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450.1. Design Stage Description

The design stage begins after FHWA approval of the environmental document and issuance of the Authority to Proceed with PE through final PS&E. It concludes with a decision of commitment to a specific design. The primary activity is engineering to identify and analyze principal design features and design elements that will satisfy the project's purpose and need.

Supporting activities include surveys, materials/foundation investigation, traffic/accident analysis, right-of-way plans and appraisals, environmental reevaluation, utility agreement development, and on projects with bridges or major structures, coordination with the Bridge and Statewide Materials sections.

450.2. Design Study

Design study is performed generally as follows:

Prepare (or update an existing) Project Management Plan and Public Involvement Plan utilizing feedback from location stage "work plan" process and consultation with appropriate technical or support groups.

Identify preliminary design alternatives and provide each support group (i.e., Environmental, Materials, Right-of-Way, Utilities) with the plan, profile, and supporting data for each alternative, enabling them to initiate their studies/evaluation. On some projects, permit applications are initiated at this stage.

On projects with bridges, transmit bridge site survey information along with horizontal and vertical control data, alignment, profile grade, typical section, and any special considerations or constraints, to the chief bridge engineer. The project manager coordinates

directly with the state materials engineer's office for foundation investigations.

Develop feasible design alternatives and compare significant parameters, such as typical section, horizontal and vertical alignment, right-of-way requirements, cost, safety features, as listed in Section 450.3., Design Study Report.

Prepare draft Design Study Report and circulate draft report for in-house review. On projects that qualify for categorical exclusion, the environmental document may be incorporated as an appendix.

For projects (excluding maintenance projects) within a municipality that are 1) categorical exclusion (CE) projects not previously seen by the municipality, or 2) expected to cause significant controversy or have substantial impacts on a local government, the Department may initiate early design coordination with the municipality to describe the proposed action to the municipality and solicit its issues and concerns.

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.

450.3. Design Study Report

Include the following in the completed Design Study Report:

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
3. Descriptions and comparative differences of possible design alternatives and their environmental effects, and consistency with urban plan adopted by community
4. Discussion of preferred 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, as needed, to substantiate need for project features
12. Safety improvements
13. Right-of-way requirements
14. Pedestrian and bicycle facilities, including provision for accessibility by people with disabilities
15. Utility relocation and coordination
16. Pavement design
17. Updated cost estimate for all phases (PE, ROW, utilities, construction)
18. Environmental commitments and coastal zone consistency determination, if available
19. Preliminary bridge layout
20. Identification and justification of exceptions to standards
21. Maintenance considerations

450.4. Design Approval

When the design study processes are complete, submit the final Design Study Report to the preconstruction engineer for approval. The completed Design Study Report constitutes design approval.

Upon receipt of the signed title page, copies of the approved final Design Study Report are distributed in accordance with regional policy.

The FHWA must receive a copy of the approved Design Study Report for NHS projects (see Appendix 2 for FHWA information copies).

450.5. Driveway Permits

450.5.1 General

The Department has promulgated and adopted regulations (17 AAC 10.010-10.050) on the legal requirements for driveways placed within the right-of-way of roads administered or maintained by the Department. In accordance with 17 AAC 10.010-10.020, those portions of the driveway within the right-of-way are the property of the state but construction, maintenance, and liability is at the expense of the property served.

Section 1190 of this manual presents Department standards for driveway design on highways, streets, and roads administered or maintained by the Department. These standards are consistent with AASHTO policies.

Driveways with permits issued prior to April 1, 1986, are not required to conform to the standards presented in Section 1190 of this manual unless the Department determines the driveway must be changed or relocated for public safety reasons or unless the permittee changes or relocates the driveway. Any changes or relocations will require a new permit and must conform to the standards presented in Section 1190 of this manual. All driveways constructed on or after April 1, 1986, must conform to the standards presented in Section 1190 of this manual unless the Department makes an exception in writing.

450.5.2 Driveway Permit Procedures

Once design approval is received and the project alignment is known, submit the alignment to the regional permits officer and request a list of existing driveway permits along the project route.

After receipt of the list of existing driveway permits, note any existing driveways on the project alignment that do not have permits and provide a list of those unpermitted driveways to the regional permits officer. Notify (by certified mail) the owners of properties accessed by driveways without permits on the project route that they must contact the regional permits officer to obtain a permit if they want their driveway to be reconstructed as part of the proposed construction project. Maintain copies of the notifications to owners of driveways without permits as part of the project records.

Existing driveways to be reconstructed as part of a project must be permitted prior to beginning construction.

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450.10. Soils/Foundation Investigation

450.10.1 General

Perform soils investigations and reports in accordance

with the Department's *Geotechnical Procedures Manual* and *AASHTO Manual on Subsurface Investigations*, by regional Materials Section staff.

Their purpose is (1) to determine the nature of underlying soils along the project alignment, (2) to estimate the availability and characteristics of construction materials, (3) to recommend earthwork structural design parameters, and (4) to identify and make recommendations for resolving special geotechnical problems.

Qualified geotechnical engineers in regional or statewide Materials sections, in coordination with the Bridge Section, perform foundation investigations for bridges and other structures.

This work may be contracted to a consultant if regional or statewide Materials are unable to undertake the necessary geotechnical investigation.

450.10.2 PS&E Stage

Geotechnical investigations to support design of the selected alternative include "centerline" and materials site borings and test pits, samples analyses, and preparation of a final report with recommendations for design. To support the field investigation, the engineering manager provides proposed line and grade data (existing and proposed), location of cuts and fills, estimates of earthwork quantities, and anticipated provisions for drainage.

Generally, the alignment is staked and stationed in the field, and the geologist prepares an exploration plan for the approval of the regional materials engineer and the engineering manager. If possible, the engineering manager or principal designer accompanies the geologist on a field review of the alignment and may return for firsthand review of problem areas during field investigations.

The final geotechnical report is not normally completed until after final alignment, grade, and geometry have been selected. Write preliminary geotechnical reports, or memoranda with interim design recommendations, as soon as the results of the fieldwork are known.

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450.20. Retaining Wall Design

450.20.1 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.

450.20.2 Retaining Wall Classification

Earth retaining structures are divided into four classifications.

1. State-Designed Structures

State-designed structures are designed completely by the Department or a consultant without use of proprietary systems.

2. 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.

3. 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.

4. 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.

450.20.3 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:

1. 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
2. When there is available for purchase more than one nonpatented, nonproprietary material, semi-finished or finished article or product that will fulfill the requirements for an item of work of a project and these available materials or products are judged to be of satisfactory quality and 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 increase in costs.

3. A state highway agency may require a specific material or product when there are other acceptable materials and products, when such specific choice is approved by the division administrator as being in the public interest. When the division administrator's approval is not obtained, the item will be nonparticipating unless bidding procedures are used that establish the unit price of each acceptable alternative. In this case, federal-aid participation will be based on the lowest price so established.

450.20.4 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. The designer should always be aware of the equipment requirements to construct a wall. It must be ascertained 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 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 a 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.

450.20.5 Wall Design

In all cases, the designer must 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*.

450.20.6 Alternative Wall Designs (Proprietary)

Alternative or proprietary wall designs should be considered 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 alternative retaining wall systems are included 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. The designer must 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.

450.20.7 Contract Plans

The contract plans shall include a Department-prepared generic design.

The contract plans should 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

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450.30. Right-of-Way

450.30.1 General

The land interests necessary for construction, operations, and maintenance of capital projects are obtained and managed by the Right-of-Way Section in each region, in accordance with the Department's *Right-of-Way Manual*. This process involves:

1. Identifying land needs 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

If negotiations fail, the Department may seek to acquire a property by eminent domain (condemnation) action through the courts. Approval to proceed with acquisition through condemnation is reserved for the preconstruction engineer, and the Department of Law handles subsequent proceedings.

450.30.2 Design Stage

After environmental approval and Authority to Proceed for PE through final PS&E, funding approval and Authority to Appraise and Acquire may be requested from the FHWA. The receipt of AAA starts the appraisal process.

Design plans may serve as a base for the right-of-way map. In any case, design changes affecting the amount or location of required land need to be coordinated closely with ROW and all other support groups.

If there is a design public hearing, ROW presents the updated relocation study and other information as required by the *Right-of-Way Manual*.

Among other factors, 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.

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), a k 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.

If negotiations fail or title complications exist, and if administrative settlement at a higher-than-market price is imprudent or unsuccessful, eminent domain proceedings are initiated through the Department of Law. These proceedings significantly affect project schedules and budgets. The proposed taking must be for the greatest public good and the least private injury, and the preconstruction engineer must approve the decision to proceed with condemnation.

When all the right-of-way has been 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 certification to the FHWA. If there are any 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 right-of-way information available to bidders.

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450.40. Utilities

450.40.1 General

After Authority to Proceed from the preconstruction engineer and design funding approval from the FHWA, utility work may proceed through relocation agreement development.

Generally, 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. After verifying the adjustments and relocations necessary to avoid conflict with the project (which may warrant revising design plans), the utility company designs the changes to its facilities and prepares plans and cost estimates to support the relocation agreement. In some cases, design is performed by the Department for relocation work to be included in the contract or by a consultant.

Return these documents to the utilities engineer for preparation of the formal agreement, program request, and permits to cover the relocated utilities, before requesting the necessary approvals.

If additional right-of-way 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.

Approval of utility agreements is a prerequisite to commencing utility relocation. Relocation may be performed by the utility company, by a contractor, or as part of the Department's contract.

Unless the relocation is included in the Department's contract, utility relocation work is authorized under Phase 7, Utilities, after final Design Study Report. The relocation work is programmed at 15 percent over agreement construction cost, to allow for utility engineering costs during the relocation stage.

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450.50. Civil Rights Programs

450.50.1 General

Numerous state and federal laws and regulations pertain to civil rights. The Civil Rights Office is a good place to start for specific information. Provisions to implement nondiscrimination and entitlement programs are included in various contract "boiler plate" forms and in the specifications. The provisions for state-funded and federal-aid contracts are similar, but not identical.

450.50.2 Disadvantaged Business Enterprise (DBE) Program

The purpose of the DBE program is to provide an equal opportunity for participation of minority-run and female-run businesses in construction contracts and subcontracts.

On all federal-aid contracts, bidders must meet minority business recruitment procedures in order to be considered for award.

When design is nearly complete and ready for PS&E review, prepare a goals worksheet using a brief description of project scope and a listing of subcontractable work items from the engineer's estimate. From this worksheet, the Civil Rights Office in Anchorage establishes the goal, which is added to the bid schedule before PS&E approval.

450.50.3 On-The-Job Training (OJT) Program

The purpose of the OJT Program is to train and employ minorities and women in the construction industry. Annually, the Department sets training goals, which are approved by the FHWA. Each region allocates a proportional number of potential trainees among those federal-aid highway projects that can support this program and distributes a list of these project allocations. Engineering managers add the necessary special provisions and bid items to the designated contracts (23 CFR 230.111).

450.50.4 Title VI

Pursuant to the Civil Rights Act of 1964, the Department has prepared a Title VI Work Plan to assure compliance with federal civil rights laws and regulations in its programs. The work 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.

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450.60. Erosion & Sediment Control Plan

The Transportation Equity Act for the 21st Century reauthorizes ISTEA. Section 1057 of ISTEA requires the United States Secretary of Transportation to develop erosion control guidelines for the states to follow when designing and constructing federal-aid-funded highway projects.

On July 26, 1994, in *Federal Register* Volume 59, No.

142, 37935-37939, the FHWA published a final rule revising 23 CFR 650, Subpart B, Erosion and Sediment Control on Highway Construction Projects. The revision formally adopts Volume III of the *AASHTO Highway Drainage Guidelines 1992*, as guidelines to be followed on all projects funded under Title 23, United States Code. The adoption of the *AASHTO Highway Drainage Guidelines* fulfills the requirement of Section 1057 of ISTEA.

The U.S. Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Program currently addresses projects that disturb 1 acre or more of ground through the Storm Water General Permit for Large and Small Construction Activities. The Alaska Administrative Code 18 (18 AAC) requires monitoring of water quality for all projects with disturbed ground regardless of size.

Storm water runoff from a highway is “nondomestic wastewater” as defined by the Alaska Department of Environmental Conservation (DEC).

18 AAC 72.600 requires written approval from the Alaska Department of Environmental Conservation (DEC) of all plans that construct, alter, install, modify, or operate any part of a nondomestic wastewater treatment works or disposal system. The project Erosion and Sediment Control Plan (ESCP) requires DEC approval prior to advertising.

Submit project plans to DEC for approval of both the storm water collection and disposal system (e.g. roadside ditches) and the Erosion and Sediment Control Plan (ESCP) prior to advertising.

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

To comply with FHWA direction and AAC 18, DOT&PF adopts the *AASHTO Highway Drainage Guidelines, Volume III*, as modified by Section 1120.4. of this manual and Chapter 16 of the *Alaska Highway Drainage Manual*.