SECTION 2

PROJECT DEVELOPMENT PROCESS

2.01 DESIGN SCOPING REVIEW

The Design Scoping Review (DSR) is an early, on-site review of a project prior to preliminary design. This enables development of a scope of work that will be consistent with the planning and design characteristics. See Section 1.02.04 for timing and scoping project pool (payroll charges) of Design Scoping Review prior to project creation and budgeting. Some projects will be created and budgeted before the scoping review meeting. It is acceptable to have two scoping meetings. One before the project is created and budgeted and another after the project is created and budgeted.

The process establishes the objectives of a project, the identification of design standards, funding sources, and the required resources necessary to complete a project. All projects, regardless of size, shall use the scoping process.

2.01.01 Form 1048, Project Scoping/Clearance Record

Form 1048, Project Scoping/Clearance Record comprises a review list used to document the design scoping process, to monitor status toward PS&E approval, and to track final clearances prior to advertisement of a project.

2.01.02 Design Scoping Review (DSR) Meeting

The DSR meeting shall be scheduled as soon as possible when a project is identified. Charges can be made to the Region Scoping Pool section 1.02.04. The DSR invitation letter shall include the CDOT Form 1048 completed through Phase I, the first three items on the following list, and as many of the remaining items on the list as possible:

1. Location map of the project with proposed project limits identified.
2. Plan and profile of existing facility, if available.
3. Traffic data.
4. Accident history and hazard rating.
5. Existing roadway condition and pavement rating.
6. Design speed and existing signed speed.
7. Related inter-modal information.
8. Environmental considerations.

2.01.03 DSR Invitees

The following shall be invited to the DSR, or receive notice of the DSR, as appropriate:

From CDOT Region:	**Others:**
Program Engineer	CDOT Staff representatives: (Bridge, Hydraulics, Safety and Traffic, Transportation Development, ROW, Environmental, Geotechnical, etc.)
Resident Engineer	Other State Agencies
Traffic and Safety Engineer	Local Government Agencies (city, county, etc.
Utilities Engineer	FHWA Representatives (and other federal agencies)
Planning/Environmental Manager	Specific organizations: emergency, schools, special districts, enhancement sponsors, etc.
Maintenance Superintendant	Railroads, Transit Operators, Airports
Materials Engineer	
ROW Supervisor	
Survey Coordinator	
Hydraulics Engineer	
Civil Rights Manager	

2.01.04 Conduct of the DSR Meeting

The Resident Engineer will conduct the Design Scoping Review. An agenda will be prepared to ensure all critical issues are addressed. All CDOT policies and directives currently in force will be considered when preparing the agenda. The items to be reviewed include, but are not limited to, the following:

1. Design Requirements – Typical sections, horizontal and vertical alignment, detour, drainage, approach to project, cut-off points, aesthetic features, pedestrian/bicycle features, landscaping, lighting, major structures, railroad, safety, traffic control, access control, source of materials, roadway and roadside clearances, erosion control, and pavement and resurfacing options.
2. Construction requirements.
3. Environmental issues, including air quality.
4. Any NEPA (National Environmental Policy Act) commitments
5. Maintenance concerns.
6. Right of Way requirements.
7. Survey requirements.
8. Multi-modal issues and accommodations.
9. Travel demand and trip reduction.
10. Traffic and safety issues.
11. Utility requirements.
12. Contract requirements.
13. Geotechnical considerations.
14. Coordination of all disciplines.

2.01.05 DSR Meeting Records

The Resident Engineer will produce the minutes of the DSR meeting, research unresolved concerns and issues, prepare cost estimates, and prepare proposed project schedules.

2.01.06 Additional References:

1. 23 CFR Part 625, Design Standards for Highways

2.02 STAGE CONSTRUCTION (FUTURE CAPACITY CONSIDERATIONS)

Stage construction accommodates future improvements when the initial construction does not provide the ultimate design needed to handle the projected traffic, particularly near urban areas. When a project is anticipated to have a design hourly volume in excess of the design capacity within 10 years after construction, the initial improvements should provide for and protect the integrity of developing a higher capacity facility in future years. The acquisition of additional right of way and appropriate clear zone, and provision for items such as extra lanes, curb and gutter, sidewalk, auxiliary lanes, or bikeways should be considered when future improvements are anticipated.

The Resident Engineer is responsible for identifying elements of future construction that should be accommodated in the current design. Future design considerations should be discussed in the Design Scoping Review and budgeted at the preliminary engineering stage. Future elements to be accommodated in the current design should be identified on the construction plans; these elements can be identified by notes or shown on typical sections.

Traffic volumes and commercial growth should be documented and analyzed during the project development phase for potential stage construction. If a project is to include stage construction, the construction plans and the five-year plan shall indicate these developments and requirements.

2.03 EXISTING TYPICAL SECTION

Most project plans show an existing roadway typical section. When an existing roadway is to be overlaid or reconstructed, current standard typical sections in Chapter 4 of the Roadway Design Guide should be reviewed for reasonable application to the existing typical roadway section.

The existing typical section is the roadway cross-section that exists prior to new construction or roadway improvements. The typical section usually consists of the roadway lane widths, shoulder widths, z-slope distance, and side slopes. It may include curb and gutter, medians, or barriers. Many existing roadways were constructed to conform to old typical section standards and do not meet current roadway design standards.

The Resident Engineer will compare the existing roadway section to the latest standard typical section based on the functional classification of the roadway and CDOT Design Guide criteria and make the proposed typical section recommendation. The Division of Transportation Development developed a website that contains road inventory data such as functional classification, traffic data, and highway data. The website is at Data Access - Transportation Data Set and DTD also has Online Transportation Information System (OTIS) available for more information and photos of existing highway conditions at the following link: (OTIS) (http://dtdapps.coloradodot.info/otis).

The existing typical section shall be documented on the Form 1048, *Project Scoping/Clearance Record*, and Form 463, *Design Data*.

Additional References:

1. CDOT Procedural Directive 512.1, Project Scoping and the Design Scoping Review (DSR)
2. FHWA *Flexibility in Highway Design, Publication No. FHWA-PD-97-062* (1997)
3. *CDOT Roadway Design Guide*, Chapter 4
4. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

2.04 PROPOSED TYPICAL SECTION

The proposed geometric typical section should be designed in accordance with the *CDOT Roadway Design Guide*. The pavement structure shall be designed by the Region Materials Engineer in accordance with the *Roadway Design Guide* and the *CDOT Pavement Design Manual*.

The Resident Engineer should provide a proposed typical section that meets the functional, safety and capacity requirements of the highway. The Form 463, Design Data, shall be used to document these requirements. (See next Section on Form 463) Any exception to the maximum or minimum standard identified on the Form 463 shall be documented in the project file and may need to be documented with a Form 464, Design Variance. Because of budget, funding type, terrain, development, or scenic conditions, new installation of a full-standard typical section may not be practical; this determination is to be documented on Form 464, Design Variance. The designer should always consider accident history of the existing facility as well. The designer may consult the *FHWA Flexibility in Highway Design* guidebook for these situations.

The proposed typical section is the roadway cross-section used on new construction or roadway improvements. The proposed typical roadway section should be in all construction plans and shall meet current CDOT or AASHTO standards, unless otherwise noted in Section 2.05 of this manual. There may be more than one typical section on a project if needed to cover the full length of the project.

Travel lane width varies from 10 feet on low volume roads to 12 feet on higher volume roads, such as collectors and arterials. Shoulder width varies from 4 to 12 feet, depending on the roadway functional type. Roadway side slopes should be designed to provide adequate clear zone recovery (a relatively flat, unobstructed area) as explained in the *AASHTO Roadside Design Guide*.

CDOT typical sections usually incorporate a slight sloping area bordering the shoulder or edge of the roadway referred to as the z-slope, detailed in the *CDOT* Roadway *Design Guide*. This slope is part of the clear zone design. Median and turn lane widths depend on the type of facility. The typical section usually details pavement type and thickness of layers. Typical sections for road approaches, bike paths, and sidewalks may also be contained in the plans.

For projects within scenic or historic areas, refer to the *FHWA Flexibility in Highway Design* guidebook.

The Resident Engineer is responsible for establishing the appropriate roadway typical section. Current and future traffic counts, current and future land use, and the functional class and use of the highway facility shall be considered, including alternate modes, such as bicycles. The proposed roadway typical section should be finalized no later than two weeks after the Field Inspection Review, based on the Field Inspection Review plans and on the final Form 463. In general, the typical section should not change significantly after the Field Inspection Review is conducted, since bridge designs, right of way acquisition, and environmental impact can all be significantly altered by changes to the typical section. If the typical section is substantially changed, an additional Field Inspection Review meeting may be required.

Prior to the Field Inspection Review, the Resident Engineer will provide the proposed typical section to the participating Bridge, Hydraulics, Materials, Traffic, and Environmental personnel, when appropriate for the project type. Appropriate personnel are to be informed of all changes to the typical section.

Additional References:

1. AASHTO Policy on Geometric Design of Highways and Streets
2. 23 CFR Part 625, Design Standards for Highways
3. CDOT Procedural Directive 512.1, Project Scoping and the Design Scoping Review (DSR)
4. CDOT M&S Standard Plans
5. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms
6. CDOT Online Transportation Information System (OTIS): http://internal/App_DTD_DataAccess/index.cfm

2.05 DESIGN DATA (FORM 463)

Form 463, Design Data, which is completed in SAP under transaction ZJ14, is used on all CDOT projects to document important design information and provide uniform information during project development. Link to the work instructions ZJ14 Form 463 (http://vupweb.dot.state.co.us/gm/folder-1.11.30033?mode=EU).

Much of the information in Form 463 is populated from information from CJ20N Project Manager Tab. If the project has FHWA oversight, then the oversight responsibilities are outlined in the Stewardship Agreement between FHWA Colorado Division and CDOT. The selection for this is made when the project is created in CJ20N – PM tab.

2.05.01 Safety Evaluation

An important goal of FHWA in conjunction with CDOT is to provide the highest practical and feasible level of safety on the transportation system and to reduce the number and severity of accidents on highways. A safety evaluation of highway sections within the project limits is required to ensure hazardous features are not overlooked. The current CDOT design standards are detailed in the *CDOT Roadway Design Guide* and the *CDOT M&S Standard Plans*. The *CDOT Roadway Design Guide* is based on the *AASHTO Policy on Geometric Design of Highways and Streets* (the "Green Book"). Form 463 compares the existing and proposed design criteria with the minimum standards acceptable for that particular type of roadway. If it is a 3R project, then Section 2.07 applies.

2.05.02 Preparing Form 463 in SAP

The Resident Engineer should begin Form 463 soon after the project is created and design scoping review meeting is completed. Federal aid projects and projects on the National Highway System shall comply with geometric and structural standards outlined in the *CDOT Roadway Design Guide*.

Form 463 prompts the preparer to compare the existing and proposed design criteria with the minimum standards acceptable for that particular type of roadway. It is important that the appropriate reference source for the standard be identified on Form 463 and Form 464, and that both forms cite the same references. In general, the reference will depend on the type of federal funding program, the functional classification of the roadway, the design elements considered, or a combination thereof.

In addition to the *CDOT Roadway Design Guide* and the *AASHTO Green Book*, a current listing of AASHTO publications that provide valuable information for obtaining good design are in 23 CFR Part 625.

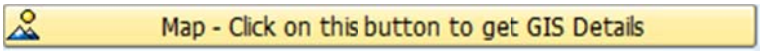
Design data on Form 463 includes, but is not limited to:

1. Traffic volumes
2. Geometric standards
3. Project characteristics
4. Right of Way issues
5. Railroad crossings
6. Agency coordination
7. Entities involved
8. Structural road parameters
9. Major structures
10. Highway classification
11. Utilities
12. Environmental category
13. Construction information

The Resident Engineer should determine accurate project limits, project description, and complete all applicable design data on Form 463 to the fullest extent possible. The "standard" typical section should be based on the chosen design speed, traffic level and type of facility. This is outlined in the CDOT Design Guide and the AASHTO Green Book. The "ultimate" typical section refers to a future design beyond the typical section proposed for the current project. If the ultimate typical section provides for future increased capacity, a NEPA document must exist that recognizes this future expansion. The Typical Section Type refers to Geometric Design Type which includes Types AA, A, B, C, and D found in the CDOT Design Guide and the AASHTO Green Book. The shoulder widths left and right refer to left as the median. For example, a two-way roadway separated by a double yellow would have an existing 0 ft. left shoulder as no median exists. Items that do not meet the design standards are to be identified on Form 463 by an asterisk and may require a variance (see Section 2.06 of this manual).

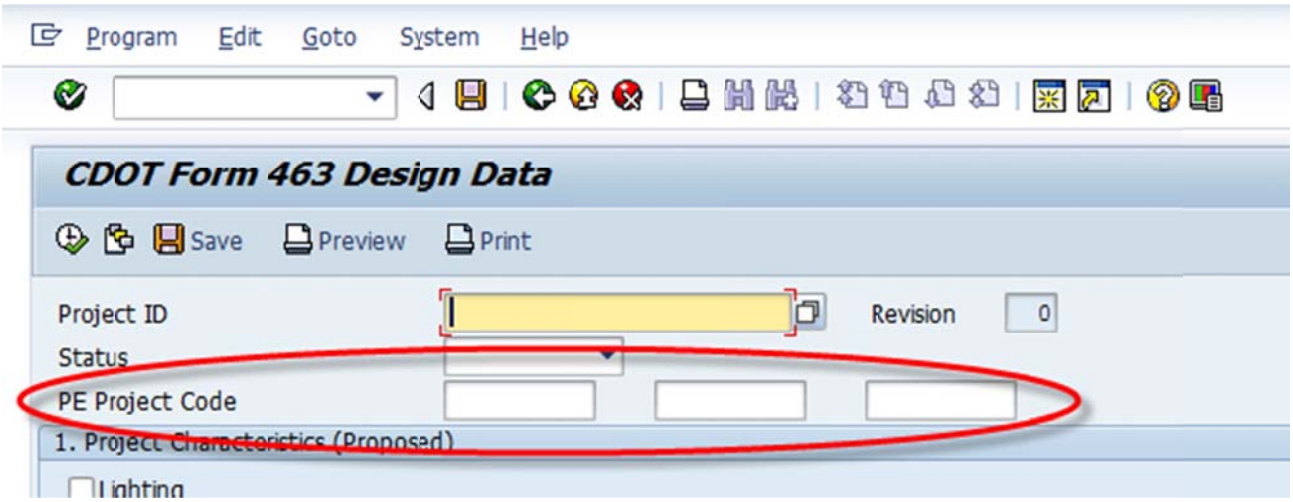
When a project reaches the Field Inspection Review stage, the information on the preliminary Form 463 should be complete and the Resident Engineer should not change the scope of work or extend the project limits. If it is necessary to revise the project limits or the scope of work, then Form 463 must be revised. The Project Limits are changed under the SAP transaction CJ20N and is auto populated into Form 463. The Resident Engineer will have to have the Project Manager tab unlocked through their Region Business office to change the project limits in CJ20N.

To modify the project limits in SAP, the project will need to have the User Status set to PMGR. This status is typically set to LOCK. To get this status changed, ask your regional Business Office or the OFMB Projects and Grants group to set it to PMGR. Once the project status is set to the PMGR User Status, the Mile Point fields can be changed in by transaction CJ20N Project Manager tab and selecting

the 

button. This grants access to the project in OTIS where the Project GIS information is stored and tracked. Once the changes are completed, a request needs to be sent to the OFMB Projects and Grants group asking them to set the status back to LOCK and explaining what changes were made and why. An email should also be sent to the Environmental Program Manager explaining the changes so he can make an informed decision on whether a change is required for the Clearance of the project.

Form 463 is created for the construction project PS and E package. A key portion of Form 463 that needs to get filled out correctly is the **PE Project Codes** fields located near the top of the form as shown below:

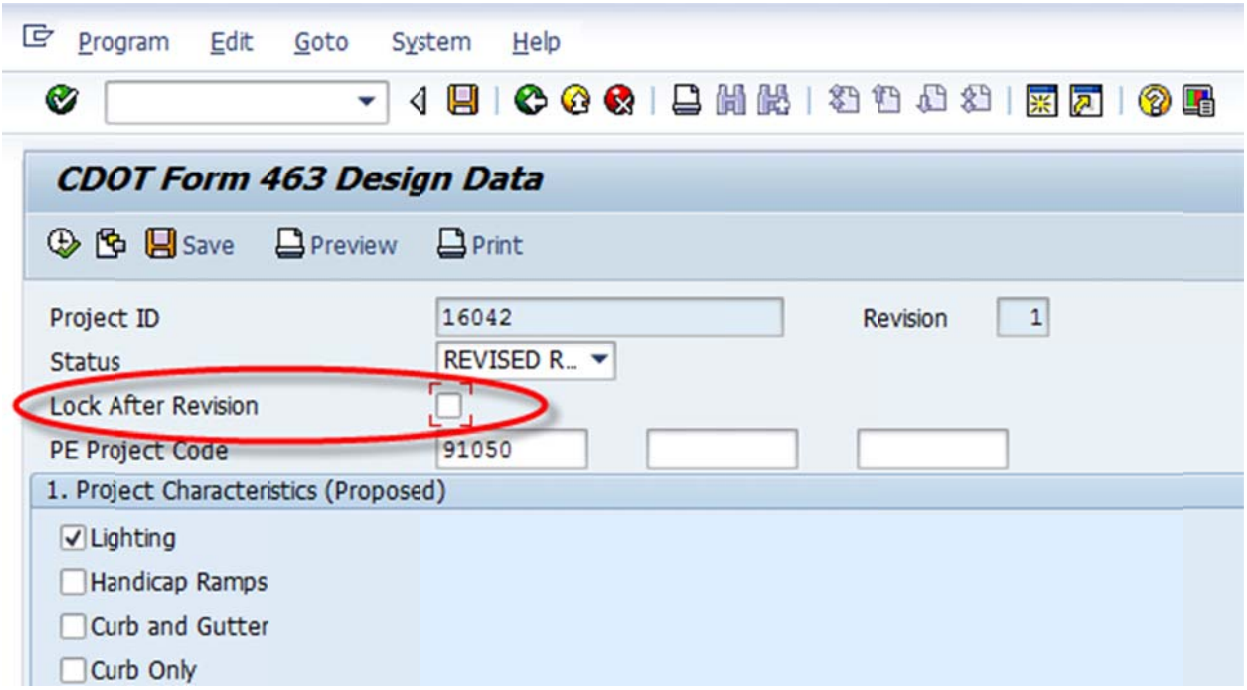


These fields are intended to list any other projects that were used for the preparation or clearing of the construction project. Generally speaking, if a separate design project was used such (like a Resurfacing Design pool or a project design corridor). Another example would be if a ROW acquisition project was used to acquire ROW for this project specifically. (the intent is not to list Projects where ROW was acquired for the original project). Additionally, if an environmental EA or EIS was completed and is being used for this project, it should be listed in these fields as well. These fields are used for tracking of related project costs in SAP, mainly for FHWA informational needs.

The Resident Engineer will check the form for accuracy and completion before submittal to the Region Program Engineer for approval. If possible, all changes to Form 463 should be made while it is still in preliminary status.

2.05.03 Revising Form 463 in SAP

If the need arises to modify the data after Form 463 has been set to Final status in SAP, the form will need to be set to Revised by the Regional Business office group. Once they have set the status to Revised, the form will be editable so the changes can be made. Once the changes have been made and approved, the Resident Engineer will need to check the Lock after Revision button as shown below and save the changes.



2.05.04 Final Form

The Final form is required for OFMB authorization prior to the project being advertised.

FHWA stresses two requirements concerning design standards on federal aid projects. These requirements, which are mandatory unless exceptions are specifically noted, are:

1. Description of the project and its controlling criteria must be identified in the project files. These criteria concern the present condition of the roadway and safety features. Any corrective action or proposed improvements needed relative to these criteria should be documented. Such documentation must be available to FHWA for reference.

2. FHWA concerns must be reasonably addressed in any variance justification request sent to FHWA for its approval. FHWA may not approve a request that does not provide enough information and detail to satisfy its concerns about the safety and design improvements provided, and the opportunity to provide such features. The Form 464 meets these requirements.

2.05.05 Summary

The following steps describe the activities involved in the completion of a Form 463:

1. Conduct the Design Scoping Review (see Sections 1.02 and 2.01 of this manual). Distribute meeting minutes with action items.
2. Initiate Create Project in SAP (see Section 1.04 of this manual). Some projects will have step 1 after this step.
3. Prepare the preliminary Form 463 after the Design Scoping Review for distribution to users and for action on any exception to design standards.
4. Complete the final Form 463 and obtain the Region Program Engineer's signature on the hard copy. This can be done after the FIR meeting when the top half of the form 128 will be signed.

In addition, Block 5 (Environmental section) of Form 463 is populated from input on both the CJ20N and the Environmental custom tab along with information entered via ZJ17, Form 128.

2.05.06 Additional References:

1. Post Award Project Financial Statement: Form 65 *http://www.coloradodot.info/business/designsupport/bulletins_manuals/construction-bulletins/current/cb-2009-5-form-65.doc/view*
2. *AASHTO Policy on Geometric Design of Highways and Streets*
3. CDOT *Procedural Directive 512.1, Project Scoping and the Design Scoping Review (DSR)*
4. CDOT Transportation Data Set http://internal/App_DTD_DataAccess/index.cfm
5. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms
6. CDOT and FHWA stewardship agreement http://www.coloradodot.info/business/permits/accesspermits/references/stewardship-agreement.pdf/view
7. FHWA core curriculum http://www.fhwa.dot.gov/programadmin/contracts/

2.06 DESIGN EXCEPTION (VARIANCE) (FORM 464)

Form 464, Design Exception Variance Request, is used to document a project design exception (variance). This form documents important decisions, mitigation, and safety information required when minimum design standards, as identified on Form 463, Design Data, cannot be met.

The Resident Engineer shall identify substandard design features based on Form 463. Substandard features that will not be corrected on the project will be described on a Form 464, along with the rationale for the exceptions. Mitigation measures for reducing the design standard, accident history data, and cost analysis for each substandard feature must be explained. The estimated cost for the project with the design exception should be compared to the estimated cost for constructing the project to full standards.

2.06.01 Agreement between Forms 463 and 464

The Form 463 prompts the preparer to compare the existing and proposed design criteria with the minimum standards acceptable for that particular type of roadway. It is important that the appropriate reference source for the standard be identified on Form 463 and Form 464, and that both forms cite the same references. In general, the reference will depend on the type of federal funding program, the functional classification of the roadway, the design elements considered, or a combination thereof.

2.06.02 Additional Resources

In addition to the *CDOT Roadway Design Guide* and the *AASHTO Green Book*, a current listing of AASHTO publications that provide valuable information for obtaining good design is in 23 CFR Part 625.

If the project is a 3R Project, follow Section 2.07 for the applicable design exception procedures.

2.06.03 Discovering Non-conformities

The Design Scoping Review provides a design data scoping process; and upon completion, prior to or concurrent with Form 463, will identify the existing criteria status and whether any exception to the minimum criteria requires further action. The following controlling design criteria require variance documentation whenever the standard values are not met.

1. Design speed
2. Lane width
3. Shoulder width
4. Structural capacity
5. Horizontal alignment
6. Vertical alignment
7. Stopping sight distance
8. Grade
9. Cross-slope
10. Superelevation
11. Horizontal clearance (except clear zone)
12. Vertical clearance
13. Bridge width

Guardrail and bridge rail are to be designed according to the latest CDOT M&S Standard Plans on all new construction and reconstruction projects. For 3R and surfacing type projects, guardrail is to be handled in accordance with Section 2.07.

FHWA may approve design exceptions on federal aid projects for experimental features or where conditions warrant an exception.

Determination to approve a project design that does not conform to the minimum criteria is to be made only after due consideration is given to project conditions and safety benefits for the dollar invested, compatibility with adjacent sections of roadway, and the probable time before the roadway section will be reconstructed due to increased traffic demands or changed conditions.

On local agency projects the involved entities and consultants should discuss the variance request with the Resident Engineer to determine the feasibility of approval and the possibility of project delays. Local agency projects may not have historical accident data and roadway safety inventories. However, accident records may be available from the Safety and Traffic Engineering Branch.

FHWA should be invited to the Field Inspection Review meeting on National Highway System projects and federal-oversight projects when there is a potential variance.

All variances should be identified by the Field Inspection Review and approved prior to the Final Office Review. Early submittal of variance requests will allow time to incorporate comments and concerns, and to collect any additional supporting data and analysis. Untimely submittal for approval of design variances can result in costly delays to the project.

When the design criteria are properly discussed on Form 464, the minimum FHWA requirements for preparing the variance request are satisfied. Additional comments can be added to clarify items. No separate variance transmittal letter is necessary when Form 464 is used.

Form 464 is approved by the Region Program Engineer and, on federal-oversight projects and all interstate projects regardless of oversight, by FHWA. Federal oversight is explained in the Stewardship Agreement between the Federal Highway Administration, Colorado Division, and the Colorado Department of Transportation.

2.06.04 No Variance Required

The following items do not require a variance, but should be documented as a design decision. See Section 2.20.

1. Reduction in existing roadway elements where the roadway still meets the minimum in *The AASHTO Policy on Geometric Design of Highways and Streets* or appropriate CDOT standard (does not apply to rehabilitation projects).
2. Changes to the *CDOT M&S Standard Plans* are handled on a project basis. However, changes to FHWA policy, such as crash-tested bridge rail, may require a variance, as stated in the policy.

2.06.05 Design Exception Request

The documentation and procedures for preparing a design exception request are as follows:

1. Identify the exception to the design standards within at least 30 days after the Design Scoping Review but prior to the Field Inspection Review. The Resident Engineer should discuss the status of variance approval at the Field Inspection Review.
2. Prepare a preliminary Form 463 and indicate all exceptions to design standards.
3. Prepare a Form 464 (or letter) with a description of all exceptions, justifications, costs, and proposed mitigation. When supporting information is not available, a statement should be included stating that such data is not collectable. The Resident Engineer should include as much information as can be reasonably researched or obtained. If criteria cannot be addressed, “Not Available” should be noted with applicable reasoning. The remarks should describe the effort made to obtain the information.
4. The following type of projects may not be required to meet full AASHTO standards but must meet the minimum standards in the appropriate sections of the *CDOT Roadway Design Guide*. Otherwise a variance request will be prepared:
   a. 3R projects: See the *CDOT Roadway Design Guide*.
   b. Corridor projects, as defined by a NEPA document: See the *CDOT Roadway Design Guide and The AASHTO Policy on Geometric Design of Highways and Streets* for those sections that apply to the classification of roadways not on the National Highway System.

c. Safety type projects. When evaluating existing conditions on safety type projects, the 3R project standards may be used to determine whether minimum roadway criteria have been met. The Resident Engineer should consider safety and hazard potential in deciding whether a higher standard is more appropriate. For example, new bridge rail and guardrail shall meet full standards and appropriate rail crash-testing requirements. The existing guardrail at the approach roadways shall be evaluated against the 3R standards. Although the scoping process may not be extensive on non-federal aid and State projects, the approval of a variance and the recommendation to prepare a safety letter may be applicable.

5. Projects with federal aid oversight and Interstate projects require FHWA approval.
6. For projects by outside agencies or consultants, the Region will review the variance request to determine whether the intent of the Form 464 is satisfied.

All affected organizations must be informed of the progress made toward obtaining approval of any variance. These organizations include local agencies, consultants, and CDOT branches.

Any design decisions that do not require a variance or design exception request should be documented in a design decision letter and placed in the project file. (See Section 2.20.)

2.06.06 Additional References:

1. Design Data (See Section 2.05 of this manual.)
2. Design Scoping Review (See Section 2.06 of this manual.)
3. *CDOT Procedural Directive 512.1, Project Scoping and the Design Scoping Review (DSR)*
4. FHWA Technical Advisory No. T 5040.28, 10/17/88, Developing Geometric Design Criteria and Processes for Non-Freeway RRR Projects at: http://www.fhwa.dot.gov/////legsregs/directives/techadvs.htm
5. Transportation Research Board, TRB Special Report 214
6. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

2.07 PROCEDURES FOR ADDRESSING SAFETY REQUIREMENTS ON RESURFACING, RESTORATION, AND REHABILITATION PROJECTS

2.07.01 Purpose of 3R Program

The purpose of the 3R program is to preserve and extend the service life of highways and enhance highway safety. 3R projects enable highway agencies to improve highway safety by strategically upgrading existing highway and roadside features without the cost of upgrading to current AASHTO design standards. It is CDOT's objective to maximize accident reduction on 3R projects within the limitations of available budgets and to be consistent with the intent of the 3R policy by making roadway safety improvements at locations where they do the most good and prevent the most accidents. The following procedures are intended to develop a more safety conscious design leading to enhanced safety statewide by taking advantage of cost effective opportunities to improve safety.

The Resident Engineer will ensure that investment in safety improvements within 3R projects will be made when justified and economically feasible.

2.07.02 3R (Resurfacing, Restoration, and Rehabilitation):

A 3R project is any project that consists of one or more of the following: resurfacing, restoration, or rehabilitation.

Resurfacing: Placement of additional surfacing material (1.5 to 6 inches thick) over the existing roadway to improve serviceability, to provide additional strength, or both.

Restoration and Rehabilitation:

1. Restoration of the existing pavement (including shoulders) to a condition of adequate structural support or to a condition adequate for placement of an additional stage of construction.
2. Widening of the lanes, shoulders, or both of an existing facility.
3. Addition of auxiliary lanes such as acceleration, deceleration, turn, short climbing lanes, etc. This does not include addition of through lanes.
4. Correction of minor structure safety defects or deficiencies (See Section 2.07.4.6).

4R (Resurfacing, Restoration, Rehabilitation and Reconstruction): Projects requiring reconstruction or resurfacing greater than six inches should not follow the 3R procedures because AASHTO design standards apply and design variances are required when the design does not meet relevant standards.

Maintenance Project: Maintenance type projects with a resurfacing depth greater than or equal to 1.5 inches will follow these 3R procedures. Maintenance type projects that are less than 1.5 inches do not fall under 3R procedures.

Safety Project: Safety projects do not fall under 3R procedures because this type of project addresses a specific safety deficiency.

2.07.03 3R Design Procedures

2.07.03.01 Design Scoping Review for 3R Projects

The Design Scoping Review (DSR) creates an early office study and on-site review of a project prior to preliminary design. The project team should evaluate safety with the knowledge of what improvements to the project yield the greatest safety gains in relation to cost. This enables the development of a scope of work that will be consistent with CDOT's 3R policy. See Section 2.01 (DSR) and Procedural Directive 512.1 for further Design Scoping Review requirements. This review should be used to identify and document potential safety improvements.

When a project falls under 3R procedures, the Region Project Team in charge of the project (Designer, Resident Engineer, Project Engineer, or Traffic Engineer) can get an initial idea of the level of possible safety work needed as related to accident history by referring to a map provided by the HQ Safety and Traffic Engineering Branch identifying "Locations with Potential for Accident Reduction". These "Location Maps" identify intersections (Yellow Dots) and highway segments (Colored Lines Parallel to the Highway) on the State Highway System where specific accident patterns are observed and can possibly be addressed. If an accident pattern exists within the project limits, the Project Team should then refer to the accompanying "Listing". This listing specifically identifies each location by Highway and Mile Point. Both the Maps and Listings (in PDF format) are located on the HQ Safety and Traffic Engineering Branch's website at:

http://internal.dot.state.co.us/stafftraffic/safety_engineering_group/accident_reduction_locations.html

2.07.03.02 Operations Evaluation for 3R Projects

3R Projects are now required to have a Operations Evaluation and are no longer required to have a separate safety evaluation.

The Operations Evaluation, which is required on all projects, consists of three parts: a Safety Analysis, an Operations Analysis, and an ITS Analysis.

Refer to section 4.12 for details on the Operations Evaluation.

2.07.03.03 Field Inspection Review/Final Office Review (FIR/FOR) for 3R Projects

FIR and FOR meetings shall be conducted in accordance with the procedures outlined in Sections 2.17 and 2.28.

At the Field Inspection Review, the Resident Engineer shall identify any exceptions to minimum design standards for 3R projects, and record those on the Form 463a when a variance is required, including a safety letter.

2.07.03.04 Safety Issues Related to Geometric Design Criteria

The designer will adhere to the following procedures for designing and documenting the 13 geometric design criteria if a safety evaluation is not done. (Design Standards, Boxes 3 and 4 of CDOT Form 463 and CDOT Form 1327). For definitions of the 13 geometric design criteria, see the CDOT *Roadway Design Guide*. For Freeway and Interstate 3R projects, full AASHTO standards apply. For the purposes of these procedures, Freeways are arterial highways with full control of access (for further information see AASHTO's *A Policy on Geometric Design of Highways and Streets* and the CDOT Transportation Data Set http://www.dot.state.co.us/App_DTD_DataAccess/index.cfm). For all other 3R projects, the 3R standards are intended to provide reduced limits in design. However, these

lesser standards should not be used automatically, but only if higher values are not possible, practical, or cost effective (See Section on 3R standards in the CDOT *Roadway Design Guide* for these standards).

The project team should address all documented safety issues identified through the Safety Evaluation, DSR, FIR, and FOR processes. Existing roadway design features may be retained where they are performing in a satisfactory manner with regard to accident history. The proposed design should not worsen an existing condition (guardrail height, edge drop-off, drainage, etc.). Safety issues identified as being related to any of the 13 geometric design criteria will be addressed in the design process. Only those geometric design criteria directly related to the identified safety issue need to be addressed. Refer to the "Process for Addressing Safety Requirements on 3R Projects" flowchart (Figure 2-1) for guidance.

If a geometric design criterion is identified as being related to accident causality, then the designer will either bring this design element up to the relevant standard, or will complete a design variance according to the procedures described in Section 2.05 Design Exception (Variance) (Form 464) and the process flowchart (Figure 2-1). Design variances for Interstate projects require FHWA approval.

All existing guardrail, bridge rail, and transitions not meeting NCHRP 230 and end and median terminals not meeting NCHRP 350 shall be upgraded to meet NCHRP 350 requirements. End terminals and cable guardrail terminals must be upgraded to NCHRP 350. See the AASHTO Roadside Design Guide and Sections 2.09 and 5.12 of the this manual for additional information. For assistance contact the Standards and Specifications Unit and Staff Bridge.

The Resident Engineer may implement safety improvements not specifically identified in the Safety Evaluation, DSR, FIR, and FOR if funding and special circumstances exist and written approval is obtained from the Program Engineer.

2.07.03.05 Safety Issues Not Related to One of the 13 Geometric Design Criteria

Safety mitigation recommendations identified through the Safety Evaluation, DSR, FIR, and FOR processes that are not related to one of the 13 geometric design criteria should be incorporated into the plans. If the decision is made not to implement recommendations for improvement, this decision should be documented in the meeting minutes or explained in a design decision letter.

2.07.03.06 Structural Recommendations for Overlay Work

The Resident Engineer will contact the appropriate Regional Staff Bridge Unit for recommendations concerning Structural Capacity and Bridge Width for all structures within the project limits.

2.07.03.07 Completion of the Preliminary Design Data (Form 463)

Resident Engineers must complete a Form 463 in accordance with Section 2.05.

2.07.03.08 Resurfacing Program Funding Limitations

The Colorado Transportation Commission determines the level of funding for the Surface Treatment Program with the goal of maintaining the condition and drivability of the state highway system. CDOT's surface treatment program restricts the type of work eligible for this funding. Minor safety work (signing, striping, delineation etc.), shoulder-up work, guardrail adjustments, and Americans with Disabilities Act requirements necessary to complete the surface treatment, are allowed under this program. For guidance on allowable items, the Resident Engineer should refer to Policy Memo No. 7 *Analysis of Essential Items*.

Enhancements that are deemed desirable or that are mandated (upgraded bridge rail and guardrail, permanent stormwater quality features, etc.) can also be implemented, but funding other than resurfacing would have to be provided to supplement the budget.

2.07.03.09 Safety Enhancement Funding

Safety enhancements not allowed under the resurfacing program can be funded through the Region - Safety Enhancements Pool. The Resident Engineer will submit these requests to the Program Engineer detailing proposed work, reasons for the safety enhancement, and estimated costs listed by appropriate work items. The Region will prioritize these requests and allocate funds based on the system-wide goal of achieving the maximum reduction of accidents within budgetary allocations. The Region Program Engineer, the Region Traffic Engineer, or both working together will decide which safety enhancements will be funded in the Region. If budgetary limitations prohibit the funding of all requested safety enhancements, the Program Engineer will document the decision to not fund the safety enhancement and will submit a copy to the Resident Engineer. The Resident Engineer will then complete the appropriate documentation. Refer to the "Process for Addressing Safety Requirements on 3R Projects" flowchart (See Figure 2-1) for guidance.

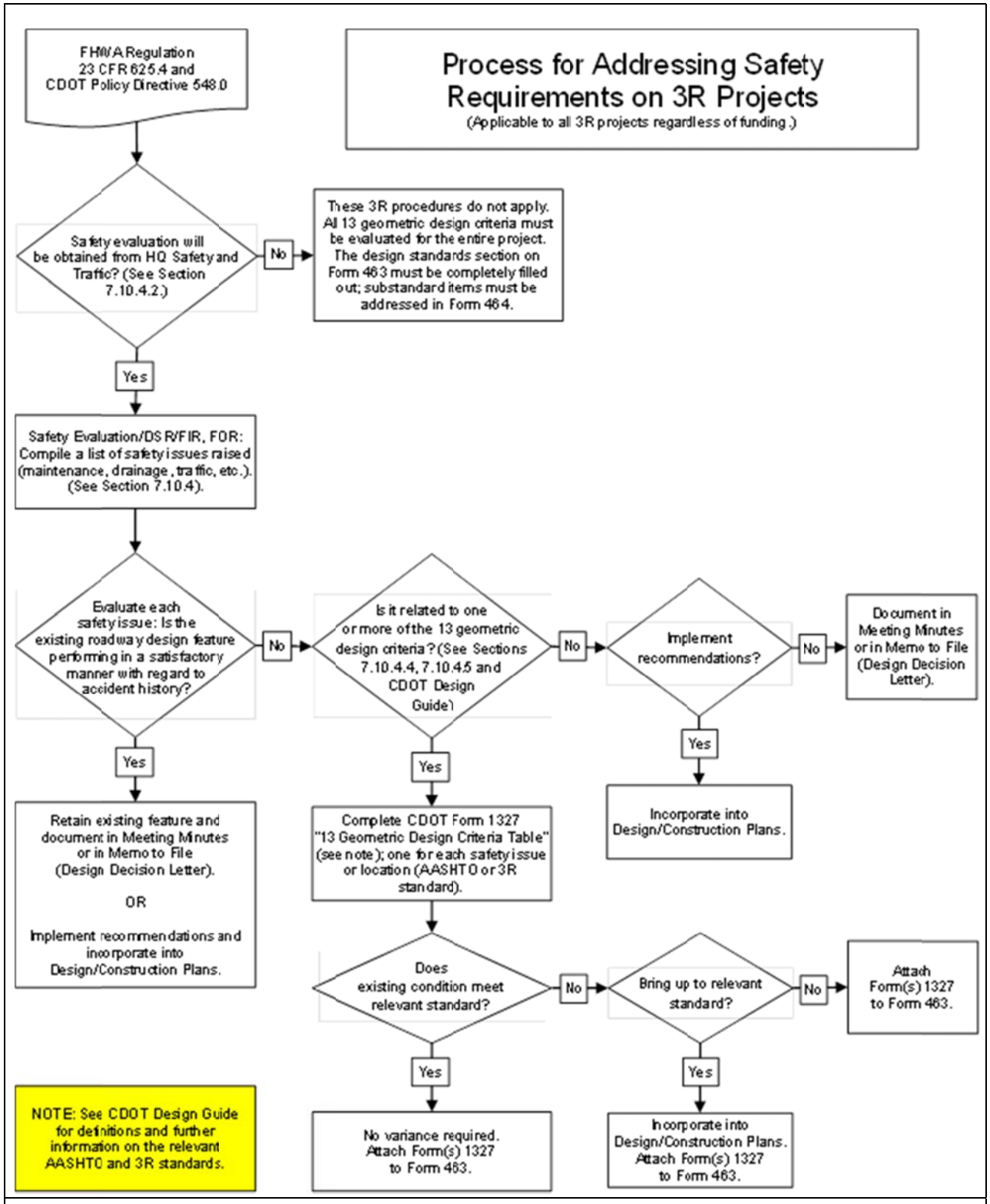


Figure 2-1 3R Projects Flowchart

Following the flowchart is an example of a sample Form 464, completed for a 3R Project

COLORADO DEPARTMENT OF TRANSPORTATION

DESIGN EXCEPTION VARIANCE REQUEST

FHWA Oversight: ☐ Yes ☒ No

Project Code: 14122

Project name: SH 99 Neptune to Venus

Date: 10/10/2004

Project Number: NH 099-121

Type (check all that are applicable)

☐ New construction ☐ Restoration ☒ Resurfacing ☐ Rehabilitation ☐ _____
☐ Reconstruction ☒ Safety ☐ Enhancement ☐ _____ ☐ _____

Revised: 11/11/2004

Region: 1

Part 1 – Complete A through H for all projects.

A. Short project description (☒ see CDOT Form 463 for more detailed description)
Resurface SH 99 from Neptune Road to Venus Avenue. Safety Work per recommendations in Safety Evaluation to include guardrail, minor widening, and slope flattening.

☐ AASHTO standards apply
☒ 3R standards apply
☐ Other:_____

B. Description of standard(s) reduced
In accordance with the PROCEDURES FOR ADDRESSING SAFETY REQUIREMENTS ON RESURFACING, RESTORATION, REHABILITATION (3R) PROJECTS, not all standards have been addressed. See attached Safety Assessment Report (Recommendations Section) and CDOT Form # 1327 (13 Geometric Design Criteria Table) for specific improvement locations considered.

C. Rational need for exception(s)
See attached Safety Assessment Report (Recommendations Section) and CDOT Form # 1327 (13 Geometric Design Criteria Table) for each specific safety issue location.

D. Mitigation measures proposed (include safety discussion)
See attached Safety Assessment Report (Recommendations Section) and CDOT Form # 1327 (13 Geometric Design Criteria Table) for each specific safety issue location.

E. Description of adjoining sections: (☒ see CDOT Form 463)
Other:

☒ same as existing project
☒ same as proposed project

F. Accident data Source: Safety Assessment Report

Most recent statewide accident rate (calendar year) for this functional class / facility: (per million vehicle-miles of travel)
a) 2.31 b) _____
Latest accident rate for this highway (usually 3 years): 5 years
a) 1.41 b) _____

G. Cost

Estimated item cost if built to full standard $ 400000
Estimated item cost with exception $ 200000
+ difference in cost: $ 200000

H. Other (as needed)

Part 2 – Appropriate signatures required.

A. Submitted by (Project Manager)	Date	Program Engineer Approval	Date

Resident Engineer Approval	Date

Required for Federal-oversight projects only

Approved by (FHWA Division Administrator)	Date

B. ☐ Not approved ☐ Approved with conditions	Conditions/comments

Previous editions are obsolete and may not be used.

Distribution: Project Manager
Program Engineer
Resident Engineer
HQ Records Center
FHWA, if applicable

CDOT Form #0464 08/04

2.07.04 Additional References:

1. 23 CFR Part 625, Design Standards for Highways
2. *AASHTO Roadside Design Guide*
3. *CDOT Roadway Design Guide*
4. FHWA Technical Advisory 5040.28, *Developing Geometric Design Criteria and Processes for Nonfreeway RRR Projects*
   http://www.fhwa.dot.gov//////legsregs/directives/techadvs.htm
5. Transportation Research Board, *TRB Special Report 214, Designing Safer Roads*
6. For forms, see CDOT on-line forms library
   http://www.coloradodot.info/library/forms
7. Policy Memo No. 7 *Analysis of Essential Items*
   http://www.coloradodot.info/business/designsupport/policy-memos .

2.08 SAFETY REVIEW (INCLUDING CLEAR ZONE DECISIONS)

The design of safer public streets and highways begins at the Design Scoping Review and continues through advertisement. Clear zones should be designed in accordance with the *AASHTO Roadside Design Guide.*

Highway safety improvements to decrease vehicular accidents and fatality reduction can be divided into three areas of concern:

1. Roadway safety improvements -- visibility and operation characteristics
2. Roadside hazard elimination -- removing roadside obstacles
3. Traffic engineering and operations -- improving traffic regulations, warnings, and directions

AASHTO's recommended order of preference for treatment of roadside obstacles on existing highways is as follows:

1. Elimination of the hazard.
2. Relocation of the hazard to a point where it is less likely to be struck.
3. Use of break-away devices to reduce the hazard.
4. Selection of a cost-effective traffic barrier (longitudinal barrier or crash cushion) to reduce accident severity.
5. Delineation of the Hazard

The Resident Engineer is responsible for providing a design with safety as a primary objective. In many instances, benefits gained from a specific safety design or treatment can equal or exceed additional cost. The Resident Engineer can best utilize limited design funds by preparing a benefit/cost analysis. The Resident Engineer shall consider a safety analysis of the project performed by the Safety and Traffic Engineering Branch detailing feasible alternatives and recommendations.

The Resident Engineer should review and document the safety issues and decisions. Any benefit/cost analysis should include the following: encroachments, roadside geometry, and accident costs. See the *AASHTO Roadside Design Guide* for more details.

AASHTO design and safety standards apply to any proposed improvement on all projects on the National Highway System (including Interstate) regardless of funding (federal, state, local, or private). Deviations from standards must be justified by approved design exceptions. The FHWA has established 13 controlling criteria

requiring formal approval, with the exception of the clear zone (23 CFR Part 625, Design Standards for Highways). Refer to Section 2.05 for Design Exceptions (Variances).

For Clear Zone requirements of hydraulic structures, refer to the CDOT Drainage Design Manual.

Additional References:

1. AASHTO *Highway Safety Design and Operations Guide*
2. AASHTO *Policy on Geometric Design of Highways and Streets*
3. CDOT *Roadway Design Guide*
4. Transportation Research Board, TRB Special Report 214, *Designing Safer Roads*
5. CDOT Procedural Directive 1602.1 *Bike and Pedestrians*

2.09 ROADSIDE BARRIER DESIGN AND REVIEW

Roadside barrier is installed to reduce the severity of run-off-the-road accidents. The primary purpose of roadside barrier is to prevent a vehicle from leaving the road and striking a fixed object or terrain feature that is more hazardous than the roadside barrier.

A roadside barrier is a longitudinal barrier used to shield motorists from natural or manmade hazards located along either side of a roadway, and may occasionally be used to protect bystanders, pedestrians, and cyclists from vehicular traffic. A barrier is installed when an obstacle cannot be removed or relocated or when the steepness of the roadside terrain prevents establishing an adequate clear zone. CDOT installs barrier only when it is not economically feasible to eliminate a hazard or make the feature traversable or when terrain conditions are such that an adequate roadside recovery area cannot be provided for the given design speed.

CDOT uses several types of barriers, primarily Guardrail Type 3 W-beam, Guardrail Type 7 F-shape Concrete Barrier, and Tensioned Wire Cable Barrier. Thrie Beam Guardrail is also used.

In many cases, slope flattening and extending hazardous features such as culverts can be viable alternatives to barrier. Guardrail Type 3 (semi-rigid) and concrete (rigid) barriers can redirect errant vehicles when impacted. Semi-rigid barriers can deflect up to 5 feet upon impact. Rigid concrete barrier that is anchored has no deflection upon impact. In some cases, the available space between the barrier and the object may not be adequate. In such cases, the barrier should be stiffened as suggested in the AASHTO *Roadside Design Guide* in advance of and alongside the fixed object. Also, important is the need for a thrie beam transition between semi-rigid and rigid barriers or between a semi-rigid barrier and bridge rail to eliminate pocketing, snagging, or penetration of the vehicle at the point of connection.

Because guardrail is a hazard in itself, it should be installed only in accordance with the guidelines of the *AASHTO Roadside Design Guide.* See CDOT *Roadway Design Guide* Section 20.3.2.4 for guidance on offset distance for the guardrail. Placement of barrier is based on accident potential and severity. Since both barriers are hazards, they should be installed only where they result in a reduction in the accident severity compared to impacting the hazard being shielded.

Substandard bridge rail should be examined for upgrading on resurfacing projects.

The Resident Engineer is responsible for evaluating factors concerning safety, traffic control, hazards, and other constraints in the use of guardrail. Justifications and warrants for guardrail design are best done after the scoping review. The Resident Engineer should use an analysis to warrant the use of guardrail based on the *AASHTO Roadside Design Guide*. Bridge rail designs and decisions should be coordinated with the Bridge Design and Management Branch.

The Resident Engineer should consider factors such as design speed and traffic volume in relation to barrier need as identified in the *AASHTO Roadside Design Guide*. The cost of slope flattening and hazard elimination compared with barrier cost should be considered.

The design sequence for the placement of barrier is as follows:

1. Provide the clear zone as determined from the *AASHTO Roadside Design Guide*.
2. Provide for slope flattening for traversable grades (4:1 slope) within the clear zone.
3. Remove the obstacle or redesign it so it can be traversed safely.
4. Relocate the obstacle or flatten the steep terrain. Relocate obstacles to a location where an errant vehicle is less likely to impact it. Location should be as far from the edge of travel way as practical.
5. Reduce impact severity by using appropriate breakaway roadway fixtures.
6. Shield the obstacle, terrain feature, or water hazard with longitudinal barrier, crash cushion, or a combination thereof when it cannot be eliminated, relocated, or redesigned.
7. Delineate the obstacle or hazard when the above alternatives are not appropriate due to type of project, low design speed, low volume, classification of the roadway as scenic, or classification of the obstacle as a historical feature.
8. If barrier is impeding the free passage of drainage flow or is causing ponding, consult the Region Hydraulics Engineer to address the drainage problem.

When the Resident Engineer recommends barrier, criteria in the *CDOT Roadway Design Guide*, *CDOT M Standard Plans,* and the *AASHTO Roadside Design Guide* should be followed. For resurfacing, rather than just replace in kind, the existing Type 3 guardrail should first be checked to ensure that the installation configuration meets the length of need criteria in the AASHTO *Roadside Design Guide* or current CDOT M Standard Plans. When the Type 3 guardrail would be less than 25 inches in height after the 3R work is complete, check to ensure that it is in good condition and able to be reset to the specified height of 28 inches,.

When completing the CDOT Form 463 Design Data in SAP, the designer should provide a detailed description of the barrier elements that do not meet current

standards. The description should appear either in the comments section of Section 8, Safety Considerations or in Section 13, Remarks where additional text can be added.

Barrier installations should use the standard configurations as shown in the CDOT M Standard Plans. For situations not addressed in the CDOT M Standard Plans, barrier installations will need to be designed in accordance with the AASHTO Roadside Design Guide. Designers are to include the barrier design calculations as part of the project file. For those barrier designs that are project specific and different from the M Standard Plans, designers need to send the proposed design into the Standards and Specifications Unit for review and comment. Allow 2-3 weeks within the project schedule for this review.

Substandard existing guardrail end sections on all Interstate highway projects and on all National Highway System projects with a design speed of at least 45 miles per hour and an average daily traffic of 6,000 or more are to be replaced. Replace them with end treatments passing the National Cooperative Highway Research Program Report No. 350 criteria or AASHTO Manual for Assessing Safety Hardware (MASH) 2009. When possible replace substandard end treatments on other roadway systems.

Additional References

1. CDOT *Cable Barrier Guide*
2. AASHTO *Roadside Design Guide*
3. CDOT *Roadway Design Guide*, Chapter 20
4. AASHTO Manual for Assessing Safety Hardware (MASH) 2009

2.10 BICYCLE AND PEDESTRIAN FACILITIES

Bicycle and pedestrian facilities are of growing importance nationally for commuting and recreational purposes. When these facilities are not incorporated or considered in the design phase, both safety and efficiency of the shared roadway can be impaired. The proper placement and design of these facilities is an important element of design on all new or reconstruction projects.

CDOT Policy Directive 1602.0 Bikes and Pedestrians requires CDOT to include the needs of bicyclists and pedestrians in the planning, design, and operation of transportation facilities as a matter of routine.

Colorado statutes recognize bicycles as vehicles. As such, bicyclists are allowed to use any roadway unless specifically prohibited and have all the rights and responsibilities of other road users. Bicycle and pedestrian facilities are portions of a road or pathway that in some manner is specifically designated as being open to bicycle travel, pedestrian travel, or both, regardless of whether such facilities are designed for the exclusive use of bicycles, pedestrians, or both. Shared bicycle use with other modes of transportation is an important consideration. On-road bicycle facilities, such as designated bike lanes and shoulders, are viable options when separate facilities are not practical.

Consideration for pedestrian and bicycle design is especially important in areas close to schools and parks.

The Resident Engineer shall evaluate the options for providing bicycle and pedestrian facilities on new construction and reconstruction projects. The evaluation will include review of *CDOT Procedural Directive 1602.1 Bike and Pedestrian, CDOT Roadway Design Guide - Chapter 14 Bicycle and Pedestrian Facilities,* and *CDOT Policy Directive 902.0 Shoulder Policy.* These facilities are an integral part of the roadway environment, and attention must be paid to their presence in rural areas as well as urbanized locations. For 3R type projects, the design of pedestrian and bicycle facilities will need to be addressed according to PD 1602.1. Construction project Traffic Control Plans are required to address accommodations for bicycles and pedestrians as called for in the MUTCD, Section 6C.01.

Bicycle and pedestrian facilities should comply with the latest design standards and Americans With Disabilities Act requirements, including requirements for sidewalks, crosswalks, overpasses and underpasses, traffic control features, curb cuts, lighting (ramps), and access ramps for persons with disabilities. Curb cuts (ramps) and other

provisions for persons with disabilities are required on all projects involving curbs or sidewalks. See paragraph 4 in Section 8.01 for information on making decisions regarding compliance and consulting the CDOT ADA Coordinator..

According to Title 23 of the *Code of Federal Regulations* the safe accommodation of pedestrians and bicyclists should be given full consideration during the development and construction of federal aid highway projects. The special needs of the elderly and persons with disabilities shall be considered on all projects. The same consideration should be given to state-funded projects.

Where current or anticipated pedestrian or bicycle traffic presents a potential conflict with motor vehicle traffic, every effort shall be made to minimize the conflicts.

Where rumble strips are proposed on projects, the effects to bicyclists should be evaluated according to the *CDOT Roadway Design Guide*, Chapter 20 – Safety and Traffic Engineering. If the decision is made to install rumble strips, CDOT Standard Plan M-614-1 for rumble strips shall be followed.

Replaced and rehabilitated bridge decks should be reconstructed to accommodate bicyclists and pedestrians where they are permitted.

The scoping document should discuss applicability of providing bicycle and pedestrian facilities, and the Form 463, Design Data, should document these decisions. For new or reconstruction projects, the Resident Engineer shall document design decisions and variances for bicycle and pedestrian facilities. The inability to provide pedestrian and bicycle facilities should be documented in accordance with Chapter 14 of the Roadway Design Guide.

Guidelines are in the *AASHTO Guide for the Development of Bicycle and Pedestrian Facilities, the AASHTO Guide for the Development of Pedestrian Facilities,* Chapter 14 of the Roadway Design Guide, and the *AASHTO Policy on Geometric Design of Highways and Streets*. These design guidelines will be used on all state or federally funded projects, and it is recommended that local agencies use them for locally funded projects.

For Hydraulic Design of drainage structures under Bicycle and Pedestrian Facilities, refer to *CDOT Drainage Design Manual*.

Additional References:

1. 23 CFR Part 652, Pedestrian and Bicycle Accommodations and Projects

2. Transportation Research Board, TRB 959 - Pedestrian and Bicycle Facilities http://pubsindex.trb.org/view.aspx?id=216854
3. *CDOT Procedural Directive 507.1, Standards for Rest Areas, Pedestrian Underpasses and Overpasses*
4. *CDOT Policy Directive 605.0 Comprehensive Accessibility for Persons with Disabilities*
5. Americans With Disabilities Act Handbook
6. FHWA Region 8 Commentary and Text, Section 14, ADA Accessibility Guidelines
7. *CDOT M Standard Plans*
8. *CDOT Roadway Design Guide,* Chapter 14 Bicycle and Pedestrian Facilities
9. *Flexibility in Highway Design* – FHWA-PD-97-062
10. *The National Bicycling and Walking Study* – FHWA-PD-94-023
11. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*
12. Pedestrian and Bicyclist Intersection Safety Indices, 2006
13. Americans with Disabilities Act Accessibility Guidelines (ADAAG)
14. Pedestrian and Bicycle Information Center http://www.bicyclinginfo.org/engineering/
15. CDOT Bridge Design Manual, Section 2.2.7 Bicycle Railing
16. Pedsafe: Pedestrian Safety Guide and Countermeasure Selection System http://www.walkinginfo.org/pedsafe/
17. ITE Bicycle and Pedestrian studies 1996 - 2005 http://www.ite.org/councils/pedbike/publications.asp
18. Accommodating Bicycle and Pedestrian Travel: A Recommended Approach A US DOT Policy Statement Integrating Bicycling and Walking into Transportation Infrastructure http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/design_guidance/design.cfm

2.11 HYDRAULIC DESIGN (EROSION CONTROL AND STORMWATER)

The purpose of hydraulic design is to determine the magnitude and frequency of storm runoff, the best location and adequate size of drainage facilities, and hydraulic efficiency of designed drainage systems. Erosion control and stormwater management is applicable to all CDOT projects.

The design of highway drainage structures requires a hydrologic analysis to determine the magnitude and frequency of storm runoff and a hydraulic analysis to locate and size the drainage facilities. Hydraulic design includes methods and practices for erosion and sediment control, water quality, and stormwater management on projects.

Design of drainage features on transportation projects will be done in accordance with the *CDOT Drainage Design Manual*, the *CDOT Pipe Type Selection Guide*, and the *CDOT Erosion Control and Stormwater Quality Control Guide*.

The Hydraulics Engineer is responsible for determining major drainage structure type, location, and size, as determined by calculations and field inspections. This involves working with the Environmental Programs staff to assess environmental needs, to identify floodplain needs, and to accommodate floodplain requirements, including any significant encroachments. The structure design will consider elevations, scour, erosion protection, storm runoff, and any other factors involved in the design of hydraulic drainage structures. Underground utilities in the vicinity of existing and proposed drainage features should be identified and located by the Region.

Routine designs, such as culverts or small concrete box culverts (CBCs), can be completed by a Resident Engineer familiar with minor structure hydraulics, and will be reviewed by the Region Hydraulics Engineer.

Hydraulic reports and documentation should be completed in accordance with the CDOT *Drainage Design Manual* as evidence that a competent and responsible design has been made. If environmental factors are affected by the hydraulic design, a complete written assessment should be prepared and submitted to the Region Planning/Environmental Manager. Reports and documentation are essential in case litigation occurs, and in case design modifications become necessary.

Procedures for the design of pipe culverts, CBCs, and bridge hydraulics are outlined in the *Drainage Design Manual*. Erosion control procedures are addressed in the *Erosion*

Control and Stormwater Quality Guide. Hydraulic design needs will be determined during the project scoping process.

When the hydrology predictions are completed, the Resident Engineer, in conjunction with the Region Hydraulics Engineer, will decide which structures the Resident Engineer is capable of designing. The Hydraulics Engineer will design the special structures, such as irrigation, storm drains, MS4 ponds, and all standard drainage structures larger than 48 inches in diameter.

The Resident Engineer will provide survey, structure cross-sections, and other necessary data to the Region Hydraulics Engineer. Preliminary designs should be completed prior to the Field Inspection Review. The Project Manager (PM) is responsible for ensuring that pipe type selection is conducted pursuant to the requirements of the *CDOT Pipe Type Selection Guide*. After the preliminary designs are completed, the PM will use engineering judgment to determine sampling locations and will schedule the soil and water testing to ensure compliance with the project advertisement date. Upon final design completion, and prior to the Final Office Review, the hydraulic design information will be sent to the Resident Engineer for incorporation into the plans.

Additional References:

1. 23 CFR Part 650, Bridges, Structures and Hydraulics
2. *CDOT Drainage Design Manual*

2.12 CONSIDERATION OF ALTERNATIVE PIPE MATERIALS FOR CULVERTS, STORM SEWERS, AND CROSS DRAINS (UNDERDRAINS AND SIDEDRAINS)

Designers will consider all available pipe product materials that are judged acceptable on engineering and economic analysis as part of the project design. Available pipe materials for consideration include concrete, metal, and plastic pipe. Federal regulations require that State DOT's allow the use of alternative pipe materials to promote competition for pricing when performance is deemed to be equivalent. The engineering analysis for considering alternative pipe materials is required for all CDOT projects and Local Agency projects receiving federal aid funds.

CDOT has developed a Pipe Material Selection Policy that is to be used to evaluate acceptability of alternative pipe materials based on application, locale, and regional factors. The Pipe Material Selection Policy replaces all previous procedures, guidelines, and policies regarding the selection of pipe material including the Chief Engineer's Memorandum, February 1984. The CDOT Pipe Material Selection Policy will be updated as changes occur and designers should stay current on the latest revisions for their projects. The CDOT Pipe Material Selection Policy can be found on the CDOT webpage on the Design and Construction Support page under "Miscellaneous Design Documents" at: http://www.coloradodot.info/business/designsupport/design-docs/cdot_pipe_selection_guide/view .

Resident Engineers will select the allowable pipe material options for each installation on a specific project after balancing the alternative use of pipe materials based on engineering requirements such as durability, environmental considerations (abrasion and corrosion), soil conditions, fill heights, need for water tight joints, slopes of inverts, and hydraulic characteristics of pipe material inside surfaces. The Contractor will choose the final pipe material from the options provided in the Contract and as specified in applicable sections of the CDOT Standard Specifications for Road and Bridge Construction and Standard Special Provisions as modified for the particular project. Any pipe that meets the corrosion and abrasion criteria in this policy and is installed in accordance with the Contract is expected to have a 50-year service life and is thus acceptable for all projects as described above.

All design decisions regarding pipe material type selection must be documented and a letter placed in the project file. Copies of all selection letters are to be sent to the Area

Engineer for guidance and verification of consistency prior to final design decisions being made.

All exceptions to the Pipe Material Selection Policy require a Justification letter and must be approved by the Region Program Engineer and the FHWA.

Additional References:

1. CDOT Drainage Design Manual
2. CDOT Pipe Material Selection Policy
3. FHWA website: http://www.fhwa.dot.gov/construction/cqit/culvert.cfm

2.13 CDOT MAINTENANCE INPUT

The State of Colorado is divided into eight CDOT Maintenance Sections for maintenance oversight of state highways. The Maintenance Sections have a Maintenance Superintendent who reports directly to a Region Transportation Director. The Maintenance Section boundaries of jurisdiction are indicated in a map found at:

http://dtdapps.coloradodot.info/staticdata/Downloads/StatewideMaps/MaintSectionsBase.pdf

The Maintenance Superintendent for the applicable Section should be contacted regarding the appropriate personnel to be involved in the project development process.

For projects on county roads or city streets including some state highways that are located within cities, maintenance is the responsibility of the local entity in accordance with C.R.S 43-2-135. The city or county maintenance or Public Works section should be included in the project development process.

The Resident Engineer should contact the CDOT Maintenance Section Superintendent or Deputy Superintendent, or both, for appropriate representation at the Design Scoping Review, the Field Inspection Review and the Final Office Review meetings.

Maintenance personnel have valuable input for project design as they have knowledge about high-water level at drainage structures, areas with erosion problems, roadway areas with surfacing and sub-base problems, and locations where guardrail has been hit. Maintenance personnel may be familiar with sites along a project that could contain hazardous materials, underground tanks, rare vegetation, and animal habitat. They may also have valuable knowledge about current and past landowners. Maintenance personnel can help determine stockpile locations and material pit sites.

Maintenance requirements for new design elements should be discussed with Maintenance personnel during the design. Particular elements of interest may include guardrail, delineators, fence, and temporary and permanent erosion BMPs, along with the appropriate type of material specified for these items. When designing the traffic control plan, snow removal should be discussed with the Maintenance Superintendent.

Maintenance personnel comments and concerns should be documented in the review minutes and incorporated into project plans as applicable.

The Resident Engineer will notify the appropriate Maintenance Section personnel of all project reviews during the project development process. The Maintenance representative should review the project plans and provide comments at the review or in writing to the Resident Engineer.

Additional References:

1. CDOT *Plant Maintenance Field Manual*
2. CDOT *Manual of Maintenance Procedures*
3. CDOT Procedural Directive 512.1, *Project Scoping and Design Scoping Review (DSR)*
4. Field Inspection Review (see Section 2.17 of this manual)
5. Final Office Review (see Section 2.28 of this manual)

2.14 FIELD SURVEY (FORM 1217)

A field survey is used to map the topography of a project within the extent of its proposed limits.

A field survey is usually required whenever a project consists of more than minor resurfacing. A field survey is appropriate when there is significant earthwork, reconstruction, new alignments, municipal separate storm sewer system (MS4) requirements, or structures to be constructed or extended. A field survey may be required when an overlay project includes slope flattening or guardrail installation. An adequate field survey is essential to a properly constructed project and is required for land acquisition on a project.

The full extent of the project limits must be determined by the Resident Engineer prior to the start of the field survey to eliminate multiple surveys and duplicate effort. Scoping is initially performed within the anticipated project area. For new or reconstruction projects, project scoping may be an extensive study of the area.

At the project scoping meeting, the Form 1217, Preliminary Survey Request, should be used as a tool to ensure that all issues are addressed at the meeting, and a draft Survey Request should be a product of the Design Scoping Review. Sufficient advance notice prior to the start of a survey is required to obtain permission to enter any property. A presurvey conference should be conducted prior to any fieldwork being done on the preliminary survey.

The Resident Engineer is responsible for including the Survey Coordinator in the Design Scoping Review to discuss issues relevant to any survey requirements. The Resident Engineer should finalize a survey request within 30 days of the Design Scoping Review. The Survey Request is a product of the Design Scoping Review, and includes input from the Resident Engineer and all the affected disciplines.

The Region Survey Unit or survey consultant firm will conduct and document the field survey on highway projects including the following:

1. Research and gather information for a pre-survey conference including existing surveys, maps, as-constructed plans, and information from other entities.
2. Conduct the pre-survey conference to establish ground rules to be followed through all survey activities.
3. Gain access to private property for the purpose of surveying, if required, through the use of Form 730, Permission to Enter Property.
4. Establish ground controls and XYZ coordinates, install monuments for use in

right of way purchases, and stake parcels, and easements.
5. Compile XYZ data on the T-MOSS computer program format and produce contours on a topographic map.
6. Schedule and obtain a review by a professional land surveyor.
7. Prepare survey report, other required submittals, or both if needed.
8. File the control diagram in the survey plat depository with the appropriate county, and file monument records with the Colorado Board of Registration for Professional Engineers and Professional Land Surveyors.
9. Sign, seal, and file the right of way plans with the appropriate county.

Additional References:

1. CDOT Survey Manual
2. CDOT Procedural Directive 512.1, Project Scoping and Design Scoping Review (DSR)
3. Memorandum of Understanding with the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors (attached)
4. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

2.15 VALUE ENGINEERING (DURING DESIGN PHASE)

Value Engineering is the systematic application of recognized techniques by a multi-disciplined team which identifies the function of a product or service; establishes a worth for that function or service; generates alternatives through the use of creative thinking; and provides the needed functions, reliably, at the lowest overall cost.

Value Engineering may be defined in other ways, as long at the definition contains the following three basic precepts:

1. An organized review to improve value by using a multi-disciplined team of specialists knowing various aspects of the problem being studied.
2. A function oriented approach to identify the essential functions of the system, product, or service being studied and the costs associated with those functions.
3. Creative thinking which uses recognized techniques to explore alternate ways of performing functions at a lower overall cost or to otherwise improve the design, service, or product.

A Value Engineering (VE) analysis is required for federally funded projects over $40 million. A VE analysis often leads to money and time savings, a more constructible project, and lower impacts to the traveling public. Although not required for projects under $40 million, it is a good practice to perform a VE on projects that have complexities, or elements that may benefit from a VE analysis. Examples are projects that have major structures, complex design or construction, challenging constraints, difficult technical issues, external influences and unique or complicated functional requirements, competing community and stakeholder objectives, etc.

2.15.01 Definitions

Life-cycle cost The total cost of a project or item over its useful life. This includes all of the relevant costs that occur throughout life of a project or item, including initial acquisition costs (such as right of way, planning, design, and construction), operation, maintenance, modification, replacement, demolition, financing, taxes, disposal, and salvage value as applicable.

Major project A project receiving Federal financial assistance that meets one of the following criteria: (1) It has an estimated cost of $500 million or more, or (2) it has been identified by the Secretary of Transportation as being “Major.”

Project A portion of a highway that a State or public authority proposes to construct, reconstruct, or improve as described in the preliminary design report or applicable environmental document. A project may consist of several contracts or phases over several years.

Product or service Any element of a project from concept through maintenance and operation. In all instances, the required function should be achieved at the lowest life-cycle cost based on requirements for performance, maintainability, safety, and esthetics.

Value Engineering analysis A systematic process of review and analysis of a project, during the concept and design phases, by a multidiscipline team of persons not involved in the project. The team provides recommendations for: (1) providing the needed functions safely, reliably, efficiently, and at the lowest overall cost; (2) improving the value and quality of the project; and (3) reducing the time to complete the project.

Value Engineering Job Plan A systematic and organized plan of action for conducting a VE analysis and assuring the implementation of the recommendations. The methodology utilized for any VE analysis shall follow widely recognized systematic problem-solving procedures that are used throughout private industry and governmental agencies.

Involve FHWA and CDOT Project Development Branch (PDB) early in the VE process. FHWA and PDB have significant experience in the requirements of Value Engineering.

After project selection, the Job Plan consists of the following phases that are conducted during a VE analysis:

1. Gather information;
2. Analyze functions, worth, cost, performance, and quality;
3. Speculate using creative techniques to identify alternatives that can provide the required functions;
4. Evaluate the best and lowest life-cycle cost alternatives;
5. Develop alternatives into fully supported recommendations; and

6. Present VE recommendations for review, approval, reporting, and implementation.

Post-analysis Job Plan activities include the implementation and evaluation of the outcomes of the approved recommendations. These post-analysis phases are conducted in accordance with the policies stated by FHWA.

2.15.02 Value Engineering Analysis Required

FHWA requires a VE analysis on:

1. Each project on the federal aid system with an estimated cost (which includes project development, design, right of way, and construction costs) of $40 million or more that uses FAHP funding; and

2. Any other federal aid projects FHWA determines to be appropriate.

3. Per MAP-21, Value Engineering analyses are not required on design-build projects..

4. A Value Engineering analysis is not required for design-build projects.

Any use of FAHP funding on a Major Project requires that a VE analysis be conducted, regardless of the amount of FAHP funding that may be used on the project. FHWA may require CDOT to perform more than one VE analysis for a Major Project.

A VE analysis is required if the established scope and estimate of the project costs in the preliminary design report or environmental document meets the criteria noted in above. After completing the required VE analysis at this stage in the project development process, if the project is subsequently split into smaller projects in final design or is programmed to be completed by the letting of multiple construction contracts, an additional VE analysis is not required. However, splitting a project into smaller projects or multiple construction contracts to avoid the requirements of having to conduct a VE analysis is not allowed.

2.15.03 Value Engineering Analysis Recommended

In addition to all projects described in Section 2.15.02, FHWA strongly encourages CDOT and other public authorities (Local Agencies) to conduct the VE analysis on other projects where there is a high potential for cost savings in comparison to the cost of the VE analysis, or the potential exists to improve the projects' performance or quality.

Projects involving complex technical issues, challenging project constraints, unique requirements, and competing community and stakeholder objectives offer opportunities for improved value by conducting VE analyses.

FHWA may require a VE analysis to be conducted if CDOT or the public authority encounters instances when the design of a project has been completed but the project does not immediately proceed to construction. In accordance with Section 2.15.02:

1. If a project that met the criteria identified in Section 2.15.02 encountered a 3-year, or longer, delay prior to advancing to a letting for construction, and a substantial change to the project's scope or design is identified when the required re-evaluation of the environmental document is performed, FHWA may encourage or require a new VE analysis or an update to the previously completed VE analysis to be conducted; or
2. If a project's estimated cost initially fell below the criteria identified in Section 2.15.02, FHWA will require a VE analysis to be conducted when all the following apply:
    a. The project advances to a letting for construction.
    b. A substantial change occurs to the project's scope or design.
    c. The change is determined to be the basis for an increase in the project cost above the criteria identified in Section 2.15.02 when the required re-evaluation of the environmental document is performed,

When the design of a project has been completed but the project does not immediately proceed to construction, the requirement to conduct a VE analysis is considered to be satisfied, or not necessary, if:

1. A project met the criteria identified in Section 2.15.02, had a VE analysis conducted, and advances to a letting for construction without needing any substantial changes in its scope or its design; or
2. A project's estimated cost initially fell below the criteria identified in Section 2.15.02, but when advancing to letting for construction, falls above the criteria due to inflation, standard escalation of costs, or minor modifications to the projects design or contract.

2.15.04 When should a VE analysis be conducted?

For maximum benefit, VE analysis should be conducted as early as practicable in the planning or design phase of a project, preferably before the completion of preliminary (30–35 percent) design. The VE analysis should be closely coordinated with other project development activities. This will enable proposed VE recommendations to be accepted and incorporated into the project design without conflicting with or adversely

impacting previous agency or project commitments, the project's development, or the construction schedule.

2.15.05 What characteristics need to be incorporated in the VE analysis process?

To satisfy the requirement to conduct a VE analysis [as specified in 23 U.S.C. 106(e) and 23 CFR 627], the analysis process will incorporate each of the following characteristics:

The use of a multi-disciplinary team of individuals not directly involved in the planning or design of the project, with at least one individual who is trained and knowledgeable in VE techniques and able to serve as the team's facilitator and coordinator;

The systematic application of the VE Job Plan described in Section 2.15.01 *Definitions* of this manual.

The production of a formal written report outlining at a minimum:

1. Project information;
2. Identification of the VE analysis team;
3. Background and supporting documentation, such as information obtained from other analyses conducted on the project (e.g., environmental, safety, traffic operations, constructability);
4. Documentation of the stages of the VE Job Plan which would include documentation of the life-cycle costs that were analyzed;
5. Summarization of the analysis conducted;
6. Documentation of the proposed recommendations and approvals received at the time the report is finalized;
7. Documentation of the proposed and approved recommendations, and related information to support the CDOT and FHWA's VE program monitoring and reporting;
8. The formal written report shall be retained for at least 3 years after the completion of the project (as specified in 49 CFR 18.42); and

For bridge projects, the VE Analyses must:

1. Include bridge substructure and superstructure requirements based on construction material;
2. Be evaluated based on:

a. Engineering and economic bases, taking into consideration acceptable designs for bridges;
b. Analysis of life-cycle costs and duration of project construction.

2.15.06 How may consultants be used to conduct VE analyses?

CDOT may employ qualified VE consultants to conduct VE analyses. Consulting firms should not conduct a VE analysis on projects (as specified in Section 2.15.02) where they have an interest in the project. It is strongly recommended that consultants be qualified VE practitioners, experienced in performing and leading VE studies, and have sufficient VE training, education, and experience to be recognized by SAVE International as meeting the requirements for certification.

2.15.07 What are CDOT's responsibilities?

As directed in 23 CFR 627.5, CDOT must establish and sustain a VE program. Generally, an acceptable VE program is one that:

1. Ensures all applicable projects noted in Section 2.15.02 will receive a VE analysis, including analyses for applicable projects being administered by Public authorities (i.e. Local Agencies);
2. Provides for the timely review, final disposition, implementation, and documentation of the VE analysis recommendations;
3. Tracks all VE analyses that are conducted and VE recommendations that are implemented; and
4. Monitors, analyzes, and disseminates the results of all VE analyses conducted and VE program performance.

CDOT's VE program, policies and procedures will provide for the identification of projects that will be subject to a VE analysis early in the process to develop the State's multi-year Statewide Transportation Improvement Program.

VE examples are available from the Area Engineers in Project Development.

The CDOT Project Development Branch Manager will complete an annual report on the status of CDOT's VE program and submit it to FHWA. FHWA VE Program Manager shall prepare the Annual VE Accomplishment Report including an assessment of the effectiveness of efforts to encourage VE on federal aid projects. FHWA VE Program Manager will submit the Annual Accomplishment Report to CDOT and post results on FHWA's VE website.

2.15.08 Additional References:

1. http://www.fhwa.dot.gov/ve
2. Pre-Construction Team (HIPA-20)

2.16 DESIGN PROJECT MANAGEMENT AND REGION PLAN STATUS REVIEW

Upon obligation of the project funds, project activities may commence and charges assessed against their appropriate project phase. During this phase, it is important to make certain responsibilities are met and that periodic Region Plan Status Meetings are held to verify that these responsibilities are met. the following tasks will be completed:

2.16.01 Design Phase Responsibilities

2.16.01.01 Target the Current Planned Ad Date

The Resident Engineer will be responsible for meeting the Current Planned Ad date of a project. As the Project Manager, the Resident Engineer will be responsible for the management of unexpected changes to the schedule, including those that could affect Specialties Units and the overall project delivery by the approved Current Planned Ad date.

2.16.01.02 Maintain Good Communications

The Resident Engineer will maintain good communications with the Specialty Units involved on the project. Person to person communication (telephone or face to face) is the preferred method for discussing project issues, especially those which could affect the overall project schedule. Conversations must be followed up with email or other written documentation, as record of the discussion and any decisions or commitments made.

2.16.01.03 Review Project Cost Estimates

The Resident Engineer will coordinate revisions to the project cost estimate, as necessary, at all major project milestones (Field Inspection Review, Final Office Review, etc.) in order to assess unforeseen budgetary needs. Specialty Units will provide updated cost estimates, as requested. In addition, the Resident Engineer will ensure that the Cost Estimates Unit is provided current project cost estimates for review and assessment.

2.16.01.04 Convey Scope or Budget Changes

The Resident Engineer will submit any changes in the project scope or budget to the Region Program Engineer for approval. When a change in project scope and/or budget is determined, the Resident Engineer must inform all members of the project team of the change(s). Changes that affect the budget or STIP/TIP must be considered, including the time required for budget actions or STIP/TIP amendments. If the changes require a new budget request or STIP/TIP amendments, the Resident Engineer will reflect these impacts in the project's working schedule.

2.16.01.05 Discuss Any Potential Impact on Ad Date

The Resident Engineer will be responsible for discussing any potential changes to the Current Planned Ad date with the appropriate Region Program Engineer, the Region Business Manager and the Region Transportation Director. Communication with these individuals needs to occur as soon as the Resident Engineer is aware of the contributing issues. The Resident Engineer will document the reasons for the requested Current Planned Ad date change and communicate these details to all affected staff and Specialty Units associated with the project.

2.16.01.06 Communicate Any Decisions on Ad Date

The Region Business Manager will communicate the final decision, regarding approval or rejection to a change in the Current Planned Ad date, to the Chief Engineer, OFMB, and the Contracts and Agreements unit for tracking purposes. The Resident Engineer will provide a document summarizing the issues which support the schedule change. The issues will be reflected through changes to the project working schedule so that their progress may be monitored.

2.16.01.07 Update Working Schedule

The Resident Engineer will update the working schedule monthly to reflect accurate progress in the project activities. Changes to the working schedule which affect common milestones or the Current Planned Ad date will not be made by any Specialty Unit without prior discussion with and approval by the Resident Engineer. This monthly update should reflect all information current at the time of any Region Plan Status Meetings, as detailed below:

2.16.02 Region Plan Status Meeting

Each Region will hold a Region Plan Status Meeting which will serve to facilitate information exchange and to assess the status of both design and construction projects. These meetings must be held at a minimum of every two months, but can be held more frequently at the discretion of each region. These meetings do not take the place of individual Project Status meetings that are often held more frequently and involve more technical detail and assessment.

The Region Plan Status Meeting should be facilitated by the Region's Program Engineers and will review the progress of projects in each Program area. The focus of these meeting should be more on critical project details. At a minimum, the following individuals are recommended to attend the Region Plan Status Meetings:

1. All Program Engineers
2. Resident Engineer
3. Environmental
4. Right of Way / Survey
5. Utilities
6. Bridge
7. Hydraulics
8. Traffic
9. Business Office
10. Materials
11. Maintenance

All Program Engineers should attend the entire Region Plan Status Meeting in order to better understand the Region's activities and to make better resource decisions based on the needs of the full region.

Region Plan Status Meetings can be conducted with scheduled time slots for each Resident Engineer or with all Resident Engineers from a respective Program Area, as determined appropriate by the Program Engineers.

In order to provide meaningful information at these meetings, a Project Status Report is recommended to be completed by each Resident Engineer and made available for the Region Plan Status Meeting. With the following information, this report will allow for a thorough review of each project managed within the residencies:

1. Current Project Budget

2. Dates of Scheduled Project Milestones
3. Dates of Actual Project Milestones
4. Initial Planned, Current Planned and Scheduled Ad Dates

Discussions at the Region Plan Status Meetings should center on issues that affect the project schedule, have fiscal impacts, involve issues of risk or require a change in the allocation of resources.

Prior to these meetings, the Resident Engineer and Specialty Units should discuss the status of their projects with their staff. The Resident Engineer and Specialty Units should come to these meetings prepared to discuss the latest project information. Updated working schedules and work-hour estimates should be available for each project.

Specialty unit schedules, work-hour estimates, and project cost estimates will be updated as necessary by specialty unit managers. The preliminary estimates provided in Phase I will be based on the best information available at the time. Although provisions for change, and identification of assumptions, should be a part of the original estimates, the estimates will be reviewed for modification as the project progresses. The Specialty Unit managers will keep the Resident Engineer informed of any activities or decisions that may affect these estimates for the specialty portion of the project work

The Region Plan Status Meeting discussions with the specialty units should allow the Resident Engineers an opportunity to update milestone dates, activity durations, etc. as required. All changes will be updated in the working schedule and will be communicated to the project team and Program Engineer, as they are made.

Involvement of the Program Engineer will be necessary if specialty unit resources need to be adjusted to meet project milestones. In some cases, all of the Region Program Engineers and affected Specialty Unit managers will need to meet and discuss resources to ensure that key region priorities are properly addressed.

2.17 FIELD INSPECTION REVIEW

The Field Inspection Review (FIR) is intended to be the on-site review of preliminary construction plans that signifies the end of the preliminary design phase. Often, the FIR is held in an office meeting environment with an optional field trip to visit the site. Field Inspection Review plans are preliminary in nature, but still must contain applicable required items and details of all salient features. The Field Inspection Review is held to conclude all unresolved issues identified during preliminary design and to establish the specific criteria and direction that are to be used in the final design.

The following instructions establish the procedures preparatory to and for the conduct of the Field Inspection Review meeting. These instructions apply to all projects on which Plans, Specifications, and Estimate (PS&E) are developed by the Resident Engineer's team.

2.17.01 Authority

The Field Inspection Review will be initiated and scheduled by the Resident Engineer.

2.17.02 Required Items

The following items are required prior to the Field Inspection Review:

2.17.02.01 Scoping, Budgeting, and Planning

1. Preliminary *Form 463 - Design Data* with safety requirements, if available. See Section 2.05 Design Data.
2. Preliminary alignment data.
3. Justification for variances: Variances to design standards must be identified and justified prior to being included in the Field Inspection Review plans. Justifications for variances are to be based upon analysis of operational and safety effects on the highway facility, alternatives considered, and mitigation features considered. See Section 2.05

2.17.02.02 Environmental Clearance Document

1. *Form 128, Categorical Exclusion Determination* showing clearance activities or other appropriate clearance document. See Section 3.02.
2. Every project requires an environmental clearance of some type.

3. Projects not eligible for Programmatic Categorical Exclusions require FHWA sign-off.
4. Resident Engineer can see if environmental clearance is complete through CJ20N in SAP under Custom Fields, then Environmental tab.

2.17.02.03 Traffic

1. Identification of detours and the proposed preliminary construction-phasing plan should be developed prior to the Field Inspection Review.
2. Complete traffic data, accident data, safety report, and turning movements should be available, if required.

2.17.02.04 Materials

1. Soil survey should be completed.
2. Final stabilization plan should be provided.

2.17.02.05 Right of way

1. The assessor's parcel maps, ownership list, old right of way plans, and other available right of way information should be prepared for review by the Right of Way Manager. All necessary temporary easements must be identified.
2. The consultant selection process for right of way work should be initiated or completed early to allow the consultant time to complete the preliminary ownership map. Accurate location of all existing right of way and property lines should be provided prior to the Field Inspection Review.

2.17.02.06 Utilities

Existing utility information, including irrigation ditches and water rights, should be available. The Region Utility Engineer should research utilities.

2.17.02.07 Hydraulics

A preliminary hydraulic report or design should be provided prior to the Field Inspection Review.

2.17.02.08 Wetlands

1. Identification and scheduling of wetland mapping by the Region Planning/Environmental Manager (see Section 3).This item is not required prior

to the Field Inspection Review, however, it is desirable to have as much of the information available as possible.

a. Before the Environmental Programs office in the Division of Transportation Development can start field mapping, the Environmental Programs office will check with the Resident Engineer or the Region Planning/Environmental Manager for project scope, termini, detours, and the project plan sheets.
b. The Region Planning/ Environmental Manager will submit the information to the Environmental Programs office.

2. Avoidance of wetlands is stressed by the Environmental Protection Agency and the U.S. Army Corps of Engineers in their Mitigation Memorandum of Agreement effective February 7, 1990. Designers must know early in the scoping and design process where wetland areas are so the sites can be analyzed for avoidance.

2.17.02.09 Survey

1. A complete survey, including topography, utilities, and existing monumentation, should be completed and tied to CDOT's survey control network to allow work on the design to begin.
2. If right of way is involved, aliquot section corners, property pins, and right of way markers must also be tied to CDOT's survey control network to allow work on the ownership map to begin.

2.17.02.10 Preliminary Cost Estimate

1. The Field Inspection Review plans are preliminary in nature. The items included below in section III, may not apply to specialized project plans.
2. FIR plans shall contain all the applicable items and preliminary details of the salient features.
3. The Engineering Estimates and Market Analysis Unit is available to assist in current pricing.

2.17.03 Included Categories

Three categories of items (required, desired and optional) are included on Field Inspection Review plans:

2.17.03.01 Required on all plans

1. Scoping, budgeting and planning:
   A title sheet, typical sections, general notes, plan and profile sheets with existing topography and utilities, proposed alignments, slope catch points, profile grades,

ground line, cross sections, existing right of way and rough structure notes, drainage plan, access plan, and detour plan.

2. Environmental
   a. Mapping of any existing wetlands identified by the Environmental Programs staff. This will allow discussion of avoidance alternatives during the Field Inspection Review meeting.
   b. Preliminary mitigation plan.
   c. Locations of environmental constraints (other than wetlands).
   d. Initial site assessment completed and potential hazardous materials sites identified.
3. Traffic
   a. Conceptual construction phasing plan.
   b. Traffic volume data.
4. Structure
   a. Bridge general layouts and applicable plan sheets.
   b. Major structure cross-sections.
5. Materials
   a. Soil profile and stabilization requirements.
6. Right of way
   a. Existing and proposed right of way shown on the design plan.
7. Utilities
   a. Identification of impacts to utilities shown.
   b. Names of utility companies and contact people.
8. Other
   a. Preliminary layouts of interchanges and intersections.
   b. Preliminary estimate.
   c. Special details and unusual specifications.
   d. Driveways and field approaches.

2.17.03.02 Desired items

The Field Inspection Review plans should contain the following items if available in time for the scheduled Field Inspection Review:

1. Preliminary survey tabulation sheet.
2. Preliminary survey control sheet.

2.17.03.03 Optional items

The Field Inspection Review plans should contain all appropriate optional items that are available at the time of the scheduled Field Inspection Review. These items may

identify design problems that can best be resolved with an on-site inspection and may also contain preliminary design data that would assist in resolving problems encountered during the Field Inspection Review. Optional items should include only those that the Resident Engineer determines will improve the efficiency of the Field Inspection Review. They do not include items such as tabulations, summaries, and final details.

2.17.04 Distribution of plans

The Resident Engineer will distribute prints of the Field Inspection Review plans at least seven, but preferably 14 days, in advance of the Field Inspection Review. Prints of the Field Inspection Review plans will be transmitted as follows (the Resident Engineer needs to determine when it is appropriate to distribute the memo without the plans):

1. FHWA-Attn.: Operations Engineer
2. Region Transportation Director
3. Project Structural Engineer
4. Geotechnical Engineer
5. Region Planning and Environmental Manager
6. Region Program Engineer
7. Region Materials Engineer
8. Region Right of Way Manager
9. Region Utility Engineer
10. Region Hydraulics Engineer
11. Region Professional Land Survey Coordinator
12. Region Maintenance Superintendent
13. Region Resident Engineer
14. Region Traffic Engineer
15. Landscape Architect
16. Colorado State Patrol
17. Other Local, State, or Federal Agencies
18. Consultant
19. Others as determined by the Resident Engineer
20. DTD Data Collection Unit

2.17.05 Participation

The Resident Engineer should limit participation at the Field Inspection Review to those who will have significant input. Those receiving plans who have only minor concerns

should communicate those to the Resident Engineer prior to the Field Inspection Review and not attend the meeting.

Staff Bridge Branch may conduct a separate Field Inspection Review.

On certain projects, outside public agencies involved in the project may request a separate field review prior to the Field Inspection Review. The Resident Engineer may conduct these reviews separately from the scheduled Field Inspection Review and should document in writing pertinent information and requirements incorporated into construction plans. When a request for a separate review is desirable, the Resident Engineer will notify the appropriate agencies' representatives and shall schedule the review with sufficient advance time to allow the agencies to prepare their own written comments (if they so desire) for consideration prior to the Field Inspection Review.

2.17.06 Conduct of the review

The Resident Engineer will conduct the review. It is strongly recommended that a prepared checklist be completed for all meetings. Also, an agenda (schedule) should be prepared and followed, especially for complex projects, so that participants can recognize which parts of the meeting they should attend. The items to be reviewed may include, but are not limited to, the following:

2.17.06.01 Scoping, Budgeting and Planning

1. Typical sections, stabilization, and general notes.
2. The horizontal and vertical alignments.
3. Plan details for approaches to project and possible cutoff points if funds are insufficient to construct the proposed length of the project.
4. Preliminary cost estimate.
5. Schedule. Update the baseline schedule to reflect impact to project milestones. The schedule should be discussed at the FIR meeting. See Section 1.02.
6. Budget the ROW and/or Utility phases as necessary knowing the scope of these items.

2.17.06.02 Environmental

1. Plan details for measures to mitigate or avoid adverse environmental impacts (such as noise, air, water, parks (4(f)), and stream encroachments).
2. Preliminary field mapping of existing wetland areas.
3. Stormwater management plans.

4. Permit requirements.

2.17.06.03 Traffic

1. Plan details for any provisions for traffic during construction, including detours, phasing, and barrier.
2. Traffic control plan.
3. Traffic signal plan (if applicable).

2.17.06.04 Structures

1. Structure Selection Report.
2. Structure demolition method.

2.17.06.05 Materials

1. Stabilization Report and Life Cycle Cost Analysis (if available)
2. Materials Recommendation Report
3. Quality incentives
4. Certifications or FIPIs for proprietary items, if any (See Section 2.24 for the approval process)

2.17.06.06 Right of way

1. Right of way requirements and access control plan.
2. Impacts to buildings, other improvements, and agricultural operations.
3. Number of owners affected and what the impacts are.
4. Purchase of mitigation areas.
5. Existing Agreements that have conditions affecting plans.
6. Plan details for fencing requirements.
7. Purchase of utility easements.
8. Purchase of temporary construction easements.
9. Section 4(f) process requirements.

2.17.06.07 Utilities

1. Utility relocation requirements.
2. Power sources.
3. New or future utility accommodations.
4. Irrigation ditches.

2.17.06.08 Agreements, justifications, and approvals status

1. Railroad requirements and other agreement conditions.
2. Requirements for any Intergovernmental Agreements.
3. Coordination of all design elements requiring mitigations, action items, conditions, or justifications within CDOT or between CDOT and other entities.

2.17.06.09 Survey

1. Preliminary survey tabulation sheet.
2. Additional survey needs.

2.17.06.10 Hydraulics

1. Irrigation and drainage requirements.
2. Major structure sizing

2.17.06.11 Others

1. Safety issues.
2. Maintenance concerns.
3. Special interest groups.
4. Specialty reports (safety, geotechnical).
5. Fencing.
6. Additional CDOT assets. For example, DTD count stations are often damaged during construction because their existence is often unknown by the Region.

2.17.07 Field Inspection Review follow-up

As soon as possible after the Field Inspection Review, the Resident Engineer will:

2.17.07.01 Distribute FIR Minutes

Send a letter reporting the minutes of the Field Inspection Review to all who were originally sent Field Inspection Review notification. The Resident Engineer will keep a copy of the marked-up plans and additional copies will be sent to others if the Resident Engineer deems it necessary.

2.17.07.02 Address Unanswered Questions

Obtain decisions and responses for all questions left unanswered at the Field Inspection Review meeting.

2.17.07.03 Update Project Schedule

Update the project schedule or complete the baseline schedule if it was not done at the scoping. This may be the case for more complex projects where the scoping is better defined.

2.17.07.04 Update Form 463

Revise the Form 463, *Design Data,* as necessary.

2.17.07.05 Revise project plans:

1. Monitor the progress of the wetlands finding that the Region Planning and Environmental Manager submits to FHWA.
2. Request traffic plans.
3. Complete stabilization and special justification letters.
4. Transmit plans showing proposed features to the Region Right of Way Manager.
5. Transmit plans showing replacement or new utility locations to the Region Utilities Engineer.
6. Request or complete the final hydraulic report.
7. Transmit the preliminary survey tabulation sheet to the Region Field Survey Coordinator.

2.17.07.06 Follow up on Wetland requirements:

If the project impacts wetlands, the Region Planning and Environmental Manager must ensure that a wetlands finding is prepared, whether by the Region, the Environmental Programs office or a private consultant. Following completion, the finding must be forwarded to the Environmental Programs office for review and approval. Once the finding is approved, copies are returned to the Region. It is the Region's responsibility to forward a copy to the Resident Engineer. This last step is important because the finding is a legally binding commitment between CDOT and FHWA regarding the extent of wetland impacts and mitigation requirements.

2.17.07.07 Prepare information for Right of way requirements

Details such as edge of pavement, curb and gutter, toe of slope, driveways, structures, field approaches, alignment, drainage ditches and pipes, irrigation design, replacement wetland areas, replacement utilities, easements, and detours should be sent to the Region's Right of Way Unit.

2.17.07.08 Follow-up on Utility Issues

Follow up on Utility issues. Have the Utility Engineer initiate utility agreements.

2.17.08 Combination Field Inspection Review-Final Office Review

For small projects, such as write-ups, it may be beneficial to combine the Final Office Review with the Field Inspection Review, if the Plans, Special Provisions, and Estimate are adequate. In some instances, formal meetings may not be necessary. This should be reflected in the baseline schedule.

2.17.09 Additional References:

1. 23 CFR Part 625, Design Standards for Highways
2. For forms, see CDOT on-line forms library
   http://www.coloradodot.info/library/forms

2.18 CONSTRUCTABILITY REVIEWS

2.18.01 Introduction

A Constructability Review (CR) is the integrating of construction knowledge, resources, technology, and experience into the engineering and design of a project. To take advantage of the wealth of knowledge and experience that exists in the construction industry (both internal and external i.e. contractors) it is recommended that persons with special expertise, relevant to the project, be included when warranted in the CR. This process may be iterative, and is expected to be multidisciplinary. The end result should be enhanced plans and specifications leading to increased ease and efficiency of construction, with fewer changes.

Projects that may benefit from constructability reviews are complex, time critical and/or have extraordinary environmental circumstances. This process is also recommended for projects that have innovative features such as experimental materials, processes, techniques and/or innovative / alternate bidding contracting. In addition, CRs conducted at project closeout are extremely valuable in assisting the project team in improving future projects.

According to section 1.07, Signature Projects require a CR. Section 1.12 recommends a CR shortly after the FIR or a 30 percent Project CR. While this is the established timeframe for a Signature Project to have a CR, it would be expected that the project might benefit from additional CRs (e.g. project scoping, 90 percent, and post construction). It should be noted, however, that *Signature Projects* are not the only projects eligible for CRs. This is a determination that the Resident Engineer and Project Manager should make on a case by case basis.

The Colorado Department of Transportation (CDOT) is required to have a process that when contractors are included in reviewing plans it does so without giving a competitive advantage to the contractors who participate in the review.

2.18.02 Project Scoping CR - PSCR

A PSCR should be held shortly after the project scoping, in order to identify “fatal flaws” in the scope. Additionally, it is recommended that regional environmental staff is invited to review the decisions of the scoping meeting. This meeting is intended to be internal only, but documented on the attached CR documentation form, and kept in the project files.

2.18.03 30 Percent Project CR – 30 Percent PCR

A 30 percent PCR should be held shortly after the final profile and alignment are established (i.e. at the FIR stage). The purpose of this meeting is so that the project team will not force a specific design without consideration of other options.

2.18.04 90 Percent Project CR – 90 Percent PCR

A 90 peercent PCR should be held after the FOR. This will give the project team an opportunity to interact with the contracting community and others knowledgeable in specific construction techniques. This will be an opportunity to fine tune the design on specific structure types, modify/add specifications, and consider detour and construction staging details (e.g. crane picking diagrams).

It may be a temptation to include a CR, at any stage, in conjunction with the meeting typically conducted (i.e. Scoping, FIR, FOR). This is not recommended, as the constructability focus may be blurred. The CR meeting should be held to only discuss constructability issues that are specific to that project and not get bogged down on the procedural issues that are common at these meetings.

2.18.05 Post Construction CR

A Post Construction CR at project closeout incorporates discussions regarding future improvements for the design project management team. It may include a survey of the construction contractor, contract change orders, delay claims, and other staging or construction issues. In the Post Construction CR, the design project management team meets with the construction project engineering team (including Resident Engineer(s) and Area Engineer), to assess the overall quality of the design product. The format of the meeting should focus on positive aspects of the project as well as topics to improve on. The Resident Engineer will schedule the Post Construction CR meeting, facilitate the meeting, finalize a report, and distribute the report to the design and construction teams, and Project Development Branch.

2.18.06 Procedures

CDOT has an FTP server that can be used to upload and download files that are too large to email. Access to CDOT's FTP server can be obtained from both within CDOT's network and from any internet location.

Files uploaded to the FTP server will have a 10 day life. After 10 days, the file(s) will automatically be deleted from the server. No exceptions will be made to increase the duration files can reside on the server. The 10 day "clock" begins the moment the file is uploaded to the server and is not reset upon use. Be sure to advise others who you plan to share documents with of this limitation.

If data is sensitive, please do NOT use this FTP site, as it is open for all CDOT staff, their customers, and is open to the internet. If you have a need to transfer sensitive data, please contact the Help Desk and the IT staff will work with you to provide a more secure solution.

The FTP site is outside the CDOT firewall and is open to the Internet. It is offered as a convenience and is not considered business critical. There are no guarantees of its stability or usability.

Files should not be opened directly from the FTP server; they should be copied or moved to the user's computer and opened from there. If you attempt to open a file from the FTP server, you may be prompted for credentials. The FTP server is not a file share and is not designed to be used to view or edit documents.

When the Project Manager, Resident Engineer, and/or the Program Engineer determine that contractors are to be included in Constructability Review, the following steps are to be taken:

1. Contact your Area Engineer for the latest FTP site user name and password, and to inform him of an upcoming Constructability Review.
2. Type the following FTP address into Windows Explorer, (not Internet Explorer):
   ftp://yogi.dot.state.co.us
   and enter the username and password you received from your Area Engineer, when prompted.
3. Create a folder with the project name and subaccount number.
4. Upload relevant plans and specifications to the newly created folder.
5. The project team should also have review documents available at the meeting. All documents to be posted on the FTP site and provided at the meeting must include a stamp stating that they are for a "constructability review" and that they are "not for construction". There is no need to collect documents at the conclusion of the meeting.
6. The Resident Engineer or Project Manager will contact at least two contractors with some expertise with similar projects to participate in the CR. The Colorado Contractors Association (CCA) may be able to assist in locating contractors to participate, however, in order to maintain fair and competitive bidding, any interested contractor can participate in these reviews, whether a member of CCA

or not. Contractors who participate in a CR will not be precluded from bidding on the project.

7. In order to not overlook any interested contractors, the Project Manager will also advertise a CR at the following location:
   http://www.coloradodot.info/business/bidding

   The Project Engineer will provide a Word document to the Construction Contracts Unit at CDOT HQ, detailing that this is
   a. for a Constructability Review
   b. name/project number
   c. Brief description of the project and reason for the CR
   d. The name and phone number of the point-of-contact that contractors can reach to participate in the CR
   e. Removal date that tells the Construction Contracts Unit when to remove the CR announcement from the bidding website
8. All attendees to the CR will be advised to not rely on what was discussed in the CR meeting, but rather on the ultimate construction plans and specifications. Contractor contact information should be gathered by the project team for the purposes of follow-up or clarification.
9. All suggestions will be reviewed by the project team. Suggestions may be directly implemented or modified then implemented. Those which are not suitable or economically feasible for implementation will be eliminated.
10. The project team should explain if / why any suggestions are not used. CDOT will formally thank all participants and express CDOT's appreciation for their participation.
11. Contact your Area Engineer prior to holding a constructability review for assistance with process uniformity, and for concurrence on which contractors will be contacted. The Project Development Branch will maintain a statewide list of projects that use constructability reviews

When the CR will consist solely of CDOT or consultant design personnel, typical invitation procedures will be followed. Ensure that all documents used in the CR are stamped as mentioned in Number 5 above.

Constructability Review Checklist

Date: _____ PM: _____
Project: _____ RE: _____
SA: _____ Reviewers: _____
Location _____

The following is a checklist of project items (if applicable to the project) that need to be reviewed during a Constructability Review (at the RE/PE's discretion):

Sheet	Issue	Clear	PE	RE

NOTICE OF CDOT CRANE CONSTRUCTABILITY REVIEW

PROJECT NO: BR R600-297
SUB-ACCOUNT: 16212
PROJECT NAME: I-25 / Bronco Arch Bridge Replacement
PROJECT LOCATION: Denver, CO
PROJECT SCHEDULE: Anticipated Advertisement Date – January 27, 2011

Intended Audience: This meeting is open to all contractors. However, CDOT is specifically looking for input from bridge and crane contractors. Also, if you have contacts that you feel would be interested in attending this meeting, please feel free to forward this invite to them. **(*Bridge Contractors are strongly encouraged to share information about this meeting with their crane contractor/supplier contacts.*)**

Meeting Information:
The Crane Constructability Review Meeting is scheduled for October 21, 2010 from 1:00 - 4:00 p.m. in the Fox Hollow Conference Room, located at 425B Corporate Circle, Golden, CO 80401.

Purpose:
The purpose of this review is to determine the crane constructability during the phased removal and replacement of the bridge and bridge deck panels. A traditional Constructability Review was held on April 27, 2010. The participants of that meeting recommended conducting a crane constructability review, as there are many constraints (limited ROW, South Platte River, two local streets, two bike paths, and a trolley line underneath, overhead transmission lines, etc.) to work with and extensive coordination efforts are needed with crane placement and selection.

Project Description:
This project includes the removal of a 3 span, steel arch bridge (384' long x 158' wide) that carries I-25 over the South Platte River (a.k.a. Bronco Arch Bridge) and constructing a new 3 span, pre-cast concrete tub girder bridge (373' long x 196' wide) in its place, as well as constructing retaining walls, drainage improvements and roadway improvements.

How to Access Project Plans Prior to Meeting:
The plans will be available for review on CDOT's FTP site on Tuesday, October 12, 2010 at 9:00 a.m. To access the FTP site please follow the instructions below.
(NOTES: The plans available on the FTP site are "For Information Only". Potential bidders should not base their bids on this preliminary set of plans, and shall ONLY bid the project based on the "Advertisement" set of plans. Contractors which participate in the review are NOT precluded from bidding on this project. Participation in the review will NOT be compensated as it is strictly voluntary.)

1. Open Windows Explorer window (not Internet Explorer).
2. In the address field, type: *ftp://yogi.dot.state.co.us* and press <ENTER>.
3. A security window will open requiring the user to enter a user name and password.

   User Name: yogib

   Password: 4resieg!
4. Press the LOGIN button.
5. The plans are located in the folder named: 16212 I-25 Bronco Arch Bridge

You are also encouraged to visit the project site to get familiar with existing site conditions. If you have any questions about this meeting or trouble accessing the FTP site, please contact the Project Manager, Jana Spiker, at (720) 497-6959.

2.19 DESIGN OFFICE REVIEW (STATUS MEETING)

Design Office Reviews usually are conducted on the more complicated projects or consultant-prepared projects when an informal meeting is desirable to discuss design issues or problems. For larger projects that require coordination with multiple specialty units and external agencies, monthly status meetings may be conducted. These reviews generally are conducted between the Field Inspection Review and the Final Office Review stages. Minutes are prepared of reviews held for examining specific problems, such as utilities, major structures, right of way, or hydraulics.

The Resident Engineer is responsible for initiating, scheduling, conducting, and documenting these reviews. Plans for specific areas of concern may be required for the meeting. The meeting should be attended by all responsible personnel involved with the issues considered at Design Office Review.

2.20 DESIGN DECISION LETTER

A design decision letter can be used by the Resident Engineer to support and document discretionary design decisions. The letter is used to document a major decision when special circumstances exist that would make conforming to accepted design guidelines less desirable. The letter should clearly explain the options that were considered and the decision that was made. Design decision letters should not be used in lieu of "safety letters" or "design exceptions" (variance from design standards). See Section 2.06 for more information on design exceptions.

Design decision letters should be:

1. Discussed with the Program Engineer.
2. Addressed to the project file if written by the Resident Engineer.
3. Addressed to the Resident Engineer if written by outside agencies or consultants.
4. Referred to on a Form 463, Design Data, under remarks.
5. Referred to in the Field Inspection Review or Final Office Review minutes.

Additional References:

1. 23 CFR Part 625, Design Standards for Highways
2. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

2.21 ON-THE-JOB TRAINEE APPROVAL

The purpose of the On-the-Job Training (OJT) Program is to provide construction training that will advance unskilled workers toward more highly skilled work, preferably to the journey worker level. Emphasis should be placed on advancement of women, disadvantaged individuals and persons from minority groups.

CDOT has established procedures for identifying and approving On-the-Job Training (OJT) relative to the Equal Employment Opportunity program. For federal aid projects, CDOT will accept training programs from two categories. CDOT will accept Standard Training Programs which have been pre-approved by CDOT/FHWA, as well as programs approved by the U.S. DOL – Office of Apprenticeship or recognized state apprenticeship agency. The CDOT OJT Specification (Standard Special Provision) is applicable to contractors participating through these programs.

The OJT Program is implemented on all projects through the inclusion of the OJT Standard Special Provision. The Region Civil Rights Office is responsible for establishing goals for each project. The On-the-Job Training Standard Special Provision defines the number of training hours a contractor is required to train on the project, as shown in Table 2-1 below. (Please visit the most recent revision of the OJT Standard Special Provision to verify the current table http://www.coloradodot.info/business/designsupport/construction-specifications/2011-Specs/standard-special-provisions/mics/OJT.docx/view.) The project goal may be met using any of the tables mentioned above. When a goal is set by the Region Civil Rights Office, the OJT project special provision with the goal must be included in the advertised contract specifications for the project.

When a project estimate is submitted to the Region Civil Rights Office for establishing goals, the Region Civil Rights Office will determine the appropriate OJT goal for the project. The Resident Engineer ensures that the project specific On-the-Job Training goals and related specifications are included in the Contract. It should be noted that although the On-the-Job Training Standard Special Provision is included in all projects, the training program requirements apply only to federal aid projects.

For federal aid projects, a project force account item and budget must be established, for On-the-Job Training. The force account amount for the project OJT training goal is defined by the Region Civil Rights Office, also shown in Table 2-1 below. The Region Civil Rights Office will use the table to determine the appropriate budget amount based on the goal set. For non-federal-aid projects, no project force account item or budget is required.

Contract Dollar Value	Minimum Total Training Hours to be Provided on the Project
Up to 1 Million	0
>1 – 2 Million	320
>2 – 4 Million	640
>4 – 6 Million	1280
>6 – 8 Million	1600
>8 – 12 Million	1920
>12 – 16 Million	2240
>16 – 20 Million	2560
For each increment of $5 million, over $20 million	+1280

Table 2-1
OJT Training Goal

Additional References:

1. 23 CFR Parts 230A, Equal Employment Opportunity
2. CDOT Construction Manual
3. Current OJT Standard Specification
4. For forms, see CDOT on-line forms library
   http://www.coloradodot.info/library/forms

2.22 DISADVANTAGED BUSINESS ENTERPRISE GOALS

2.22.01 Introduction

The Disadvantaged Business Enterprise (DBE) program was created to achieve the following objectives on highway construction and highway design and engineering contracts:

1. Ensure nondiscrimination in the award and administration of contracts in the Department's highway, transit, and airport financial assistance programs;
2. Create a level playing field on which Disadvantaged Business Enterprises can compete fairly for contracts;
3. Ensure that CDOT's Disadvantaged Business Enterprise program is narrowly tailored in accordance with applicable law;
4. Ensure that only firms that fully meet the Disadvantaged Business Enterprise Program eligibility standards are permitted to participate as Disadvantaged Business Enterprises;
5. Help remove barriers to the participation of Disadvantaged Business Enterprises in contracts;
6. Assist the development of firms that can compete successfully in the marketplace outside the Disadvantaged Business Enterprise program; and
7. Provide appropriate flexibility in establishing and providing opportunities for Disadvantaged Business Enterprises.

2.22.02 Certification

To be considered a Disadvantaged Business Enterprise and be credited toward the Disadvantaged Business Enterprise goal on a project, the firm must have received Disadvantaged Business Enterprise Certification through the Colorado Unified Certification Program (UCP). Currently, the CDOT Center for Equal Opportunity and the City and County of Denver's Division of Small Business Opportunity (DSBO) are the only formally recognized UCP certifying entities. The current UCP DBE directory is published on the CDOT external website along with other DBE Program related materials.

The Disadvantaged Business Enterprise Program was established under the authority of the CDOT Executive Director *and CDOT Policy Directive 611.0, Disadvantaged Business Enterprise*.

To be certified as a Disadvantaged Business Enterprise, a firm must be:

1. A small business concern as defined pursuant to Section 3 of the Federal *Small Business Act*.
2. At least 51 percent owned by one or more minorities or women; the groups that are included are people who are Hispanic, Asian American, African American, Native American, women, or members of other groups found to be economically and socially disadvantaged under Section 8(a) of the *Small Business Act*.
3. Independent from any other firm.
4. Managed and controlled on a day-to-day basis by the disadvantaged owners.
5. Able to meet other requirements contained in the 49 CFR Part 26.

2.22.03 Project Goals

It is the responsibility of the Region Civil Rights Office, at the request of the project staff, to set a DBE goal for each project. Several items will be considered by the Region Civil Rights Office when establishing the DBE goal including type of funding, final engineer's estimate and bid items, location of the project, availability of DBEs for bid items, anticipated construction issues by project staff, the CDOT bidders list, etc. The goal set on the project will be reasonable and achievable based on the information available and considered by the Region Civil Rights Office. The goal set on each project will be communicated back to the project staff. The DBE project special provision (worksheet) with the goal must be included in the advertised contract specifications.

A CDOT *Form 863, DBE Contract Goal Recommendation*, is filled out by the Region Civil Rights Office and sent to the HQ Center for Equal Opportunity. Potential items that the Region Civil Rights Officer believes can be subcontracted to Disadvantaged Business Enterprises are listed on the form. At bid time and when evaluating bids submitted by contractors, Form 863 is used by HQ staff to verify the goal set on the project. Due to confidentiality issues, Form 863 is not provided to project staff.

2.22.04 Outreach

Conducting outreach to small and disadvantaged businesses is an important component for the DBE program. Project staff should keep in mind that additional contract specifications may be needed if a mandatory requirement is added for outreach. Please be sure to consult with the Region Civil Rights Office as needed.

2.22.05 Funding

Projects administered by CDOT may be funded from various sources: federal funds, state funds, local agency funds, or a combination thereof. During the project development phase, it may be advantageous to adjust the funding sources for a particular project. This may be due to new or additional funding sources becoming available or for the purpose of funding additional projects or extending the scope of the project.

Federally funded projects are subject to requirements that may not apply to projects funded solely without federal funds. Examples of these requirements may include the DBE requirements and how contract DBE goals are established. Therefore, once a project is advertised, adjustment of funding sources is limited as follows:

1. Projects funded solely with non-federal aid funds at the time of advertisement must remain funded solely with non-federal aid funds. Federal funds are not to be added after advertisement.
2. Projects funded wholly or in part with federal aid funds at the time of advertisement must remain at least partly funded with federal aid funds. Do not remove all federal aid funds after advertisement.

For additional guidance please contact your area engineer.

2.22.06 Administration

It is the Region's Civil Rights Office responsibility to administer the DBE program within its geographical region. Conducting outreach to small and disadvantaged businesses, establishing project goals, providing technical assistance, establishing project goals, conducting dispute resolution for project issues, and enforcing compliance with contract specifications are part of administering that program. The CRO will monitor each Disadvantaged Business Enterprise goal and participation to help ensure CDOT meets its overall annual DBE goal by the end of each federal fiscal year. This commitment includes monitoring DBE participation on both federally funded and state funded projects regardless of those projects' DBE percentage goal amounts. It is important to track achievements, issues, and discrepancies to monitor, verify, and ensure overall program implementation.

The CDOT Center for Equal Opportunity will monitor Disadvantaged Business Enterprise Participation, and furnish the Region and the Colorado Transportation Commission with monthly reports that list Disadvantaged Business Enterprise

participation on federally and state funded projects for each Region and for the entire state.

2.22.07 Additional References:

1. 13 CFR Part 121, Small Business Size Regulations
2. 23 CFR Part 635.107, Small and Disadvantaged Business Participation
3. 23 CFR Subchapter A, Part 1, Section 1.36, Compliance With Federal Laws and Regulations
4. 49 CFR Part 26, Participation by Disadvantaged Business Enterprises in Department of Transportation Financial Assistance Programs
5. Latest “DBE Definitions and Requirements” in the CDOT Standard Special Provisions
6. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

2.23 SPECIAL PROVISIONS

Special Provisions are additions and revisions to the standard and supplemental specifications covering conditions specific to an individual project or group of projects. Special provisions fall within one of the two following categories:

1. Project Special Provisions: Additions and revisions to the Standard and Supplemental Specifications, specific to a project.
2. Standard Special Provision: Additions and revisions to the Standard and Supplemental Specifications, specific to a selected group of projects or which are intended for temporary use.

The Resident Engineer is responsible for preparing referenced standard special provisions and the project special provisions prior to the Final Office Review. All new or changed special provisions are to be submitted to the Project Development Branch's Specification Engineer for review at least 2 weeks prior to their inclusion in the PS&E. All Section 100 – "General Provisions" specification changes should have the Resident Engineer's concurrence, and all materials specification changes should have the Region Material Engineer's concurrence. The Resident Engineer will verify that all the project special provisions are completed accurately, and all necessary standard special provisions are included in the Plans, Specifications and Estimate package in accordance with the latest list provided from the Standards and Specifications Unit at the time of advertising the project.

2.23.01 Standard Specifications

The *Standard Specifications for Road and Bridge Construction* (referred to as the *Standard Specifications*) is revised and reissued periodically by the Project Development Branch, Standards and Specifications Unit, and contains the standard specifications used to control the work on CDOT transportation, maintenance, and federally funded local agency administered projects. This is the primary reference for specifications related to road and bridge construction.

2.23.02 Standard Special Provisions

The Standard Special Provisions revise, clarify or supersede the *Standard Specification* book to implement current CDOT construction and materials requirements. Standard Special Provisions have an issue date and apply to a group of projects. They contain revised requirements related to procedures, current wages, construction materials and

technology, and project management. Standard Special Provisions are included in projects in accordance with the instructions issued by the Project Development Branch.

The Standards and Specification unit writes and updates the Standard Special Provisions and the instruction for use in accordance with Procedural Directive 513.1 and Chapter 16 of the CDOT *Roadway Design Guide*. The Resident Engineer adds the applicable special provisions to each project. Each Region has access to the up-to-date list of Standard Special Provisions with instruction for the use of each provision:

http://www.coloradodot.info/business/designsupport/construction-specifications .

2.23.03 Project Special Provisions

Project Special Provisions are revisions to the Standard Specifications that supplement or modify a particular aspect, item or condition contained in the plans, specifications, and bid package specific to a particular project. The Project Special Provisions supersede the Standard Special Provisions and provide the Contractor and Project Engineer specific information and requirements related to specific aspects of a particular project. Project Special Provisions include an index of the required Standard Special Provisions that apply to the project

Project Special Provisions are used when specific requirements are not adequately addressed in the *Standard Specifications* or in the Standard Special Provisions. They provide project specific materials and construction requirements to the Contractor to ensure proper completion of a project. The provisions appear as changes to sections of the *Standard Specifications*.

Special provisions are essential parts of the Contract, and contain requirements that are intended to be complementary and binding instructions to complete a project. The Resident Engineer is responsible for the content and accuracy of each Project Special Provision.

Review Procedural Directive 513.1 and Chapter 16 of the 2005 Roadway Design Guide frequently, and keep the following guidelines in mind when preparing project special provisions.

1. Submit every new project special provision to the Standards and Specifications Unit (SSU) for review at least two weeks before it is needed.
2. Expect SSU to delay approval and initiate a more formal review of project special provisions it determines to be controversial or have a broad impact. The more

formal review may involve appropriate CDOT staff or technical committees and industry representatives.

3. Submit a commonly used project special provision to SSU for review at least two weeks before it is needed if it has been significantly modified for a particular project.
4. Submit a project special provision that was approved for use on a particular project to SSU for review before it is used on other projects. If you intend to use a new project special provision on more than one project, indicate that when you submit it to SSU. New project special provisions that will be widely used require a more thorough review that may include additional stakeholders; SSU will make that determination.
5. Prepare a new project special provision for a proposed new pay item when that pay item or the materials and construction requirements for that pay item do not appear in the Standard Specifications. Submit that special provision to both SSU and the Engineering Estimates & Market Analysis Unit (EEMA). EEMA will not approve a new pay item without consulting SSU to ensure that the requirements for that pay item are adequately covered and that there are no technical or policy problems with its use.
6. Check the Specifications page on the CDOT web site to see if there is already an approved project special provision that covers the issue you are trying to address. If there is an approved special provision, use it instead of writing a new special provision. If the existing special provision is not adequate for your project, modify it and submit it to SSU for review.
7. Do not subvert the special provision development process by incorporating un-reviewed additions or changes to the specification requirements in general notes or other plan notes.

Following are examples of Project Special Provisions that are usually included in the transportation construction plans:

1. Index Pages – List the applicable Project Special Provisions and Standard Special Provisions.
2. Notice to Bidders - Establishes the required amount of the proposal guaranty and lists CDOT construction representatives assigned to the project.
3. Commencement and Completion of Work - Establishes beginning work requirements and Contract time. On small simple projects it lists salient features to be shown when a bar chart schedule is allowed. Most projects require a CPM schedule.
4. Contract Goals - Establishes Disadvantaged Business Enterprises goals.
5. Force Account Items - Identifies CDOT's estimate for force account work included in the Contract.
6. Traffic Control Plan, General Contains key elements of the traffic control plan and the proposed method of handling traffic.

7. Utilities - Lists utility companies and types of utility relocations within the project limits.
8. Right of Way Restrictions – Lists restrictions that will affect the project.
9. Project Specific Special Provisions - Contain specification changes appropriate to the project.

The following outlines the procedures for preparation of special provisions:

1. The Resident Engineer will prepare Project Special Provisions for inclusion in the Final Office Review plans and include specification changes made at the Final Office Review prior to final plan review. Concurrence of the person responsible for the appropriate discipline, for example, construction, materials, or bridge, should be obtained.
2. To request new or revised Standard Special Provisions, the Resident Engineer should follow *CDOT Procedural Directive 513.1, Construction Project Specifications*. The Resident Engineer will review the current list of Standard Special Provisions for changes and additions prior to advertisement.
3. Upon request by the Resident Engineer, the Project Development Standards and Specifications Unit (SSU) will review the specifications portion of the Plans, Specifications and Estimate package. The specifications should be submitted to SSU at least 2 weeks before they need to be complete.

2.23.04 Additional References:

1. CDOT *Roadway Design Guide*, Chapter 16
2. Procedural Directive 513.1

2.24 PROPRIETARY ITEMS

2.24.01 Construction Contracts

The use of trade or brand names or the direct reference to patented or proprietary materials, specifications, or processes should be avoided in contracts. This applies to all projects, NHS and non-NHS, regardless of funding source. Generic construction specifications should be developed that will obtain the desired results as well as assure competition among equivalent materials or products. There are instances, however, where a particular proprietary product must be specified for use on a project.

If only patented or proprietary products are acceptable, they shall be bid as alternatives with all, or at least a reasonable number of acceptable materials or products listed. A reasonable number would be to specify three or more equally suitable products and include the term “or approved equal”. If a product is on the approved Finding in the Public Interest list it will be noted in the specification and the term “or approved equal” is not required.

When the use of a patented or proprietary (trade name) item is essential for a project or fewer than three suitable products can be found, a Finding in the Public Interest shall show that no equally suitable alternative exists.

One or more of the following criteria must be documented in the Finding in the Public Interest to justify the use of proprietary items:

1. CDOT certifies that such patented or proprietary item is essential for synchronization with existing transportation facilities; or
2. CDOT certifies that no equally suitable alternative exists; or
3. 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.

When research is used as the justification for using a proprietary item it must be processed through the Research Branch of the Division of Transportation Development (See Section 8.10 Experimental Items in this manual).

A Finding in the Public Interest may be written for use of a proprietary item on a specific project, for use on a region-wide basis, or for use on state-wide basis. A project-specific Finding in the Public Interest applies only to that one project and cannot be used to justify use of the proprietary item on other projects.

Finding in the Public Interest will require the approval by the Resident Engineer (for project specific), Program Engineer (for regionwide use), or Branch Manager (for statewide use). Copies of approved project specific, regionwide and statewide Findings in the Public Interest shall be distributed to the Standards & Specifications Unit. The Standards & Specifications Unit will maintain a list of the approved products.

Approved Findings in the Public Interest are valid until any of the following criteria occurs:

1. Three years have elapsed from date of approval.
2. New products are found or created that are equal to the products in the original Finding in the Public Interest.
3. Research has been completed on the patented or proprietary item and a recommendation for use of the product has been made.

If any of the above criteria occurs and the particular proprietary product must still be specified for use on a project, then another Finding in the Public Interest must be submitted for approval.

Once a proprietary item is accepted as meeting standards and a non-proprietary specification can be written, the material or product should be selected on a competitive basis.

2.24.02 Procurement Contracts

A justification letter approved by the Manager of Procurement and Contract Services to the files certifies that no equally suitable or patented item exists for use on the project and that such patented or proprietary item is essential for the construction of the project. Generally, products identified by their brand or trade name are not to be specified without an "or equal" or equivalent phrase.

A Sole Source Certification Form

https://www.codot.gov/business/procurement-and-contract-services
(shall be completed only for sole sources of goods or services.) This certification does not apply to situations classified as "Emergency Procurement" covered by CRS 24-103-206.

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2.25 PROJECT INFORMATION TECHNOLOGY NEEDS

Most projects will have some need for information technology (IT) services. IT may be needed for field offices, field labs, or another project facility. This subsection provides guidance on determining what those IT needs are; it includes steps to be taken to determine what IT services may be needed.

The steps should be taken during the FIR process to help the project engineer and CDOT's IT personnel determine what IT requirements the project has as well as what services are available at the project site. This will ensure that all IT needs are defined by the FOR stage and ready for CDOT project staff to use when the project site is setup.

The following steps should be taken to identify IT needs for the project:

1. During the FIR process, contact your region IT support team. If you are unsure who this is, contact the CDOT Help Desk at 303-757-9317.
2. Please provide your region IT support team with the following information:
   a. Project name, number, start date, and location; this will help IT identify possible locations for the facilities that are within reach of high-speed Internet.
   b. Number of project facilities requiring high speed Internet that will be on-site and the date those facilities are expected to arrive on site.
   c. Identity of the CDOT staff (if it has been determined) who will be on-site during the project – this information will be needed by the FOR stage of the process
   d. Identity of the CDOT staff on location who (if it has been determined) will be bringing their CDOT issued workstations to the project site – this information will be needed by the FOR stage of the process
   e. Duration of the project
3. Before the FOR process, the region IT support team will provide the Resident Engineer with the CDOT IT requirements for the project. These can then be included when the project is sent out to bid so contractors will be aware of what IT equipment they need to provide to the project.
4. Only CDOT authorized equipment and users shall have access to the CDOT network and primary Internet connection at the project site. If the Contractor requires Internet access it must provide a separate service for its own use.
5. Once the project has come to a close, the on-site network equipment that was provided by the region IT support team must be returned so it can be used on future projects.

2.26 PROJECT CONTROL DATA (FORM 859)

The Form 859, Project Control Data, is used to establish the contract time, and controlling or salient features for a construction project at the Final Office Review or shortly thereafter prior to advertisement for bids.

The completed Form 859 contains information that is relevant to the determination of contract time, affected pay item quantities, and a *Microsoft (MS) Project* Critical Path Method (CPM) schedule or a bar chart showing established time allotted for the "controlling items of work" and "salient features." Although a bar chart may be used for simple projects, CDOT has chosen MS Project as its preferred CPM scheduling software, and more complex projects warrant the use of this preferred scheduling tool. An MS Project CPM schedule should be prepared for all but the simplest projects. A bar chart may be used on very simple projects. Note that current CDOT construction specifications require the Contractor's schedule to be a CPM schedule, unless modified for a particular project. Attaching the MS Project CPM Schedule output to the 859 is a preferred scheduling method. A draft schedule should be prepared early in the project Design phase. Subsequent modification and updates throughout the project development process will help the project team make important and informed project decisions with accurate schedule information.

NOTE: A "controlling item of work" is an item of work that will extend the overall completion time of the project if the duration of this item is increased. A "salient feature" is an item of work that may be of special interest in coordinating the project schedule, but may not affect the overall completion of the project.

All specific project features, construction requirements, and other special requirements that may impact contract time should also be included in the Form 859. The Resident Engineer is responsible for initiation and completion of this form.

In addition to the items on the form the following key issues should also be documented when completing the Form 859:

1. Urgency of proposed improvement.
2. Effect of construction on local businesses and property access.
3. Need for coordination with other projects.
4. Irrigation requirements.
5. Special events, schedules, and holiday impacts.
6. Production rates used.

The procedures for preparing the Form 859 are:

1. Complete the final Form 859 after the Final Office Review and all key issues have been resolved.
2. Determine contract time for the project.
3. Identify the controlling items of work, salient features, and related working days.
4. List items of work in chronological order on the Bar Chart of Form 859 or the MS Project CPM.
5. Complete the Form 859 four weeks prior to the scheduled advertisement date and receive Program Engineer approval signature.
6. Distribute Form 859 and attachments.

Additional References:

1. CDOT Construction Manual
2. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms
3. CDOT, Fundamentals of CPM Scheduling Using Microsoft Project,

2.27 ESTIMATE REVIEW BY ENGINEERING ESTIMATES AND MARKET ANALYSIS UNIT

The final engineer's estimate will be used as a basis for either award or rejection of the apparent low bidder's bid on the project.

All bid items listed in the construction plans are tabulated by the Resident Engineer with unit quantities and given to the Engineering Estimates and Market Analysis Unit (EEMA) in the Contracts and Market Analysis Branch for assignment of unit prices.

EEMA activities include:

1. Preliminary unit pricing prior to the Final Office Review stage.
2. Review of Final Office Review engineer's estimate.
3. Preparation of the final engineer's estimate prior to advertisement.
4. Creation of bid tabulations based on contractor bids.
5. Retention of historical cost data.

Copies of estimates prior to bid will be sent to CDOT Regions and FHWA when applicable. Estimates will be confidential prior to the bid opening, after the bid opening they are no longer confidential.

The Resident Engineer should coordinate each stage of the project estimating process with the EEMA. The following activities describe the cost estimate review:

1. The Resident Engineer tabulates the plan quantities and requests unit prices from the EEMA.
2. The EEMA provides unit prices for the Preliminary Engineer's Estimate.
3. The EEMA reviews any subsequent estimates as requested by the Resident Engineer.
4. The EEMA determines the unit prices for the final estimate prior to advertisement.

2.27.01 Estimate Security

To provide for the confidentiality of the estimate, the following restriction shall be adhered to:

1. Engineers prepare their cost estimates using the CDOT computerized estimating system.
2. Consultants prepare “quantity only” estimates.
3. The Engineer’s Estimate is protected by the computer system and is confidential by CDOT policy.

2.27.02 Additional References:

1. 23 CFR Part 630B, Plans, Specifications and Estimates
2. *CDOT Procedural Directive 303.01, Award of Contract – Justification* of Bid
3. *CDOT Procedural* Directive *511.1, Security and Confidentiality of the Engineer’s Detailed Estimate*
4. Estimated Total Project Cost (see Section 1.02 of this manual)

2.28 FINAL OFFICE REVIEW

The Final Office Review (FOR) is a final review of construction plans, specifications, and cost estimates for completeness and accuracy. The Final Office Review plans are to be a fully completed plan set. A Final Office Review is conducted for all projects on which the Plans, Specifications and Estimate (PS&E) are finalized by CDOT or its consultants. Prior to the Final Office Review, the Resident Engineer should ensure that all variances have been approved (See Section 2.05).

Design Bulletin 2009-5 *Project Special Provisions* summarizes CDOT policies regarding use of new or revised project special provisions on CDOT construction projects.

The Resident Engineer leads the project design team. A design team consists of individuals from various CDOT work units, consultants and entities. The principal responsibility of the Resident Engineer is to ensure that the important objectives (e.g., schedule, budget, scoping, design, and quality are successfully accomplished.

1. Final Office Review documents shall consist of the following plan package:
   a. Plans and specifications
      i. Complete project plans containing all necessary tabulations and details required for construction.
      ii. All special provisions necessary for the project, current as of the date of the Final Office Review.
   b. Cost Estimate (not to be distributed except as described below)
      An updated cost estimate of all finalized plan quantities, including planned force account work and other items chargeable to the project such as design, right of way, utilities, construction engineering, and indirect costs.
2. Procedure
   a. Initiation of the Final Office Review
      The Final Office Review will be initiated, scheduled and conducted by the Resident Engineer. The Final Office Review will be held in the office most convenient to the majority of the attendees, as determined by the Resident Engineer.
   b. Distribution of the Plans, Specifications, and Estimate package.
      Copies of the plans and special provisions will be distributed by the Resident Engineer at least seven days, but preferably 14 days, in advance of the Final Office Review. The distribution of any preliminary cost estimate is rigidly controlled and will be distributed only in accordance with *CDOT Procedural Directive 511.1, Security and Confidentiality of the Engineer's Detailed Estimate*.

Plans and special provisions will be transmitted to the following (the Resident Engineer will determine when and to whom it is appropriate to distribute the memo without the plans):

i. FHWA-Attn.: Operations Engineer
ii. Region Transportation Director
iii. Project Structural Engineer
iv. Geotechnical Engineer
v. Region Planning and Environmental Manager
vi. Region Program Engineer
vii. Region Materials Engineer
viii. Region Right of Way Manager
ix. Region Utility Engineer
x. Region Hydraulics Engineer
xi. Region Professional Land Survey Coordinator
xii. Region Maintenance Superintendent
xiii. Region Resident Engineer
xiv. Region Traffic Engineer
xv. Landscape Architect
xvi. Colorado State Patrol
xvii. Other Local, State or Federal Agencies
xviii. Consultants
xix. Others as determined by the Resident Engineer

c. Those receiving plans and specifications will review them for completeness and accuracy of construction details and plan quantities, and will be prepared to present their recommendations for revisions and corrections at the FOR. Specialties with significant involvement should attend the Final Office Review. If their involvement is limited, they can communicate their concerns to the Resident Engineer prior to the FOR meeting and not attend.

d. Conduct of the Final Office Review
The Resident Engineer should prepare an agenda for the Final Office Review so the participants can recognize which parts of the meeting they should attend. Following the Final Office Review meeting, the Resident Engineer will ensure that all corrections are made for advertising. All decisions necessary for the finalization of the plans, special provisions, and cost estimate will be made at or prior to the Final Office Review.

e. Documentation
The Resident Engineer will maintain one set of prints on which to record the corrections and revisions that result from the review. The Resident Engineer will send the minutes reporting the results of the Final Office Review to all who were originally sent Final Office Review notification. The Resident Engineer will keep a copy of the marked-up plans and additional copies will be sent to others, as the Resident Engineer deems necessary.

On consultant-designed projects, the consultant will conduct the Final Office Review meeting and prepare and distribute the minutes. The consultant will

incorporate all modifications agreed to into the plans and specifications and submit to the Resident Engineer the minutes of the meeting, the revised reproducibles, CAD files, and the Final Office Review documents with corrections, if applicable.

2.29 BID PACKAGE REVIEW (FORM 1299)

Plans and specifications of a project describe the location and design features with all the construction items in sufficient detail to facilitate construction. The estimate reflects the anticipated costs in detail to permit an effective review and comparisons of bids received.

The Resident Engineer should use portions of the Form 1299 not covered in Form 1048 to help finalize the plans before advancing the project to Advertisement and Reproduction.

Whoever checks the Plans, Specifications and Estimate (PS&E) should use the Form 1299 *Plans, Specifications and Estimate Checklist* to ensure the plans are complete before the project is advanced to Advertisement and Reproduction. Form 1299 is found here: http://www.coloradodot.info/library/forms/cdot1299.docx/view

A complete PS&E set of plans shall include:

1. *Standard Specifications for Road and Bridge Construction.* This book will be supplemented or modified by special provisions to suit the specific contract.
2. Plans in the form of detailed drawings, layouts, profiles, and any appropriate cross-sections. These plans contain information pertaining to geometrics, hydraulics, structures, soil, pavements, and other features of the project.
3. Project costs of bid items, force account items, right of way, and utility costs.

The Engineering Estimates and Market Analysis Unit in the Contracts and Market Analysis Branch will review or establish prices for materials, labor, and equipment required to perform the work (see Section 2.27 of this manual).

The Resident Engineer is responsible for assembling the final Plans, Specifications, and Estimate package. The package includes, but is not limited to, plan sheets, cross-sections, special provisions, estimate, schedule, advertisement notice, bid documents and reproduction work order. Assembly involves:

1. Compiling the final plan sheets.
2. Running the final Engineer's Estimate, as reviewed by the Engineering Estimates and Market Analysis Unit in the Contracts and Market Analysis Branch.
3. Obtaining CDOT clearance approvals and sign-offs as required on *Form 1048, Project Scoping/Clearance Record*. Clearances from Specialty Units should be received in writing. Emails are an acceptable form of clearance.
4. Reviewing the final Plans, Specifications, and Estimate for compliance with federal and state requirements.

5. Submitting the Plans, Specifications, and Estimate package for printing to the reproduction center.

The Form 1048, *Project Scoping/Clearance Record*, is to be completed by the Resident Engineer. All clearances outlined on the Form 1048 will be obtained prior to advertisement of a project.

Immediately prior to requesting that a project is advertised the Resident Engineer will finish the final check of the bid package following Region procedures. The Resident Engineer shall also confirm all clearances and requirements (see Form 859, *Project Control Data*, Form 1048, and check sheets) have been met.

Additional References:

1. 23 CFR Part 635B, Force Account Construction
2. *Procedural Directive 520.1, Documents for Bidding and Contracting on Construction Projects*
3. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

2.30 PLANS, SPECIFICATIONS AND ESTIMATE APPROVAL (FORM 1180)

After the final Plans, Specifications and Estimate are reviewed and all requirements of federal and state regulations have been met the Resident Engineer initiates Form 1180 *(Standards Certification and Project Plans, Specifications and Estimates Approval*) in SAP in order to obligate the construction phase and obtain approval to advertise the project. The Resident Engineer cannot initiate the Form 1180 until the final Form 463 and Form 859 have been approved by the Program Engineer and, for Categorical Exclusion projects, the Form 128 has been finalized and approved by the Region Environmental Manager,

Obligation:

SAP Steps:

1. ZJ14 - Form 463 – Finalize
2. ZJ17 – Form 128 – Environmental Manager
3. Update Trns*port funding to match SAP funding
4. ZJ23 – Initiate Form 1180
5. ZJ30 – Track Form 1180 progress
6. ME51N – Create a Purchase Requisition for Construction

Construction Estimate in Trns*port reviewed by CDOT Cost Estimating has to be within 10 percent of the Construction funds budgeted.

1. If the estimate is 10% over the budget, then additional funds must be added to the project before it can be advertised. Be aware this may take up to 2-3 months depending if a STIP amendment is required.
2. If the estimate is 10% less than the budget, then funds need to be de-budgeted to ensure the budget is not more than 10% over the estimate.

Authorization is requested from FHWA once OFMB receives:

1. Final Form 463 (Design Data)
2. Form 1180 workflow(Standards Certification and Project Plans, Specifications and Estimate Approval)
3. An approved Form 128 (*Environmental Categorical Exclusion Determination)* from the region.

These forms should be submitted to OFMB at least 7-10 days prior to the scheduled advertisement date to allow adequate time for OFMB/FHWA to process the

authorization request. Therefore the start of the form 1180 workflow should be timed adequately before the planned advertisement date. When FHWA has oversight, they require two weeks to approve the PS&E package for authorizing funds for construction.

The Region Program Engineer will certify on Form 1180 that appropriate design and safety standards have been met, and approve the Plans, Specifications, and Estimate package by approving the Form 1180 in SAP.

The Region Business Manager will certify on Form 1180 in SAP that funds are available to advertise the project. With the Region's approval, projects may be advertised with budget deficits up to 10 percent (based on Transportation Commission budget plus planned action versus Engineer's Estimate). For projects with deficits greater than 10 percent, the clearance indicates approval by the Region Transportation Director and notification of the Chief Engineer. Deficits greater than 15 percent may delay the advertisement of the project because of required Transportation Commission action.

The Form 1180 will then be forwarded in SAP to OFMB (Office of Financial Management and Budget). The Resident Engineer is responsible for forwarding the 463, current cost estimate and Form 128 (if applicable) to OFMB.

When OFMB receives the completed Form 1180 and all of the associated documents, they will approve the budget for advertisement (if only state funds are used), or will forward the package to FHWA for obligation and authorization of Federal Funds.

A federal aid construction project will not be advertised for bids until the construction phase obligation/authorization has been received from FHWA In those instances where a project does not include any federal funding final approval of the budget action constitutes authorization to proceed with advertisement.

Once the Construction phase is authorized by FHWA, the FHWA authorization date can be found in SAP using transaction ZJ40 or CJ20N.

After FHWA has obligated and authorized the Federal Funds, they will respond to OFMB. OFMB will, in turn, authorize the budget for advertisement.

To determine whether a project has received FHWA authorization, you can log into SAP (CJ20N). If the project has received FHWA authorization, the date it was approved will appear in the "FHWA Agreement Date" field in the CJ20N User fields.

NOTE**:** 23 CFR Part 630.106 specifies that federal funds shall not be used (participating) for costs incurred prior to the dates of obligation and authorization.

Federal Highway Administration authorization is not required for non-federal-aid projects. See Section 1.03 and Section 1.04 of this manual for an explanation of when charges can be made against a project.

Additional References:

1. 23 CFR Part 625, Design Standards for Highways, and Part 630B, Plans, Specifications and Estimates
2. 23 USC 106, Project Approval and Oversight
3. *CDOT Procedural Directive, 512.1, Project Scoping and Design Scoping Review (DSR)*
4. 23 CFR Part 630A, Federal-Aid Project Authorization
5. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

2.31 PURCHASE REQUISITION FOR CONSTRUCTION CONTRACT

After the project is authorized by OFMB for advertisement, the Resident Engineer will create a Purchase Requisition (PR) in SAP. The PR is generally a request to encumber the funds and advertise the project. It also will serve as a preliminary budget check to ensure the project has adequate funds for advertisement in the construction phase.

The Resident Engineer will create the PR using transaction code ME51N.

For a standard CDOT project, please use the attached Resource guide with the proper instruction on how to fill out a PR for a standard CDOT funded project.

Link to ME51N – Create a Construction Project PR Resource guide

ME51N - Federally Funded Construction

http://vupweb.dot.state.co.us/gm/folder-1.11.30001

PRs for Bridge Enterprise or Tolling Enterprise projects will need to be created differently and instruction for those PRs are attached as a reference below.

After you have saved the PR, you'll need to record the PR number for future reference. First you will need to send the PR number to both the Program Engineer and the Business Office and request that they approve (aka release) the PR in SAP. This release must be completed prior to the project getting advertised. The PR information will also be required on the request advertise letter that will be sent to the Construction Contracts Unit on the *HQ-CU/Construction Contracts Unit distribution list.

For federally funded projects, the Purchase Requisition should not be started until the "FHWA Agreement Date" has been received. SAP will not allow the completion of the Purchase Requisition on a federally funded project unless the federal approval and obligation are complete. These requirements are based on 23CFR 630.106 which states that federal funds shall not be used for costs incurred prior to the date of obligation and agreement. See Figure 2-3.

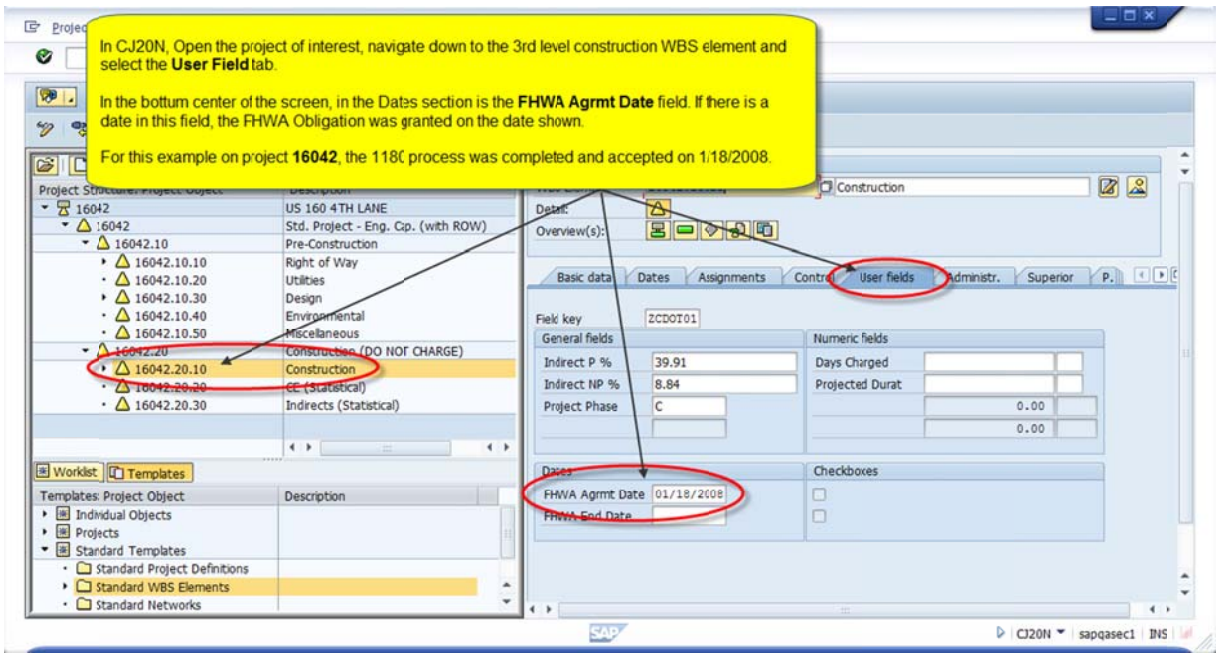


Figure 2-3
Checking FHWA Agreement Date

2.31.01 Key SAP Purchase Requisition Points

1. In the “Account Assignment Category,” enter either a P for a participating project (projects that require federal authorization) or a Z for a non-participating project (projects that do not need federal authorization). The “Account Assignment Category” field of the Purchase Requisition is a critical field for ensuring that FHWA agreement date is in place and federal participation is approved.
2. When a P is entered for the “Account Assignment Category” field, SAP will automatically check for the “FHWA Agreement Date”. If a Z is entered indicating state only funds, there is no validation check on whether or not there is an “FHWA Agreement Date.”
3. Based on the “Account Assignment Category,” SAP correctly populates the General Ledger Number (G/L Number) in the Purchase Requisition. Please do not alter or edit the G/L Number on a Purchase Requisition for a construction project before going to Advertisement.
4. The Region Business Office should also cross check for the “FHWA Agreement Date.” The Region Business Office should be contacted for any questions regarding Purchase Requisitions or the “FHWA Agreement Date.”

5. If the Purchase Requisition is created incorrectly prior to the federal obligation, CDOT is in jeopardy of losing the federal funds for the project.
6. Upon award of the project, the PR will be converted into a PO by the Agreements Unit.

2.31.02 Additional References:

1. Link to BE CDOT combined PR creation resource guide
   http://vupweb.dot.state.co.us/gm/folder-1.11.30001

2.32 PLANS AND REPRODUCTION PROCESSES

The Resident Engineer develops an Advertisement package which includes plans, special provisions, bid schedules, cross sections or other supplemental information if applicable, and several forms for the Printing and Visual Communications Center (VCC). Four groups of people receive these documents. Each of these groups needs the documents at different stages. The groups are:

1. CDOT Project Staff:
   Supporting the advertisement (Ad) process, the CDOT Project Staff answers Contractor's questions and submits-revisions-under-ad and requests for bid deferrals. This group needs the Ad documents and revisions-under-ad as soon as possible, just in case there are immediate Contractor questions. (See discussion of Form 644.)
2. CDOT Construction Staff:
   The CDOT Construction Staff can wait for normal ground delivery of all documents.
3. Agencies:
   External agencies such as FHWA, other federal agencies, and Local Agencies who may need the Ad and revisions-under-ad documents as soon as possible for internal review and processes (see discussion of Form 644.)
4. The Contractor:
   Upon award of the Contract, the Contractor will be sent Contractor's Award sets of plans and specifications. The project special provision, *Revision of Section 102 Project Plans and Other Data*, specifies how many sets the Contractor will receive without cost and how the Contractor will receive the documents. The Contractor's Award sets include Ad plans, standard special provisions, project special provisions, plus all revisions-under-ad.

   After Award distribution, the Contractor's Award sets will be available for pick-up at the Visual Communication Center in Denver. If the Contractor doesn't pick up the Award plan sets within one week, these sets are labeled "Contractor's Sets" and are shipped to the Resident Engineer.

2.32.01 Form 287 Project Distribution

The Printing and Visual Communications Center business process uses Form 287 Project Distribution (See Figure 2-4.) as a worksheet for determining the total number of construction document sets that will be printed. All sections of the form (including totals from Forms 644 and 155) are combined to get a total print run. The construction

document sets needed for the entire Ad through award process are printed in one initial printing. The goal of VCC is to print only once.

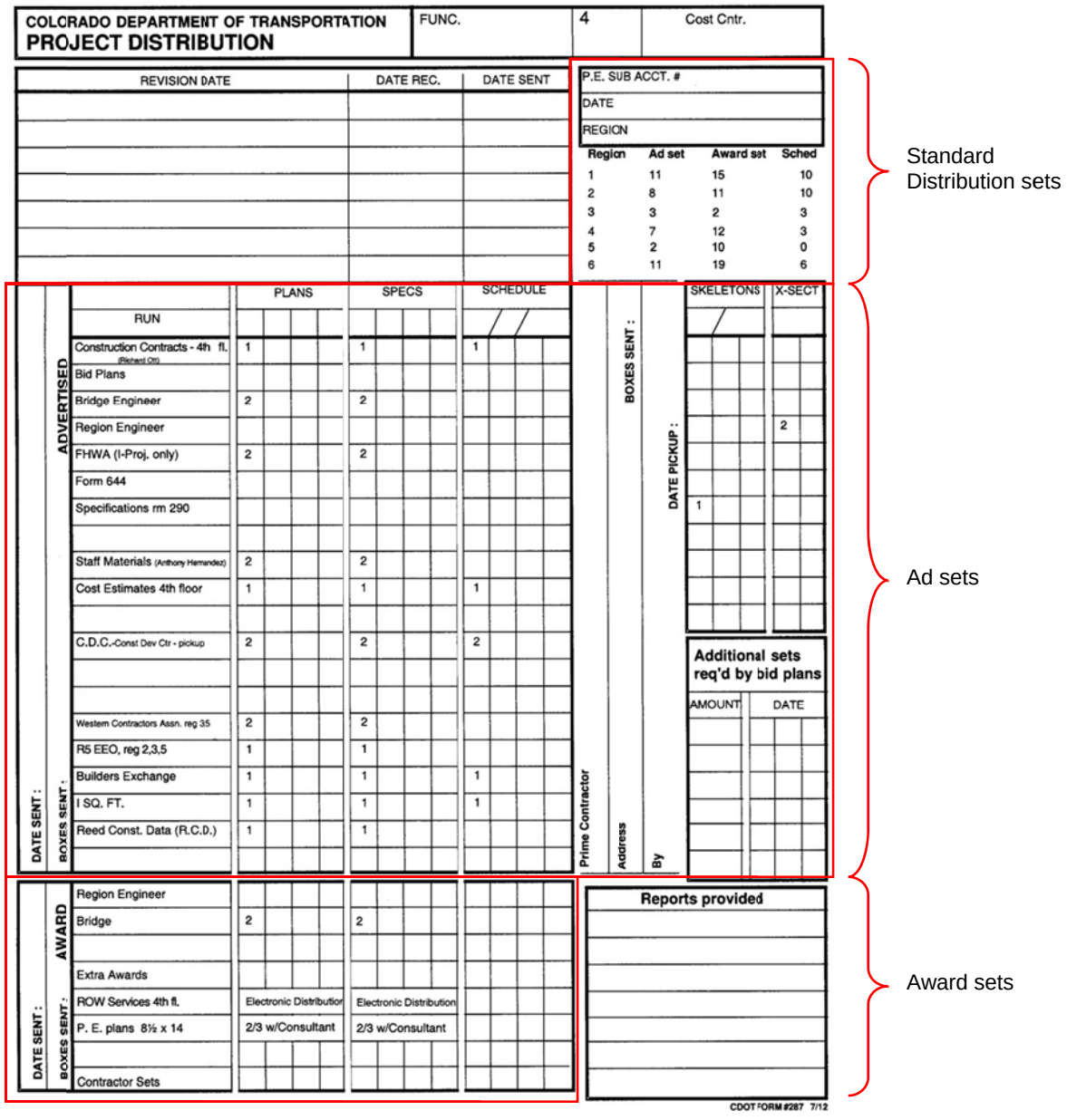
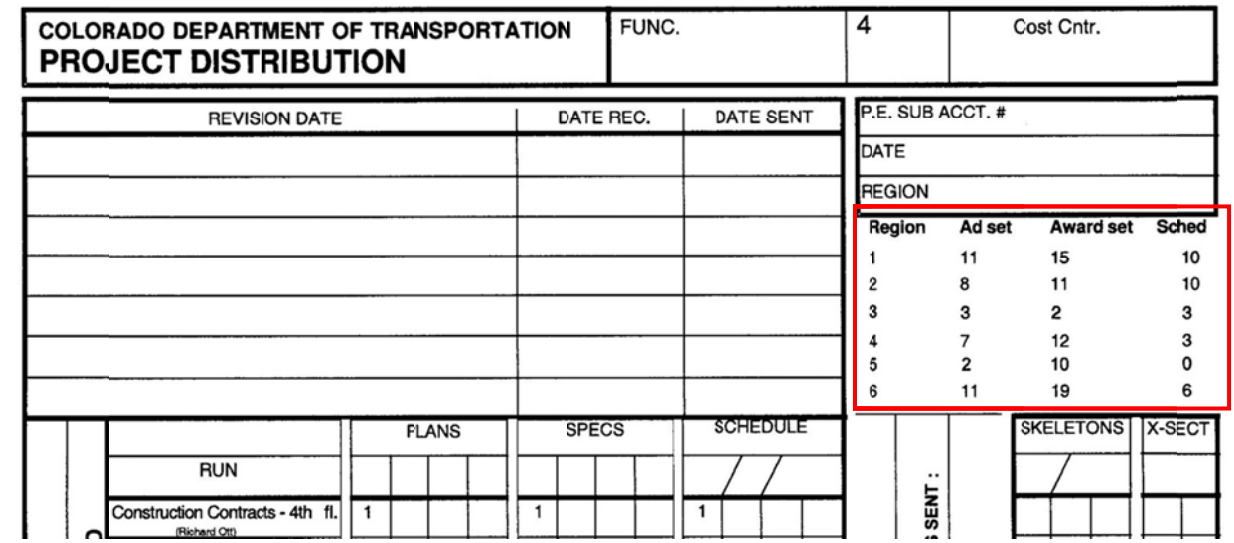


Figure 2-4
Example Form 287

The illustration in Figure 2-5 is the top part of Form 287, the standard distribution print run. For each region, the number designated here will be the number of advertisement sets that will be printed and sent by ground delivery to the region for distribution. As revisions-under-ad are printed, each is sent separately to the region for distribution. The Award sets are the Contractor's sets, as specified in the project special provision, *Revision of Section 102-Project Plans and Other Data*. The Designer needs to check the project's special provision for the number of sets the Contractor is to receive. The number of Award sets on the Form 287 must be equal to or larger than what is specified in the special provision. If the special provisions state that the Contractor will get more sets, the Designer will need to order them (see discussion on Form 155.)



COLORADO DEPARTMENT OF TRANSPORTATION
PROJECT DISTRIBUTION

FUNC.	4	Cost Cntr.

REVISION DATE	DATE REC.	DATE SENT

P.E. SUB ACCT. #
DATE
REGION

Region	Ad set	Award set	Sched
1	11	15	10
2	8	11	10
3	3	2	3
4	7	12	3
5	2	10	0
6	11	19	6

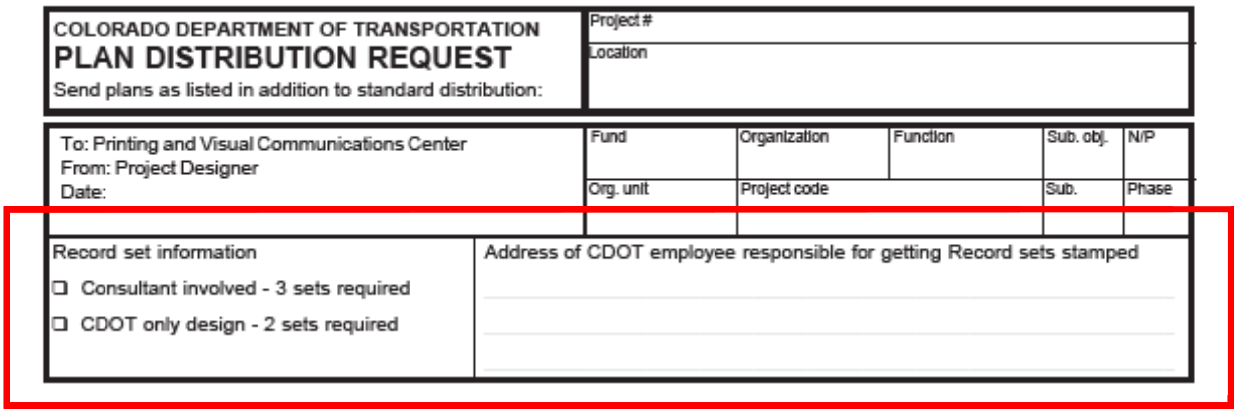
RUN	PLANS	SPECS	SCHEDULE	SKELETONS	X-SECT
Construction Contracts - 4th fl. (Richard Ott)	1	1	1		

SENT :

Figure 2-5
Top Part of Form 287

2.32.02 Form 644 Plan Distribution Request

This form has three functions. The first function is for the Resident Engineer to order Record sets for the residency and Consultants. (See Figure 2-6.)



COLORADO DEPARTMENT OF TRANSPORTATION
PLAN DISTRIBUTION REQUEST
Send plans as listed in addition to standard distribution:

Project #
Location

To: Printing and Visual Communications Center
From: Project Designer
Date:

Fund	Organization	Function	Sub. obj.	N/P

Org. unit	Project code	Sub.	Phase

Record set information

- ❑ Consultant involved - 3 sets required
- ❑ CDOT only design - 2 sets required

Address of CDOT employee responsible for getting Record sets stamped

Figure 2-6
Form 644: Resident Engineer Orders Record Sets

The second function is for the Resident Engineer to order the 2 sets that will be shipped standard mail. These are the documents needed immediately to answer Contractor questions. (See Figure 2-7.)

The Visual Communications Center does not ship overnight mail unless specifically requested and at the requestor's expense.

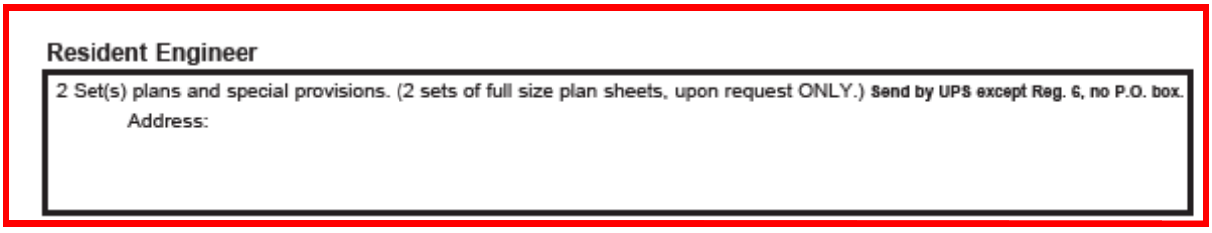


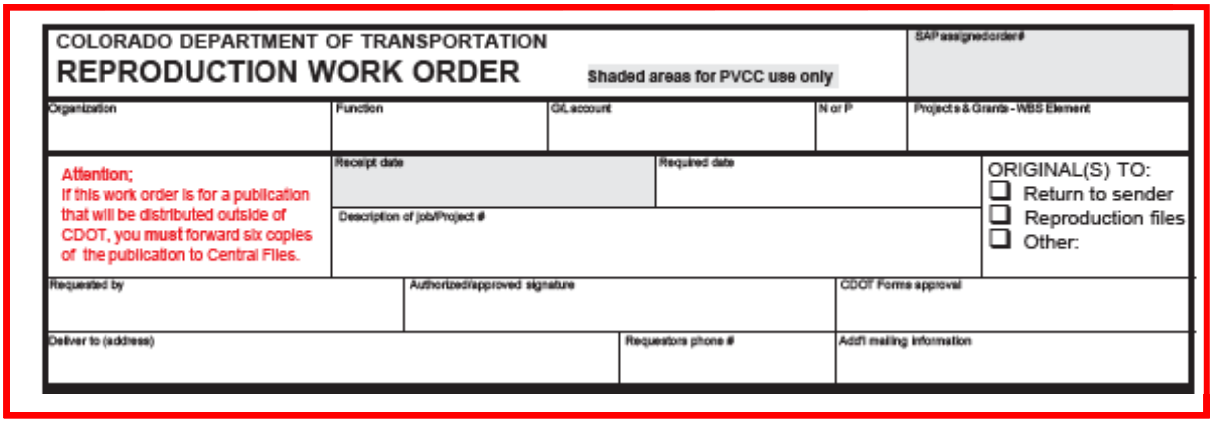
Figure 2-7
Form 644: Resident Engineer Orders 2 Sets

The third function is to order copies that will be needed immediately for external agencies such as the Federal Highway Administration, Forest Service, Bureau of Land Management, and National Park Service. Also, depending on the project, Local Agencies such as cities, counties, and special improvement districts may want copies. These are ordered in the box below (See Figure 2-8.) and are sent to the individuals by the Printing and Visual Communications Center. Note: if these agencies don't need immediate Ad copies, the Resident Engineer can order construction document sets on the Form 155 but will have to remember to mail the Ad sets and revisions-under-ad, as each is received.

Figure 2-8
Form 644: Copies for External Agencies

2.32.03 Form 155 Reproduction Work Order

This form has three functions. The first function is to authorize the printing of the Ad documents. (See Figure 2-9.)



COLORADO DEPARTMENT OF TRANSPORTATION

REPRODUCTION WORK ORDER

Shaded areas for PVCC use only

SAP assigned order#

Organization	Function	GL account	N or P	Projects & Grants - WBS Element

Attention;
If this work order is for a publication that will be distributed outside of CDOT, you must forward six copies of the publication to Central Files.

Receipt date | Required date

Description of job/Project #

ORIGINAL(S) TO:
- ❑ Return to sender
- ❑ Reproduction files
- ❑ Other:

Requested by	Authorized/approved signature	CDOT Forms approval

Deliver to (address)	Requestors phone #	Addl mailing information

Figure 2-9
Form 155: Authorize Printing of Ad Documents

The second function is to tell the Printing and Visual Communications Center how you want your order printed. (See Figure 2-10.)

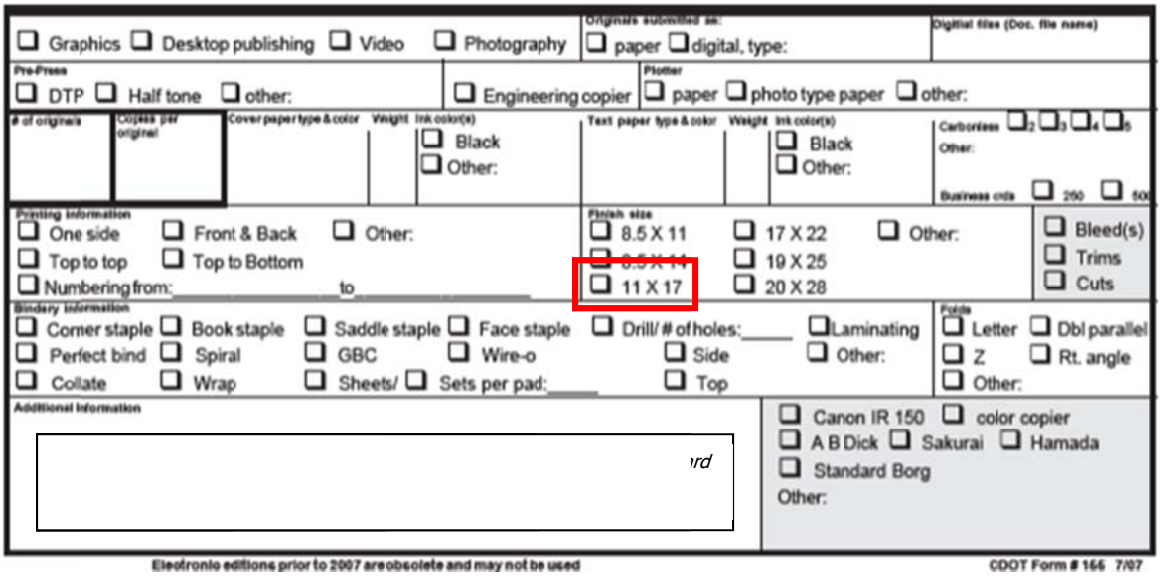


Figure 2-10
Form 155: Printing Instructions

The third function of this form (See Figure 2-11.) gives the Resident Engineer the flexibility to order more sets of documents for the following situations:

1. There aren't enough sets identified on Form 287 in the Standard Distribution Sets box,
7. The project is large and construction staff will need additional copies,
8. The Resident Engineer wants to send plan sets and revisions under ad to outside agencies, and
9. The Revision of Section 102 requires the Resident Engineer to order additional sets for the Contractor. In the "Additional Information" box, you need to clearly ask for additional sets of specific sets. For example, Repro suggests the following wording:

   "In addition to the standard printing, please print X sets of *plans, Standard Special Provisions, Project Special Provisions*, *and cross sections.*" (This list should be only the additional documents that will be needed.)

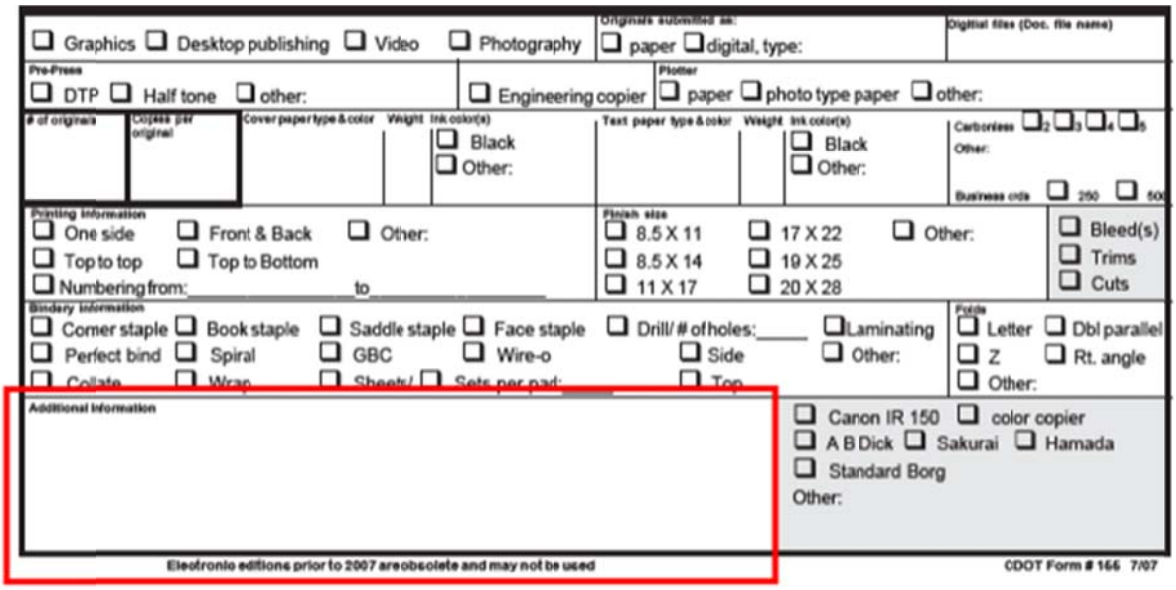


Figure 2-11
Form 155: Ordering Additional Sets

Using the Form 287, the Printing and Visual Communications Center prints all the plans, specs, cross sections, etc. that are needed for the entire project at one time. Therefore, it's important that the Resident Engineer order enough sets when Form 287 is submitted.

To reduce the amount of paper being used during project development, some Regions are now distributing FIR and FOR plans electronically. In the case of the FOR, the Resident Engineer may send out a "Notice of FOR" meeting via email and provide a link to the project Construction Plans and Special Provisions on the FTP site. Since files residing on the FTP server are removed after 10 days, project reviewers must get their electronic copies quickly. Individuals attending the FOR may print the documents they need, which typically is not the full set of documents. At the FOR, the Resident Engineer will develop a preliminary distribution list of who needs plans, specifications, and, when appropriate, bid schedules and at what stage they are needed – either Ad or Award. This list should be included in the FOR notes and used in filling out the forms 287, 644, and 155.

Final plans, special provisions, bid schedule, and Forms 155 and 644 should be placed in a new folder under \\public\reprojobs\plansandspecs which is the Repro folder on the website. **NOTE: When choosing a name for the new folder use the actual project number and ad date, not a subaccount.**

Reproduction combines all forms and prints both Ad and Award documents at this time. The Ad sets are issued as instructed on Forms 287, 155 and 644. The remaining sets are held in the Printing and Visual Communications Center until the advertisement period is over and Award is made.

As Revisions-Under-Ad are completed, VCC will print them and distribute them accordingly.

2.33 ADVERTISEMENT

CDOT typically advertises a project for three weeks. There are situations in which a longer or shorter advertisement period may be appropriate. In either case, the Program Engineer is to request concurrence from the Contracts and Market Analysis Branch Manager.

Two weeks is the minimum advertisement period required by State statute. Three weeks is the minimum advertisement period required by FHWA according to 23CFR 635.112(b) unless approved by the Region Transportation Director (see CDOT/ FHWA stewardship agreement).

An advertisement period of 5 weeks or more can be used when the potential bidders (Contractors) may have a difficult time accurately assessing the risks of the project. If the project has a unique element or difficult phasing, is a signature project, or uses an Innovative Contracting method, bidders may benefit from the longer Advertisement period.

The activities that lead up to project advertisement are:

1. Process design requirements and clearances.
2. Check estimate and budget
3. Check final design, specifications, and bid items.
4. Compile the Plans, Specifications, and Estimate deliverable package.
5. Approve the Plans, Specifications, and Estimate package, including advertisement for bid.
6. Prepare the Plans, Specifications, and Estimate delivery schedule.

The Resident Engineer will ensure that all applicable clearances have been obtained on the *Form 1048, Project Scoping/Clearance Record*, and that all mitigating issues and discrepancies have been resolved.

The Resident Engineer is responsible for delivering the documents to the Printing and Visual Communications Center (See Section 2.28 Bid Package Review). The following should be included:

1. Form 644, Plan Distribution Request
2. Form 155, Reproduction Work Order
3. Project schedule of items
4. Original project plan sheets

5. Original project specifications and special provisions
6. Original project cross-sections, if applicable
7. Earthwork calculations, if applicable
8. Advertisement letter from Resident Engineer (e-mail)
9. Other supplemental information, if applicable

To ensure a timely advertisement of the project the Printing and Visual Communications Center requires the following submittal schedule to be followed (additional consideration should be given during holidays):

1. Typical PS&E packages (200 plan sheets or less):
   Deliver to the Center 8 calendar days prior to advertisement.
2. Large PS&E packages (between 200 and 400 plan sheets):
   Deliver to the Center 15 calendar days prior to advertisement.
3. Very Large PS&E packages (over 400 plan sheets):
   Deliver to the Center 22 calendar days prior to advertisement

The Advertisement Notice in Trns*Port must contain the following information:

In upper left corner:
- Letting Date
- Counties
- Region

In upper right corner:
- Contract ID
- Project No.
- DBE Goals/Guaranty
- Plan Price
- Work or Calendar Days
- Resident Engineer
- A check mark by the correct one of the following:

__ More than $20,000,000
__ Between $10,000,000 and $20,000,000
__ Between $5,000,000 and $10,000,000
__ Between $1,500,000 and $5,000,000
__ Between $600,000 and $1,500,000
__ Less than $600,000

Use the following to determine the Plan Price:

Number of Original Plan Sheets	Plan Price
MTCE Projects	$10.00
1 – 150	$20.00
151 – 250	$30.00
251 – 350	$40.00
351 – 450	$50.00
Add $10 for every additional 100 plan sheets, or portion thereof, over 450.	

The quantities should read “MAJOR ITEMS” as opposed to “BID ITEMS.” If a pre-bid conference is scheduled, include the location, time, and date, and clearly state whether it is mandatory.

2.33.01 Authorization Letters

Authorization letters must be sent to the “*HQ-CU/Construction Contracts Unit” distribution list in Outlook. All advertisement authorizations must be received no later than 9:00 a.m. on the Monday morning before the advertisement date. If Monday is a holiday, they must be received by 9:00 a.m. the previous Friday.

A sample advertisement authorization letter and procedural instructions are located on the CDOT website at:

http://www.coloradodot.info/business/bidding

(You may need to scroll down to find the “Advertisement Letter Instructions” link.)

The sample format is to be used on all letters authorizing project advertisements.

2.33.02 Bid Opening Deferral

The Resident Engineer should notify the Award Officer of a deferral via email. The email should provide the new bid opening date and indicate if there is a revision to follow.

2.34 PS&E REVISIONS UNDER ADVERTISEMENT

The following procedure and format are to be followed for all plan Revisions Under Advertisement.

All revision packages are to be submitted to the Printing and Visual Communications Center (VCC) at least 10 days prior to the scheduled bid opening date. Revisions submitted later will result in a deferred bid opening. The package to the Printing Center will include the revision letter and all revised sheets. Additionally, an e-mail distribution of the revision letter must be made concurrently with or prior to the submittal to the VCC. These steps must be followed to ensure that key processes are initiated.

Address the actual revision letter to "All Holders of Plans for Project No. _____." The Revision No. should be listed under "Subject." (All bidders are to acknowledge receipt of the revision in their submitted bid proposals.) Include the following recipients at the bottom of the letter for hard copy distribution:

FHWA, Colo. F/A Division Operations Engr. (if FHWA has project oversight)
Individuals listed in the most current *CU_HQ/construction Contracts distribution list
Duran/Stiller, Printing Center
M. Pyle, Bid Plans
R. Liljenberg, Business Programs
R. Ott, Constr. Contracts
S. Yu, Cost Estimating
Central Files

Project Manager
Resident Engineer

The "Subject" for the e-mail cover letter should note "Revision No. _____ Project No._____" All the standard non-regional recipients have been consolidated in a distribution list called "HQ-CU/Construction". The current names in this list are shown for information only.

Alvaro Duran
Bid Plans
Jack Stiller
B. Rasmussen
Tracie Benton
Richard Ott
} = *HQ-CU/Construction

Region Transp. Dir.
Program Engineer

All non-regional distribution instructions must be followed exactly. The intra-regional distributions are based on a consensus taken from all the regions and may be modified as the Region directs.

The latest version of the revision letter can be found on CDOT's website at: http://www.coloradodot.info/business/bidding.

The revision letter shall include the following in the order specified:

1. Reasons for Revision.
   List the reasons for the need to revise the project plans and specs in order to enhance newly required reporting needs. Check as many reasons as may apply for each revision. There are eight potential categories from which to choose:
   a. Plan or specification correction,
   b. commencement or completion of work time change,
   c. biddable quantity change,
   d. addition or deletion of specs,
   e. addition or deletion of plan sheets,
   f. new Davis Bacon wage rates,
   g. funding availability,
   h. other (explain)
2. Bid Proposal
   Indicate whether there are any changes to the bid proposal (or schedule). If there are, state that the revised schedule (for those not using EBS) or EBS amendment must be used (see example).
3. Project Special Provisions
   List page numbers with titles and brief descriptions for each revised special provision.
4. Standard Special Provisions
   List titles, dates, number of pages, and brief description of change.
5. Plan Sheets
   List sheet numbers with description of revision. **The Title Sheet must always be revised when any plan revision occurs. The Resident Engineer must verify that the Title Sheet has been revised.**
6. Date
   Explicitly state the date of the bid opening and whether it has changed. Do not make vague statements, such as, "At the time previously advertised." If the project has been deferred, call attention to the revised EBS file (see example text).
7. FHWA Approval
   If the project has FHWA oversight, identify FHWA engineer who approved the revision.

8. Authorization
   Indicate who is authorizing the revision and the Region. All revisions must be authorized by someone at or above the Professional Engineer II level. A signature is not required.

IMPORTANT: If significant plan quantity errors become known, it is mandatory to issue a revision. In the past, there have been some incidents when the Region went forward with the intent to deal with the errors "in the field." This is not permissible because it creates distortions in the bidding process that cannot be administered fairly.

NOTE: If a revision adds Disadvantaged Business Enterprise participation to a project, the Bid Plans Room must be instructed to include the *Form 714, Underutilized DBE Bid Conditions Assurance*, "Note on DBE %" with the package sent to plan holders and add these forms to all new sets that are sold.

The Resident Engineer should attempt to minimize revisions by reviewing all plans and specifications carefully prior to advertisement. If there are any questions on this process, please contact Richard Ott in Contracts and Market Analysis at (303) 757-9006.

EXAMPLE OF REVISION REQUEST E-MAIL:

Date:
From: (Automatically filled in by Email)
Dept:
Tel No:

TO: See Below

Subject: Revision No. 1 HB 9999-999

Please find attached the following revision letter for Project _____.

Distribution:

*HQ-CU/Construction contracts
|
Which may include the following individuals but the distribution list is kept up to date and should be used over the list below.
TO: Bid Plans @DHQ

TO:	Duran, Alvaro @DHQ
TO:	Stiller, Jack @DHQ
TO:	Ott, Richard @DHQ
TO:	Rasmussen, Bernie @DHQ
TO:	Benton, Tracie @DHQ
CC:	RTD
CC:	Program Engineer

The latest version of the revision letter can be found on CDOT's website at:

http://www.coloradodot.info/business/bidding .

2.35 RE-ADVERTISEMENT

Occasionally projects need to be re-advertised because there were less than three bidders all of whom exceeded the engineers estimate by more than that which is prescribed by statute, or there were no acceptable bids.

CDOT can reject bids for any reasonable cause. The Resident Engineer can request to re-advertise the project at a later date or request additional funds from the Transportation Commission. A cost justification is required to award any project with a low bid greater than 15 percent over or 20 percent under the estimate. This requirement does not limit the Department's authority to reject bids. If additional funds are approved by the Transportation Commission, the Chief Engineer can authorize award of the project.

If a project's low bid is greater than 115 percent or less than 80 percent of the "Detailed Engineer's Estimate," it will be discussed with the apparent low bidder and the Engineering Estimates and Market Analysis Unit in the Contracts and Market Analysis Branch to determine the reason for the difference.

The Engineering Estimates and Market Analysis Unit will document the reasons for the excessive variations from the engineer's estimates.

Bids on a project may be rejected for any of several reasons including but not limited to:

1. Less than three bids received with the low bid being greater than 110 percent of the engineer's estimate (greater than 125 percent on projects under $1 million) in accordance with CRS 43-1-113(16).
2. Lack of funding to award the project at the amount bid. Contact Region Business Office for resolution of funding shortfall.
3. Failure of bidders to satisfactorily respond to the Disadvantaged Business Enterprise requirements.
4. A negative finding on the cost justification review or low bid analysis.

If all bids are rejected, the Region may re-advertise the project. The Region should take steps to remedy the causes for not receiving acceptable bids prior to re-advertisement. Examples of such remedies are changing completion time specifications or working conditions, modifying the scope of the work, and revising the engineer's estimate when appropriate.

Additional References:

1. 23 Part CFR 635A, Contract Process
2. CDOT Procedural Directive 303.01, *Award of Contract – Justification of Bids*

2.36 RETAINING BID SURPLUS FUNDS

When a bid results in surplus funds on the project, the Bids and Awards Unit will issue a Preliminary Financial Statement and will submit a request to the Region Business Office for a budget action.

If the Region wants to retain all or part of the bid surplus, the Region Transportation Director shall request retention of surplus funds after bid opening day. The request process for the region has two steps.

2.36.01 Step One

Step one is to send an e-mail to the Chief Engineer (CE) with notification of the region's "intent" to request to retain all or part of the bid surplus funds. This email must be submitted to the Chief Engineer by noon the day following bid opening.

Prior to the submission of the email to the CE the region will submit a spreadsheet to the Engineering Estimates and Market Analysis Unit (EEMA) of the Contracts and Market Analysis Branch analyzing the proposed costs of the work to be added if funding becomes available. The spreadsheet will list all items of work; the unit prices of the low bidder, second low bidder, and third low bidder; and the product extensions for each bidder. If EEMA determines that including the additional work in the low bidder's bid would result in higher costs to CDOT than if it were included in the bids from either the second or third low bidder, the additional work will not be added to the Contract. The region will also analyze costs to perform the additional work as though it were a separate contract, including additional mobilization, traffic control, indirect costs, etc. This analysis will also be submitted to EEMA in a spreadsheet format containing quantities, estimated unit prices, and product extensions. The EEMA may adjust the estimated unit prices to complete the work under a separate contract as necessary. If EEMA does not concur that the anticipated cost savings to add the work to the Contract is reasonable, EEMA will notify the region.

2.36.02 Step Two

Step two is to submit a formal letter requesting to retain all or part of the bid surplus funds to the Chief Engineer's office by the Monday following bid opening.

Both submissions should be sent via email to the Chief Engineer. The second email should contain the funds retention request letter and a copy of the first email with initial

approval and amount of surplus. The following Units are to be copied on the second email: Office of Financial Management & Budget, Project Budget Unit (Pam Thomson, Eric Ehrbar, and Darrell Johnson), Office of Financial Management & Budget - Project Award and Accounting Unit (Abeba Yehdego, Tram Ngo), Contracts and Market Analysis (Richard Ott), and the Region Business Office Manager.

The formal letter should contain the following justification at a minimum:

1. Time involved in preparing, letting, awarding and issuing a notice to proceed for a separate contract.
2. Anticipated competition for the work.
3. Time remaining and the critical work that must be done before winter shut-down period.
4. Justification of work that was omitted because of funding constraints.
5. Environmental clearances for the extra work, if any.

After receipt of the signed letter from the Chief Engineer, the Project Awards and Accounting Unit will add a CMO line in the Trns*port worksheet bid project under category 0200 and item number 700-70002. The amount to input in the CMO line will be the net amount of funds retained after allowance for CE and Indirect Costs. The net amount is calculated by dividing the amount retained by 1.2395 (or the current CE & Indirect number).

The Project Awards and Accounting Unit will generate a final financial statement and submit it to the Agreements Unit for project award.