter to Community Council

THE STATE of ALASKA

GOVERNOR MIKE DUNLEAVY

Department of Transportation and Public Facilities

Section
DOT&PF Engineering Manager

Address 1
Address 2
Phone
Fax

Date

Re: *Project name, number, and location*

Certified Mail #: _____
Return Receipt Requested

Name and Mailing Address of Village Council

Dear *Village Council,*

The enclosed plans are submitted for your review and comment in accordance with AS 35.30.010.

You have 90 days from the delivery of the plans for your review and to offer any comments on the project and plans. Failure to provide comments within this time frame will result in the Department moving forward with the project without taking your comments into consideration.

Thank you for your attention to the matter.

Respectfully,

DOT&PF Engineering Manager

Enclosure: Project Plans

"Keep Alaska Moving through service and infrastructure."

Figure 450-3
Example Letter to Village Council

470. Advertising and Award

470.1. Introduction
470.2. Shelved Projects
470.3. PS&E Approval and Project Certification
470.4. ATP for Construction and Authority to Advertise (ATA)
470.5. Advertising for Bids
470.6. Addenda
470.7. Bid Opening, Evaluation and Analysis
470.8. Bid Award, Cancellation and Protests
470.9. References

470.1. Introduction

This phase of project development generally begins with completion of the final PS&E and ends with an award to a contractor for construction of the project.

Procedures detailed in this section are required on federal-aid projects. Project certification is different for state funded projects (see Section 490 of this manual). Bid analysis is advisable on State funded projects.

Design-build contracting is allowed under 23 CFR 636, AS 36.30.200(c) and 2 AAC 12.933. Follow guidelines presented in 23 CFR 636, P&P 10.02.020, and the *Guidebook for Design-Build Highway Project Development* manual when advertising design-build contracts. This manual is located here:

http://www.dot.state.ak.us/comm/design_build.shtml

470.2. Shelved Projects

When a project does not have construction funding available immediately upon completion of the final P&SE, it is shelved. Follow regional policy for shelving projects.

Shelved projects should be reviewed prior to advertising to ensure:

- Current design standards are met
- Engineer's estimates are still accurate
- Environmental documents have not expired and permits are still valid
- Standard specifications and standard modifications have not changed, required FHWA contract provisions have not changed and DBE/OJT goals are still valid.
- Status of utility agreements and ROW certification is still valid
- No field changes within the project limits, such as a change in original ground, or new driveways, signs, utility work, etc.

470.3. PS&E Approval and Project Certification

When the PS&E is final, circulate it with the FHWA Project Certification Form and the review comment resolution memo. Route it to the REM, the regional ROW chief and the regional utilities engineer then sign it before submitting to the preconstruction engineer for final PS&E approval. The FHWA Project Certification Form is found here:

http://www.dot.state.ak.us/stwddes/dcsprecon/preconmanual.shtml

470.4. ATP for Construction and Authority to Advertise (ATA)

Once the final PS&E is approved and the project certified, Project Control prepares the ATP for Construction funding request and submits it to FHWA. The ATP for Construction request must include the FHWA Project Certification Form with the requested Phase 4 programming amount.

Approval of the ATP for Construction constitutes PS&E approval by FHWA.

After FHWA approves the ATP for Construction, Project Control will confirm that authorization has been received. The preconstruction engineer will then grant approval for Authority to Advertise (ATA).

Once the ATA is received, deliver the final PS&E, project certification, and ATA to the Contracts Section for bid advertising.

470.5. Advertising for Bids

Establish the bid advertising period after receiving the ATA. By state and federal law (AS 36.30.130, and 23 CFR 635.112[b]), the minimum advertising period is 21 days prior to bid opening. Four to six weeks is advisable depending on the complexity and location of the project.

The contracting officer may approve a written determination to shorten the minimum advertising period when it is advantageous for a particular bid and adequate competition is anticipated.

The Contracts Section will prepare and post an invitation to bid. Provide them with any additional advertising information they require, such as special notices to bidders.

470.6. Addenda

Addenda are used to make changes to the contract documents or to advise all bidders of pertinent information after a contract is advertised for bids. Changes to the bid proposal, bid schedule, bid bond, specifications, plan sheets, or appendices require an addendum. Prepare, process, and approve addenda in accordance with departmental and regional policy and procedures.

Addenda are posted on the DOT&PF Procurement website and/or faxed to all plan holders generally at least 48 hours prior to the bid opening. The Contracts Section keeps hard copies of the addenda in the plans room and shall keep records relating to the posting and distribution of all addenda in the contracts file.

470.7. Bid Opening, Evaluation and Analysis, and Recommendation

470.7.1. Bid Opening

Open bids in accordance with P&P 10.02.011. After the Bid Tabulation is checked and certified, total bid amounts are posted on the DOT&PF Procurement and Contracting web site:

http://www.dot.state.ak.us/procurement/bidding/index.shtml

470.7.2. Bid Evaluation and Analysis

After bid opening examine the low bid tabulation, conduct a bid evaluation and analysis, and then prepare a recommendation memo to submit to the contracts officer.

On federal-aid projects, FHWA requires the apparent low bid be checked for reasonable conformance with the engineer's estimate. It also requires a bid analysis on a bid where (a) there are extreme variations from the engineer's estimate, or (b) there is an unbalanced bid situation.

The two types of unbalanced bids are mathematically unbalanced and a materially unbalanced bid.

Mathematically Unbalanced Bid

A mathematically unbalanced bid contains lump sum or unit price items which do not reflect reasonable actual costs plus a reasonable proportionate share of the bidder's anticipated profit, overhead, and other indirect costs.

Materially Unbalanced Bid

A materially unbalanced bid contains mathematical unbalancing, and:

- Raises doubt that award to the bidder will result in the lowest ultimate cost to the department, or
- Is so unbalanced it results in a significant advance payment to the bidder.

The *Standard Specifications for Highway Construction* (SSHC) states that materially unbalanced bids shall be rejected as nonresponsive (see Section 102-1.06); thus, a bid evaluation and analysis is necessary in the bid award process.

To perform a bid evaluation and analysis, do the following:

1. Sum the total of the bid, construction engineering and ICAP amounts and determine whether they are within the programmed funding amount. If so, advance to 2.

   If they are not, consult with Project Control and the Planning Section to determine if additional funding is available. If additional funding is unavailable the Department may consider: (1) rejecting all bids or (2) repackaging and rebidding the project with possible modifications to lower the cost.

2. Determine if the bid prices are in reasonable conformance with the engineer's estimate and other bids.

3. Determine whether the bid is mathematically unbalanced (as defined above).

   If the answer to (2) is yes and the answer to (3) is no, the bid analysis can stop here. If the answer to (2) is no and (3) is yes, then proceed to the following steps:

4. Verify that the bid quantities are correct. If not, will the contract cost increase if the quantities are corrected? Will the low bidder remain the low bidder if quantities are corrected?

5. On bid items where quantities may vary, will the low bidder remain as low bidder if quantities change?
6. Determine whether the contractor can manipulate the final quantity of any mathematically unbalanced bid items.
7. Is the bid materially unbalanced? If so, did the unbalancing have a detrimental effect on the competitive bid process or could it cause contract administration problems after award?

470.7.3. Recommendation Memo

After evaluating and analyzing the bids, the engineering manager will prepare a recommendation memo. This memo will recommend either awarding the contract to the low bidder or rejecting all bids and cancelling the award. In the event of a materially unbalanced bid, recommend either rejecting the apparent low bid and awarding it to the next low bidder, or cancelling the bid.

A recommendation to award should comment on the following:

- Competitiveness of the bids received
- Recommendation for awarding the contract

A non-award recommendation should comment on the following:

- Competitiveness of the bids received
- Conformance of bid prices with the engineer's estimate
- Any mathematical unbalancing
- Any material unbalancing and the nature of the detrimental effects on the bidding process or contract administration
- In the case of a materially unbalanced bid rejection, whether the next low bid should be evaluated

470.8. Bid Award, Cancellation, and Protests

The engineering manager will submit the recommendation memo to the Contracts Section and send a copy to the preconstruction engineer. The Contracts Section will issue either a Notice of Intent to Award (NOI) or a Notice of Cancellation (NOC) to all bidders.

If a contract award is recommended, the Contracts Section will issue a NOI to all bidders.

A recommendation to cancel a bid or reject all bids on a construction project must be submitted to the chief contracts officer (CCO). If the CCO concurs, a Notice of Cancellation (NOC) is sent to all bidders. See P&P 10.02.017.

The NOI and NOC trigger a protest period of 10 days in which unsuccessful bidders may dispute the contract award (AS 36.30.365) or bid cancellation (2 AAC 12.615).

If the Contracts Section receives a bid protest within the protest period, it must decide whether to award the contract, postpone award, or issue a written "Stay of Award" in accordance with AS 36.30.575.

Absent compelling reasons to continue with the award, the contracting officer should, at a minimum, postpone the award until the protest and appeal have been fully evaluated.

If a written "Stay of Award" is issued, it will automatically continue if there is a timely appeal of the protest decision. Without a Stay of Award, a contract may be awarded at any time during the protest and/or appeal.

After the low bidder executes and returns the necessary forms, the Letter of Award and Notice to Proceed may be issued.

The engineering manager should send a memo to Project Control requesting a closeout of Phase 2 prior to awarding of the contract. Phase 2 closes on the date of award.

470.9. References

1. Code of Federal Regulations 23 CFR 635.112 – Advertising for Bids and Proposals
2. 23 CFR 635.113 - Bid Opening and Bid Tabulation
3. 23 CFR 635.114 – Award of Contract and Concurrence in Award
4. DOT&PF Policy and Procedure 10.02.011 – Bid Openings
5. DOT&PF Policy and Procedure 10.02.017 – Cancellation of a Solicitation and Rejection of all Bids or Proposals Procurements.

6. FHWA Memorandum to Regional Federal Highway Administrators and Direct Federal Program Administrators, "Bid Analysis and Unbalanced Bids" May 16, 1988. Reference No. HHO-32

   http://www.fhwa.dot.gov/programadmin/contracts/051688.cfm

7. AS 36.30.130 – Public Notice of Invitation to Bid
8. AS 36.30.140 – Bid Openings
9. AS 36.30.150 – Bid Acceptance and Bid Evaluation
10. 2 AAC 12.860 – Rejection of All Bids or Proposals

480. Preventive Maintenance Force Account Projects

480.1. Introduction
480.2 Project Development

480.1. Introduction

Preventive Maintenance Force Account (PMFA) projects use state maintenance and operations equipment and personnel to complete preventive maintenance activities. Preventive maintenance work is only done by state forces when it is cost effective and in the best interest of the state, and falls within P&P 07.05.080. Force account construction is covered in 23 CFR 635 Subpart B.

480.2. Project Development

The development of PMFA projects is similar to other projects discussed in this chapter. Prepare an environmental document as described in Section 430 and in accordance with the *EPM*. Plans and specifications for PMFA projects need not be as comprehensive as for competitively bid projects.

Other steps in the design process are covered in P&P 07.05.080, Procedure, Part C.

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485. Intelligent Transportation System (ITS) Projects

480.1. Introduction
480.2. Policy
480.3. Definitions
480.4. Identification of ITS Projects
480.5. Systems Engineering Analysis

485.1. Introduction

Intelligent Transportation System (ITS) projects improve transportation safety and efficiency, and enhance productivity through the integration of advanced communication technologies into the transportation infrastructure and in vehicles.

ITS includes a broad range of wireless and wire line communications-based information and electronic technologies. The FAST Act encourages the use of ITS to improve the safety and efficiency of transportation systems.

485.2. Policy

23 CFR Subchapter K, Part 940 on ITS System Architecture and Standards and FHWA policy on Architecture and Standards Conformity requires all ITS projects or ITS elements within a project using federal funds be developed using systems engineering.

23 CFR 940 provides policies and procedures for implementing that part of Section 6002 of the FAST ACT pertaining to conformance with the National Intelligent Transportation Systems Architecture and Standards. 23 CFR 940 requires that ITS projects conform to the National ITS Architecture and Standard through the regional ITS architecture. 23 CFR 940 provides policies and procedures for conformance with the National ITS Architecture and Standards. Two regional architectures have been established in Alaska:

- The Alaska regional architecture (Alaska Iways Architecture), and
- The Anchorage regional architecture.

Develop ITS projects in accordance with the applicable regional architecture. The Alaska regional ITS architecture is available on line at:

http://www.dot.state.ak.us/iways/architecture.shtml

This section provides guidance to meet those requirements.

485.3. Definitions

Archived Data Management System: An automated computer system that collects and stores traffic data from roadway sensors or detectors.

Automated Anti-Icing and De-Icing System: An automated system that remotely applies anti-icing or de-icing chemicals to the roadway. The system uses atmospheric and pavement sensors to provide early warning of changing conditions. Technology includes environmental sensors to detect weather conditions, telecommunications to transmit data from the environmental sensor, and computer software to generate criteria and trigger the anti-icing and de-icing system built into roadway infrastructure.

Automated Pedestrian Detection System: A system that detects the presence of pedestrians as they approach the curb prior to crossing the street, and automatically calls the "Walk" signal. These systems can also extend the clearance interval in order to allow more crossing time for slower persons.

Avalanche Detection System: A system that provides nearly immediate notification and real-time mapping of current avalanche activity. It uses sound sensor arrays which transfers sound information to data loggers and then to a local computer for processing. The computer generates a map of avalanche activity and forwards this to avalanche staff.

AVL: Automatic Vehicle Location. Systems that incorporate positioning technologies, mapping, and communications to allow the location of a vehicle to be determined. Examples include route guidance, computer-aided dispatch, transit traveler information, commercial vehicle fleet management, "Mayday" or motorist assist technologies, congestion detection and stolen vehicle recovery systems.

AVL often uses Global Positioning Systems (GPS), radio frequency triangulation, proximity beacons, and cellular telephone systems.

Crash Data Reporting System: A computerized system that allows the electronic transfer of crash data

from incident/accident response agencies to transportation agencies for analysis to benefit traffic safety.

Credentials Administration System: An Internet site that allows commercial vehicle operators to apply for and receive credentials online.

Dynamic Message Signs: Signs that display information and can electronically vary the display as traffic or environmental conditions warrant. Also known as changeable or variable message signs.

Electronic Screening: An electronic data interchange system that transmits safety and credentials history data from an information infrastructure to a roadside system. It typically involves vehicles equipped with transponders and roadside readers to either receive messages from the vehicles or send messages to vehicle.

Environmental Sensors: A system used by transportation agencies to make winter maintenance decisions and to provide traveler information to the public, consisting of:

- Surface sensors, which monitor pavement temperature and surface conditions including presence of ice, frost, water, and snow
- Atmospheric-condition sensors, which monitor air temperature, dew point, relative humidity, precipitation, wind direction, wind speed, and visibility
- Remote processing units, which collect and transmit the surface and atmospheric data from the sensors to a central processing unit
- Central processing units that contain data for graphic presentation and transmit data to remote terminals

Ferry Tracking: Online vessel tracking system using GPS, satellite, and a computer-based information system. The vessel's status, location, speed, arrival, and departure information is displayed on a website in near real-time.

Freight Management System: The application of automated vehicle location systems using GPS, telecommunications, computer-based information systems, and mobile communications to improve efficiencies in shipping freight.

Fleet Management System: The application of automated vehicle location using GPS, telecommunications, computer-based information systems, and an automated vehicle detection system (sensors on the vehicle that detect diagnostics and maintenance) to improve the efficiency, reliability, and safety of transit systems.

Infrared Inspection System: Infrared camera and computer based system used at commercial vehicle weigh stations to detect malfunctioning brakes.

Intelligent Specialty Vehicle System: A system of differential GPS, telecommunications, computers, radar detectors, and a heads-up video monitor display ("smart snowplow/snow blower" or "driver-assistive systems technology") in the cab of maintenance vehicles to provide drivers with information under difficult driving conditions, such as low visibility, severe weather, and narrow and congested roadways.

ITS: Intelligent Transportation System. Electronics, communications, or information processing used to improve the efficiency or safety of a surface transportation system.

ITS Project: Any project that in whole or in part funds the acquisition of technologies that provide or significantly contribute to the provision of one or more ITS user services as defined in the National ITS Architecture.

ITS System Manager: The individual position responsible for the design standards, integration, and operational standards of specific ITS components. This position may, or may not, be the one responsible for day-to-day maintenance and operation of the system.

ITS Telecommunication Projects: Telecommunication technology used in Intelligent Transportation Systems.

Land Mobile Radio System: High-frequency, two-way radios that allow both voice and data transmission to communicate with other emergency service agencies and access data from other intelligent transportation systems, such as road weather information systems, maintenance management systems, etc.

Maintenance Decision Support System: A computer-based system that collects information from various weather databases and disseminates it

electronically to transportation-related agencies with the intent of improving road weather forecasting.

Maintenance Management Systems: A computer-based system that allows transportation agencies to manage and monitor maintenance activities electronically by collecting information in the field using laptops and transmitting the information to a central computer system where the data is stored and retrieved for analysis.

Onboard Safety and Security System: A commercial vehicle system that uses automated sensors on the vehicle to collect and process on board vehicle and driver safety and security information for detection of unsafe equipment or load conditions.

Safety Information Exchange: An automated system using electronic data transfer software and the internet to enable roadside collection and exchange of interstate/intrastate commercial vehicle safety information.

Signal Operations Center: A location from which signals can be controlled and monitored.

Signal Preemption: Event driven system of signal control at intersections typically used to reduce delays for emergency services or to prevent conflicts with Railroad operations.

Signal Priority: Event driven system of signal control at intersections typically used to reduce delays for mass transit vehicles.

TOC: Traffic Operations Center. A physical location or virtual facility for the control, monitoring and management of traffic signal, freeway, and corridor control, and traveler information systems within its jurisdiction using data gathered from ITS technologies. Also referred to as Traffic Management Center (TMC).

Traffic Detection: A system used to indicate the presence or passage of a vehicle, providing volume, speed, and occupancy data. They include weigh in motion systems, traffic recorders, classifier detectors, and other similar technologies

Traffic Management System: A Traffic Management System is used to monitor, control, and manage traffic more effectively. A Traffic Management System includes a Traffic Management Center and links to other ITS components in a metropolitan area.

Examples of a Traffic Management System include:

- ramp metering
- signal operations center (SOC)
- ramp closures
- lane control
- variable speed control
- priority control for high-occupancy vehicles
- vehicle detectors
- call boxes
- weather and environmental detectors
- overheight vehicle detectors
- automatic truck warning system
- closed circuit television (CCTV)
- video
- lane-use control signals
- highway advisory radio (HAR)
- in-vehicle systems
- highway/railway intersection control
- communications (including real-time communications received from police and maintenance personnel, as well as cellular telephone reports called in from drivers)

Traffic Signal Control System: A system of devices that work together to operate a single traffic signal or to provide coordination between multiple signal systems and optimize roadway operations.

Transportation Infrastructure Monitoring System: A security system used to monitor strategic transportation infrastructure, such as major bridge crossings. Technologies include video cameras and telecommunications to relay images back to a central server.

Traveler Information System: A system of computers that centralizes information from various databases, traffic sensors and detectors, environmental sensors, and cameras and disseminates the data in the form of information such as road conditions, traffic advisory reports, and weather advisories to the traveling public via internet,

telephone (511) systems, and smartphone apps. 511. Alaska.gov is an example of such a system.

TSMO: Transportation Systems Management and Operations. TSMO is an approach to congestion mitigation that seeks to identify improvements to enhance the capacity of an existing system through better management and operation of existing transportation facilities. TSMO techniques are designed to improve traffic flow, accessibility, and safety.

TSMO strategies are generally low-cost but effective in nature and eliminate the need for major projects.

Video: Video is used for traffic detection and roadway surveillance. Video is an integral part of many ITS services such as Transportation Infrastructure Monitoring System, Traffic Management System, Traffic Operations Center, etc.

485.4. Identification of ITS Projects

An ITS project is one that includes elements or systems of elements contributing to one or more ITS service areas.

The engineering manager determines whether the scope of the project includes ITS elements. Table 430-1 lists ITS elements, the associated ITS service area, and system manager. Consult with the ITS system manager(s) to determine which, if any, ITS elements to include in your project. If a project is federally funded and contains any of the elements listed in Table 430-1, it must be developed as an ITS project. Non-federally funded projects that contain any of the elements listed in Table 430-1 are considered ITS projects and should be developed in accordance with this Section.

An ITS project can be either a significant, or non-significant one. A non-significant ITS project contains ITS elements, but represents a minor modification or upgrade to any existing system. A non-significant ITS project does not require a Systems Engineering Analysis.

Examples of a non-significant ITS project are:

- Upgrade of a traffic signal controller from an ASC/2 to ASC/3.
- Upgrade of opticom sensors and controller equipment to prevent unauthorized users or devices from activating the system while maintaining authorized users activation capabilities.
- A traffic signal installation that only includes technologies already present in the current system.
- A Temporary Traffic Control device not interconnected with the ITS Architecture or one with an established interconnection protocol.
- Connecting a device to a system that does not provide new technological capabilities or alter the relationships of similar previously installed devices or the system.

Request concurrence from FHWA on all non-significant ITS project determinations. Include concurrence documentation in the Design Study Report (DSR) (See Section 450.5.1)

Contact the State ITS Coordinator if any part of a project may be an ITS element (as presented in the regional ITS architecture) but is not included in the elements listed in Table 485-1. A portion of a project that is not listed as an ITS element but which contains or interfaces with electronic components should also be referred to the State ITS Coordinator for evaluation for ITS element status.

485.5. Systems Engineering Analysis

The purpose of a System Engineering Analysis is to deliver a project that:

- Is constructible
- Fulfills anticipated benefits
- Can be operated and maintained
- Capable of communicating and integrating with other systems now, or in the future.

All significant ITS projects require a Systems Engineering Analysis (SEA), except for Non-Systems Engineering Projects. Non-Systems Engineering Projects are ones that:

- Do not include any ITS devices
- Only include signal systems equipment upgrades or signal re-timing/re-coordination
- Only include stand-alone ITS devices that do not/will never communicate
- Only include fiber or conduit

Non-significant ITS projects do not require an SEA. See 485.4 for the differentiation between significant and non-significant ITS Projects.

In consultation with the ITS systems managers, complete a Systems Engineering Checklist (SE Checklist) for all significant ITS projects. The SE Checklist includes:

1. Portions of the Regional ITS or Statewide Iways Architecture being implemented and, identification of the program area(s), including a brief description of the functional needs to meet that Program Area(s).

   Consult the Statewide ITS Coordinator if any ITS element in your project does not fit in with the goals of the program area.

2. List of participating agencies and a discussion of their roles and responsibilities.

3. Definition of system requirements.

4. Analysis of alternative system configurations and technology options to meet the system requirements.

5. Identification of procurement options.

6. Identification of applicable ITS standards and testing procedures.

7. Identification of procedures and resources necessary for operations and management of the system. Some ITS O&M costs qualify for Federal Participation. Identify those costs in this section. If a project would otherwise qualify as non-significant, it might be desirable to perform an SEA to qualify these costs.

The following online table with contact information for individual ITS system managers can be found here:

http://www.dot.state.ak.us/stwddes/dcsprecon/index.shtml

The SE Checklist and instructions are found at the same location.

For examples of SE checklists, contact the Iways Program Administrator.

Include the completed SE Checklist as an appendix to the DSR. Provide an electronic copy of all SE Checklists to the statewide Iways/ITS coordinator and the FHWA ITS coordinator.

Table 485-1
ITS Elements

ITS ELEMENT	ITS SERVICE AREA*	ITS SYSTEM MANAGER
Archived Data Management System	Data Archive	Regional Traffic Data Manager
Automated Anti-Icing System	Winter Maintenance	Regional M&O Chief
Automated Pedestrian Detection	Traffic Management	Regional Traffic and Safety Engineer
Automatic Vehicle Location	Winter Maintenance Public Transportation	Regional M&O Chief State Transit Office
Avalanche Detection System	Winter Maintenance Incident and Emergency Management	Regional M&O Chief
Bridge Scour Detection Systems	Other	State Bridge Engineer
Crash Data Reporting System	Data Archive	Regional Traffic Data Manager
Credentials Administration System	CVO and Freight	MS&CVE ITS Coordinator
Dynamic Message Signs	Traffic Management CVO	Reg.. Traffic & Safety Engineer MSCVE
Electronic Screening	CVO and Freight	MS&CVE ITS Coordinator
Environmental Sensors	Winter Maintenance	Statewide ITS Coordinator (RWIS)
Ferry Tracking	Public Transportation	AMHS
Freight Management System	CVO and Freight	MSCVE ITS Coordinator
Fleet Management System	Public Transportation State Equipment Fleet	AMHS SEF Manager
Infrared Inspection System	CVO and Freight	MS&CVE ITS Coordinator

Table 485-1 (Con't)
ITS Elements

ITS ELEMENT	ITS SERVICE AREA*	ITS SYSTEM MANAGER
Intelligent Specialty Vehicle System	Winter Maintenance	Regional M&O Chief
Intersection Collision Warning System	Traffic Management	Regional Traffic and Safety Engineer
Land Mobile Radio System	Multiple	Central Region M&O Manager
Maintenance Decision Support	Winter Maintenance	Regional M&O Chief
Maintenance Management Systems	Winter Maintenance	Regional M&O Chief
IT Communications Interface Projects	Multiple	Statewide ITS Coordinator
Onboard Safety and Security System	Commercial Vehicle Operations	MS&CVE ITS Coordinator
Roadway Lighting System Control	Traffic Management	Regional Traffic and Safety Engineer
Traffic Detection	Traffic Management	Regional Traffic and Safety Engineer
Traffic Signal Systems, Subsystems, and Equipment	Traffic Management	Regional Traffic and Safety Engineer
Traveler Information	Traffic Management / Multiple	State ITS Coordinator
Video Surveillance and CCTV	Traffic Management	Regional Traffic and Safety Engineer

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490. State-Funded Projects

490.1. Purpose
490.2. Reserved
490.3. General
490.4. Project Development Authorizations
490.5. Civil Rights Program
490.6. Design Criteria Approval
490.7. Environmental Requirements
490.8. Right-of-Way Requirements
490.9. Local Concurrence
490.10. Non-Required Process

490.1. Purpose

The purpose of this chapter is to establish procedures for state-funded capital improvement projects, from authorization through construction contract award.

While this chapter establishes minimum requirements, the engineering manager may determine that additional steps are appropriate for a project.

When not specifically exempted or altered by this subsection, follow the guidance provided in the remainder of this manual.

490.2. Reserved

490.3. General

The flow chart in Figure 490-1 shows the relative progression of design, right-of-way, and environmental work on a state project. There are no FHWA approvals required on state-funded projects.

490.4. Project Development Authorizations

Proper authorization to obligate funding and commence project development activities consists of an approved PDA.

Request ATP for PE through Final PS&E on the initial design PDA for state-funded projects. Project Control prepares the initial PDA based on input from Planning and Design. Planning provides the project scope, project purpose, vicinity map, funding source, and amount authorized by the Legislature.

Design provides estimated funding requirements by phase similar to those of a federally-funded project. State-funded projects are not usually included in the STIP.

Complete the State-Funded Project Certification form and submit to the preconstruction engineer along with the request for Authority to Advertise (ATA). Once the project is certified, submit the PDA for Construction. The State-Funded Project Certification is located here:

http://www.dot.state.ak.us/stwddes/dcsprecon/preconmanual.shtml

See Section 420.1 of this manual for further information on project development authorization.

490.5. Civil Rights Program

490.5.1. Disadvantaged Business Enterprise (DBE)

Bidders are not required to meet minority business recruitment goals on state-funded projects.

490.5.2. On-The-Job Training (OJT)

OJT positions are not included in state-funded projects.

490.5.3. Title VI

Title VI compliance and reporting is required for state-funded projects. (See Section 430.6.5 and the State Projects Environmental Form)

490.6. Design Criteria Approval

Design criteria is established by the engineering project manager and approved by the preconstruction engineer after the proposed action is identified.

Approval of design criteria constitutes design approval.

490.7. Environmental Requirements

Environmental documentation on state-funded projects is addressed in Chapter 9 of the *Alaska FHWA Program Environmental Procedures Manual*, which if found here:

http://www.dot.state.ak.us/stwddes/desenviron/resources/docprep.shtml

490.8. Right-of-Way (ROW) Requirements

The *Alaska Right-of-Way Manual* provides specific guidance for state-funded projects.

Project ROW plans must be complete before acquisition begins on any property that is less than a total acquisition.

Advanced acquisition prior to completion of ROW plans may be accomplished for total takes.

490.9. Local Concurrence

Comply with Section 450.17 of this manual.

490.10. Non-Required Process

Many processes, policies, and procedures contained in Chapter 4 of this manual are not required for state-funded projects, but may be prudent for specific complex or controversial projects. The regions may decide whether or not to do the following:

- Design Study Report (DSR)
- Project Information Document (PID)
- Local Review
- Public Involvement

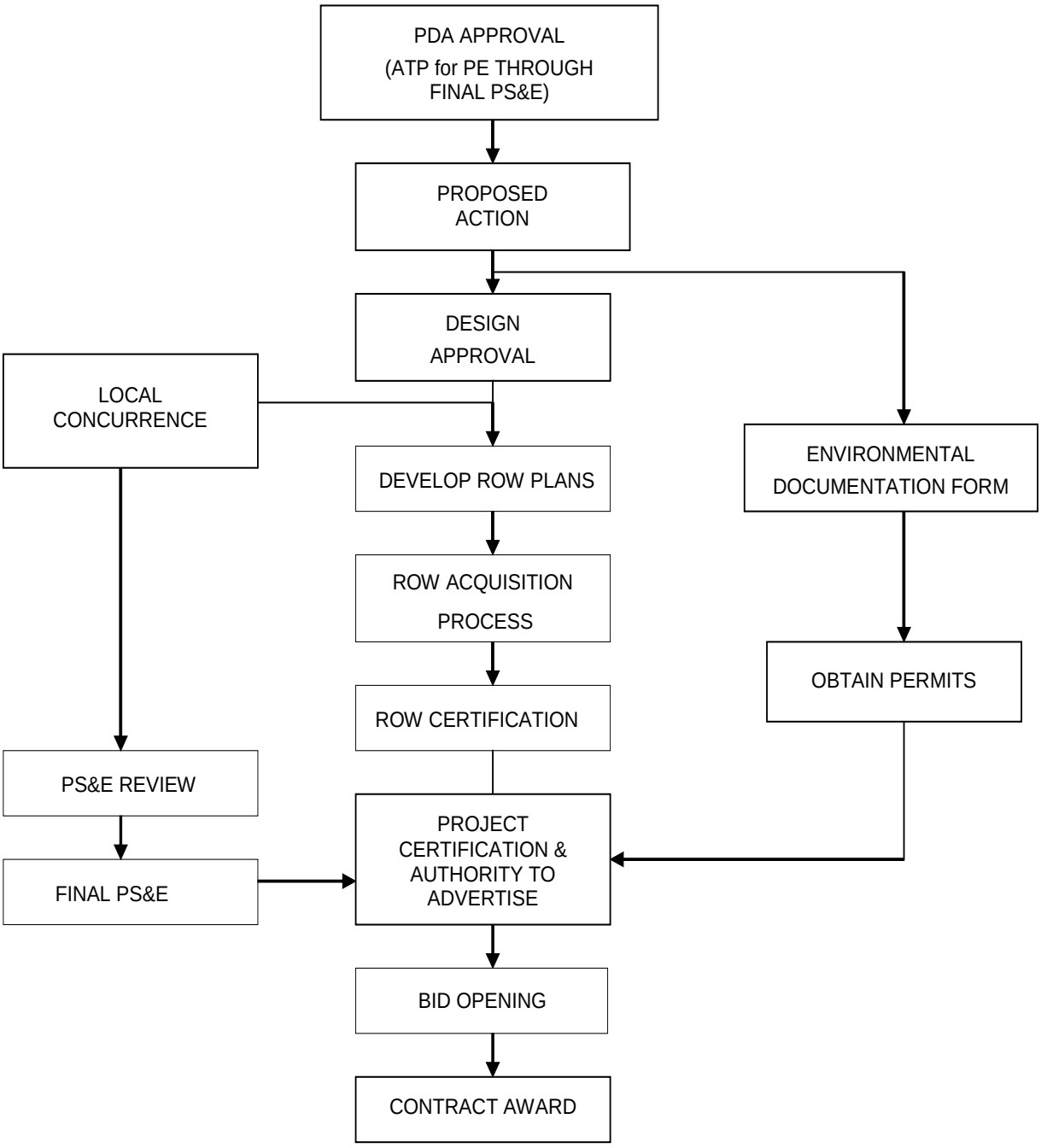

Figure 490-1
State Funded Design Process

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495. Denali Commission Projects

495.1. Purpose
495.2. General
495.3. Project Grant Award
495.4. Project Development Authorizations
495.5. Coordination with Owner/Public Involvement
495.6. Project Management Plan (PMP)
495.7. Civil Rights Program
495.8. Design Study Report (DSR)
495.9. Project Reviews
495.10. Environmental Requirements
495.11. Right-of-Way (ROW)
495.12. Utilities
495.13. Maintenance Agreements

495.1. Purpose

This chapter establishes the procedures for capital improvement projects funded by the Denali Commission (Commission). It covers activities from authorization to contract award for construction.

495.2. General

The Denali Commission was established by Public Law 105 – 277 enacted in 1999, as amended by Section 1520 of MAP-21. The purpose of the Commission is to:

1. Deliver the services of the Federal Government in the most cost-effective manner practicable by reducing administrative and overhead costs.
2. Provide job training and other economic development services in rural communities, particularly distressed communities.
3. Promote rural development; provide power generation and transmission facilities, modern communication systems, water and sewer systems, and other infrastructure needs.

The Commission is composed of appointed members with a statewide perspective and knowledge of rural Alaska matters, including:

- Transportation
- Design
- Construction
- Maintenance of rural infrastructure
- Community and regional planning
- Workforce development
- Health
- Energy
- Communications infrastructure

The Commission establishes projects through the authority granted to it and seeks the services and expertise of the Department on some projects.

The "Memorandum of Agreement between the Denali Commission and the Alaska Department of Transportation and Public Facilities" (MOA) is found here:

http://www.dot.state.ak.us/stwddes/dcsprecon/index.shtml

The MOA establishes three levels of Departmental involvement in Commission projects. Those three levels are:

1. DOT&PF Administered Projects;
2. DOT&PF Design, Procure and Monitor Projects;
3. DOT&PF Project Cost Accounting and Periodic Inspection projects.

Table 1 of the MOA establishes general responsibilities associated with the three levels of Commission projects. Responsibilities may be altered or refined in the project Grant Award (see subsection 495.3.).

The flow chart in Figure 495-1 shows the relative progression of design, right-of-way, and environmental work on projects funded by the Commission. Note that only ATP through Final PS&E and ATA are required.

495.3. Project Grant Award

The Commission prepares the project Grant Award. After negotiation, the Commission and DOT&PF execute the mutually agreed upon project Grant Award.

The Grant Award establishes the responsibilities of DOT&PF and the Commission. The responsibilities established in the grant award will usually follow those provided in Table 1 of the MOA; however,

changes to the responsibility matrix may be made in the Grant Award on a project by project basis.

495.4. Project Development Authorizations

Request ATP through Final PS&E on the initial design PDA for Commission projects. Project Control prepares the initial PDA based on input from Planning and Design.

Authorization to obligate funding and commence project development activities may begin once the ATP through final PS&E is processed.

Planning provides:

- Project purpose and scope
- Vicinity map(s)
- Schedule
- Funding source and programmed amount

Design provides estimated funding requirements by phase. Because Commission projects are not included in the STIP, use a preliminary engineering estimate to establish funding amounts per phase.

The PDA establishes the authorized funding levels by project phase. Subsequent PDAs are initiated by the engineering manager.

Once the final PS&E is complete, submit the Project Certification Form-and submit it to the preconstruction engineer for approval along with the request for ATA. The Denali Commission Project Certification Form is found here:

http://www.dot.state.ak.us/stwddes/dcsprecon/precon manual.shtml

495.5. Coordination with Owner/Public Involvement

Commission projects may be developed for local entities provided they own the ROW where the project is to be constructed and assume maintenance responsibilities for the completed project.

Coordinate with the owner(s) to establish responsibility and the extent of local public involvement before any work begins. Participate in, or lead, any public workshops, meetings, or hearings as agreed through coordination with the owner.

495.6. Project Management Plan (PMP)

Guidance for developing a PMP is provided in Section 430.2 of this manual.

Add a section to the PMP designating the general guidance to be followed in the project design. Use this manual as a guide unless other design guidance is specified in the Grant Award.

495.7. Civil Rights Program

Civil rights program requirements are the same as those for FHWA-funded projects (see Section 450.9.2.).

495.8. Design Study Report (DSR)

The regional preconstruction engineer determines if a DSR is necessary. Complete a DSR after identification of the proposed action.

495.9. Project Reviews

Typically a combined PIH and PS&E review is conducted for Commission projects. The engineering manager may determine that a separate PIH review is necessary due to project complexity or in the interest of assuring understanding between DOT&PF and the owner(s) concerning project scope.

495.10. Environmental Requirements

Environmental documents for Denali Commission projects are developed by the Department or the owner of the project. The environmental process follows either the *Alaska DOT&PF Environmental Procedures Manual (DOT&PF EPM*) or the *Alaska FHWA Program Environmental Procedures Manual (FHWA EPM)* depending on whether the project is assignable or non-assignable per the NEPA Assignment Program Memorandum of Understanding between DOT&PF and FHWA.

495.11. Right-of-Way (ROW)

The Department is generally not involved in ROW actions needed for non-Department administered Commission projects. The owner or partner will certify that ROW interests necessary for project construction are obtained.

On Department administered projects, the regional ROW chief transmits a letter of ROW certification recommendation to the Commission.

When DOT&PF resources are used to accomplish ROW acquisitions, follow the *Alaska Right-of-Way Manual* state-funded project guidance.

495.12. Utilities

The Department is generally not involved in utility relocations for non-Department administered Commission projects. The owner(s) will certify that appropriate and adequate utility relocation coordination has taken place prior to construction.

On Department administered projects, the regional utility engineer transmits a letter of recommendation for certification to the Commission.

When DOT&PF resources are used to accomplish utility relocations, follow the *Alaska Utility Manual*.

495.13. Maintenance Agreements

Maintenance agreements are normally prepared and executed between the Commission and the local owner or partner. If the project is state owned, the Department will draft the maintenance agreement and transmit it to the Commission for approval.

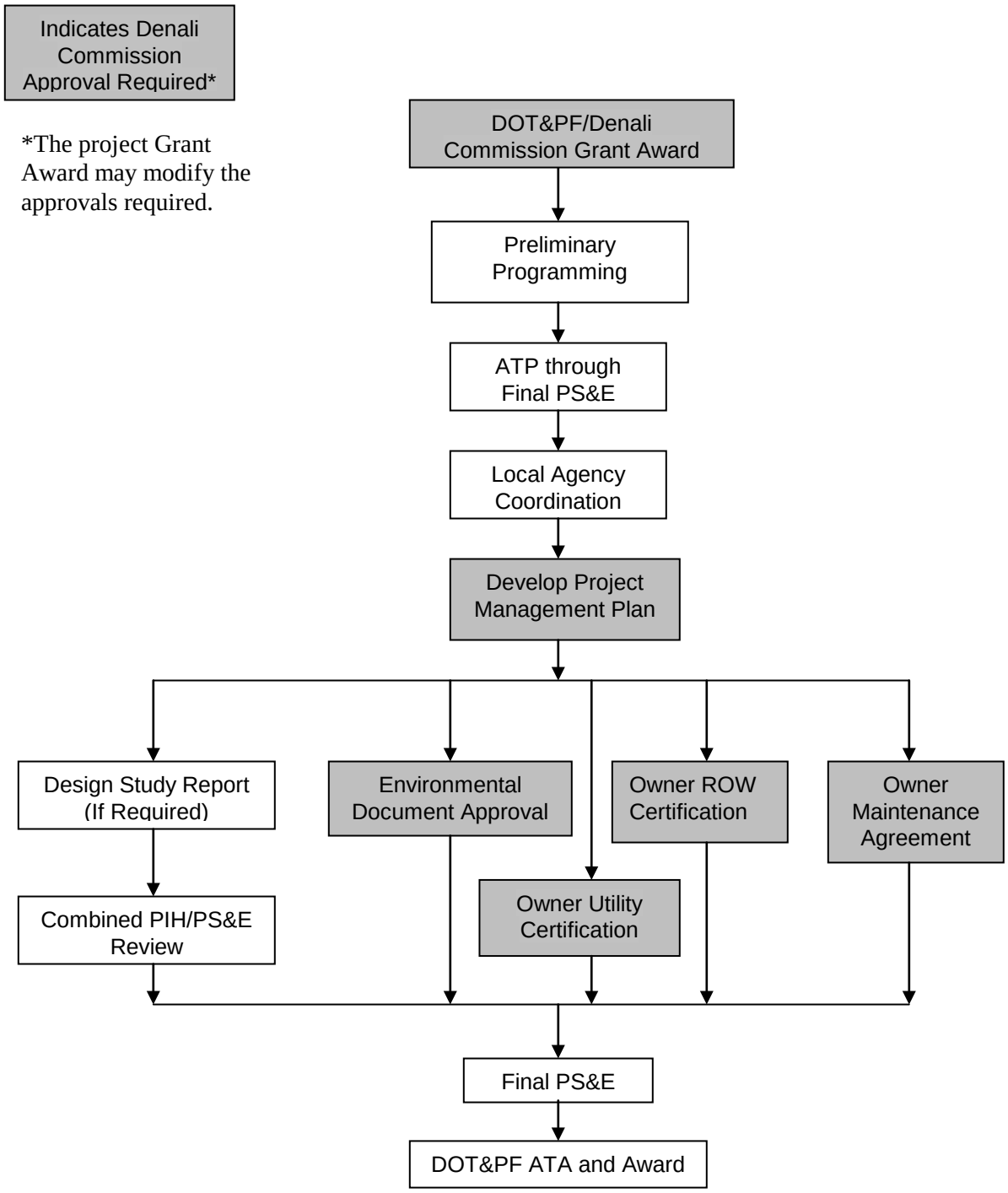

Figure 495-1
Denali Commission Project Flow Chart

497 Projects of Division Interest (PoDIs)

497.1 Introduction
497.2 Project Responsibilities

497.1. Introduction

This section highlights procedures specific to FHWA Projects of Division Interest (PoDIs). PoDI projects are:

- Major projects estimated to have a total project cost of more than $500 million
- TIGER and BUILD Discretionary Grant Projects
- Projects selected by FHWA for Risk Based Stewardship and Oversight.
- Programmatic

The FHWA Alaska Division office selects projects designated as PoDI. Individual PoDI are common and are selected based upon an individual project risk assessment. Programmatic PoDI are uncommon – they reflect the risk-based need for FHWA to retain responsibilities for certain project approval actions on a program-wide basis.

Project risk areas that FHWA considers include:

1. Complexity
2. Cost
3. Schedule
4. Urgency
5. Environmental Considerations/Stakeholders
6. Funding
7. Project Administration
8. National/Regional Significance
9. Corporate Actions
10. Local Considerations

497.2. Project Responsibilities

The Stewardship and Oversight Agreement (SOA) identifies federal-aid highway project approval and related responsibilities which are subject to DOT&PF assumption. For each individual PoDI, the FHWA Alaska Division office prepares a project-specific Stewardship and Oversight Plan (SOP). The SOP describes the project risk areas that FHWA Division has identified, as well as FHWA's planned risk response strategies. Risk response strategies usually include approvals and responsibilities otherwise assumed by the DOT&PF which are reverted back to the FHWA Alaska Division for the individual project. Because each individual SOP is unique to the project, it is important to be familiar with the approvals and responsibilities which FHWA has retained.

When the FHWA Alaska Division office creates a new PoDI or updates an existing one, the new or updated SOP is provided to DOT&PF. The project-specific SOP will normally include the following information:

1. Project information
2. FHWA contact person
3. Primary PoDI type
4. Risk areas associated with the project (from FHWA's risk-based assessment)
5. Project elements that will be reviewed by FHWA in response to the risks
6. Activities to be conducted on the project – i.e. retained/reassumed approval action(s), inspections, etc.

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5. Public Involvement and Agency Coordination

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500. Public Involvement and Agency Coordination

500.1. Public Involvement Personnel

500.1. Public Involvement Personnel

500.1.1 Headquarters (Reserved)

500.1.2 Regions

Each regional director will assign public information functions, including preparation of news releases and news articles for publication and/or broadcast on the status of projects within the region.

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510. Planning

510.1. Public Involvement Program
510.2. Participants

510.1. Public Involvement Program

Include a public involvement program as necessary in planning studies, such as modal system plans, regional multimodal transportation plans, area multimodal plans (i.e. AMATS, FMATS, STIP), master plans and facility plans, project feasibility studies, and other transportation and public facility planning studies.

510.2. Participants

Public involvement in planning studies and in the ongoing planning process will include, where applicable, involvement of the following groups:

- All DOT&PF divisions
- Local, state, and federal governments, and elected officials
- Native corporations and associations
- User groups (airlines, trucking firms, etc.)
- Other interest groups (local Chambers of Commerce, Americans With Disabilities Act advisory groups, Associated General Contractors, Trucking Association, etc.)
- The public

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520. Project Development

520.1. Public Involvement Plan
520.2. Coordination With Agencies
520.3. Local Planning Authority
520.4. Highways
520.5. Airports
520.6. Harbors, Ports, and Buildings Projects

520.1. Public Involvement Plan

Prepare a Public Involvement Plan (PIP) for each project. Each region shall assign a responsible party to take the lead in preparing the Public Involvement Plan.

The plan shall address, at a minimum, all state and federal public involvement requirements and assign responsibility for implementation. Regional Design and Construction Standards and the regional environmental coordinator must concur on the Public Involvement Plan. Always consult Planning for information on publicly sensitive issues.

520.2. Coordination With Agencies

a. During the project development phase, the degree of involvement of other agencies varies depending on the issues that must be addressed. This degree of involvement may include other agencies providing:

   1. Input to the information base for project development
   2. Conceptual reviews, including project purpose and need and practicable alternatives
   3. Participation in specific project studies
   4. Participation in project specific meetings/groups
   5. Participation in cooperative research
   6. Participation as cooperating agencies as defined by the Council on Environmental Quality (CEQ).

b. Regardless of the degree of involvement, you normally contact agencies identified to have expertise or jurisdiction within an area affected by a project three times during the course of project development; i.e. during:

   - Scoping
   - Environmental document review
   - Review for permits

   These contact points include the Notice of Intent to Develop a Project, the formal agency review of a project, and the Notice of Availability of the Environmental Document. Invite some agencies to participate in public hearings, meetings, etc.

c. The Environmental Section of each region will maintain a master list containing the addresses and contacts for all agencies.

   The Environmental Section will prepare a project-specific list for each project.

   Periodically review and update the project mailing list during project development.

520.3. Local Planning Authority

For guidance on local planning authority project involvement, see sections 430.2., 460.2. and 460.4. of this manual.

520.4. Highways

520.4.1 Federal-Aid Highway Projects

1. Depending on the impact classification of the project, specific public hearing requirements must be met (23 CFR 771.111[h]). You must hold a public hearing or offer the opportunity for a public hearing for projects:

   - Requiring significant amounts of right-of-way
   - Having an adverse affect on abutting property
   - Modifying legal access rights—either vehicular or pedestrian
   - Substantially changing the layout of connecting streets or nearby pedestrian facilities
   - Having an obvious, suspected, or known significant and/or controversial

environmental, social, or economic impact

For projects that have long-term design activities or where concepts change after the initial hearing, resulting in the reevaluation of project environmental documents, consider having a second public hearing, though not required, prior to completing the design study report.

All projects shall offer at least an opportunity for a public hearing during the environmental analysis process, unless the project meets Federal Highway Administration criteria for a categorical exclusion. (If an EA or EIS is required, early public involvement will be required.)

If preliminary impact studies show a project to be without significant impacts, the region may elect to hold or offer an opportunity for a public hearing later during project development.

2. For most projects meeting the FHWA criteria for a categorical exclusion, a hearing or opportunity for public hearing is usually not necessary, but consider public meetings/workshops.

   For example, improvements that are normally noncontroversial, such as resurfacing, widening existing lanes, adding auxiliary lanes, replacing existing grade separation improvements, etc., do not require specific hearings, unless the project:

   - Requires the acquisition of significant amounts of right-of-way that is in private ownership
   - Would have an adverse effect on abutting real property
   - Would substantially change the layout or function of connecting roads, streets, or adjacent pedestrian features of the facility being improved
   - Has a significant social, economic, environmental or other effect, or for which FHWA determines that a public hearing is in the public interest

3. All formal public hearings must be preceded by one or more of the following activities to ensure maximum opportunity for public participation (many of these activities are good practice even if no formal public hearing is required):

   - An informal public meeting or workshop targeting participation by businesses and residents affected by the proposed project
   - Addressing directly and personally the concerns of local groups expressing a desire to discuss the project before the hearing
   - Conducting face-to-face meetings with the people involved
   - Corresponding with businesses and residents who may be affected by or on the mailing list for the project
   - Making data available for public inspection at locations and times convenient to the public
   - Providing announcements to radio and television and other available media (radio is a primary source of information for blind people) concerning the project
   - Issuing news releases in conjunction with meetings when the information would be of public interest
   - Scheduling public meetings within accessible facilities and at times that will enable maximum public participation
   - Posting notices for meetings within the study area
   - Publishing notices in the Alaska Administrative Journal

4. Place notices for public hearings in local or regional newspapers and, where possible, include the information necessary to satisfy the Public Notice requirements of state and federal permits, wetlands and flood plains, executive orders, and the Alaska Coastal Zone Management Program.

5. The Department may satisfy the requirements for a formal public hearing by:

- Holding a public hearing, or
- Publishing two notices of opportunity for public hearing and holding a hearing if any written requests are received that cannot be resolved by contact with the requester

Requirements for Notices of Opportunity for Public Hearing and Public Hearings are found in Section 570.

520.4.2 State-Funded Highway Projects

There is no state law requiring public hearings on a state-funded project. Keep in mind that urban or neighborhood residents may expect the same type of opportunity to comment on a state-funded project that they get on a federally-funded project. If the Department does not provide the opportunity, it may suffer loss of credibility and have difficulty with the next federal project. In some cases, it may be desirable to hold or offer an opportunity for a public hearing for these projects if:

1. Federal-aid funds could be used at a future date on the route
2. Significant controversy can be avoided by explaining the project through the public hearing format
3. Holding a public hearing would facilitate permit requirements for the project

520.5. Airports

520.5.1 Federal-Aid Airport Projects

In accordance with the Airport and Airways Improvement Act, the sponsoring agency for a proposed airport development project must offer the opportunity for public hearing if the project involves any of the following:

1. New airport location
2. New runway
3. Extension of existing runway

In general, hold the public hearing prior to formal submission of the sponsor's environmental report.

In all other situations, whether or not to hold a public hearing is discretionary. The Federal Aviation Administration has provided guidelines for determining whether hearings should be held based on:

1. The magnitude of the proposal in terms of environmental impacts
2. The degree of interest in the proposal as evidenced by requests for a hearing from residents and public officials
3. The complexity of issues and likelihood that relevant information will be presented at the hearing
4. The extent to which effective public involvement has already been achieved through means other than public hearings

The FAA requires that the sponsor consult with air carriers and fixed base operators regarding the proposed project and should submit documentation of the consultation.

520.5.2 Community Approval

The FAA requires that when a new airport is constructed in a non-metropolitan area, the sponsor must provide a certification that the community supports the location of the proposed airport.

520.5.3 State-Funded Airport Projects

Same as for Federal-Aid Airport Projects.

520.6. Harbors, Ports, and Buildings Projects

Local governments shall review all harbors, ports, and building projects as described in the Local Planning Authority, Section 520.3.

Local government approval or permit processes normally fulfill all the requirements for public hearings. Keep in mind that urban or neighborhood residents may expect the same opportunity to provide input on a state-funded project that they get on a federally funded project. If that opportunity is not given, the Department could suffer a loss of credibility and difficulties in future projects.

Depending on the nature and sensitivity of the project, also consider public hearings, a notice of opportunity for a public hearing, or a public meeting.

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530. Construction

530.1. General

530.1. General

Note in the project files questions and coordination with the public and other agencies that come up during construction.

Construction staff will handle controversial construction issues, such as traffic interruptions and noise complaints, with assistance from other regional staff when requested.

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540. Maintenance and Operation

540.1. General

540.1. General

When a project is complete and open to public use, the public may again submit questions and comments. Regional Maintenance and Operations staff may keep a record of the issues, and call on other sections to help answer questions and evaluate comments.

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550. Public Involvement Activities

550.1. Public Meetings (Workshops)
550.2. Notice of Opportunity for Public Hearing

550.1. Public Meetings (Workshops)

A meeting or workshop is an informal exchange of information that allows for informal procedures. Use meetings or workshops throughout the public involvement process where appropriate, and you may record or transcribe them. Include a summary of events at the meeting or workshop in the project file.

To acquire resident input that is timely and representative, the Department may use interviews and questionnaires. Surveys provide comprehensive information on general attitudes and preferences related to the project development process. This is an effective way of finding characteristics such as:

- Mobility
- Income level
- Length of residence in the area
- Dependence on the neighborhood for making project-relative decisions, especially among marginally different alternatives

550.2. Notice of Opportunity for Public Hearing

a. Explain the procedure for requesting a public hearing in the notice and publish it in local or regional newspapers, and in the Alaska Administrative Journal.

b. A request for a public hearing cannot be made more than 21 days after the date of publication of the first notice, and not more than 14 days after the date of publication of the second notice. Advertise an opportunity for a public hearing on aviation airport projects for at least 30 days.

   State in the notice of opportunity for a public hearing that the hearing is “for the purpose of considering the economic, social, and environmental effects of the project and its consistency with the goals and objectives of such urban planning as has been carried out by the community.”

c. Include in each notice a description of the proposed project and a map or other graphic, contact person and phone number, and deadline for the request for a public hearing. Include in the notice the location of the following information:

   1. Drawings, maps, plans, reports, or other project information
   2. Environmental documents prepared or being prepared for the project
   3. Written views from other agencies, private groups, and individuals

d. All of the information in c. above must be available for copying and/or public inspection.

e. Furnish a copy of the notice of opportunity for public hearing to the responsible federal agency, and to the commissioner's office. If the Department receives no requests in response to a notice within the time specified, the Department will document this.

f. Provide the opportunity for a public hearing when either the Department or the federal funding agency is in doubt about whether a hearing is required.

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560. Changes in Scope/Public Hearing Opportunity

560.1. General

560.1. General

Provide the opportunity for another public hearing when proposed changes in location or design would have substantially different social, economic, or environmental effects.

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570. Public Hearings

570.1. Definition
570.2. Notice of Public Hearing
570.3. Conduct of Public Hearings
570.4. Post-Hearing Public Involvement
570.5. ADA Requirements

570.1. Definition

A public hearing is a formal meeting required by specific regulations requiring complete, verbatim transcripts.

570.2. Notice of Public Hearing

a. Publish a Notice of Public Hearing at least twice in at least one local or regional newspaper. The notices should also be published in any newspapers having substantial local readership, such as foreign language newspapers and community newspapers. Publish the first notice 30 to 40 days before the hearing, and publish the second notice five to 12 days before the hearing. The timing of additional notices is optional. Also publish the notices in the Alaska Administrative Journal.

b. In addition to publishing a formal Notice of Public Hearing, mail copies to appropriate agencies, local public officials, and public advisory groups.

   Attempt to contact owners of affected property who may not realize a hearing is scheduled, especially absentee landowners. Consider the use of tax rolls, where they are available, to notify these people by letter.

   Establish and maintain a list of federal and state agencies, local public officials, public advisory groups or agencies, civic associations, or other community groups who may request notices of area projects.

c. Include in each Notice of Public Hearing the same background information required under Notice of Opportunity for Public Hearings and the procedure for submitting written comments.

d. Include in the Notice for a Public Hearing the project's purpose and need, alternatives, and tentative schedules for right-of-way acquisition and construction.

e. Indicate in the notice that relocation assistance programs will be discussed when applicable.

f. Furnish a copy of the Notice of Public Hearing to the federal funding agency, the commissioner's office, and the regional Design and Construction Standards director upon first publication.

g. Include in the notices other issues as required by local, state, and federal regulations (*Note:* Mandatory ADA-related text is available from the Department's ADA coordinator).

570.3. Conduct of Public Hearings

Hearings are conducted to exchange information and help make decisions. Concerns raised during the hearing process are addressed before final decisions are made. Activities will include:

a. Obtaining an attendance list or registration card for future reference

b. Establishing time limits for comments to allow equitable public participation

c. Providing pre-addressed envelopes for submitting written comments

d. Devising appropriate non-technical graphics to aid understanding. This may include:

   1. Models of the proposed action to be displayed at hearings
   2. Mosaics or maps presented through a series of aerial photos depicting detail of a specific area
   3. Slides or video tapes
   4. Other appropriate methods

e. Providing appropriate auxiliary aids and services (see Section 570.5.)

f. Holding public hearings in accessible facilities and at a time generally convenient for those wishing to attend

g. Providing for submission of written statements and other exhibits in place of, or in addition to, oral statements at a public hearing. Describe the procedure for the submissions at the public hearing. The final date for submitting statements or exhibits shall be at least 10 days after the public

hearing. All statements will become part of the project records.

h. When the project is a federal-aid highway project:

1. Make suitable arrangement for responsible highway officials to conduct public hearings and respond to questions.

2. Describe the state-federal relationship in the federal-aid highway program with an appropriate brochure, pamphlet, statement, or by other means.

   In addition, use the topical information comprising the Design Study Report (see Section 450.3.) as a basis for discussing the details of the project (*Note:* The Design Study Report may not be available when EA or EIS hearings are held).

3. Arrange for local public officials to conduct a required public hearing. The state shall be appropriately represented at a public hearing and is responsible for meeting other requirements.

4. Compile the public hearing record along with a summary of testimony, an analysis of comments received, and any recommendation for the engineering manager, who distributes the information.

When the state or the FHWA receive location or design approval for federal-aid highway projects, they will notify the public of the availability of the environmental document or Design Study Report by placing an advertisement in a local paper, or by other methods.

570.4. Post-Hearing Public Involvement

Regional staff will be available to answer public questions on post-hearing activities, schedules, and decisions.

Prior to and during right-of-way acquisition and final plan preparation, the Department responds to inquiries on the project's status. Information must also be continuously available to public officials, civic organizations, and other interested groups.

Upon the award of contract for construction of the project, the Department may arrange for notice of award in the Alaska Administrative Journal or local media. During and after construction, staff assists in answering inquiries, issuing news releases, and handling other project-related publicity.

570.5. ADA Requirements

The *Americans with Disabilities Act*, Public Law 101-366, requires that:

a. A public entity takes all appropriate steps to ensure that communication with applicants, participants, and members of the public with disabilities is as effective as communication with others.

b. A public entity furnishes appropriate auxiliary aids and services:

   - Necessary to provide a person with a disability an equal opportunity to participate in, and enjoy the benefits of, a service, program, or activity conducted by a public entity

   - With primary consideration given to the requests of the person with disabilities

c. Auxiliary aids and services might consist of the following: qualified interpreters, transcription services, listening assistance systems, video-text displays, or other effective means of delivering aural material, *and* qualified readers, taped texts, audio recordings, Braille or large-print materials, or other effective visual aids.

580. Separate Activities

580.1. General

580.1. General

The following is a list of activities that require notices for publication. Combine notices when appropriate.

1. Environmental Notice of Intent (published in the Federal Register–EIS projects only)
2. Notice of Floodplain Involvement
3. Notice of Wetlands Involvement
4. Notice of Availability of the Environmental Document
5. Record of Decision (EIS projects only)

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10. Highway Capacity

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1000. Design

1000.1. General
1000.2. HCM Supplement
1000.3. Waivers from Design Criteria

1000.1. General

The Alaska Department of Transportation and Public Facilities (DOT&PF) adopted the Transportation Research Board Special Report 209, Highway Capacity, 2010, (HCM) as policy. The HCM is a tool for calculating capacity.

Target Level of Service (LOS) goals are not established in the HCM, LOS targets for 3R and new construction are established on a project-by-project basis using the 2011 AASHTO Green Book, Section 2.4.5. The result is the opportunities for transit and non-motorized LOS will be no less than for mainline or side street vehicular LOS. Traffic control devices to improve LOS are subject to selection criteria in the Alaska Traffic Manual.

This chapter supplements the HCM.

Where discrepancies occur between the HCM, this manual, and the 2011 AASHTO *A Policy on Geometric Design of Highways and Streets* (AASHTO Green Book), a listed part shall take precedence over those listed below it:

- This manual
- The AASHTO Green Book
- The HCM

1000.2. HCM Supplement

Chapters 1-15: No changes.

Chapters 16-23: Transit and non-motorized LOS design analysis is not required.

1000.3. Waivers from Design Criteria

Develop waivers to the design criteria presented in this chapter in accordance with Section 1100.3 of this manual.

No waiver is required to use above-minimum stated design standards.

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1100. Introduction

1100.1. Establishment of Design Criteria
1100.2. Project Design Criteria
1100.3. Design Exceptions and Design Waivers
1100.4. Specific Project Criteria

1100.1. Establishment of Design Criteria

Alaska statues require the Department to establish design standards, and the Federal Highway Administration encourages the development of design standards by states in the interest of uniformity. AS 19.10.160(a) states:

> *The Department shall prepare and adopt uniform standard plans and specifications for the establishment, construction, and maintenance of highways in the state. The Department may amend the plans and specifications as it considers advisable. The standards must conform as closely as practicable to those adopted by the American Association of State Highway and Transportation Officials.*

The Federal Highway Administration lists standards, specifications, policies, guides, and references that are approved for use on federal-aid projects in the *Code of Federal Regulations, Title 23 Highways, Part 625 – Design Standards for Highways.*

The *Alaska Highway Preconstruction Manual* (HPCM) establishes or references standards for design of highways by the Department. This manual interprets, amends, and supplements AASHTO standards.

Standards, specifications, policies, guides, and references are routinely revised or replaced with never versions. The Department does not necessarily and immediately adopt these newer versions. Table 1100-1 lists the version dates formally adopted.

1100.2. Project Design Criteria

1100.2.1 General

Use design criteria contained or referenced in this manual. Criteria in this manual takes precedence if there is a conflict between criteria provided in this manual and criteria in referenced publications. When selecting design criteria, use expertise and judgment to achieve designs that fit into the natural and human environments while considering preservation and enhancement of scenic, aesthetic, historic, community, and environmental resources; while also improving or maintaining safety, efficiency, mobility, operations, and infrastructure conditions. Consider economics, but do not use it as the sole determination for design criteria selection.

Design criteria vary according to the type of project, e.g. new construction, reconstruction, 3R, or PM. The type of project is identified in the planning and scoping of the project. Generally, the type of project is reflected in the project title, scope, description, Project Information Document, and Design Designation. Any questions or inconsistencies regarding the type of project should be resolved with planning and project control as this can affect the applicable design criteria.

In some situations, it may be necessary to use values less than the minimums, or greater than the maximums, provided due to constraints beyond the engineer's control. In such cases, follow the procedures set forth in Section 1100.3. – Design Exceptions and Design Waivers.

Figure 1100-3, Project Criteria Summary, provides design references for New Construction / Reconstruction and 3R projects. The initial design reference may direct the designer to succeeding references.

Use U.S. customary units of measure for all designs.

1100.2.2 Application of Design Criteria

Designers need to recognize that every project is unique and that flexibility in the design standards exists. This flexibility is permitted to allow independent designs tailored to a particular project. Minimum values are given by the lower value in a given range of values. Larger values within a given range can be used when the social, economic, and environmental impacts are not critical.

The Department follows a context sensitive solutions approach in designing projects. This approach encourages designers to take advantage of the flexibility in design standards to produce designs that

fit their natural and human environments while functioning efficiently and operating safely.

The following publications are available for a further, more detailed, discussion of design flexibility:

- Forward to the AASHTO "A Policy on Geometric Design of Highways and Streets"
- FHWA's "Flexibility in Highway Design"
- AASHTO's "A Guide for Achieving Flexibility in Highway Design."
- Performance-based practical design

  https://www.fhwa.dot.gov/design/pbpd/documents/pbpd_fs01.pdf

1100.2.3 New Construction and Reconstruction Project Design Criteria

Design new construction and reconstruction projects in accordance with the criteria provided in Figure 1100-3 of this manual. For any criteria not provided in Figure 1100-3, refer to the Green Book version noted in Table 1100-1.

1100.2.4 3R Project Design Criteria

The design criteria for 3R projects is provided in Table 1100-3 of this manual. Waivers or design exceptions of 3R design criteria are required only when the results or determinations of the 3R design procedures provided in section 1160 of this manual require a feature improvement and the proposed project does not include that improvement.

1100.2.5 HSIP Project Design Criteria

The design criteria for Highway Safety Improvement Program (HSIP) projects are different from other projects. Because HSIP projects are intended to be cost-effective solutions to specific safety problems, project scope is limited to that which was HSIP-approved by the Chief Engineer. In general, it is not necessary to improve features that do not meet current standards unless the improvements contribute to solving the safety problem targeted by the project. (However, it is necessary to make improvements that are *legally* required, such as those covered by the Americans with Disabilities Act, on all facilities that are physically altered by an HSIP project).

In some cases, it may be appropriate to expand the scope of an HSIP project beyond that approved by the chief engineer. Submit proposed scope change to the regional traffic and safety engineer (RTSE) for consideration. If the additional work qualifies under the HSIP process, the RTSE submits the recommended changes to the state traffic & safety engineer for scope modification and HSIP funding change approvals. If the additional work does not qualify under the HSIP process, the RTSE submits the recommended scope change to the state traffic engineer for scope modification approval prior to seeking funding for the work from other sources.

1100.2.6 Preventive Maintenance (PM) Project Design Considerations

Design considerations for PM projects are found in Section 1140.

1100.3. Design Exceptions and Design Waivers

1100.3.1 General

A design exception or waiver may be granted for an individual project element or a segment of the project where design criteria does not satisfy applicable design standards. 23 CFR 625.3(f) provides that design exceptions may be given on a project-specific basis to designs which do not conform to minimum design criteria. The Americans with Disabilities Act legally imposes design requirements that cannot be waived.

Justification for an exception or waiver may include:

- High cost of construction
- Negative environmental impacts
- Difficulty or cost of obtaining right-of-way
- Sensitivity to context or community values
- Performance-based practical design analysis

The careful application of flexibility in design standards and policies, appropriate use of design exceptions and waivers, and coordination with transportation enhancement activities can result in projects that provide safe and efficient transportation facilities and are sensitive and responsive to scenic and historical resources.

Two types of roadway design criteria are provided in Figure 1100-2: controlling design criteria and non-controlling design criteria. Use Section 1100.3.2 -

Design Exceptions - for controlling design criteria and Section 1100.3.3 Design Waivers for non-controlling design criteria.

Design exceptions and waivers are not required for Preventive Maintenance (PM) projects, except for vertical clearance.

1100.3.2 Design Exceptions

Design exceptions apply only to controlling design criteria. FHWA identifies controlling design criteria as those having substantial importance to the operational and safety performance of a highway such that special attention should be paid to them in design decisions.

The 10 controlling design criteria for high-speed NHS roadways with a design speed greater than or equal to 50 mph are:

1. Design speed
2. Lane width
3. Shoulder width
4. Horizontal curve radius
5. Superelevation
6. Maximum grade
7. Stopping sight distance (SSD)
8. Cross slope
9. Vertical clearance
10. Design loading structural capacity

The two controlling design criteria for low-speed NHS roadways with a design speed less than 50 mph are:

1. Design speed
2. Design loading structural capacity

Design exceptions to these controlling criteria can, for the most part, be easily identified and defined. However, design speed is a design control rather than a specific design element. It is used to determine the range of design values for many of the individual design elements such as stopping sight distance and horizontal curvature. Exceptions for design speeds are rare and can often be handled by exceptions for specific design elements rather than the design control (design speed).

Justification, Evaluation, and Approval of Design Exceptions

When design standards for controlling design criteria are not met, a design exception is required. If no minimum or maximum design standards are provided for the specific controlling design criteria, an exception is not required.

Design exceptions need to document all of the following:

- Specific design criteria not met
- Existing roadway characteristics
- Alternatives considered
- Comparison of the safety and operational performance of the roadway
- Right-of-way
- Environmental impacts
- Cost
- Comparison of usability of all modes of transportation
- Proposed mitigation measures
- Compatibility with adjacent sections of roadway

When a design exception involves design speed, additional documentation is required:

- Length of section with reduced design speed compared to the overall length of the project
- Measures used in transitions to adjacent section with higher or lower design or operating speeds

When a design exception involves design loading structural capacity, verify that the safe load-carrying capacity (load rating) meets state legal loads and routine overweight permit loads.

Submit the design exception request, including the proposed preliminary design, cost estimates, justification, and evaluation to the regional preconstruction engineer. The regional preconstruction engineer will either approve the design exception request in writing or reject it. Furnish an informational copy of all approved design exceptions to FHWA. FHWA must concur with design exception approvals on high profile projects.

Discuss all design exceptions in the Design Study Report (DSR) and include approvals in the DSR appendix.

For further information regarding design exceptions, see FHWA publication *Mitigation Strategies for Design Exceptions, July 2007* (FHWA-SA-07-011):

http://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/fhwa_sa_07011.pdf

1100.3.3 Design Waivers

A design waiver is a documented decision to design a highway element or a segment(s) of a highway project to design criteria that do not meet standards as established for that highway or project. The design criteria, for this definition, are all design criteria not considered controlling design criteria as previously defined in Section 1100.3.2.

Submit the design waiver request, including the proposed preliminary design, cost estimates, justification, and evaluation to the regional preconstruction engineer. The regional preconstruction engineer will either approve the design waiver request in writing or reject it.

Design waivers are not required for PM projects, except for vertical clearance.

Discuss all design waivers in the DSR and include approvals in the DSR appendix.

1100.4. Specific Project Criteria

The engineering manager is provided source program documents that describe the proposed design project which are used to develop the Design Designation.

1100.4.1 Design Designation

The Design Designation requires written approval by the regional preconstruction engineer. The Design Designation contains the data which is the basis for establishing the design criteria. The Design Designation contains the following:

- State route number
- Route name
- Project limits
- State project number
- Federal project number
- General project description
- Project type
- Design functional classification
- Project design life
- Traffic projections
- Traffic mix
- Design vehicle(s) description
- Design vehicle loading
- Equivalent single-axle loads (ESALs)
- Level of service (urban)
- Terrain Type

An example Design Designation form is shown in Figure 1100-1.

Functional Classification

The design designation establishes the appropriate functional classification for design.

Chapter 1 of the Green Book provides definitions and descriptions of functional systems for rural and urban areas. The portion of Chapter 1, titled Functional Classification as a Design Type, provides guidance for establishing appropriate functional classification for design.

Design Life

The engineering manager establishes the project design life.

AS 19.10.160 requires use of the minimum design life listed in the following table for new construction and reconstruction projects (preventive maintenance and 3R projects are excluded) within federally recognized metropolitan planning areas:

Contract Amount[1]	Min. Design Life[2]
0 - $5 Million	10 Years
> $5 Million	20 Years

[1] *The Contract Amount is the estimated construction contract amount at Environmental Document approval.*
[2] *The beginning of the design life period is the calendar year following the estimated calendar year of construction final acceptance.*

For reconstruction and new construction highway projects outside recognized metropolitan planning areas, use the above table as guidance.

The design life for all projects, including 3R projects, should at least equal the expected service life of the improvements.

For PM projects, the design life equals the pavement design life as specified in Section 1140.

1100.4.2 Project Design Criteria

Project design criteria are developed from the Design Designation and the project development process. The Project design criteria are integral to the Design Study Report and the regional preconstruction engineer must approve them. An example Project Design Criteria form is shown Figure 1100-2.

DESIGN DESIGNATION

State Route Number: _____ Route Name: _____

Project Limits: _____

State Project Number: _____ Federal Aid Number: _____

Project Description: _____

Design Functional Classification: ☐ Freeway ☐ Collector, type _____ ☐ Rural Local Rd.
☐ Rural Arterial ☐ Local Recreational Rd. ☐ Urban Local St.
☐ Urban Arterial ☐ Local Resource Recovery Rd. ☐ Local Service Rd.
☐ Other _____

Project Type: ☐ New Construction - Reconstruction ☐ 3R
☐ Preventive Maintenance (PM) ☐ HSIP

Project Design Life (years): 5 ☐ 10 ☐ 20 ☐ 25 ☐ 30 ☐ Other _____

Traffic Projections:

	Current Year	Construction Year	Mid - Life Year	Design Year
2-Way AADT*				
2-Way DHV				
Peak Hour Factor				
Directional Distribution				
Percent Recreational Vehicles				
Percent Commercial Trucks				
Compound Growth Rate				
ESALs				
Pedestrians (Number/Day)				
Bicyclists (Number/Day)				

* Use AFPDM Traffic Data Request Form, Figure 6.1 for pavement design. Form 6.1 is available on-line at:
http://www.dot.state.ak.us/stwddes/dcsprecon/assets/pdf/other/traffic_data_req_form.pdf

Design Vehicle: _____

Level of Service (Urban Only):_____

Design Speed : _____

Terrain : ☐ Level ☐ Rolling ☐ Mountainous

Attach intersection diagrams to this document, when appropriate

APPROVED _____ DATE _____
Preconstruction Engineer

Figure 1100-1
Design Designation Form

DESIGN CRITERIA CHECKLIST

Project Name Page of
State Project No. Fed. Project No.
Functional Classification: Terrain:
Present Year (&ADT): Design Year (&ADT):
DHV (%): Directional Split (%): Percent Trucks:
Pavement Design Year: Pavement Design ESAL:
Design Turning Vehicle: Design Accommodated Vehicle:
Project Type: Choose an item.

FEDERAL 10 CONTROLLING DESIGN CRITERIA		SOURCE	STANDARD	AS DESIGNED	EXCEPTION[1]
1. Design Speed[1]			mph	mph	Choose an item.
2a. Travel Lane Width			ft	ft	Choose an item.
2b. Auxiliary Lane Width			ft	ft	Choose an item.
3a. Outside Shoulder Width			ft	ft	Choose an item.
3b. Inside Shoulder Width			ft	ft	Choose an item.
3c. Auxiliary Lane Shoulder Width			ft	ft	Choose an item.
4. Horizontal Curvature Radius			ft	ft	Choose an item.
5. Superelevation Rate*, e(max)			%	%	Choose an item.
6. Stopping Sight Distance (SSD)*			ft	ft	Choose an item.
7. Grade	Min.		%	%	Choose an item.
	Max.		%	%	Choose an item.
8. Cross Slope			%	%	Choose an item.
9. Vertical Clearance*			ft	ft	Choose an item.
10. Design Loading Structural Capacity[1]					Choose an item.

* *Attach calculations.*

1. *On low speed roadways (<50 mph) on the NHS only Design Speed and Design Loading Structural Capacity require a Design Exception; all other criteria become a Design Waiver. For projects off the NHS, all criteria become a Design Waiver.*

Figure 1100-2(a)
Project Design Criteria
For New Construction and Reconstruction Projects

Page ____ of ____

OTHER DESIGN CRITERIA		SOURCE	STANDARD	AS DESIGNED	WAIVER
Superelevation Transition*, Δ			____%	____%	Choose an item.
Bridge Clear-Roadway Width			____ ft	____ ft	Choose an item.
Vertical Curvature, Min.	K(crest)		____	____	Choose an item.
	K(sag)		____	____	Choose an item.
Lateral Offset to Obstruction			____ ft	____ ft	Choose an item.
Surfacing Material			____	____	Choose an item.
Clear Zone Slope			____	____	Choose an item.
Clear Zone Width			____ ft	____ ft	Choose an item.
Bicycle Lane Width			____ ft	____ ft	Choose an item.
Sidewalk Width			____ ft	____ ft	Choose an item.
Intersection Sight Distance, Left Turn*			____ ft	____ ft	Choose an item.
Right Turn*			____ ft	____ ft	Choose an item.
Crossing*			____ ft	____ ft	Choose an item.
Passing Sight Distance			____ ft	____ ft	Choose an item.
Degree of Access Control			____	____	Choose an item.
Median Treatment			____	____	Choose an item.
Median Width			____ ft	____ ft	Choose an item.
Illumination			____	____	Choose an item.
Curb Type			____	____	Choose an item.

* *Attach calculations.*

Notes: ____

Proposed by: _____ Date:_____
Designer Signature (Consultant or Staff)

Recommended by: _____ Date:_____
Engineering Manager Signature

Accepted by: _____ Date:_____
Regional Preconstruction Engineer Signature

Figure 1100-2(a)
Project Design Criteria
For New Construction and Reconstruction Projects

PROJECT DESIGN CRITERIA - 3R PROJECTS

Project Name:				
Project Number:				
Functional Classification:				
Design Year:			Present ADT:	
Design Year ADT:			Mid Design Period ADT:	
DHV:			Directional Split:	
Percent Trucks:			Equivalent Single Axle Loading:	
Pavement Design Year:			Design Vehicle:	
Terrain:			Number of Roadways:	
Design Speed:	☐ As-Built ☐ Posted			
85th Precentile Speed:	☐ Speed Study ☐ Project Drive-thru ☐ Derived from existing geometrics			
Existing Lane Width				
Existing Shoulder Width				
Existing Lane + Shoulder Width				
Lane + Shldr Width for New Const.				
Exist. Superelevation Rate:				
Min. Radius for New Const.	(Evaluate Curves tighter than this)			
Min K-Value for Vert. Curves (new)	Sag:		Crest:	
Stopping Sight Distance:				
Passing Sight Distance:				
Exist. Bridge No(s):				
Exist. Bridge Width(s):				
Surface Treatment:	TAW:		Shoulders:	
Degree of Access Control:				
Median Treatment:				
Existing Illumination:				
Proposed Illumination:				
Existing Bicycle Accomodation:				
Proposed Bicycle Accomodation:				
Existing Pedestrian Provisions:				
Proposed Pedestrain Provisions:				
Misc. Criteria:				

The shaded area represents features requiring 3R evaluation per Section 1160.

Proposed - Designer/Consultant: _____ Date: _____

Accepted - Engineering Manager: _____ Date: _____

Approved - Preconstruction Engineer: _____ Date: _____

Figure 1100-2(b)
Project Design Criteria
For 3(R) Projects

Table 1100-1
Adopted Design Standards

Acronym	Design Publication	Date
ABSM	*Alaska Bridges and Structures Manual*	See Note 1
ADA[2]	U.S. Department of Transportation ADA Standards for Transportation Facilities, and U.S. Department of Justice ADA Standards for Accessible Design	2006 2010
AHDM	Alaska Highway Drainage Manual	2006
ASD	Alaska Standard Plans Manual	See Note 3
ATM	Alaska Traffic Manual	See Note 4
GB	AASHTO A Policy on Geometric Design of Highways and Streets (Green Book)	2011
GDBF	AASHTO Guide for the Development of Bicycle Facilities	2012
GDVLVLR	AASHTO Guidelines for Design of Very Low-Volume Local Roads	2001
HCM	Highway Capacity Manual	2010
RDG	AASHTO Roadside Design Guide	2011
RPRL	IES Recommended Practice for Roadway Lighting (RP-8-14)	2014
SSSS	AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals	See Note 5.

Note 1: Use latest edition with interims effective at time of design approval
Note 2: In most cases, the 2006 US DOT ADA Standards for Transportation Facilities applies. See ADA design policy below for when the 2010 US DOJ ADA Standards apply
Note 3: Use the latest edition at the time of advertising
Note 4: Use the latest edition at the time of design approval
Note 5: AASHTO, 2013, with September 2013 Errata and 2015 Interim Revisions.

ADA Design Policy:

Transportation facilities and their appurtenances constructed in public rights-of-way are required to accommodate those with disabilities. These disabilities include, but are not limited to: limited mobility, impaired vision, and impaired hearing.

Design all new public transportation facilities, including bus stops and stations, and rail stations, to meet the *Americans with Disabilities Act (ADA) Standards for Transportation Facilities* adopted by the U.S. Department of Transportation (DOT) (2006). Other types of facilities covered by the ADA are subject to the *2010 ADA Standards for Accessible Design* adopted by the U.S. Department of Justice (DOJ). 49 CFR 37, Appendix D, Subpart B, Section 37.21 states, "Both sets of rules apply; one does not override the other.

The DOT rules apply only to the entity's transportation facilities, vehicles, or services; the DOJ rules may cover the entity's activities more broadly. For example, if a public entity operates a transit system and a zoo, DOT's coverage would stop at the transit system's edge, while DOJ's rule would cover the zoo. DOT and DOJ have coordinated their rules, and the rules have been drafted to be consistent with one another. Should, in the context of some future situation, there be an apparent inconsistency between the two rules, the DOT rules would control within the sphere of transportation services, facilities and vehicles."

The following figure contains the initial design references for project type and design particular. The initial design reference may direct the designer to succeeding references.

Design Particular	New Construction and Reconstruction			3R
	Urban	Rural	Very Low Volume Local Roads	All
1. Design Speed*	GB	GB	N/A	HPCM Sect. 1160
2. Lane Width	GB	GB	N/A	HPCM Sect. 1160
3. Shoulder Width	GB	GB	N/A	HPCM Sect. 1160
4. Horizontal Curve Radius	GB	GB	N/A	HPCM Sect. 1160
5. Superelevation Rate	GB	GB	N/A	HPCM Sect. 1160
6. Stopping Sight Distance (SSD)	GB	GB	N/A	HPCM Sect. 1160
7. Maximum Grade	GB	GB	N/A	HPCM Sect. 1160
8. Cross Slope	GB	GB	N/A	HPCM Sect. 1160
9. Vertical Clearance	GB	GB	N/A	HPCM Sect. 1160
10. Design Loading Struct. Capacity*	GB	GB	N/A	HPCM Sect. 1160
Note: *All 10 apply to high-speed facilities. Those with an * apply to low-speed facilities.*				

Figure 1100-3a
Highway Design Criteria Summary
For Roads on the NHS

Design Particular	New Construction and Reconstruction			3R
	Urban	Rural	Very Low Volume Local Roads	All
Alleys	GB	Not Applicable	Not Applicable	HPCM Sect. 1160
Bicycle Facilites	HPCM Ch. 12	HPCM Ch. 12	HPCM Ch. 12	HPCM Sect. 1160
Bridge Width	GB	GB	GDVLVLR	HPCM Sect. 1160
Bus Turnouts	GB	GB	GB	HPCM Sect. 1160
Capacity	HPCM Ch. 10	HPCM Ch. 10	HPCM Ch. 10	HPCM Sect. 1160
Clear Zone	GB[2]	HPCM Sect. 1130	GDVLVLR	HPCM Sect. 1160
Climbing Lanes	GB	GB	GB	HPCM Sect. 1160
Cross Slope	HPCM Sect. 1130	HPCM Sect. 1130	GDVLVLR	HPCM Sect. 1130
Cul De Sacs	GB	GB	GB	HPCM Sect. 1160
Curbs	ASD	ASD	ASD	HPCM Sect. 1160
Design Loading Structural Capacity	ALBDS	ALBDS	ALBDS	HPCM Sect. 1160
Design Speed	GB	GB	GDVLVLR	HPCM Sect. 1160
Design Vehicle (Turning)[3]	GB	GB	GB	HPCM Sect. 1160
Drainage	AHDM	AHDM	AHDM	HPCM Sect. 1120.6
Driveways	HPCM Sect. 1190	HPCM Sect. 1190	HPCM Sect. 1190	HPCM Sect. 1160
Erosion Control	AHDM	AHDM	AHDM	AHDM
Escape Ramps	GB	GB	GB	HPCM Sect. 1160
Foreslopes	HPCM Sect. 1130	HPCM Sect. 1130	GDVLVLR	HPCM Sect. 1160
Freeways	GB	GB	N/A	HPCM Sect. 1160
Grade	HPCM Sect. 1120	HPCM Sect. 1120	HPCM Sect. 1120	HPCM Sect. 1160
Horizontal & Vert. Curvature	HPCM Sect. 1120	HPCM Sect. 1120	GDVLVLR	HPCM Sect. 1160
Interchanges	GB	GB	N/A	HPCM Sect. 1160
Intersection Design	GB	GB	GDVLVLR	HPCM Sect. 1160
Lane & Shoulder Width (ADT≤2000)	GB	HPCM Sect. 1130	GDVLVLR	HPCM Sect. 1160
Lane & Shoulder Width (ADT>2000)	GB	GB	N/A	HPCM Sect. 1160
Lane & Shoulder Width (Interstate)	HPCM Sect. 1120.3.3	HPCM Sect. 1120.3.3	N/A	HPCM Sect. 1160
Level of Service	GB Table 2-5[5]	GB Table 2-5[5]	GB Table 2-5[5]	HPCM Sect. 1160
Lighting	RPRL	RPRL	RPRL	HPCM Sect. 1160
Medians	HPCM Sect. 1150	HPCM Sect. 1150	HPCM - Sec. 1150	HPCM Sect. 1160
On-Street Parking	GB	GB	GB	HPCM Sect. 1160
Pavement	HPCM Sect. 1180	HPCM Sect. 1180	HPCM Sect. 1180	HPCM Sect. 1160

Figure 1100-3b
Highway Design Criteria Summary
(Page 1 of 2)

Design Particular	New Construction and Reconstruction			3R
	Urban	Rural	Very Low Volume Local Roads	All
Rail Road Grade Crossing	GB	GB	GB	HPCM Sect. 1160
Sidewalks	GB	GB	GB	HPCM Sect. 1160
Stopping Sight Distance (SSD)	HPCM Sect. 1120	HPCM Sect. 1120	GDVLVLR	HPCM Sect. 1160
Structural Supports for Signs, Luminaries and Traffic Signals	SSSS	SSSS	SSSS	SSSS
Superelevation	HPCM Sect. 1130	HPCM Sect. 1130	GDVLVLR	HPCM Sect. 1160
Super Transitions	HPCM Sect. 1130	HPCM Sect. 1130	GDVLVLR	HPCM Sect. 1160
Traffic Control Devices	ATM	ATM	ATM	HPCM Sect. 1160
Traffic Barriers	HPCM Sect. 1130	HPCM Sect. 1130	GDVLVLR	HPCM Sect. 1160
Turn Lanes	HPCM Sec. 1150	GB	GB	HPCM Sect. 1160
Turnouts	HPCM Sec. 1120.5	HPCM Sec. 1120.5	HPCM Sec. 1120.5	HPCM Sect. 1160
Vertical Clearance	HPCM Sect. 1130	HPCM Sect. 1130	HPCM Sect. 1130	HPCM Sect. 1160
Work Zone Traffic Control	HPCM Ch. 14	HPCM Ch. 14	HPCM Ch. 14	HPCM Ch. 14

[2] Follow the requirements of HPCM Section 1130 for uncurbed urban sections.

[3] Reference 17 AAC 25.012 and 17 AAC 25.014 for allowable legal vehicle sizes.

[5] For urban and suburban arterials, see section 7.3.2 of the Green Book for further discussion on selecting the design level of service.

For urban and suburban freeways, see section 8.2.3 of the Green Book for further discussion on selecting the design level of service.

Figure 1100-3b
Highway Design Criteria Summary
(Page 2 of 2)

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1110. (Reserved)

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1120. Elements of Design

1120.1. General
1120.2. Interstate
1120.3. Bridges
1120.4. Retaining Wall Design
1120.5. Drainage
1120.6. Turnouts
1120.7. Erosion & Sediment Control Plans (ESCPs)

1120.1. General

The basic geometric elements of design are described in the *AASHTO A Policy on the Geometric Design of Highways and Streets 2001*. Recommendations and amendments to some of the design elements described by AASHTO may occur in the *Alaska Preconstruction Manual*. Use the design criteria set forth in the *AASHTO A Policy on the Geometric Design of Highways and Streets 2001*, as appropriate to the scope of any given project. The discussions, references and examples in this Section 1120 of the manual are preferential. Departures from Section 1120 preferential references for the design of highways and streets, other than interstate, do not require a design waiver, however, they should be supported by adequate documentation.

1120.2. Interstate

1120.2.1 General

Interstate design criteria are essentially the same as for any limited-access, high-speed arterial. Some exceptions apply to Alaskan Rural Interstate roadways by agreement with the FHWA. This section describes these exceptions.

1120.2.2 Design Speed

Interstate rural design speed for level terrain is 70 mph, for rolling terrain is 60 mph, and for mountainous terrain is 50 mph. The minimum design speed for urban interstate is 60 mph.

1120.2.3 Roadway Width

Interstate criteria generally require a minimum four-lane divided facility. In Alaska, unless the DHV exceeds the capacity of a two-lane, two-way facility, a two-lane is acceptable provided the width requirements for arterials provided in the AASHTO publication *A Policy on the Geometric Design of Highways and Streets 2001* are followed and the interstate surface is no less than 36 feet from outside shoulder to outside shoulder.

1120.2.4 Access Control

Interstate roadways by definition are major arterials and continuous control of legal access is highly desirable. In urban and suburban areas, legal access to interstate roadways should only be via a public roadway; there should be no private access points. In rural areas, public roadways are desirable access points. However, private access points may be required where the route traverses major private land holdings.

1120.3. Bridges

1120.3.1 General

Use the latest edition (with interims) of the *AASHTO Bridge Design Specifications* in the design of all bridges. Refer to 1160.1.3 for bridges on 3R projects.

1120.3.2 Design Loads

The design live load for all interstate bridges shall be HS-25. HS-25 shall also be the live load for major hauling routes, for routes accessing major shipping points, and for access routes to identified resource areas.

All designs shall include 26 psf for future surfacing dead load.

1120.3.3 Seismic Design

a. **General:** All new structures must follow the requirements as stated in 1 above. All bridge retrofit projects (except 3R) must follow the latest *FHWA Seismic Retrofitting Manual for Highway Bridges.*

b. **Seismic Sensitivity:** The state materials engineer will provide the seismic level of activity for a given site.

c. **Seismic Resistance Standards:** Simply supported multiple span structures require the ends of the superstructure to be tied together and to the substructure. Do not use skew angles for bridges greater than 30 degrees unless approved by the chief bridge engineer, and do not use steel rocker bearings. Provide all bearings with transverse restraints, and all anchor bolts for bridge bearings with an anchor plate at the embedded end. Provide all abutments with a full-width, continuous-bearing seat, mechanically stabilized wall systems may be used to support abutments only with the prior approval of the state

foundation engineer. For abutment and retaining walls, use dowels in addition to normal shrinkage and temperature steel on the compression face to connect the stemwall to footing. Spread footings for abutments and piers must have reinforcement in the top face to resist seismic forces.

d. **Detailing Standards**: For new bridges, special detailing standards are required for the four components of the bridge system: superstructure, bearings and joints, substructure, and foundation. In addition, pay special attention to the following areas:

- **Special reinforcement for columns:** Per AASHTO, extend reinforcement the required distance into the soffet of the superstructure and into the footing.
- **Vertical column reinforcement:** Laps shall be within the centermost section of columns.
- **Footing steel layout (abutments and piers):** We require a minimum reinforcement of #8 bars at 12 inches each way, top and bottom.

1120.3.4 Vertical Clearance

Reference Table 1130-1 for vertical clearances.

1120.3.5 Bridge Rail

The standard bridge rail will be the “Oregon Two-Tube” rail with curb, with PL-2 rating. The concrete barrier or some other crash-tested rail shape may be desirable in some circumstances. Do not use railings other than the Oregon Two-Tube unless approved by the chief bridge engineer. Bridge rail must comply with NCHRP 350 test level 2 or 3.

1120.3.6 Bridge Decks

Make the minimum deck thickness 6 inches, including prestressed units. All reinforcing steel in the deck (for precast girders this would include the stirrups) shall be epoxy-coated. Minimum concrete cover on reinforcing steel in cast-in-place decks shall be 2.5 inches, with a minimum cover on prestressed units of 2.5 inches.

1120.3.7 Bridge Deck Protection

Use a full-width deck membrane on all bridge decks, overlaid with a minimum of 2 inches of asphalt.

1120.3.8 Elastomeric Pads

Elastomeric compound used in the construction of the pads shall contain only virgin natural polyisoprene (natural rubber) as the raw polymer. Do not use Neoprene.

1120.3.9 Shear Transfer on Skewed Bridges

In a skewed bridge, the loads tend to distribute to the supports in a direction normal to the support. This causes a greater portion of the load to be concentrated at the obtuse corners of the span and less at the acute corners. On concrete girders, additional shear reinforcing is required; on steel girders, additional transverse stiffeners may be required, depending on diaphragm type and location.

HORIZONTAL CURVE, GRADE AND SIGHT DISTANCE CRITERIA SUMMARY

Design Speed (mph)	SIGHT DISTANCE (2)		HORIZONTAL CURVES					MAXIMUM GRADES % (1)								
	MINIMUM STOPPING (feet)	MINIMUM PASSING (feet)	DESIRABLE		MINIMUM*	MAXIMUM	MINIMUM**	FUNCTION and TERRAIN								
			RADIUS (feet) (4)	DEGREE OF CURVE (4)	RADIUS (feet) (4)	DEGREE OF CURVE (4)	LENGTH (feet) (4)	ARTERIAL			COLLECTOR			LOCAL		
								L	R	M	L	R	M	L	R	M
20	115	710	155	36.75	115	49.25	(3)				7	10	12	8	11	16
25	155	900	235	24.25	185	30.75	(3)				7	10	11	7	11	15
30	200	1090	350	16.25	275	20.75	450				7	9	10	7	10	14
35	250	1280	550	10.25	380	15.00	525				7	9	10	7	10	13
40	305	1470	750	7.50	510	11.00	600	5	6	8	7	8	10	7	10	13
45	360	1625	1250	4.50	660	8.50	675	5	6	7	7	8	10	7	9	12
50	425	1835	1725	3.25	835	6.75	750	4	5	7	6	7	9	6	8	10
55	495	1985	2500	2.25	1065	5.25	825	4	5	6	6	7	9	6	7	10
60	570	2135	3500	1.50	1340	4.25	900	3	4	6	5	6	8	5	6	
65	645	2285	5000	1.00	1660	3.25	975	3	4	5						

* Maximum e $\leq$ 6%

** The minimum length for horizontal curves on main highways, $L_{c\ min}$ should be about 15 times the design speed in mph. On high speed controlled-access facilities that use flat curvature, a desirable minimum length of curve for aesthetic reasons would be about double the minimum length described above, or $L_{c\ des}$=30V

(1) Short grades (500 ft long or less) and one-way downgrades may be one percent steeper. L = Level, R = Rolling, M = Mountainous. Urban arterial grades except for freeways and expressways may be increased to the maximums indicated for Collectors. Grades may be 2% steeper than shown for low-volume rural highways. The minimum grade for streets with curb and gutter is 0.3%.

(2) Sight distances are based on a drivers height of eye of 3.5 ft, height of object for stopping of 2 ft and height of object for passing 3.5 ft.

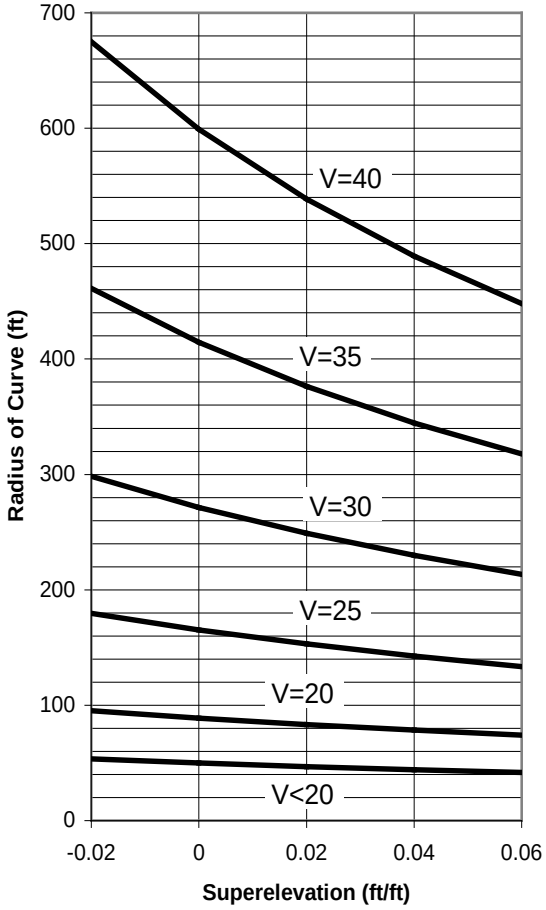
(3) Design speeds of 20 and 25 mph are usually restricted to local roads and separate turning roadways where other design criteria apply.

(4) Radii and degree of curvature are rounded for design and field layout convenience and do not necessarily equate. Only one system (radius or degree of curvature) should be used on a given roadway. This does not preclude use of degree of curvature for through roadways and radii for turning roadways in the same project.

(5) The radius and degree of curve values in this table are for higher speed roadways. Low speed streets may use values presented in Figure 1120-2. Gravel roads should use radius values shown in Figure 1120-3.

Figure 1120-1
Horizontal Curve, Grade, and Sight Distance Criteria Summary

Safe Speeds on Low Speed
Paved Streets and Turning Roadways

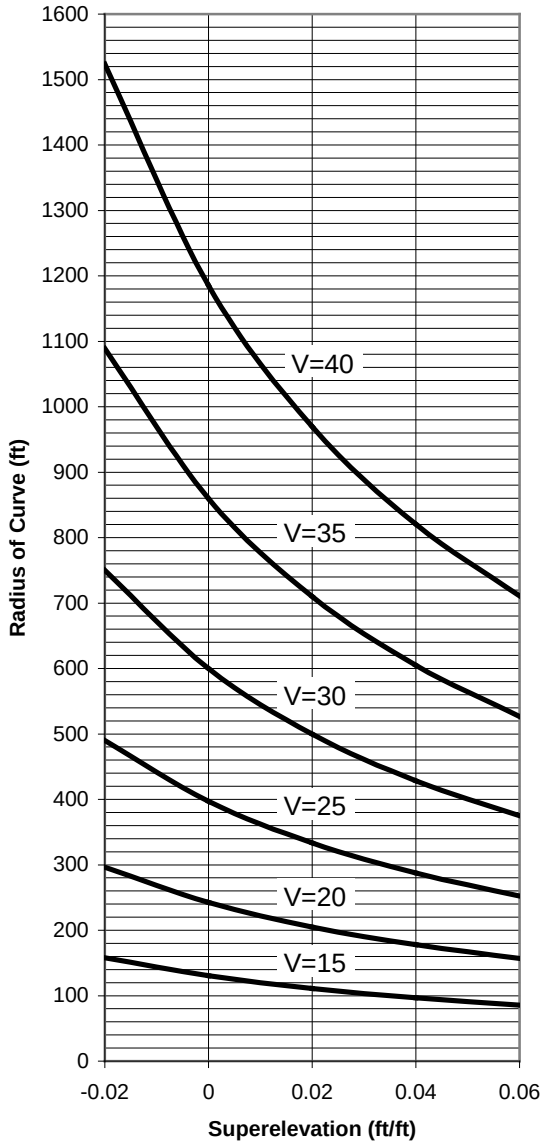


V	f
<20	0.300
20	0.300
25	0.252
30	0.221
35	0.197
40	0.178

Motorists navigating low-speed streets and turning roadways expect to encounter higher side-thrust (f) values, hence, the higher "f" values used in the standard formulas. These values may be used in critical locations for urban collector and local streets with design speeds less than 40 mph. See Figure 1120-1 for radii on higher speed roadways with standard superelevation rates.

Figure 1120-2
Design Speeds on Low-Speed Paved Streets and Turning Roadways

Safe Speeds on Low Speed
Gravel Streets and Turning Roadways



V	f
15	0.115
20	0.110
25	0.105
30	0.100
35	0.095
40	0.090

Figure 1120-3
Design Speeds on Low-Speed Gravel Streets and Turning Roadways

1120.4. Retaining Wall Design

1120.4.1 General

After you receive ATP to PS&E, conduct a foundation investigation in accordance with Section 450.10. of this manual.

The geotechnical engineer conducting the foundation investigation must complete a written foundation report. The report should describe soil conditions, make foundation engineering design recommendations, and recommend workable wall systems. Submit the report to the project manager upon completion.

After completion of the foundation report, design and plan preparation can begin. All contract documents for retaining walls must contain a Department-approved generic wall system with fully detailed plans. In addition to the generic plan, alternative wall systems may be allowed.

1120.4.2 Retaining Wall Classification

Earth retaining structures are divided into four classifications.

State-Designed Structures

State-designed structures are designed completely by the Department or a consultant without use of proprietary systems.

Pre-Approved Proprietary Structures

These are patented systems. Pre-approved status means that these retaining walls may be listed in the special provisions as an alternative retaining wall system based on the recommendation of the statewide Materials Section.

Proprietary Structures Pending Approval

A vendor has submitted these retaining wall system designs for approval. They may be added to the pre-approved list if they meet the statewide Materials Section requirements.

Experimental Structures

All new earth-retaining systems must undergo an evaluation before being accepted for routine use. Newly introduced designs or untried combinations of proprietary and nonproprietary designs or products are considered experimental. Construction project personnel, in coordination with the Department's research engineer, shall perform the evaluation of the experimental system.

1120.4.3 Federal Requirements, Proprietary Items

For the use of proprietary walls on federal-aid projects, adhere to the Code of Federal Regulations, Title 23, Section 635.411, Material or Product Selection. It is quoted as follows:

A. Federal funds shall not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the plans and specifications for a project, unless:

- Such patented or proprietary item is purchased or obtained through competitive bidding with equally suitable nonpatented items; or
- The state highway agency certifies either that such patented or proprietary item is essential for synchronization with existing highway facilities, or that no equally suitable alternate exists; or
- Such patented or proprietary item is used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes

B. When there is available for purchase:

- More than one non-patented, nonproprietary material
- Semi-finished or finished article; or
- A product that will fulfill the requirements for an item of work of a project

and these available materials or products are:

- Of satisfactory quality
- Equally acceptable on the basis of engineering analysis

and the anticipated prices for the related item(s) of work are estimated to be approximately the same, the PS&E for the project shall either contain or include by reference the specifications for each such material or product that is considered acceptable for incorporation in the work. If the state highway agency wishes to substitute some other acceptable material or product for the material or product designated by the successful bidder or bid as the lowest alternate, and such

substitution results in an increase in costs, there will not be federal-aid participation in any cost increases.

C. A state highway agency may require a specific material or product, when there are other acceptable materials and products, when the division administrator determines the specific choice is in the public's interest. When the division administrator's approval is not obtained, the item will be nonparticipating unless bidding procedures establish the unit price of each acceptable alternative. In this case, federal-aid participation will be based on the lowest price established.

1120.4.4 Wall Selection

Selection of wall types depends on performance variables. Material availability and cost are important considerations for every site. Mechanically stabilized embankment walls usually require a select backfill material. These materials are not locally available in certain areas of the state. In remote sites, concrete is not normally practical, and the necessary aggregate may not be available locally. Again, with remote sites, transportation cost for construction equipment and materials is a major consideration. Weight and bulk should be minimized where practical.

Ease of construction is always a consideration. Always be aware of the equipment requirements to construct a wall. You must ascertain that the required equipment can be mobilized to the construction site and that it will have sufficient maneuvering room. Generally, mechanical stabilized embankment walls and anchored walls can be constructed with small tools and lifting equipment. For all the wall types, some earth-moving equipment is required, but with the tie-back wall it may be kept to a minimum.

Potential settlement is also a consideration. Rigid walls do not tolerate settlement well. If you predict any significant settlement, the most favorable walls are the mechanically stabilized embankments. With limited construction space, pile-driven cantilever walls or tie-back walls may be ideal. Cast-in-place concrete walls can be founded on piling to resist settlement, but this is usually a costly solution.

Service life is another consideration, and the use of metal products in corrosive environments (marine or acidic soils) requires special attention. Timber products should always be treated with a preservative for ground contact, and the number of field cuts should be kept to a minimum. Concrete products exposed to salt should have corrosion protection systems for their steel reinforcing bars.

Surcharge loading (loads along the top of the retained embankment) may require walls with additional strength and stiffness. Most structures built on top of retained embankments are sensitive to significant settlement.

Aesthetic values of wall facings are important where visual exposure will be high, certainly in urban settings. Aesthetic judgments are subjective, and if appearance has a bearing on wall selection, it is best to have as large a consensus as possible.

1120.4.5 Wall Design

In all cases, determine the wall controlling geometry. The wall must fit the facility site. Design the structural aspects of a wall using the current *AASHTO Standard Specifications for Highway Bridges*.

The DOT&PF Bridge Section, or a consultant experienced in retaining wall design, will design all non-proprietary cast-in-place retaining walls over 4 feet in height.

1120.4.6 Alternative Wall Designs (Proprietary)

Consider alternative or proprietary wall designs where different wall systems appear to be equal in performance and approximately equal in estimated cost. Provide sufficient information in the contract plans so that the alternates can be competitively bid. The geometry for the alternative wall designs shall be identical to that of the required generic design. We recommend that you include alternative retaining wall systems in all contract plans and specifications involving earth-retaining structures. Using alternative designs, various retaining wall systems are presented in the contract bid package, from which the contractor can make a selection.

Proprietary wall systems must have the approval of the statewide Materials Section. Provide sufficient geometric controls on the contract plans so that a vendor may prepare a system structural design.

It is the responsibility of the designer to ensure that the wall can be constructed within the constraints of the site. Contact the statewide Materials Section for the most current list.

1120.4.7 Contract Plans

The contract plans must include a Department-

prepared generic design.

The contract plans should also provide the following minimum geometric and design information:

a. Beginning and end of wall stations

b. Elevation on top of wall at the beginning and end of wall, all profile break points, and roadway profile data at wall line

c. Original and proposed profiles in front of and behind the retaining wall

d. Cross sections at the retaining wall location at 50- to 100-foot intervals

e. Horizontal wall alignment

f. Details of wall appurtenances such as traffic barrier, coping, handrail, noise barrier, drainage outlets, location, and configuration of signs and lighting, including conduit location

g. Right-of-way lines and construction permits

h. Construction sequence requirements if applicable, including traffic control, access, and stage construction sequences

i. Elevation of highest permissible level for foundation construction (the top of footings should be placed at least 2 feet below the frost line), location, depth, and extent of any unsuitable material to be removed and replaced

j. Quantities table showing estimated square feet of wall area and quantity of appurtenances and traffic barriers

k. Extreme high water and normal water levels at stream locations

l. Subsurface boring logs (the materials foundation report should be provided as supplemental information to the contract bidding documents)

m. The relative location of new or existing utilities in proximity of the retaining wall

n. Material transitions at the end of walls

1120.5. Drainage

This section sets forth the design criteria for the hydraulic and hydrologic development of drainage systems for highways. When using these policies, follow the hydraulic and hydrologic design methods found in the *Alaska Highway Drainage Manual* and the *AASHTO Highway Drainage Guidelines*.

1120.5.1 Cross Drainage Culverts

Design culverts for the appropriate Hw/D Ratio. See Chapter 9 of the *Alaska Highway Drainage Manual* for the Hw/D Ratio for the particular application.

The minimum diameter for round cross-drainage culverts shall be 24 inches (Equivalent pipe-arch culverts shall have a minimum span-to-rise of 29 inches by 18 inches.). However, in icing problem areas, 36-inch diameter, round culvert pipes will be the minimum. We do not recommend equivalent pipe-arch culverts in icing areas.

Evaluate all culverts 48 inches in height or greater for the potential to fail during a design discharge due to hydrostatic and hydrodynamic forces, erosion, saturated soils, or plugging by debris. Any culvert that is found to have a failure potential must be restrained at the ends by half-height concrete headwalls or an equivalent, deadmen, or other form of vertical restraint.

Restrain all mitered pipes with half-height concrete headwalls or an equivalent. Deadmen or other forms of comparable vertical restraint are acceptable if the culvert invert lip is structurally reinforced.

1120.5.2 Storm Sewers

Inlets in sag locations require special attention from the designer and special design criteria are required to size and space them properly (See *Alaska Highway Drainage Manual*). A sag is any portion of the roadway where the profile grade changes from a negative grade to a positive grade. The depression formed is capable of ponding water that extends more than halfway into the nearest traveled lane if all the grate inlets become plugged with debris. This ponded area is generally contained by a curb, traffic barrier, retaining wall, or any other obstruction that prevents it from flowing off the traveled roadway.

A sag vertical curve that is located in a fill section would not be considered a sag in the above sense if the runoff can overtop the curb and flow down the fill slope without ponding water over more than half of

the nearest traveled lane. Width of spread criteria for gutter flow can be found in the *Alaska Highway Drainage Manual*.

Avoid placing sags on bridges. It is difficult to fit inlets among the reinforcing steel and the location of downspouts is often limited.

Table 1120-1
Design Flood Frequency

Type of Structure	Design Frequency Exceedance Probability
Culverts in designated flood hazard areas*	100 years (1%)
Culverts on primary highways	50 years (2%)
Culverts on secondary highways with high DHVs or	50 years (2%)
Culverts on secondary highways of less importance	10 years (10%)
Channel changes in designated flood hazard areas	100 years (1%)
Channel changes along primary highways and	50 years (2%)
Channel changes along less important secondary	25 years (4%)
Trunk storm sewers lines on primary highways	50 years (2%)
All other trunk storm sewer lines	25 years (4%)
Storm sewer feeder lines	10 years (10%)
Side ditches, storm water inlets, and gutter flow	10 years (10%)
Bridges in designated flood hazard areas*	100 years (1%)
Bridges on all highways	50 years (2%)
Scour at bridges, design	100 years (1%)
Scour at bridges, check	1.7x100 years or 500 years (0.2%)

* Unless local ordinance requires a greater design frequency

Note: In addition to the exceedance probability used for design purposes, the Federal Highway Administration under Executive Order #11988 and the State of Alaska under Administrative Order #46 (AO #46) require the evaluation of a structure's ability to pass an event with an exceedance probability of 1 percent (Q100). This evaluation is required on all tidal and freshwater stream encroachments (i.e. 100-year tidal surge and/or 100-year flood). AO #46 further requires the evaluation of flood-related, erosion-prone, and mud slide (i.e. mud flow) hazard areas. In the case of erosion, this includes currents of water exceeding anticipated cyclical levels, an unusually high water level in a natural body of water accompanied by a severe storm, an unanticipated force of nature, a flash flood or an abnormal tidal surge, or some similarly unusual and unforeseeable event that results in flooding. For mud slides, this includes periods of unusually heavy or sustained rain.

Locate and size the inlets using the procedures outlined in the *Alaska Highway Drainage Manual.*

Provide Inlet Grates: Hydraulic-efficient and bicycle-resistant inlet grates on all storm sewer inlets. The *Alaska Highway Drainage Manual* lists acceptable grates.

1120.5.3 Filter Courses or Subsurface Drainage Matting

All required filter cloth, geotextile filters or fabrics, geomembrane systems, geosynthetic materials, or granular material filter courses must be specifically designed for the application and be called for and/or detailed in the project plans.

1120.5.4 Hydraulic Site Surveys

Coordinate site survey efforts with the state hydraulic engineer for all bridge structures (all hydraulic structures greater than 20 feet in length measured parallel to the roadway centerline, including single and multiple culvert installations), and regional hydraulic engineers for culvert installations and other drainage structures such as stormwater facilities. Site surveys for erosion and sediment control shall be as directed by the regional hydraulic engineer. Early coordination is critical. The hydraulic engineer may be required to visit the site prior to or with the survey crew. Site survey efforts from within consultant contract designs shall be under the direction of the consultant's engineer-in-responsible-charge.

Obtain survey data that will represent the typical conditions at the structure site as well as other locations where stage-discharge and related information will be necessary. The type of hydraulic analysis will govern the density of site data required. The following requirements for hydraulic site surveys are meant to supplement normal topographic survey requirements. Surveys for computerized terrain modeling will require additional site information, such as definition of slope break lines and distribution of survey points with regard to triangular networks (TIN). Cross-sections derived from a TIN by interpolation are not sufficiently accurate for hydraulic modeling purposes.

Site survey requirements for the design of bridges, culverts, and other drainage facilities shall include the following items commensurate with the significance of environmental impact, risk, and importance of the structure:

A. Provide a summary of the survey that includes a description of the basis of survey, monuments, local coordinate system with sketch, true north direction, and project datum elevation. Project datum must be reconciled with the as-built information of any existing structures within the project. If the project has tidal considerations, project datum shall be MLLW. Reconcile project stationing with any existing as-built stationing.

B. Ordinary High Water Mark (OHW) shall be surveyed for all stream crossings along both banks within the right-of-way limits of the project. The ordinary high water mark (defined by 11AAC53.900[23]) forms a boundary line along the bank or shore up to which the presence and action of nontidal water are so common and usual, and so long continued in all ordinary years, as to leave a natural line impressed on the bank or shore and indicated by erosion, shelving, changes in soil characteristics, destruction of terrestrial vegetation, or other distinctive characteristics. The OHW line forms a jurisdictional boundary and is determined by a land surveyor registered in Alaska. Similarly, survey the High Tide Line tidal areas. Include time and date tags in water level measurements, and document the edge of water along both banks at the time of survey. If extreme high water marks are evident, locate and survey them at various points along the stream to help define the hydraulic grade line of the high water.

C. For bridge sites, stream cross sections normal to flow direction that define the floodplain, banks, and channel bottom shall be surveyed at intervals upstream and downstream from the hydraulic structure. Generally, these cross sections will be spaced approximately one channel width. A minimum of four cross sections downstream of the structure and three cross sections upstream of the structure are usually required. Hydraulic modeling considerations require one cross section each at the downstream and upstream edges of the deck. If the bridge is skewed with respect to the flow, these two cross sections should be placed at the downstream and upstream corners respectively. Each cross section should be long enough to encompass the limits of the floodplain

and have surveyed points (x, y, z) at each slope breakpoint. In addition to cross sections, both edges of water and tops of banks shall be surveyed at the midpoint between each cross section or every 50 feet, whichever is less. Additional shots may be required to supplement cross section information at sharp bends in streams. For shallow streams, wading will be required. For deeper rivers, hydrographic (boat) survey will be required. Document pertinent observations with photographs.

D. If the site involves an existing bridge, locate the structure horizontally and vertically with stations, offsets, and elevations. Bearings for tangents to the bridge shall be provided and compared to as-built information. Reconcile new surveys with as-built information, and elevation and station conversion equations supplied. Survey existing centerline profile on the structure and for a minimum of 200 feet from either end of the bridge. Normally required points to be surveyed on the bridge include Begin Bridge, End Bridge, centerline of pier(s), and the four corners of the structure. If asphalt is present, contact Bridge Design Section for preferred alternative point locations. Shots made on the bridge structure should be specific points that are thoroughly described so they are identifiable and repeatable. Survey existing embankment approaches to the bridge. A sufficient number of survey points under the structure to define embankments and stream banks in those areas are usually required.

E. For culvert sites, cross sections normal to direction of flow that define the floodplain, banks, and channel bottom shall be surveyed at intervals upstream and downstream from the hydraulic structure. Survey cross sections at the estimated upstream and downstream embankment catch points. As a typical minimum, survey two additional cross sections upstream and downstream at intervals of approximately one stream width or 20 feet, whichever is greater. Survey the thalweg line (the line of deepest channel) at a maximum of a point every 20 feet between each cross section. Survey the inverts and station/offsets for both ends of existing culverts, and record a description of the culvert, including height, width, and condition. Document pertinent observations with a photograph (e.g. inlet, outlet, etc.).

F. Survey for horizontal and vertical location other private and public structures that may be affected by the project and/or the hydraulic structure's performance. Document these structures with photographs.

1120.5.5 Hydrologic and Hydraulic Standards

A. **Hydrology:** The hydrologic methods used to determine flood flow frequencies shall conform to the standards prescribed in the *Alaska Department of Transportation and Public Facilities Alaska Highway Drainage Manual.*

B. **Hydraulic:** Hydraulic design standards shall conform to the standards prescribed in the Alaska Highway Drainage Manual, DOT&PF Standard Specifications for Highway Construction and the AASHTO Highway Drainage Guidelines.

1120.5.6 Hydrologic and Hydraulic Reports

For all bridges and all culverts 48 inches in diameter or greater, a Hydrologic and Hydraulic Report is required (The Hydrologic and Hydraulic Summary can be used as the report for culverts).

The state hydraulic engineer is responsible for the hydrologic and hydraulic design aspects of all bridge projects. Regional hydraulic engineers are responsible for all single and multiple culvert projects of spans less than 20 feet, measured parallel to centerline of roadway, and other drainage projects requiring a report. A qualified hydraulic engineer shall stamp consultant-prepared Hydrologic and Hydraulic Reports after review and approval by the appropriate DOT&PF regional or statewide hydraulic engineer. In addition, all changes or addendum should be reviewed prior to the start of construction. Stamped Hydrologic and Hydraulic Reports shall be forwarded to the design project manager for distribution and will become a permanent part of the project record.

Include in the Hydrologic and Hydraulic Report the following information, commensurate with the significance of the environmental impact, risk, or importance of the crossing:

A. Location map and site plan

B. Description of the project and any alternates

C. **Hydraulic history of the site**, which should include, but is not limited to, the following:

1. **Tidal:** Tidal influence

Mean Lower Low Water Elevation (MLLW)

Mean High Water Level Elevation (MHW)

Mean Higher High Water Elevation (MHHW)

Extreme High water Elevation (EHW)

2. **Nontidal:** Freshwater streams

   Flood of record elevation

   High water marks

   Ordinary High Water Elevation (OHW) or Meander Line Elevation (ML) if documented

3. Navigation:

   a. Present

   b. Future or potential

4. Confluence:

   a. Upstream

      Distance

      Potential changes

   b. Downstream

      Distance

      Potential backwater

5. Mining Activity:

   a. Present

   b. Future or potential

6. Debris Problems:

   a. Trees and underbrush

   b. Bedload

   c. Mud flow

   d. Debris flow

   e. Lake dumps

7. Icing Problems:

   a. Types of Icing Problems

      Frazil

      Glaciering

      Ice debris

      Glacier-dammed lakes (type of breakout)

   b. Location

      At bridge

      - Thickness
      - Elevation
      - Unusual loads on existing piers
      - Scouring of existing piers

      Upstream

      Downstream

   c. Flow over ice

   d. Flow under ice

   e. Type of breakup

8. Geomorphology:

   a. Straight

   b. Meandering

   c. Braided

   d. Alluvial fan

   e. Aggradation

   f. Degradation

   g. Potential for lateral movement

9. **Bedload:** Bed material size

10. **Environmental:** Environmental activities, such as fish passage considerations, that relate to the hydraulics of the stream or installation

D. **Hydrology:** A discussion of the hydrology of the site should include, but is not limited to, the following:

1. **Drainage Shed:** Contributing drainage area at the site

   Storage area

   Stream slope

   Mean elevation

   Area of glaciers

2. **Geometry:** Limiting factors

   Road sag elevation

   Backwater constraints

   Private property

   Access requirements

3. **Frequency:** Perform a flood frequency analysis for all bridges, longitudinal encroachments or culverts 48 inches in diameter and larger (or equivalent for other shapes) as follows:

   a. Q50: 2 percent probability

   b. Q100: 1 percent probability

      Or capacity of structure if less than Q100

      If the capacity is less than Q100, address the probable damage, environmental impact, and economic costs that will result.

      Culverts on secondary highways of less importance (See Table 1120-1, Design Flood Frequency) may be designed for a 10-year flood capacity. However, evaluate the culvert for overtopping at the 50- and 100-year flood.

   c. Probability, or capacity of structure if less than Q200

   d. Q500: 0.2 percent probability, or capacity of structure if less than Q500

   e. Overtopping flood

      Approximate exceedance probability

      Water surface elevation

      Location (where determined)

   f. Other high water events as required

   When data are sparse, or may lack the desired level of credibility, address the limitations of the analysis, probable error, or risk factor.

4. **Fish Passage:** In addition to item 3 above, evaluate proposed culverts in streams that support anadromous fish (i.e. salmon, grayling, etc.) for fish passage capabilities during an event that has an exceedance probability of 50 percent with a potential of a two-day delay (Q2-2).

5. **Peak Discharge:** The design frequency (Q10, Q50, etc.) versus the peak discharge (Flood of Record) relationship for the site

E. **Local input:** Local knowledge of past floods at the site

F. **Backwater:** A backwater analysis of the existing structure (or natural channel) versus the proposed structure(s) during a high water event that has an exceedance probability equal to 1 percent (Q100)

G. **Scour:** For bridges, the calculated general, pier, and abutment scour associated with the proposed structure(s) and any counter-measures required for the following exceedance probabilities:

   1. Q100: 1 percent probability

   2. Q500: 0.2 percent probability, or the capacity of the structure if less than Q500

   3. Additional: Evaluate the structure for scour for lesser recurrence intervals as required, or as engineering judgment dictates. If you incorporate appropriate abutment scour protection into the design, abutment scour calculations are not required.

H. **Hydraulic Design:** A discussion of the hydraulic features of the design and why they are needed

   1. Alternate designs and their features

   2. A discussion of the limitations of the alternates and why they were rejected

I. **23 CFR:** The 23 Code of Federal Regulations (23 CFR), part 650.111, "Location Hydraulic Studies," requires the following items be addressed for all construction projects that encroach on the 100-year floodplain:

   1. Use National Flood Insurance Program (NFIP) maps or information developed by the highway agency, if NFIP maps are not available, to determine whether a highway location alternative will include an encroachment.

   2. Include in location studies an evaluation and discussion of the practicability of alternatives to any longitudinal encroachment.

3. Also include in location studies a discussion of the following items, commensurate with the significance of the risk or environmental impact, for all alternatives containing encroachments and for those actions that would support base floodplain development:

   The risks associated with the implementation of the action

   The impacts on natural and beneficial floodplain values

   The support of probable incompatible floodplain development

   The measures to minimize floodplain impacts associated with the action

   The measures to restore and preserve the natural and beneficial floodplain values affected by the action

4. Include in location studies an evaluation and discussion of the practicability of alternatives to any significant encroachments or any support of incompatible floodplain development.

5. The studies required by part 650.111, 3 and 4 above shall be summarized in the environmental review documents prepared pursuant to 23 CFR, Part 771.

6. Consult local, state, and federal water resource and floodplain management agencies to determine if the proposed highway action is consistent with the existing watershed and floodplain management programs and to obtain current information on development and proposed actions in the affected watersheds.

J. **Conclusion:** A summary of the hydraulic features and how they will accomplish the desired protection

K. **Rip rap:** The size of rip rap required, the method of placement, and depth of key or length of toe

L. **Flood Hazard Area:** If the proposed project falls within a designated flood hazard area, the following is required:

   1. Additional Requirements: A discussion on the additional requirements imposed on the design because of the local floodplain regulations

   2. Compliance: The proposed methods of complying with the regulations

   3. Certification: Statement of certification as required by local ordinance

M. **Illustrations:** Include clarifying drawings, tables, charts, graphs, or pictures where appropriate.

N. **Documentation:** Include supporting or pertinent documentation in the appendices.

O. **Certification:** A registered professional engineer will stamp all hydraulic reports.

1120.5.7 Summary Hydraulic Report

A Summary Hydraulic Report may be used for projects that have minor hydraulic impact or risks such as smaller bridges, projects with culverts only, or minor longitudinal encroachments. Consultant-prepared reports may use a Summary Hydraulic Report after consultation with the appropriate regional or statewide hydraulic engineer. Requirements for review, stamping, and submittal are the same as those stated in Section 1120.4.6. Projects that have major bridge crossings or are in designated flood hazard areas shall have a full hydraulic report. A Summary Hydraulic Report shall consist of the following as a minimum:

1. Introduction
2. History
3. Hydrology
4. Hydraulic Design
5. 23 CFR
6. Conclusion
7. Rip rap

1120.5.8 Hydrologic and Hydraulic Summary

Include a Hydrologic and Hydraulic Summary on all plan sheets that have hydraulic encroachments as follows:

A. The site plan sheet for all bridges

B. The plan sheet for longitudinal encroachments. If the encroachment is depicted on more than one plan sheet, place the summary on the first sheet where the encroachment begins.

C. The plan sheet for culverts as follows:

1. All culverts 48 inches in height or greater
2. Any multiple culvert installation that has a total high water flow of 500 cubic feet per second (cfs) or greater for an exceedance probability of 2 percent (Q50)
3. All culverts smaller than 48 inches in height for which a hydraulic analysis has been performed

Include in the Hydrologic and Hydraulic Summary the following information:

A. **Drainage Area** in square miles

B. **Exceedance Probabilities:** The exceedance probabilities in percentages used to size the installation as required by Table 1120-1, Design Flood Frequency

C. **Design Discharges*** in cubic feet per second (cfs) for the exceedance probabilities required in above section (Table 1120-1, Section D3)

D. **Design High Water Elevation*** in feet for the exceedance probabilities required in item I above

E. **Anticipated Additional Backwater:** For highway crossings the additional backwater in feet for a high water event having an exceedance probability of 1 percent (Q100)

F. **Overtopping Flood:** For highway crossings, the discharge in cfs and water surface elevation in feet of the overtopping flood and its exceedance probability. The overtopping elevation is defined as follows:

1. Bridges: low steel (chord) or low-grade elevation
2. Culverts: Low-grade elevation
3. Longitudinal: Top of riprap or top of structure elevation

G. **Datum Elevation:** Datum and equation for Mean Sea Level (MSL) to Mean Lower Low Water (MLLW) if appropriate

H. **Design Streambed Elevation:** The elevation of the stream bed (or average stream bed) in feet, used for design purposes

I. **Scour:** The calculated Contraction (general) Scour depth and Local Scour depths at the piers and abutments for all bridges for the following exceedance probabilities:

1. 1 percent exceedance probability (Q100)
2. 0.2 percent exceedance probability (Q500)*
3. Capacity of bridge if less than a Q500
4. Crossings of greater importance shall be analyzed for other exceedance probabilities as required.

** Including regulatory flood in designated flood hazard areas (if available).*

Summary Example
Hydrologic and Hydraulic Summary

Drainage Area		25 square miles	
Exceedance Probability	2%	1%	*Regulatory Flood
Return Period	50-year (Q_{50})	100-year (Q_{100})	
Design Discharge	1,500 cfs	1,750 cfs	2,500 cfs
Design High Water Elevation	961.0 ft	961.9 ft	964.0 ft
Anticipated Additional Backwater = 0.2 ft			

The capacity of the structure is 2,500 cfs at elevation 964.0 feet, which has an exceedance probability equal to or less than 0.2 percent (Q500).

Datum = Mean Lower Low Water (-7.6 feet)

The following scour information shall be provided on bridge plans only:

Scour from streambed elevation 85 feet:

Return Period	100-year (Q_{100})	500-year (Q_{500})
Contraction Scour	1.0 ft	2.0 ft
Abutment Scour	9.0 ft	10.0 ft
Pier Scour	3.0 ft	4.0 ft

* Shall be provided for the regulatory flood in designated flood hazard areas, if available.

1120.6. Turnouts

1120.6.1 Types

Truck Emergency Turnout: This is a widened shoulder area that is used at locations where frequent truck stops are anticipated or experienced. Typically these turnouts are provided at the beginning of passes to install tire chains or at the top of steep grades to check brakes.

Slow Vehicle Turnout: A widened shoulder area provided for slow moving vehicles to pull over without stopping to allow a queue to pass. Generally, two-lane highways with substantial recreational vehicle traffic and limited passing opportunities can benefit from these turnouts.

Scenic Turnout: This is a widened shoulder area or a separated turnout for the motorist to stop to view a point of interest. Anticipated stays are short and rest facilities generally are not provided.

Rest Area: This is a separated turnout to provide breaks for motorists. Convenience and comfort facilities may be provided.

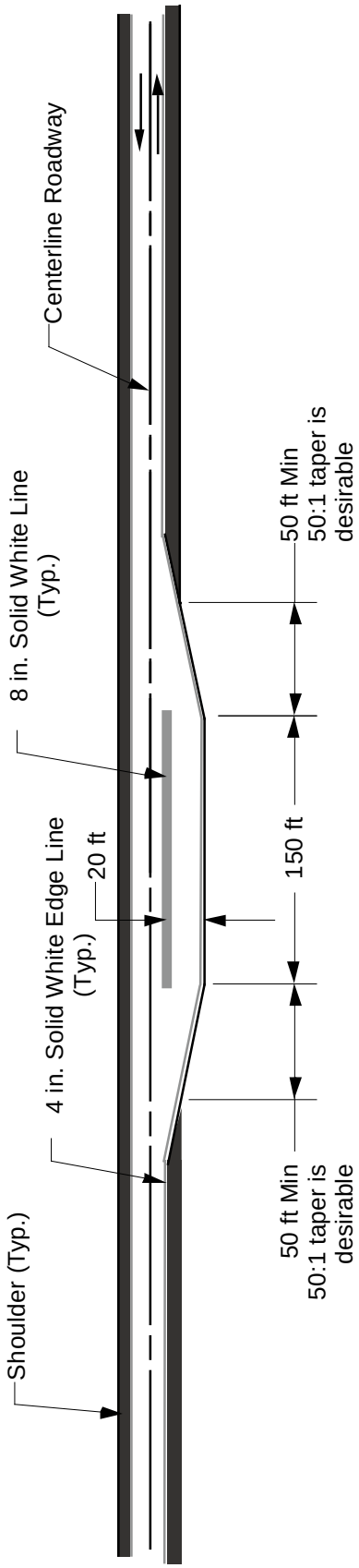
1120.6.2 References

Figures 1120-4 through 1120-7 are examples of minimum recommended scenic turnouts and rest areas. Geometric, geomorphic, and environmental conditions generally dictate a custom design. References available for rest area design are provided below:

- *A Guide for Development of Rest Areas on Major Arterials and Freeways*, AASHTO, 2001, *A Guide for Transportation Landscape and Environmental Design*, AASHTO, 1991
- FHWA-IP81-1, *Safety Rest Areas: Planning, Location and Design*, FHWA, 1981
- FHPM 6-2-5-1 *Landscape and Roadside Development*
- RD-77-07 *Waste Water Treatment Systems for Safety Rest Areas*, FHWA, 1977

1120.6.3 Accessibility

Scenic turnouts and rest areas and any included facilities must be accessible in accord with the Americans with Disabilities Act.

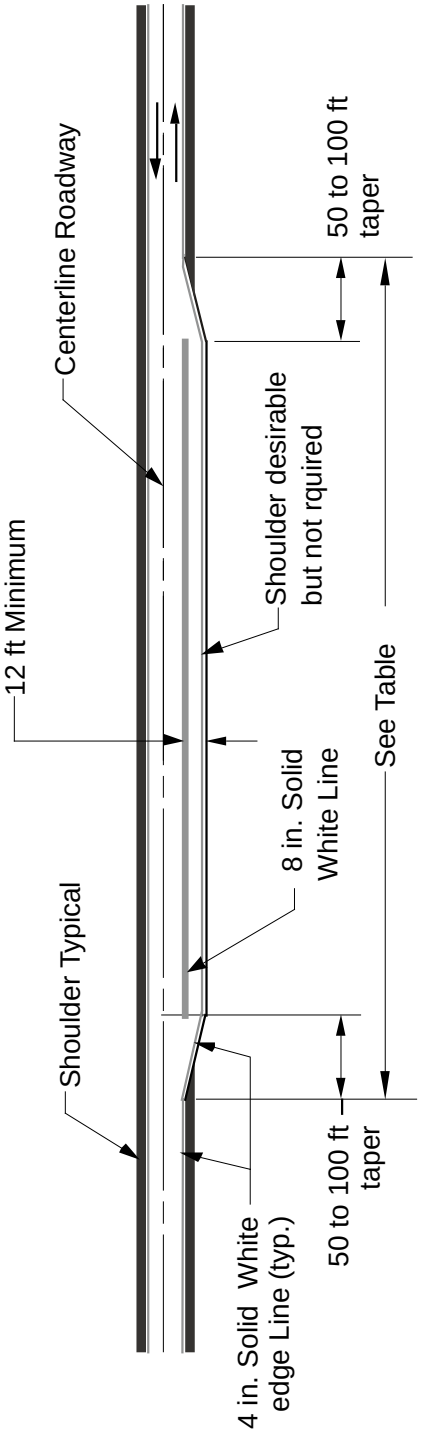


NOTES:

1. Install drainage system where required.
2. Turnout should be graded and surfaced with the same type and depth material as specified for the roadway.

RECOMMENDED MINIMUM TRUCK EMERGENCY TURNOUT

Figure 1120-4
Recommended Minimum Truck Emergency Turnout



SIGNS

See Alaska Sign Design Manual for applicable signs.

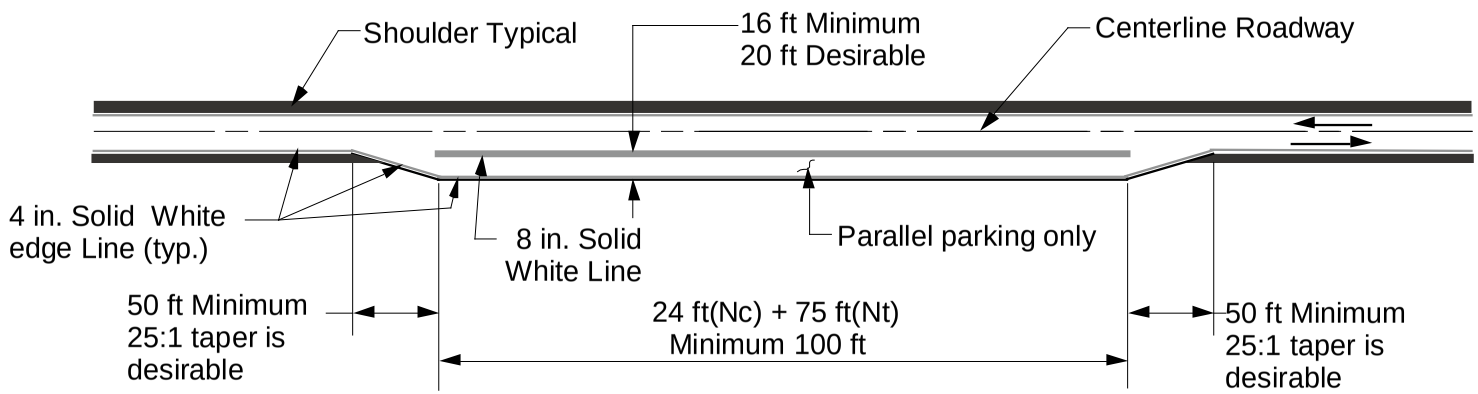
See the Alaska Traffic Manual for sign placement.

APPROACH SPEED (mph) OF SLOW VEHICLE	MINIMUM LENGTH (ft) *
25	200
30	200
40	300
45	350
50	450
55	550
60	600

* Maximum Length should be 600 ft to avoid use as passing lane.

SLOW VEHICLE TURNOUT FOR RURAL TWO LANE ROADWAYS

Figure 1120-5
Slow Vehicle Turnout for Rural Two-Lane Roadways



RECOMMENDED MINIMUM SCENIC VIEW POINT

PARKING

Car parking space = 24 ft x 8 ft
Truck parking space = 75 ft x 8 ft
Nc = Car parking spaces required
Nt = Truck parking spaces required
ADT = Average daily traffic with access to scenic view point
Dc = percent of traffic composed of cars
Dt = percent of traffic composed of trucks or large RV's
P = Total percent on mainline traffic stopping at rest area adjusted by the ratio DSL/50
DSL = Design section length or distance between turnouts in miles.
Interstate P = 0.12(DSL)/50 Primary (recreational) P= 0.08(DSL)/50 Primary (rural) P = 0.055(DSL)50

Nc = 0.09(ADT)(P)(Dc)
Nt = 0.09(ADT)(P)(Dt)
Source: Minnesota DOT Road Design Manual (rest areas)

SIGNING

Specifications: MUTCD/Alaska Supplement and the Alaska Sign Design Specifications

Ref: AASHTO Guide for Transportation Landscape and Environmental Design 1991
AASHTO 1990 Policy on Geometric Design of Highways and Streets
Transportation and Land Development by Institute of Transportation Engineers

Figure 1120-6
Recommended Minimum Scenic Viewpoint

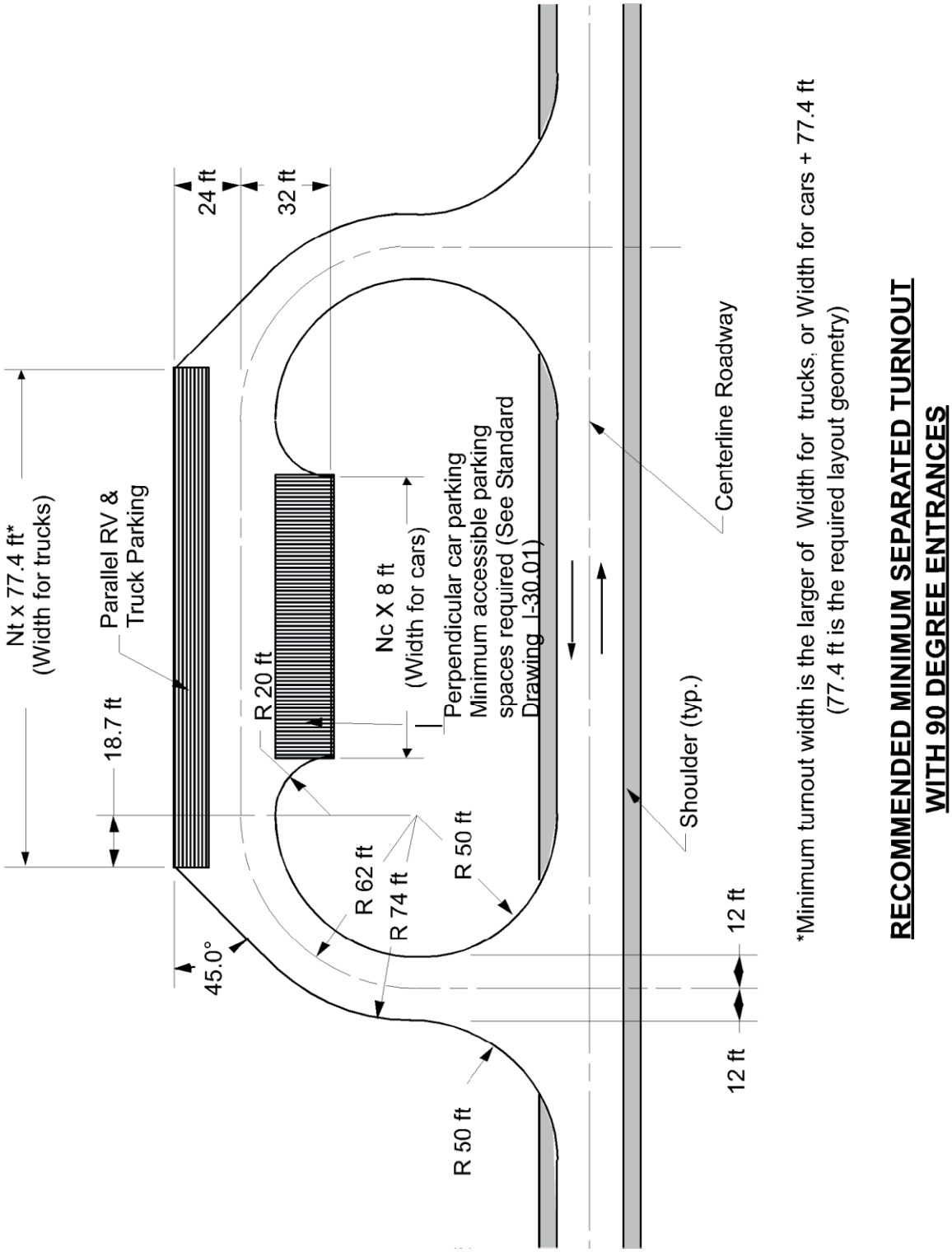


Figure 1120-7
Recommended Minimum Separated Turnout With 90-Degree Entrances

1120.7. Erosion & Sediment Control Plans (ESCPs)

1120.7.1 Background

Water pollution in the U.S. is regulated under the Federal Water Pollution control Act of 1972, now referred to as the Clean Water Act (CWA). In 1987, the CWA was amended to include non-point sources of pollution, such as runoff from land. Eroded sediment from construction sites that discharges into waters of the U.S. is considered pollution.

Section 402 of the CWA provides the legal basis for the Alaska Pollutant Discharge Elimination System (APDES) permit program. The Department conducts construction activities under APDES permits, primarily, the DEC Construction General Permit (CGP). The CGP requires a site specific erosion control plan for construction activities.

DEC assumed the issuance, inspection, and enforcement of all storm water permits from the EPA on November 1, 2009.

In 2010, the Department entered into a Consent Decree with the U.S. Department of Justice and the EPA. The Consent Decree requires

- Training,
- Certification,
- Additional documentation and record retention,
- Construction requirements above and beyond the CGP,

The Consent Decree has stipulated penalties for non-compliance.

The Consent Decree is found here:

http://www.dot.state.ak.us/stwddes/desenviron/resources/stormwater.shtml

23 CFR 650 Subpart B states that:

> *" . . . all highways funded in whole, or in part under title 23, United States Code, shall be located, designed, constructed and operated according to standards that will minimize erosion and sediment damage to the highway and adjacent properties and abate pollution of surface and ground water resources."*

Construction contractors must develop a Storm Water Pollution Prevention Plan (SWPPP) for all projects with land disturbance and must receive sufficient information and guidance in the contract documents to prepare a well-conceived, cost effective SWPPP. The purpose of an Erosion and Sediment Control Plan (ESCP) is to provide this information.

1120.7.2 ESCP Policy

Develop an ESCP for all projects with disturbed ground that meet either of the following conditions:

- Owned by the Department, or
- Designed (or design administered by) and constructed (or construction administered) by the Department

Utility Relocations. There are three types of utility relocation:

1. **Concurrent Relocation -** When the utility construction work happens at the same time as the highway construction. This is the most common type.
2. **Partial Advance Relocation –** When the utility construction work starts prior to the highway construction project. This type is uncommon.
3. **Complete Advance Relocation** – When all of the utility construction work is complete prior to award of the highway construction project. This type is rare.

All utility relocation projects require an ESCP. Types 1 and 2 generally have the ESCP developed in conjunction with the highway project's ESCP. For type 3, a specific stand-alone ESCP must be developed for the utility relocation project.

1120.7.3 ESCP Development

Develop the ESCP early and in collaboration with Construction. A well prepared and complete ESCP assists in compliance with the Consent Decree.

An ESCP can consist of the following components:

- Plan sheets
- Standard specifications
- Special provisions

- Narrative (as an Appendix to the specifications or notes on the ESCP sheets)
- SWPPP template pre-filled to extent possible

Show permanent Erosion and Sediment Control (ESC) features, including final stabilization, on the roadway plan and detail drawings. These drawings are sealed and signed in accordance with 12 AAC 36.185.

Show temporary ESC features and construction phasing in the ESCP drawings, if known, and reference permanent ESC features identified elsewhere in the plans and specifications. ESCP drawings are intended to be modified by the construction contractor in preparation of his SWPPP. Do not seal ESCP drawings.

Develop the ESCP with the DOT&PF SWPPP Template format and content in mind. Designers should prepare a draft electronic copy of the project-specific SWPPP by populating the DOT&PF SWPPP Template with data, as appropriate, from the project design. The following information is recommended:

- Section 3
  - Project location, including latitude and longitude
  - Descriptions of precipitation, soils, topography, drainage patterns, approximate growing season, vegetation, and historic use of the site.
  - Size of 2 year, 24 hour storm event
- Section 4
  - Function of the project
  - Project area, disturbed area, impervious area, and runoff coefficients (before and after).
- Section 7
  - Listing of all water bodies and storm drainage systems that will receive storm runoff from the site.
  - Provide ADF&G anadromous waters catalog number for receiving waters
  - Listing of impaired water bodies with their TMDLs and relevant recommendations from the Implementation Section of the TMDL
  - Listing of impaired water bodies without TMDLs
  - Documentation of an anti-degredation consultation that DOT&PF conducted, if the receiving water is in a state park or refuge
- Section 8: Documentation regarding endangered species
- Section 9: Describe any applicable federal, state, tribal, or local requirements
- Section 10:
  - Areas to be protected from disturbance
  - Topsoil preservation methods
  - Natural buffer areas
  - Velocity dissipation at culvert outlets
  - Run-on diversions
  - Identification of steep slopes
  - Perimeter control
  - Stabilized construction exits
  - Final stabilization
- Appendix A – Site Maps and Drawings
- Appendix D – Supporting Documentation
  - TMDLs
  - Endangered species
  - DEC non-domestic wastewater plan review
  - Environmental commitments
  - Environmental permits, including permit conditions

Provide a copy of the initial electronic DOT&PF SWPPP Template to Construction who will provide it to the construction contractor to assist in developing their SWPPP.

Use Chapter 16 of the *Alaska Highway Drainage Manual* (*AHDM*) for:

- Fundamentals of erosion control
- Guidance and technical principals for controlling erosion
- Preparation and requirements of an ESCP

ESCP preparers are allowed to use other recognized resources for selection and application of temporary and permanent Best Management Practices (BMPs), such as:

- Alaska DOT&PF SWPPP Guide *
- Alaska Storm Water Guide
- EPA National Menu of Stormwater BMPs
- Other state DOT or municipal stormwater/BMP manuals

Do not use Appendix B of Chapter 16 in the *AHDM* for seed mixes. Use the following revegetation resources instead:

- Alaska Department of Natural Resources (DNR) *"A Revegetation Manual for Alaska"* – 2008 updated version
- DNR's Alaska Coastal Revegetation and Erosion Control Guide, if located in a coastal area.
- DNR's Interior Alaska Revegetation & Erosion Control Guide, if located in the interior of the state.

The AHDM is found here:

www.dot.state.ak.us/stwddes/desbridge/pop_hwydrnman.shtml

The DNR manuals are located here:

http://plants.alaska.gov/

1120.7.4 Payment for Erosion, Sediment, and Pollution Control

Erosion and sediment control (ESPC) work, including SWPPP preparation and administration, typically ranges from 3-7% of the total construction cost.

Include the following pay items (refer Section 641 of the *Alaska DOT&PF Standard Specifications for Highway Construction* [SSHC]) on all projects with ESC work:

- 641(1) - Erosion, Sediment, and Pollution Control Administration.
- 641(2) or (3) - Temporary Erosion, Sediment, and Pollution Control (contingent sum or lump sum payment – use one or the other, not both).
- 641(6) - Withholding

Every project should contain the combination of 641(1), (2), and (6) or 641(1), (3), (4), and (6) pay items. Pay items 641(5) and (7) should be added at the discretion of the designer.

The project's temporary and permanent ESC items can be paid for under

- Pay item 641(2)
- Standard SSHC pay items outside of Section 641
- Items established by special provision.

1130. Cross Sections

1130.1. Roadway Surfaces
1130.2. Roadside Geometry
1130.3. Sideslopes, Roadway Sections, and Drainage Channels
1130.4. Mailboxes
1130.5. Traffic Barriers
1130.6. Cost-Effective Analysis
1130.7. Pedestrian Crossings

1130.1. Roadway Surfaces

1130.1.1 Vertical Clearance

Vertical clearances over roadways, bikeways, and pedestrian facilities should conform to Table 1130-1.

1130.1.2 Cross-Slopes (See Figure 1130-1)

1. Two-lane and wider two-way undivided roadways on tangents should be crowned on the centerline dividing traffic flow. Traveled ways should slope downward from the crown to the outside edges in a plane surface at a slope not flatter than 0.02 ft/ft for paved surfaces and not flatter than 0.03 ft/ft for unpaved gravel surfaces.

2. One-way traveled ways on tangent divided roadways with two lanes may slope downward from the median or left edge of the traveled way in a single plane at a slope no flatter than 0.02 ft/ft or may be crowned as in two-lane, two-way undivided roadways. We suggest that you use a crowned section if you anticipate future widening. Crown one-way traveled ways on tangent divided roadways with three lanes or more with slopes not flatter than 0.015 ft/ft or slopes no greater than 0.02 ft/ft.

3. On all superelevated sections where the rate of cross-slope exceeds the normal shoulder rate, the superelevated rate may be carried across the entire shoulder area, or the upper shoulder may be rolled over, but the algebraic difference in slopes shall not exceed 8 percent.

1130.1.3 Lane and Shoulder Widths

New Construction and Reconstruction

National Highway System roadway widths shall conform to the recommendations of AASHTO.

On rural roadways, off the National Highway System, with design ADT less than 2,000, you should use the lane and shoulder widths shown in Tables 1130-2 through 1130-7. If design ADTs exceed 2,000, lane widths should be used as recommended by AASHTO.

For all urban roadways, follow AASHTO's recommendations for width of lane and shoulder, and the widths should be compatible with the level of service specified for the project.

Rehabilitation (3R)

For rural roadways, use the lane and shoulder widths as determined by the performance requirements of Section 1160.

Urban roadways must have lane and shoulder widths as determined for new construction.

Interstate

Section 1120.2. provides the minimum roadway top width for interstate.

1130.2. Roadside Geometry

1130.2.1 General

The term "clear zone" describes a roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. The width of the clear zone is a function of vehicle speed, ADT, and sideslope. The speed used to determine the width of the clear zone should be the design speed. The general design procedure using the clear zone concept consists of:

1. Delineating the clear zone

2. Identifying obstacles in the clear zone

3. Determining alternative treatments for obstacles within the clear zone. Except where modified by sections 1130.2, 1130.3, and 1130.4, discussion, graphs, figures, and examples from the 2002 *AASHTO Roadside Design Guide* should be the basis of roadside design. Section 1130.6 presents a cost-effective method of selecting treatment alternatives.

This chapter applies to new construction. Section 1160 applies to 3R projects.

1130.2.2 Low-Speed Roadways

Where curbs exist, establish the minimum horizontal clearance as recommended by the AASHTO *A Policy*

on the Geometric Design of Highways and Streets 2001, for urban roadways.

1130.2.3 Clear Roadside Concept

Statement of the Clear Zone Concept

It is desirable to provide a roadside clear of hazardous objects or conditions for a distance consistent with the speed, traffic volume, and geometric conditions of the site. Provide clear zone or cost-effective alternative obstacle treatment for all new construction and reconstruction highway designs.

Clear Zone Width

Table 1130-2 defines clear zone width adjacent to the traveled edge of a highway. The clear zone is measured from the edge of the traveled way, and clear zone width includes the shoulder width.

Where there are through-auxiliary lanes (passing, truck climbing, and truck descending lanes) the clear zones widths are measured from the edge of the auxiliary lane travel way. In the absence of traffic studies on similar auxiliary lanes, assume when performing cost-effective analysis that the auxiliary lanes carry 50 percent of the one-way traffic at the same speed as on adjacent segments of the road.

Chapter 3 of the *AASHTO 2002 Roadside Design Guide* provides guidance and methods for determining clear zones where combinations of foreslopes and backslopes are within the roadside.

Special Situations Requiring Greater Width

The basic conditions assumed in the definition of the clear zone are 1) a tangent roadway section; and 2) level or near-level roadside slopes. For varying geometric conditions including slopes, curvature, and grade, errant vehicles may require lesser or greater clear recovery zones. You may also evaluate the horizontal width of the clear zone for non-tangent, non-level roadway sections using the procedures in Section 1130.6., Cost-Effective Analysis. This procedure allows adjustments to the clear zone based on varying geometric alignments and a roadside equated to a near-level clear zone.

- **Example 1130-1**

  Referring to Table 1130-2, for a given sideslope, you may determine the appropriate clear zone width for a given speed. For example, a 6:1 fill sideslope for 50 mph and 5,000 ADT requires an 18-foot clear zone, while a 6:1 side slope for 60 mph and 500 ADT requires a clear zone of 16 feet.

- **Example 1130-2**

  There are occasions when roadway sections may have compound slopes within the clear zone, for example, low fills with natural ground in the clear zone and ditch bottoms within the clear zone. In this case, average the slopes beginning at the edge of the traveled way. A slope steeper than 3:1 is not traversable without hazard and must be addressed as an obstacle (see 1130.3.2.). Slopes steeper than 4:1 cannot be used in averaging calculations. See Examples C through G at the end of Chapter 3 of the *AASHTO 2002 Roadside Design Guide* for example calculations.

Comply with DOT&PF Policy and Procedure 5.05.030, Beautification of the Highway Right-of-Way (P&P 5.05.030), when placing landscaping in a project right-of-way. P&P 5.05.030 is available online at: http://www.dot.state.ak.us/admsvc/pnp/assets/chapt_5/05_05_030.pdf.

If clear zone is not provided, evaluate beautification using cost-effective analysis in Section 1130.6 to determine the appropriate treatment.

Treatment of Hazards and Obstacles

There are six treatments for hazards or obstacles:

1. Remove or relocate the obstacle or hazard outside of the clear zone width.
2. Redesign the obstacle or hazard so that it is traversable.
3. Provide bases that are designed to break away upon vehicle impact for engineered obstacles that must remain in the clear zone to be functional (such as a sign or illumination pole), or are too expensive to relocate (such as utilities). Breakaway fixtures meet the NCHRP 350 Test Level 3 requirements.
4. Provide clear zone by flattening slopes.
5. Shield the obstacle or hazard with traffic barriers or crash cushions.
6. Leave the obstacle or hazard in place and provide delineation that marks the hazard and increases the motorist's awareness of it.

Determine the best treatment alternative through the procedures in Section 1130.6., Cost-Effective Analysis.

Culvert Ends in Clear Zone

Refer to Chapter 3 of the *AASHTO 2002 Roadside Design Guide* for treatment of obstacles and traversable features, including approach culvert ends and cross slope pipe ends.

Standard Drawings D-42.01, 43.01, 44.01, and 45.01 show Type C and D inlets, which have traversable designs. Verify hydraulic capacity will meet design flows before using in the project design. Other treatments are described in sections 3.4.2 and 3.4.3 of the *AASHTO 2002 Roadside Design Guide.*

Trees in the Clear Zone

Remove all trees greater than 4 inches in diameter, or those that are likely to be greater than 4 inches in diameter at full maturity, from the clear zone unless there are unusual circumstances—for example, an eagle nesting tree, or the existence of cost-effective alternate treatments.

If clear zone is not provided, evaluate the trees using cost-effective analysis in Section 1130.6 to determine the appropriate treatment.

1130.2.4 Clear Zones on Horizontal Curves

Where accident rates indicate a need for an improvement, you may use widening of the clear zone as a mitigating technique.

The following method may be used to determine widening clear zones on horizontal curves:

$CZ_c = K_{cz} \times CZ_t$

$$K_{cz} = \frac{L_o + W_r}{W_r}$$

$$L_o = \sqrt{R^2 + \left[\frac{(0.9V + 15)^2}{13}\right]^2} - R$$

V	=	Design speed
W_r	=	Roadside width constant
L_o	=	Increased width factor
K_{cz}	=	Curve correction multiplier
CZ_c	=	Clear zone for curved roadways
CZ_t	=	Clear zone for tangent roadways
R	=	Radius of curve

Figure 1130-2 provides values for W_r and shows the method for tapering into the additional width that occurs on horizontal curves.

- **Example 1130-3:**

The radius of the roadway in Example 1130-1 is 2,292 feet.

The fill sideslope is 6:1.

The design speed is 50 mph.

$$L_o = \sqrt{(2292)^2 + \left[\frac{(0.9 \times 50 + 15)^2}{13}\right]^2} - 2292$$

L_o	=	17 ft
W_r	=	108 ft

$$K_{cz} = \frac{17 + 108}{108} = 1.16$$

CZ_t	=	18 ft (From Table 1130-2 for 50 mph and 5,000 AADT)
CZ_c	=	1.16 x 18 ft = 21 ft

You may evaluate the horizontal width of the clear zone for non-tangent roadway sections using cost-effective analysis procedures of Section 1130.6 of this manual.

1130.2.5 Clear Zones on Slopes Steeper Than 4:1

Where embankment slopes are steeper than 4:1, but equal to or flatter than 3:1, a vehicle is considered to have the ability to traverse that slope but not recover. Slopes steeper than 3:1 are not considered traversable and should be treated as obstacles.

In short, the recovery area is the required clear zone plus the horizontal distance occupied by slopes steeper than 4:1. Do not use slopes steeper than 4:1 as part of the clear zone. For additional guidance on traversable slopes, see Section 3.2 of the *AASHTO 2002 Roadside Design Guide*, and see Example C (Chapter 3) for evaluation methods. The clear runout area shown in the

AASHTO 2002 Roadside Design Guide should have a desirable minimum width of 10 feet.

1130.3. Sideslopes, Roadway Sections and Drainage Channels

1130.3.1 Transverse Sideslopes

Refer to the *AASHTO 2002 Roadside Design Guide*, Section 3.2.3 Transverse Slopes, for guidance in designing transverse slopes within the clear zone.

1130.3.2 Roadway Sections

Roadway sections should reflect the clear roadside concept. Provide recoverable slopes unless more cost-effective alternatives are used.

One strategy to reduce costs for high fills is to use a "barn roof" section where clear zone width is provided with a recoverable slope (4:1 or flatter), then a steeper slope (non-traversable, non-recoverable, typically 1.5:1 or 2:1) is constructed to the toe of the fill. Examples D and E from Chapter 3 of the *AASHTO 2002 Roadside Design Guide* illustrate this construction.

While the barn roof section complies with desirable clear zone guidelines, there are other issues to consider. The Department has had to reevaluate these sections after construction due to public perception they are unsafe. Also, the steeper slope, even though outside of the clear zone, is an obstacle. Studies indicate that on high speed highways (greater than 45 mph) a width of 30 feet or more from the edge of the through traveled way allows about 80 percent of the vehicles leaving a roadway out of control to recover.

Another strategy for reducing costs for high embankments is the use of traffic barriers.

There is no one solution that can be applied to all high fill situations. However, cost-effective analysis procedures in 1130.6 can be used to select one of the four roadside alternatives (recoverable slopes, traversable slopes, barn roof, and barriers) on the basis of least combined accident and construction costs over the project life.

1130.3.3 Ditches and Drainage Channels

Figure 1130-3 shows recommended ditch section in rock slopes. The recommended rock excavation section uses the additional consideration of trapping falling debris by dissipating kinetic energy prior to reaching the traveled way.

The *AASHTO 2002 Roadside Design Guide* Figures 3.6 and 3.7 present traversable channel configurations and design considerations. Figure 3.6 is also applicable to rounded trapezoidal channels with bottom width less than 4 feet, and Figure 3.7 is applicable to rounded trapezoidal channels with bottom width greater than or equal to 4 feet.

Other examples of slope averaging and ditch section calculations with regard to clear zones are shown in Examples C through I of Chapter 3 in the *AASHTO 2002 Roadside Design Guide*. In some circumstances, these recommended sections will not be adaptable to certain design demands. Use the cost-effective analysis procedures in Section 1130.6 to justify other designs.

1130.4. Mailboxes

Mailboxes are generally found in the clear zone and, to maintain mail service, they usually cannot be relocated outside of the clear zone. Although a mailbox and the supporting structure are obstacles, you can reduce the hazard to an acceptable level.

The vertical support in the single mailbox installation is the critical member. The support should yield on impact. The vertical support member size and its ground embedment length establish stiffness. Chapter 11 in the *AASHTO 2002 Roadside Design Guide* addresses mailboxes, location, and mailbox turnout design. Alaska Standard Drawings M-20 and M-23 comply with the AASHTO guide. Cantilever supports are preferable because the vertical member is offset farther from the traveled way and there is less conflict with snow removal.

With multiple mailbox installations, the vertical support system is stiffer because of the horizontal member that transfers load. The horizontal member itself is a problem because its level allows it to penetrate a windshield. Avoid this situation; Alaska Standard Drawings M-20 and M-23 show acceptable mountings.

Existing mailbox installations that resemble the Alaska standards from the standpoint of structural stiffness may remain in the clear zone based on the designer's judgment. Remove other installations from the clear zone unless this is not cost-effective in accordance with Section 1130.6.

Table 1130-1
Vertical Clearance

VERTICAL CLEARANCE

Minimum vertical clearances for the entire roadway width, should be provided according to the following table.

RECOMMENDED VERTICAL CLEARANCE *

OVERPASSING FACILITY / UNDERPASSING FACILITY	STATE HIGHWAY		LOCAL ROADS OR STREETS	RAIL-ROAD	PEDES-TRIAN STRUC-TURES	SIGN BRIDGES	BOTTOM SIGNAL HOUSING	OVERHEAD UTILITIES
	INTER-CHANGE	GRADE SEPARATION						
LOCAL ROADS OR STREETS	16 ft - 6 in.	16 ft - 6 in. **			17 ft - 6 in.	18 ft - 6 in.	17 ft - 6 in.	20 ft - 6 in.
STATE HIGHWAY	16 ft - 6 in. **							
RAILROAD	23 ft							27 ft - 6 in.
PEDESTRIAN FACILITY	8 ft - 6 in.							

* Clearance values shown include a 6 in. allowance for future resurfacing of the roadway.
** From the Port of Anchorage to the North Slope the clearance of roadways underpassing railroads shall be 18 ft.

Table 1130-2
Clear Zone Distance

CLEAR ZONE DISTANCE

In feet from the edge of traveled way.

Use low side clear zone values as related to lower speed and ADT for each range.
Use high side clear zone values as related to higher speed and ADT for each range.

Design Speed	Design ADT	FILL SLOPES			CUT SLOPES ***		
		6:1 or flatter	5:1 to 4:1	3:1	3:1	4:1 to 5:1	6:1 or flatter
40 mph or less	Under 750	7-10	7-10	**	7-10	7-10	7-10
	750-1,500	10-12	12-14	**	10-12	10-12	10-12
	1,501-6,000	12-14	14-16	**	12-14	12-14	12-14
	Over 6,000	14-16	16-18	**	14-16	14-16	14-16
45 to 50 mph	Under 750	10-12	12-14	**	8-10	8-10	10-12
	750-1,500	14-16	16-20	**	10-12	12-14	14-16
	1,501-6,000	16-18	20-26	**	12-14	14-16	16-18
	Over 6,000	20-22	24-28	**	14-16	18-20	20-22
55 mph	Under 750	12-14	14-18	**	8-10	10-12	10-12
	750-1,500	16-18	20-24	**	10-12	14-16	16-18
	1,501-6,000	20-22	24-30	**	14-16	16-18	20-22
	Over 6,000	22-24	26-30 *	**	16-18	20-22	22-24
60 mph	Under 750	16-18	20-24	**	10-12	12-14	14-16
	750-1,500	20-24	26-30 *	**	12-14	16-18	20-22
	1,501-6,000	26-30	30 *	**	14-18	18-22	24-26
	Over 6,000	30 *	30 *	**	20-22	24-26	26-28
70 mph	Under 750	18-20	20-26	**	10-12	14-16	14-16
	750-1,500	24-26	28-30 *	**	12-16	18-20	20-22
	1,501-6,000	28-30 *	30 *	**	16-20	22-24	26-28
	Over 6,000	30 *	30 *	**	22-24	26-30	28-30

* Clear zones in this table are limited to 30 feet for practicality and economy. Consider increasing the clear zone where a specific site investigation or engineering judgment indicate that an area has a higher probability of crashes and high severity conditions are present beyond 30 feet. Figure 3-1b and Table 3-1 of the *AASHTO 2002 Roadside Design Guide* provide guidance for increased clear zones.

** Because recovery is less likely on the unshielded, traversable 3:1 fill slopes, fixed objects should not be present near the toe of these slopes because high-speed vehicles that encroach beyond the edge of shoulder may continue and travel beyond the toe of slope. Determination of the width of the clear runout area at the toe of slope should take into consideration right-of-way availability, environmental concerns, economic factors, safety needs, and accident histories. The width of the clear runout area should conform to the recommendations presented in Figure 3.2, example C (chapter 3), and sections 3.2.1 and 3.3.2 of the *AASHTO 2002 Roadside Design Guide*. The desirable minimum width of clear runout area is 10 feet.

*** The slopes shown are the ditch backslopes. To use these values, the foreslopes and ditch should be traversable.

See Examples C through I at the end of Chapter 3 of the *AASHTO 2002 Roadside Design Guide* for example calculations in situations where there are multiple foreslope and backslope combinations.

Table 1130-3
Off the National Highway System

Rural Local Roadway

Lane and Shoulder Widths for New Construction and Reconstruction

(For Rehabilitation Projects, see 3R Standards, Section 1160 and for ADTs greater than 2,000, reference the AASHTO *A Policy on the Geometric Design of Highways and Streets 2001*)

Lane width presents distance from centerline marking lines to the shoulder marking line.

Local Roads **Design Year ADT 0-2000 vpd** **≤10% Trucks – (Reference NCHRP Report 362 Table 29(a))**									
Design Year Traffic Volumes (ADT) in Vehicles per Day									
Design Speed (mph)	0-400	401-600		601-750		751-1500		1501-2000	
		Lane	Shoulder	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder
LEVEL TERRAIN									
30	Use AASHTO GDVLVLR -	10	5	10	5	10	5	10	6
40		10	5	10	5	10	5	10	6
50*		11	4	11	4	11	4	11	6
ROLLING TERRAIN									
30	Use AASHTO GDVLVLR	10	5	10	5	10	5	10	6
40*		10	5	10	5	10	5	10	6
50		11	4	11	4	11	4	11	6
MOUNTAINOUS TERRAIN									
20	Use AASHTO GDVLVLR	9	2	10	5	10	5	10	6
30*		9	2	10	5	10	5	10	6
40		10	5	10	5	10	5	10	6

*Recommend Design Speed for Terrain, AASHTO GB 2001 Exhibit 5-1

Table 1130-4
Off the National Highway System

Rural Local Roadway

Lane and Shoulder Widths for New Construction and Reconstruction

(For Rehabilitation Projects, see 3R Standards, Section 1160 and for ADTs greater than 2,000, reference the AASHTO *A Policy on the Geometric Design of Highways and Streets 2001*)

Lane width presents distance from centerline marking lines to the shoulder marking line.

Local Roads **Design Year ADT 0-2000 vpd** **>10% Trucks – (Reference NCHRP Report 362 Table 29(b))**									
Design Year Traffic Volumes (ADT) in Vehicles per Day									
Design Speed (mph)	0-400	401-600		604-750		751-1500		1501-2000	
		Lane	Shoulder	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder
LEVEL TERRAIN									
30	Use AASHTO GDVLVLR	10	5	10	5	10	5	10	6
40		10	5	10	5	10	5	10	6
50*		11	4	11	4	11	4	11	6
ROLLING TERRAIN									
30	Use AASHTO GDVLVLR	10	5	10	5	10	5	10	6
40*		10	5	10	5	10	5	10	6
50		11	4	11	4	11	4	11	6
MOUNTAINOUS TERRAIN									
20	Use AASHTO GDVLVLR	9	2	10	5	10	5	10	6
30*		9	2	10	5	10	5	10	6
40		10	5	10	5	10	5	10	6

*Recommend Design Speed for Terrain, AASHTO GB 2001 Exhibit 5-1

Table 1130-5
Off the National Highway System

Rural Collector Roadway

Lane and Shoulder Widths for New Construction and Reconstruction

(For Rehabilitation Projects, see 3R Standards, Section 1160 and for ADTs greater than 2,000, reference the AASHTO *A Policy on the Geometric Design of Highways and Streets 2001*)

Lane width presents distance from centerline marking lines to the shoulder marking line.

Collector Roads **Design Year ADT 0-2000 vpd** **≤10% Trucks – (Reference NCHRP Report 362 Table 29(c))**									
Design Year Traffic Volumes (ADT) in Vehicles per Day									
Design Speed (mph)	0-400	401-600		601-750		751-1500		1501-2000	
		Lane	Shoulder	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder
LEVEL TERRAIN									
40	Use AASHTO GDVLVLR	10	5	10	5	10	5	10	6
50*		11	4	11	4	11	4	11	6
60		11	4	11	4	11	4	11	6
ROLLING TERRAIN									
30	Use AASHTO GDVLVLR	10	5	10	5	10	5	10	6
40*		10	5	10	5	10	5	10	6
50		11	4	11	4	11	4	11	6
60		11	4	11	4	11	4	11	6
MOUNTAINOUS TERRAIN									
20	Use AASHTO GDVLVLR	9	2	10	5	10	5	10	6
30*		9	2	10	5	10	5	10	6
40		10	5	10	5	10	5	10	6
50		11	4	11	4	11	4	11	6

*Recommend Design Speed for Terrain, AASHTO GB 2001 Exhibit 6-1

Table 1130-6
Off the National Highway System

Rural Collector Roadway

Lane and Shoulder Widths for New Construction and Reconstruction

(For Rehabilitation Projects, see 3R Standards, Section 1160 and for ADTs greater than 2,000, reference the AASHTO *A Policy on the Geometric Design of Highways and Streets 2001*)

Lane width presents distance from centerline marking lines to the shoulder marking line.

Collector Roads **Design Year ADT 0-2000 vpd** **>10% Trucks – (Reference NCHRP Report 362 Table 29(d))**									
Design Year Traffic Volumes (ADT) in Vehicles per Day									
Design Speed (mph)	0-400	401-600		601-750		751-1500		1501-2000	
		Lane	Shoulder	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder
LEVEL TERRAIN									
40	Use AASHTO GDVLVLR	10	5	10	5	10	5	10	6
50*		11	4	11	4	11	4	11	6
60		11	4	11	4	11	4	11	6
ROLLING TERRAIN									
30	Use AASHTO GDVLVLR	10	5	10	5	10	5	10	6
40*		10	5	10	5	10	5	10	6
50		11	4	11	4	11	4	11	6
60		11	4	11	4	11	4	11	6
MOUNTAINOUS TERRAIN									
20	Use AASHTO GDVLVLR	10	5	10	5	10	5	10	6
30*		10	5	10	5	10	5	10	6
40		10	5	10	5	10	5	10	6
50		11	4	11	4	11	4	11	6

*Recommend Design Speed for Terrain, AASHTO GB 2001 Exhibit 6-1

Table 1130-7
Off the National Highway System

Lane and Shoulder Widths for New Construction and Reconstruction

(For Rehabilitation Projects, see 3R Standards, Section 1160 and for ADTs greater than 2,000, reference the AASHTO *A Policy on the Geometric Design of Highways and Streets 2001*)

Lane width presents distance from centerline marking lines to the shoulder marking line.

Arterial Roads **Design Year ADT 0-2000 vpd** **≤10% Trucks – (Reference NCHRP Report 362 Table 29(e))**												
Design Year Traffic Volumes (ADT) in Vehicles per Day												
Design Speed (mph)	0-250		251-400		401-600		601-750		751-1500		1501-2000	
	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder
LEVEL TERRAIN												
40	9	3	9	3	10	5	10	5	10	7	10	7
50	11	2	11	2	11	4	11	4	11	6	11	6
60*	11	2	11	2	11	4	11	4	12	6	12	8
70*	12	2	12	2	12	4	12	4	12	6	12	8
ROLLING TERRAIN												
40	9	3	9	3	10	4	11	4	11	6	11	8
50*	10	3	10	3	11 or 10[a]	4 or 5[a]	11 or 10[a]	4 or 5[a]	11	6	11	8
60*	11	2	11	2	11	4	11	4	11	4	11	8
MOUNTAINOUS TERRAIN												
20	9	3	9	3	10	5	10	5	10	5	10	6
30	10	2	10	2	10	5	10	5	10	5	10	6
40*	10	3	10	3	11	2	11	2	11	6	11	6
50*	10	3	10	3	11	2	11	2	11	6	11	6

*Recommend Design Speed Range for Terrain, AASHTO GB 2001 Discussion page 448

[a]10-foot lane, 5-foot shoulder if shoulder is not paved. Otherwise use 11-foot lane 4-foot shoulder.

Table 1130-8
Off the National Highway System

Rural Arterial Roadway

Lane and Shoulder Widths for New Construction and Reconstruction

(For Rehabilitation Projects, see 3R Standards, Section 1160 and for ADTs greater than 2,000, reference the AASHTO *A Policy on the Geometric Design of Highways and Streets 2001*)

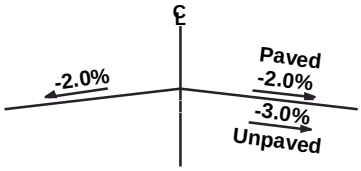
Lane width presents distance from centerline marking lines to the shoulder marking line.

Arterial Roads **Design Year ADT 0-2000 vpd** **>10% Trucks – (Reference NCHRP Report 362 Table 29(f))**												
Design Year Traffic Volumes (ADT) in Vehicles per Day												
Design Speed (mph)	0-250		251-400		401-600		601-750		751-1500		1501-2000	
	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder	Lane	Shoulder
LEVEL TERRAIN												
40	10	3	10	3	10	5	10	5	10	7	10	7
50	10	3	10	3	10	5	10	5	10	7	10	7
60*	11	2	11	2	11	4	11	4	11	4	11	8
70*	12	2	12	2	12	4	12	4	12	4	12	8
ROLLING TERRAIN												
40	10	3	11	2	11	4	11	4	11	4	11	8
50*	10	3	11	2	11	4	11	4	11	4	11	8
60*	10	3	11	2	11	4	11	4	11	4	12	8
MOUNTAINOUS TERRAIN												
20	10	3	10	3	10	5	10	5	10	5	10	6
30	10	3	10	3	10	5	10	5	10	5	10	6
40*	10	3	10	3	11	2	11	2	11	6	12	6
50*	10	3	11	2	11	2	11	2	11	6	12	6

*Recommend Design Speed Range for Terrain, AASHTO GB 2001 Discussion page 448

RECOMMENDED CROSS SLOPES

TWO-LANE 2-WAY



DIVIDED HIGHWAYS

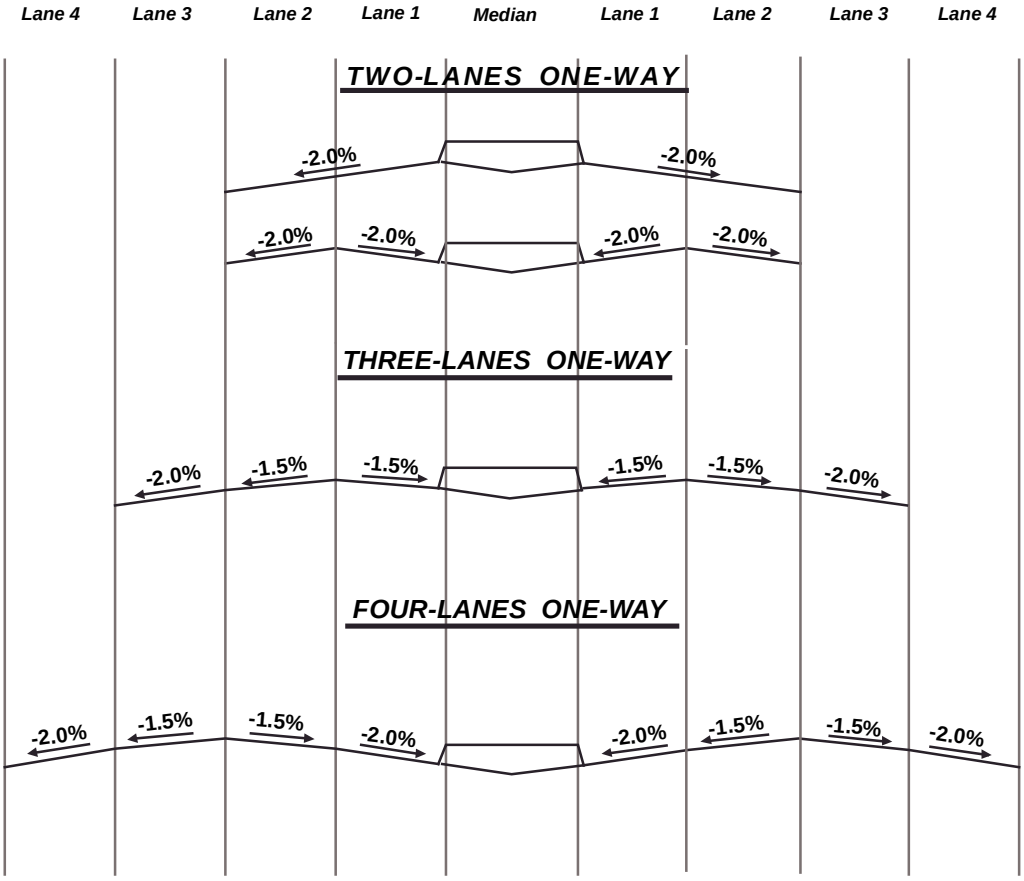
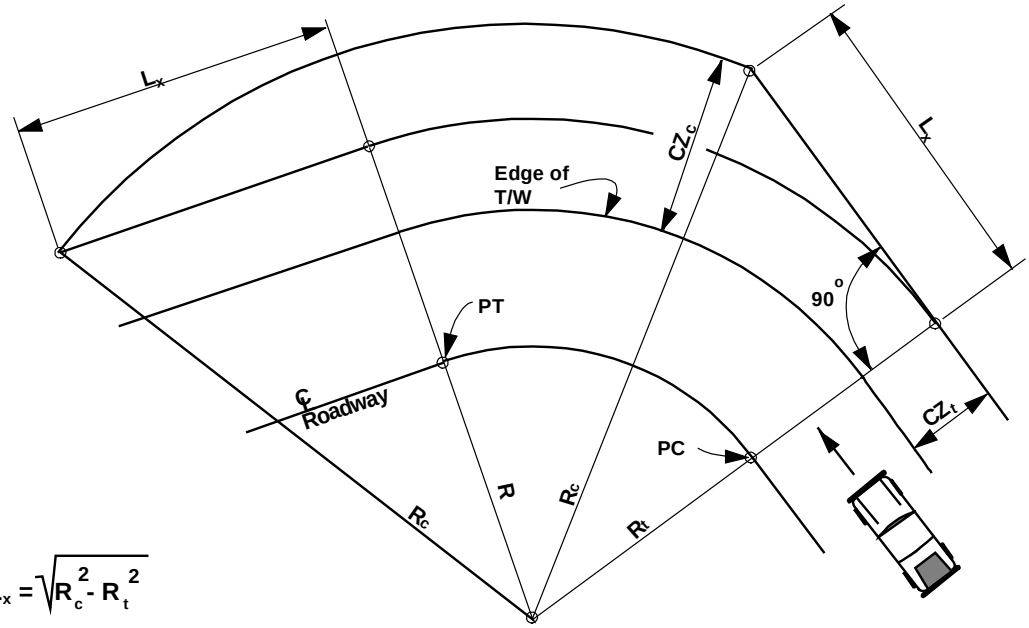


Figure 1130-1
Recommended Cross Slopes

HORIZONTAL CURVE CLEAR ZONE WIDENING OPTION FOR ACCIDENT MITIGATION



$$L_x = \sqrt{R_c^2 - R_t^2}$$

$$CZ_c = K_{cz} \times CZ_t$$

CURVE CORRECTION FACTOR (K_{CZ})							
Degree of Curve	DESIGN SPEED (mph)						
	40	45	50	55	60	65	70
2.0	1.08	1.10	1.12	1.15	1.19	1.22	1.27
2.5	1.10	1.12	1.15	1.19	1.23	1.28	1.33
3.0	1.11	1.15	1.18	1.23	1.28	1.33	1.40
3.5	1.13	1.17	1.22	1.26	1.32	1.39	1.46
4.0	1.15	1.19	1.25	1.30	1.37	1.44	
4.5	1.17	1.22	1.28	1.34	1.41	1.49	
5.0	1.19	1.24	1.31	1.37	1.46		
6.0	1.23	1.29	1.36	1.45	1.54		
7.0	1.26	1.34	1.42	1.52			
8.0	1.30	1.38	1.48				
9.0	1.34	1.43	1.53				
10.0	1.37	1.47					
15.0	1.54						

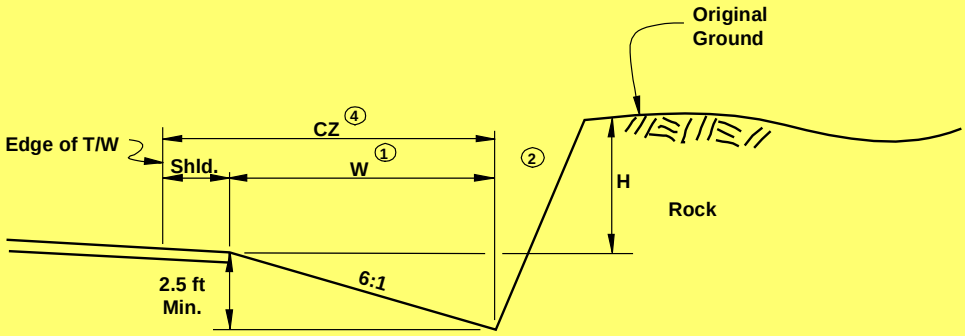
V = Design Speed (mph)
W_r = See Table
K_{cz} = Curve Correction Factor
CZ_t = Clear Zone Distance (ft) Tangent Roadway (See Figure)
CZ_c = Clear Zone Distance (ft) Curved Roadway
L_o = Increased Width Factor
R = Radius of Curve (ft)
R_t = Distance Radius Point to Normal Clear Zone at Curve PC
R_c = $R_t + (CZ_c - CZ_t)$

V (mph)	W_r (ft)
40	91
45	100
50	108
55	117
60	125
65	134
70	142

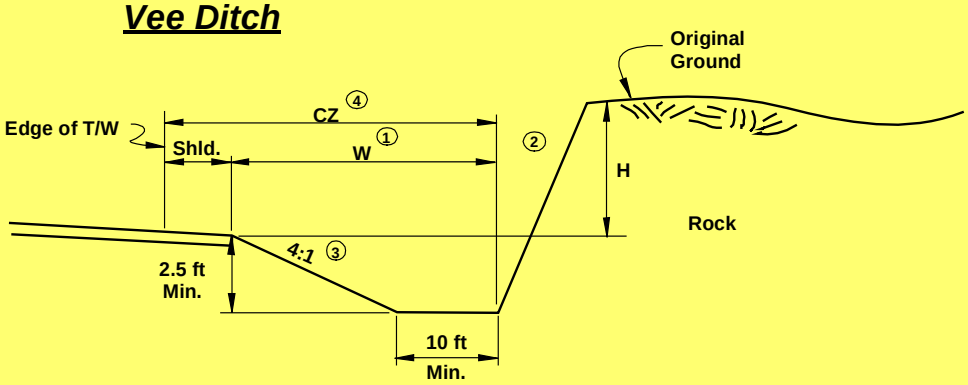
$$K_{cz} = \frac{L_o + W_r}{W_r}$$

$$L_o = \sqrt{R^2 + \left[\frac{(0.9V + 15)^2}{13}\right]^2} - R$$

Figure 1130-2
Horizontal Curve Clear Zone Widening Option for Accident Mitigation



Vee Ditch



Flat Bottom Ditch

Rock Slope	H (ft)	W (ft)
Near Vertical	0-20	CZ - Shld.
to	20-30	16
0.50:1	30-60*	19

① The greater value shall govern -- CZ or (W+Shld.).

② Rock slope: As per geotechnical recommendations.

③ If a slope steeper than 4:1 is used then barrier may be warranted. (See 1130.5). The width of slopes steeper than 4:1 shall not be included in the CZ dimension (See 1130.2.5).

④ CZ = Clear Zone (See 1130.2).

* 1. Refer cuts over 60‘ to regional or state geotechnical engineer for roadside ditch design.

2. For cuts over 20’ in height and 1/2 mile in length it may be desirable to request design from regional or state geotechnical engineer to insure cost effectiveness.

ROCK CATCHMENT DITCH WIDTH

Recommended Sections for All ADTs

Figure 1130-3
Rock Excavation

1130.5. Traffic Barriers

1130.5.1 Introduction

There are two types of protective barriers commonly used on Alaska roadways: longitudinal barriers and end terminals. These serve as less severe obstacles that redirect traffic from impacting more severe hazards. Strong post w-beam guardrail is the most common longitudinal barrier, though concrete barrier, weak post box-beam, and other types of solutions are available to meet site-specific needs.

Common end terminals use posts similar to longitudinal guardrail, with specially designed systems for gating at the end and redirecting traffic along the face, while still anchoring the longitudinal barrier. In gores and medians where gating is not desirable, crash cushions may be used to bring vehicles to a stop.

Because no policy can address every real-world condition, temper these guidelines with engineering judgment. See Figure 1130-9 for guidance in evaluating when barrier use is appropriate. In general, if eliminating the hazard and barrier installation are equally cost-effective, eliminate the hazard.

1130.5.2 Guardrails

General

Barriers shall comply with NCHRP 350 test level 3, but may be increased to higher test levels as discussed in *AASHTO 2002 Roadside Design Guide* Section 5.3.

Guardrail Warrants for Embankments

The primary highway factors contributing to embankment accident severity are the height and slope of the embankment. The embankment height comprises the height of a fill, a natural hillside, or a combination of both. An “embankment” can also be a cut if the subject road exists at the top of that cut.

A cost-effective analysis is necessary to determine if guardrail is warranted (see Section 1130.6.). Where cost-effective, the flattening of warranting slopes is preferable to guardrail installation.

Guardrail Warrants for Roadside Obstacles

Roadside obstacles may be classified as non-traversable or fixed objects. Guardrail is warranted for roadside obstacles when shown to be cost-effective (see Section 1130.6.).

Longitudinal Non-Traversable Hazards

Examples of longitudinal non-traversable hazards that may warrant guardrail are:

- Rough rock cuts
- Permanent bodies of water over 3’ deep
- Drop-offs with slopes steeper than 3:1

Because of the extended length of the hazard along the roadway, the probability of an errant vehicle striking the non-traversable hazard is greater than that of a vehicle hitting a fixed object. Barrier need for rough rock cuts is a matter of judgment.

Fixed Objects

Examples of fixed objects that may warrant guardrail are:

- Bridge piers and abutments
- Retaining walls
- Fixed sign bridge supports
- Trees
- Approach roadway embankment

For clear zone widths, see Table 1130-2. Clear zones on horizontal curves may be adjusted as shown in Figure 1130-2 if widening is cost-effective.

Length of Need

Length of need is equal to the length of guardrail needed for the hazard plus a length in advance to prevent vehicle penetration behind the rail into the hazard. The hazard may be a “point” hazard such as a tree, or a hazardous area such as a roadway section with severe side slopes.

Where slopes back of the graded shoulder are flat enough (see Guardrail Position Requirements: Guardrail Beyond Shoulder Edge), locate the guardrail as far away from the graded shoulder as possible to minimize this length of need, but with adequate clearance for guardrail deflection.

In the more common instances, where slopes are steeper, the guardrail will run along the shoulder. The barrier may be flared away from the traveled way. Where terrain allows, the barrier end may be buried in the backslope as a way to minimize the length of need. The flare is a method to transition the barrier to a hazard, minimizing driver reaction. The flare also

allows for a shorter barrier installation while locating the terminal end farther from the traveled way. Table 1130-10 shows recommended flare rates (b/a).

The recommended flare rates are related to the location of the barrier with respect to the Shy Line Offset. The Shy Line Offset is defined as the distance from the edge of the traveled way, beyond which a roadside object will not be perceived as hazardous and result in a motorist reducing speed or changing vehicle positions on the roadway. Table 1130-9 provides Shy Line Offsets to be used in the flare rate determination.

For additional information on calculating the length of need, as shown in Example 1130-5, refer to the *AASHTO 2002 Roadside Design Guide*. The Department has not developed any methods for calculation of length of need other than the one illustrated in Example 1130-5. The assumption of a specific encroachment angle to determine a length of barrier, as mentioned in the 2002 *AASHTO Roadside Design Guide*, is not an approved method in Alaska.

- **Example 1130-4:**

Refer to Figure 1130-4a and Figure 1130-4b.

Definitions:

L_R : The theoretical distance needed for a vehicle that has left the roadway to come to a stop

L_H : The distance from the edge of the traveled way to the far side of the hazard that falls within the clear zone

L_C : The distance from the edge of the traveled way to the clear zone line

L_1 : The length of barrier upstream of the obstacle that is parallel to the traveled way

L_2 : The distance from the edge of the traveled way to the face of the barrier at the obstacle

L_3 : The distance from the edge of the traveled way to the near face of the obstacle

P : The parabolic offset, obtained from Figure 1130-4a.

Given:

- G-4W barrier
- Obstacle 15 feet deep by 10 feet long
- ADT = 1,800
- Design Speed: 55 mph
- Shoulder: 6 feet
- Near face of obstacle 10 feet from edge of traveled way

Using the design speed and traffic volume, determine the desirable Run Out Length (L_R) from Table 1130-11. With a volume of 1,800 vehicles per day and design speed of 55 mph., L_R is 315 feet.

The Shy Line Offset is 7.2 feet from Table 1130-9.

Position barrier 3 feet in front of the obstacle (measured face of obstacle to face of barrier).

Therefore L_2 = 7 ft, L_3 = 10 ft, & L_H = 25 ft

L_1 = 6.25 ft (See Standard Drawings for spacing from obstacle).

L_2 < Shy Line Offset. Therefore, from Table1130-10, the flare rate b/a = 1:24.

Solve equation for a tangent and flared guardrail with a parabolic end terminal (assume SRT 350). Equation is:

$$x = \frac{L_H - L_2 + \frac{b}{a}L_1 - \frac{a \times P}{\sqrt{a^2 + b^2}}}{\frac{L_H}{L_R} + \frac{b}{a}}$$

And:

$$x = \frac{25 - 7.5 + \frac{1}{24} \times 6.25' - \frac{24 \times 1.79}{\sqrt{24^2 + 1^2}}}{\frac{25}{315} + \frac{1}{24}}$$

x = 131.97 feet, or 132 feet

Guardrail Position Requirements

Guardrail Beyond Shoulder Edge

At fixed objects, it is best to locate guardrail as far away from the shoulder as practical to maximize recovery area and minimize the length of need. Adequate deflection space must be allowed between the guardrail and the object (See the *AASHTO 2002*

Roadside Design Guide Appendix B for deflection data.) If the deflection space cannot be attained, use a stiffer rail section. For installations where the guardrail is located within 20 feet of the shoulder edge or hinge point, negative slopes in front of the guardrail shall be 10:1 or flatter, and the algebraic difference between the shoulder slope and the slope in front of the guardrail should not be greater than 0.10 in order to ensure the proper impact height. Guardrail placed more than 20 feet from the hinge point should have at least 12 feet of 6:1 or flatter slope in front of the rail, and the hinge point need not be rounded.

Guardrail Back of Curb

Curbs in front of guardrail should be avoided where possible. Where no alternative is available, refer to the *AASHTO 2002 Roadside Design Guide* Sections 3.4.1 and 5.6.2.1 for additional guidance on the design of traffic barriers near curbs.

Bridge Approaches

Guardrail at bridge approaches shall have appropriate transitions to alleviate pocketing for impacts just in front of the abutment or bridge rail ends. Determine the length of need using procedures of 1130.5.2, Guardrails: Length of Need. Generally, embankments at bridges are steep and may also warrant guardrail protection.

Gaps Between Warranting Features

Avoid gaps in guardrail less than 200 feet where possible to minimize guardrail endings, which are obstacles.

Road Approaches, Driveways, and Turnouts

Where a road approach, driveway, or vehicle turnout interrupts a normal guardrail alignment parallel to the through roadway, or causes a guardrail section to be terminated short of the normal terminal point based on length of need, guardrail ends must be treated. You may do this with a Controlled Release Terminal or any DOT&PF-approved and NCHRP 350 Test Level 3 certified end terminal.

Other Guardrail Considerations

One of the problems with guardrails is they must end somewhere. It is desirable to bury the rail end in the backslope. All guardrail ends must be anchored.

All upstream guardrail ends must be crashworthy. All downstream guardrail ends must be crashworthy except:

1. On one-way roadways
2. On divided highways or two-lane roadways where the downstream end is outside the clear zone for opposing traffic

Consider the use of crashworthy downstream terminals outside of the opposing traffic flow's clear zone when in the engineer's judgment it is likely that there will be a higher than normal incidence of vehicle encroachment beyond clear zone.

1130.5.3 Median Barriers

The principles of guardrail usage are equally applicable to median barriers. However, median barriers additionally prevent errant vehicles from crossing the median area of divided highways and entering the opposing traveled ways. Therefore, they must be capable of containing and redirecting from two directions and on both sides.

Available median width may limit the choice of barrier. If a narrow median exists, a rigid barrier, which does not deflect into the opposing travel lanes, is necessary.

If space limitations present a borderline choice between rigid (concrete "safety shape") and semi-rigid (back-to-back blocked-out W sections) barrier, then take into account economic and other considerations for the particular site. While the concrete "safety shape" ("F-shape") barrier may have a slightly higher initial cost, yearly maintenance costs of the W-section barrier may be substantially more than that of the concrete median barrier. Sloped medians may require special consideration. See 2002 *AASHTO Roadside Design Guide.*

A true median barrier usually requires a different end treatment than a single guardrail unless the median widens sufficiently to terminate outside the clear zones of the two roadways, in which case only structural (anchorage) considerations are mandatory.

Operational median barrier end treatments consist of those in the 2002 *AASHTO Roadside Design Guide*.

Again, eliminate gaps where possible. Coordination with emergency services and enforcement agencies in the design stage may allow elimination of unnecessary emergency crossovers.

Warrants for Median Barriers

Low speed and intermediate speed urban section roadways generally do not require median barriers. Rural section intermediate speed roadways and all high-speed roadways may require median barriers.

Section 6.2 of the *AASHTO 2002 Roadside Design Guide* provides information on median barrier applications and warrants procedures. Median barrier warrants for rural intermediate and all high-speed roadways are shown in Figure 6.1 of the *AASHTO 2002 Roadside Design Guide*.

1130.5.4 Bridge Rails

Refer to Section 1120.3.5 and Chapter 7 of the *AASHTO 2002 Roadside Design Guide* for information on Bridge Rails. The "Alaska Two Tube" Bridge Rail is used for new projects. The Department's Bridge Section supplies the drawings on a project-by-project basis. Transition drawings are in the standard drawings (G-30.00 and G-31.00).

1130.5.5 Crash Cushions

Crash cushions are sometimes used to absorb vehicle energy at a rate that is tolerable to the average, properly restrained vehicle occupant. In many cases, such as at elevated gore areas and bridge piers in medians at underpasses, they should also provide for redirection in side-angle impacts to alleviate pocketing near the fixed object.

Crash cushions are usually corrective measures, but may be included in the design phase if there is no feasible alternative, or if the crash cushion is the more cost-effective treatment. For example, at a rural, immovable "point" obstacle where the likelihood of impact is relatively small but the consequences of such impact great, it may be better to install a crash cushion, as opposed to a length of guardrail, to keep the collision cross-section small.

Continuing maintenance considerations for crash cushions is extremely important. For proper performance, almost all crash cushions depend on meticulous attention to functional details during installation, routine maintenance, and post-crash replacement or rehabilitation.

Refer to Chapter 8 of the *AASHTO 2002 Roadside Design Guide* for additional information about crash cushions. For areas of documented repeat impacts, consider using low maintenance or reusable crash cushions, which can be reconstructed in place. Chapter 8, Section 8.4.4 and Table 8.5 of the 2002 *AASTHO Roadside Design Guide* have additional information, including maintenance and crash repair.

1130.5.6 Guardrail End Terminal Replacement

Replace guardrail terminals in accordance with Table 1130-12.

Table 1130-9
Recommended Shy Line Offsets

Design Speed (mph)	Recommended Shy Line Offsets (feet)
80	12.1
75	10.5
70	10.0
60	8.0
55	7.2
50	6.5
45	5.5
40	5.0
30	3.5

Table 1130-10
Flare Rates for Barrier Design
(b/a)

Design Speed (mph)	Flare Rate for Barrier inside the Shy Line (b/a)	Flare Rate for Barrier Beyond Shy Line (b/a)	
70	1:30	1:20*	1:15**
60	1:26	1:18*	1:14**
55	1:24	1:16*	1:12**
50	1:21	1:14*	1:11**
45	1:18	1:12*	1:10**
40	1:16	1:10*	1:8**
30	1:13	1:8*	1:7**

* Suggested maximum flare rate for rigid barrier systems.

** Suggested Maximum flare rate for semi-rigid systems.

Table 1130-11
Recommended Runout Lengths for Barrier Advancement Length Determinations

	Traffic Volume (ADT)			
	Over 10,000	5,000 to 10,000	1,000 to 4,999	Under 1,000
Design Speed (mph)	Runout Length L_R (ft)	Runout Length L_R (ft)	Runout Length L_R (ft)	Runout Length L_R (ft)
70	360	330	290	250
65	330	290	250	225
60	300	250	210	200
55	265	220	185	175
50	230	190	160	150
45	195	160	135	125
40	160	130	110	100
35	135	110	95	85
30	110	90	80	70

Notes: Values are from Table 5-10b of the 2011 RDG, except values for 35, 45, 55 and 65 mph are interpolated.

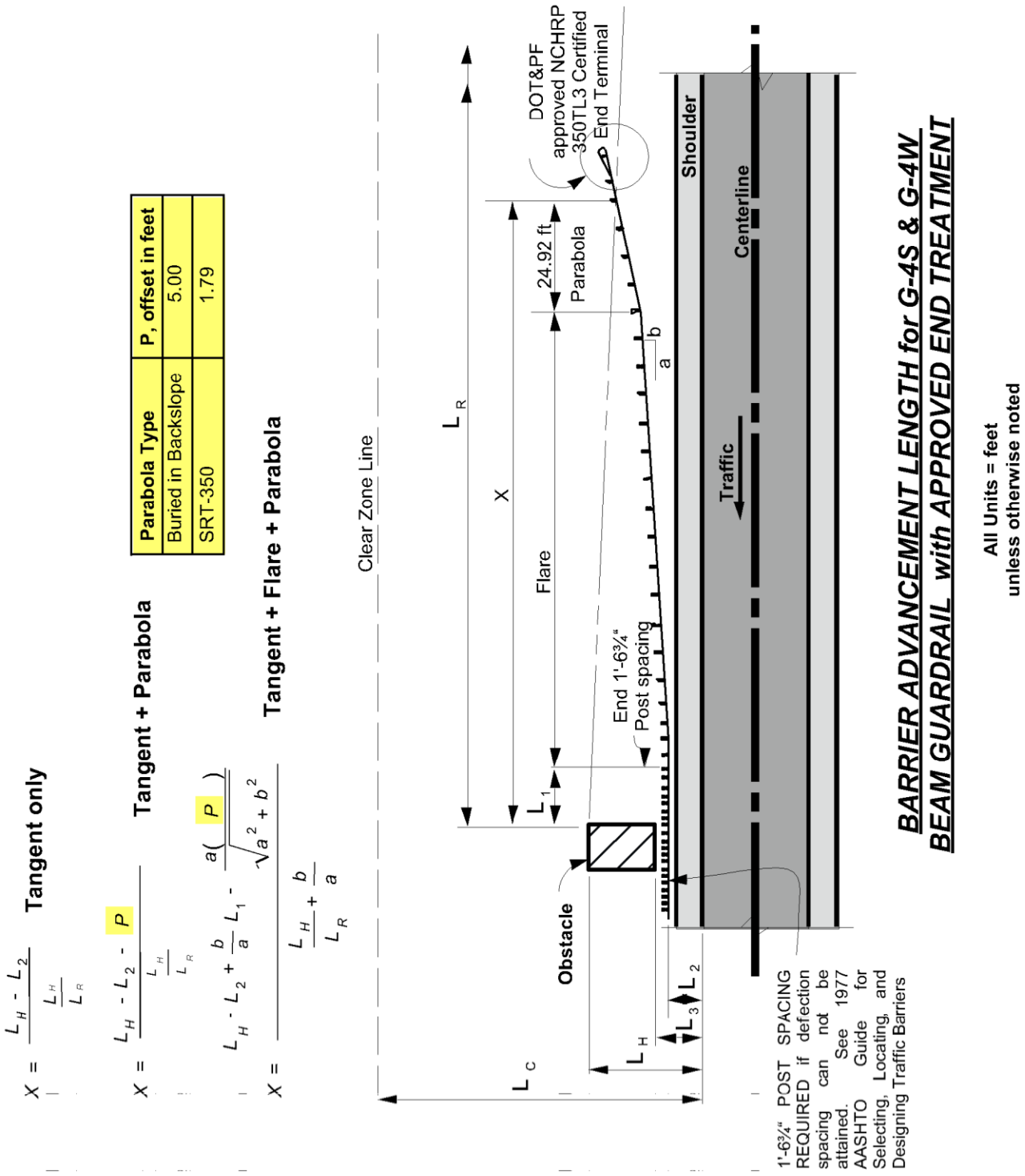
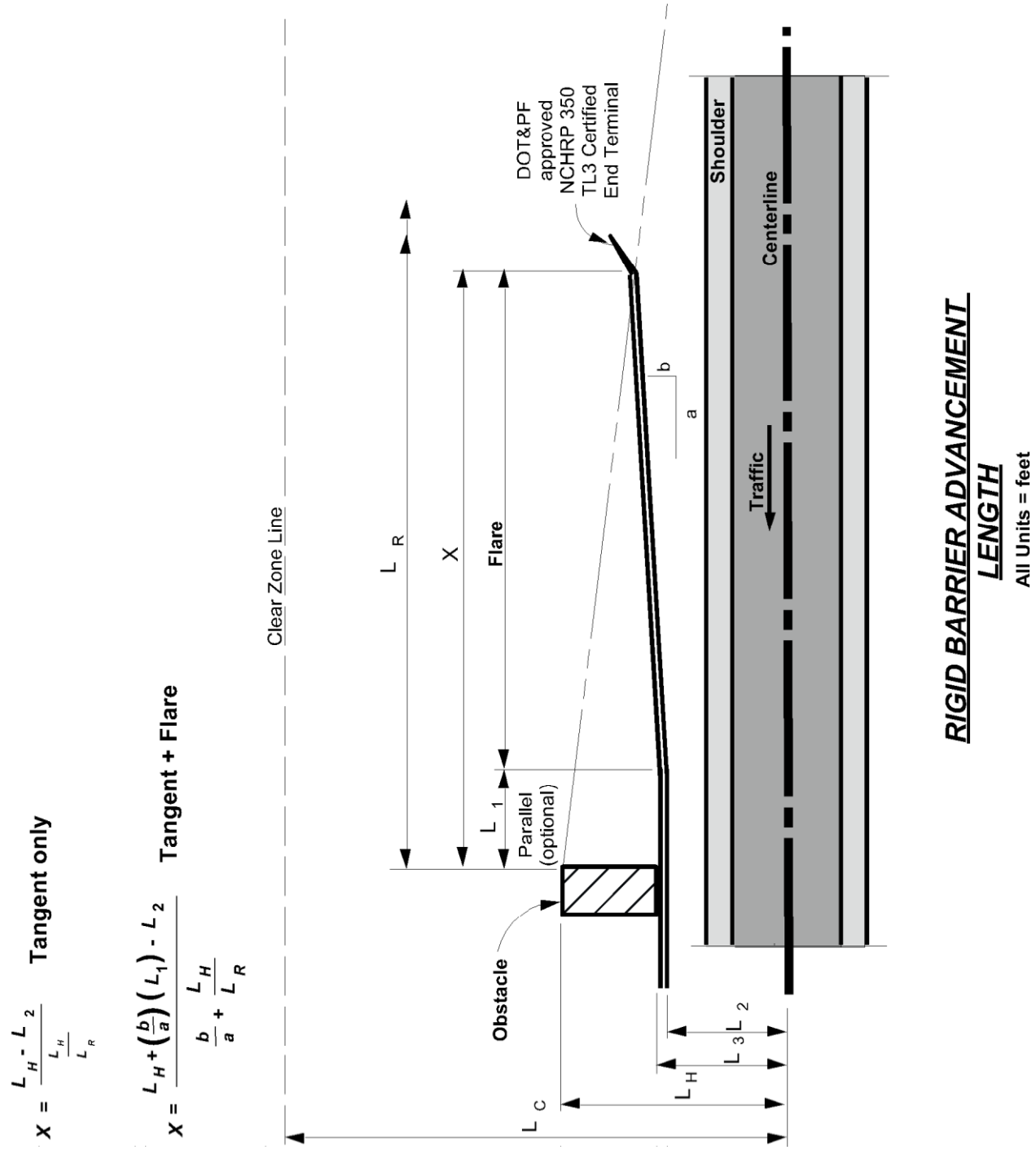


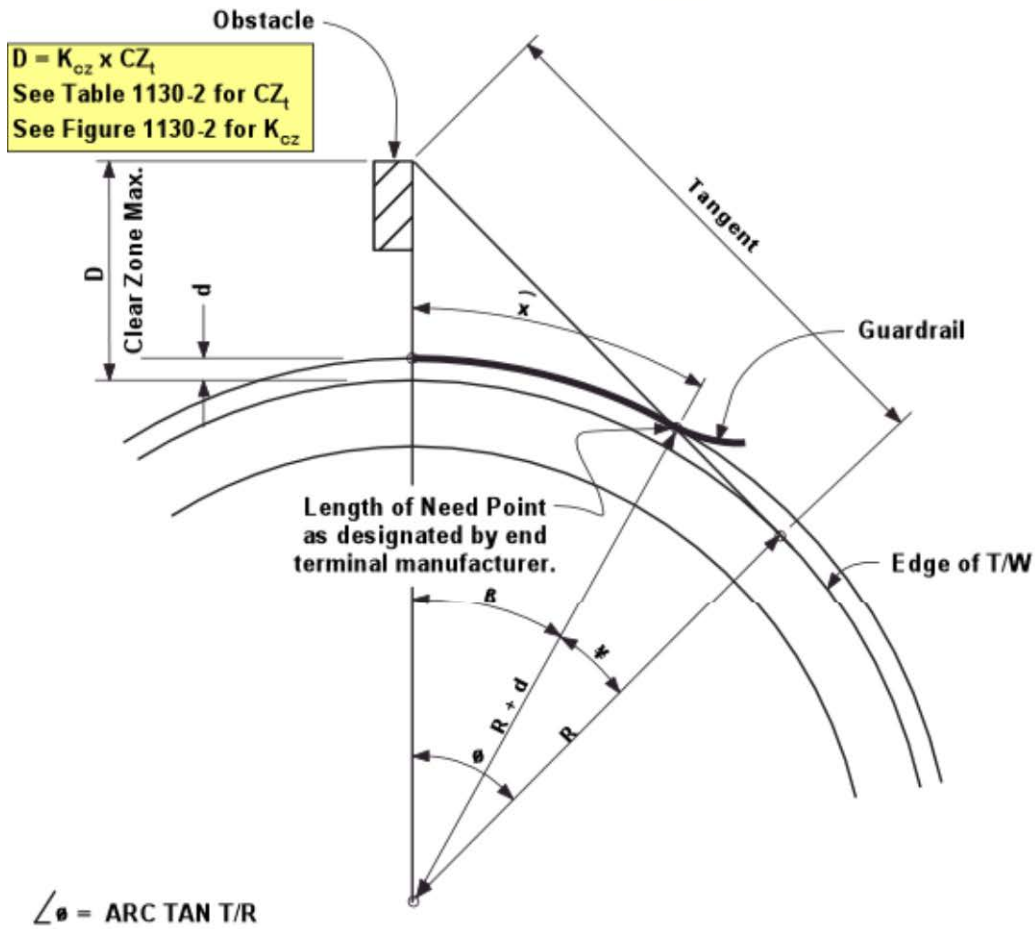
Figure 1130-4a
Barrier Advancement Length for G-4S & G-4W Beam Guardrail with Approved End Treatment



Flare rates are not used on horizontal curves

Figure 1130-4b
Rigid Barrier Advancement Length

TRAFFIC BARRIER ADVANCEMENT
LENGTH on OUTSIDE of HORIZONTAL CURVE
TANGENT ≤ L_R



∠ø = ARC TAN T/R

∠¥ = ARC COS R /(R+d)

∠ß = ø - ¥

$\widehat{x}$ = π(R+d) ß /180

T = Tangent (feet), T = $\sqrt{(R + D)^2 - R^2}$

L_R = Runout Length Table 1130 -11

R = Radius to edge T/W

D = Distance from edge T/W to back of hazard

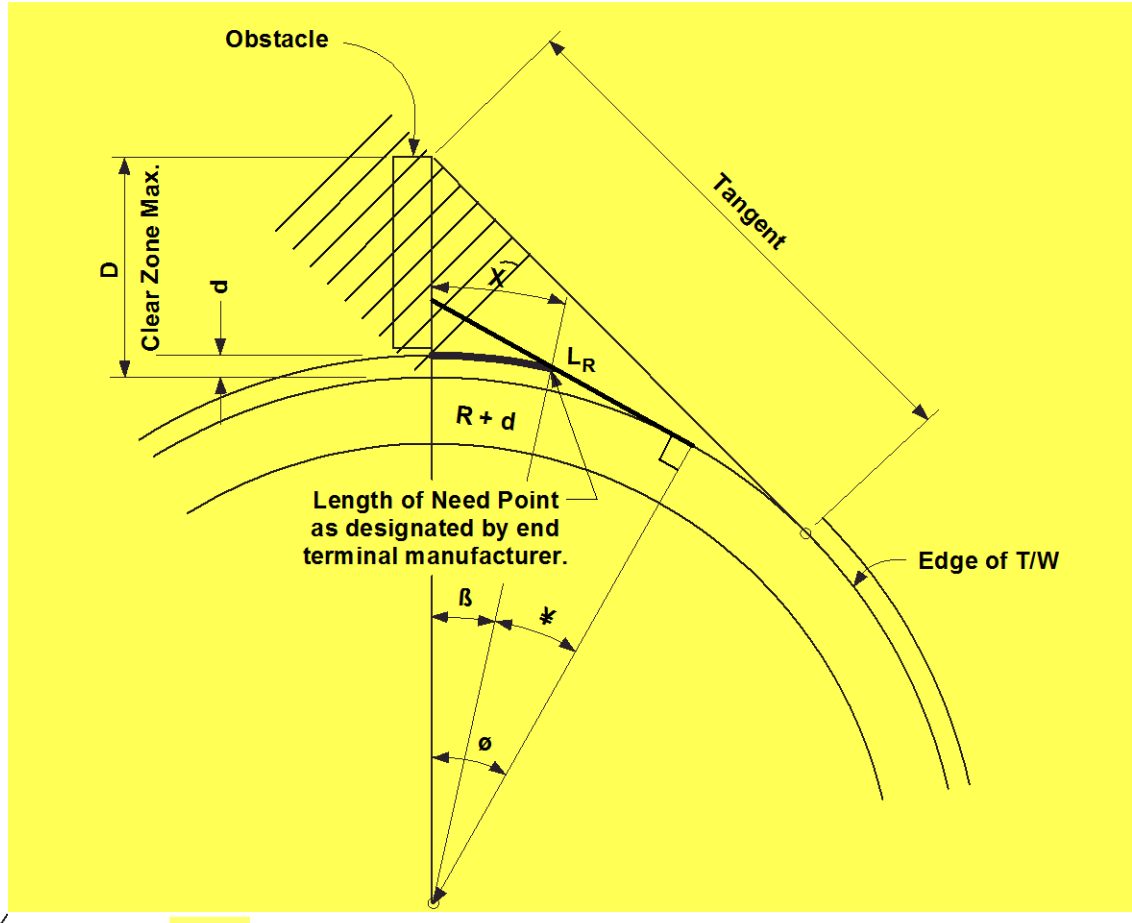
d = distance from edge T/W to face barrier

$\widehat{X}$ = Advancement Arc Length

Flare rates are not used on horizontal curves

Figure 1130-5
Traffic Barrier Advancement Length on Outside of Horizontal Curve Tangent ≤ L_R

TRAFFIC BARRIER ADVANCEMENT
LENGTH on OUTSIDE of HORIZONTAL CURVE
TANGENT > L_R



∠ø = ARC TAN (L_R/R)

∠¥ = ARC C0S R /(R+d)

∠ß = ø - ¥

$\overset{\frown}{x}$ = ?(R+d)ß/180

T = Tangent (feet), T = $\sqrt{(R + D)^2 - R^2}$

L_R = Runout Length Table 1130 -11

R = Radius to edge T/W

D = Distance from edge T/W to back of hazard

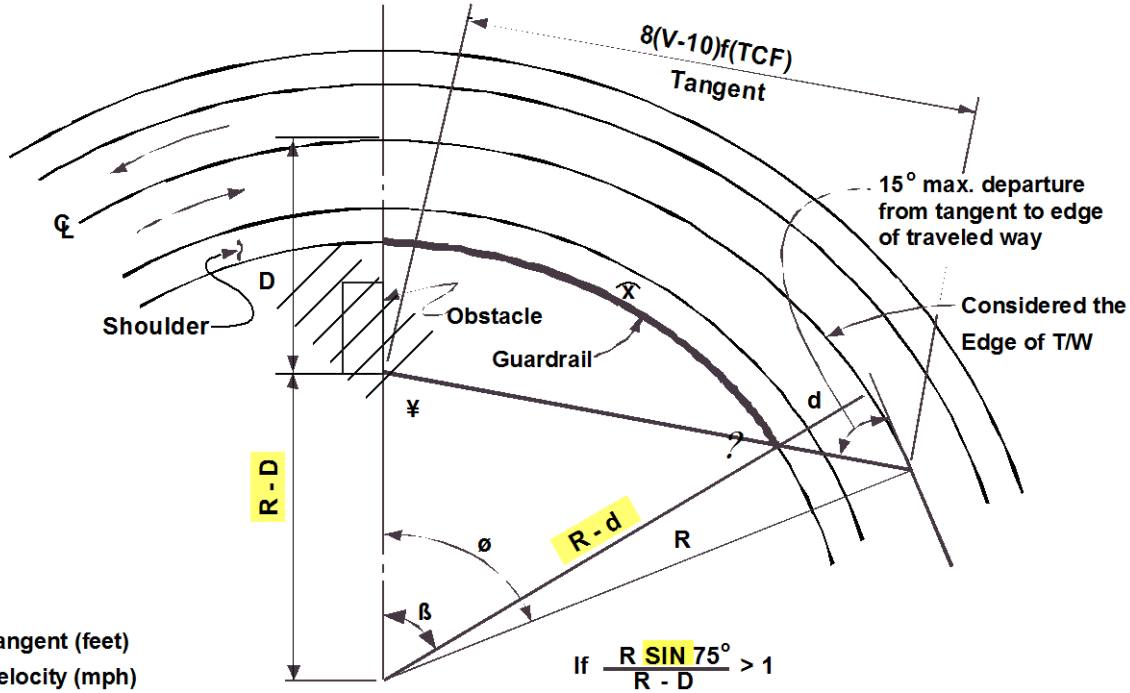
d = distance from edge T/W to face barrier

$\overset{\frown}{X}$ = Advancement Arc Length

Flare rates are not used on horizontal curves

Figure 1130-6
Traffic Barrier Advancement Length on Outside of Horizontal Curve Tangent >L_R

TRAFFIC BARRIER ADVANCEMENT LENGTH on INSIDE of HORIZONTAL CURVE



T = Tangent (feet)
V = Velocity (mph)
R = Radius to edge T/W
D = Distance from edge T/W to back of hazard
d = distance from edge T/W to face barrier
x = Advancement Arc Length

If $\frac{R \text{ SIN } 75^\circ}{R - D} > 1$

Then evaluate as if on a tangent section.

If x >> 8(V/2) f (TCF) then the curve is too shallow and should be treated as a tangent.

Tangent Correction Factors (TCF)	
Design Speed (mph)	TCF
40	0.923
45	1.000
50	1.000
55	1.000
60	1.000
65	1.048
70	1.091

$\angle ¥ = 2 \text{ ARC TAN } r$

$\angle ? = \text{ARC SIN } \frac{(R-D) \text{ SIN } ¥}{R - d}$

$\angle ß = 180 - ¥ -$

$x = ? (R-d) ß / 180$

$S = 1/2 \; [2R - D + 8 f(V-10) (TCF)]$

$$r = \sqrt{\frac{[S-R+D] \; [S - 8 (V/2) f (TCF)]}{S \; [S-R]}}$$

ADT Factors	
Design ADT	f
> 6,000	1.00
2,000-6,000	0.90
800-2,000	0.82
250-800	0.75
< 250	0.67

Figure 1130-7
Traffic Barrier Advancement Length on Inside of Horizontal Curve

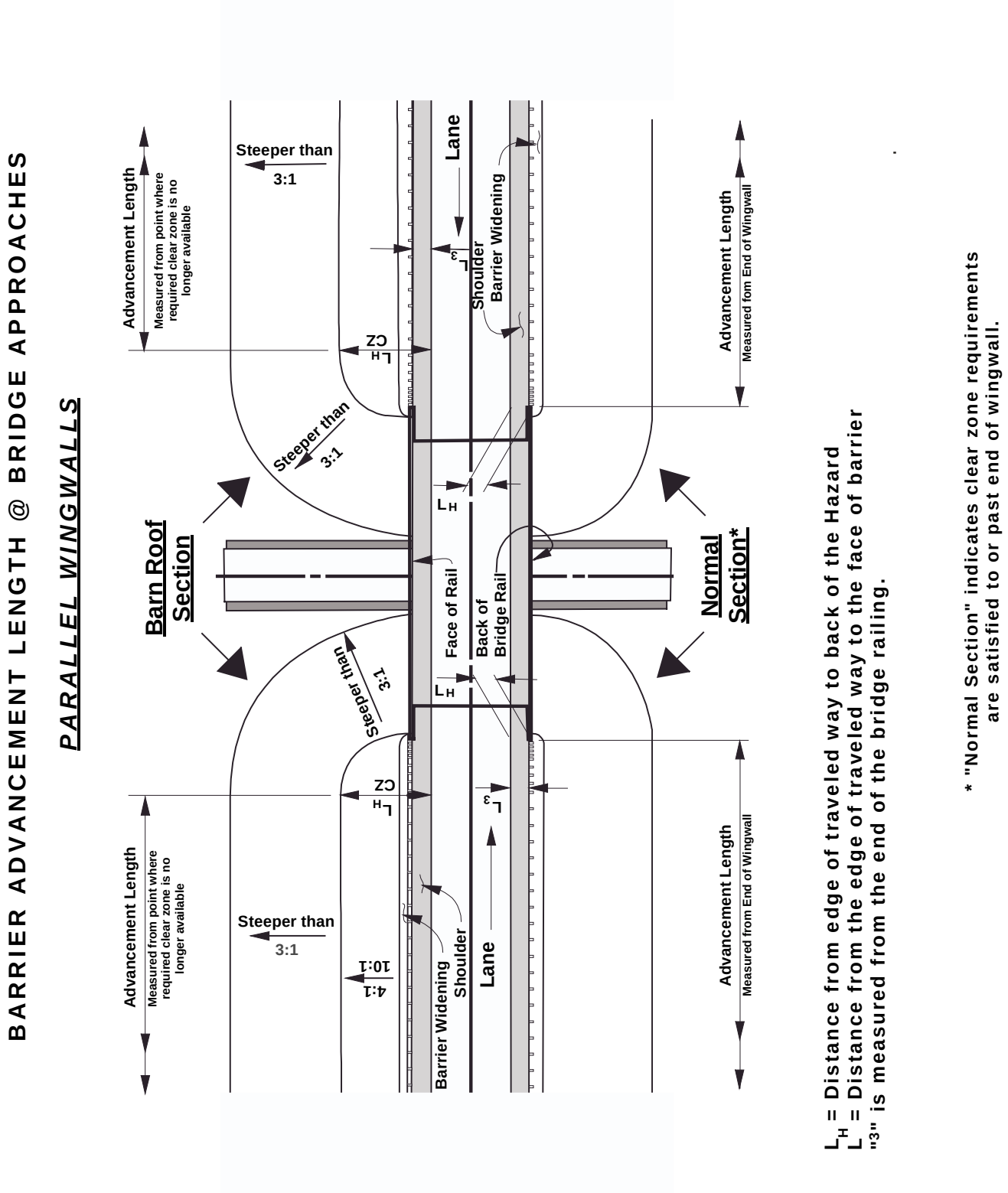


Figure 1130-8a
Barrier Advancement Length at Bridge Approaches (Parallel Wingwalls)

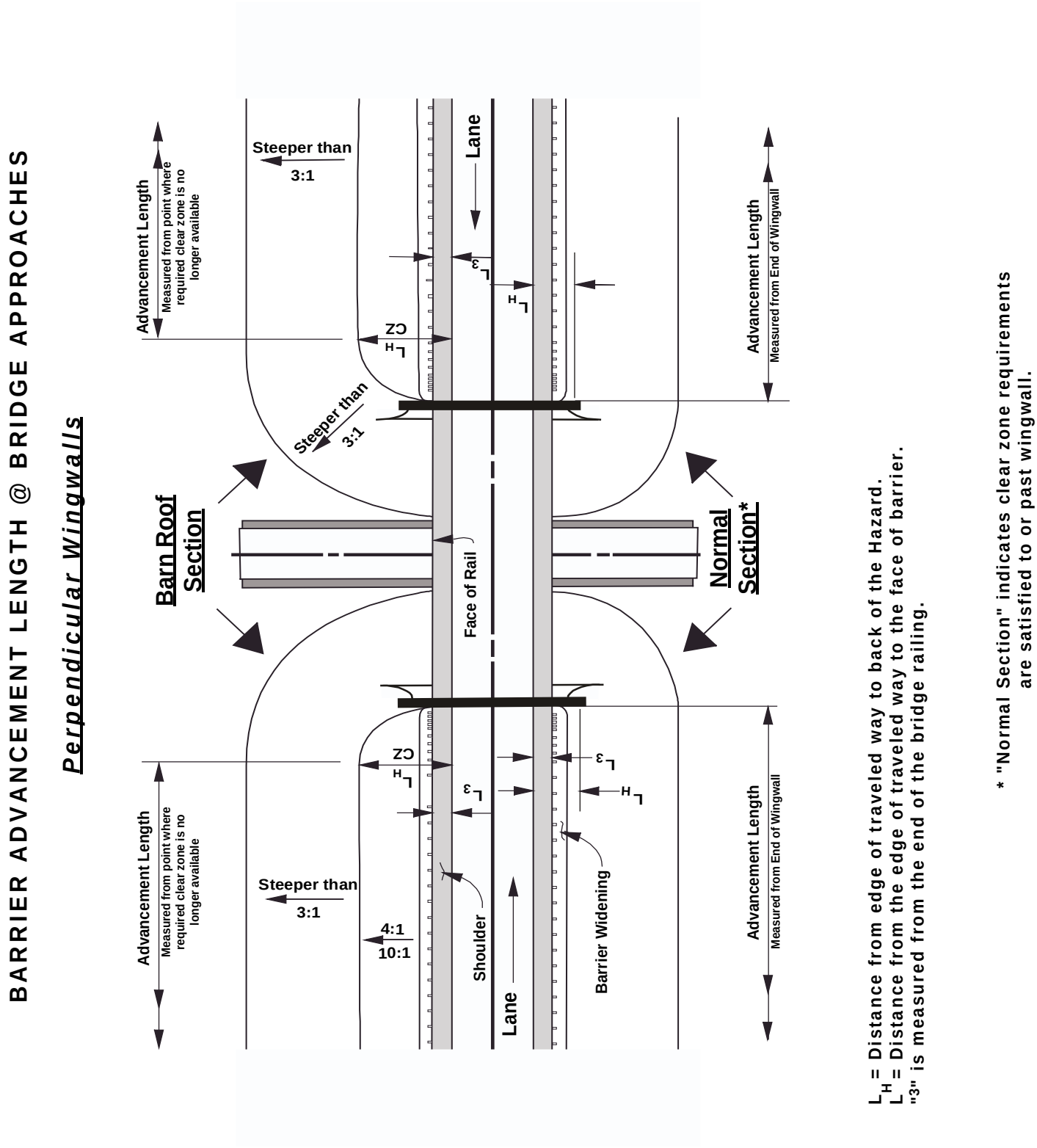


Figure 1130- 8b
Barrier Advancement Length at Bridge Approaches (Perpendicular Wingwalls)

Table 1130-12
Guardrail End Treatment Replacement

Alaska DOT&PF Guardrail End Terminal Replacement Requirements (Rev 8-2-02)													
Existing Guardrail End Terminal (GET)	***Type of Project or Maintenance***	***Non-NHS***				***National Highway System (NHS)***							
						Non-Hi Spd/Hi Vol				***Hi Spd / Hi Vol***			
		GET Condition				***GET Condition***				***GET Condition***			
		OK	***Def-icient***	***Damage***		***OK***	***Def-icient***	***Damage***		***OK***	***Def-icient***	***Damage***	
				Major	***Minor***			***Major***	***Minor***			***Major***	***Minor***
Any or None	New Construction Projects	I350	I350	I350	I350	I350	I350	I350	I350	I350	I350	I350	I350
Breakaway	4R Projects	>40 MPH: R350	>40 MPH: R350	>40 MPH: R350	>40 MPH: R350	R350	R350	R350	R350	R350	R350	R350	R350
Cable	3R Projects (Including Gravel to Pavement)	RNR	RNR	RNR	RNR	R350	R350	R350	R350	R350	R350	R350	R350
Terminal	Surface Repair Maintenance Projects	RNR	RNR	RNR	RNR	R350	R350	R350	R350	R350	R350	R350	R350
(BCT)	State-funded maintenance (non-project)	RNR	RNR	>40 MPH: R350	RNR	RNR	RNR	R350	RNR	RNR	RNR	R350	R350
Turned Down	All projects (4R, 3R, Maintenance)	R350	R350	R350	R350	R350	R350	R350	R350	R350	R350	R350	R350
or Blunt Ends	State-funded maintenance (non-project)	RNR	RNR	R350	RNR	R350	R350	R350	R350	R350	R350	R350	R350

Note. Terminal replacement requirements may be waived for a current project if a separate guardrail project that will correct terminal deficiencies within the limits of the current project is included in the STIP and is scheduled to receive construction funding no later than one year after construction begins on the current project.

Definitions

I350: Install new NCHRP-350 compliant terminals conforming to current installation standards.

R350: Replace Non-NCHRP-350 compliant guardrail end terminals within project limits with Alaska-approved, 350-compliant terminals, with the following exceptions:

1) Upstream breakaway cable terminals outside of the clear zone for both directions of traffic.

2) Downstream breakaway cable terminals outside of the clear zone for the opposing direction of traffic.

When replacing a terminal, make sure embankment widening at the terminal conforms to standard drawing G-20. If not, grade and/or widen as necessary to achieve conformance. Consider relocating terminals if widening can be more easily constructed elsewhere (length of need must be verified where a relocated terminal would result in a reduced length of guardrail). If building embankment widening in accordance with G-20 is not feasible due to slope steepness, height and constraints on extension of the road footprint, the reasons for not doing it should be documented (in the design study report for design projects).

>40 MPH R350: Replace in accordance with R350 above if the speed limit is greater than 40 MPH. If the speed limit is 40 MPH or less, comply with RNR below.

RNR: Replacement Not Required: It is not mandatory to replace terminals with those that are 350-compliant. However, if terminals are not replaced, damaged parts still must be repaired. If terminals are replaced, replacements must be 350-compliant.
Hi Spd / Hi Vol: High-speed, high volume - 50 MPH or more and 6000 ADT or more.

Table 1130-12 cont.
Guardrail End Treatment Replacement

Surface Repair Maintenance Projects: Surface repair projects funded under the federal Preventive Maintenance Program, not including crack sealing or projects that are eligible under the 3R program (3R-eligible projects must conform to the 3R requirements in the matrix). Preventive Maintenance Program projects include asphalt surface treatments, rut filling, profiling, and similar work and may be done either by DOT&PF maintenance or contractors.

Deficient: Deficient terminals include those that have, after project completion, improper flares, improper approach cross slope, rail height too high or low (lower than 24" or higher than 30" on strong-post W-beam), breakaway hardware stub height over 4", etc.

Minor Damage: Post and rail damage, no foundation damage, less than half of the terminal posts need replacement.

Major Damage: Damage to concrete foundations, or when half or more of the terminal posts need replacement

1130.6. Cost-Effective Analysis

1130.6.1 Introduction

A cost-effective analysis (CEA) is one that compares the benefits of an improvement to the cost of that improvement. This subsection focuses on roadway improvements where costs are borne by the Department and benefits accrued by the public.

The CEA procedures presented in Subsection 1130.6 apply to engineering analyses that compare alternatives with respect to the reduction of crash costs (fatalities, injuries, and property damage) to motorists.

The CEA procedures presented here do not apply to Highway Safety Improvement Program (HSIP) projects. See the HSIP Handbook for its own specific procedures.

1130.6.2 Procedure

The procedure presented here is an overview. Consult the ROADSIDE or RSAP User's Manual for more detailed procedures.

To perform a CEA, you must estimate the costs and benefits for a given alternative. These are calculated as an equivalent uniform annual cost for the design life of the roadway improvement.

Costs

The general formula for cost is: Cost = Improvement Costs + Maintenance Costs + Accident Costs + Salvage Value, where:

- **Improvement Costs** = Construction Costs + Right-of-Way Costs + Utilities Costs.
- **Maintenance Costs** = Cost of maintaining the roadside, including repairing and maintaining obstacles that are damaged by vehicular impacts.
- **Crash Costs** = Predicted or actual costs of fatalities, injuries or property damage due to vehicles impacting obstacles or hazards.

  Costs for actual crashes come from crash reports that identify the type of crash and whether there were fatalities, injuries or property damage. These crash costs are monetized so they can be compared to the cost of the improvement.

  Actual crash data is obtained from the Department's statewide crash database. This data is reported in conformance with the Model Minimum Uniform Crash Criteria (MMUCC). Under the MMUCC crash report system, data is presented in the following format, with the corresponding KABCO value (refer to the Benefits section below) identified:

INJURY STATUS		KABCO Value
Code	Injury Description	
00	No Apparent Injury	O
01	Possible Injury	C
02	Suspected Minor Injury	B
03	Suspected Serious Injury	A
04	Fatal Injury (Killed)	K

  Predicted crash costs come from the use of an engineering analysis program, which is discussed later.

- **Salvage Value** = Value of the material or hardware at the end of its economic life. The salvage value is commonly considered zero for highway applications.

Benefits

In order to determine the benefits of a roadway improvement alternative, it is necessary to monetize the value of reducing fatalities and injuries. The benefit of preventing one fatality is quantified by the Value of a Statistical Life (VSL). The VSL is not the valuation of life as such; rather, it is the valuation in reduction of risks.

The US DOT issues the VSL number and updates it periodically. The following KABCO values are derived from the VSL:

K = Fatality = VSL
A = Incapacitating Injury
B = Non-incapacitating Injury (Evident)
C = Possible Injury
O = Property Damage

The KABCO values are used by engineering analysis programs to predict the crash costs of a

given alternative or existing condition. Official KABCO values and discount rates are updated annually and published on the Design and Engineering Services Preconstruction webpage located here:

http://dot.alaska.gov/stwddes/dcsprecon/index.shtml

There are two department approved analysis programs available for predicting crash costs for roadway improvements:

- ROADSIDE
- Road Side Analysis Program (RSAP)

ROADSIDE is an engineering analysis tool that determines the benefits and costs of a given alternative under consideration. The value of ROADSIDE is its ability to predict accident rates and crash costs associated with a given roadside model. It requires input of estimated costs and modeling of the roadway segment under analysis, including cross-sectional geometry, horizontal and vertical alignment, obstacles, et.al.

ROADSIDE was included with early versions of the AASHTO Roadside Design Guide (RDG) beginning in 1989. Copies of this program and its user manual can be found on the Design and Engineering Services Preconstruction webpage located here:

http://dot.alaska.gov/stwddes/dcsprecon/index.shtml

The RSAP (Roadside Safety Analysis Program) is a roadside evaluation model that was developed under National Cooperative Highway Research Program Project 22-9 to assist designers in benefit-cost analyses. It is similar to ROADSIDE in function.

RSAP was included with the RDG (Appendix A) beginning in 2002. Copies of the current RSAP program and user manual can be found on the Design and Engineering Services Preconstruction webpage located here:

http://dot.alaska.gov/stwddes/dcsprecon/index.shtml

Designers may use either, or both, of these programs and should apply engineering judgement in interpreting the results from their use.

CEA Procedure

The discount rate, KABCO values, design life, and improvement costs need to be selected for use in the selected analysis program. In addition, the roadway alignment and cross section geometry, including roadside hardware, need to be modeled and input into the analysis program. The analysis program will compute the uniform annualized cost and benefit for each alternative under consideration and provide the benefit-to-cost (B/C) ratio.

As illustrated in Figure 1130-9, evaluation of alternatives is based on the following order of precedence:

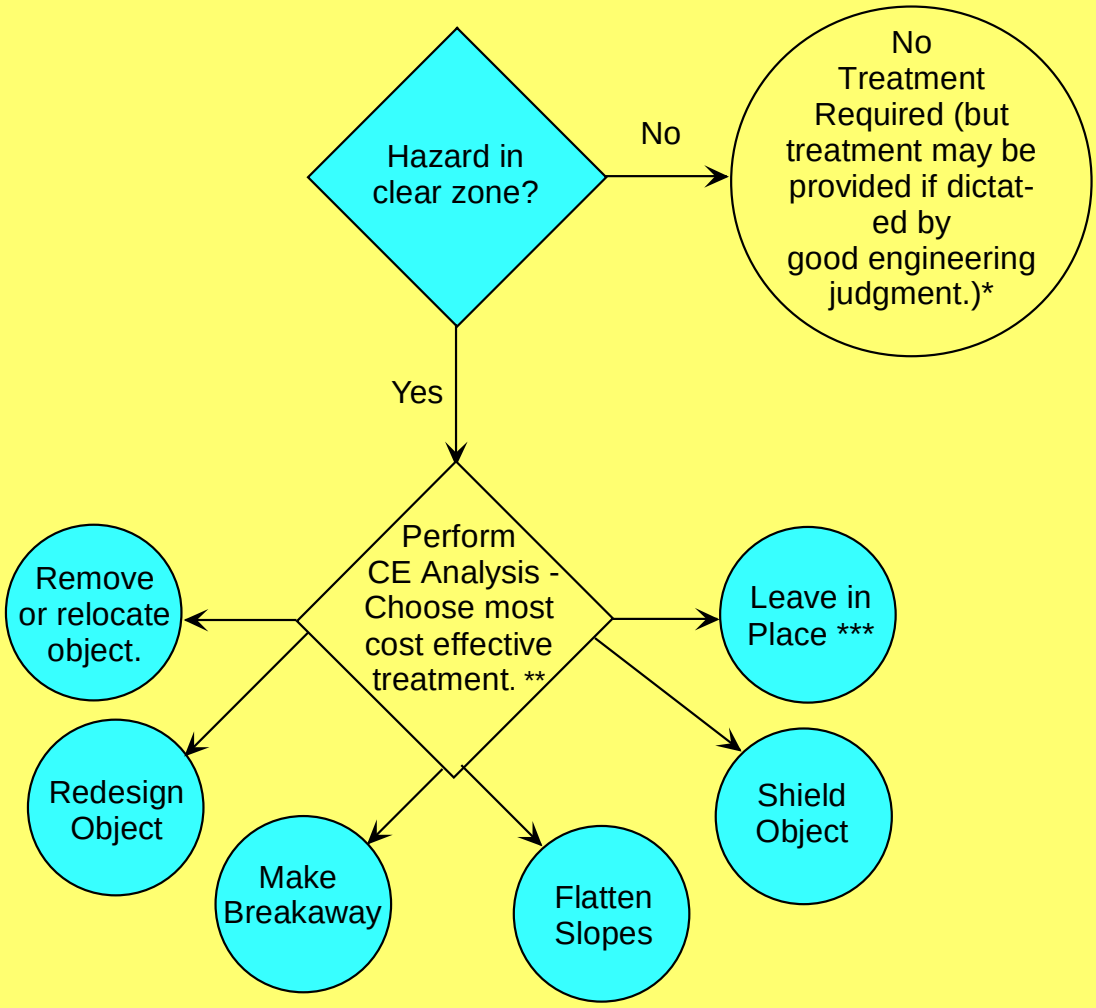
1. Remove the obstacle
2. Redesign the obstacle
3. Relocate the obstacle
4. Reduce the Severity of the obstacle
5. Shield the obstacle
6. Delineate the obstacle

An alternative with a B/C ratio greater than 1.00 is considered cost-effective; however, having a B/C ratio greater than one is not, in itself, sufficient justification for selection of a given alternative.

When comparing several alternatives, do not rely on the magnitude of the B/C ratio as the indicator of the best alternative. Use incremental B/C ratios to determine the most cost-effective solution. Consult the ROADSIDE or RSAP user's manual for further information on incremental B/C ratios and selection of the most cost-effective alternative.

Any alternatives under consideration that are within 10 percent of each other are essentially equal given the accuracy of estimating, analysis program modeling (user input), and analysis program output. The designer should ultimately use engineering judgement in selecting a final solution.

Process for Determining Treatment of Roadside Hazards for new construction and reconstruction projects



CZ = Clear Zone

* Instances where pedestrians congregate near roadways (such as school play yards or other high use pedestrian facilities), especially adjacent to the outside of curves on medium to high speed roadways and in areas with histories of run off the road type accidents, should receive special consideration.

** Perform cost effective analysis in accordance with subsection 1130.6 of this section. If the engineering manager determines that the most cost effective treatment is not the desirable treatment present justification for selecting a less cost effective treatment in the design study report.

*** Delineate the hazard when in the judgment of the engineer delineation would be effective in reducing accident frequency or severity.

Figure 1130- 9
Process for Determining Roadside Treatments on New and Reconstruction Projects

1130.7. Pedestrian Crossings

1130.7.1 Separation Structures for Pedestrian Crossings

Guidelines for Pedestrian Structures

A pedestrian grade separation may be considered if any of the following conditions (volumes, gaps, geometrics) are met:

Volumes

Consider pedestrian grade separations:

- When for each of any eight hours of an average day, the traffic volume is at least 600 vehicles per hour and the crossing pedestrian volume is at least 150 pedestrians per hour during the same eight hours; or
- When on an officially designated safe route to school, the vehicular volume is at least 400 vehicles per hour and the crossing school-age pedestrian volume during the same hour is at least 150 pedestrians, during any one-hour period of an average day.

Gaps

Consider pedestrian grade separations if all of the following requirements are met:

- 85th percentile speed of vehicles approaching the crossing site exceeds 40 mph
- The width of traveled way (exclusive of shoulders or median) exceeds 40 feet
- The average vehicular volume exceeds 750 vehicles per hour during the two heaviest pedestrian crossing hours
- There are less than 60 gaps per hour in the vehicular stream adequate for pedestrian crossings during both peak pedestrian crossing hours. Determination of gap adequacy (time required for pedestrian to cross) is presented in the ITE Recommended Practice *"A Program for School Crossing Protection."*

$$\textit{Gap Time} = \frac{W}{3.5} + 3 + (N - 1) \times 2 \quad \text{seconds}$$

W = Curb to curb width of roadway (feet)

N = Number of rows of pedestrians

Geometrics

Consider pedestrian grade separations if one of the following circumstances occurs:

- The available sight distance is less than the stopping sight distance required by the 85th percentile approach speed, and no other crossings are available for a distance of 500 feet from this location.
- A full freeway intersects a pedestrian way where no vehicular structure is to be built, and no other pedestrian crossing of the freeway is available within a minimum distance of 500 feet.

Access

Access Control

Prevent pedestrian access to the vehicular roadway by a 6-foot-high fence or other physical barrier for:

1. Five hundred feet each direction along both sides of the vehicular way from each end of the pedestrian structure
2. One thousand feet each direction along one side of the vehicular way from one end of the pedestrian structure, or
3. An unspecified distance each direction if the structure's use by pedestrians is guaranteed because the route via the structure requires substantially less time and effort than a route across the roadway at the vehicular grade

1140. Preventive Maintenance (PM) Projects

1140.1 Introduction
1140.2 Definition
1140.3 Project Development and Design
1140.4 References

1140.1. Introduction

Preventive maintenance (PM) is a cost-effective means of extending the useful life of Alaska's highways. PM slows or delays future deterioration and maintains or improves the functional condition of highway facilities without increasing structural capacity. FHWA supports the increased flexibility in using federal-aid funding for cost-effective PM.

PM is a proactive approach to maintaining highway facilities while they are still in relatively good condition. PM performed before the onset of serious damage, delays or eliminates the need for major rehabilitation or reconstruction.

Routine Maintenance is not eligible for federal-aid funding.

1140.2. Definition

PM projects are normally those that focus on pavement preservation, but may include area-wide or system-wide activities which have formally been considered routine maintenance as well as enhancements to the current level of safety and accessibility. Minor structural improvement are allowable provide that the structural improvement area(s) is less than 25% of the total project surface area. The following work items are routinely eligible for federal-funding as preventive maintenance:

1. Crack sealing
2. Profiling
3. Milling
4. Thin overlays
5. Roadway surface replacement
6. Substandard guardrail replacement when done in conjunction with overlays or roadway surface improvements
7. Upgrading guardrail end treatments to current standards
8. ADA improvements
9. Systematic replacement and/or upgrade of light and signal poles, light fixtures, signal heads, signal bulbs or LEDs near the end of their service life, and bases
10. Area-wide striping
11. Rumble strips
12. Mitigation of pavement edge drop offs
13. Systematic sign replacement
14. Restoration of drainage systems
15. Culvert replacements or upgrades to address structural or capacity issues, or to meet fish passage requirements when done in conjunction with overlays or roadway surface improvements.
16. Bridge work, such as crack sealing, joint repair, seismic retrofit, scour countermeasures, deck overlays, bridge rail replacement or retrofit, and painting

This list is not all-inclusive and is only a summary of work items which have been previously determined, in consultation with FHWA, to be federal-aid eligible. Consult with FHWA regarding eligibility on work items not included in this list.

1140.3. Design Considerations

This subsection outlines the design considerations for PM projects.

1140.3.1 General Design

PM projects do not require a formal 3R analysis per Section 1160, but should consider maintaining or enhancing the current level of safety and accessibility. Consider addressing isolated or obvious deficiencies.

PM projects are required to:

a. Assure replacement striping is in accordance with the ATM
b. Assure rumble strips are replaced or installed to meet current policy
c. Follow vertical clearance policy for structures and utility lines per Table 1130-1. If the existing vertical clearance is less than 18' 0" or the resulting project improvements will result in a vertical clearance less than 18' 0", relocate the overhead utility with a minimum clearance of 20' 0". When mitigating factors

exist, the relocated utility may be installed with a vertical clearance no less than 18' 0".

d. Consider installing or replacing guardrail
e. Consider treatment of roadside obstacles
f. Assure warning devices for highway-rail grade crossings within the project limits or near the project terminus are installed and functioning properly per 23 CFR 646.214
g. Replace guardrail end treatments in accordance with Table 1130-12
h. Upgrade non-crashworthy sign supports in the clear zone, except those permitted under 17 AAC 10 and 17 AAC 60
i. Mitigate pavement edge drops per Section 1160.3.7
j. Maintain functionality of traffic signal vehicle detection and other ITS elements
k. Adjust appurtenances (i.e., manholes, valve boxes, monuments, etc.) in pavement as necessary
l. Complete a pavement design analysis

PM projects do not require:

- Hydraulic investigation/report
- Geotechnical investigation/report

ADA Improvements

Projects considered alterations are required to make certain simultaneous ADA upgrades while projects considered maintenance are not.

Maintenance includes:

- Chip seals
- Crack filling and sealing
- Diamond grinding
- Dowel bar retrofitting
- Fog seals
- Joint crack seals
- Joint repairs
- Pavement patching
- Scrub sealing
- Slurry seals
- Spot high-friction treatments
- Surface sealing

Alterations include:

- Addition of a new layer(s) of asphalt
- Cape seals
- Hot in-place recycling
- Microsurfacing / thin-lift overylays
- Mill & fill / mill & overlays
- Open-graded surface course

If a project is considered an alteration, and there are adjacent pedestrian walkway amenities, then curb ramps and crosswalks must be constructed or improved to current ADA standards as part of the alteration project, except as noted in the following paragraphs. See Table 1100-1 of this manual for a discussion of applicable ADA standards and the difference between the 2006 and 2010 ADA Standards.

If a curb ramp was built or altered prior to March 15, 2012, and complies with the requirements for curb ramps in either the 1991 ADA Standards for Accessible Design or Uniform Federal Accessibility Standards (UFAS), it does **not** have to be modified to comply with the requirements of the 2010 ADA Standards. However, if that existing curb ramp did not comply with either the 1991 Standards or UFAS as of March 15, 2012, then the "safe harbor" provision does not apply and the curb ramp must be brought into compliance with the requirements of the 2010 ADA Standards concurrent with the road alteration.

Any features disturbed by construction must be replaced so they are accessible, even on maintenance projects. Pedestrian amenities other than curb ramps and crosswalks, such as sidewalks, paths, bus stops, etc., do not require upgrading as part of an alteration project, but should be evaluated for accessibility and any identified deficiencies noted.

When existing curb ramps and crosswalks meeting 1991 ADA Standards or UFAS will remain in place, transmit this information to the Civil Rights Office (CRO). Inform the CRO of any known accessibility deficiencies within the public right-of-way for inclusion into the Transition Plan. The Transition Plan identifies non-compliant features and serves as a guide for future planning and prioritization of ADA improvements. The DOT&PF Transition Plan is found at the following webpage:

http://www.dot.state.ak.us/cvlrts/ada.shtml

Pavement Design

Design pavement resurfacing and overlays in accordance with Section 1180. Use a minimum pavement design life of 5 years. The pavement design life equals the project design life for PM projects. Strive for a longer design life when possible.

1140.4. References

1. FHWA Guidance on Highway Preservation and Maintenance, dated Feb. 5, 2016

   https://www.fhwa.dot.gov/preservation/memos/160225.cfm

2. US DOJ/US DOT joint technical assistance on requirement to upgrade curb ramps on resurfacing projects:

   http://www.fhwa.dot.gov/civilrights/programs/doj_fhwa_ta.cfm

3. Q & A for Supplement to the 2013 DOJ/DOT Joint Technical Assistance on the Title II of the Americans with Disabilities Act Requirements To Provide Curb Ramps when Streets, Roads, or Highways are Altered through Resurfacing (Safe Harbor provisions discussed in Q1/A1)

   https://www.ada.gov/doj-fhwa-ta-supplement-2015.html

4. FHWA Office of Civil Rights guidance document. FAQs on ADA and Section 504. Discussion of transition plans, timing of accessibility improvements, et. al.

   http://www.fhwa.dot.gov/civilrights/programs/ada_sect504qa.htm

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1150. Urban Roads

1150.1. Urban Streets Roadway Width Guidelines
1150.2. Urban Arterials

1150.1. Urban Streets Roadway Width Guidelines

Intersection and street lanes are determined through capacity analysis procedures presented in HCM2000. The number and movement assignments for lanes are configured to meet level of service guidelines in American Association of Street and Highway Transportation Officials' *A Policy on the Geometric Design of Highways and Streets 2001(GB).* Reference the GB for lane widths, shoulder widths, and other cross-sectional element requirements.

1150.2. Urban Arterials

1150.2.1. General Design Considerations

Design of urban arterials shall conform to recommendations in the GB.

1150.2.2. Medians

Median openings generally permit cross traffic and left turns, which conflict with the through traffic on the arterial. These conflicts result in delays and accident exposure, which you can minimize by providing as few median openings as possible. However, keep in mind that restriction of mid-block left turns often substantially increases the number of U-turns at the adjacent intersection with median openings. A similar situation exists where a minor street intersects the arterial and does not provide a median opening.

Generally, provide median openings only if the volume of cross- or left-turn traffic is relatively large, such as at another arterial or major collector street or, in some cases, at an access point to a major traffic generator, such as a regional shopping center or industrial plant. Because the openings are at major traffic points, assume that at some time, if not immediately, these median opening locations will be signalized. Additionally, where signalized intersections are 0.5 mile or less apart, efficiency and safety require interconnected or synchronized signals to achieve smooth traffic flow along the arterial.

One of the most critical design criteria for smooth, two-way operation of a signalized arterial is to evenly space signalized intersections along the arterial. It is not necessary that the distance between signalized intersections be exactly even, provided the longer distances are integer multiples of the ultimate minimum spacing. As indicated above, assume that every median opening will eventually be signalized and hence, median openings should be evenly spaced or spaced at integer multiples along the arterial.

The minimum distance between median openings is also critical if reasonable progression speed is to be achieved along the arterial. Analysis of progression is most efficiently performed with software that is specifically designed for that purpose. The longer the distance and/or the shorter the cycle, the better the progression speed. The progression speed should approximate the average running speed along the arterial and should be greater than 25 mph, preferably greater than 30 mph, for a normal divided urban arterial.

As a rule, alternating signals should be greater than 0.25 mile apart. Although you may achieve closer spacing between signalized intersections by using simultaneous signal groups with alternating group displays, be aware that when using adjacent simultaneous signals, the available green time for continuous through-movements on the arterial is substantially reduced.

In addition to signal progression considerations, median openings should be sufficiently spaced to provide adequate length for storage in the left turn lane and an appropriate length taper. Turn lane lengths should be designed to meet storage and deceleration requirements presented in Table 1150-1. Storage, or queue lengths, should be determined through methods in the HCM2000 or through simulation software. Deceleration length should be determined through methods presented in the GB.

A minimum length should accommodate one 60-foot truck regardless of turning volume.) Space median openings to accommodate the full length of the left turn lane, including taper. Lane and taper requirements are found in the GB and the Alaska Traffic Manual.

Table 1150-2 presents recommended median widths for urban streets.

Table 1150-1
Auxiliary Lane Length Guidelines

Unsignalized Intersections			References
Approach	Length Component		NCHRP 457
	Left-Turn Bay	Right-Turn Bay	
Free-flow, Main Street	Storage & Deceleration	Deceleration	
Stopped, Minor Street	Storage	Storage	
Signalized Intersections			
Approach Speeds	**Left-Turn Bay**	**Right-Turn Bay[1]**	NCHRP 279
30-35 mph	Storage	Storage	
40-45 mph	Storage & Deceleration	Storage & Deceleration	
> 50 mph	Storage & Deceleration	Storage & Deceleration	

[1]These guidelines are derived from left-turn recommendations presented in NCHRP 279

References: *NCHRP 457* Evaluating Intersection Improvements- An Engineering Study Guide, *NCHRP 279* Intersection Channelization Design Guide

Notes

1) It is desirable for all deceleration to occur outside of the through lanes. However, where constrained, the turning vehicle may enter the turn lane taper at 10 mph less adjacent through lane speeds.

2) The minimum turn lane length shall accommodate at least one design vehicle, but shall be no less than 100 feet.

Table 1150-2
Recommended Median Widths

Median Function	Minimum Width (ft)
Separation of opposing traffic streams	4
Provide pedestrian refuge	6
Provide width for signs or appurtenances	4
Provide storage for left-turning vehicles	12
Provide protection for vehicles crossing the through lanes	18
Provide for U-turns, inside lane to outside lane	18
Provide for U-turns, inside lane to inside lane	30

1160. Resurfacing, Restoration, & Rehabilitation Projects (3R)

1160.1. Guidelines
1160.2. Factors
1160.3. 3R Geometric Design Standards
1160.4. Studies
1160.5. Gravel to Pavement

1160.1. Guidelines

1160.1.1 General

This chapter presents the procedures for development of 3R projects in Alaska, which are cost-effective and enhance highway safety. These procedures are required where projects are federally funded or on federal-aid routes. In nonfederal projects, these procedures represent good engineering, but they are not mandatory.

1160.1.2 Background

Prior to 1976, federal-aid highway funds were generally limited to participation in the new construction of highways. Preservation of the existing highways was a state or local agency responsibility.

By 1975, it became evident that many sections of the existing highway system were reaching the end of design life, and the rate of deterioration was exceeding the funding levels available for preservation. In recognition of this problem, Congress, in the 1976 Federal-Aid Highway Act, broadened the scope of the Federal-Aid Highway Program to include preservation work by adding resurfacing, restoration, and rehabilitation (3R) to the definition of construction under Title 23, USC, Section 101(a).

However, since many existing highways do not meet current design standards and have safety deficiencies, the amount of upgrading to current 3R project standards has been a continuing concern. This concern was recognized in the 1982 Surface Transportation Assistance Act, Section 101(a), which emphasizes safety by stating that 3R projects "shall be constructed in accordance with standards that preserve and extend the service life of the highways *and enhance highway safety*." (Emphasis added.)

1160.1.3 Definition

Rehabilitation (3R) projects consist of the resurfacing, restoration, and rehabilitation of an existing roadway on the same alignment or modified alignment. The principal objective of 3R projects is to restore the structural integrity of the existing roadway, thereby extending the service life of the facility. In addition, the safety and capacity of the facility should be enhanced, if required.

Generally, a 3R project consists of the repaving or the asphalt paving of an existing gravel surface. It can also include drainage improvements and reconstruction of the structural section. Safety enhancements include improvement of deficient geometry identified by a performance criterion found in this section. Capacity enhancements include the addition of truck climbing lanes, passing lanes, and slow moving vehicle lanes. Turnouts may be added as safety enhancements where driver fatigue or sightseeing are factors in accidents.

Section 1160.5. describes a modified design procedure for non-NHS road construction projects whose primary purpose is to reduce maintenance costs and improve the quality of life for Alaskans by hard surfacing of gravel roads, but that may include limited shoulder, drainage, and other work related to preserving the road structure.

1160.1.4 Determining the Type of Project

Follow normal project planning and programming procedures for determining the type of improvement: new construction, reconstruction on existing alignment, or restoring the existing facility (3R). This determination is specified on the Design Designation.

Select a design year that at least equals the expected life of the improvement. Designate the design year in five-year increments.

1160.2. Factors

Evaluate the following in determining type and scope of a project:

1. **Pavement Condition:** The existing pavement condition and the scope of needed pavement improvements dictate to a large extent what improvements are feasible. The project analysis should indicate how existing pavement condition

and the scope of pavement improvements will interrelate with the scope of geometric improvements and the values used for design of geometric improvements.

2. **Physical Characteristics:** The physical characteristics of a highway and its general location often determine what improvements are necessary, desirable, possible, practical, or cost-effective. Consider topography, climate, adjacent development, existing alignment (horizontal and vertical), cross-section (pavement width, shoulder width, cross slope, and sideslopes), and similar characteristics in determining the scope of geometric or safety improvements to be made in pavement-type 3R work.

3. **Traffic Volumes:** Traffic data are needed in the design of all highway improvements, including 3R. Traffic volume is an important consideration in determining the appropriate level of improvement (for example, reconstruction versus 3R) and in the selection of values for the various geometric elements.

4. **Traffic Controls and Regulations:** Signing and marking in all highway projects, including 3R, must conform to the *Alaska Traffic Manual* (ATM). Where roadway geometry or other roadway or roadside features do not meet the drivers' expectancy and reconstruction is not appropriate, consider additional signs, markings, and other devices beyond the normal requirements of the ATM. While traffic control devices cannot fully mitigate all problems associated with substandard geometric features, they can compensate for certain operational deficiencies. In addition, judicious use of special traffic regulations, positive guidance techniques, and traffic operational improvements can often forestall expensive reconstruction by minimizing or eliminating possible adverse safety and operational features of existing highways.

5. **Accident Records:** Accident records are an integral part of these 3R standards. It is necessary to reference the state reporting system to evaluate existing geometric features for accident performance. Generally, use a three- to five-year period. When evaluating historical accident records, examine each accident as a whole, regardless of the number of vehicles or people involved. Moose accidents and alcohol-related accidents are eligible. Obtain average accident rates from the January 25, 2002, DOT&PF *Highway Safety Improvement Program Handbook*.

6. **Skid Resistance:** A skid-resistant surface should be an essential part of any pavement surface improvement, regardless of the scope of geometric problems or improvements. The Alaska design method for asphalt pavement provides a skid-resistant surface. Portland cement concrete requires a broom or similar finish.

7. **Economics:** By their purpose and definition, 3R projects reflect and emphasize the economic management of the highway system. The purpose of 3R is to prolong and preserve the service life of existing highways and to enhance highway safety to protect the investment in, and derive the maximum economic benefit from, the existing highway system. Economic considerations should be a major factor in determining the priority and scope of 3R work.

8. **Potential Impact of Various Improvements:** Often, development and effects on the land influence the scope of geometric improvements made by 3R projects. Typically, social, environmental, and economic impacts severely limit the scope of 3R projects, particularly where the existing right-of-way is narrow and there is considerable adjacent development.

1160.3. 3R Geometric Design Standards

1160.3.1 General (Design Exceptions)

Design all 3R-type projects using the 3R design criteria found in this section. Design standards for 3R projects that are not in this section shall be dictated by the remaining applicable sections of Chapter 11 and the current *AASHTO A Policy on the Geometric Design of Highways and Streets 2001*. All signing and pavement markings must conform to the *Alaska Traffic Manual*. Upgrade all warranted guardrail terminals and bridge rail terminal connections to current standards (see Table 1130-12 of this manual for guardrail terminal replacement guidance). If an engineering analysis indicates that a section of existing guardrail is not warranted for obstacle protection or other operational factors, it may be removed. Design exceptions, in accord with Section 1100.3., shall be required when the results or determinations of the 3R design procedures require a feature improvement and the proposed project does not include that improvement.

Continuity may require that routes be analyzed as a whole with respect to lane, shoulder widths, and cross-section geometry. Apply 3R standards to individual projects, but regional policy may be required for minimum acceptable geometry on individual routes.

Urban and Multilane Rural Highways

Less is known about the safety cost-effectiveness of widening urban and multilane rural highways, and minimum values have not been proposed that highway agencies can adopt as standards. Use the minimum widths recommended for rural two-lane highways as a guide to safety cost-effective improvements for multilane rural and urban highways. However, routinely upgrading lane and shoulder widths in urban areas to the minimum widths recommended for rural two-lane highways is likely to produce some widening projects that are not safety cost-effective, particularly when there are physical constraints or high right-of-way costs. In such situations, determine the scope of widening improvements on a case-by-case basis.

Gravel Surfaced Roads

Roads in this class do not have to be analyzed for routine safety enhancement unless a prodigious accident history at specific locations warrants an improvement.

Design Volume

Determine ADT for the design life of the project. The design ADT shall equal the mid-design period ADT. Generally, design life periods for 3R projects are equal to the pavement design periods and should be compatible with the service life of the improvement.

Design Speed

The recommended minimum design speed is the 85th percentile speed. You should consider that the actual 3R improvement may increase the operating or measured 85th percentile speed over that currently posted.

On lower volume roadways, AADT less than 2,000, it may be cost prohibitive to obtain a sample size that provides a statistically valid speed study to define 85th percentile speeds for design. In these cases, the engineer should drive the project and use operating speeds observed during field investigations for the design speed, or use the safe speeds defined by existing geometrics.

Where AADT is greater than or equal to 2,000, it is likely that the Department has speed studies for the roadway on file and these should be used to estimate the 85th percentile speeds for 3R evaluation and design. If not, speed studies at these locations are usually economically feasible. Consider additional speed studies or field observations to estimate speeds in areas where there are significant accident clusters.

1160.3.2 Lane and Shoulder Widths

Rural Two-Lane Paved Highways

Select lane and shoulder width improvements in accordance with a performance evaluation based on historical accident rates versus a predicted rate A. Compilation of actual accident rates and computation of a predicted accident rate A are required. Calculate the actual accident rate for the previous three- to five-year period for comparison to the predicted rate A.

If the historical accident rate is equal to or less than the predicted rate A, then the existing total lane and shoulder width may remain unchanged.

If the historical accident rate exceeds the predicted rate A, widen the total lane and shoulder width, in each direction, by 1 foot on each side for every 10 percent increment the historical accident rate exceeds A. The widening shall not exceed the values required for new construction.

Study accident data to identify accident clusters that may result from high hazard locations atypical to the route or project. You may remove the accident data from these locations for the determination of lane and shoulder widths, but analyze them on an individual basis as required by the 3R Procedure Outline shown in Figures 1160-1 and 2.

When evaluating lane and shoulder widths, consider route continuity. Adjoining projects could have a bearing on the width selection.

$$A = 0.0019\ ADT^{0.882} \times 0.879^{W} \times 0.919^{PA} \times 0.932^{UP} \times 1.236^{H} \times 0.882^{TER1} \times 1.322^{TER2}$$

(Ref. Transportation Research Board Special Report 214, Appendix C)

A = number of run-off road, head-on, opposite-direction sideswipe, and same-direction sideswipe accidents per mile per year. Does not include intersection accidents

ADT = two-directional average daily traffic volume for the study period

W = existing lane width in feet

PA = existing width of paved shoulder in feet

UP = existing width of unpaved (gravel, turf, earth) shoulder, in feet

H = median roadside hazard rating for the highway segment, measured subjectively on a scale from 1 (least hazardous) to 7 (most hazardous). See Figures 1160-1 through 1160-7.

TER1 = 1 for flat terrain, 0 otherwise

TER2 = 1 for mountainous terrain, 0 otherwise

This accident model is limited because it applies only to:

- Lane widths of 8 to 12 feet and shoulder widths of 0 to 10 feet. Combinations of lane and shoulder widths that can be reasonably modeled are limited to those shown in Figure 3-2, Chapter 3 of *TRB Special Report 214.*
- Two-lane, two-way paved rural roads
- Homogeneous roadway sections. It does not include the additional accidents expected at intersections.

Table 1160-1
3R Procedure Outline (Case I)

3R PROCEDURE OUTLINE

CASE I

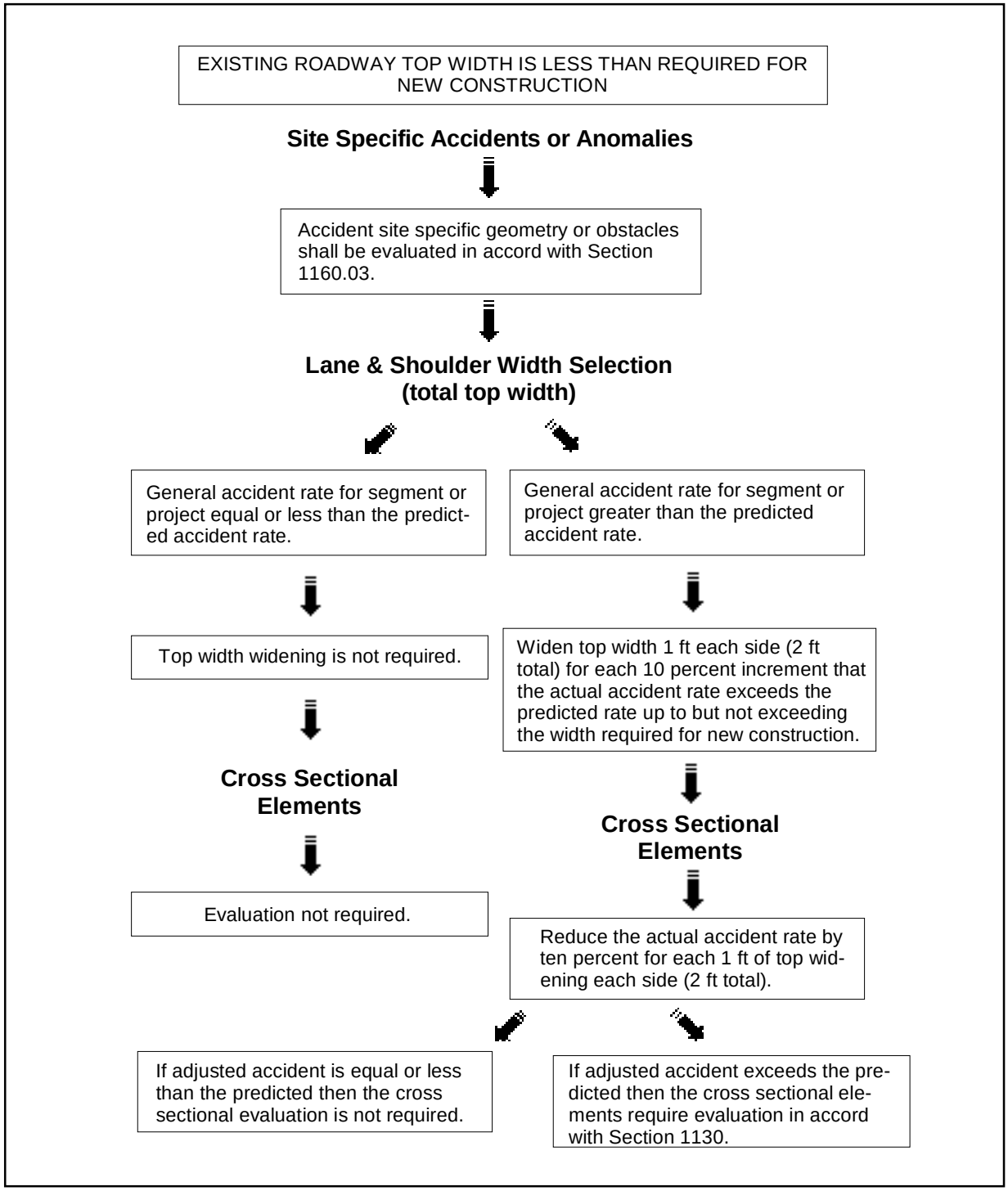


Table 1160-2
3R Procedure Outline (Case II)

3R PROCEDURE OUTLINE

CASE II

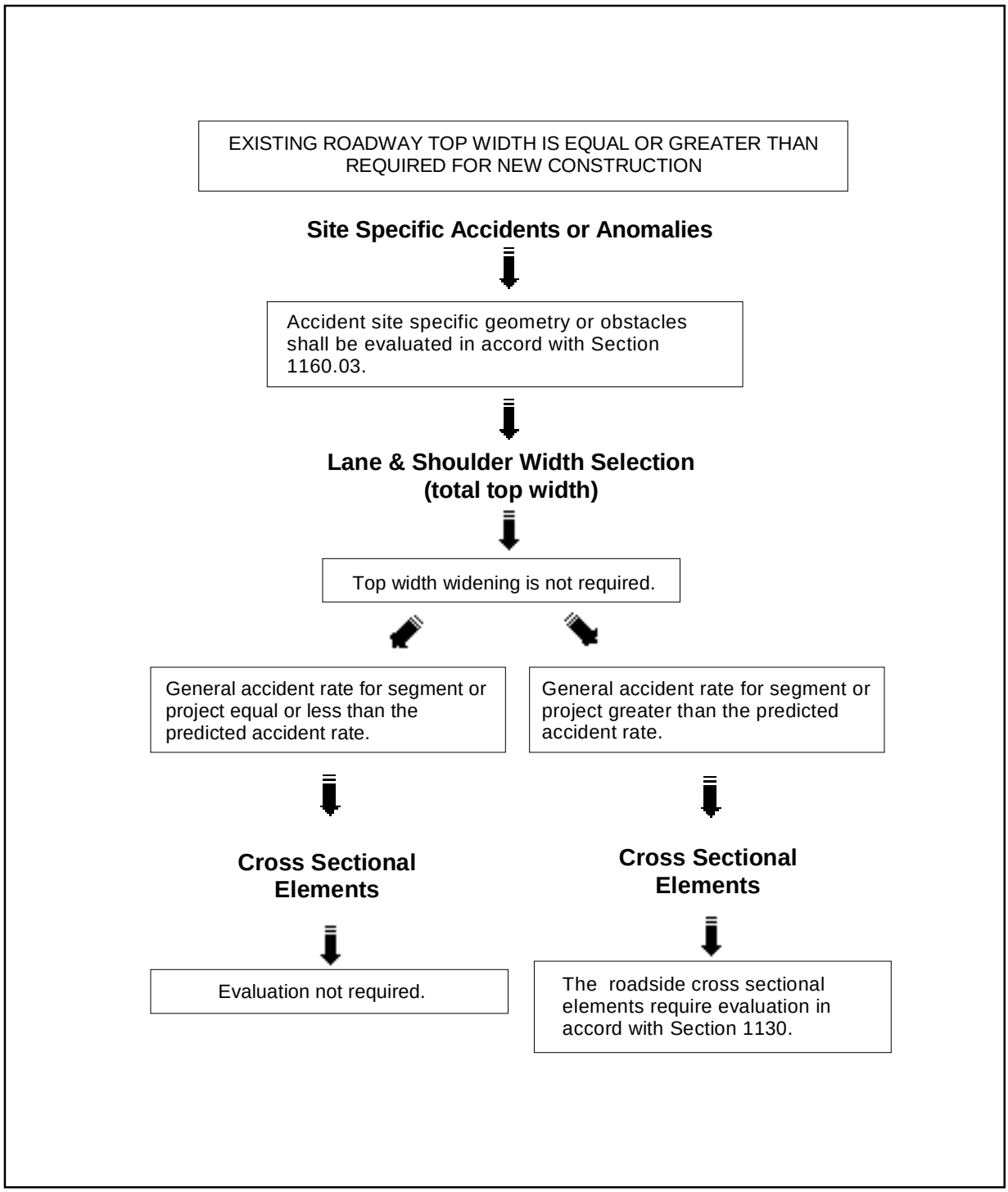


Figure 1160-1
Rural Roadside Hazard Rating of 1

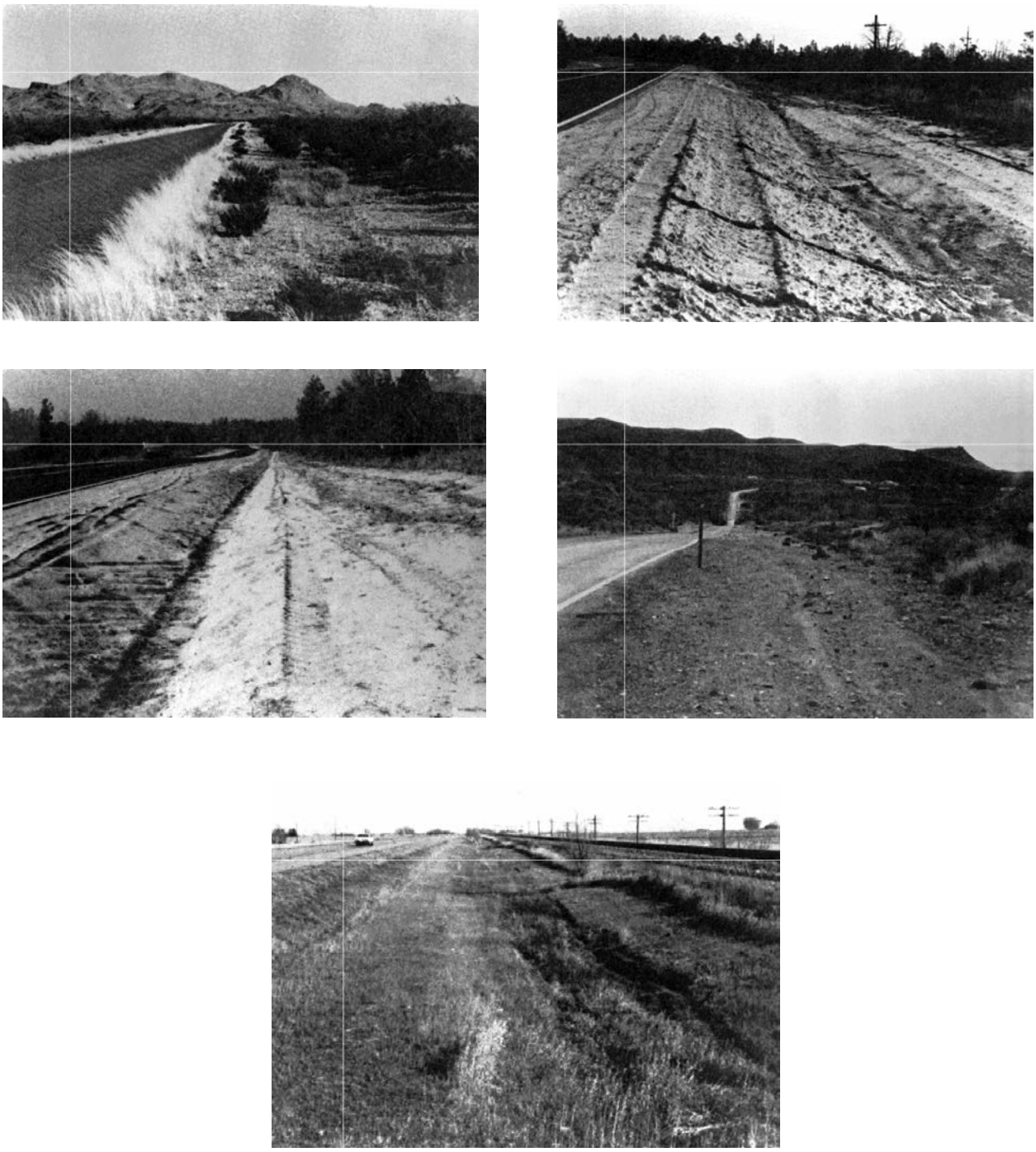
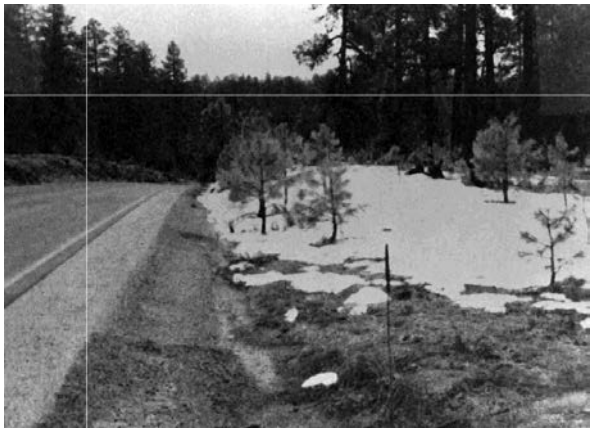


Figure 1160-2
Rural Roadside Hazard Rating of 2



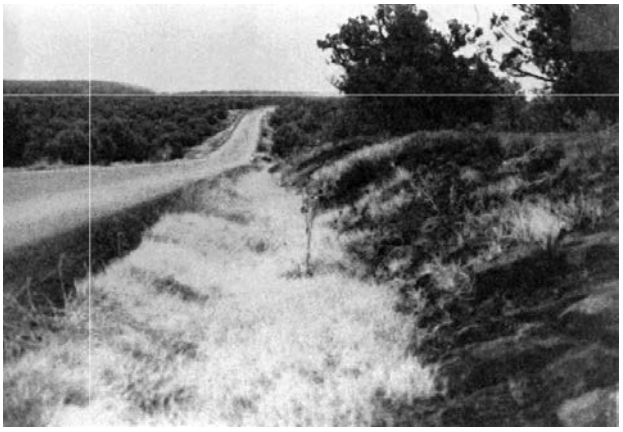


Figure 1160-3
Rural Roadside Hazard Rating of 3

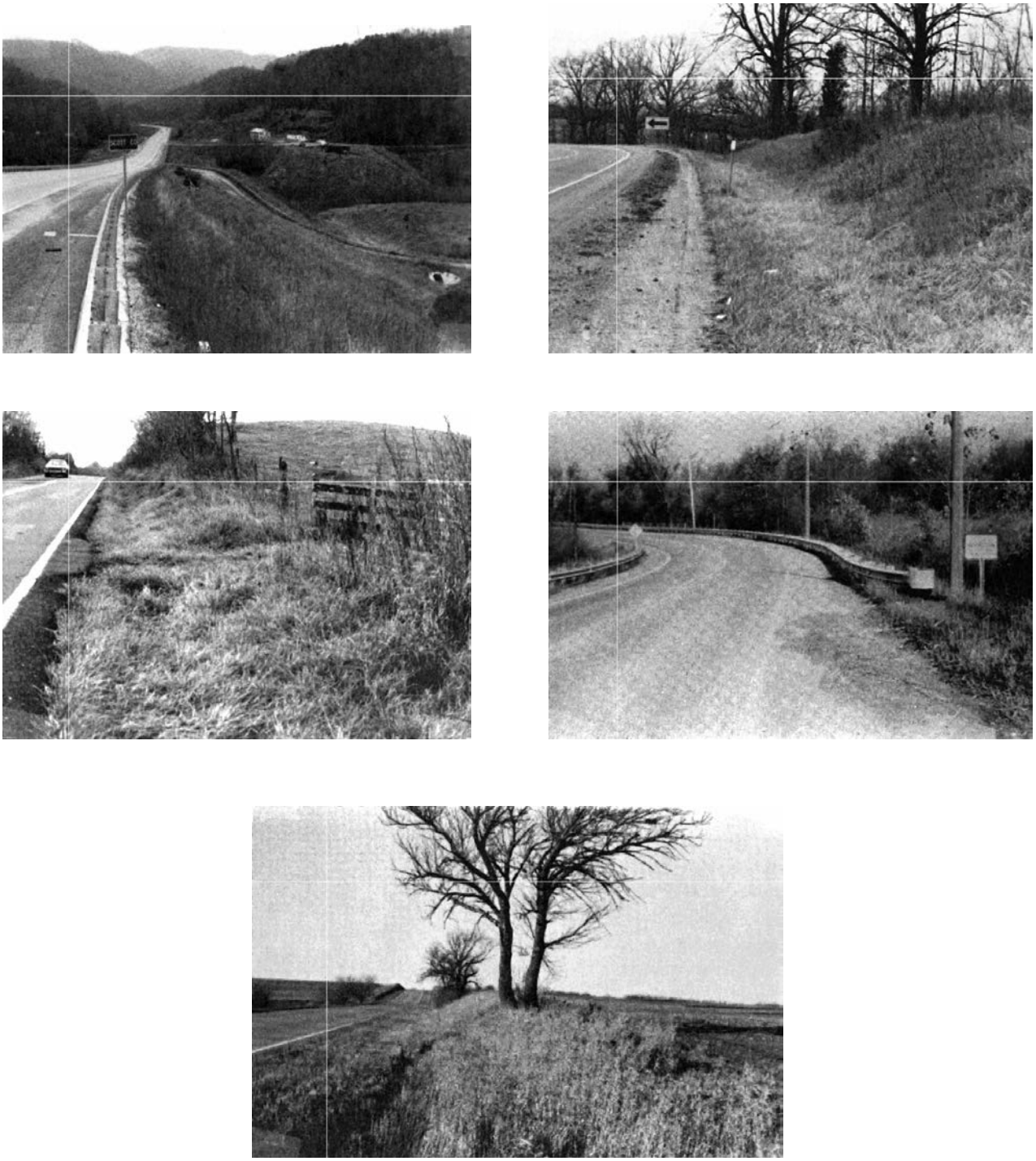


Figure 1160-4
Rural Roadside Hazard Rating of 4

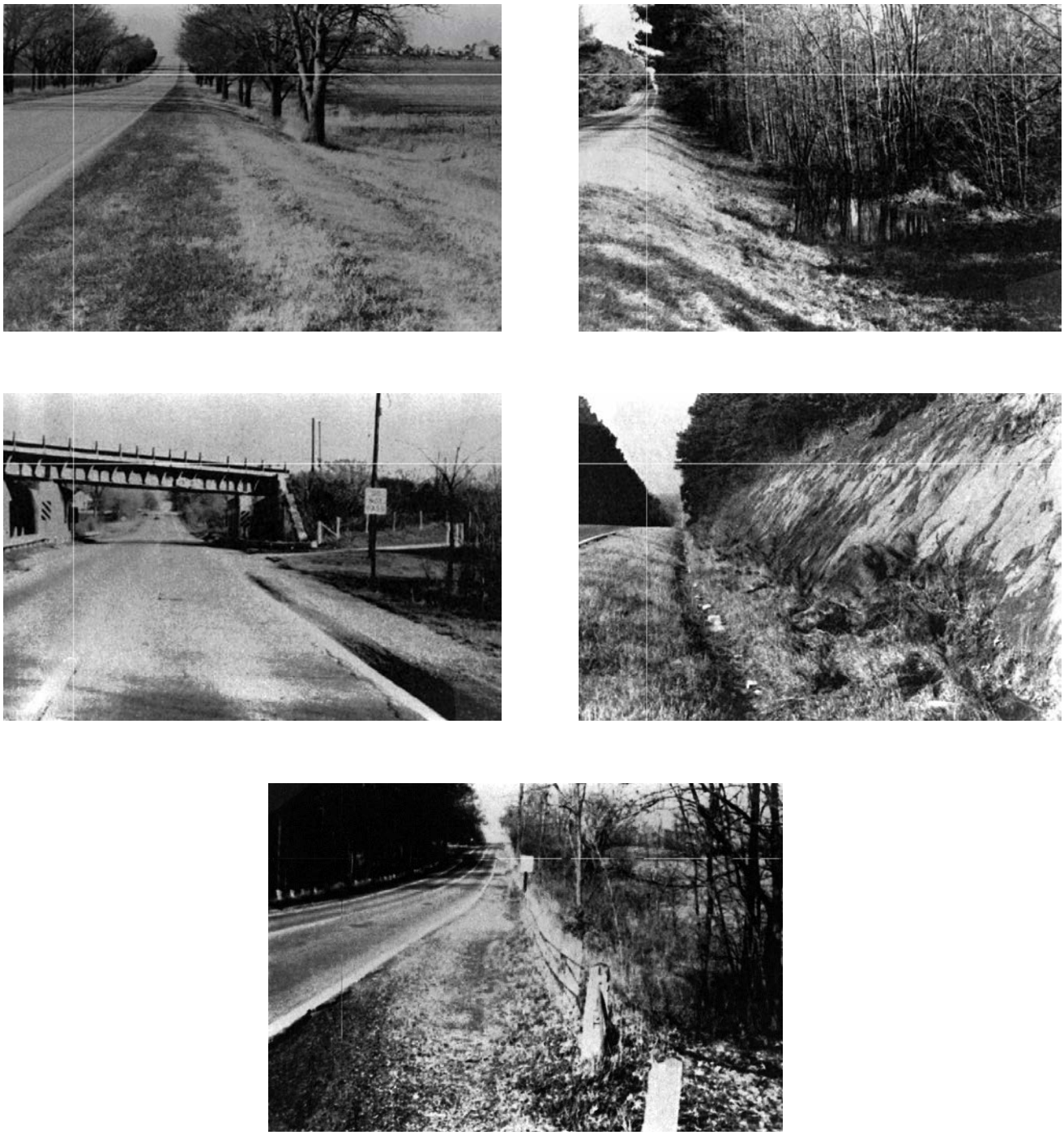


Figure 1160-5
Rural Roadside Hazard Rating of 5

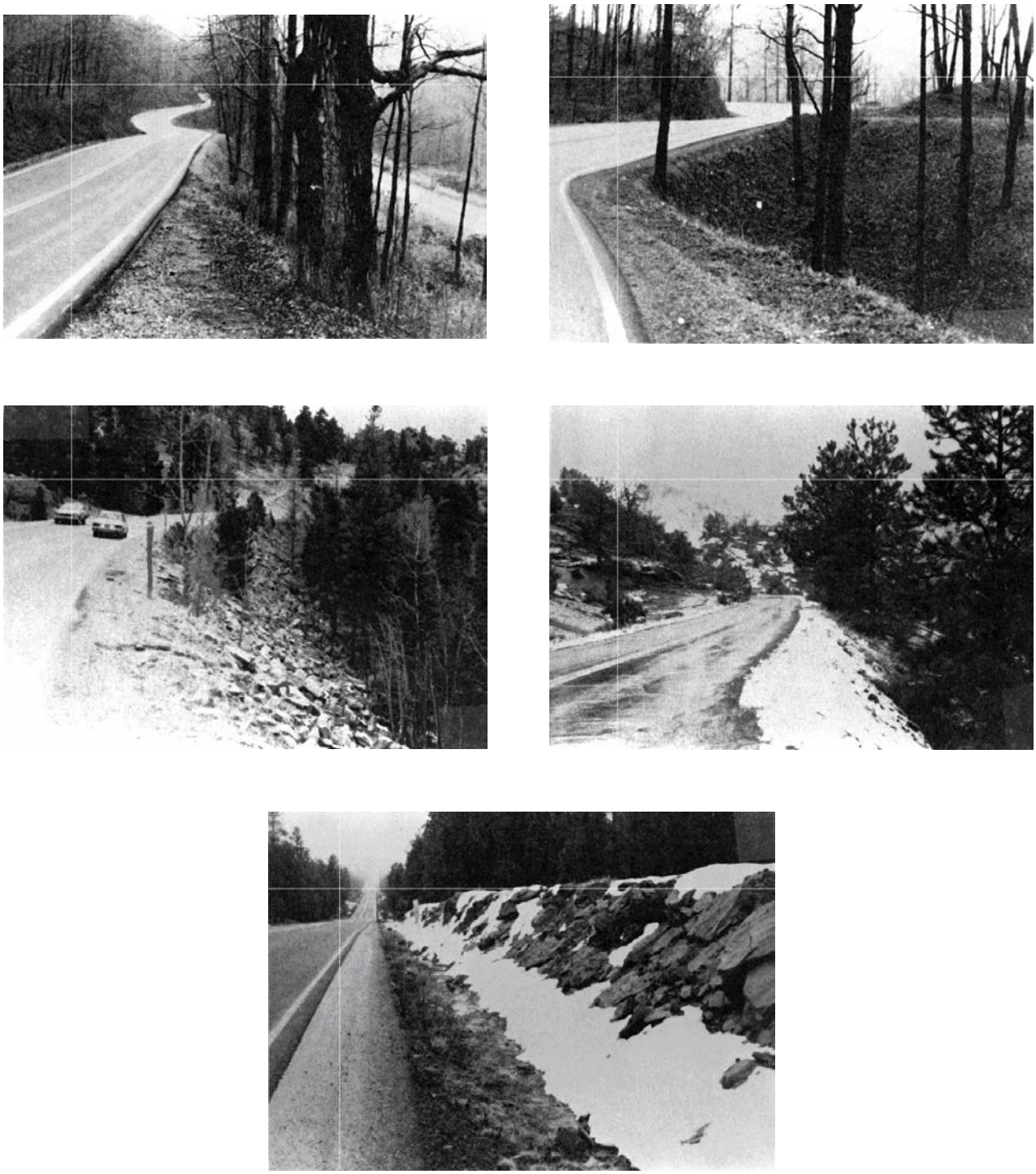


Figure 1160-6
Rural Roadside Hazard Rating of 6

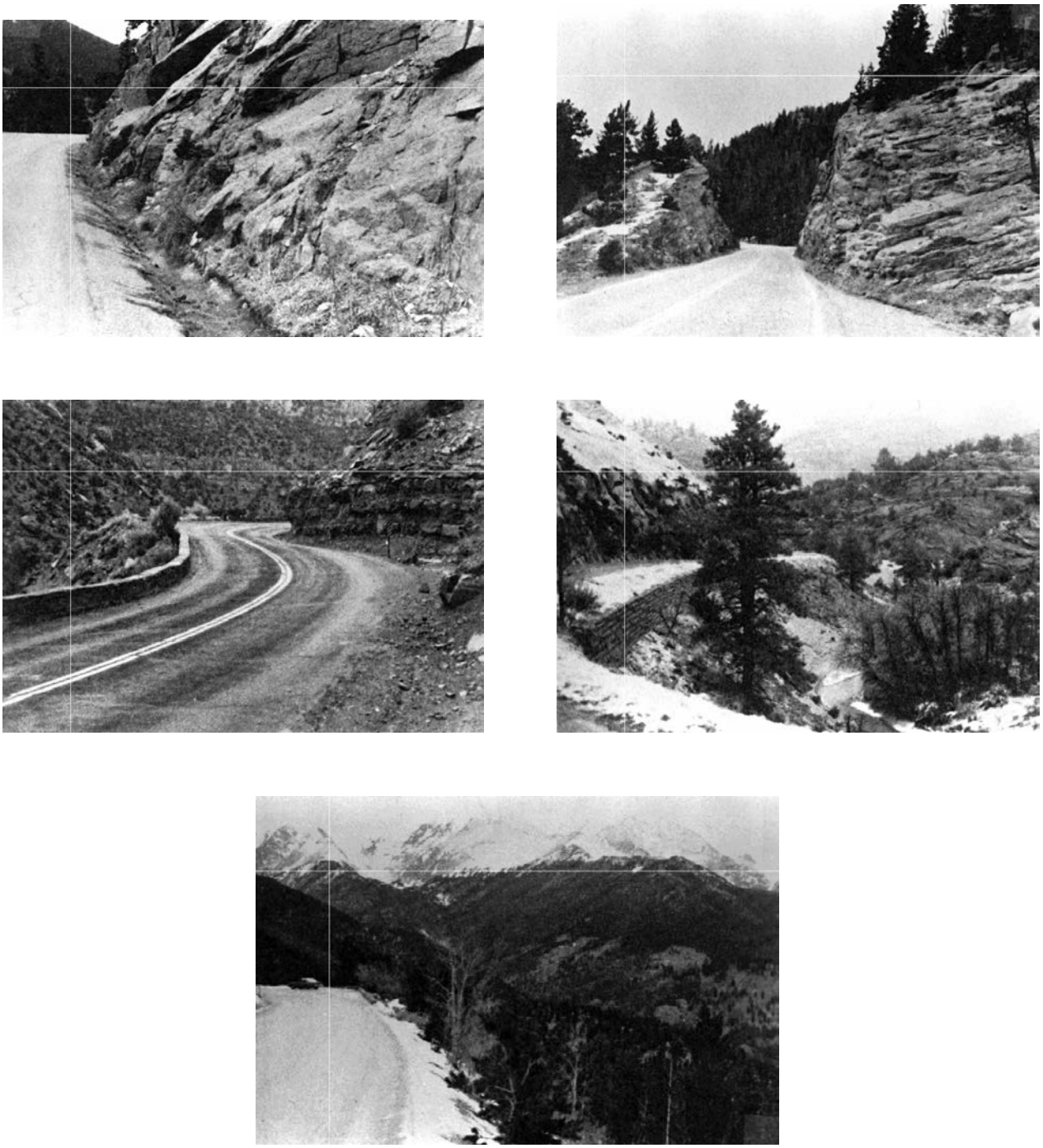


Figure 1160-7
Rural Roadside Hazard Rating of 7

1160.3.3 Horizontal Curves

Radius of Curvature

The existing horizontal curvature may be used if superior (or equal) to the values required for new construction, or if the actual number of accidents for the previous three- to five-year period on the section of road under consideration is less than A_h. If the number of accidents is equal to or greater than A_h, improve the horizontal curvature to the standards of new construction unless it is not cost-effective. Horizontal curves that have no accident history do not require an evaluation and may remain unmodified.

$$A_h = AR_s(L)(V) + [0.0336 * D * V] \quad \text{for } L \geq L_c$$

(Ref. Transportation Research Board, Special Report 214, Appendix C)

where:

A_h = predicted total number of accidents on the segment

AR_s = accident rate on comparable straight segments in accidents per million vehicle miles

L = length of highway segments in miles

V = total traffic volume in millions of vehicles

D = curvature in degrees

L_C = length of curved component in miles

Consider in the cost-effective analysis the historic accident rate for the previous three- to five-year period and the related societal costs (See Example 1160-4). An annual accident cost can be calculated and compared to the annual cost of the improvement.

An annual accident cost savings should be determined as the product of the accident reduction factor (ARF) (Equation 4 in Appendix D, TRB 214; Table D-7, TRB 214; or DOT&PF's Highway Safety Improvement Program Handbook, January 25, 2002) produced by the improvement and the historic annual accident cost over the study period. The improvement is considered cost-effective if the annual accident cost savings exceeds the annual cost of the improvements.

When it is not cost-effective to improve curve alignment, consider other safety improvement measures. These improvements can consist of widening and paving shoulders, widening the clear zone, flattening steep sideslopes, removing or relocating roadside obstacles, and installing traffic control devices such as raised pavement markings or reflective guideposts.

Superelevation

Superelevation may remain unchanged if there are no related accidents. When accidents are related to the existing superelevation, modify it to conform to the requirements for new construction. In unusual cases, it may be possible to show by a cost-effective analysis, based on a three- to five-year accident history, that an existing cross slope may remain.

Superelevation Transition Length

Transition length requirements generally control driver comfort and roadway appearance rather than safety, so existing transition lengths that do not meet the requirements for new construction may remain.

Minimum Length of Curve

Curve length requirements generally control driver comfort and roadway appearances rather than safety, so existing curve lengths that do not meet the requirements for new construction may remain.

1160.3.4 Vertical Curvature and Stopping Sight Distance

Sag Vertical Curves

An analytical method is not available to analyze accidents at sag vertical curves. Generally, sag vertical curves that do not meet AASHTO requirements may remain. If a grouping of accidents at a sag vertical curve appears to be an anomaly when compared to similar curves, an improvement may be needed if cost-effective.

Crest Vertical Curves

Existing crest vertical curvature may be used if superior or equal to the values required for new construction, or if the actual number of accidents for the previous three- to five-year period on the section of road under consideration is less than N_c. If the number of actual accidents is equal to or greater than N_c, then improve the crest vertical curvature to the standards of new construction unless it can be shown not cost-effective. Vertical curves that have no actual

accident history do not require an evaluation and may remain unmodified.

$$N_c = AR_h(L_{vc})(V) + AR_h(L_r)(V)(F_{ar})$$

(Ref. Transportation Research Board, Special Report 214, Appendix C)

where:

N_c = number of predicted accidents attributable to the crest vertical curve segment

Ar_h = average accident rate for the highway in consideration in accidents per million vehicle miles

L_{vc} = length of vertical curve (highway segment) in miles

V = total traffic volume in millions of vehicles

L_r = length of restricted sight distance in miles (The length of restriction is the distance over which the available sight distance is less than that considered adequate by AASHTO procedures for the actual highway operating speed.)

$$L_r = \frac{[a_0 + (a_1 \times A)]}{5280}$$

A = the absolute value of grade difference in percent

F_{ar} = accident rate factor. See Table 1160-3 and Table 1160-4.

Equation 7 in Appendix E of TRB 214 predicts the change in accidents resulting from lengthening crest vertical curves. An annual cost savings can be estimated using the historic annual accident cost over the study period. The improvement is considered cost-effective if the annual accident cost savings exceeds the annual cost of the improvements.

1160.3.5 Bridges

Width

Improve bridge widths to the minimums established in the *AASHTO A Policy on the Geometric Design of Highways and Streets 2001* when the length is less than 100 feet and the usable width is less than the following values:

Mid Design Period ADT	Usable Bridge Width (ft)[a]
0-750	Width of Approach Lanes
751-2,000	Width of Approach Lanes plus 2 feet
2,001-4,000	Width of Approach Lanes plus 4 feet
Over 4,000	Width of Approach Lanes plus 6 feet
[a]: If lane widening is planned as part of the 3R project, the usable bridge width should be compared with the planned width of the approaches after they are widened.	

You may leave qualified bridges above in place if no improvement is necessary based on a cost-effective analysis considering the previous 10-year accident history.

Bridges longer than 100 feet that are substandard in width generally are not considered for width improvement under 3R standards.

Structural Capacity

If any existing structural member has a design capacity less than HS 15 (HS 20 for interstate bridges), replace that member.

Bridge Rail and Transitions

On projects containing major bridge rehabilitation (widening, strengthening, and/or deck replacement), ensure all bridge rail and rail transitions meet strength and crash test criteria for the appropriate rail performance level. In lesser rehabilitation projects, determine by a cost-effective analysis the appropriate rail upgrade (previously discussed in this chapter). The Bridge Section will be responsible for maintaining the procedures to be used and for applying the current bridge rail upgrade guides.

Earthquake Capacity

All bridges on rural or urban arterials and rural or urban collectors, where there are no feasible detour routes, are essential. In addition, classify bridges as essential if they provide the only feasible access to:

- Military bases, supply depots, and National Guard installations
- Hospitals, medical supply centers, and emergency depots
- Major airports

- Defense industries and those that could easily or logically be converted to them
- Refineries, fuel storage, and distribution centers
- Major railroad terminals, railheads, docks, and truck terminals
- Major power plants, including nuclear power facilities and hydroelectric centers at major dams
- Major communication centers
- Other facilities that the state considers important from a national defense viewpoint or during emergencies resulting from natural disasters or other unforeseen circumstances

Bridges on 3R projects shall be assigned to a Seismic Performance Category in accordance with the current *AASHTO Specifications for Seismic Design of Highway Bridges*.

You do not have to investigate bridges rated SPC "A" for earthquake retrofitting.

Investigate bridges rated SPC "B," "C," or "D" for bearing width, bearing height, joint restraint, bearing restraint, support width, and other evident areas of potential seismic motion distress. Retrofit those structures that do not conform to the *AASHTO Specifications for Seismic Design* in the above areas in accord with the Federal Highway Administration publication FHWA-RD-94-052, *Seismic Retrofitting Manual for Highway Bridges.*

The Headquarters Bridge Section will be responsible for the retrofitting investigation. If required, the Bridge Section will also prepare retrofitting plans and specifications for inclusion in the 3R project documents.

The estimated cost of any individual bridge earthquake retrofit shall not exceed 10 percent of the estimated total structure value. If the cost exceeds 10 percent, qualify the structure for retrofitting under another funding source.

1160.3.6 Sideslopes and Clear Zones

Evaluate section geometry and obstacles within the clear zone when required by the 3R Procedure Outline shown in Tables 1160-1 and 2.

1160.3.7 Pavement Edge Drop

Edge drops at the edge of the traveled way are a recognized safety hazard. These drops generally occur with degradation of unpaved shoulders. Paving shoulders is the best solution for eliminating the edge drop. If shoulders won't be paved, bring the existing shoulders to a grade with new material that matches the top edge of the driving surface.

1160.3.8 Intersections

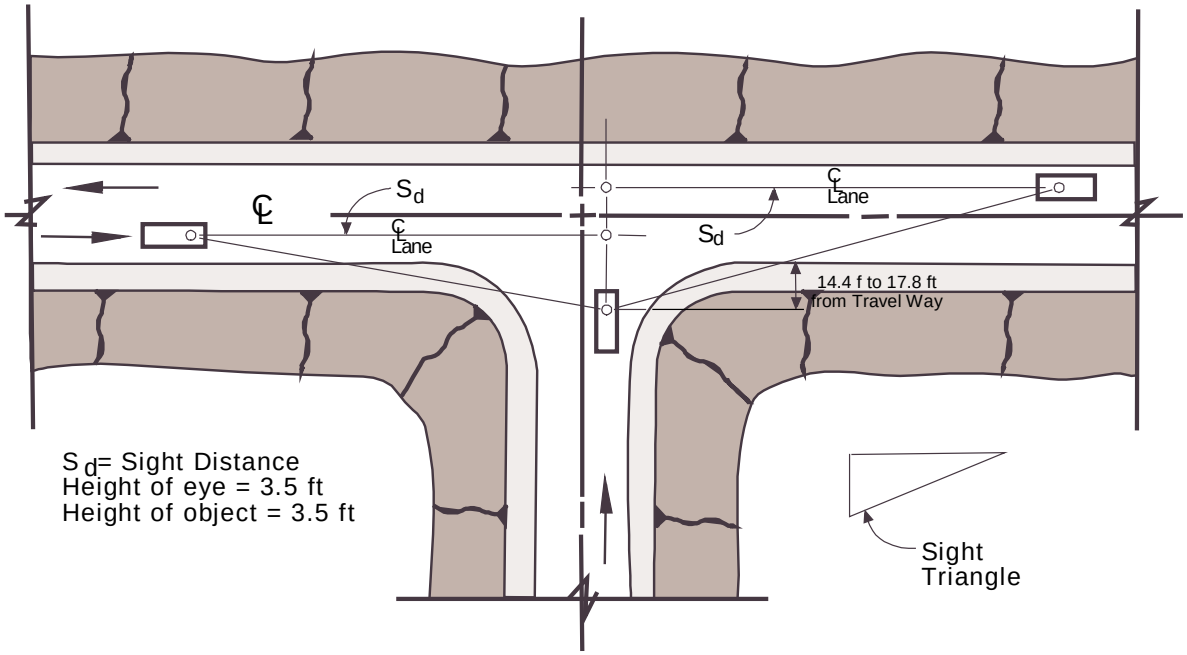
The relative risk of accidents at intersections is high. It is normal to observe accident clustering at intersections. Study the accident history of an intersection to determine if accidents are caused by a design deficiency or operator error. Correct a geometric deficiency related to accidents to the new design standards of this manual or the *AASHTO A Policy on the Geometric Design of Highways and Streets 2001*, if cost-effective or corrected by actions such as signing, signaling, or channelization.

Sight distance is of primary importance at intersections to allow operators sufficient time to observe and react to conflicts. The sight triangle shown in Figure 1160-8 is the minimum allowable at any existing intersection (driveway). The sight distances required (S_d) are the minimum stopping sight distances required by Section 1120.1. of this manual.

1160.3.9 Driveways

Existing driveway geometry may remain except if accident records indicate an anomaly. In that case, the driveway requires an engineering evaluation for improvement to meet the requirements of Section 1190 of this manual.

MINIMUM INTERSECTION SIGHT DISTANCE



DESIGN SPEED or POSTED SPEED LIMIT mph	SD MINIMUM (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645

Note: Minimum sight distances are stopping sight distances for level grades, between -3% and +3%. Refer to AASHTO *A Policy on Geometric Design of Highways and Streets 2001,* for desirable intersection sight distances and for grade adjustments.

Figure 1160-8
Minimum Intersection Sight Distance

Table 1160-3
Accident Rate Factor (F_{ar})

Severity of sight Restriction (mph)	Degree of Hazard in Sight Restricted Area[a]		
	Minor	Significant	Major
0	0	0.4	1.0
5	(0.3)	(0.8)	(1.4)
10	0.5	1.1	1.8
15	1.2	2.0	2.8
20	2.0	3.0	4.0

[a]: See Table 1160-4

Note: Numbers in parentheses were interpolated from J.C. Glennon "Effects of Alignment on Highway Safety: A Synthesis of Prior Research" In TBR State of the Art Report. TRB, National Research Council, Washington D.C.

Table 1160-4
Relative Hazard

Relative Hazard	Geometric condition
Minor	Tangent horizontal alignment Mild curvature (less than 3 degrees) Mild downgrade (less than 3 percent)
Significant	Low-volume intersection Intermediate curvature (3 to 6 degrees) Moderate downgrade (3 to 5 percent) Structure
Major	High-volume intersection Y-diverge on road Sharp curvature (greater than 6 degrees) Steep downgrade (greater than 5 percent) Narrow bridge Narrow pavement

Table 1160-5
Constants for L_r

Operating Speed on Vertical Curve (mph)	Equivalent speed to existing crest Vertical curve stopping sight distance (mph) [1]							
	60	55	50	45	40	35	30	25
				Values of a_0				
60	-524	-138	-25	113	202	256	305	382
55		-452	-163	11	111	172	221	301
50			-405	-65	45	115	169	248
45				-332	-76	21	82	167
40	No sight restriction				-272	-55	15	110
35						-231	-74	51
30							-193	19
25								-130
				Values of a_1				
	207.3	152.6	120.9	80.2	56.6	38.6	29.4	15.3

$$L_r = \frac{[a_0 + (a_1 \times A)]}{5280}$$

A = the absolute value of grade difference in percent

[1] TRB Special Report 214 uses the definition Highway Design Speed of the existing vertical curve.

1160.3.10 Passing Sight Distance

Operational and passing sight distances are given in Section 3B of the *Alaska Traffic Manual*. Improvements of passing distances are not required within the context of 3R projects.

1160.3.11 Grades

Grades that do not meet new construction standards should be evaluated as a potential contributing factor where there are clusters of accidents on or in the vicinity of the grade section. Grade-related accidents might include single or multiple vehicle accidents where a vehicle lost control and leaves the travel lane or is unable to stop. Countermeasures for steep grades may include warning signs or realignment.

1160.3.12 Safety Mitigation

Even though these 3R standards may not require a geometric improvement, the designer should anticipate circumstances where mitigating improvements could be made at minimum cost. For example, geometric changes at an intersection or horizontal curve to increase sight distance may not be cost-effective, but cutting brush or trees can partially alleviate the problem.

1160.4. Studies

1160.4.1 Design Study Report

Prepare a Design Study Report in accord with Chapter 4, Section 450. In addition to the Section 450 requirements, include the following in the report:

- A list of all existing horizontal and crest vertical curves that do not meet the current minimum design requirements of AASHTO for new construction
- A discussion of the design speed determination in accord with Section 1160.3.3
- A discussion of the determination of lane widths in accord with Section 1160.3.4 and the clear zone requirements as determined by Section 1160.3.8
- A discussion of horizontal curve treatments in accord with Section 1160.3.5
- A discussion of vertical curve treatments in accord with Section 1160.3.6
- A discussion of bridge features that require improvement
- A discussion of accidents at intersections and what improvements may be made

Include supportive calculations for the above items in the report.

1160.5. Gravel to Pavement

1160.5.1 General

Section 1160.5, Gravel to Pavement, applies to non-NHS road construction projects whose primary purpose is reducing maintenance costs and improving the quality of life for Alaskans by hard surfacing of gravel roads, but which may include limited shoulder, drainage, and other work related to preserving the road structure.

The existing alignment, profile, and sideslopes may remain as long as the project does not degrade any existing safety or geometric aspects. Guardrail, guardrail terminals, and bridge rail terminal connections will not routinely be upgraded to more current standards.

Signing and Markings

Inventory and evaluate all existing signing for sign placement and condition. Conform signing to the requirements of the *Alaska Traffic Manual* (ATM) and the *Alaska Sign Design Specifications* (ASDS). Install regulatory speed limit signing conforming to the chosen design speed of the roadway. Install curve, grade, advance intersection, and other warning signs as required to warn of conditions where the safe speed is lower than the posted speed limit. Other regulatory signing requirements include stop signs at side street approaches.

Upgrade signposts that do not conform to current safety standards.

1160.5.2 Design Year

The design year should at least equal the expected surface life of the selected surface type.

1160.5.3 Design Speed

Use the current posted as a minimum design speed. In the absence of posted speeds, use the criteria in *A Policy for the Geometric Design of Highways and Streets 2001,* to establish a minimum design speed.

In selecting the design speed, consider the anticipated speed of traffic traveling on the newly surfaced roadway. You may use the speed limit on paved roads of similar character in selecting design speed.

1160.5.4 Lane and Shoulder Widths

Rural Two-Lane Paved Highways

Table 1160-6 shows minimum lane and shoulder width improvements.

Table 1160-6
Two-Lane – Two-Way Traffic
Combined Roadway Minimum Lane & Shoulder Widths
For Use With Gravel to Pavement Modified Procedure

Design Year ADT 0-2000 vpd Minimum Lane and Shoulder Width (ft)					
Design Year Traffic Volumes (ADT) in vpd					
Design Speed (mph)	0-250	250-400	400-750	750-1500	1500-2000
20	18	20	22	22	22
30	18	20	22	22	22
45	18	22	22	22	22
50	22	22	22	22	22

Waiver of Roadway Width
For roadway width less than shown in Table 1160-6, obtain a design waiver in accordance with *Alaska Preconstruction Manual* Section 1100.3. guidelines.

The minimum width for two-lane roads is 18 feet.

1160.5.5 Grades

Grades do not require improvement under these standards.

1160.5.6 Horizontal Curves

Radius of Curvature
No change is required under these standards.

Superelevation
Superelevation should match the design speed for the project. Follow *AASHTO A Policy on the Geometric Design of Highways and Streets 2001*. Maximum superelevation is 6 percent cross-slope.

Superelevation Transition Length
When possible, provide minimum superelevation transition length in accordance with the *AASHTO A Policy on the Geometric Design of Highways and Streets 2001*.

Minimum Length
No change is required under these standards.

1160.5.7 Vertical Curvature and Stopping Sight Distance

Sag and Crest Vertical Curves
No change is required under these standards.

Stopping Sight Distance
No change is required under these standards.

Intersection Sight Distance for Side Streets
No change is required under these standards.

Consider clearing to the right-of-way limits to improve sight distance that does not meet AASHTO minimum sight distance standards.

Driveway Sight Distance
No change is required under these standards.

Consider clearing to the right-of-way limits to improve sight distance that does not meet AASHTO minimum sight distance standards.

1160.5.8 Bridges

No change to the existing structure or railing is required, except as necessary to keep structures serviceable through the design period.

1160.5.9 Clear Zones

No change is required under these standards.

1160.5.10 Bicycles

No enhancements required.

1160.5.11 ADA

Do not construct anything that will diminish the access to, or use of the facility by, a disabled person.

1160.5.12 Design Study Report

For gravel to pavement projects, the requirements of Chapter 4 of this manual concerning preparation of the Design Study Report are modified to include the following:

- Structural section, addressing embankment suitability. Reference section 1180.8.
- Materials sources
- A copy of the Design Study Report to the regional maintenance director/chief

Example 1160-1
Lane-Shoulders & X-Section

Glacier Highway, North Lena Loop Road to Point Stephens Road

Design Period	20
Current ADT	1027
Design Year ADT	1383
Mid Period ADT	1205
Percent Trucks	6.4%
Average Running Speed	45 mph
Terrain Values	Use “0”

Existing Lanes = 11 feet and Shoulders = 0 feet

Accident Study Period

1977 to 1987
Mid-study Period ADT 900

Cross-Section Elements

Roadside Hazard Rating selected as 6, see Figures 1160-1 through 1160-7

$A = 0.0019\ ADT^{0.882} \times 0.879^{W} \times 0.919^{PA} \times 0.932^{UP} \times 1.236^{H} \times 0.882^{TER1} \times 1.322^{TER2}$

$A = 0.0019\ (900)^{0.882} \times 0.879^{11} \times 0.919^{0} \times 0.932^{0} \times 1.236^{6} \times 0.882^{0} \times 1.322^{0}$

= 0.7 accidents /mi /year

Route No. 296000
CDS mile points from Alaska DOT&PF General Road Log: 22.93 to 21.68 = 1.25 miles

See accidents for Period = 1977 through 1987 (shown on next page)

(*Note:* Category 7, 8, 10, 11, & 12 intersection accidents do not qualify)

Example 1160-1
Lane-Shoulders & X-Section, continued

ACCNBR	ACCDTE YYMMDD	TIME	ROUTE	MI	ACC DIA	NBR VEH	TOT	MAJ INJ	MIN INJ	DAMAGE	ACC TYPE	ROAD CHAR	ROAD COND
7912635	791125 04	1630	296000	21.95	9		1				1,200	17	2
7815249	780509	1539	296000	21.72	9	1			1	800	40	4	01
8012890	801124	0640	296000	22.57	9	2				800	08	1	0
7709900	770707	1630	296000	22.14	9	1			1	2,000	25	5	01
8200598	820110	0230	296000	21.71	9	3				1,400	12	1	04
8202582	820221	1520	296000	21.75	7	3		1	3	9,000	06	1	04
8218451	821129	0750	296000	22.57	2	2				200	07	5	04
8400740	840110	0745	296000	22.55	9	1				900	29	5	05
8521909	851226	1530	296000	21.82	9	1			2	8,000	17	4	04
8606011	860422	2057	296000	21.92	9	1			1	3,000	29	4	02
8606208	860429	1426	296000	22.53	1						40	4	01
8702618	870214	2154	296000	21.71	9	1				4,000	17	1	04
8712934	871104	0825	296000	21.68	9	1					17	5	04
8715589	871216	2249	296000	21.94	9	2				600	08	5	04

Roadway Character

1. Straight and level
2. Straight and grade
3. Straight and hillcrest
4. Curve and level
5. Curve and grade
6. Curve and hillcrest

Roadway Surface Condition

1. Dry
2. Wet
3. Muddy
4. Snow/Ice
5. Slush
6. Other

Type of Accident

Collision With
1. Pedestrian
2. Pedacycle
3. Train
4. Animal
5. Moose

MV in Transport
6. Head on
7. Rear end
8. Angle

MV in Other Roadway
9. Head on
10. Rear end
11. Angle

Parked MV
12. Parked

Fixed Object
13. Bridge/Overpass
14. Building
15. Culvert
16. Curb/Wall
17. Ditch
18. Divider
19. Parking meter
20. Traffic light
21. Light support
22. Sign post
23. Utility post
24. Other support
25. Embankment
26. Fence
27. Guardrail
28. Machinery
29. Tree/Shrub
30. Other object
31. Aircraft

Non-Collision
40. Overturn
41. Fire/Explosion
42. Immersion
43. Gas inhalation
44. Other

Total 14 accidents, 10 accidents qualify.

$$\text{Actual} = \frac{10 \text{ acc}}{(1.25 \text{ mi} \times 10 \text{ yrs})} = 0.8 \text{ acc / mi / yr}$$

$$\left(\frac{\text{Actual}}{\text{Predicted}} - 1\right) \times 100 = \left(\frac{0.8}{0.7} - 1\right) \times 100 = 14.3$$

- Round 14.3 percent to the nearest 10 percent increment, or 10 percent
- The 10 percent increment requires an increased traveled way width by 2 feet.
- Clear zone need not be addressed after 4-foot widening. The widening reduces the accident rate sufficiently to preclude clear zone investigation.

Example 1160-2
Lane-Shoulders & X-Section

Denali Highway Rehabilitation

Design Period	10
Current ADT	100
Design Year ADT	150
Mid Period ADT	125
Percent Trucks	4.0%
Average Running Speed	50 mph
Terrain Values	"0"

Existing Lanes = 10 feet and Shoulders = 2 feet

Accident Study Period

1975 to 1985
Mid-study Period ADT 80

Roadside Hazard Rating selected as 5, see Figures 1160-1 through 1160-7

$A = 0.0019\ (80)^{0.882} \times 0.879^{10} \times 0.919^{2} \times 0.932^{0} \times 1.236^{5} \times 0.882^{0} \times 1.322^{0}$

= 0.1 accidents / mi / year

Route No. 140000
CDS mile points from Alaska DOT&PF General Road Log: 0.0 to 21.5 = 21.5 miles

See below accidents for the Period = 1975 through 1985

ACCNBR	ACCDTE YYMMDD	TIME	ROUTE	MI	ACC DIA	NBR VEH	TOT FAT	MAJ INJ	MIN INJ	DAMAGE	ACC TYPE	ROAD CHAR	ROAD COND
7712183	770722	2340	140000	5.18	9	1	1			2,000	40	4	01
8106618	810704	0901	140000	15.90	9	1				30,000	40	4	01
8106947	810712	1000	140000	21.50	1	2				4,700	07	2	03

Total 3 accidents, 2 accidents qualify (*Note*: Category 7 accident does not qualify)

$$\text{Actual} = \frac{2\ \text{acc}}{(21.5\ \text{mi} \times 10\ \text{yrs})} = 0\ \text{acc/mi/yr}$$

A > Actual Lane $\Rightarrow$ shoulder improvements not required.

Cross-Section Elements
Investigation not required by accident rate, see Tables 1160-1 and 2.

Example 1160-3
Horizontal Curve

Alaska Highway, Mile 1303 to 1285

Project Parameters

Project Length	17.52 miles
Design Speed	
(as defined in Section 1160.3.3)	60 mph
Design Period	20
ADT 1985	485
ADT 2005	750

Curve Location CDS mile 68.1 to 68.4

Curve Data $D = 5^0 - 45^0$
$L = 1502.07$ ft

Accident Record for curve 10-year period 1975 to 1985, 3 recorded accidents

$A_h = [AR_s \times L \times V] + [0.0336 \times D \times V]$

Solve AR_s

Project Length = 17.5 mi, CDS mile 62.6 to 80.1
Period: 1975 to 1985, 33 qualified accidents
(Total non-intersection accidents on straight roadway segments only)

Mid Period ADT (1980) = 300

Total Vehicle Miles = 300 ADT x 365 days x 10 yrs. x 17.5 mi. = 19.2 mvm

$$AR_s = \frac{33 \text{ accidents}}{19.2 \text{ mvm}} = 1.7 \frac{acc}{mvm}$$

V = 300 ADT x 365 days x 10 yrs. = 1,095,000 vehicles

$A_h = [1.7 \text{ acc/mvm} \times 0.3 \text{ mi} \times 1.095 \text{ Milveh}] + [0.0336 \times 5.75^0 \times 1.095 \text{ Milveh}] = 0.8$ accidents

Actual accidents (3) exceeds predicted A_h ($3 > 0.8$)

Therefore, improve curve to new construction minimums or check with cost-effective analysis
See following Example 1160-4.

Example 1160-4
Cost-Effective Analysis

Horizontal Curve; See Previous Example 1160-3

Given: Typical cut section

Shoulder	6 feet from new typical section
Cut height	50 feet
Horizontal line shift to accommodate new alignment	100 ft
Excavation cost	\$3 per yd^3

First cost: Curve length = 1502.07 ft from previous example 1160-3

Excavation EFC = [1502.07 x 50' x 100'] / [2 x 27]x \$3.00 = \$417,242

CRF = Capital Recovery Factor, to compare present cost of multi-year cost of improvement

$$CRF = \frac{(1.07)^{20} \text{ x } 0.07}{(1.07)^{20} - 1} = 0.0944$$

Annual First Cost = 0.0944 X \$417,242 = \$39,388 per yr.

Accident cost:

ACCNBR	ACCDTE YYMMDD	TIME	ROUTE	MI	ACC DIA	NBR VEH	TOT FAT	MAJ INJ	MIN INJ	DAMAGE	ACC TYPE	ROAD CHAR	ROAD COND
7910447	791203	1345	180000	68.25	9	2	1			25,000	06	x	x
8012908	801115	1630	180000	68.25	9	1				3,000	40	5	04
7811753	781002	1145	180000	68.25	9	1			1	800	17	6	04

Fatality	1		=	\$2,600,000
Major injury	0			
Property Damage	3	\$25,000 + \$3,000 + \$800	=	\$28,800
Total accident cost			=	\$2,628,800

10-year period (from Example 1160-3)
Annual accident cost = \$2,628,800/10 = \$262,800

Annual accident cost greater than annual first cost of improvement; therefore, the curve geometry should be changed.

Discussion
There is the question of whether the fatality was an anomaly. Was high speed involved, an object in the traveled way, or some other factor not related to the curvature? In this case, two vehicles were involved, and it is possible that the accident cause was unrelated to the curvature. If the fatality was an anomaly, then it may be reasonable to only consider the remaining accidents. In that case, the annual accident cost would be \$380 ([\$3,000 + \$800]/10), and the curve would not require improvement.

Example 1160-5
Vertical Curve

Unknown Highway, Mile 31 to 44

Project Parameters
Project Length = 13.8 miles, CDS mile 31 to 44.8
Design Speed (as defined in Section 11603.3) = 50 mph
Design Period = 20
ADT 1990 804
ADT 2010 981
Sight Distance = 475 ft (See AASHTO Policy on Design)

Curve Location CDS mile 31.6 to 31.7.

Curve Data g_1 = 2.00%
g_2 = -3.00%
Length = 500.00 ft

Existing Sight Distance

Select the following value for "S" which meets the stated relationship of "S" to "L."

S > L

$$S = \frac{1}{2}\left(L + \frac{1329}{A}\right) = \frac{1}{2}\left(500' + \frac{1329}{5}\right) = 383 \text{ ft}$$ Not OK; less than "L"

S < L

$$S = \left(\frac{1329 \times L}{A}\right)^{\frac{1}{2}} = \left(\frac{1329 \times 500}{5}\right)^{\frac{1}{2}} = 364 \text{ ft}$$ OK; less than "L"

Existing sight distance = 364 ft and is substandard to the required 475 ft.

See Section 1160.3.6, Vertical Curvature and Stopping Sight Distance.

Accident Record for curve 10-year period 1978 to 1987, three recorded accidents

Mid Period ADT(1983) = 600

$$N_c = \left[AR_h \times L_{vc} \times V\right] + AR_h\left(L_r\right)\left(V\right)\left(F_{ar}\right)$$ See 1160.3.6a, Sag Vertical Curves

Determine AR_h

Project Length = 13.80 mi, CDS mileage 31 to 44.8

Period: 1978 to 1987, 27 qualified non-intersection accidents

Mid Period ADT (1983) = 600
(continued on next page)

Example 1160-5
Vertical Curve, continued

Total vehicle miles = (600 ADT x 365 days x 10 yrs x 13.8 mi)/1,000,000 = 30.2 mvm

$$AR_h = \frac{27\ accidents}{30.2\ mvm} = 0.9\ \frac{acc}{mvm}$$

Solve for L_r

Equivalent speed to existing crest vertical curve stopping sight distance of 364 ft = 45 mph (nearest 5 mph) from Table 1160-5, value for a_o

From Table 1160-5, using a design speed of 45 mph
a_o = -65

a_1 = 80.2

$$L_r = (a_0 + (a_1 \times A))\left(\frac{1}{5280}\right) = (-65 + (80.2 \times 5))\left(\frac{1}{5280}\right) = 0.064\ miles$$

Find F_{ar}

From Tables 1160-3 and 4
F_{ar} = 0.8

Severity of sight restriction = (50 mph)-(45 mph) = 5 mph

Moderate down grade @ -3% = significant

Find Vertical Curve Volume

V = (600 ADT x 365 days x 10 yrs)/1,000,000 = 2.190 mv

Solve N (Number of accidents for ten year period in question.)

$$N_c = \left[AR_h \text{ x } L_{vc} \text{ x } V\right] + AR_h\,(L_r)(V)(F_{ar})$$

$$N_c = \left[0.9\frac{acc}{mvm} \text{ x } \frac{500'}{5280\frac{ft}{mi}} \text{ x } 2.19mv\right] + 0.9\frac{acc}{mvm}(0.064\,mi)(2.19mv)(0.8) = 0.29\ acc$$

Actual accidents (3) exceeds predicted N_c

Therefore, improve curve to appropriate minimums or check with cost-effective analysis.

1170. Special Design Elements

1170.1. Roadway Illumination
1170.2. Bus Stops
1170.3. Bus and HOV Lane
1170.4. Boardwalks
1170.5. Boat Ramps
1170.6. Airway-Highway Clearances
1170.7. Highway Signs, Luminaires, Traffic Signals, Poles, and Posts
1170.8. Fencing

1170.1. Roadway Illumination

Select and design new lighting systems in conformance with the criteria in the 1984 AASHTO publication *An Informational Guide for Roadway Lighting* (IGRL), and the following:

1. Do not exceed the allowable veiling luminance ratio, as shown in Table 2 of the IGRL. This applies when using either the Luminance or Illuminance design method.
2. The Luminance design method (as described in the IGRL) is preferred over the Illuminance method because it typically results in systems that are more economical to construct and maintain.
3. Use cutoff or full cutoff luminaires where feasible.
4. Avoid staggered light pole arrangements where feasible.
5. "Small Target Visibility" results (as defined in ANSI/IES RP-8-00, "Roadway Lighting," 2000) may be used as a tiebreaker when choosing between systems that otherwise perform similarly.

1170.2. Bus Stops

Bus transit is an integral part of the operation of many urban streets and highways. Consider the existing operating policies and the future transit needs of communities where applicable, particularly where bus movements caused by bus stops will affect intersection capacity. Normally, locate bus stops on the far corner of intersections to free the approach shoulder lane for right-turning vehicles.

Consider other transit facilities for buses, such as bus passenger shelters, park-and-ride lots, and turnouts (separate loading zone). Base the decision to include bus turnouts on the volume and turning movements of both the bus traffic and through traffic, the distance between bus stops, and right-of-way limitations. Base the design features for turnouts on the size and turning radius of the bus. Generally, radii allow buses to remain in the outer lane during the full turn. For ADA access considerations, also see Americans with Disabilities Act Accessibility Guidelines.

1170.3. Bus and HOV (High Occupancy Vehicle) Lane

Include special lanes for buses and HOVs on projects only where such an auxiliary lane is part of an integrated network for buses and/or HOVs. Typically, these lanes are shoulder lanes of sufficient width to accommodate the wider buses. A normal bus/HOV lane is 12 to 14 feet wide, with no additional shoulder provisions.

Bus/HOV lanes should be to the right of normal traffic. This makes the shoulder lane available during off-peak hours for disabled and right-turning vehicles.

1170.4. Boardwalks

Water, sewer, and solid waste conveyance systems in rural Alaska are not always feasible without great expense due to permafrost and other natural constraints. As an alternative, water may have to be delivered to each home from a community well and sewage collected and hauled to a sewage lagoon. It may be necessary to transport solid waste to a community dumpsite.

It is common practice to handle most of this transport with four-wheel, all-terrain vehicles (ATVs) pulling trailers loaded with tanks. Sizes of vehicles and tanks vary depending on the size of the community. Other transportation systems may be necessary to provide maintenance access.

The construction and maintenance of roads are sometimes extremely expensive due to natural constraints and the lack of locally available materials. An economical alternative to a road is a drivable boardwalk. For ADA access considerations, see Section 1310.

Consider the following in design for a drivable boardwalk:

1. Designate design speed as 5 mph or as recommended by the regional traffic engineer.

2. Use as the minimum design vehicle a four-wheel, all-terrain vehicle pulling a two-wheel trailer with an 80-gallon tank, with a design load of up to 700 pounds per wheel.
3. Use as design width a minimum of 8 feet including wheel rails (See Figures 1170-1a and 1b).
4. Design and specify horizontal and vertical geometry, if required, on a per project basis.
5. Design turnouts, if required, to accommodate the design vehicle.
6. Ensure the boardwalk design meets the Americans with Disabilities Act guidelines.
7. You may require an anchoring system in areas that are subject to seasonal flooding.
8. Boardwalks installed in or near tidal areas may need to be built on pilings to avoid flooding during extreme high tides.
9. Space surface planks ¾ inch apart to enable drainage.
10. Install wheel guards as required. Wheel guards are not required at access points.
11. If you anticipate pedestrian use, you may need handrails for elevated sections.
12. Ensure timber treatment complies with the Clean Water Act.

Figure 1170-1a is a cross-sectional view of a minimum design boardwalk. The loading is 700 pounds per wheel. All dimensions for lumber are nominal.

1170.5. Boat Ramps

1170.5.1. General

This section describes basic criteria for the design of boat ramps. However, the final design will involve many other engineering factors to provide a safe, efficient facility. Grades, alignment, and surface materials are probably the most important factors.

1170.5.2. Grades

Boat ramp grades should be greater than 10 percent and less than 13 percent. Flatter ramps require backing the motorized towing vehicle too far into the water before the boat floats free of the trailer. Steeper grades make it difficult to pull the loaded trailer up the ramp. A 12 percent grade is desirable.

1170.5.3. Alignment

If possible, design the ramp and approaches so that the combination of towing and towed vehicles lines up directly down the ramp. Avoid turning movements while backing if possible.

1170.5.4. Surface

Use concrete planks from just above the highest high-water line to a point sufficiently below the mean low-water line to permit unloading a boat without the trailer wheels leaving the planking, even at mean lower low-water. The ramp above the planking should be firm and have a surface that provides adequate traction to the towing vehicle when pulling a loaded trailer from the water.

1170.5.5. Other Considerations

Wherever you construct a boat ramp, provide sufficient areas for parking, including for boat trailers. Provide piers or floats adjacent to the ramp for access to the boat after flotation. You may also want lavatories and picnic tables in the area.

1170.6. Airway-Highway Clearances

Whenever a highway project will involve construction or operations within 1.74 nautical miles (2 miles) of an airport, airstrip, heliport, or other aircraft facility, be aware of the airspace navigational requirements of the aircraft facility. The *FHWA Federal-Aid Program Manual Volume 6*, Chapter 1, Subchapter 2.4(c) states:

"Federal funds shall not participate in projects where substandard (airway) clearances are created or will continue to exist."

Part 77, Federal Aviation Regulations, sets forth aircraft facility clearances, including horizontal and vertical "nonintrusion" zones. Conform to these FAA regulations whenever any of the following conditions exist:

1. The project is near an FAA-recognized or FAA-controlled aircraft facility
2. The project involves a federal-aid route
3. The project is federally funded in whole or in part

On air strips and other non-FAA facilities, conform to the federal regulations or document justification for noncompliance. Furnish a copy of the documentation to the commissioner.

1170.7. Highway Signs, Luminaires Traffic Signals, Poles, and Posts

1170.7.1. General

Sign, electrolier, and signal design must conform to the requirements of the *Alaska Traffic Manual*.

Design highway lighting structures under 60 feet in height and traffic signals to conform to the 1994 edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

Design high tower lighting systems (60 feet and over in height) to conform to the 2001 edition of *AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals.*

1170.7.2. Sign Supports

Design sign post supports in accordance with Figures 1170-2 through 1170-12.

Place all new roadside signs and luminaires on breakaway supports on high-speed highways located within the clear zone width, unless you locate them behind a barrier or crash cushion that is necessary for other reasons. Supports outside this suggested clear zone should preferably be breakaway where there is a probability of being struck by errant vehicles.

Replace all existing sign supports that do not comply with NCHRP 350 crashworthiness standards. This includes all perforated steel tube sign supports larger than 2 inches on a side that are located within 7 feet of each other.

1170.7.3. Breakaway Supports

The design of breakaway support mechanisms allows them to function properly when loaded primarily in shear. The design of most mechanisms allows them to be hit at bumper height, typically about 20 inches above the ground. If hit at a significantly higher point, the bending moment in the breakaway base may be sufficient to bind the breakaway device. For this reason, do not put breakaway supports near ditches or on steep slopes, or at similar locations where a vehicle is likely to be partially airborne at the time of impact.

1170.7.4. Large Roadside Signs

Large roadside signs are greater than 500 square feet. They typically have two or more breakaway support posts. To achieve satisfactory breakaway performance, they should meet the following criteria (see Figure 1170-12):

- Place a hinge at least 7 feet above the ground so no portion of the sign or upper section of the support is likely to penetrate the windshield of an impacting vehicle (see Standard Drawing S-34, Fuse Plate Details).
- A single post, if 7 feet or more from another post, or all posts within a 7-foot path, should weigh less than 45 lbs/ft. The total weight below the hinge, but above the shear plate of the breakaway base, should be less than 600 pounds.
- Do not attach supplementary signs below the hinges if such placement is likely to interfere with the breakaway action of the support post or if the supplemental sign is likely to strike the windshield of an impacting vehicle.

1170.7.5. Small Roadside Signs

Small roadside signs are those supported on one or more posts and having a sign panel area less than 50 square feet. Small sign supports are driven directly into the soil, set in drilled holes, or mounted on a separately installed base.

The breakaway mechanisms of small signs supports consist of a base bending fracture or breakaway coupling design (see slip base details on Standard Drawing S-34.00). The bottom of a small sign panel should be a minimum of 7 feet above the ground and the top of the panel a minimum of 9 feet above the ground to minimize the possibility of the sign panel and post rotating on impact and striking the windshield of a vehicle.

Fracturing sign supports are wood or steel posts, or steel pipes connected at ground level to a separate anchor. Wood posts are typically set in drilled holes and backfilled, while anchors for steel pipe or post systems are driven into the ground (see Standard Drawing S-30.03).

You may provide unidirectional slip bases for small sign support posts (see Standard Drawing S-34.00). The inclined design shown on Standard Drawing S-34.00 ensures the sign will move upward to allow the impacting vehicle to pass under without the sign hitting the windshield or top of the car. When you use this type of slip base for small signs, you do not need hinges in the post.

The major limitation of the inclined slip base is its directional property. The inclined slip base can only

be struck from one direction to yield satisfactorily and should not be used in medians or traffic islands or other locations where hits from several directions are likely. Multi-directional slip bases are typically triangular and are designed to release when struck from any direction. These types of breakaway supports are ideally suited for use on medians, channelizing islands, ramp terminals, and other locations where a sign may be hit from several directions.

1170.7.6. Multiple Post Supports for Sign Supports

Consider all breakaway supports within a 7-foot width in multiple post sign structures as acting together. This 7-foot criterion is based on a need to minimize the potential for unacceptable performance of breakaway hardware. In some cases, a vehicle could leave the roadway at a sufficiently high angle that it would hit two posts within a 7-foot path. In other cases, a vehicle could yaw in the roadside to such an extent that it would strike two posts within a 7-foot path. In many instances, the greatest change in vehicle velocity occurs when hitting breakaway hardware at slower speeds because less energy is available to activate the breakaway mechanism. Since vehicles leaving the roadway at very high angles or yawing vehicles would likely be traveling at slower speeds, the 7-foot criterion is a reasonable safety factor that you should use in roadside design of breakaway hardware.

1170.7.7. Signal Poles

Signal poles are obstacles. The mastarm loading overturning moment (due to equipment positioning) and wind loads require substantial poles with fixed bases and foundations.

Section 1130.2.2, Low Speed Roadways, and AASHTO 2001 A Policy on the Geometric Design of Highways and Streets allow 18 inches of clear zones in low-speed urban areas with curbs because of the expense of obtaining full clear zones (e.g. Table 1130-2) in urban areas. As such, signal pole location in low-speed urban areas is rarely an issue.

Where signalization is required for intersection control on high-speed roadways (>45 mph) or in rural areas, place signal poles outside of the clear zone where practical. However, offset location of the pole is constrained by the need to position mastarm equipment over lanes, and because mastarm length is limited to 60 feet. Removal or relocation of the signal pole outside of the clear zone may not be an option. The design loads prohibit breakaway supports, so the only obstacle treatment options are to shield the poles with crash cushions or barriers, or to provide obstacle delineation.

Evaluate signal poles in high-speed, rural locations for cost-effectiveness to determine if a barrier should be installed, or if a pole can stand without treatment (the signals on the structure should provide adequate delineation). Use the procedures and methods in 1130.6 of this manual to complete a cost-effective analysis and determine the appropriate treatment for signal poles located inside the clear zone at high-speed locations.

1170.8. Fencing

1170.8.1. Introduction

Fencing may be required or desirable on some highway projects. The need for fencing can be identified during planning, scoping, environmental document, design, ROW, or construction phases of a project.

This section covers permanent fence installation. Temporary installations, such as during construction, are not covered in this Section.

1170.8.2. Functions

Fencing serves a number of purposes including:

1. Barrier to human and wildlife encroachment
2. Safety
3. Property boundary delineation
4. Security
5. Channelization
6. Privacy
7. Noise reduction
8. Snow drift abatement

Fences may, and often do, serve multiple purposes.

1170.8.3. Types

The Department normally uses the following types of fence:

- Chain link
- Woven wire
- Barbed wire

- Decorative

The *Standard Specifications for Highway Construction* – Sec. 607 - covers construction of chain link, woven wire and barbed wire fences. The *Alaska Standard Drawings Manual* contains standard plans and details for these types of fences.

1170.8.4. Design Considerations

Install fence consistent with the clear zone concept outlined in Section 1130.2.3 of this manual. Avoid installing fence in drainage collection areas.

Barrier Fence

Barrier fence provides maximum protection against ROW encroachments by pedestrians, bicyclists, wildlife and other motorized vehicles such as snow machines and ATVs.

Consider barrier fence:

- Along fully or partially access controlled highways
- Between freeways or expressways and adjacent frontage roads or business districts
- Near schools, colleges, playgrounds, parks and athletic fields
- Where existing streets dead end at a freeway controlled access line
- In industrial areas or large residential developments
- Adjacent to military reservations
- At other locations were a barrier is needed to protect against vehicular, pedestrian, bicycle, or wildlife encroachment.

Barrier fence is generally installed parallel to centerline and on, or just inside, the ROW line or access control line. Fencing on a continuous alignment usually has a pleasing appearance and is the most economical to construct and maintain.

Safety Fence

Safety fence is installed:

- To protect users of sidewalks and paths located within the ROW from hazards adjacent to or near these transportation features
- To protect the general public and maintenance workers from other readily accessible hazards within the ROW
- To protect adjacent private property from hazards at or near the ROW line

Consider safety fence when:

1. Vertical drop offs equal, or exceed 4 feet
2. Side slope and slope height is steeper than 2H:1V and greater than 8 feet, respectively
3. Permanent bodies of water over 3 feet deep or swift flowing water are present
4. Children or mobility impaired persons are present in significant numbers near the hazard(s)

Other factors such as proximity and likelihood of exposure to hazard from paths and sidewalks, and severity of hazard need consideration. When deciding the necessity for safety fence, engineering judgment should prevail.

Install 4 foot high, minimum, safety fence. In some circumstances, safety rail will serve the same function as safety fence. Safety rail is not part of this Section.

Property Boundary Delineation

Fencing can delineate property boundaries, but this purpose is usually secondary to a primary function such as a barrier or safety fence.

Security Fence

Security fence is commonly used on or adjacent to military reservations.

Channelization Fence

Channelization fence is commonly used for directing and funneling pedestrians or wildlife to, or away from, specific locations or structures. In the case of wildlife, this could be an at-grade crossing or an underpass structure.

Privacy Fence

Privacy fence is used for visual screening. Materials, geometry and alignment are selected to meet the location-specific terrain, vistas and aesthetics.

Plastic coated chain link with vinyl slats, available in a variety of colors, is a cost-effective privacy fence.

Custom privacy fence may be used in special cases where the context of the physical and human

environmental dictates it, or when stipulated in ROW agreements.

Noise Fence

Refer to the Alaska DOT&PF Alaska Environmental Procedures Manual Noise Policy for guidance on when to consider installing noise fence.

http://www.dot.state.ak.us/stwddes/desenviron/resources/noise.shtml

Select alignment, geometry and material for the target level of noise reduction.

Snow Drift Abatement Fence

Consider the use of snow fence where blowing and drifting snow can inhibit maintenance and operations. Also consider fencing where snow removal operations could cause private property damage.

1170.8.5. Other Considerations

Except where warranted for highway applications, fencing is normally the responsibility of the abutting property owner. Existing private fences within the State ROW are considered encroachments that property owners must remove it at their own expense.

If a request by a private property owner, public agency or local government is made for additional fencing during construction, field personnel should confer with Design on its merits. If warranted, provide documentation justifying the need in the change order.

Metallic fencing can interfere with airport traffic control radar. When locating fencing in the vicinity of an airport, contact the Federal Aviation Administration to determine whether metal fence will create radar interference at the airport. If so, use non-metallic fencing.

1170.8.6. References

1. AASHTO - *An Informational Guide on Fencing Controlled Access Highways* - 3rd Edition November 1990.

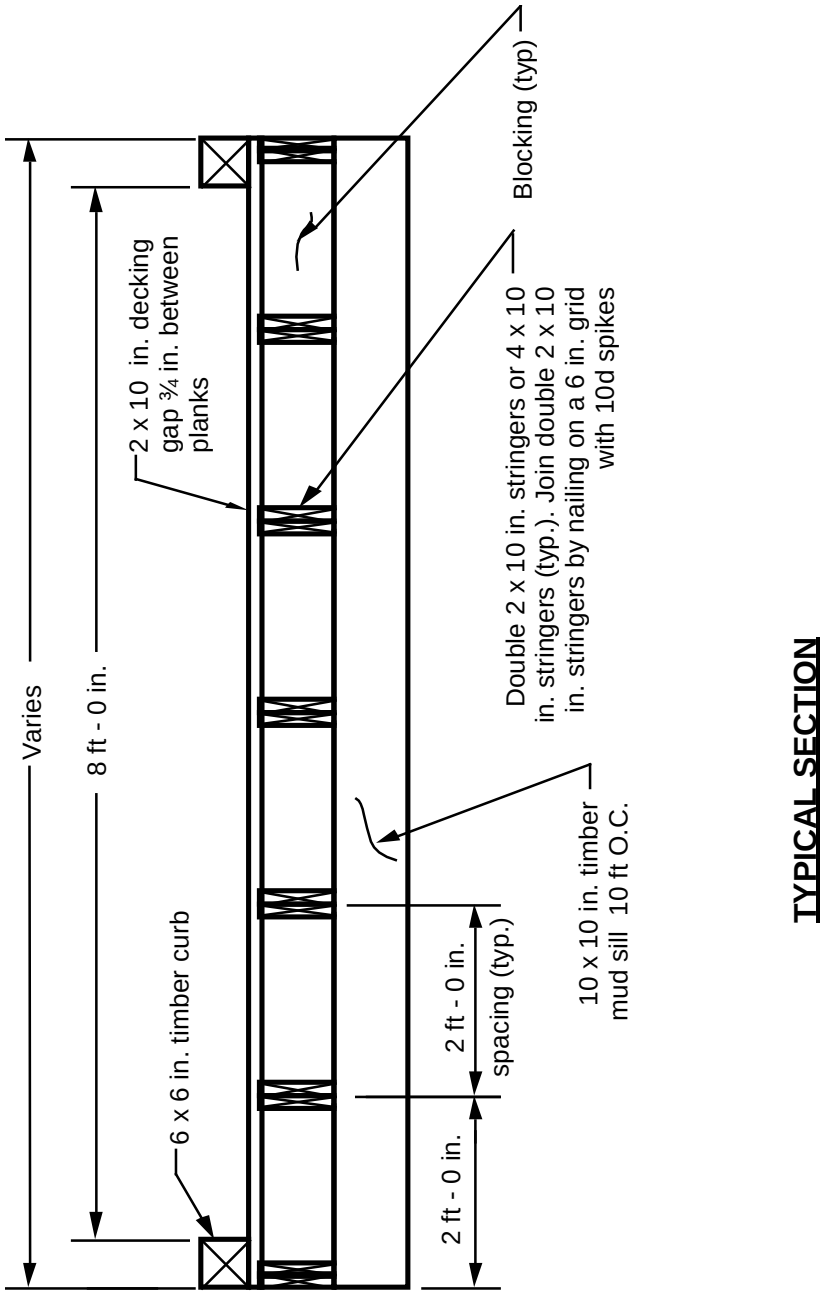


Figure 1170-1a
Boardwalk
(Designed for minimum loading)

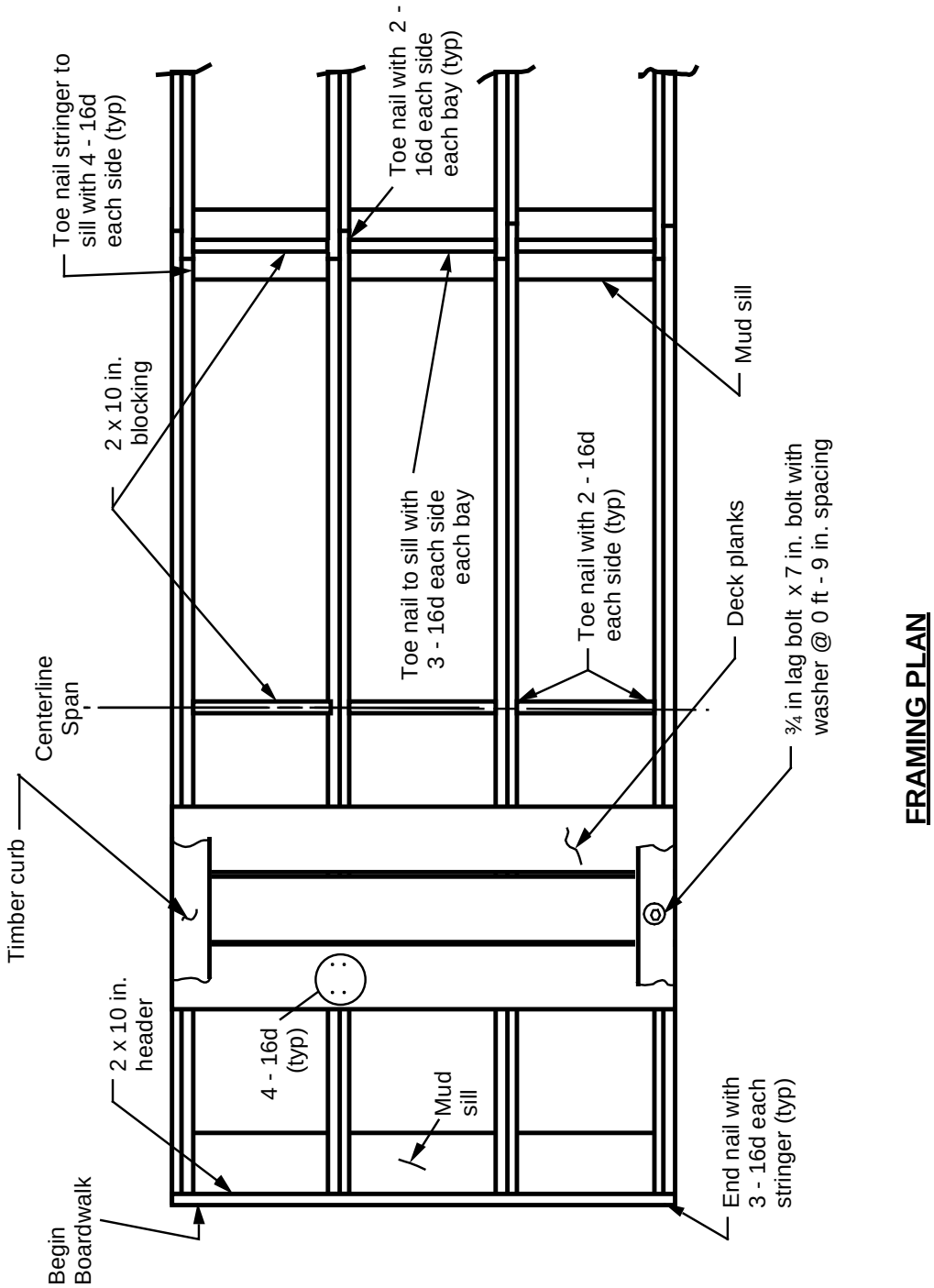
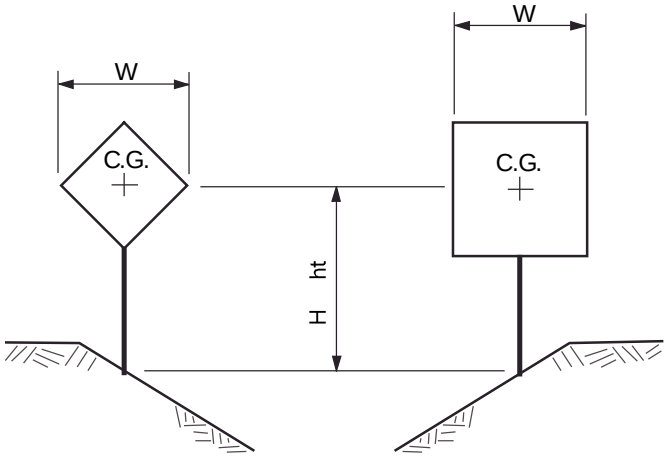


Figure 1170-1b
Boardwalk
(Designed for minimum loading)

SIGN POST DESIGN SPECIFICATIONS



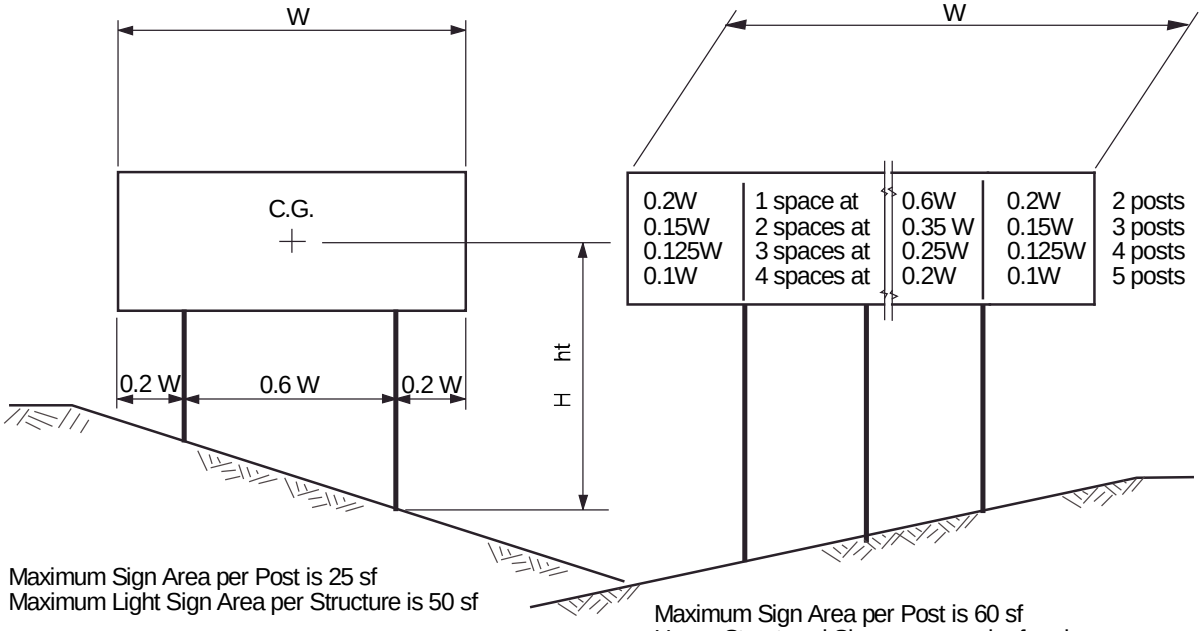
GENERAL NOTES for SIGN POST SELECTION

1. Design based on the following Post Material: Steel conformed to the requirements of ASTM A501 for Steel Tubing, ASTM A53 for Steel Pipe standard weight, ASTM 36 for W Shape Beams, and ASTM 446 for Perforated Tubing. Sawed Wood Post material shall conform to AASHTO M 168.

2. Solid lines on Figure 1170-5 through 1170-10 indicate maximum use of the indicated post. Any combined value of sign area and height to the right or above the solid line indicates the use of the next larger post.

3. Fracture posts or slip bases shall be used for all Posts in the clear zone.

4. Designer should determine the type of sign support by the following: Wind velocities expected in the project area, location of sign in sheltered or exposed areas, temporary or permanent type sign, expected life of sign, maintenance cost in relation to construction cost.



Maximum Sign Area per Post is 25 sf
Maximum Light Sign Area per Structure is 50 sf

LIGHT SIGN STRUCTURES
< 50 sf

Maximum Sign Area per Post is 60 sf
Heavy Structured Signs may require framing.
See Standard Drawing S.00.00.

HEAVY SIGN STRUCTURES
≥ 50 sf

Figure 1170-2
Sign Post Design Specifications

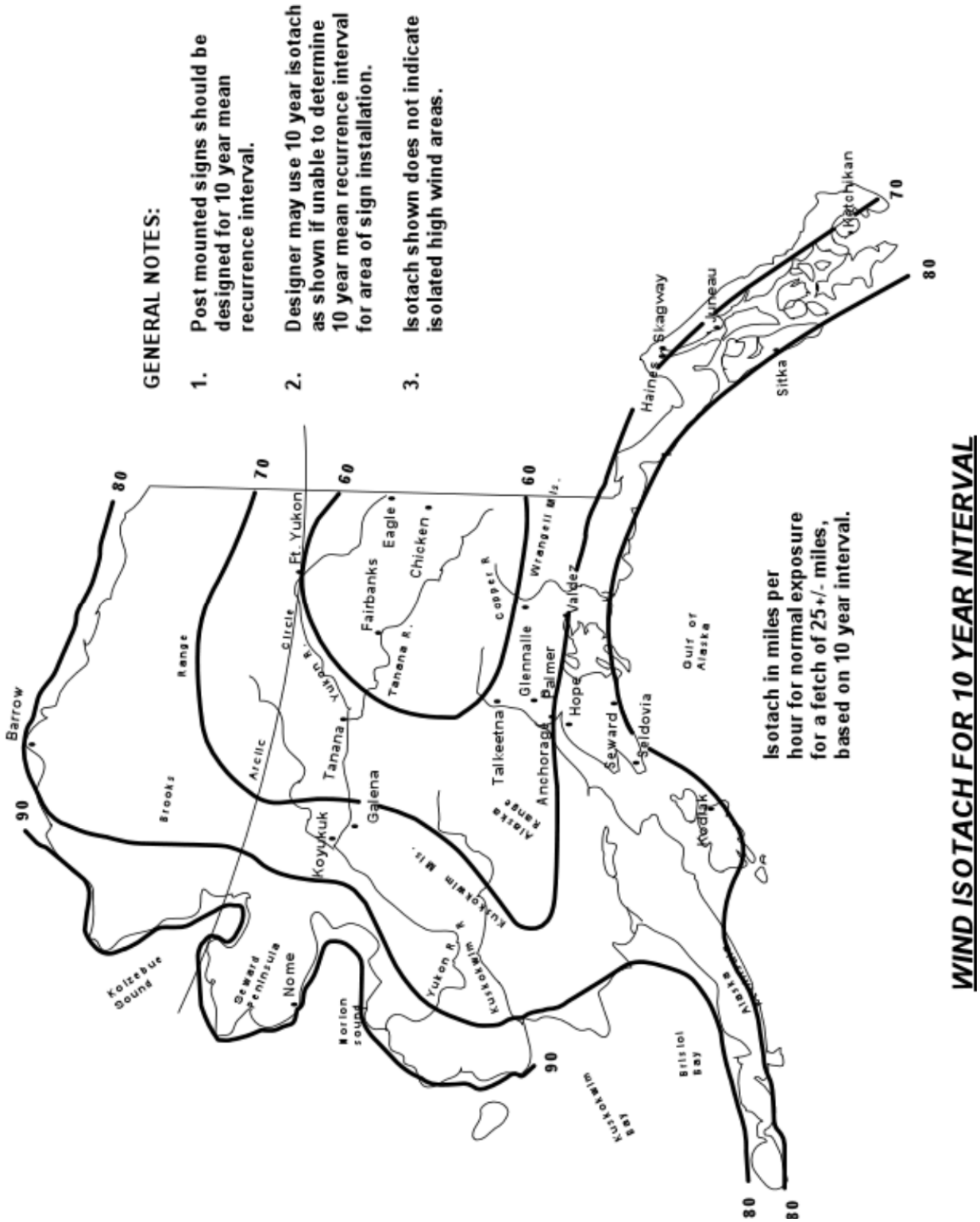


Figure 1170-3
Wind Isotach for 10-Year Interval

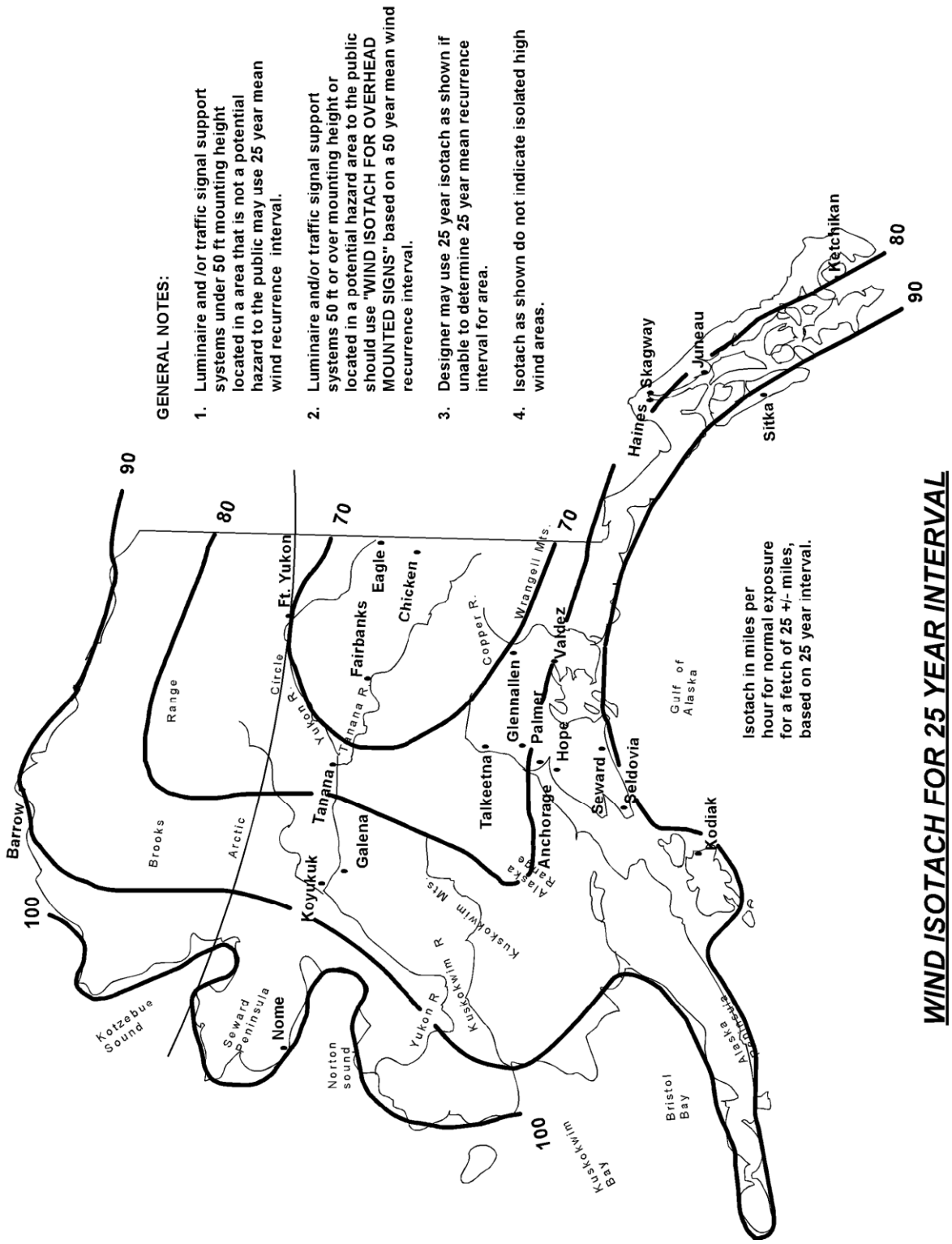


Figure 1170-4

Wind Isotach for 25-Year Interval

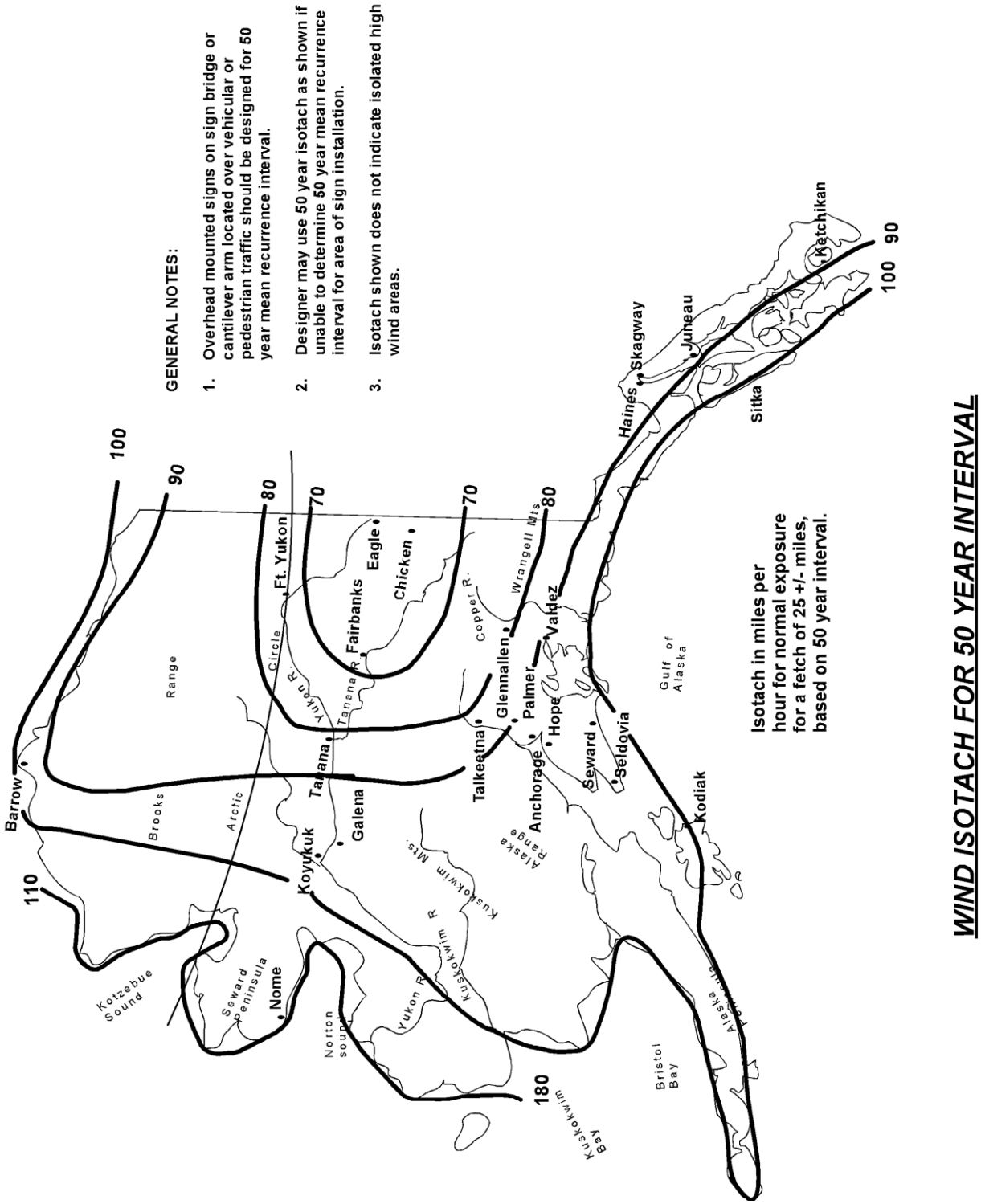
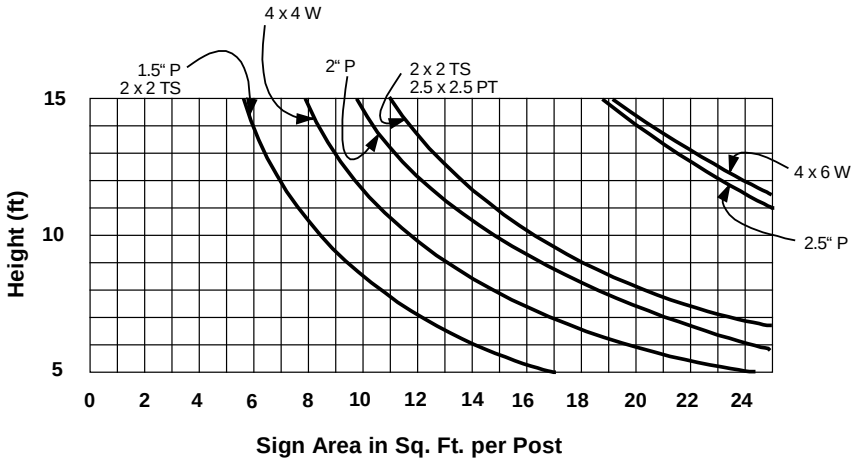
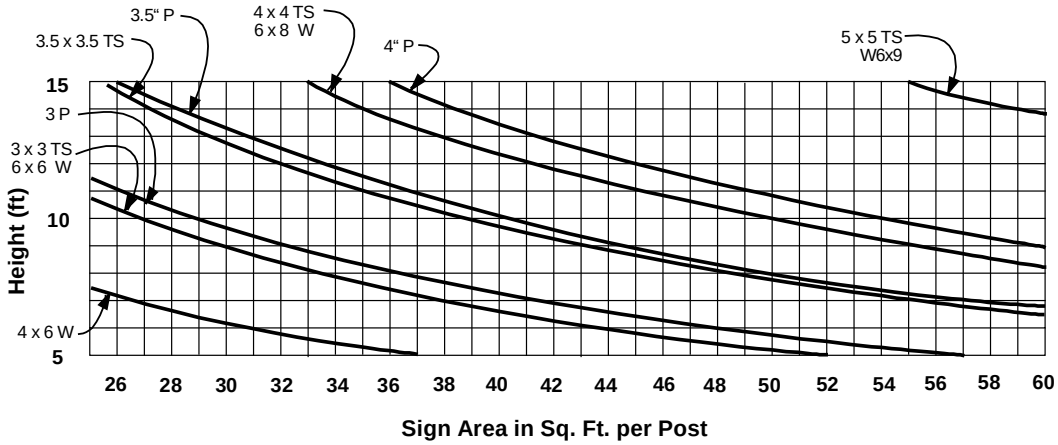


Figure 1170-5
Wind Isotach for 50-Year Interval

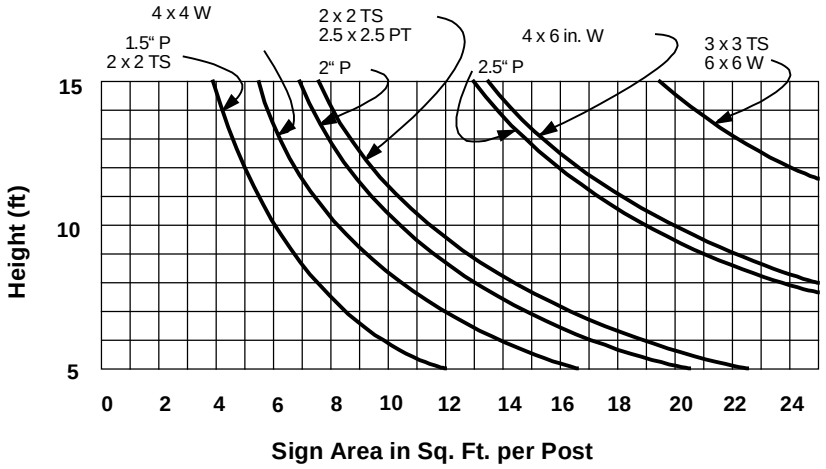


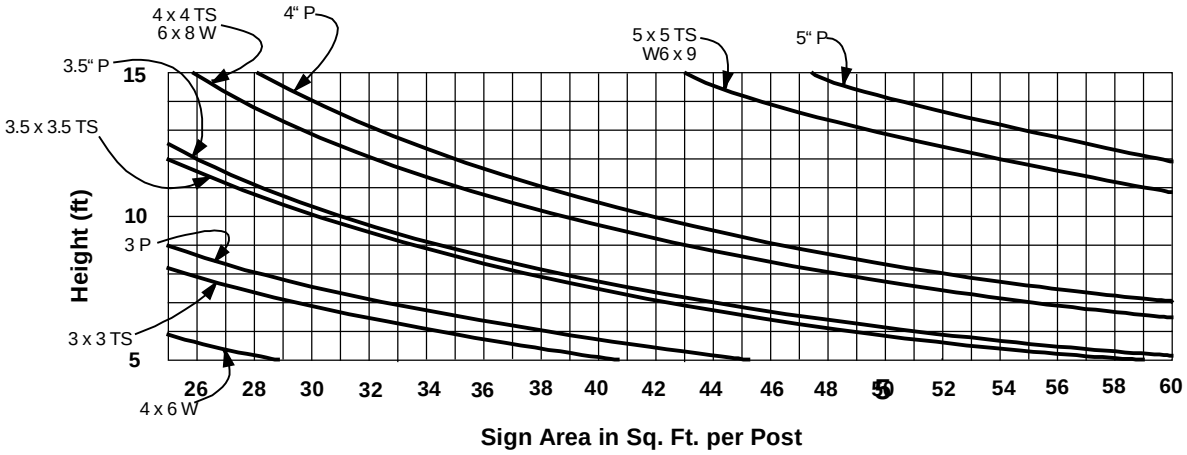


POST MATERIAL
P.....Steel pipe (std. wt.)
P.T.....Perforated steel tubing (0.105 in. wall)
TS.....Steel tube square (0.1875 in. wall)
_x_ W....Treated wood
W_x_.....Steel W shapes

SIGN POST SELECTION
50 MPH DESIGN WIND VELOCITY

Figure 1170-6
Sign Post Selection 50 mph Design Wind Velocity

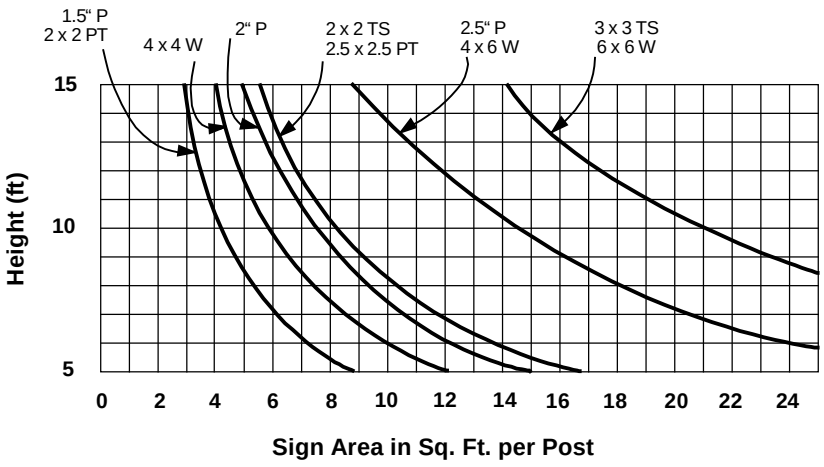


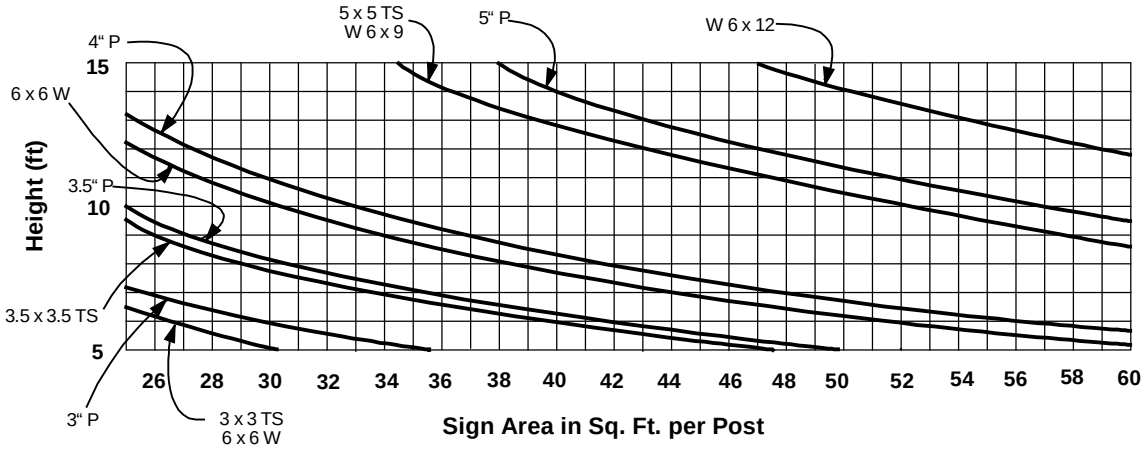


POST MATERIAL
P.....Steel pipe (std. wt.)
P.T.....Perforated steel tubing (0.105 in. wall)
TS.....Steel tube square (0.1875 in. wall)
_x_ W....Treated wood
W_x_.....Steel W shapes

SIGN POST SELECTION
60 MPH DESIGN WIND VELOCITY

Figure 1170-7
Sign Post Selection 60 mph Design Wind Velocity

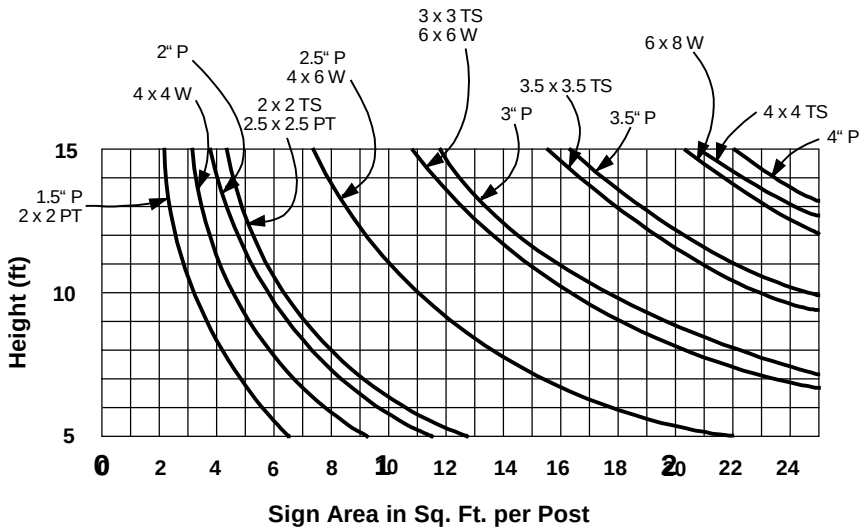


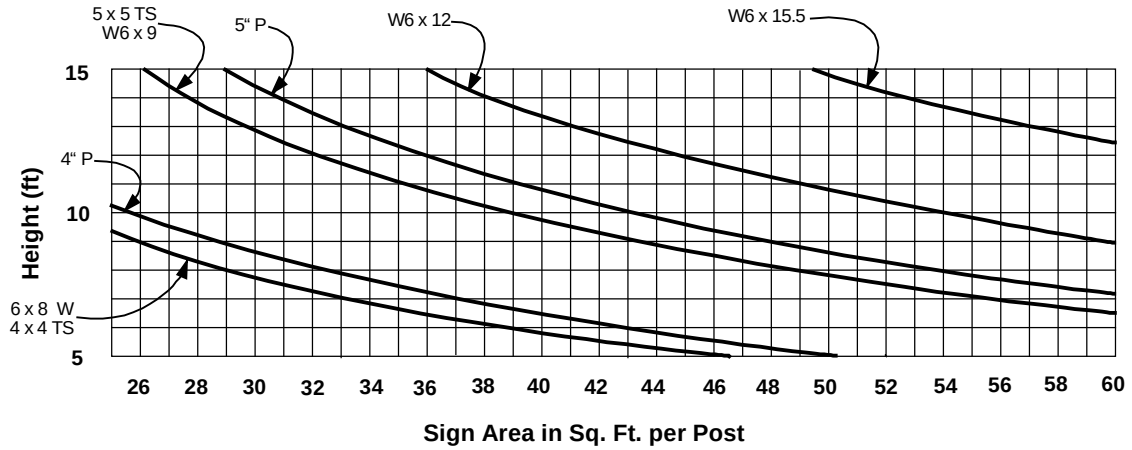


POST MATERIAL
P.....Steel pipe (std. wt.)
P.T.....Perforated steel tubing (0.105 in. wall)
TS.....Steel tube square (0.1875 in. wall)
_x_ W....Treated wood
W_x_.....Steel W shapes

SIGN POST SELECTION
70 MPH DESIGN WIND VELOCITY

Figure 1170-8
Sign Post Selection 70 mph Design Wind Velocity



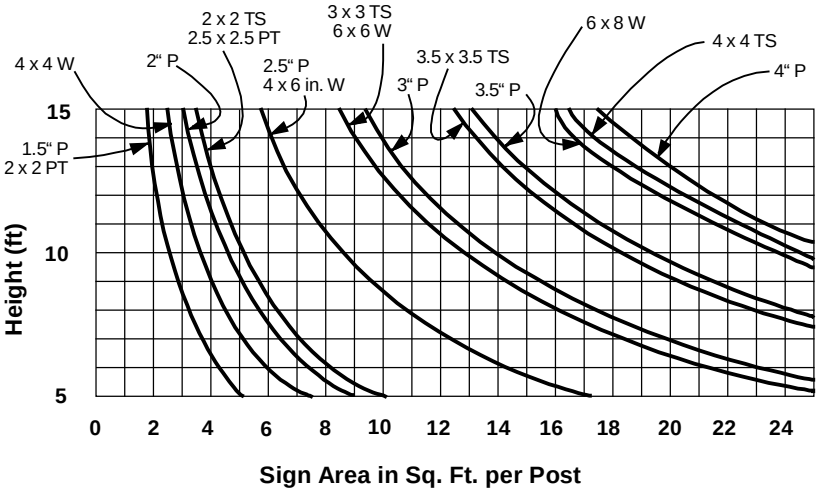


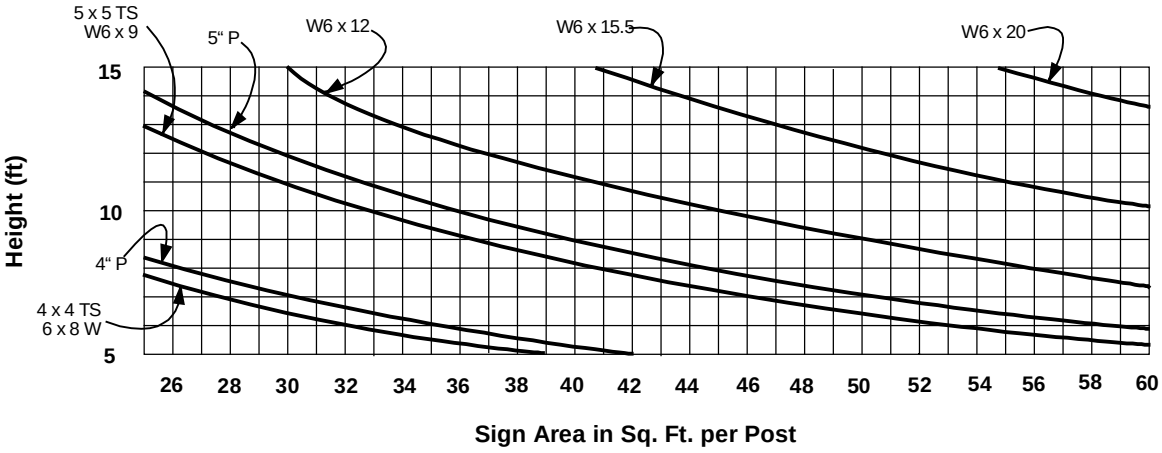
POST MATERIAL
P.....Steel pipe (std. wt.)
P.T.....Perforated steel tubing (0.105 in. wall)
TS.....Steel tube square (0.1875 in. wall)
_x_ W....Treated wood
W_x_.....Steel W shapes

SIGN POST SELECTION
80 MPH DESIGN WIND VELOCITY

Figure 1170-9

Sign Post Selection 80 mph Design Wind Velocity

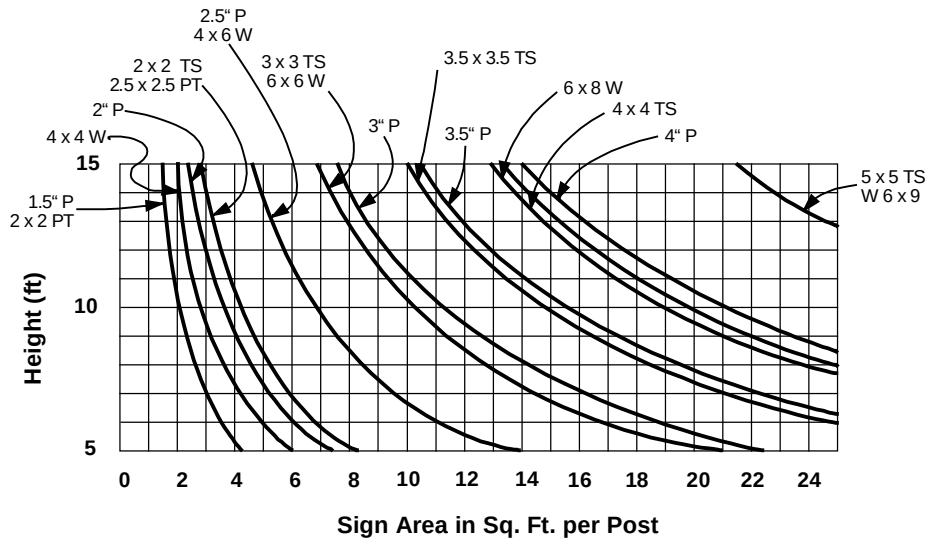


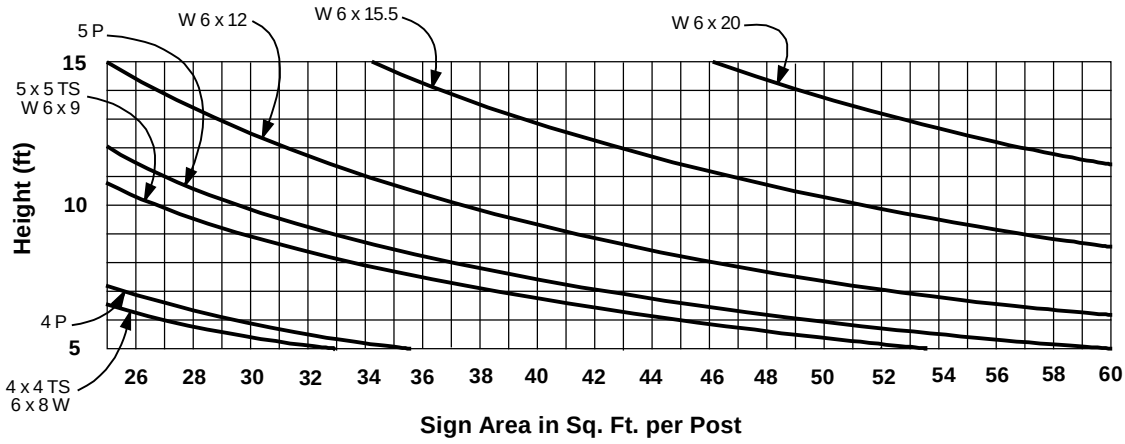


POST MATERIAL
P.....Steel pipe (std. wt.)
P.T.....Perforated steel tubing (0.105 in. wall)
TS.....Steel tube square (0.1875 in. wall)
_x_ W....Treated wood
W_x_.....Steel W shapes

SIGN POST SELECTION
90 MPH DESIGN WIND VELOCITY

Figure 1170-10
Sign Post Selection 90 mph Design Wind Velocity



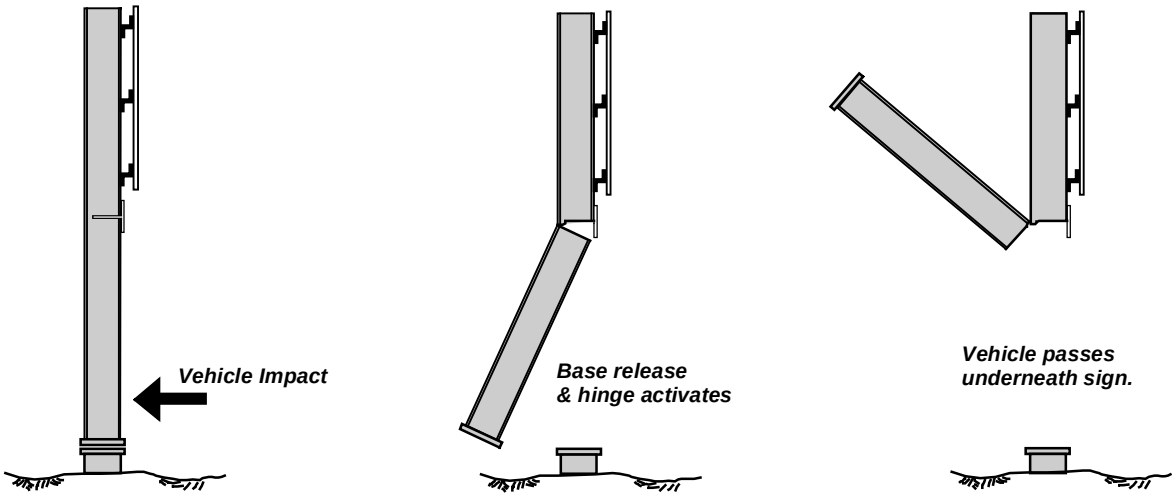


POST MATERIAL
P.....Steel pipe (std. wt.)
P.T.....Perforated steel tubing (0.105 in. wall)
TS.....Steel tube square (0.1875 in. wall)
_x_ W....Treated wood
W_x_.....Steel W shapes

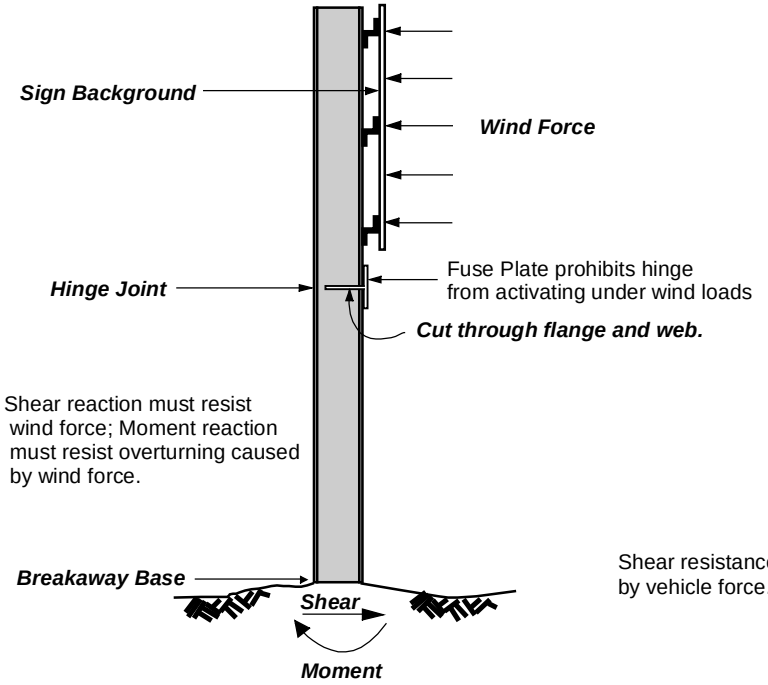
SIGN POST SELECTION
100 MPH DESIGN WIND VELOCITY

Figure 1170-11

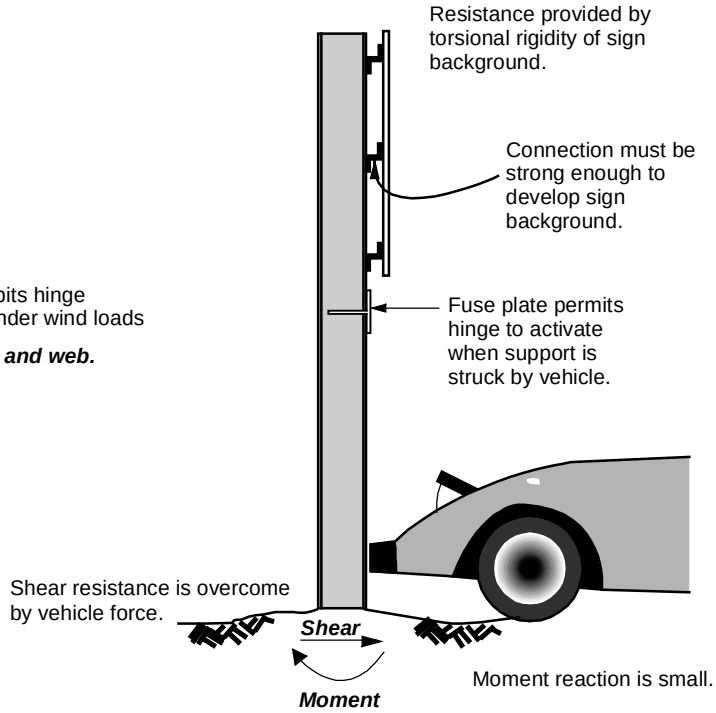
Sign Post Selection 100 mph Design Wind Velocity



VEHICLE IMPACT OPERATION



WIND LOADING CONDITION



COLLISION CONDITION

LARGE ROADSIDE SIGN SUPPORTS

Figure 1170-12

Large Roadside Sign Supports

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1180. Pavement Design

1180.1. Introduction
1180.2. Pavement Overview
1180.3. Wearing Course
1180.4. Binder Course
1180.5. Base Course
1180.6. Subbase/Select Material/Borrow
1180.7. Gravel Roads
1180.8. Glossary

1180.1. Introduction

Alaska's road transportation system is vital to the state's residents and economy. Pavements must withstand a variety of traffic and environmental conditions and must serve the public in a safe and comfortable manner. In addition, pavements are expected to perform over extended periods of time.

This chapter is an overview of the DOT&PF policy and design philosophy for pavements. Detailed policy and procedures that govern Alaska's flexible pavement design are provided in the *Alaska Flexible Pavement Design* (AKFPD) *Manual* and its companion software.

The *AKFPD Manual* is available online at:

http://www.dot.state.ak.us/stwddes/desmaterials/mat_pvmtmgt/pop_flexpaveman.shtml.

1180.2. Pavement Overview

1180.2.1 Pavement Structure

Pavement structure is a layered system of materials built on top of a prepared subgrade to protect it from excessive deformations due to traffic loads. In general, a pavement structure consists of (top to bottom): wearing course, binder course, base course (stabilized or unstabilized) and subbase or selected material (individually or in combination). The principal function of the layers is to distribute traffic load stresses within the pavement structure, thus protecting the subgrade from excessive deflection. Layer properties (i.e. density, strength, and stiffness) normally decrease from the top to the bottom of the system.

1180.2.2 Highway Pavements

A pavement design analysis is required for all roadway projects requiring pavement construction, reconstruction, or rehabilitation. The regional preconstruction engineer is responsible for the final pavement design.

1180.2.3 Non-Highway Pavements

Pavement designs for non-roadway projects, such as parking areas, paths, and sidewalks, do not require the use of the *AKFPD Manual* procedure if the design equivalent single axel load (ESAL) is below 10,000. If the ESALs are 10,000 or more, then follow Section 2.2.4 of the *AKFPD Manual*. The minimum thickness of all non-highway hot mix asphalt pavements shall be 2 inches.

A Type II or III, Class C hot-mix asphalt may be used for parking areas, paths, and sidewalks with low ESALs. Section 401 of the DOT&PF *Standard Specifications for Highway Construction* (specifications) addresses Class C asphalt pavement.

1180.3. Wearing Course

The wearing course is the top layer of a surfacing system that is in direct contact with traffic loads. The wearing course is designed to:

- Provide resistance to abrasion
- Provide a smooth ride
- Resist plastic deformation
- Resist water permeability
- Resist fatigue
- Resist thermal cracking

Available surfacing types are listed in section 7.3 of the *AKFPD Manual*. Following are descriptions of some of the more common types of surfacing DOT&PF uses.

1180.3.1 Hot Mix Asphalt (HMA)

Hot Mix Asphalt (HMA, or asphalt concrete pavement) is the predominant type of wearing course used on DOT&PF roadways. A pavement that receives such a surfacing is called a flexible pavement. HMA is appropriate for highway pavements, parking lots, pathways, and sidewalks.

HMA pavement structures are designed in accordance with the policies and design procedures in the *AKFPD Manual*. Use a minimum thickness of 2 inches for new and overlay HMA layers. The specifications cover HMA in Section 401.

1180.3.2 Asphalt Surface Treatment (AST)

An AST is an asphalt/aggregate application to a road surface. Usually less than 1 inch thick, asphalt surface treatments do not increase the load bearing capacity of pavement structures. They provide friction and decrease dust generation. ASTs are appropriate when unstable embankments are present and/or for low-traffic roadways.

ASTs may be used if any of the following conditions are met (refer to Section 2.1 of the *AKFPD Manual*):

- The AADT is less than 1,000
- Life-cycle cost analysis supports their use
- Unstable foundations underlie more than 60 percent of the project
- The regional preconstruction engineer has approved them

Design ASTs using the *Asphalt Surface Treatment Guide*, which is available online at:

http://www.dot.state.ak.us/stwddes/research/assets/pdf/fhwa_ak_rd_01_03.pdf

Section 405 of the specifications covers ASTs.

1180.3.3 Portland Cement Concrete (PCC)

PCC is rarely used in Alaska pavements. High cost and damage due to foundation settlement preclude its use in roadways.

If a PCC pavement is used, consult the 1993 *AASHTO Guide for Design of Pavement Structures*. Consult the regional materials engineer for special provisions, specific concrete mix designs, and subgrade requirements.

1180.3.4 Gravel Surfacing

See Section 1180.7 for guidance on gravel surfacing.

1180.4. Binder Course

The binder course is the bottom layer of pavement below the wearing course. The binder course supports the wearing course. A binder course has all the properties of a wearing course except that resistance to abrasion is not essential. The minimum thickness of a binder course is 3 inches when placed on top of a non-stabilized base and 2 inches when placed on top of a stabilized base.

The wearing course and binder course may be composed of the same material when advantageous; however, the binder course often has a different asphalt content and gradation or hardness of aggregate. A binder course is not necessarily required in a specific pavement design.

1180.4.1 Hot Mixed Asphalt (HMA)

Binder courses are usually HMAs, but in the case of overlays, the original wearing course layer becomes a binder course layer when topped with a new HMA layer.

The specifications cover HMA materials in Section 401.

1180.4.2 Recycled Asphalt Pavement

Recycled asphalt pavement is the process of recycling old asphalt into new pavement by in-place cold mixing process or hot mixing at a plant. To be considered adequate as a binder course, a recycled asphalt pavement must have a resilient modulus greater than 300 ksi.

Consult the regional materials engineer for recycled asphalt pavement special provisions.

1180.5. Base Course

The base course is the layer of material placed on top of the subbase or subgrade that supports the wearing and binder courses. A base course can be stabilized or non-stabilized.

Use of a bound stabilized base is required on all roadway construction, reconstruction, and rehabilitation projects except for:

1. Projects designed under the *Gravel to Pavement* program
2. Projects exempted in writing by the regional preconstruction engineer. Rationale for an exemption may include:
   - Projects with a low AADT
   - Areas underlain by unstable foundations, such as ice-rich permafrost, where settlement results in frequent maintenance
   - Projects for which a stabilized base will not provide a cost-effective improvement in the pavement performance, reduced maintenance, or reduced future rehabilitation costs through a comprehensive life-cycle cost analysis. The

period of the life-cycle cost analysis shall be 30 years.

- Roads designed on behalf of agencies other than DOT&PF

1180.5.1 Stabilized Bases

Stabilized bases are normally defined as standard base course materials containing one or more of the following binder additives:

- Asphalt emulsion
- Asphalt cement
- Foamed asphalt cement
- Lime
- Portland cement
- Reclaimed asphalt pavement (RAP)

Stabilized bases are used to improve long-term pavement performance, reduce maintenance costs, and reduce future rehabilitation costs. While a stabilized base has no minimum amount of required binder additive, it must achieve a resilient modulus of at least 80 ksi.

The minimum thickness of a stabilized base is 3 inches. In developing flexible pavement designs using stabilized bases, refer to general policies GP5, 6, and 7 in Section 2.1 of the *AKFPD Manual*. In addition, use the following:

1. *Alaska Soil Stabilization Guide* (Report No. FHWA-AK-RD-01-6B)
2. The mechanistic design method used in the AKFPD computer program
3. The definition of stabilized layers as found in Section 7.4.1 of the *AKFPD Manual*

The *Alaska Soil Stabilization Guide* is online at:

http://www.dot.state.ak.us/stwddes/research/assets/pdf/fhwa_ak_rd_01_06b.pdf

The resilient modulus, M_R, of the stabilized base is determined from experience, back calculation, or testing and is a necessary input variable to run the AKFPD analysis program.

Following are stabilized bases used relatively frequently in Alaska:

Asphalt Treated Base (ATB)

Asphalt treated base (ATB) is a stabilized base course constructed using a minimum of 4 percent asphalt cement binder. ATB's primary use is as a binder course in the Alaska Renewable Pavement (ARP) layering system. Refer to sections 7.4.2 and 7.4.3 of the *AKFPD Manual* for a detailed discussion of ATBs and the ARP. To be used as a binder course in the AKFPD method, an ATB must have a resilient modulus greater than 300 ksi.

There is some functional overlap with HMAs, but ATBs have different asphalt oil content, can use softer aggregate, and are less restrictive on aggregate gradation and in placing and leveling requirements. Therefore, they are more economical than HMAs.

Asphalt treated base course is addressed in section 306 of the specifications.

Emulsified Asphalt Treated Base (EATB)

Emulsified asphalt treated base course (EATB) is addressed in section 307 of the specifications.

When used with emulsified asphalt, crushed asphalt base course is also considered a stabilized base. Crushed asphalt base course is covered in Section 308 of the specifications.

Reclaimed Asphalt Pavement (RAP)

Reclaimed asphalt pavement (RAP) that contains greater than 50 percent asphalt concrete pavement or greater than 3 percent residual asphalt content is considered a stabilized base.

1180.5.2 Non-Stabilized Bases

Non-stabilized bases comprise materials that do not have any binder additive. Crushed aggregate is the most common type of base course. Non-stabilized base course layers shall be a minimum of 4 inches thick.

Aggregate base course is covered in Section 301 of the specifications. Reclaimed asphalt pavement (RAP) may be used as base course, or blended with aggregate base course, when produced in accordance with section 308 of the specifications.

1180.6. Subbase/Select Material/Borrow

The lower pavement structure typically includes subbase or selected material, individually or in combination. Where existing natural material is of adequate quality, it may serve as the lower portion of the pavement structure.

Section 304 of the specifications covers subbase.

1180.7. Gravel Roads

1180.7.1 General

Alaska has several existing major gravel roads and gravel surfacing is appropriate for some new, very low-volume roads in rural areas, where dust is not an environmental issue. This section has therefore been included in this "pavement design" section of the *Preconstruction Manual*.

Maintenance cost of gravel roads is considerably higher than that for HMA, AST, or PCC surfaced roads and is an important consideration when performing cost-effective or life-cycle cost analysis.

1180.7.2 Gravel Surface Structure

New Gravel Roads

The following references provide guidance that will assist in design of gravel roads:

- *AKFPD Manual*
- AASHTO *Guidelines for Design of Very Low-Volume Local Roads*
- AASHTO *Design of Pavement Structures-Part II* (Chapter 4 Low-Volume Road Pavement Design)
- Asphalt Institute *MS-1 Thickness Design Asphalt Pavements for Highways and Streets*.

When future paving of a gravel road is planned, evaluate the pavement structure in accordance with the design guidance appropriate to the anticipated future pavement type (i.e. *AKFPD Manual* for HAP).

Consult the regional materials engineer for more specific gravel roadway design guidance. Aggregate surface courses are addressed in section 301 of the specifications.

Consult the regional Maintenance and Operations (M&O) Section to determine if adequate personnel and equipment will be available to maintain the roadway prior to selecting gravel as surfacing.

Existing Gravel Roads

The roadway surfacing design process for existing gravel roads is as follows:

1. Evaluate the existing gravel road for previous performance and drainage system adequacy. M&O should participate.
2. Determine the adequacy of the embankment strength. Consider in the determination that the existing roadway structure will or will not support a base and surface course the recommendations from Materials, and Maintenance and Operations. Supplement as needed by structural support readings (i.e. Falling Weight Deflectometer, California Bearing Ratio, Dynamic Cone Penetrometer) or fines content.

If the embankment has adequate strength, provide sufficient aggregate surface course to shape cross slope and superelevation as a minimum. Aggregate surface course is addressed in section 301 of the specifications.

If the embankment does not have adequate strength, follow the guidance provided in the "New Gravel Roads" portion of this subsection.

1180.8. Glossary

The following is a brief glossary. A comprehensive glossary of asphalt design and construction terminology is found in the *AKFPD Manual*.

AADT: Average Annual Daily Traffic. AADT is a measure of traffic volume.

Asphalt Concrete: Also referred to as asphalt concrete pavement (ACP), hot mix asphalt (HMA), flexible pavement, and hot bituminous pavement. It is the material most commonly used for surfacing roadways and airports in Alaska that are subject to high traffic. ACP is a high-quality, controlled, hot mixture of asphalt cement and graded aggregate, thoroughly compacted into a uniform dense mass.

Emulsified Asphalt: A combination of ground asphalt, emulsifying agents, and water. It cures by "breaking," which is water removal by evaporation or steaming off. Asphalt emulsions fall into three categories: anionic, cationic, and nonionic. The first two types are ordinarily used in roadway construction and maintenance. The anionic (electronegatively charged) and cationic (electropositively charged) classes refer to the electrical charges surrounding the asphalt particles. With nonionic emulsions, the asphalt particles are neutral. Cationic emulsions are used with aggregates that are negatively charged. Anionic emulsions are used with positively charged aggregates. Opposite charges attract. The relative setting time of either slow setting (SS), medium setting (MS), or rapid setting (RS) emulsions further categorizes emulsified asphalts.

Emulsified Asphalt Treated Base (EATB): A product of mixing base course material with emulsified asphalt and sometimes a few percent Portland cement. It can be mixed on grade by heavy equipment or by specially made traveling plants. It can also be produced in a central mixing plant. Emulsified asphalt treated bases bind up P_{200} in base course material and reduce frost heave and high moisture content. They also can create an effective structural support layer so that the otherwise required thickness of pavement or subbase can be reduced.

ESAL: An acronym for Equivalent Single Axle Load. An ESAL is the vertical load of a standard 18,000-pound, dual-tire, single-axle truck. The effect of pavement performance of any combination of axle loads is equated to the number of ESALs.

Mix Design: The project-specific combination of materials to be used in construction of a given pavement.

Resilient Modulus (M_R): An elastic property of pavements and stabilized bases. The resilient modulus is defined as the ratio of repeated axial stress over the recoverable elastic strain.

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1190. Driveway Standards

1190.1. General
1190.2. Definitions
1190.3. Functional Classification
1190.4. General Principles
1190.5. Control Dimensions

1190.1. General

Driveways that intersect public roadways are a type of at-grade intersection. The numbers of accidents at driveway intersections are disproportionately higher than at public road intersections and consequently, driveway intersection design merits special attention.

The regional director or his or her designee may grant exceptions on driveways to be constructed or reconstructed along existing highways built to design standards prior to the *AASHTO A Policy on the Geometric Design of Highways and Streets 2001*. Driveways to be constructed or reconstructed along highways built according to the *AASHTO A Policy on the Geometric Design of Highways and Streets 2001* must follow the procedures of Section 1100.3. in the consideration of waivers from the driveway standards.

Use municipal geometric standards approved for use on Department roadways within a municipality instead of the geometric standards contained in this section for all driveways within the municipality.

The regional director will grant approval of municipal driveway geometric standards for use on roadways administered or maintained by the Department after review by the following people:

- Regional preconstruction engineer
- Regional director of maintenance and operations
- Headquarters chief engineer of Statewide Design and Engineering Services

1190.2. Definitions

(See Figures 1190-1 through 1190-7b).

Angle of Intersection: The horizontal angle of 90 degrees or less between the driveway centerline and the edge of the traveled way of the public roadway

Buffer Area: The border area along the property frontage between the edge of traveled way and the right-of-way line bounded at each end by the frontage boundary lines

Collector-Distributor Road: An arterial road (usually one-way, with limited access) auxiliary to and adjacent to the side of a freeway for collection or distribution of traffic entering or leaving the freeway

Clear Zone: The roadside border area, starting at the edge of the traveled way, available for safe use by errant vehicles. Establishment of clear zone implies that rigid objects and other hazards with clearances less than the minimum width should be removed, relocated to an inaccessible position or outside the minimum clear zone, remodeled to make safely traversable or breakaway, or shielded.

Corner Clearance: The distance along the edge of traveled way of a public road or street from the near edge of traveled way of another public road or street to the tangent projection of the nearest edge of any driveway, not including transition slopes, tapers, or return-radii

Distance Between Driveways: The distance measured parallel to the centerline of roadway between intersection of the inside edges of two adjacent driveways and the right-of-way line

Driveway Foreslope: In cross-section, that portion of the driveway embankment that slopes downward from the driveway

Edge Clearance: The distance measured along the edge of traveled way between the frontage boundary line and the tangent projection of the nearest edge of driveway, not including returns, flares, or transition

Frontage: The length along the road or street right-of-way line of a single property tract, measured parallel to the centerline of the road or street, between the edges of the property. Corner property at a road or street intersection has a separate frontage along each road or street.

Frontage Boundary Line: A line perpendicular or radial to the public road or street centerline at each end of the frontage, extending from the right-of-way line to the edge of traveled way

Frontage Road: A local road auxiliary to and adjacent to the side of an arterial highway for service

to abutting property and adjacent areas and for control of access

Interchange Ramp: A turning roadway at an interchange for travel between intersecting legs

May: A term indicating permission. There is no requirement for design or application.

Return: The curbed or uncurbed edge of the road, street, or driveway intersection that connects the edge of the public roadway with the adjacent edge of the driveway or another public roadway; usually as a single radius

Right-of-Way (ROW): A strip of land owned by a municipality or the state upon which a public road is constructed

Setback: The distance measured perpendicular or radial to the right-of-way line and the nearest building, pump island, display stand, or other manmade object over 6 inches in height within the property

Shall: Where requirements in the design standards are described with the "shall" or "must" stipulation, it is mandatory to meet these requirements.

Should: An advisory term. Where the word "should" is used, the specific design criteria are recommended, but they are not mandatory. However, you should document why you did not follow the recommended criteria.

Width: The distance across the driveway at its narrow point within the right-of-way measured at right angles to the centerline of the driveway

1190.3. Functional Classifications

Highways, roads, and streets are classified according to their intended function as arterials, collectors, or local roads or streets. Arterials are primarily, if not exclusively, for through traffic along the roadway. Local roads and streets are primarily, if not exclusively, to provide access to the public road system from the property adjacent to the roadway. Collectors serve as limited through traffic ways and provide access from the adjacent property. For safety and efficiency, arterials should have few, if any, private driveways.

Freeways and expressways are special, high-design-type arterials that are exclusively for through traffic. Access is legally controlled along the arterial and no private driveways are permitted.

Driveways will not be allowed on other arterials if other access is available. The Department's primary concern is the safe, efficient movement of through traffic. If driveways directly accessing the arterial are necessary, then their number, location, and design will be controlled to minimize the effect on through traffic.

On local roads and streets, the roadway's primary purpose is to provide access to adjacent lands. Consequently, the Department only exercises driveway controls that are necessary to a safe roadway. Collector roadways require more driveway controls than local roads and streets, but less than arterials.

Where there are differences in the required degree of control for driveway design and placement due to variance in functional classes, we provide differing criteria. The process of formally classifying Alaska roadways is not complete. If a particular roadway is not classified, the regional director or his or her designee will determine the interim classification for administering the driveway design standards.

1190.4. General Principles

1. **Buffer Area:** Buffer areas should be graded and landscaped to ensure adequate sight distance along the roadway, proper drainage, adequate clear zones, and a good appearance.

2. **Sight Distance:** The profile grade of a driveway and the treatment of the buffer area should allow the driver on the driveway to see sufficiently along the roadway to enable entry to the roadway without creating a hazard, and without encroaching into the traveled way (See Figure 1190-1).

3. **Setbacks:** The location of improvements on private property adjacent to the right-of-way line should not require parking, stopping, and maneuvering of vehicles within the right-of-way for vehicles or patrons to be properly served.

4. **Location of Driveways:** The location of driveways must minimize interference with the free movement of normal roadway traffic. This will reduce the hazards caused by congestion. Do not place driveways adjacent to or within an intersection. They also should not be located on

a separate turning roadway, auxiliary speed change lane, or exclusive turning lane. Driveway placement must not provide direct access to the through roadways, ramps, or collector-distributor roadways of a freeway or expressway.

5. **Number and Arrangement of Driveways:** The number of driveways provided to a property should be the minimum required to adequately serve the needs of that property. Frontages of 50 feet or less must be limited to one driveway per frontage. Not more than two driveways should be provided to any single property tract or business establishment, but where the single ownership frontage exceeds 1,000 feet, additional driveways may be allowed provided they are required for servicing the property, and the distance between adjacent driveways is at least 330 feet.

   Where two driveways are provided for one frontage less than 1,000 feet long, the clear distance between driveways should not be less than the minimum distances presented in 1190.5., Control Dimensions. Corner clearances at intersections should also be in accordance with the distance shown in 1190.5.

   Develop driveways and adjacent property so that vehicles entering any arterial or collector roadway are not required to do so by backing into the right-of-way. Develop all frontages having two or more driveways and all commercial developments so that backing into a public roadway isn't necessary. Multi-family residential developments of more than four units per lot are considered commercial development as far as driveway standards are concerned.

6. **Curbs:** Where the posted speed limit on an existing roadway or the design speed on a proposed roadway is 50 mph or greater, driveway curbs, if used, must be the mountable type and you must place them no closer to the edge of through traveled way than the outside edge of shoulder or 8 feet, whichever is greater. On rural roadways with speed limits or design speeds less than 50 mph, curbs, if used, should be mountable and placed at the outside edge of shoulder, but no closer than 4 feet from the edge of traveled way. Surface all roadway areas between the edge of traveled way and curbs placed parallel to the edge of traveled way with the same material as the traveled way.

7. **Drainage:** Construct all driveways and buffer areas so that there will be no right-of-way surface drainage onto the traveled way of the public roadway. Where driveways are on the high side of a superelevated roadway, or are otherwise on a descending grade into the edge of traveled way, special drainage structures, including drop inlets or slotted drains, may be required to prevent non-right-of-way drainage from flowing into or across the public roadway traveled way. It is the responsibility of the property owner or permittee to maintain these drainage structures.

   In addition, design and construction of the driveway and buffer must not impair or alter drainage within the right-of-way, which may damage or threaten the stability of the public roadway. All drainage facilities within the right-of-way must conform to any applicable Department standards.

8. **Embankment (Transverse Slopes):** Driveway foreslopes, when constructed in a roadway ditch section on high-speed roadways, should have a 6:1 or flatter slope within the roadway's clear zone. Low-speed roadways or urban areas may have transverse foreslopes steeper than 6:1. Refer to Section 1130.3.1 and the *2002 AASHTO Roadside Design Guide* Section 3.2.3, Transverse Slopes, for additional information on driveway transverse slopes within the clear zone.

9. **Lighting:** The Department will not provide roadway illumination solely for private driveways. The adjacent property owner may, except as stated here, install such lighting as long as it conforms to accepted highway lighting criteria in the AASHTO publication *An Informational Guide for Roadway Lighting*. A property owner may not illuminate a driveway if it is within 500 feet of an unlit public road intersection.

10. **Anticipated Traffic:** It is not necessary to estimate the volume of traffic for the majority of driveways. However, for larger developments it may be desirable, if not necessary, to do so to determine the number, size, and design of the driveways needed to serve the development. A

few well-designed driveways are preferable to many smaller driveways.

When the volume of traffic is expected to exceed 100 vehicles during the peak hour, a competent licensed professional engineer should conduct an analysis of the vehicle trip generation characteristics of the development. If such an analysis is not available, you may use the average trip generation factors in Table 1190-1, which are based on the Institute of Transportation Engineers Informational Report, *Trip Generation, 3rd Edition*, to determine anticipated traffic for establishing the number, size, and design of driveways needed to accommodate the development.

"Peak hour" is the peak traffic-generating hour of the off-street facility.

Table 1190-1
Average Trip Generation Factors *

Type of Development	Peak Hour Trips
Apartments and other residential units	1.00 trips per dwelling unit
Hotels and motels	1.00 trips per room
Schools (All)	0.25 trips per student
Industrial facilities	0.50 trips per employee
Hospitals	1.36 trips per bed
Nursing homes	0.36 trips per bed
Clinics	2.48 trips per 1,000 sf*
General office buildings	2.00 trips per 1,000 sf
Medical office buildings	3.90 trips per 1,000 sf
Civic centers	2.85 trips per 1,000 sf
Post offices, motor vehicle offices and other high-turnover public services	11.00 trips per 1,000 sf
Discount stores	6.97 trips per 1,000 sf
Hardware stores	5.20 trips per 1,000 sf
Shopping centers, per feet squared	
0-50,000 sf	$Trips = 110\sqrt{\frac{\text{Size of Shopping Center in sf}}{1{,}000}}$
50,000-1,500,000 sf	$Trips = 3.22\left[\frac{\text{Size of Shopping Center in sf}}{1{,}000}\right] + 614$
Service stations	6.00 trips per pump (two hoses)
Car wash	132.00 trips per site
Truck stop	88.00 trips per site
Supermarket	15.7 trips per 1,000 sf
Convenience market	47.0 trips per 1,000 sf
Wholesale markets	0.52 trips per 1,000 sf
Furniture stores	0.10 trips per 1,000 sf
Banks	30.00 trips per 1,000sf
Savings & Loan offices	9.70 trips per 1,000 sf
Insurance offices	2.40 trips per 1,000 sf

* Average number of one-way trips generated (or attracted) by a given facility during the peak generating (or attracting) hour of the facility. This peak may or may not coincide with peak traffic flow on the adjacent street. Where the average time of the motorist at the generator (or attractor) is less than one hour, the flow is half into the facility and half out. (Example: Truck stops with 88 peak hour trips per site would represent 44 inbound and 44 outbound trips.) Trips based on area are based on gross leasable floor area.

11. **Median Openings:** Where a median exists or is to be constructed on a public roadway, driveways should be designed and controlled to allow right turns only. Median openings should not be provided for driveways unless all the following conditions exist:

    a. There is a sufficient volume of traffic using the subject driveway to warrant driveway intersection design as a public intersection.

    b. The driveway intersection is evenly spaced between adjacent arterial or collector intersections.

    c. Installation of a signal at present or in the future at the subject driveway intersection will not adversely affect the capacity of the public roadway.

    To minimize wrong way movements on the divided public roadway, driveways planned near a median opening should be placed either directly opposite the median opening or at least 200 feet from the median opening.

12. **Design Vehicles:** Refer to AASHTO *A Policy on the Geometric Design of Highways and Streets 2001,* Chapter 2, Design Vehicles General Characteristics, for guidance in selecting the appropriate design vehicle for the driveway. At least one driveway shall have widths, intersection alignments, and corner radii designed to accommodate the turning paths of the largest vehicles generated by the site. This would include large single units or tractor-trailer combination vehicles that deliver freight.

1190.5. Control Dimensions

Specific control dimensions implement the general principles in 1220.4. Exceed minimum dimensions as much as possible. Due to differing conditions in rural and urban areas, different dimensions are provided. Where appropriate, the control dimensions also reflect the difference between differing functional classes of roadways.

In administering these driveway standards, urban areas have populations of 500 or more within a defined compact area. The defined area need not be incorporated, but an incorporated place containing 500 people would be an urban area. Unincorporated places that have the characteristics of an incorporated community of 500 should be considered urban. In addition, if a roadway has urban characteristics such as small lot frontages, you may use the urban control dimensions.

1. **Sight Distances:** Figure 1190-1 illustrates the unobstructed sight distance along the public roadway, which should be available to a motorist entering the roadway. On arterial collector roadways, if the appropriate sight distance cannot be reasonably achieved, relocate the driveway.

   The sight line used to set sight distance is from the entering height of eye (3.5 feet above the driveway surface) to the driver eye height of the design vehicle (3.5 feet above the surface of the public roadway at the required distance from the driveway). The driver's eye is assumed to be between 14.4 to 17.8 feet from the edge of the nearest through traveled way, and the triangle formed by the sight lines left and right from this point to the required sight distances left and right along the public roadway is the sight distances triangle. Nothing should substantially obstruct the entering driver's view of public roadway traffic anywhere within this triangle.

2. **Width:** Residential driveways, rural and urban, should be a minimum of 14 feet wide and a maximum of 20 feet wide. Rural farm driveways should be a minimum of 14 feet wide and a maximum of 24 feet wide to accommodate machinery. Commercial driveways should be a minimum of 24 feet wide for traffic volume up to 100 vehicles per hour and may be a maximum of 34 feet wide for up to 200 vehicles per hour. Where repetitive peak hour traffic is expected to exceed 200 vehicles per hour, the driveway should be designed as a normal street intersection in accordance with the AASHTO publication *A Policy on the Geometric Design of Highways and Streets, 2001* as modified by Chapter 11 – Design of the Department's *Alaska Highway Preconstruction Manual.*

3. **Driveway Angle:** The driveway angle should be 90 degrees. It must not be less than 60 degrees except where designed as a one-way, one-lane,

right-turn-only ramp, in which case it should be designed in accordance with *A Policy on the Geometric Design of Highways and Streets 2001* (AASHTO).

4. **Return Radii:** Curb or edge of pavement returns should connect the edge of the driveway with the face of curb on curbed roadways and with the edge of a 9-foot paved shoulder on uncurbed roadways. Where uncurbed roadways have paved shoulders less than 9 feet wide, the return should terminate 8 feet from the edge of traveled way and be connected to the edge of pavement (traveled way or paved shoulder) with a 10:1 taper (10 feet longitudinally along the roadway for each 1 foot transversely).

   The return radii for driveways using returns, curbed or uncurbed, should conform to Table 1190-2.

5. **Curb Cuts:** The bottom width of curb cuts should equal the width of driveway and should match the flow line (or bottom of curb face line) of the curb section at the edge of roadway. Transitional slopes should begin at the edge of driveway and slope upward to reach the top of a 6-inch-high curb face in 6 feet. The transitional slopes behind the curb face may have a constant width with a variable slope or a constant slope with a variable width.

6. **Distance between Driveways:** The minimum distance between two adjacent driveways, on the same parcel, measured along the right-of-way line between the adjacent edges, should conform to Table 1190-3.

7. **Setback:** Setback distances must conform to local zoning requirements. Where local zoning ordinances do not provide a minimum setback, the minimum setback should be 16.5 feet, and where angle parking is permitted adjacent to the right-of-way line, the setback should be 50 feet.

8. **Edge Clearance:** The property line edge clearance should be equal to the return radius for driveways using returns and should be 16.5 feet for driveways using curb cuts with transitional slopes. *Exception:* Where a common-use driveway is to serve two adjoining properties, the approximate centerline of the driveway may be on the frontage boundary line.

9. **Corner Clearance:** The minimum distance from the nearest face of the curb, or nearest edge of traveled way for uncurbed roadways, of an intersecting public roadway to the nearest edge of driveway should conform to Table 1190-4.

10. **Driveway Profiles:** The maximum access grade for a residential driveway should be 15 percent. Commercial driveways should have a maximum algebraic difference of 8 percent between access grade and landing grade. The maximum landing grade is $\pm$ 2 percent for all driveways. Driveway profiles must conform to the following descriptions.

    a. **Driveway with Uncurbed Returns:** Public roadway with a negative cross-slope (i.e. outer edge of traveled way lower than lane or centerline):

       - From the outer edge of the traveled way to the edge of the shoulder or 9 feet, whichever is greater, the driveway profile grade should be the same as the traveled way or shoulder cross-slope.
       - From the outer edge of the shoulder, a vertical curve should connect the profile to a positive or negative grade, which will bring the driveway profile to the adjacent property grade.

    b. **Driveway with Curbed Returns:** Public roadway with a negative cross-slope (i.e. outer edge of traveled way lower than lane or centerline):

       - Beginning with an angle point at the flow line (bottom of face of curb) along the roadway, the driveway profile should rise at a gradient such that the algebraic difference in grade between the cross-slope of the roadway and the grade of the driveway does not exceed 8 percent.
       - A landing zone must begin after a rise of 6 inches.

    c. **Driveway with Returns:** Public roadway with positive cross-slope (i.e., on high side of superelevated section):

- From the outer edge of traveled way to the edge of the shoulder or 8 feet, whichever is greater, the driveway profile grade should be the same as the traveled way superelevation rate.
- From the outer edge of the shoulder, a vertical curve should connect the profile to a positive or negative grade, which will bring the driveway profile to the adjacent property grade

d. **Driveway with Curb Cuts**

- From the bottom face of curb or flow line, the driveway profile grade should slope uniformly upward at a grade not to exceed an algebraic difference of 8 percent with the adjacent lane or shoulder cross-slope.
- If a sidewalk or portion thereof remains to be crossed, the driveway profile may match the surface of the sidewalk.
- The profile should then follow a vertical curve or have an angle point, if necessary, to connect with a positive or negative grade, which will bring the driveway profile to the adjacent property grade.

e. **Vertical Curves:** Vertical curve should be symmetrical and as flat as feasible. Crest vertical curves should not exceed a 3¼-inch hump in a 12-foot chord, and sag vertical curves should not exceed a 2-inch depression in a 12-foot chord. Vertical curves must not have humps or depressions exceeding 3.6 inches in a 12-foot chord.

f. **Landings:** All driveways are to have landing zones. Landing length depends on anticipated traffic. Passenger cars require 12 feet minimum while semi-tractor trailers require 30 feet based on wheel bases.

g. **Pedestrian Areas:** Where curbed returns intersect a pedestrian way, provide appropriate handicapped access ramps.

11. **Speed Change Lane and Left-Turn Lanes:** On high-speed (50 mph or over) or high-volume arterial roadways, speed change lanes may be required for the acceleration or deceleration of vehicles entering or leaving the public roadway from or to a higher-volume traffic generation (greater than or equal to 100 vehicles per hour) or attracting development. Use Figure 4-3 of NCHRP 279 Intersection Channelization Design Guide as a guideline for the right-turn treatments. On a one-way street, the above criteria also apply to the left through lane. For guidelines on the need for left-turn lanes on a main street or road at a driveway, refer to Exhibit 9-75 in AASHTO *A Policy on the Geometric Design of Highways and Streets 2001*.

Table 1190-2
Driveway Return Radii (feet)

Driveway	Residential		Farm		Commercial	
Width (ft)	Curbed	Uncurbed	Curbed	Uncurbed	Curbed	Uncurbed
14 - 20	*20	20	-	20	-	-
24 - 34	-	-	-	40	*40	40

* For curbed roadways where residential driveways or commercial driveway have a 100-vehicles-per-hour or fewer repetitive peak, use a curb cut rather than a return.

Table 1190-3
Distance Between Driveways

(*On Same Parcel*)

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

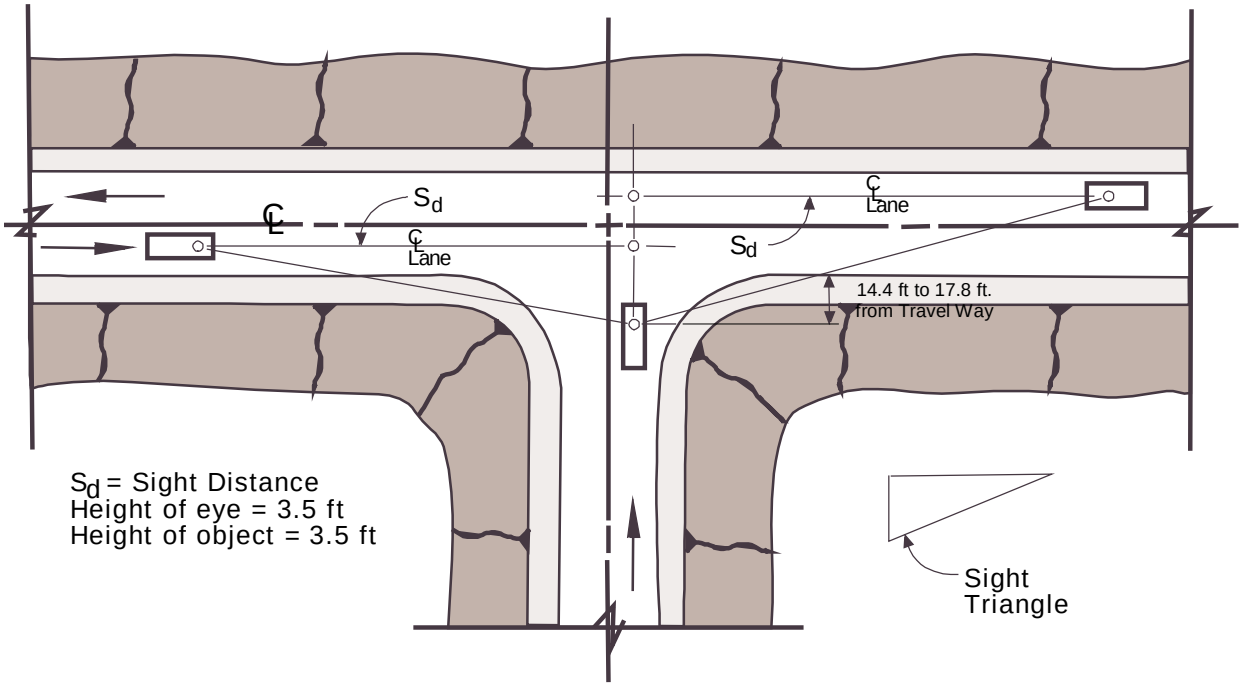
Hourly Volume Less than or equal to 10 vph	
Functional Classification	**Distance**
Arterial roadways	75 feet
Collector roadways	50 feet
Local roadways	35 feet

Table 1190-4
Corner Clearance

Hourly Volume less than or equal to 10 vph			
Corner Clearance (Feet)			
Functional Classification	Curbed Crossroad	Uncurbed Crossroad	
		Urban	Rural
Arterial roadways	60 feet	70 feet	100 feet
Collector roadways	50 feet	60 feet	60 feet
Local roadways	40 feet	50 feet	60 feet

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

DRIVEWAY SIGHT DISTANCE



DESIGN SPEED or POSTED SPEED LIMIT mph	SD MINIMUM (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645

Note: Minimum sight distances are stopping sight distances for level grades, between –3% and +3%. Refer to AASHTO *A Policy on the Geometric Design of Highways and Streets 2001,* for desirable intersection sight distances and for grade adjustments.

Figure 1190-1
Driveway Sight Distance

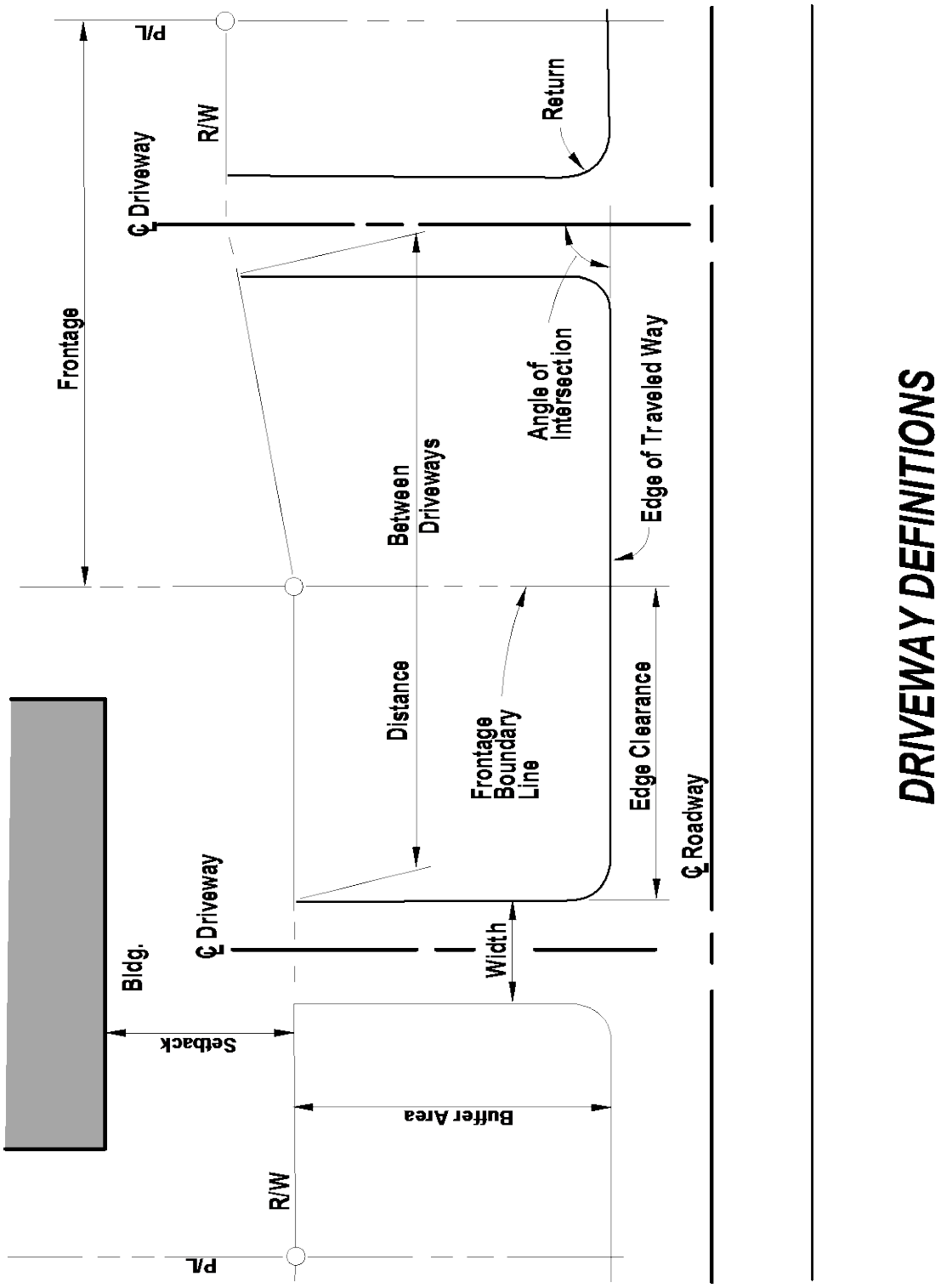


Figure 1190-2
Driveway Definitions

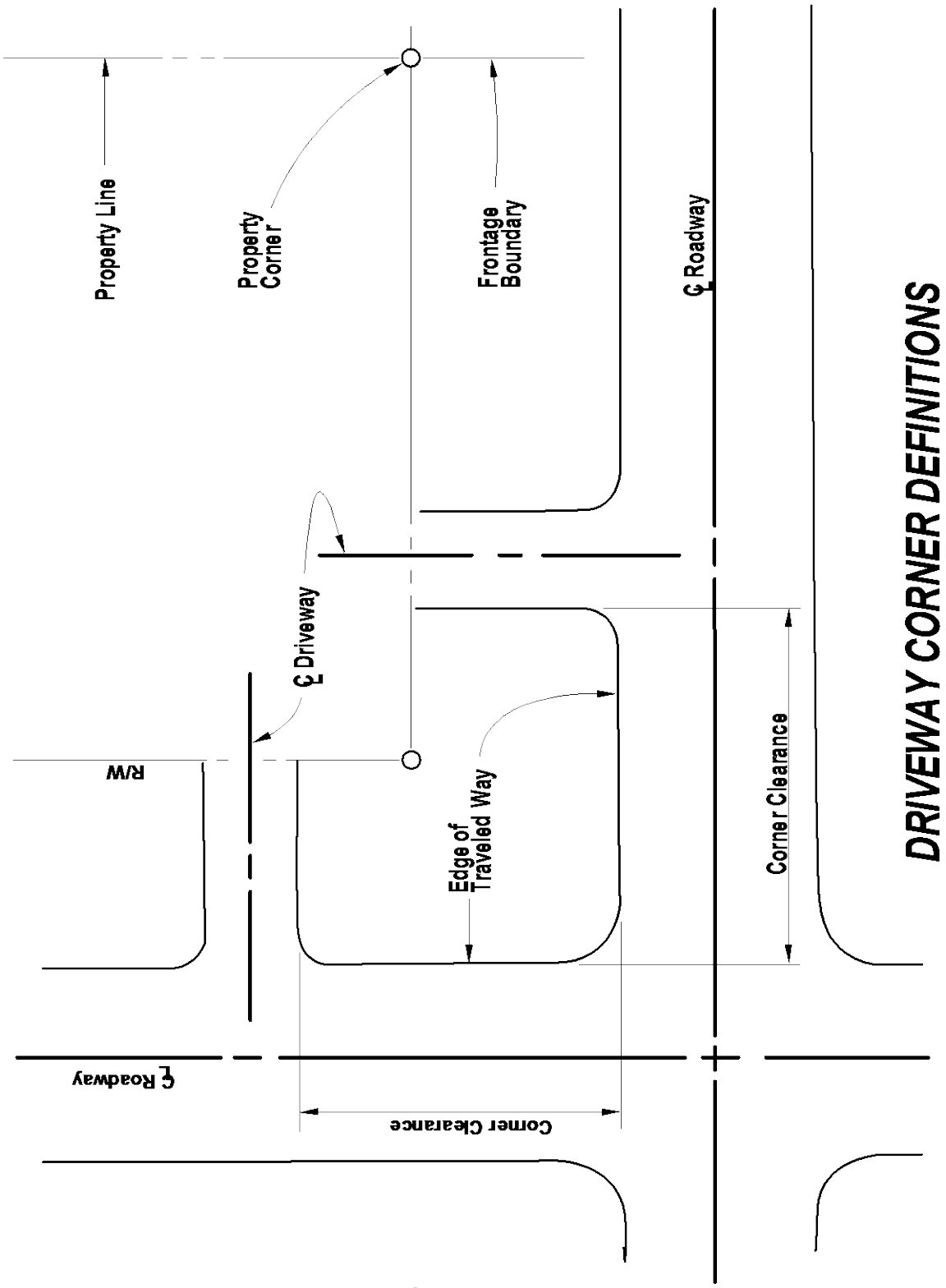


Figure 1190-3
Driveway Corner Definitions

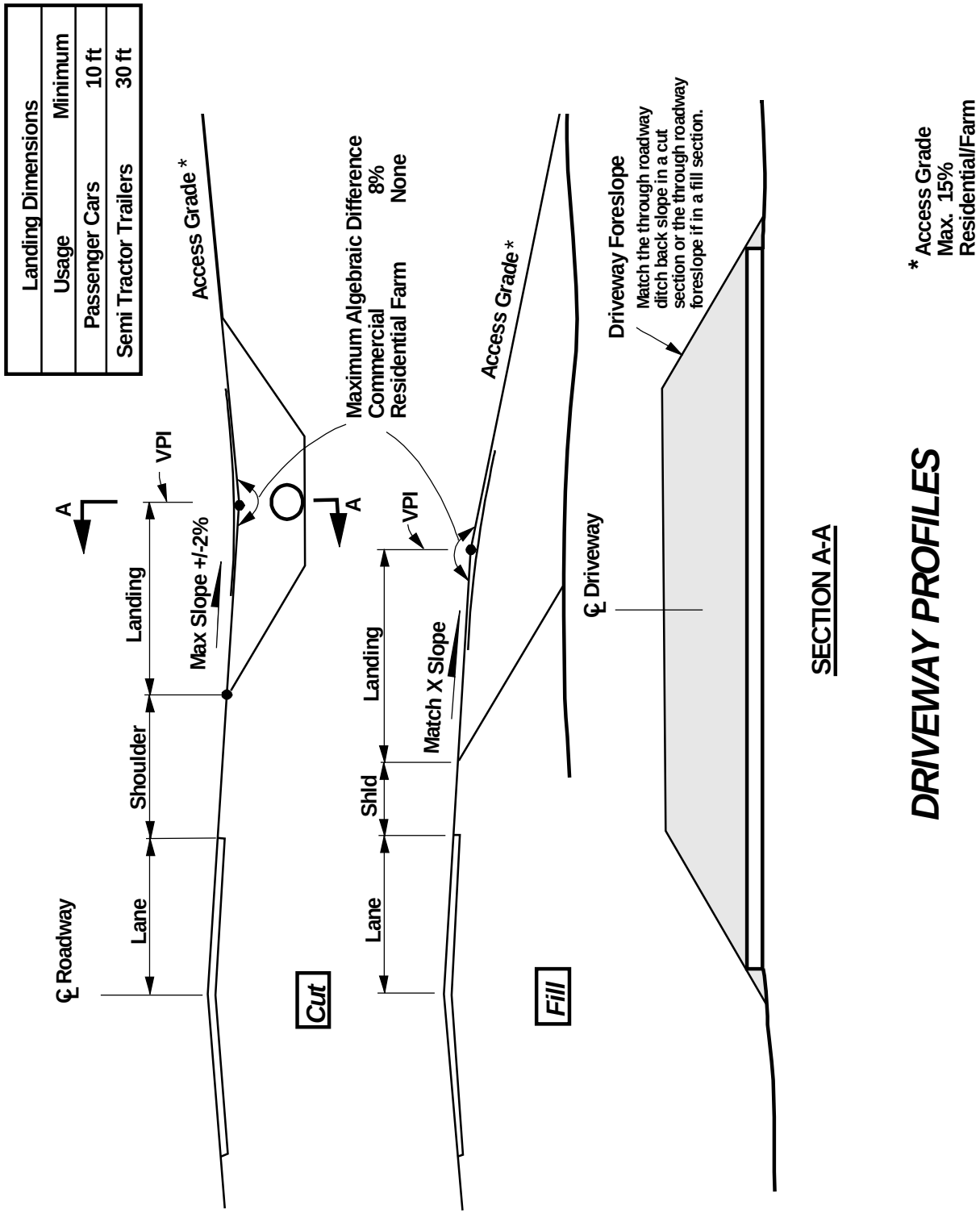


Figure 1190-4
Driveway Profiles

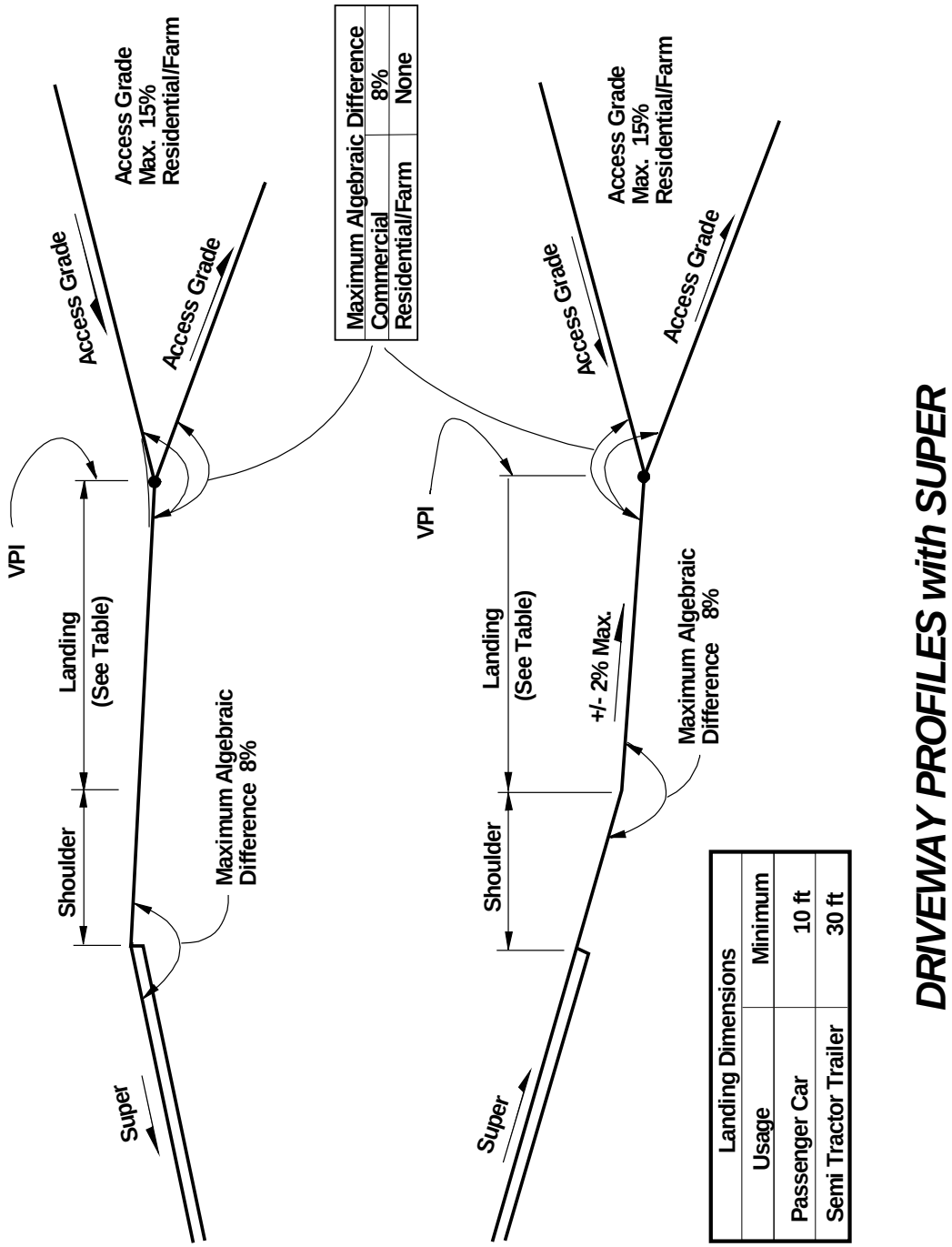
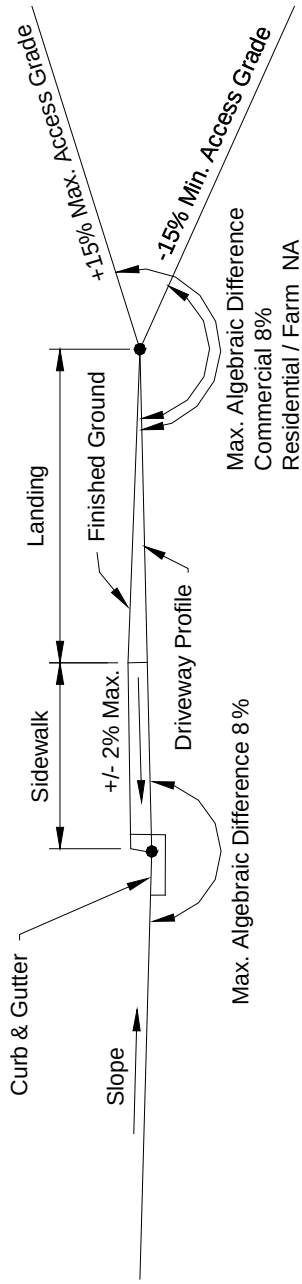
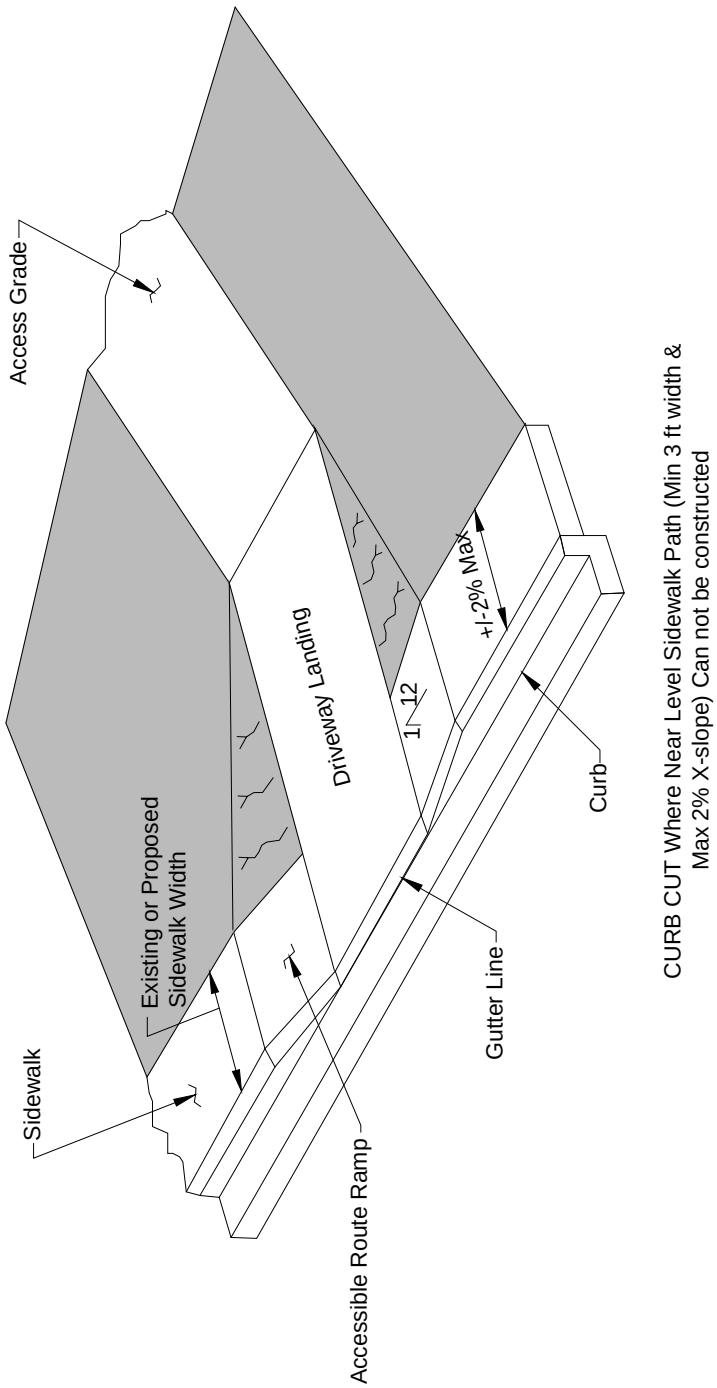


Figure 1190-5
Driveway Profiles With Super



CURB CUT PROFILE

Landing Dimensions	
Usage	Minimum
Passenger Car	10 ft
Semi Tractor Trailer	30 ft



CURB CUT Where Near Level Sidewalk Path (Min 3 ft width & Max 2% X-slope) Can not be constructed

Figure 1190-6a
Curb Cut Profile

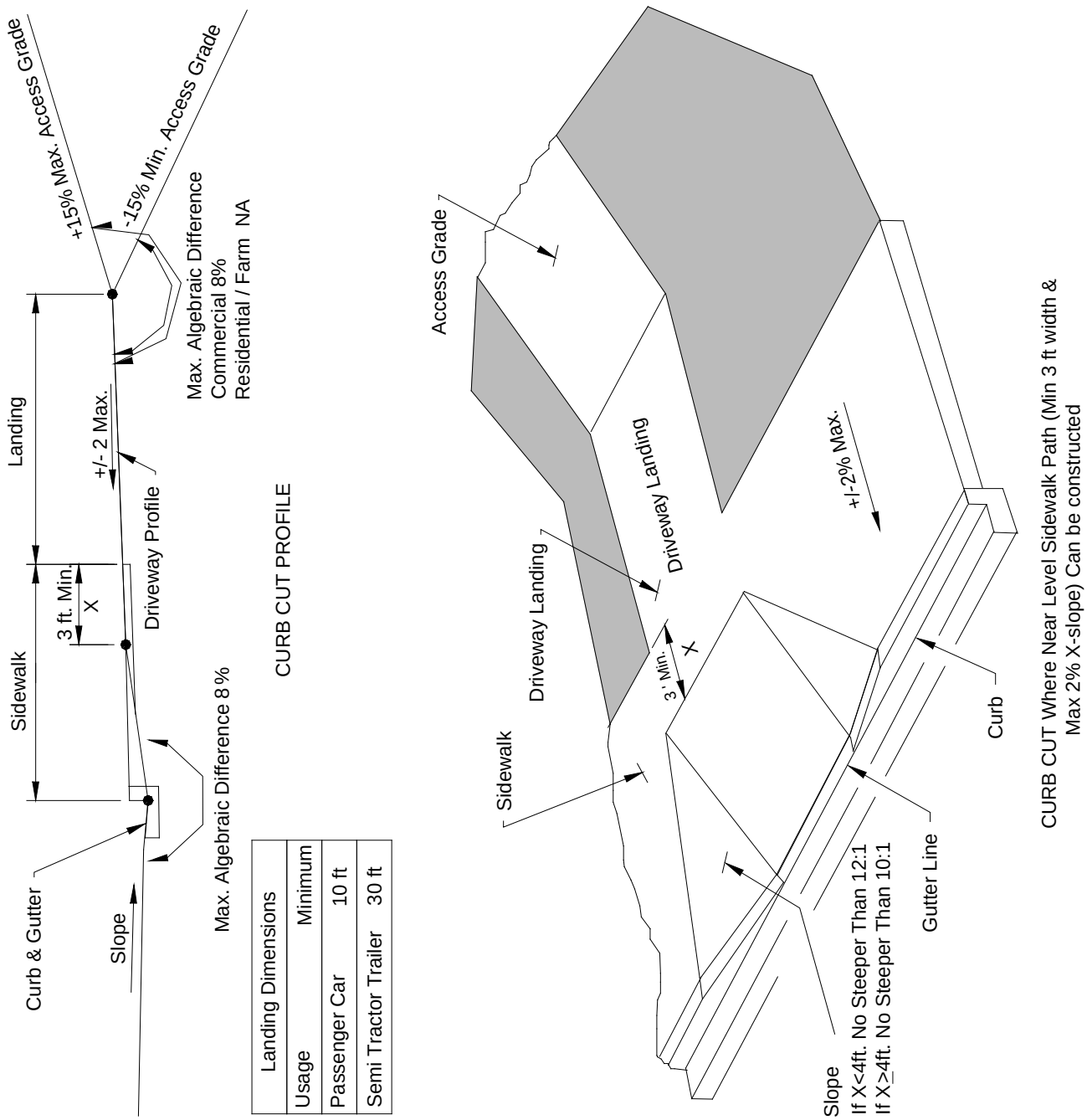


Figure 1190-6b
Curb Cut Profile

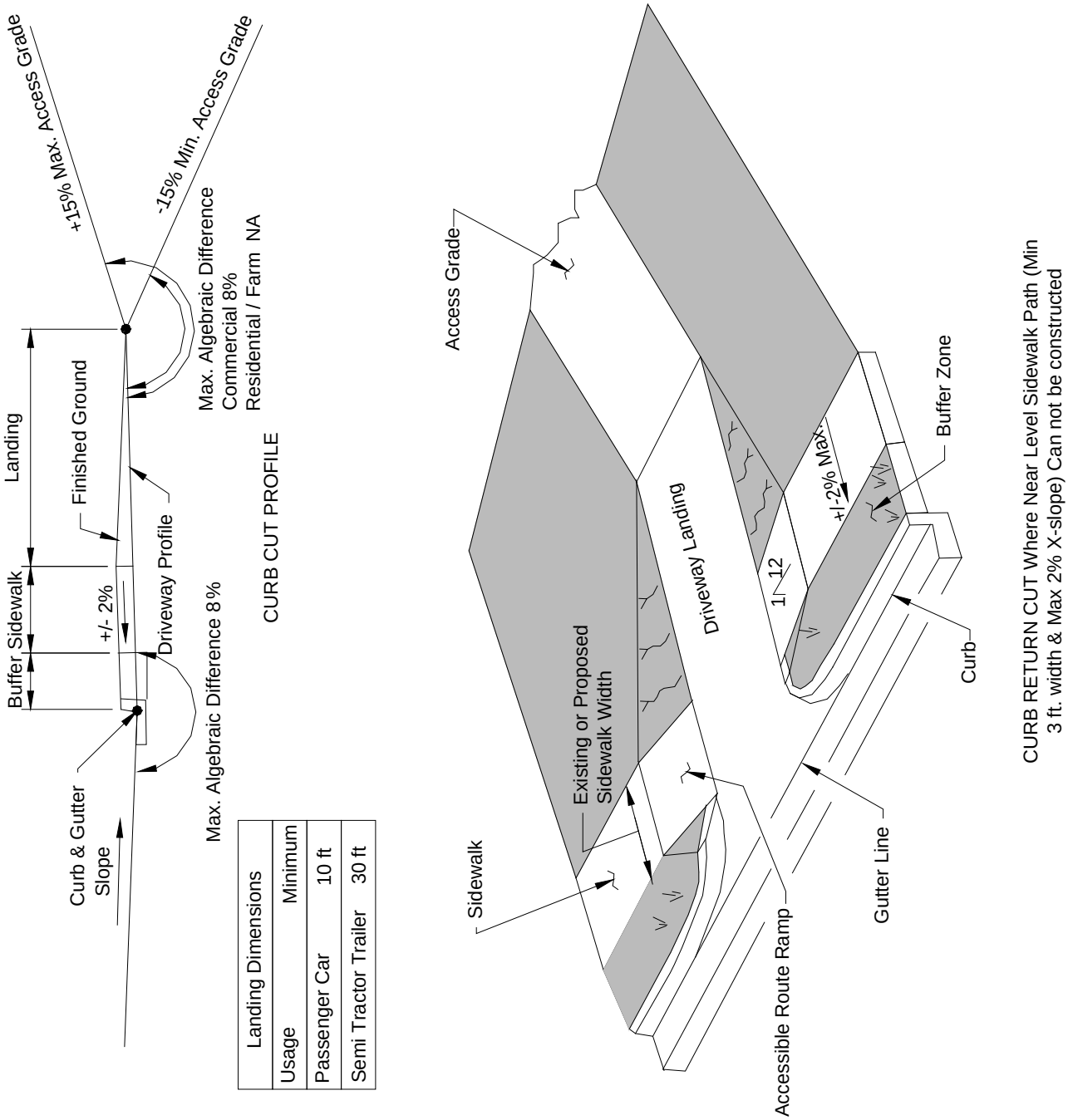
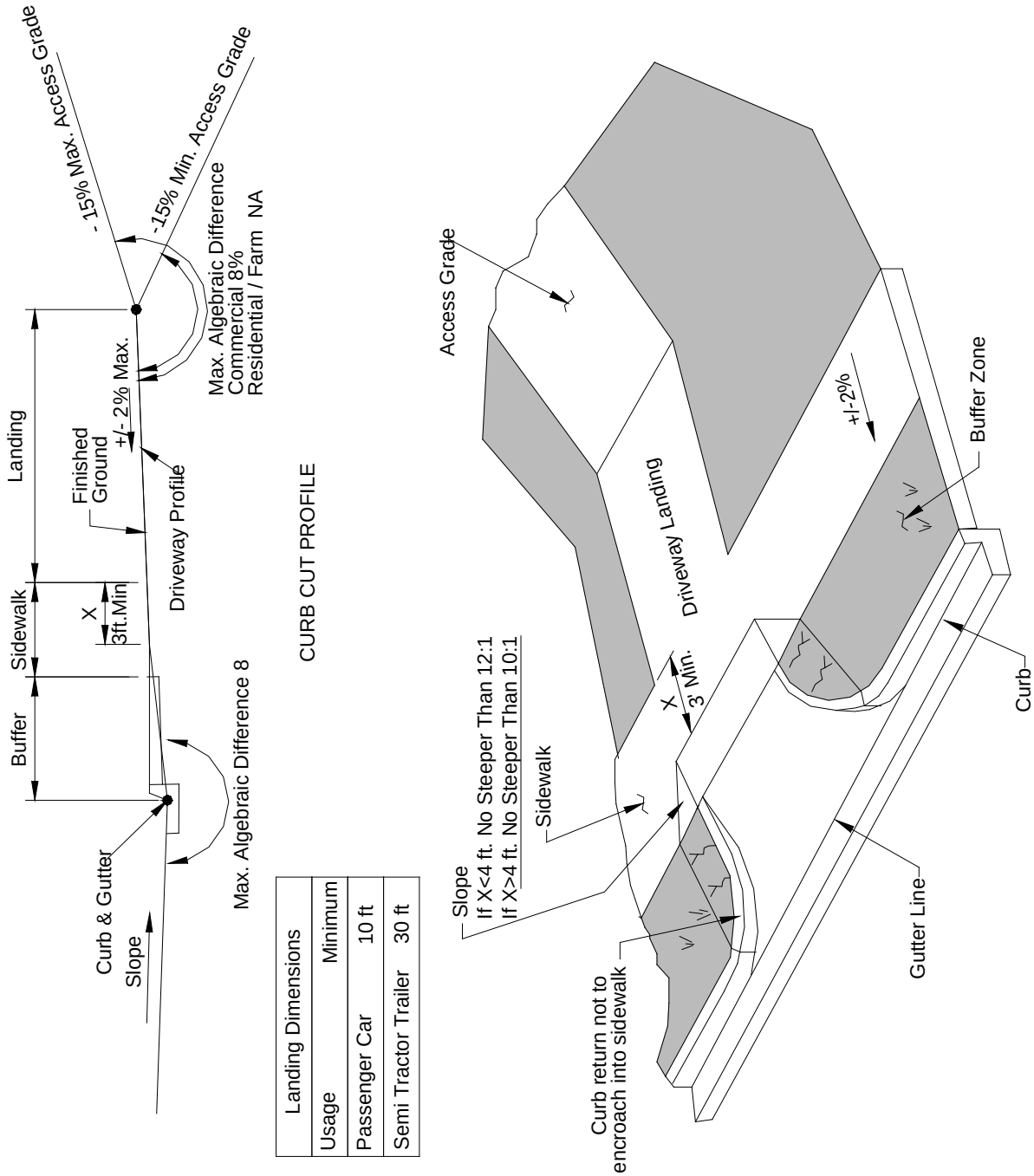


Figure 1190-7a
Curb Cut Profile



Landing Dimensions	
Usage	Minimum
Passenger Car	10 ft
Semi Tractor Trailer	30 ft

Figure 1190-7b
Curb Cut Profile

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12. Non-Motorized Transportation

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1200. Definitions

The following definitions supplement the *AASHTO Bike Guide.*

AASHTO Bike Guide: The American Association of State Highway and Transportation Officials 1999 Guide for the Development of Bicycle Facilities

Adjacent Path: A path alignment that closely parallels the main roadway corridor

ADT: Average Daily Traffic

Commissioner: The Commissioner of the Alaska Department of Transportation and Public Facilities

Mid-block Crossing: Intersections formed when paths or sidewalks cross other transportation facilities at locations other than roadway-to-roadway intersections

Non-Motorized Transportation: Transportation by human power, including bicycling, walking, in-line skating, skiing, and other methods

Path: An improved facility, greater than or equal to 8 feet in width, physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. Bicyclists, pedestrians, skaters, wheelchair (both self- and electric-powered) users, joggers, skiers, and other non-motorized users may use paths.

Shared Use Path: See "Path"

Rules of the Road: Regulations in the State of Alaska Administrative Code that govern the operation of motorized and non-motorized use of transportation facilities

Small Community: Topographically concentrated, unincorporated population areas large enough to support a nearby post office or local school

Trail: An unpaved or unimproved route, which may serve non-motorized or motorized off-road uses

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1210. Bicycle Facilities

1210.1. General
1210.2. Waivers
1210.3. Facility Types
1210.4. Design

1210.1. General

Expect bicycle traffic along most roads and streets. Where bicycles are allowed, all new construction and reconstruction must provide for use by bicyclists and pedestrians unless specifically exempted under the requirements of this chapter. Consider bicycle use on all other project types, and consider existing local bicycle plans when determining appropriate facilities for a project.

Shared use of a roadway is usually preferable to paths because accident rates are usually lower and because it is typically more cost effective.

When desirable values are provided without minimum values, the engineer must use other references, past experience, and/or engineering judgment to determine acceptable minimum values.

Required design criteria are normally stated in the form, "*Use* the following offsets" or "The offset *shall be*." Design criteria that are desirable or allowable, but not required, are normally stated in the form, "The offset *may be*" or "The offset *should be*."

1210.2. Waivers

Due to Alaska's developing nature and the need to provide basic transportation facilities within the limited transportation budget, there may be situations where use of full design criteria will price the improvement beyond reasonable cost. In such cases, develop a preliminary design to establish a basic construction cost estimate. Next, develop a second design using criteria less than stated minimums, including a construction cost estimate and a written comparison of the cost differential versus the negative aspects of the reduced geometric design standards.

Submit the proposed preliminary design with analysis and rationale for using below-minimum design criteria to the regional preconstruction engineer as a design waiver request. The regional preconstruction engineer will approve or disapprove the design waiver. If the regional preconstruction engineer concurs, furnish informational copies to the Department's chief engineer and bicycle/pedestrian coordinator. Furnish an informational copy of the approved waiver to the FHWA for national highway system (NHS) projects only.

When a waiver is necessary for the elimination (as opposed to reduction) of a facility that is normally required under the guidelines of this section, the waiver requires the endorsement of the regional preconstruction engineer and chief engineer, and the approval of the commissioner.

1210.3. Facility Types

1210.3.1 Freeways and Other Controlled-Access Facilities

Place signs on freeways or other controlled-access facilities to prohibit bicycle use in accordance with AS 19.20.020. If no reasonable alternate bicycle route is available, bicycle use of a controlled access facility, or portion of a controlled access facility, may be allowed.

1210.3.2 Rural

Bicycle facilities are not required on rural roadways with less than 1,000 ADT unless cost-effective analysis of accidents indicates improvements are needed.

Design for Class A riders, minimum. Paths for other classes of bicyclists are generally not cost effective in rural areas.

1210.3.3 Urban

Business and Commercial

Design for Class A riders, minimum.

Residential Areas and Small Communities

Design for all classes of riders, or design for Class A riders and identify/provide alternate routes for Class B/C riders.

1210.4. Design

1210.4.1 General

Use the *AASHTO Bike Guide*, as modified by this section, to design bicycle facilities.

If there is a conflict between the *AASHTO Bike Guide* and the *Alaska Traffic Manual* (ATM) for striping and signing, use the ATM.

1210.4.2 Shared Roadway

General

Use "Selecting Roadway Design Treatments to Accommodate Bicyclists" FHWA publication RD-92-073 to determine all shared roadway facility configurations. Shoulders may take the place of bike lanes for all sections except those with adjacent on-street parking.

1210.4.3 Shared Use Path

Separation Between Shared Use Paths and Roadways

The *AASHTO Bike Guide* recommends at least a 5-foot separation from the edge of roadway shoulder to edge of the path.

When paths are plowed during winter or when non-motorized use is available year-round, it is desirable to maintain a 10-foot separation between the edge of road traveled way and the nearest edge of the path, except where it is necessary to bring paths closer to the roadway (such as at public intersections as described in the Adjacent Path Crossings portion of this subsection).

Width and Clearance

Low ADT Paths

Paths meeting all the following criteria may use the widths in Table 1210-1:

- Less than 200 ADT (bicycles)
- Less than 100 ADT (pedestrians)
- Stopping sight distances meet minimum requirements of the *AASHTO Bike Guide*
- Not subject to edge damage by maintenance vehicles

Railings

End openings between rail panels must not exceed 6 inches.

Use fences only where they are needed for safety.

Path-Roadway Intersections

Mid Block Crossings

Skew median crossings of 6 feet or more in width by 45 degrees. This aligns the bicyclists so that they are looking in the direction of approaching traffic. See Figures 1210-1 and 1210-2.

Adjacent Path Crossings

Figure 1210-3 illustrates a design for path approaches to signalized intersections that improves visibility for cyclists.

At adjacent path crossings, the edge of path should be 6 feet, minimum, from the edge of traveled way on the parallel mainline roadway (see Figures 1210-4 [Desirable] and 1210-5).

Another, usually less desirable, option is to place the path crossing beyond the influence of stopping traffic at the intersection and where path users will be visible to motorists as shown in Figure 1210-4 (Mid-Block Crossing).

If you cannot provide sight triangles, and the path cannot be realigned in front of the stop location at side streets, provide regulatory and warning signing along the roadway and the path in accordance with the ATM.

Beyond the crossing, maintain normal path separation.

End of Path

Paths should end at a logical destination, such as a side street, school, or park.

The path should end at a highway shoulder where there is adequate sight distance and where it is convenient to cross the road. See Figure 1210-5. Designate and sign the path terminus to discourage wrong-way bicycle travel on road shoulders.

A path may also end perpendicular to any location along the road. Treat it the same as a side street intersection with a mainline through-route.

Pavement Structure

In general, paved shared-use paths should provide 2 inches of asphalt pavement concrete overlying 4 inches of crushed aggregate base course, on top of 2 feet of selected material, Type B or better quality.

You may use other surfacing materials. Unpaved paths are acceptable, although it is best to prevent erosion and material degradation due to rainfall, wind, or heavy use, and to allow for wheelchair use with a "hard, unyielding surface."

Structures

Bridges

It is desirable to provide the same widths for bicycle facilities across bridges that are provided approaching the bridge. For example, if there are 10-feet-wide

shoulders approaching a bridge, then it is desirable to provide 10-foot shoulders, plus any required shy distances, across the bridge. You may provide a separate structure to accommodate a path.

The clear width on structures between railings must not be less than 10 feet for two-way paths and 6 feet for one-way paths. The minimum vertical clearance to obstructions across the clear width of the path is 8 feet, 4 inches. Provide adequate access for maintenance and bridge inspection equipment.

See Section 1160.3.7a of this manual for allowable improvements to bridges for accommodation of bicycles on projects other than new construction or reconstruction.

Use 54-inch rail heights on bridges.

Path Undercrossings

Refer to Section 1130.7. of this manual for pedestrian crossing grade separation warrants and access control for grade-separated pedestrian crossings.

Where minimal fill heights are available, provide at least an 8-foot wide and 8-foot, 4-inch high clear area for two-way bicycle passage. A 10-foot by 10-foot clear area for two-way bicycle passage is desirable.

Options for undercrossings include metal multi-plate underpasses and concrete box culverts. Concrete box culverts require less overall height and width than metal underpasses.

Provide sight distance at each end of the underpass when reasonable. Right-of-way limitations and obstructions may limit the feasibility of providing adequate sight distance. In these cases, other traffic control measures, such as warning signs and striping, may be used. While skewing of the undercrossing usually increases cost, it is another method that you may consider to provide sight distance.

Path alignments are typically designed leading into pipes rather than skewing the pipes to meet the path alignment.

Guidance for maximum skew angles is provided in the *Handbook for Steel Drainage and Highway Construction Products, American Institute of Steel Construction, AISC.*

Drainage

When there are width constraints or when it is more cost effective, you may carry drainage across a sloped (uncrowned) path to a single ditch.

Lighting

If lighting is to be applied to a path, refer to the AASHTO publication, *An Informational Guide for Roadway Lighting.*

Table 1210-1

Minimum Path and Path Shoulder Widths for Low ADT Paths

The widths presented in this table may be used for shared use paths:

- With less than 200 ADT (bicycles)
- With less than 100 ADT (pedestrians)
- With stopping sight distances that meet minimum requirements of the *AASHTO Bike Guide*
- That will not be subject to edge damage by maintenance vehicles

For paths that do not meet any one or more of the above parameters, follow the guidance for path and shoulder width provided in the *AASHTO Bike Guide*.

Side Slope	Max. Slope Height	Min. Path Width	Min. Shoulder Width
4:1 (inclusive) or flatter	Any	8 feet	0
3:1 (inclusive) to 4:1 (not inclusive)	10 feet	8 feet	0
3:1 (inclusive) to 4:1 (not inclusive)	Over 10 feet	8 feet	2 feet
1.5:1 (inclusive) to 3:1 (not inclusive)	Any	8 feet	2 feet
Steeper than 1.5:1	6 inches or less	8 feet	0
Steeper than 1.5:1	Over 6 inches	*	*

* Use the guidance for shared-use path width and clearance provided in the *AASHTO Bike Guide*.

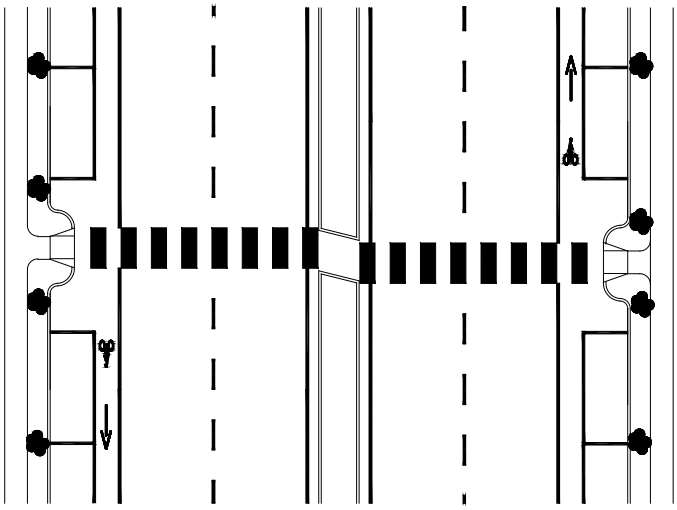


Figure 1210-1
Urban Mid-Block Crossing, With Parking and Median

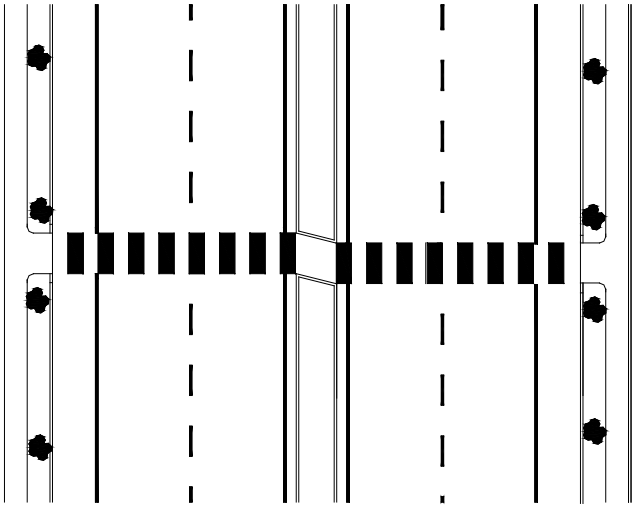


Figure 1210-2
At-Grade Mid-Block Crossing, with Median Without Parking

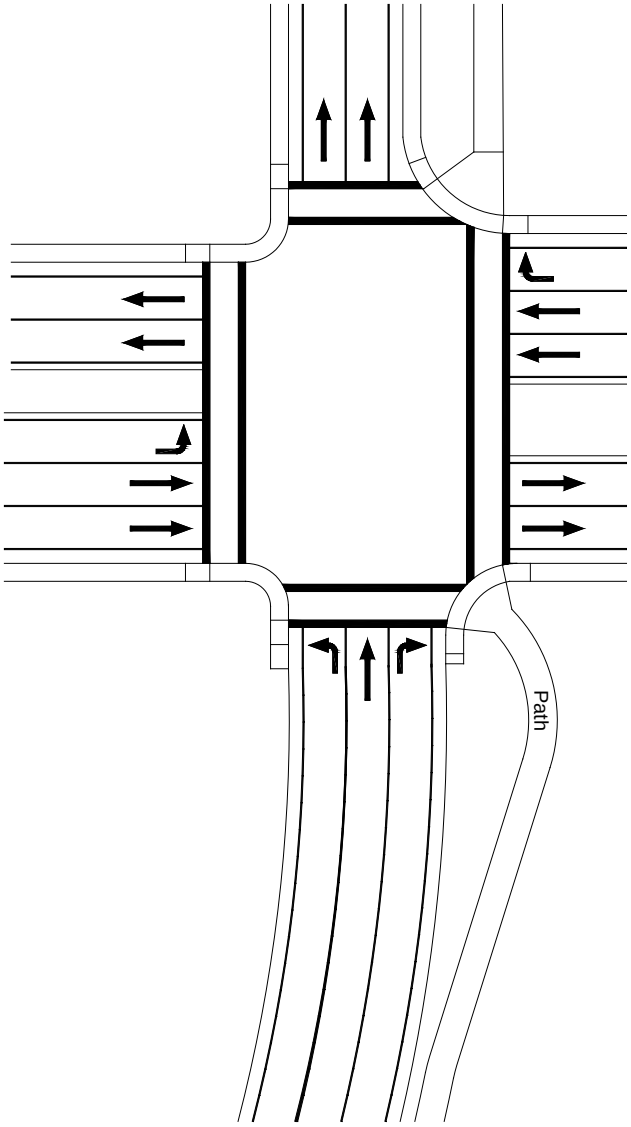
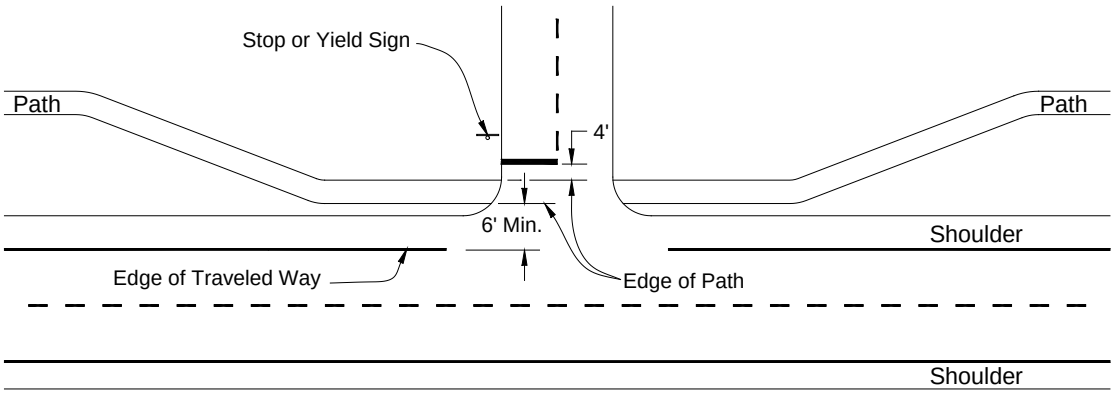
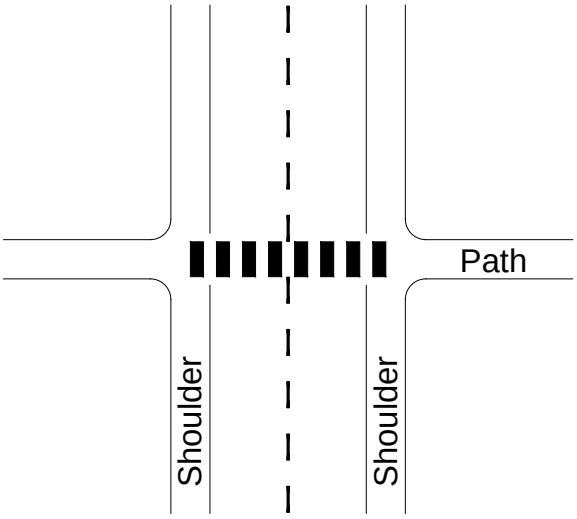
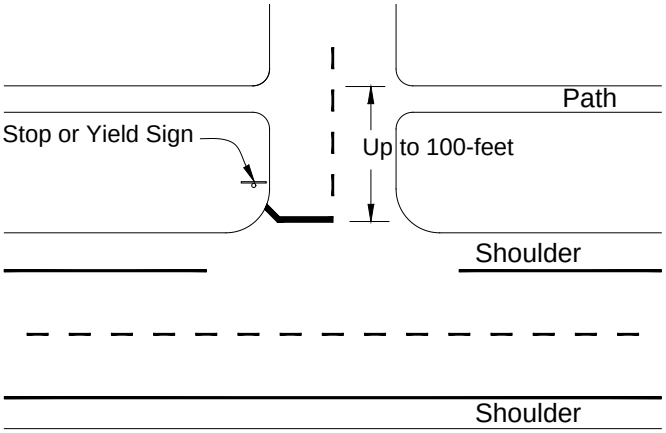


Figure 1210-3
Path Curves to Improve Visibility at Signalized Intersection
Reference: Oregon Bicycle and Pedestrian Plan, June 1995



Desirable





Mid-Block Crossing **Undesirable**

Figure 1210-4
Path Configurations
At Crossings

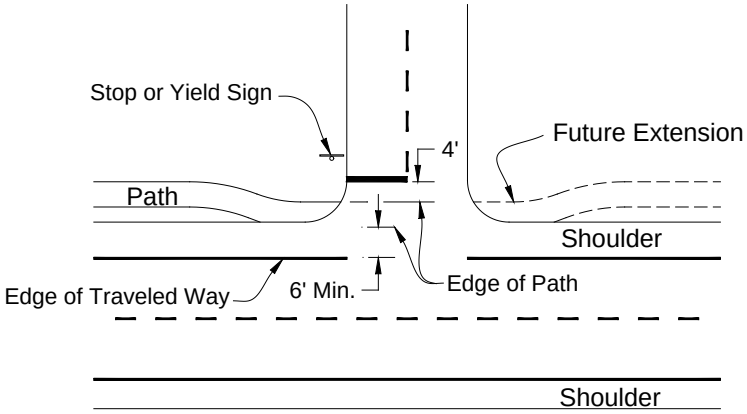


Figure 1210-5
Desirable Begin/End Path

1220. Pedestrian Facilities (Reserved)

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1230. Other Non-Motorized Facilities (Reserved)

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14. Highway Work Zone Safety and Traffic Control Plans

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1400. Highway Work Zone Safety and Traffic Control Plans

1400.1. Introduction
1400.2. Definitions
1400.3. State & Federally Funded Projects and Work on State Highways
1400.4. References

1400.1. Introduction

Works zones directly impact the safety and mobility of road users and highway workers. Addressing these safety and mobility issues starts early in the project development process and continues through project completion.

This section provides guidance and establishes procedures for developing Traffic Control Plans, Transportation Management Plans, and Traffic Operations Plans in accordance with 23 CFR 630, Subparts J & K, and Department Policy and Procedure (P&P) No. 05.05.015. In highway work zones, it is the Department's policy to:

- Provide a high level of safety for road users and workers.
- Minimize congestion and community impacts by holding road user delay as close as practicable to pre-construction levels.
- Provide the contractor adequate access to the roadway to complete the work efficiently while meeting the quality requirements of the contract.

All parties working on state roads and highways must comply with the requirements of this chapter.

1400.2. Definitions

Positive Protection Devices (PPDs): Traffic barriers that contain and/or redirect vehicles and meet the crashworthiness evaluation criteria contained in National Cooperative Highway Research Program (NCHRP) Report 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features, 1993.

Project: Any work in the highway right of way that may have an impact on traffic.

Public Information Plan: A communications plan to inform affected road users, the general public, area residences and businesses, and appropriate public entities of project scope, expected work zone impacts, closure details, and recommended action (if any) to avoid impacts and changing conditions during construction.

Significant Project: A significant project falls into either a Category 1 or Category 2 classification.

A Category 1 significant project occupies a location for more than three days with either intermittent or continuous lane closures on Interstate Highways within a Transportation Management Area

A Category 2 significant project is one that either:

- Occupies a location for more than three days with either intermittent or continuous lane closures on arterials, expressway, or freeways with Average Annual Daily Traffic (AADT) of 30,000 or more,
- Fully closes an arterial for more than one hour at a time with no practical alternate route, or
- Any other project that, alone or in combination with other concurrent projects nearby, is anticipated to require greater than normal attention to traffic control to eliminate sustained work zone impacts greater than what would be considered acceptable.

Traffic Control Plan (TCP): A plan identifying what traffic control devices to use and showing their location and operation in a work zone to ensure traffic flow. TCPs also include phased staging and traffic routing plans where needed.

Transportation Management Area (TMA):
1) An urbanized area with a population of over 200,000 or 2) any urbanized area for which TMA designation has been requested by the Governor and the area's metropolitan planning organization and granted by the Secretary of the United States Department of Transportation (USDOT.) Currently, Anchorage is the only TMA in Alaska. Its boundary coincides with the Anchorage Metropolitan Area Transportation System boundary. Check with Planning for any changes in TMA designations.

Transportation Management Plan (TMP): A plan to manage work zone impacts of a highway project. It includes a Traffic Control Plan and may include Transportation Operations and Public Information Plans. Neither the TMP nor its three component plans are standalone documents. Plan provisions are included in project plans, specifications, or

agreements with other parties and are scaled as appropriate for the complexity of individual projects.

Transportation Operations Plan (TOP): A plan to minimize project impacts not covered under a Public Information Plan or TCP. In general, these activities consist of coordination with external agencies, events, projects and systems, and may include:

- Plans for on-project law enforcement and other activities by external agencies
- Coordination with other projects to minimize cumulative impact
- Coordination with agencies that manage signal operations
- Plans to maintain access for emergency vehicles, school buses, transit, etc.
- Plans to minimize impacts to major traffic-generating events

1400.3. State & Federally Funded Projects and Work on State Highways

Every project will have a Transportation Management Plan (TMP). A TMP must include a Traffic Control Plan (TCP) and may contain a Transportation Operations Plan and a Public Information Plan.

The regional design section working in conjunction with the regional construction and traffic sections, and in coordination with external agencies, events, projects, and systems, as necessary, should prepare a project specific TMP.

Emergency incidents are exempt from the requirements of this section, except for development of a TCP, which is done in accordance with section 1400.3.5.

1400.3.1 Determination of "Significant Project"

Refer to the definitions in Section 1400.2. Determine whether the project is "significant" and document this in the *Preliminary Work Zone Traffic Control* section of the Design Study Report (DSR.)

1400.3.2 Transportation Management Plan (TMP)

Significant Projects

For non-exempt "significant" projects, prepare a full Traffic Management Plan, including Transportation Operations, Public Information, and Traffic Control Plans.

Exempt Significant Projects

Some significant projects may be exempt from requiring a full TMP as anticipated traffic impacts are minimal or insignificant. For an exempt significant project, a TCP is still required, but the TOP and Public Information Plans are optional.

For a Category 1 significant project, an exemption is requested in accordance with 23 CFR 630.1010 (d) by the Regional Preconstruction Engineer. He sends a memo to the FHWA Division Administrator requesting an exemption and includes a discussion of the justification. If approved, copy the exemption request and FHWA approval memos to the Chief Engineer.

For a Category 2 significant project, an exemption may be granted by the Regional Preconstruction Engineer.

Project-specific exemptions may be granted if:

- lane-closures occur only at night,
- lane-closures occur only during off-peak and weekend hours, or
- roadway capacity under construction conditions substantially exceeds traffic volumes.

A Category 2 significant project exemption is initiated with a memo from the project manager to the Regional Preconstruction Engineer. If the exemption is approved, provide a copy of the exemption approval letter to the FHWA Division Administrator and the Chief Engineer.

Include a discussion and documentation of exemptions in the *Preliminary Work Zone Traffic Control* section of the Design Study Report (DSR). See Section 450.5.2 for a discussion of DSRs.

All Projects

For all projects:

1. Involve stakeholders as appropriate.

2. Provide information on potential construction impacts on traffic mobility to the public.
3. Prepare a TCP.
4. Consider whether it is appropriate to include a TOP and/or Public Information Plan or portions thereof.

1400.3.3 Transportation Operations Plans (TOPs)

The design and construction sections share joint responsibility for developing TOPs. Some of these tasks begin in design but are not finalized until the project is under construction. Coordination between design and construction is essential and inclusion of TMPs is important in plan reviews.

Agreements made under the TOP that are not incorporated in project plans or specifications shall be retained in project files. Where appropriate, include them as referenced appendices in construction contracts.

1400.3.4 Public Information Plans

When a Public Information Plan is used, the information may be distributed directly by:

- The contractor's Worksite Traffic Supervisor
- The Department's construction section thru the Department's 511 system

  http://511.alaska.gov/
- Television, radio and/or newspaper advertisements
- Other location-specific communication tools

If the Public Information Plan is to be distributed by the contractor, include the requirements in the contract.

1400.3.5 Traffic Control Plans (TCPs)

Traffic control plans are required on all highway projects where work occurs in a State maintained right-of-way.

Develop TCPs for moderate to large and complex projects in coordination with the construction section.

On smaller, simple projects, the designer may choose to require the contractor to develop TCPs as required by Section 643-1.03 of the Standard Specifications.

Do not seal TCPs, except as noted below, as TCPs are commonly field modified during construction.

Seal temporary traffic signal systems and geometric designs for 50 mph posted speed, or higher, detour or bypass routes.

On projects where the work is outside the clear zone but the activities may impact traffic flow, consider whether a TCP is desirable or necessary. Signing and flagging for truck crossings are examples of traffic control that may be desirable or necessary when work is accomplished outside the clear zone only.

Scope, Preparation and Detail

Prepare all TCPs in accordance with the *Alaska Traffic Manual* (ATM).

The ATM sets forth basic principles and prescribes standards for the application, installation, and maintenance of various traffic control devices for highway and street construction. However, it does not address all potential traffic situations in work zones. Tailor TCPs to specific project conditions and requirements.

The scope and detail of a TCP will depend on project complexity and the extent to which construction interferes with traffic flow. TCPs may include:

- Plans and detail drawings
- Special provisions
- Typical applications from the ATM.

In developing a TCP:

- Consider if there is enough room within the right-of-way for both the construction activity and a travel route. If not, consider obtaining temporary construction permits.
- Verify that any temporary, constructed detours or bypasses meet acceptable geometric standards including grade, cross slope, lane width, superelevation, and clear zone for the posted speed limit. Detours routed onto existing streets do not require this.
- Confirm that any constructed detours or bypasses comply with the environmental document and project permits.
- Verify that traffic volumes can be adequately handled with available lanes at all hours.

- Provide access to businesses, residences and work zones if feasible. If access cannot be provided to businesses or residences, coordinate with the ROW section to see if specific agreements are needed.
- Provide for non-motorized traffic accommodations, including ADA accessible routes when they currently exist.

For all projects:

1. Establish times and dates, if any, when lane and/or road closures are prohibited. This may include requirements for night and/or weekend work.
2. Provide guidance for mitigation of specific safety concerns.
3. Consider establishing allowable delay/queue standards.
4. Consider whether coordination with the entity that manages traffic signals will be necessary during construction of the project.
5. Consider whether road volumes under anticipated construction conditions need evaluation.
6. Include all appropriate TOP agreements that are not incorporated in project plans or specifications as referenced appendices in construction contracts.
7. Coordinate with local governments on all significant projects or other projects that may conflict with local projects.
8. Coordinate with local transit, school bus, and emergency vehicle operation.
9. To minimize worker exposure to traffic and exposure of road users to construction activities, consider including the following exposure control measures:
   a. Road or ramp closures
   b. Detours
   c. Median crossovers
   d. Accelerated construction techniques
   e. Night or off-peak work hours* (noise permits or variances may be necessary for night work.)

   * A detailed procedure for assessing the feasibility of performing highway work at night is provided in NCHRP Report 475, *"A Procedure for Assessing and Planning Nighttime Highway Construction and Maintenance."*

10. Identify whether and under what conditions to install positive protection devices. In making this determination, consider the following factors:
    a. Project scope and duration
    b. Anticipated traffic speeds through the work zone
    c. Anticipated traffic volumes
    d. Vehicle mix
    e. Type of work (as related to worker exposure and crash risks)
    f. Distance between traffic and workers, and degree of worker exposure
    g. Escape paths available for workers to avoid vehicle intrusion into the work space
    h. Time of day the work occurs (e.g., night work)
    i. Work area restrictions (including impact on worker exposure)
    j. Consequences from/to road users resulting from roadway departure
    k. Potential hazard to workers and road users presented by device itself and during device placement and removal
    l. Geometrics that may increase crash risks (e.g., poor sight distance and sharp curves)
    m. Access to/from work space
    n. Roadway traffic volume and speed
    o. Impacts on project cost and duration

    In particular, consider installation of positive protection devices under the following conditions:

    a. Work zones that provide workers no means of escape from motorized traffic (e.g., tunnels, bridges, etc.)
    b. Long duration work zones (e.g., two weeks or more) resulting in substantial worker exposure to motorized traffic
    c. Projects with anticipated operating speeds of 45 mph or greater, especially when combined with high traffic volumes
    d. Work operations that place workers close to travel lanes open to traffic
    e. Roadside hazards, such as drop-offs or unfinished bridge decks, that will remain in place overnight or longer

11. Consider truck mounted attenuators for short duration or mobile work on roads with a posted speed of greater than 45 mph and in other areas as appropriate.
12. Consult with the construction section to determine if and when uniformed police officers should be present on construction projects. Coordinate with construction personnel to make the necessary agreements. In determining whether officers are needed, consider the factors listed in 23 CFR 630.1108(d). Also, consider prearranged regional agreements with police departments, rather than project-by-project agreements.

Work Zone Roadside Safety

Provide direction in the specifications or drawings on

- How to treat roadside slope or obstacle hazards
- Required roadside clear distances
- How to treat pavement drop-offs
- Acceptable channelization devices, barriers, and barrier end treatments

Pre-existing roadside safety hardware should be preserved or improved for use until the progress of construction necessitates its removal. From that time until permanent roadside safety hardware is installed, maintain roadside safety hardware as required in the plans and specifications.

Work Zone Speed Limits

If work zone speed limits are established, set them in accordance with P&P 05.05.020 - "Establishment of Speed Limits and Zones."

Oversize/Overweight (O/O) Equipment

Make provisions in the TCP for special signing, pilot vehicles, or special routing if you anticipate using O/O equipment on the project or if O/O vehicles or equipment will utilize the route during construction.

Coordinate with the Division of Measurement Standards and Commercial Vehicle Enforcement (MSCVE) for existing and pending O/O permits and project specific traffic control measures. Include construction notices pertaining specifically to O/O vehicles in the Public Information Plan.

O/O vehicles are not permitted on bridges unless written approval is obtained from the Chief Bridge Engineer, or the bridge is a temporary structure designed by the contractor and intended for the O/O vehicles.

Department approval of a traffic control plan allowing oversize or overweight vehicles or equipment waives normal legal size and weight limitations **within the project limits** (see 17 AAC 25.011).

Consider whether allowing oversize/overweight vehicles or equipment will lower construction costs and can be done with reasonable safety without damage to the infrastructure. If so, consider providing a “Notice to Bidders” indicating that oversize or overweight vehicles may be allowed based on approval of an acceptable TCP.

1400.3.6 Payment for Traffic Control

The strategy for traffic control payment can vary depending on project size, duration, and complexity. Consult with construction regarding choice of pay items. It is best to provide flexibility here so the contractor can submit his own TCP based on his sequencing and schedule. The contractor’s plan may differ from the TCP preparer’s assumptions.

Traffic control devices may be paid for by lump sum, contingent sum, unit price, or a combination thereof. Contingent sum is the most common method of paying for most traffic control items.

Do not make payment for work zone traffic control features and operations incidental to the contract or other items of work not related to traffic control and safety.

Traffic Maintenance

Include a Traffic Maintenance item – either Pay Item 643(1) or 643(2) - on all projects with traffic control, except for lump sum projects, where it is optional. Inclusion of this pay item allows the Contractor to directly allocate costs associated with:

- Providing a Worksite Traffic Supervisor.
- Preparing TCPs.
- Preparing and publishing public information notices.
- Preparing a Construction Phasing Plan.
- Maintaining all roadways, approaches, crossings, intersections and pedestrian and bicycle facilities.
- Providing any traffic control devices required, but not shown on the bid schedule.

Lump Sum

Traffic control, except for positive protection devices (PPDs), may be paid for as lump sum only on projects, or portions thereof, where:

1. Traffic control is not complex,
2. The contractor can readily evaluate the required traffic control work, and
3. The number and placement of traffic control devices is easily determined

Use contingent sum and/or unit price payment strategies on all projects that do not meet these conditions.

When lump sum payment is an option, consider the following when deciding whether to use it:

1. Lump sum traffic control is more difficult to monitor and change because the contractor is not paid for individual traffic control items and it requires closer oversight to ensure all necessary traffic control items are in place.
2. The use of lump sum traffic control payment requires a detailed TCP. All necessary traffic control devices need be shown on the TCP to reduce disagreement between the engineer and the contractor about what is required and to reduce the potential for claims for increased traffic control payments from the contractor.

If the use of lump sum for traffic control is questionable, consult the FHWA Alaska Division for guidance.

Positive Protection Devices (PPDs)

Provide separate pay items for Positive Protection Devices (PPDs) when they are used. Separate payment for PPDs may be either lump sum, unit price or contingent sum. If PPDs are used on a project with lump sum payment for traffic control, PPDs must still be paid for as a separate pay item.

Flagging

Flagging is primarily used for public safety or at the convenience of the contractor to support his operations.

The Department is responsible for paying for flagging required for construction of the project. Contractors should pay for flagging solely for their own convenience, benefit or productivity.

When not included in a lump sum pay item, pay for flagging by contingent sum at the Department's approved rate. See the Statewide Construction Standards Resources webpage for the current rate,

http://www.dot.state.ak.us/stwddes/dcsconst/index.shtml.

Contingent Sum

Contingent sum (C.S.) pay items include traffic control devices, flagging and traffic price adjustment.

Special consideration should be given in the use of the C.S. Traffic Price Adjustment pay item. Traffic Price Adjustment is a liquidated damage charge assessed for unauthorized contractor activity or traffic control that results in any lane of traffic not being open to full use by the public. Set the bid amount on the bid schedule for this pay item to $0 (zero).

Unit Price

There are two types of unit price pay items used to pay for traffic control:

- Contractor bid unit price
- Department-set (fixed) unit price

In contractor bid unit price, the contractor establishes the payment price for particular traffic control items. A list of common unit price pay items is contained in the Standard Specification for Highway Construction (SSHC). New pay items are established by special provision for specific or special needs.

When Department-set unit price is used, a Traffic Control Rate Schedule (TCRS) is provided in the special provisions. The TCRS includes a list of all the commonly used traffic control devices and their respective predetermined fixed prices. When using this method of payment, use SSHC Pay Item 643(25) and allocate an appropriate amount of contingent sum money to pay for these devices.

Contractor bid unit price items should be considered when

- The contractor has little control over the bid quantity, or
- There is a firm estimate on the bid quantity, and the Department has control of the actual quantity required during the project, or
- The bid item in question is high cost and likely to have one time or limited used by the contractor.

Use of a TCRS and the inclusion of a 643(25) Pay Item is the most common way to pay for traffic control devices. This reduces the opportunity for bid unbalancing by contractors.

Estimates

Total traffic control costs typically range from 5 to 15% of the total construction cost. The lower end of this range is for rural, low-volume projects with simple traffic control plans and low impacts to traffic, while the upper end represents urban, high-volume projects with complex traffic control.

1400.4. References

1. Code of Federal Regulations 23 CFR 630 Subparts J & K
2. Part 6 of the *Alaska Traffic Manual* (ATM). The ATM consists of the *Manual on Uniform Traffic Control Devices* (MUTCD) and the *Alaska Traffic Manual Supplement*
3. *Alaska Construction Manual*
4. *Alaska Standard Specifications for Highway Construction*, Section 643
5. Alaska Standard Drawings (“C & G” Series)
6. P&P 05.05.020 - "Establishment of Speed Limits and Zones"

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