Section 2

Project Development Process

December, 2024

COLORADO
Department of Transportation
Office of the Chief Engineer

Table of Contents

2.01 Design Scoping Review

The Design Scoping Review (DSR) is an early review of a project scope, schedule, and budget prior to preliminary design. This enables development of a scope of work that will be consistent with the planning and design characteristics.

It is acceptable to have two scoping meetings—one before the project is created and budgeted, and another after. The first of these meetings may be referred to as a “Pre-Scoping Meeting”, and may involve a smaller group of key specialty units and stakeholders. At the Pre-Scoping Meeting, some early goals might be to identify any known, major risks to schedule and budget such as utility Subsurface Utility Engineering (SUE) investigations, right of way acquisition, railroad involvement, and floodplain/environmental permitting. At the Pre-Scoping, preliminary survey limits may also be identified. A time charge of cost center, functional area 1150, is sometimes necessary to cover time spent on a pre-scoping activity when the Design Phase has not yet been 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 and PMWeb Stage Gates, 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 Plans, Specifications & Estimate (PS&E) approval, and to track final clearances prior to advertisement of a project. Current as of this writing (February, 2024).

2.01.02 DSR Meeting

The DSR meeting shall be scheduled as soon as possible when a project is identified. The DSR invitation letter shall include the Colorado Department of Transportation (CDOT) Form 1048 completed through Phase 1, 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. Crash history and hazard rating.
5. Existing roadway condition and pavement rating.
6. Design speed and existing signed speed.
7. Related intermodal information.
8. Environmental and historical considerations.

9. Context Sensitive Solutions.
10. Bicycle/Pedestrian Impacts and Considerations.
11. Operations Evaluation Considerations.

Design Scoping Review (DSR) meeting attendees should receive all of the available materials prior to the meeting. This will allow the specialty units time to look into the project area and identify concerns or needs prior to the DSR meeting. The attendees will also need to determine any staffing support needs prior to the DSR meeting.

2.01.03 DSR Invitees

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

Table 2.01.03 DSR Invitees

From Colorado Department of Transportation (CDOT) Region:	Others:
Program Engineer	CDOT Staff representatives: (Bridge, Hydraulics, Safety and Traffic, Transportation Development, Right of Way (ROW), Environmental, Geotechnical, etc.)
Resident Engineer	Other state agencies
Traffic & Safety Engineer	Local government agencies (city, county, etc.)
Utilities Engineer	Federal Highway Administration (FHWA) representatives (and other federal agencies)
Planning/Environmental manager	Specific organizations: emergency, schools, special districts, enhancement sponsors, etc.
Maintenance superintendent	Railroads, transit operators, airports
Materials Engineer	Bicycle and Pedestrian coordinator
ROW supervisor	Transit Liaison
Survey coordinator	Field and Plans Professional Land Surveyors (PLS's) coordinators for the project
Hydraulics Engineer	No value
Civil Rights manager	No value
Access manager	No value

2.01.04 Conduct of the Design Scoping Review (DSR) Meeting

The Project Manager (PM), under the supervision of the Resident Engineer (RE), shall conduct the Design Scoping Review. An agenda will be prepared to ensure all critical issues are addressed. All Colorado Department of Transportation (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 National Environmental Policy Act (NEPA) commitments.
5. Maintenance concerns.
6. Right of Way requirements.
7. Survey requirements.
8. Multimodal issues and accommodations.
9. Travel demand and trip reduction.
10. Traffic Operations, Access management and safety issues, operations evaluation recommendations, operations evaluations analysis levels.
11. Utility requirements.
12. Contract requirements.
13. Geotechnical considerations.
14. Coordination of all disciplines.

2.01.05 DSR Meeting Records

The project manager will produce and distribute the minutes of the DSR meeting, research unresolved concerns and issues, prepare cost estimates, and prepare proposed project schedules. The schedule and estimate will be entered into the appropriate PMWeb records. The Project Delivery Plan is prepared in PMWeb and sent to all teams through workflow.

Additional Resources:

23 Code of Federal Regulations (CFR) Part 625, Design Standards for Highways

2.02 Staged Construction Build-Out

2.02.01 (Future Capacity Consideration)

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 Program Engineer, Resident Engineer, and Project Engineer are responsible, in conjunction with the region Planning Unit, 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 10-Year Vision Plan

In 2019 the Colorado Department of Transportation (CDOT) utilized the planning process to create the 10-year Strategic Project Pipeline focusing the Department on delivering a defined set of priority projects. The 10-year plan is organized by region and provides a planning list of projects and strategic funding for Fiscal Year (FY) 19 through FY 27 and beyond. The plan focuses on improving safety, increasing the resiliency of the transportation system, repairing our existing infrastructure and improving access to multimodal transportation. The latest plan can be found on Programs – 10-Year Vision Plan & Story Map.

2.04 Design Data (Form 463)

Form 463, Design Data, which is completed in Systems, Applications and Products in Data Processing (SAP) under transaction “ZJ14”, is used on all CDOT projects to document important design information and provide uniform information during project development.

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

2.04.01 Operations Evaluation (Safety Evaluation)

All projects are now required to have an Operations Evaluation and are no longer required to have a separate safety evaluation. The Operations Evaluation is entered in PMWeb. Work instructions can be found at the following link: Operations Evaluations in PMWeb.

The Operations Evaluation, which is required on all projects, consists of three parts: a Safety Analysis, an Operations Analysis, and an Access Management Analysis. Refer to Section 4.12 for details on the Operations Evaluation.

As part of the Operations Evaluation, a safety evaluation should be considered. An important goal of the 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 crashes 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 Miscellaneous & Safety (M&S) Standard Plans. The CDOT Roadway Design Guide is based on the American Association of State Highway and Transportation Officials (AASHTO) Policy on Geometric Design of Highways and Streets (the “Green Book”). All CDOT employees have access to a wide array of AASHTO resources in electronic format including the Green Book that can be accessed Accuris - Login. Please contact Accuris - Contact Customer Care or the Design Area Engineer if you have access issues.

E-Form 463 compares the existing and proposed design criteria with the minimum standards acceptable for that particular type of roadway. If it is a Resurfacing, Restoration, Rehabilitation (3R) project, then Section 2.06 applies.

2.04.02 Preparing Form 463 in Systems, Applications and Products in Data Processing (SAP)

The project manager 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 Colorado Department of Transportation (CDOT) Business – Roadway Design Guide 2023 and the American Association of State Highway and Transportation Officials (AASHTO) Green Book, a current listing of AASHTO publications that provide valuable information for obtaining good design are in 23 Code of Federal Regulations (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 summary data.
5. Railroad crossings.
6. Agency coordination.
7. Entities involved.
8. Structural loading parameters.
9. Functional classification.
10. Utilities.
11. Environmental category.

The project manager and design team 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 National Environmental Policy Act (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 foot 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 2.05 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

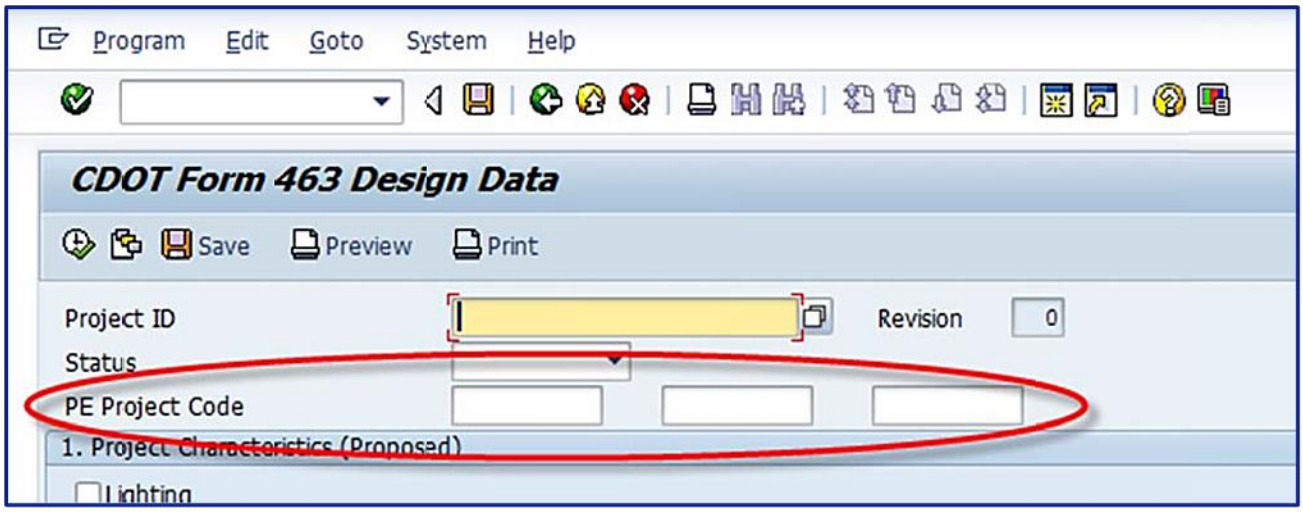
work or extend the project limits. If it is necessary to revise the project limits or the scope of work, then Form 463 must be revised. The Project Limits are changed under the Systems, Applications and Products in Data Processing (SAP) transaction “CJ20N” and is auto-populated into Form 463. The Resident 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 Office of Financial Management and Budget (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 transaction “CJ20N” Project Manager tab and and selecting this button:

This grants access to the project in the Online Transportation Information System (OTIS) where the project Geographic Information System (GIS) information is stored and tracked. Once the change are completed, a request needs to be sent to the Office of Financial Management and Budget (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 they 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 Plans, Specifications & Estimate (PS&E) package. A key portion of Form 463 that needs to get filled out correctly is the “PE Project Code” fields located near the top of the form, as shown below:

Figure 2-1 Form 463, “PE Project Code” fields highlighted



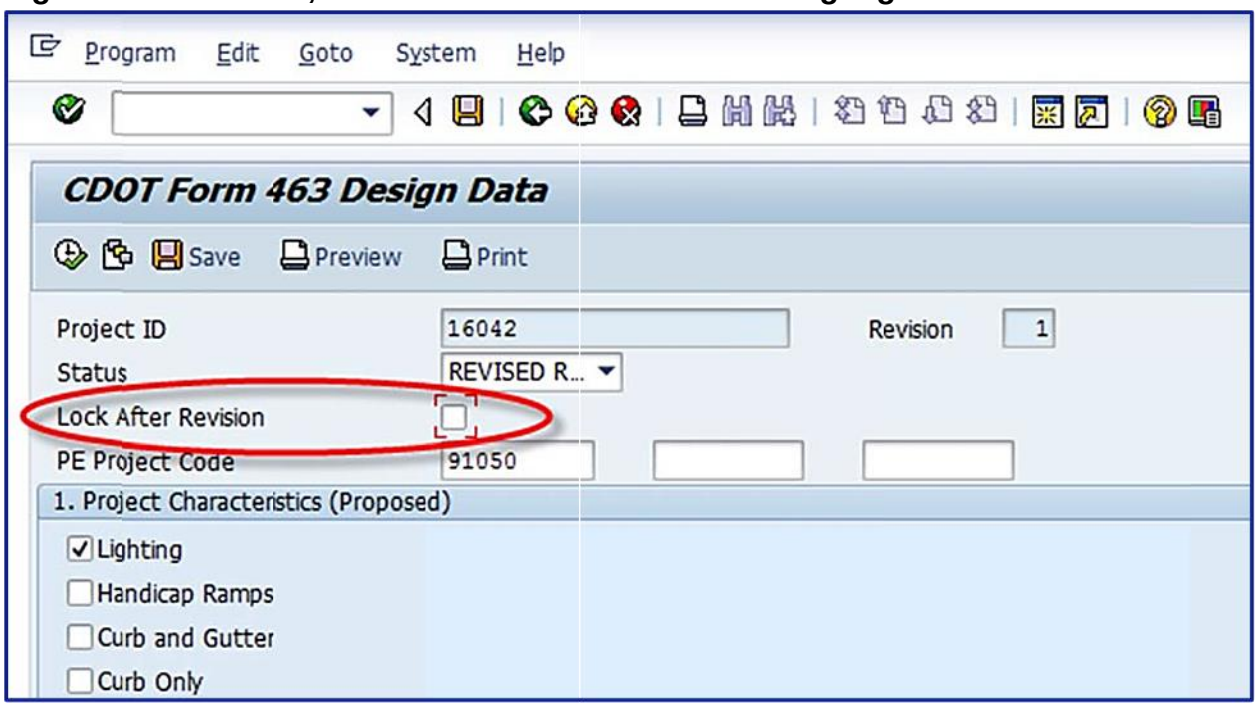
These fields are intended to list any other projects that were used for the preparation or clearing of the construction project. For example, if a separate design project was used such as as a Resurfacing Design pool or a project design corridor. Another example would be if a Right of Way (ROW) acquisition project was used to acquire the project's ROW. The intent is not to list Projects where ROW was acquired for past projects. Additionally, if an Environmental Assessment (EA) or Environmental Impact Statement (EIS) was completed and is being used for the current project, it should be listed in these fields as well. These fields are used for tracking related project costs in Systems, Applications and Products in Data Processing (SAP), mainly for Federal Highway Administration (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.

2.04.03 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.

Figure 2-2 Form 463, Lock After Revision checkbox highlighted



2.04.04 Final Form

The Final form is required for Office of Financial Management and Budget (OFMB) authorization prior to the project being advertised. Federal Highway Administration (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 the Federal Highway Administration (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.

2.04.05 Summary

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

1. Conduct the Design Scoping Review (see Sections 1.03 and 2.01 of this manual). Distribute meeting minutes with action items.
2. Initiate Create Project in Systems, Applications and Products in Data Processing (SAP) (see Section 1.03 of this manual). Some projects will have step one 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 Field Inspection Review (FIR) meeting when the top half of the Form 128 will be signed.

In addition, block five (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.

Additional Resources:

Post Award Project Financial Statement: Form 65
Project Finanacial Statement – Form 65.pdf

American Association of State Highway and Transportation Officials (AASHTO) Policy on Geometric Design of Highways and Streets

Colorado Department of Transportation (CDOT) Procedural Directive 512.1, Project Scoping and the Design Scoping Review (DSR)

For forms, see CDOT online forms library About CDOT – CDOT Forms Catalog

CDOT and Federal Highway Administration (FHWA) stewardship agreement Stewardship And Oversight Agreement.pdf

FHWA core curriculum Construction – Contract Administration

2.05 Design Exception Variance Request (Form 464)

Design Exception Variance Request – Form 464.pdf 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, crash 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.

The Stewardship and Oversight Agreement delegates CDOT the approval of design exceptions for National Highway System (NHS) projects. FHWA is the approval authority for design exceptions for projects on Interstate Highways (regardless of funding) or as indicated by the FHWA Project Level Stewardship and Oversight Agreement (when applicable). Form 464 is approved by the region Program Engineer when FHWA approval is not required. However, the Region Program Engineer and Resident Engineer sign off on all design exceptions.

2.05.01 Controlling Criteria

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. Per the Federal Register Notice published May 5, 2016, Volume 81, Number 87, 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. Horizontal curve radius.
5. Superelevation rate.
6. Stopping sight distance.
7. Maximum grade.
8. Cross slope.
9. Vertical clearance.
10. Design loading structural capacity.

All 10 controlling criteria apply to high-speed (i.e., interstate highways, other freeways, and roadways with design speeds > 50 mph) roadways on the National Highway System (NHS).

On low-speed roadways (i.e., non-freeways with design speed < 50 mph) on the NHS, only the following two controlling criteria will apply:

1. Design speed.
2. Design loading structural capacity.

The following type of projects may not be required to meet full American Association of State Highway and Transportation Officials (AASHTO) standards but must meet the minimum standards in the appropriate sections of the Colorado Department of Transportation (CDOT) Business – Roadway Design Guide 2023. Otherwise a variance request will be prepared:

1. Resurfacing, Restoration, Rehabilitation (3R) projects: See the CDOT Roadway Design Guide.
2. Corridor projects, as defined by a National Environmental Policy Act (NEPA) document: refer to 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 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 the latest 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.

2.05.02 National Environmental Policy Act (NEPA) Compliance

Since many highway improvement projects are funded exclusively with non-federal funds, NEPA compliance for those projects is not required. However, approval of a design exception for projects on the NHS or Interstate System is considered to be a Federal Action (as

specified in 23 Code of Federal Regulations [CFR] 771.107), and NEPA compliance would be required on those non-federally funded projects that require design exception approval. Regardless of delegation of authority, National Environmental Policy Act (NEPA) would apply to all design exceptions on the National Highway System (NHS).

The selection of the appropriate environmental review, documentation, and approval of the Federal Highway Administration's (FHWA's) decision-making process will usually be based on the type and scope of the project. Design exceptions by themselves normally do not result in a change in the scope of a project or cause any significant impacts. In many circumstances, the approval of the design exception will likely fall under Categorical Exclusion (CE) 23 CFR 771.117(c).

2.05.03 FHWA Colorado Division Requirements

The process to evaluate and justify a design exception must be based on an evaluation of the context of the facility (e.g., community values), needs of all the various project users, safety, mobility (i.e., traffic performance), human and environmental impacts, and project costs.

The FHWA Colorado Division expects documentation of design exceptions to describe all the following:

1. Specific design criteria that will not be met.
    a. Description of proposed design, compared to its criteria requirement, including the difference reason.
2. Existing roadway characteristics.
    a. Description of roadway's current typical section, traffic information, crash data, Public demand, etc.
3. Alternatives considered.
    a. What other alternatives were studied prior to request a design exception?
    b. Analysis of a design meeting all criteria.
4. Data Driven Safety Analysis (DDSA)
    a. Applicability is indicated on Colorado Department of Transportation (CDOT) Form 464. The DDSA should compare the predicted safety performance of the following scenarios: the existing condition, the design exception scenario (when this differs from the existing condition), and the full standard.
    b. The DDSA analysis should also provide the benefit cost ratio associated with design exception implementation.
5. Context sensitive considerations.
    a. Design exception benefits or impacts, related to stakeholder preferences, right of way, environmental, and usability by all applicable modes of transportation.
6. Proposed mitigation measures.

   a. What improvements are being proposed to enhance the area, in lieu of the design deficiency?
   b. Mitigation Strategies for Design Exceptions (archived) provides valuable guidance about the impact design exceptions may have on the safety and operational performance of roadways, and potential mitigation strategies when any of the 10 controlling criteria are not met. However, it is a guide, and does not constitute a standard, nor does it set forth new policy regarding when design exceptions are required, when this document conflicts with the adopted American Association of State Highway and Transportation Officials (AASHTO) policies or the AASHTO policies adopted through Federal Highway Administration (FHWA) regulations.
7. Compatibility with adjacent sections of roadway.

Additionally, for Design Speed and Design Loading Structural Capacity exceptions, documentation describing the following is required:

1. Design Speed
   a. Length of section with reduced design speed compared to overall length of project.
   b. Measures used in transitions to adjacent sections with higher or lower design or operating speeds.
2. Design Loading Structural Capacity
   a. Verification of safe load-carrying capacity (load rating) for all state unrestricted legal loads or routine permit loads and, in the case of bridges and tunnels on the interstate, all federal legal loads.

Anticipated operational and posted speeds should be considered in the selection of the design speed, however, there is no regulation establishing a more direct relationship. Selection of a posted speed is an operational decision for which the owner and operator of the facility is responsible. A design speed less than the posted speed limit does not necessarily present an unsafe operating condition. If state legislation or highway agency establishes a speed limit greater than a roadway's design speed, the FHWA recommends that a safety analysis be performed to determine the need for appropriate warning or informational signs such as advisory speed on curves or other mitigation measures prior to posting the speed limit.

2.05.04 Design Exception Request Standard Procedures

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. Colorado Department of Transportation (CDOT) should be the lead in the preparation of the design exception documentation, with assistance from the FHWA Colorado Division, if desirable.
    a. Development of Form 463, Form 464, and the required documentation to satisfy Federal Highway Administration (FHWA) requirements
3. Upon completion of the document(s), CDOT should submit the design exception for review/approval to the FHWA Area Engineer.
    a. For some unique projects, conditions that may be considered to warrant a design exception can be the extreme difficulty of achieving the design compliance, extremely high cost of obtaining right of way, considerable environmental impacts, extremely high construction cost, or the preservation of historic or scenic values of the location. These conditions should be measured and documented. However, mitigation(s) must be implemented in the project when practical.
4. The FHWA Area Engineer will share the comments to CDOT, for their action.
5. Once the document is revised by CDOT and no comments are pending, FHWA Colorado Division can approve the design exception request, by having the Design Program manager signing CDOT Form 464.

For projects by outside agencies or consultants, the region will review the variance request to determine whether the intent of the Design Exception Variance Request – Form 464.pdf 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 2.18.

2.05.05 Additional Considerations

Particularly when FHWA approval is required, a design exception is encouraged to be requested as early as possible in the Project Development process. Design exception requests received late in the project's process could result in potential delays to the project delivery. A final copy of all design exceptions are to be placed on the Design Exceptions Shared Google Drive under the appropriate calendar year folder.

Guardrail and bridge rail are to be designed according to the latest CDOT Miscellaneous & Safety (M&S) Standard Plans, Standard Specifications for Road and Bridge Construction and American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide on all new construction and reconstruction projects. All proprietary products shall be installed conforming to the manufacturer's recommendations. For Resurfacing, Restoration, Rehabilitation (3R) and surfacing type projects, guardrail is to be handled in accordance with Section 2.06.

On local agency projects, the project manager 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 crash data and roadway safety inventories. However, crash records may be available from the Safety and Traffic Engineering Branch.

All variances should be identified by or before 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.

2.05.06 No Variance Required

The following items do not require a variance, but should be documented as a design decision. See Section 2.18.

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

Additional Resources:

In addition to the CDOT Business – Roadway Design Guide 2023 and the AASHTO Green Book, a current listing of AASHTO publications that provide valuable information for obtaining good design is in 23 Code of Federal Regulations (CFR) Part 625.

If the project is a Resurfacing, Restoration, Rehabilitation (3R) Project, follow Section 2.06 for the applicable design exception procedures.

2.06 Procedures for Addressing Safety Requirements on Resurfacing, Restoration, and Rehabilitation Projects

2.06.01 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 American Association of State Highway and Transportation Officials (AASHTO) design standards. It is the Colorado Department of Transportation's (CDOT's) objective to maximize crash reduction on Resurfacing, Restoration, Rehabilitation (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 crashes. 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.

2.06.02 3R:

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 (1.5–6 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.

Resurfacing, Restoration, Rehabilitation and Reconstruction (4R): Projects requiring reconstruction or resurfacing greater than 6 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 Resurfacing, Restoration, Rehabilition (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.

2.06.03 3R Design Procedures

2.06.03.01 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 reference the Safety Analysis section of the Operations Evaluation described in Section 2.04.01 to understand what safety improvements to the project will yield the greatest safety gains in relation to cost. This enables the development of a scope of work that will be consistent with the Colorado Department of Transportation's (CDOT's) 3R policy. See Section 2.01 (DSR) and Procedural Directive 512.1 for further Design Scoping Review requirements.

2.06.03.02 Operations Evaluation for 3R Projects

All projects, including 3R and **Resurfacing, Restoration, Rehabilitation and Reconstruction (4R)** Projects, are now required to have an 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 Access Management Analysis.

Refer to Section 4.12 for details on the Operations Evaluation. The Operations Evaluation is completed in PMWeb. Find work instructions at the following link, Operations Evaluations in PMWeb .

2.06.03.03 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 2.15 and 2.26.

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.

2.06.03.04 Safety Issues Related to Geometric Design Criteria

All projects, including Resurfacing, Restoration, Rehabilitation (3R) projects are required to have an Operations Evaluation. The Operations Evaluation includes the element of safety analysis. Unlike Resurfacing, Restoration, Rehabilitation and Reconstruction (4R) projects on the National Highway System (NHS), 3R projects on the NHS are not required to meet the 10 controlling geometric design criteria unless a safety item associated with one of the 10

controlling geometric design criteria is noted in the Operations Evaluation. Nevertheless, reduced design criteria requirements on 3R projects should not be chosen automatically, but only if higher values are not possible, practical, or cost-effective.

If a safety item related to one of the 10 controlling geometric design criteria is noted in the Operations Evaluation and the 3R project is on a freeway or interstate, Federal Highway Administration (FHWA) approval is required on the design exception in addition to the standard Colorado Department of Transportation (CDOT) approvals for design exceptions as described in Section 2.05 Design Exception (Variance) (Form 464). Data Driven Safety Analysis (DDSA) is often the best tool to support a design exception depending on the DDSA results. The Region Traffic Representative (RTR) is the central point of contact for DDSA support.

All existing guardrail, bridge rail, transitions and end and median terminals not meeting National Cooperative Highway Research Program (NCHRP) 350 shall be upgraded to meet the Manual for Assessing Safety Hardware (MASH) 2016 requirements. MASH related memos can be accessed at Business – MASH Related Memos. All roadside safety devices meeting the NCHRP 350 in good condition, determined to function as designed, and meeting minimum height requirements may remain in place. See the American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide and Sections 2.08 and 5.12 in 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, Design Scoping Review (DSR), Field Inspection Review (FIR), and Final Office Review (FOR) if funding and special circumstances exist and written approval is obtained from the Program Engineer.d

2.06.03.05 Safety Issues Not Related to One of the 10 Geometric Design Criteria

Safety mitigation recommendations identified through the Operations Evaluation, DSR, FIR, and FOR processes that are not related to one of the 10 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.

2.06.03.06 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.

2.06.03.07 Completion of the Preliminary Design Data (Form 463)

Resident Engineers must complete a Form 463 in accordance with Section 2.04.

2.06.03.08 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. The Colorado Department of Transportation's (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 Business – Policy Memo 7 – Analysis of Surface Treatment Budgets and Essential Costs.

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.

2.06.03.09 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 systemwide goal of achieving the maximum reduction of crashes 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.

Additional Resources:

23 Code of Federal Regulations (CFR) Part 625, Design Standards for Highways

American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide

CDOT Roadway Design Guide

Transportation Research Board (TRB) Special Report 214, Designing Safer Roads

For forms, see the Colorado Department of Transportation (CDOT) online forms library
About CDOT – CDOT Forms Catalog

Policy Memo Number 7 – Analysis of Essential Items
Business – Policy Memo 7 – Analysis of Surface Treatment Budgets and Essential Costs

2.07 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 American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide.

Highway safety improvements to decrease vehicular crashes 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 crash severity.
5. Delineation of the hazard.

The project manager 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 Project Manager (PM) can best utilize limited design funds by preparing a benefit/cost analysis. The PM shall consider a safety analysis of the project performed by the Safety and Traffic Engineering Branch detailing feasible alternatives and recommendations.

The PM should review and document the safety issues and decisions. Any benefit/cost analysis should include the following: encroachments, roadside geometry, and crash 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. See Section 2.5 for more information.

For Clear Zone requirements of hydraulic structures, refer to the Colorado Department of Transportation (CDOT) Business – 2019 Drainage Design Manual.

Additional Resources:

AASHTO Highway Safety Design and Operations Guide

AASHTO Policy on Geometric Design of Highways and Streets

CDOT Roadway Design Guide

Transportation Research Board (TRB) Special Report 214, Designing Safer Roads

CDOT Procedural Directive 1602.1 Bike and Pedestrians

2.08 Roadside Barrier Design and Review

Roadside barrier is installed to reduce the severity of run-off-the-road crashes. 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.

The Colorado Department of Transportation (CDOT) uses several types of barriers, primarily Midwest Guardrail System (MGS) Type 3 W-beam 31 Inches, Precast Type 7 Concrete Barrier, Guardrail Type 9 Single Slope 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 American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide in advance of and alongside the fixed object. All CDOT employees have access to a wide array of AASHTO resources in electronic format including the AASHTO Roadside Design Guide that can be accessed Federal Highway Administration – 5.1-5.2 Roadside Design Guide, 4th Edition. Please contact customer care or the Design Area Engineer if you have access issues. 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. Placement of barrier is based on crash potential and severity. Since both barriers are hazards, they should be installed only where they result in a reduction in the crash severity compared to impacting the hazard being shielded. Substandard bridge rail should be examined for upgrading on resurfacing projects.

The project manager 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 Project Manager (PM) 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 PM 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 the barrier is impeding the free passage of drainage flows or is tending to pond, consult the region Hydraulics Engineer to address the drainage problem.

When the Project Manager (PM) recommends barrier, criteria in the Colorado Department of Transportation (CDOT) Roadway Design Guide, CDOT M Standard Plans, and the American Association of State Highway and Transportation Officials (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.

If Type 3 guardrail condition is such that it will function and safely perform as designed and the height is at least 26.5 inches following Resurfacing, Restoration, Rehabilitation (3R) work, the guardrail may remain in place. If guardrail would be less than 26.5 inches in height after the 3R work is complete, adjusting and resetting to a specified height of 29 inches plus or minus 1 inch may be an option under specific conditions. It is necessary to check to ensure that existing guardrail is in good condition before adjusting and resetting.

If the height of guardrail will be less than 26.5 inches following 3R work, the following options are available:

1. Guardrail with a height less than 25 inches must be removed and replaced with 31-inch Midwest Guardrail System (MGS) guardrail per CDOT M Standards.
2. Guardrail with steel posts at a height 25 inches to less than 26.5 inches may be modified by using additional predrilled bolt holes to raise block and guardrail assembly and reset to height to 29 inches plus or minus 1 inch. Field drilling of steel posts is not permitted. Rail shall be adjusted along guardrail run, so rail splice location is midspan between posts.
3. Guardrail with timber posts at height less than 26.5 inches must be removed and replaced with 31-inch MGS guardrail per CDOT M Standards. Field modification of timber posts in any kind is not permitted.

Raising, resetting or reuse, or both of removed guardrail posts (steel or timber) in an attempt to attain acceptable guardrail height, in any manner, is not permitted. Consideration must be given to the condition of assembly hardware (bolts, nuts) and guardrail components (blockouts, metal W-beam sections) when choosing to leave in place or modify. Replacement of hardware or individual blockouts or W-beam guardrail sections, or all may be necessary to ensure overall integrity of the guardrail system. More information on the Manual for Assessing Safety Hardware "(MASH) Tested 31-inch Guardrail Implementation Policy and MASH Implementation Dates" can be found in Colorado Department of Transportation

(CDOT) Memorandum – Division of Project Support Memo 2015-04.pdf and in Federal Highway Administration – Guardrail Resources.

When completing CDOT Form 463 Design Data in Systems, Applications and Products in Data Processing (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 American Association of State Highway and Transportation Officials (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 two-three 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 AASHTO MASH 2016. When possible, replace substandard end treatments on other roadway systems with the latest available roadside safety devices, most preferably based on the MASH 2016 criteria. Except for the situations that only the National Cooperative Highway Research Program Report (NCHRP) Number 350 provides the most recent crash test criteria. “CDOT Memo 2017-4", provides guidance on existing X-Lite end terminals and those on current active projects in addition to future use Memorandum – Division of Project Support Memo 2017-04, X-Lite End Anchorage.pdf.

Additional Resources:

CDOT Cable Barrier Guide

AASHTO Roadside Design Guide

CDOT Roadway Design Guide, Chapter 20

American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH) 2009

2.09 Bicycle and Pedestrian Facilities

Bicycle and pedestrian facilities are of growing importance both nationally and in Colorado 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.

Colorado Department of Transportation's (CDOT's) Elevating Bicycle and Pedestrian Opportunities in Colorado – Policy Directive 1602.0.pdf requires CDOT to include the needs of bicyclists and pedestrians in the planning, design, and operation of transportation facilities as a necessary component of all projects. This policy is also enshrined in state statute, which states that CDOT and its subdivisions "shall provide transportation infrastructure that accommodates bicycle and pedestrian use of public streets in a manner that is safe and reliable for all users of public streets" Colorado Revised Statute (CRS) § 43-1-120. According to Policy Directive (PD) 1602 and state statute, any decision by CDOT to not accommodate the needs of bicyclists and pedestrians must be documented and must be based on exemption criteria established by the Transportation Commission.

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 community or neighborhood destinations such as homes, schools, groceries, health care facilities, pharmacies, shops, parks, or recreational facilities, or all. In areas with residential density or mixed land uses, or both; bicycle and pedestrian facilities are vital to provide transportation mode choice and improve safety and mobility for all people.

The project manager shall evaluate the options for providing bicycle and pedestrian facilities on new construction and reconstruction projects. The evaluation will include review of CDOT Release Memorandum – Updated Procedural Directive 1602.1.pdf, the CDOT Roadway Design Guide, and CDOT Policy Directive 902.0 Shoulder Policy. Rather than just one designated chapter designated for accessible pedestrian design—Americans with Disabilities Act (ADA) considerations—and another allocated to bike and pedestrian facility design, the Colorado Department of Transportation (CDOT) Roadway Design Guide now has multimodal design considerations incorporated throughout its core content. In addition to examining

these two important chapters, there is much more bike and pedestrian guidance woven throughout many other chapters in the CDOT Roadway Design Guide.

CDOT supports taking a flexible approach when designing and planning bicycle and pedestrian facilities. While we have traditionally looked to our Roadway Design Guide and the American Association of State Highway and Transportation Officials (AASHTO) bicycle and pedestrian design guides when planning and designing bicycle and pedestrian facilities, there is a wealth of additional planning and design resources which build on the concepts such as those provided in the AASHTO and CDOT guides. For more information about design flexibility and additional design resources, please see the Memorandum – Bicycle and Pedestrian Facility Design Guidance.pdf.

Bicycle and pedestrian 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 Resurfacing, Restoration, Rehabilitation (3R)-type projects, the design of pedestrian and bicycle facilities will need to be addressed according to Procedural Directive 1602.1. Construction project Traffic Control Plans are required to address accommodations for bicycles and pedestrians as called for in the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), Section 6C.01.

Bicycle and pedestrian facilities should comply with the latest design standards and Americans with Disabilities Act requirements and United States (US) Access Board – Public Right-of-Way Accessibility Guidelines (PROWAG) including requirements for sidewalks, crosswalks, overpasses and underpasses, traffic control features, curb cuts, lighting (ramps), and access ramps for persons with disabilities. Consult the CDOT Roadway Design Guide or consult the CDOT ADA Coordinator, or both for more information.

For hydraulic design of drainage structures under Bicycle and Pedestrian Facilities, refer to the CDOT Drainage Design Manual.

Additional Resources:

Transportation Research Board (TRB) Record 959 – Pedestrian and Bicycle Facilities
Transportation Research Record 959 – Pedestrian and Bicycle Facilities.pdf

CDOT Procedural Directive 507.1, Standards for Rest Areas, Pedestrian Underpasses and Overpasses

CDOT Policy Directive 605.0 Comprehensive Accessibility for Persons with Disabilities

Americans with Disabilities Act Handbook

Federal Highway Administration (FHWA) Region 8 Commentary and Text, Section 14, Americans with Disabilities Act Accessibility Guidelines (ADAAG)

Colorado Department of Transportation (CDOT) M Standard Plans

CDOT Roadway Design Guide, Chapter 14 Bicycle and Pedestrian Facilities

Flexibility in Highway Design – FHWA-PD-97-062

The National Bicycling and Walking Study – FHWA-PD-94-023

Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)

Pedestrian and Bicyclist Intersection Safety Indices, 2006

ADAAG

Public Right of Way Accessibility Guidelines (PROWAG) United States (US) Access Board – Public Right-of-Way Accessibility Guidelines

Pedestrian and Bicycle Information Center "ped bike info" – Design and Engineering Guidance

CDOT Bridge Design Manual, Section 2.2.7 Bicycle Railing

Pedsafe: Pedestrian Safety Guide and Countermeasure Selection System Pedsafe – Pedestrian Safety Guide and Countermeasure Selection System

Recommended Actions: United States Department of Transportation (USDOT) Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations Federal Highway Administration – (FHWA) Highway Safety Programs

CDOT Chief Engineer Memo on Bicycle and Pedestrian Facility Design Guidance Memorandum – Bicycle and Pedestrian Facility Design Guidance.pdf

American Association of State Highway and Transportation Officials (AASHTO) Guide for the Planning, Design, and Operation of Pedestrian Facilities

AASHTO Guide for the Development of Bicycle Facilities

National Association of City Transportation Officials (NACTO) Urban Street Design Guide National Association of City Transportation Officials – Urban Street Design Guide

National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide National Association of City Transportation Officials – Urban Bikeway Design Guide

Colorado Department of Transportation (CDOT) Pedestrian Crossing Installation Guide Colorado Department of Transportation – Pedestrian Crossing Installation Guide 2021 Edition.pdf

Federal Highway Administration (FHWA) Separated Bike Lane Planning and Design Guide Federal Highway Administration – Bicycle and Pedestrian Program

FHWA Bikeway Selection Guide Federal Highway Administration – Bikeway Selection Guide, February 2019.pdf

FHWA Small Town and Rural Multimodal Networks Federal Highway Administration – Bicycle and Pedestrian Program – Small Town and Rural Multimodal Networks

FHWA Incorporating On-Road Bicycle Networks into Resurfacing Projects Federal Highway Administration – Bicycle and Pedestrian Program – Incorporating On-Road Bicycle Networks into Resurfacing Projects

FHWA Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts Federal Highway Administration – Bicycle and Pedestrian Program – Achieving Multimodal Networks

Hydraulic Design

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.

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 shall include methods and practices for designing permanent water quality control measures such as extended detention basins. Chapter 16, Permanent Water Quality, in the CDOT Drainage Design Manual should be referred to along with relevant chapters in the Mile High Flood District Stormwater Criteria Manual. Design of drainage features on transportation projects will be done in accordance with the CDOT Drainage Design Manual and the CDOT Pipe Material Selection 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 local floodplain administrators to identify floodplain needs and floodplain requirements. 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 small culverts can be completed by the Residency or the region Design Unit familiar with these design processes and will be reviewed by the region hydraulic Engineer.

Hydraulic reports and documentation should be completed in accordance with the Colorado Department of Transportation (CDOT) Drainage Design Manual to provide documentation that a competent and responsible design has been made. Reports and documentation are essential in case litigation or design modifications become necessary.

Procedures for the design of pipe culverts, Concrete Box Culverts (CBC), and bridge hydraulics are covered in the CDOT Drainage Design Manual. Hydraulic design needs will be determined during the project scoping process when the hydrology predictions are completed, the Residency or region Design Unit, in conjunction with the region Hydraulics Engineer, will decide which structures the Residency or region Design Unit is capable of designing. The Hydraulics Engineer will design the standard drainage structures larger than 48 inches in diameter and special structures, such as irrigation, storm drains, permanent water quality control measures.

The Residency or region Design Unit 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 the pipe material selection process is followed pursuant to the requirements of the CDOT Pipe Material Selection Guide. Upon final design completion, and prior to the final office review, the hydraulic design information will be sent to the Residency or region Design Unit for incorporation into the project plans.

Additional Resources:

23 Code of Federal Regulations (CFR) Part 650, Bridges, Structures and Hydraulics

CDOT Drainage Design Manual (2019)

2.10 Culvert Pipe Material Selection

Project managers will consider all available pipe product materials that are judged acceptable based on engineering and economic analysis as part of the project design. Federal regulations recommend that state Departments of Transportation (DOT’s) allow the use of alternative pipe materials to promote competition for pricing when performance is deemed to be equivalent. Following the Pipe Material Selection Guide process is required for all

Colorado Department of Transportation (CDOT) projects and some local agency projects depending on circumstances.

CDOT has developed a Business – CDOT Pipe Material Selection Guide that is to be used to evaluate acceptability of alternative pipe materials based on application, location, and regional factors. The Pipe Material Selection Guide (2015) 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 Guide will be updated as changes occur and designers should stay current on the latest revisions for their projects.

Project managers will select the allowable pipe material options for each installation on a specific project after evaluating the alternative pipe materials based on engineering factors such as durability, environmental considerations (abrasion and corrosion), soil and water 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. Section 603 (Culverts and Sewers) and Section 624 (Drainage Pipe) shall apply. Any pipe that meets the criteria in this policy and is installed in accordance with the contract is expected to have a minimum 50-year service life and is acceptable for all projects as described above.

Pipe materials may be, in certain cases, pre-selected by the Engineer of Record for the drainage design for special or unique applications. All design decisions regarding pipe material type selection must be documented and a letter placed in the project file. All exceptions to the Pipe Material Selection Policy require a Justification letter and must be approved by the region Program Engineer.

Additional Resources:

CDOT Drainage Design Manual 2019

CDOT Pipe Material Selection Guide 2015

2.11 CDOT Maintenance Input

The state of Colorado is divided into eight CDOT Maintenance Sections for maintenance oversight of state highways with the numbering system jumping from Maintenance Section 7 to Section 9. The maintenance sections have a maintenance superintendent who reports directly to a region transportation director. The boundaries of maintenance sections are indicated using a map found at Online Transportation Information System (OTIS) OTIS Mapview – Boundaries.

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 Colorado Revised Statute (CRS) 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 Colorado Department of Transportation (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 Best Management Practices (BMP’s), 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 Resources:

CDOT Plant Maintenance Field Manual

CDOT Manual of Maintenance Procedures

CDOT Procedural Directive 512.1, Project Scoping and Design Scoping Review (DSR)

Field Inspection Review (see Section 2.15 of this manual)

Final Office Review (see Section 2.26 of this manual)

2.12 Field Survey (Form 1217)

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 Project 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 facilitate use of Form 1217 for the pre-survey Preliminary survey request in PMWeb and review 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 Colorado Department of Transportation (CDOT) safety standards to be followed by all personnel working on CDOT projects 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 Primary ground control, complete a Project control Diagram establishing “XYZ” coordinates, install control monuments for use in right of way purchases and

appraisal parcels. Control will be used for setting Right of way monuments, easements and to set construction Survey control. Compile three-dimensional (3D) topographic digital file using the “T-MOSS” numerical code format in order to have features and contours on the correct electronic file levels used for the project.

5. Schedule and obtain a review by a professional land surveyor.
6. Prepare survey report, other required submittals, or both if needed.
7. 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.
8. Sign, seal, and file the right of way plans with the appropriate county.

Additional Resources:

Colorado Department of Transportation (CDOT) Survey Manual

CDOT Procedural Directive 512.1, Project Scoping and Design Scoping Review (DSR)

Memorandum of Understanding with the Colorado State Board of Registration for Professional Engineers and Professional Land Surveyors (attached)

Please consult PMWeb for the most current business processes PMWeb – PMWeb at CDOT

2.13 CDOT Design Phase Value Engineering (VE) Program

2.13.01 General

Value Engineering is the systematic process of review and analysis of a project during the planning and design phase by a multi-disciplined team not involved in the project, to make recommendations for:

- Providing the needed functions safely, reliably, and at the lowest overall cost;
- Improving the value and quality of the project; and
- Reducing the time to complete the project.

The scope of this Value Engineering (VE) program is to provide guidance for selecting projects for VE analysis, and to standardize the procedure for conducting studies and reporting results in compliance with federal requirements. This guidance focuses on Value Engineering during the planning and design phase of a project.

The goal of the VE program is to provide a positive benefit to a given project, and CDOT as a whole. This benefit may take the form of monetary saving, reduced construction time, reduced impact to the traveling public, improved maintainability, reduced environmental or cultural impacts, or some other identified benefit. The effectiveness of the VE Program will be

tracked and reported to Colorado Department of Transportation (CDOT) management in the spirit of continuous improvement.

2.13.02 Requirements

CDOT/Federal Highway Administration (FHWA) Stewardship agreement states that CDOT will conduct VE analyses for:

- Projects on the federal aid system with an estimated total cost of 50 million dollars or more, and
- Any other project that the United States (US) Secretary of Transportation determines to be appropriate.

Total project cost is defined as the cost of all phases of a project, including environmental, design, right of way, utilities, construction, and construction engineering costs. If total project cost is revised any time prior to award to exceed 50 million dollars, then a Value Engineering (VE) analysis is required. If construction is advertised in multiple projects for a corridor improvement, all construction projects need to be considered in the total. VE analyses are not required on projects delivered using a design-build method of construction.

2.13.03 Additional Guidance

A VE analysis is not just limited to projects meeting the total cost threshold. A VE analysis during design may also be considered for other design-bid-build projects with one or more of the following elements:

- Major Structures;
- Complex design or construction;
- Challenging constraints or difficult technical issues, or both;
- External influences and unique or complicated functional requirements;
- Potential to improve the projects' performance or quality;
- Competing community and stakeholder objectives;
- Potential alternative solutions that impact scope and cost;
- New alignment or bypass sections;
- Capacity improvements that widen existing highways;
- Interchanges;
- Extensive or expensive environmental or geotechnical requirements,
- Materials that are difficult to acquire or have special requirements;
- Inferior material sources;
- New/reconstruction project; and
- Major traffic control requirements or multiple construction phases.

2.13.04 Roles and Responsibilities

2.13.04.01 State Value Engineering (VE) Coordinator

The state VE coordinator role is held by the Design Program manager in the Project Development Branch. The state VE coordinator ensures statewide implementation of the VE Program in compliance with federal requirements, and is responsible to:

- Coordinate the statewide VE Plan;
- Prepare and submit to the Federal Highway Administration (FHWA) an Annual VE Report to summarize results, accomplishments, costs, and benefits;
- Maintain VE Program documents and forms and monitors federal requirements;
- Maintain an informational webpage and a list of resources to support the VE Program, including a statewide pool of qualified team leaders and members;
- Assist project managers to select VE team leaders and team members;
- Serve as a proponent for the VE Program and monitor and publicize benefits; and
- Develop and coordinate training.

2.13.04.02 Project Manager

The project manager is responsible to:

- Review assigned projects to identify opportunities to implement VE analyses per the requirements and guidelines;
- Initiate VE Studies and work with state VE coordinator to select VE team leaders and team members;
- Coordinate the preparation of VE Study Packages for the project, and provide those study packages to VE team members;
- Coordinate and facilitate VE Team Review;
- Ensure preparation of Final Report for completed studies;
- Ensure implementation of approved recommendations; and
- Report the results of the project VE Study to the state VE coordinator.

2.13.04.03 VE Team Leader

The VE team leader oversees all aspects of individual VE studies including coordinating the logistical arrangements, leading team efforts, and completing the final report. Team leaders can be affiliated with the region, another region, headquarters, or the consultant community, but should have some autonomy from the project. If utilizing a consultant as the VE team leader, the consultant shall provide his or her VE qualifications to the project manager for review and acceptance. A generally accepted qualification for team leaders is to be licensed by the Society of American Value Engineers (SAVE) International. Being licensed by SAVE

International is not required, but should be considered by the project manager. The team leader should be knowledgeable and proficient in transportation design and construction as well as the VE analysis process, and is responsible for:

- Planning, leading, and facilitating the Value Engineering (VE) Study;
- Scheduling a pre-workshop meeting with the project team, providing the pre-study materials to team members, and preparing the agenda for the VE Study;
- Ensuring proper application of VE methodology;
- Guiding the team through the activities needed to complete the VE Study, preparation of the report, and the post-study stages.

2.13.04.04 VE Team Members

The VE team is typically comprised of five–ten members with diverse expertise relevant to the specific project including major functional areas and any critical, high-cost issues. Team members may be from the regions; headquarters; other local, state, or federal agencies; or the private sector. Team members must not be directly involved in the planning and development phases of the project, and preferably, should have attended Value Engineering training.

2.13.05 Planning and Reporting

2.13.05.01 Annual VE Plan

The state VE coordinator works with the individual project managers to prepare an Annual VE Plan that lists projects identified for VE analysis. The VE Plan is the basis for determining projected VE Program needs, including costs, team members, team leaders, consultants, and training. The Annual VE Plan will be completed by November 30.

2.13.05.02 Annual VE Tracking Report

The state VE coordinator will prepare an Annual VE Tracking Report that summarizes project benefits and cost savings from completed VE Studies. The state VE coordinator will report VE Program achievements and best practices to the Federal Highway Administration (FHWA) as required. The Annual VE Tracking Report will be completed by November 30.

2.13.05.03 Conducting a VE Study

A VE analysis should be conducted as early as practicable in the planning and development of a project, preferably before the completion of preliminary design and at a minimum, prior to completing the final design. If the need for a VE Study has yet to be determined, the topic shall be discussed at the scoping, Field Inspection Review (FIR), and Final Office Review

(FOR) meetings, and the decision to conduct a study or not, shall be documented in the meeting minutes. The Value Engineering (VE) analysis should be closely coordinated with other project development activities to minimize the impact that approved recommendations might have on the project. Although benefits can be realized by performing a VE analysis at any time during project development, four prime windows of opportunity are:

1. **Planning Phase:** The subject of whether or not to conduct a VE analysis on a given project is to be discussed once a preferred alternative has been identified during the National Environmental Policy Act (NEPA) phase.
2. **Post Scoping Meeting:** The subject of whether to conduct a VE analysis is to be discussed at the scoping meeting and should be documented in the scoping meeting minutes, along with justification for the decision. The best time to consider alternatives to design solutions is soon after the scoping meeting when preliminary engineering information is available. At this point, the study can also provide an opportunity for building consensus among stakeholders.
3. **Pre-Final Field Inspection Review (FIR):** Major design decisions with regard to project scope have been made at this point, preliminary costs have been established, and the design team has initiated the development of Plans, Specifications & Estimate (PS&E). Although the VE analysis may be limited by these decisions and activities, there is opportunity for the study to focus on technical aspects of specific design elements.
4. **Pre-Final Final Office Review (FOR):** At the FOR stage, most of the important project decisions have been made and the opportunity to affect the project design is limited. At this stage, the VE analysis should focus on constructability, construction sequencing, staging, traffic control, and significant design issues.

Note:

If a project has been identified for a VE analysis, the project manager shall notify the state VE coordinator.

A VE Study can be conducted in conjunction with, or in lieu of, a Constructability Review if the VE team consists of two or more members of the contracting community. If the VE is to be considered in lieu of the Constructability Review, this shall be noted in the introduction portion of the VE Final Report.

Process

To initiate a VE Study, the project manager will contact the state VE coordinator. The state VE coordinator maintains a list of qualified team leaders and team members. The project manager and the state VE coordinator will work together to appoint a VE team leader and select team members for the VE Study. The VE team leader will work with the project manager and design team to prepare a Study Package (see Table 2.13.05) that is provided

to each of the team members at least one week prior to the study. The project manager should arrange for the use of a meeting facility and needed equipment for the team meeting. The facility, if possible, should be near the project site, to allow for a site visit.

Table 2.13.05 – Value Engineering (VE) Study Team Information and Logistics Planning

Requirements	Timeframe
Study Package for VE Team Members: Crash data, traffic data, aerial photos, contour maps, cross-sections and profiles, environmental documents, estimates, as-built plans for existing elements, geotechnical reports, hydraulic report, land use maps, plan sheets, quantities, right of way plans, vicinity maps, design decision memos, and any other identified design information.	Provide to VE team members at least one week prior to meeting.
Facilities and Equipment: Conference room with a large table and adequate space for the team, American Association of State Highway and Transportation Officials (AASHTO) Green Book, Field Log of Structures, calculators or computers or both, telephone, projector, Colorado Department of Transportation (CDOT) Design Guide, design file, large-scale aerial photos (if available), easel(s) with paper, field tables, office supplies, network access, power strip(s) and extension cords, scales, straight edges and curves, Standard Plans, Standard Specifications, and vehicle or vehicles with adequate seating to transport the VE team for a site visit.	Typically allow three–five days for the team to meet.

It is recommended that the VE Job Plan (see Table 2.13.06) approach be followed for conducting and documenting the results of a VE analysis. The phases can be tailored as appropriate for each project, and more information is available regarding this approach in the Value Methodology Standard and Body of Knowledge by The Society of American Value Engineers (SAVE) – The Power of the Value Methodology).

Table 2.13.06 – Value Engineering (VE) Job Plan

Phase	Activities
1. Information	● Gather project information, including project commitments and constraints. ● Investigate technical reports and field data. Develop team focus and objectives.
2. Function Analysis	● Analyze the project to understand the required outcomes. ● Review and analyze these project outcomes to determine which items could benefit from improvement to meet overall project goals.
3. Creative	● Generate ideas on alternative proposals and solutions to accomplish required outcomes, which improve the project's performance, enhance its quality or lower the project's costs, or all.
4. Evaluation	● Evaluate and select feasible ideas for development. ● Analyze design alternatives, technical processes, and life-cycle costs.
5. Development	● Develop the selected alternatives into fully supported recommendations. ● Develop technical and economic supporting data to prove the benefits and feasibility of the desirable concepts. ● Develop team recommendations including long-term and interim solutions. ● Generate cost or time savings, or both based on proposed solutions.
6. Presentation	● Present the VE recommendation in an oral presentation to the project stakeholders, the region project team, region management, Federal Highway Administration (FHWA), and any other relevant stakeholders that the project manager has identified. ● Provide a written report.
7. Resolution	● Evaluate, resolve, document, and implement all Approved recommendations and record this information in the VE Study Summary and Implementation Report. ● Post VE analysis activities include the implementation and evaluation of the outcomes of the approved recommendations. ● Conduct a VE Close Out meeting to review VE Study results with identified members of the Colorado Department of Transportation (CDOT) and FHWA. ● Document for each recommendation whether the recommendation has been "Approved", "Declined", or "Tabled for Further Consideration".

2.13.05.04 VE Final Report

The results of a VE analysis will be documented in a Final Report prepared by the VE team leader that includes the following sections:

- Introduction;
- Executive summary;
- Project number and narrative description of project information, including estimated project cost prior to the Value Engineering (VE) study;
- VE project team;
- Background, history, constraints, and controlling decisions;
- VE team focus areas;
- Discussion of the team speculation and evaluation processes;
- Approximate cost to conduct the VE;
- Benefits that the VE outcome will provide to the project;
- Time or cost savings, or both to the project; and
- Final recommendations recorded on the VE Study Summary and Implementation Report.

All of the team's evaluation documentation including sketches, calculations, analyses, and rationale for recommendations should be included. A copy of the Final Report will be included in the project file and made available to the region's project team.

Following the VE analysis, the project manager and the region's design team will add their evaluation to the VE Final Report. The project manager will provide a copy of the VE Study Summary and Implementation Report to the state VE coordinator. The state VE coordinator will record the study outcome on the Annual VE Tracking Report for reporting to the Federal Highway Administration (FHWA).

2.13.06 Training and Information

The state VE coordinator will identify regular VE training courses in order to build a pool of qualified VE team leaders and team members. The state VE coordinator will maintain a list of qualified VE team leaders and team members.

Additional Resources:

Colorado Department of Transportation (CDOT)/FHWA Stewardship Agreement

23 United States Code (USC) 106 (e, g, and h)

23 Code of Federal Regulations (CFR) Part 627, Value Engineering

Public Law (PL) 112-141, MAP-21

Value Methodology Standard and Body of Knowledge, Society of American Value Engineers (SAVE) International, The Value Society SAVE – Value Methodology Body of Knowledge (VM Guide).

Colorado Department of Transportation (CDOT) Value Engineering (VE) website (under development)

2.14 Design Project Management and Region Plan Status Review

All CDOT regions hold regular Plan Status and Program Status meetings, often centered around a particular region program's preconstruction and construction activities.

2.14.01 Design Phase Responsibilities

One of the first, and most important, tasks for the Project Engineer early in the Design Phase of a project is the initiation and circulation of the Project Development Plan (PDP). This document lives within the PMWeb environment. It describes the project Scope, Schedule, and Budget as determined at the Pre-Scoping/Scoping level, and allows all CDOT stakeholders and specialty units to provide their buy-off on those critical aspects of the project. In addition, the PDP allows each member of the CDOT project team to list potential risk items, and pose potential solutions to those risk items, in light of the proposed Scope, Schedule, and Budget. Training and workflows for initiating the PDP as the project manager, or endorsing a PDP as a specialty unit, may be found at the PMWeb online training hub PMWeb – Job Aids.

2.14.01.01 Target the Current Planned Ad Date

The Project Engineer will be responsible for meeting the Current Planned Ad date of a project. The Project Engineer will be responsible for the management of unexpected changes to the schedule, including those that could affect Specialty Units and the overall project delivery by the approved business manager's Ad date. The business manager's Ad date (maintained in Systems, Applications and Products in Data Processing [SAP]), as well as the Advertisement and Late Advertisement dates (maintained in PMWeb), shall be in agreement and shall be modified via appropriate Change Control processes if necessary.

2.14.01.02 Maintain Good Communications

The Project 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. Recurring meetings (monthly, bi-weekly, etc.) can encourage communication with and between specialty units, but the project manager should be sensitive to the schedules and workloads of specialty unit representatives.

2.14.01.03 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 prior to milestone meetings. The Colorado Department of Transportation (CDOT) has published a Program Reporting and Transparency Office – Project Cost Planner Tool to assist with this task.

2.14.01.04 Convey Scope or Budget Changes

The Project Engineer will submit any changes in the project scope or budget to the region Program Engineer for approval. When a change in project scope or budget, or both is determined, the Project Engineer must inform all members of the project team of the change(s). Changes that affect the budget or Statewide Transportation Improvement Program (STIP)/Transportation Improvement Program (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 Project Engineer will reflect these impacts in the project's working schedule. Adjustments to the Scope, Schedule, and Budget of a project once the Design Phase is underway shall be captured within the PMWeb environment, utilizing appropriate Change Control.

2.14.01.05 Discuss Any Potential Impact on Ad Date

The Project 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 Project Engineer or Resident Engineer, or both, are 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.

2.14.01.06 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, Office of

Financial Management and Budget (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.

2.14.01.07 Updated 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:

2.14.02 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 meetings 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.
12. Planning.
13. Program Reporting and Transparency Office (PRTO).
14. Bike and Pedestrian Liaison.

15. Transit Liaison.

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 1 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.

2.15 Field Inspection Review (FIR)

The 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 & Estimate (PS&E) are developed by the Resident Engineer's team.

2.15.01 Authority

The field inspection review will be initiated and scheduled by the Resident Engineer.

2.15.02 Required Items

The following items are required prior to the field inspection review:

2.15.02.01 Scoping, Budgeting, and Planning

1. Preliminary Form 463 – Design Data with safety requirements, if available. See Section 2.04, 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.

2.15.02.02 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 Federal Highway Administration (FHWA) sign-off.
4. Resident Engineer can see if environmental clearance is complete through “CJ20N” in Systems, Applications and Products in Data Processing (SAP) under Custom Fields, then Environmental tab. The environmental clearance and Form 128 activities will eventually be supplanted by the PMWeb process.

2.15.02.03 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, crash data, safety report, and turning movements should be available, if required.
3. Review all Operations Evaluation Recommendations (Safety, Operations, and Access) and get concurrence on which recommendations were incorporated into the design.
4. Update the Operations Evaluation if there are major changes to the project scope of work.

2.15.02.04 Materials

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

2.15.02.05 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 Survey Project manager and region survey coordinator or 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

2.15.02.06 Utilities

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

2.15.02.07 Hydraulics

A preliminary hydraulic report or drainage design should be provided prior to, or at, the field inspection review. It is recommended that floodplain permitting initiation wait until after the Field Inspection Review (FIR) meeting to ensure that significant design changes, proposed at the FIR, do not result in substantial rework in the local, state or federal, or all floodplain permitting process.

2.15.02.08 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 United States (US) Army Corps of Engineers in their Mitigation Memorandum of Agreement effective Feb. 7, 1990. Designers must know early in the scoping and design process where wetland areas are so the sites can be analyzed for avoidance.

2.15.02.09 Survey

1. A complete survey, including topography, surface utilities, and existing monumentation, should be completed and tied to the Colorado Department of Transportation's (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.

2.15.02.010 Preliminary Cost Estimate

1. The field inspection review plans are preliminary in nature. The items included below in Section 2.15.03.01, 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.

2.15.03 Included Categories

Three categories of items (required, desired, and optional) are included on field inspection review plans. The project manager should ensure required items are included where applicable (i.e., not all projects require structure sheets).

2.15.03.01 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.

2.15.03.02 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.

2.15.03.03 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.

2.15.04 Distribution of Plans

The Resident Engineer will distribute the field inspection review plans at least seven, but preferably 14 days, in advance of the field inspection review. 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. Federal Highway Administration (FHWA) – Attention: 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 Survey Professional Land Surveyor (PLS)-II (two).
10. Region Utility Engineer.
11. Region Hydraulics Engineer.
12. Region Professional Land Survey Coordinator.
13. Region Maintenance Superintendent.
14. Region Resident Engineer.
15. Region Traffic Engineer.
16. Landscape Architect.

17. Colorado State Patrol.
18. Other local, state, or federal agencies.
19. Consultant.
20. Others as determined by the Resident Engineer.
21. Division of Transportation Development (DTD) Data Collection Unit.

2.15.05 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.

2.15.06 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:

2.15.06.01 Scoping, Budgeting and Planning

1. Typical sections, stabilization, and general notes.
2. The horizontal and vertical alignments.
3. Plan details for approaches to the 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 Field Inspection Review (FIR) meeting. See Section 1.02.
6. Budget the Right of Way (ROW) or Utility, or both phases as necessary knowing the scope of these items.

2.15.06.02 Environmental

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

2.15.06.03 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).
4. Review all Operations Evaluation Recommendations (Safety, Operations, and Access) and concurrence on which recommendations were incorporated into the design.
5. Update the Operations Evaluation if there are major changes to the project scope of work.

2.15.06.04 Structures

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

2.15.06.05 Materials

1. Stabilization Report and Life Cycle Cost Analysis (if available).
2. Materials Recommendation Report.
3. Quality incentives.
4. Certifications or Findings-in-the-Public-Interest (FIPI's) for proprietary items, if any (see Section 2.22 for the approval process).

2.15.06.06 Right of Way

1. Right of way area requirements.
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) properties affected.

2.15.06.07 Utilities

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

2.15.06.08 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 the Colorado Department of Transportation (CDOT) or between CDOT and other entities.

2.15.06.09 Survey

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

2.15.06.010 Hydraulics

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

2.15.06.011 Others

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

2.15.07 Field Inspection Review Follow-up

As soon as possible after the field inspection review, the Resident Engineer will:

2.15.07.01 Distribute FIR Minutes

Send a letter reporting the minutes of the field inspection review to all who were originally sent the 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.

2.15.07.02 Address Unanswered Questions

Obtain decisions and responses for all questions left unanswered at the field inspection review meeting.

2.15.07.03 Update Project Schedule and Estimate

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.

2.15.07.04 Update Form 463

Revise the Form 463, Design Data, as necessary.

2.15.07.05 Revise Project Plans

1. Monitor the progress of the wetlands finding that the region Planning/Environmental manager submits to the Federal Highway Administration (FHWA).
2. Request traffic plans.
3. Complete stabilization and special justification letters.
4. Transmit plans showing proposed features to the region Professional Land Surveyor (PLS)-II (two) and 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.

2.15.07.06 Follow-Up on Wetland Requirements

If the project impacts wetlands, the region Planning/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 the Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA) regarding the extent of wetland impacts and mitigation requirements.

2.15.07.07 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.

2.15.07.08 Follow-Up on Utility Issues

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

2.15.08 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.

Additional Resources:

23 Code of Federal Regulations (CFR) Part 625, Design Standards for Highways

For forms, see CDOT online forms library About CDOT – CDOT Forms Catalog

2.16 Constructability Reviews

2.16.01 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 or have extraordinary environmental circumstances, or all. This process is also recommended for projects that have innovative features such as experimental materials, processes, techniques or innovative/alternate bidding contracting, or all. In addition, Constructability Reviews (CR's) conducted at project closeout are extremely valuable in assisting the project team in improving future projects.

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. More information on CR's can be found at Colorado Department of Transportation – Constructability Review Guidelines, February 2020.pdf.

2.17 Project Status Meetings

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, bi-weekly or 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.

2.18 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 2.05 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.

Design decision letters may also apply to “variances” to specialty unit criteria and published Colorado Department of Transportation (CDOT) guidance which does not meet the criteria for a proper Design Variance. Examples might include bridge freeboard over waterways, which cannot be fully met due to physical constraints of the site.

Example below:

COLORADO
Department of Transportation
Region 4

CDOT
Region 4 Loveland Residency
10601 West 10th Street
Greeley, CO 80625
Ph. 970-622-1270

PROJECT: FBR 0142-055 (18085) State Highway (SH) 14 Replacement of Poudre River Bridge
DATE: [Date]
TO: Project File, CDOT R4 Loveland Office
FROM: Richard Christy, CDOT R4 Loveland Office
SUBJECT: 40 Miles Per Hour (MPH) Design Speed Decision

Background:

Bridge Number B-16-D over the Cache La Poudre River on SH 14 (Mulberry Street) is being replaced by the Colorado Bridge Enterprise.

Several factors were considered in the decision for the selected design speed. These included:

- The highway functional class is Principal Arterial, in an urban context[1],
- Design speeds for urban arterials generally range from 30–60 MPH[2]; this section of highway is transitional from a higher speed (50 MPH) to lower speed (35 MPH) facility. Therefore a speed in the mid-range is desirable to convey the transition to

the driver;

- Posted speeds are 40 Miles Per Hour (MPH) (eastbound) and 35 MPH (westbound)[3];
- Sight distance above 40 MPH can be provided through the project, the only element anticipated to be designed to the design speed minimum is the taper for the eastbound right turn lane at Lemay;
- It is desirable to keep the eastbound, right-turn lane taper off of the bridge deck and thereby eliminating approximately four feet of additional bridge deck throughout most of the structure. A savings of $190,500.

Decision:

This list of considerations lends itself to selecting moderate-speed arterial criteria (35—40 MPH)[4]. Due to the posted speeds, 40 MPH was selected as the design speed. This decision allows for the use of barrier curb, an eastbound right-turn taper completely off structure, and no need for a separation barrier on the structure.

Richard Christy, P.E., Project Manager

---

[1] Colorado Department of Transportation (CDOT) Geographic Information System (GIS) mapping, July 2012, www.dtdinternal2/mapview2/index

[2] A Policy on Geometric Design of Highways and Streets. Washington, D.C., United States of America (USA): American Association of State Highway and Transportation Officials (AASHTO), 2004

[3] CDOT Staff Traffic Stripmaps, M014C_134_2_2010-09-22.pdf and M014C_136_3_2010-07-21.pdf, 2010
www.internal.dot.state.co.us/stafftraffic/field_ops/forms/stripmap_inventory

[4] Urban Street Geometric Design Handbook, Washington, D.C., United States: Institute of Transportation Engineers (ITE), 2008

Example below:

COLORADO
Department of Transportation
Region 4

COLORADO DEPARTMENT OF TRANSPORTATION (CDOT)
Region 4 Boulder Residency
1050 Lee Hill Road
Boulder, Colorado 80302
Ph. 303-546-5649

PROJECT: STA 052A-033 State Highway (SH) 52 Resurfacing from SH 52 to US 287
DATE: [Date]
TO: Project File, CDOT R4 Boulder Office
FROM: Ryan Sorensen, CDOT R4 Boulder Office
SUBJECT: SH 52 Lane Striping from SH 119 to First Street

Background: It was suggested by Boulder County at the Feb. 16, 2011 SH 52 Overlay Field Inspection Review (FIR)/Final Office Review(FOR) meeting that CDOT stripe 11 feet lanes from SH 119 to First Street in order to provide more shoulder room for bicyclists. During a post-meeting discussion with Tim Swope, Ryan Sorensen, James Flohr and Mark Gosselin agreed that 11 feet lanes are acceptable in this location.

Reasoning:

- Bicycle traffic is high through both the SH 119 corridor in that area and the SH 52 corridor in that area.
- Currently the shoulder narrows to less than 1 foot in some areas between SH 119 and First Street.
- 11 feet lanes provide a reasonable amount of room for vehicles.

Decision:

11 feet lanes will be striped on SH 52 from SH 119 to First Street.

Ryan Sorensen, Project Manager

Additional Resources:

23 Code of Federal Regulations (CFR) Part 625, Design Standards for Highways

For forms, see Colorado Department of Transportation (CDOT) online forms library
About CDOT – CDOT Forms Catalog

2.19 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 OJT relative to the Equal Employment Opportunity program. Refer to the CDOT OJT Manual for more information CDOT Civil Rights – On-The-Job Training Manual.pdf.

2.20 Disadvantaged Business Enterprise Goals

2.20.01 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.

More DBE information like DBE goals can be found on CDOT's DBE Program Overview site, Business – DBE Program Overview.

2.21 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 Provisions: 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 two weeks prior to their inclusion in the Plans, Specifications & Estimate (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 Materials 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 & Estimate package in accordance with the latest list provided from the Standards and Specifications Unit at the time of advertising the project.

2.21.01 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 Colorado Department of Transportation (CDOT) transportation, maintenance, and federally funded local agency administered projects. This is the primary reference for specifications related to road and bridge construction.

2.21.02 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 Specifications 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 Colorado Department of Transportation (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 by starting at Business – Construction Specifications.

2.21.03 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. For more information, refer to Chapter 17 of the 2023 CDOT Roadway Design Guide.

2.22 Proprietary Items

2.22.01 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, National Highway System (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. The Colorado Department of Transportation (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 regionwide basis, or for use on statewide 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.

2.22.02 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 shall be completed only for sole sources of goods or services. This certification does not apply to situations classified as "Emergency Procurement" covered by Colorado Revised Statute (CRS) 24-103-206.

2.23 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 Field Inspection Review (FIR) process to help the Project Engineer and the Colorado Department of Transportation’s (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 Final Office Review (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 Final Office Review (FOR) stage of

the process.

e. Duration of the project.

3. Before the FOR process, the region Information Technology (IT) support team will provide the Resident Engineer with the Colorado Department of Transportation (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.

2.24 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. It is intended to be completed at the final office review meeting or shortly thereafter. The form must be complete and approved prior to project advertisement for bids.

The completed Form 859 contains information that is relevant to the determination of contract time, affected pay item quantities, and project phasing. A Microsoft (MS) Project Critical Path Method (CPM) schedule or a more simplified Gnatt Chart, such as found in the PMWeb Scheduling module, must be included with the Form 859. This CPM or Gnatt Chart, following the guidance in the CDOT Construction Manual (Section 108.8.3), shall include the Controlling Items of Work. A simplified bar chart may be used for simple projects, however, a true CPM schedule or PMWeb-generated Gnatt Chart is preferred. Note that current CDOT construction specifications require the Contractor’s schedule to be a CPM schedule, unless modified for a particular project. A draft schedule should be prepared early in the project during the Design phase, and the schedule within PMWeb updated at a monthly or otherwise agreed-upon cadence by the project team.

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.

All specific project features, construction requirements, and other special requirements that may impact contract time should also be included in the Form 859. The project manager or Resident Engineer is responsible for initiation and completion of this form. The project manager is encouraged to seek input from knowledgeable construction personnel to develop production rates and ensure logical construction progression.

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.
7. Complete the final Form 859 after the final office review and all key issues have been resolved.
8. Determine contract time for the project.
9. Identify the controlling items of work, salient features, and related working days.
10. List items of work in chronological order on the Bar Chart of Form 859 or the Microsoft (MS) Project Critical Path Method (CPM). Alternatively, submit the PMWeb-generated Gnatt Chart showing the chronology of the project.
11. Complete the Form 859 as soon as practical after the FOR meeting, and no less than four weeks prior to the scheduled advertisement date. The Resident Engineer and Program Engineer shall sign to indicate approval.
12. Distribute Form 859 and attachments.

Additional Resources:

Colorado Department of Transportation (CDOT) Construction Manual

For forms, see CDOT online forms library About CDOT – CDOT Forms Catalog

CDOT, Fundamentals of CPM Scheduling Using Microsoft Project

2.25 Estimate Review by Engineering Estimates and Market Analysis Unit

2.25.01 Engineer's Estimate

On the fundamental level the Cost Estimating Services, Engineering Estimates & Market Analysis (EEMA) Unit has two roles to play in the CDOT project development process: efficient allocation of funds and vigilant protection of public funds. The former is done by helping set the project budgets; and the latter is done mainly through post-bid analyses to decide whether to award a project to the apparent low bidder.

Estimates produced/reviewed by the Engineering Estimates & Market Analysis (EEMA) Unit are called Engineer's Estimates (EE's). These estimates are required at the Final Office

Review (FOR) and Ad. Estimates are recommended at the Field Inspection Review (FIR) and when the project experiences significant changes in scope or quantities. EEMA prices only biddable items. Non-bid items are priced by the region project team. Together they form the basis for total project costs, or Preliminary Detailed Estimates.

Project design and cost estimates are integral parts of the project development process which is iterative in nature. An estimate that is higher than previously thought may lead to reduction in project scope or increased funding. On the other hand, a lower estimate may lead to increased project scope or funds moved away from the current project. Currently, the Colorado Department of Transportation (CDOT) only commits real funds to a project 90 days before Ad.

The various estimates produced prior to the FOR are parametric in nature. They are based on information available during a timeframe of 0–60% design and are subject to scope and market changes as the design process evolves. These estimates are preliminary and may be used to establish a preliminary project construction budget. However, the confidence placed on them should be at an appropriate level.

At FOR, the project is fully itemized for the first time and the EE revised to a higher level of accuracy. The EE produced based on FOR plans and specs, and the revisions based on comments at FOR, should be the basis for setting or adjusting project construction budgets. After the FOR EE is completed, neither EEMA nor the project team should change the EE without letting the other side know.

There may be many reasons an EE could be modified, including but not limited to:

1. The scope has been changed;
2. The quantities of certain major items have been changed dramatically;
3. New quotes are available from the supplier for major items;
4. The market/trend in general has changed dramatically.

When considering making changes to EE after FOR, one should keep the “efficient allocation" of funds criteria in mind. For EEMA, the most important thing is to pass the new information to the project team and not just to make the EE more accurate. For the project team, the most important thing is to communicate updated project information to EEMA, the region and CDOT management in a timely manner so that sound decisions may be made based on the most up-to-date information.

When a project is under Ad, adjustments to the EE should not occur, unless there is a Revision-Under-Ad. At time of bid opening, if a large difference occurs between the EE and apparent low bid, reasons should be documented to the project file and appropriate processes followed for award, where applicable. If the total cost of the project is projected to

be higher than the Approved Commission Budget Level, the project team should follow Policy Directive 703.0 (effective Aug. 27, 2014) to acquire additional funding.

2.25.02 Estimate Security

Engineer's Estimates are confidential until award. Follow Procedural Directive 511.1, Security and Confidentiality of the Engineer's Detailed Estimate.

Additional Resources:

23 Code of Federal Regulations (CFR) Part 630B, Plans, Specifications & Estimates

House Bill (HB) 15-1046, Highway Project Contract Amount Limit Waivers, effective April, 2015

Colorado Department of Transportation (CDOT) Construction Manual

CDOT Procedural Directive 511.1, Security and Confidentiality of the Engineer's Detailed Estimate

Estimated Total Project Cost (see Section 1.02 of this manual)

2.26 Final Office Review

The Final Office Review (FOR) i s a "final" review of construction plans, specifications, and cost estimates for completeness and accuracy. In practice, the overall project design package should be around a 90% completion at the time of the FOR milestone meeting and review. The final office review plans are to be nearing a fully completed plan set. A final office review is conducted for all projects on which the Plans, Specifications & 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 2.04). The project manager must refer to Business – Construction Specifications to ensure all the latest project special provisions are included in the contract package instead of copying from a previous project.

2.26.01 Required Items

Final office review documents shall consist of the following plan package:

1. Plans and Specifications
    a. Complete project plans containing all necessary tabulations and details required for construction.

   b. All special provisions necessary for the project, current as of the date of the final office review.
2. 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. A project typically maintains at least two cost estimates. A construction cost estimate to compare with the bids received after project advertisement and an “all-in” cost estimate including construction engineering, indirects, etc.

2.26.02 Authority

The final office review will be initiated, scheduled and conducted by the Project Engineer.

2.26.03 Procedure

The final office review will be held in the office most convenient to the majority of the attendees, as determined by the Resident Engineer, or held virtually. A field visit to the site is optional, but may be desired.

2.26.04 Distribution of the Plans, Specifications & Estimate Package

The plans and special provisions will be distributed by the Project Engineer at least seven days, but preferably 14 days, in advance of the final office review. 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):

1. Federal Highway Administration (FHWA) – Attention: 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 Professional Land Surveyor (PLS)-II (two).
10. Region Utility Engineer.
11. Region Hydraulics Engineer.
12. Region Professional Land Survey Coordinator.
13. Region Maintenance Superintendent.
14. Region Resident Engineer.
15. Region Traffic Engineer.
16. Landscape Architect.

17. Colorado State Patrol.
18. Other local, state or federal agencies.
19. Consultants.
20. Others as determined by the Resident Engineer.

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 Final Office Review (FOR). Specialty units 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.

2.26.05 Preliminary Cost Estimate

The distribution of any preliminary cost estimate is rigidly controlled and will be distributed only in accordance with the Colorado Department of Transportation (CDOT) Procedural Directive 511.1, Security and Confidentiality of the Engineer's Detailed Estimate.

2.26.06 Conduct of the Final Office Review and Participation

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.

2.27 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 the Repro Unit.

Whoever checks the Plans, Specifications & Estimate (PS&E) should use the Form 1299, Plans, Specifications & Estimate Checklist to ensure the plans are complete before the project is advanced to advertisement and the Repro Unit. 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 Cost Estimating Services Unit of the Construction Engineering Services Branch will review or establish prices for materials, labor, and equipment required to perform the work (see Section 2.25 of this manual). The project manager leads the team in assembling the final Plans, Specifications, & Estimate package. The package includes, but is not limited to, plan sheets, cross-sections, special provisions, estimate, schedule, advertisement notice, bid documents.

Assembly involves:

1. Compiling the final plan sheets.
2. Running the final Engineer's Estimate, as reviewed by the Cost Estimating Services Unit of the Construction Engineering Services Branch.
3. Obtaining Colorado Department of Transportation (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 & Estimate for compliance with federal and state requirements.
5. Submitting the Plans, Specifications & 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 CDOT 0859, Project Control Data) About CDOT – CDOT Forms-by-Form Number-All – 0859, Form CDOT 1048 About CDOT – CDOT Forms-by-Form Number-All – 1048, and check sheets) have been met.

Additional Resources:

23 Code of Federal Regulations (CFR) Part 635B, Force Account Construction

Procedural Directive 520.1, Documents for Bidding and Contracting on Construction Projects

For forms, see the CDOT online forms library About CDOT – CDOT Forms Catalog

2.28 Plans, Specifications & 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 & Project Plans, Specifications & Estimate Approval) in Systems, Applications and Products in Data Processing (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. Refer to the Federal Highway Administration (FHWA) Project Level Stewardship and Oversight Agreement (when applicable) for additional instructions on FHWA involvement.

Obligation:

SAP Steps:

1. “ZJ14” – Form 463 – Finalize.
2. “ZJ17” – Form 128 – Environmental Manager.
3. Update Transport funding to match SAP funding.
4. “ZJ23” – Initiate Form 1180.
5. “ZJ30” – Track Form 1180 progress.

Construction estimate in Transport, reviewed by Colorado Department of Transportation (CDOT) Cost Estimating, has to be within 10% 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 two–three months depending if a Statewide Transportation Improvement Program (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 the Office of Financial Management and Budget (OFMB) receives:

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

These forms should be submitted to the Office of Financial Management and Budget (OFMB) at least seven–ten days prior to the scheduled advertisement date to allow adequate time for OFMB/ Federal Highway Administration (FHWA) to process the authorization request. Therefore the start of the Form 1180 workflow should be timed adequately before the planned advertisement date.

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 Systems, Applications and Products in Data Processing (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% (based on Transportation Commission budget plus planned action versus Engineer's Estimate). For projects with deficits greater than 10%, the clearance indicates approval by the region transportation director and notification of the Chief Engineer. Deficits greater than 15% may delay the advertisement of the project because of required Transportation Commission action.

The Form 1180 will then be forwarded in SAP to OFMB. The Resident Engineer is responsible for forwarding the Form 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, 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 Code of Federal Regulations (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 Resources:

23 Code of Federal Regulations (CFR) Part 625, Design Standards for Highways, and Part 630B, Plans, Specifications & Estimates

23 US Code (USC) 106, Project Approval and Oversight

Colorado Department of Transportation (CDOT) Procedural Directive 512.1, Project Scoping and Design Scoping Review (DSR)

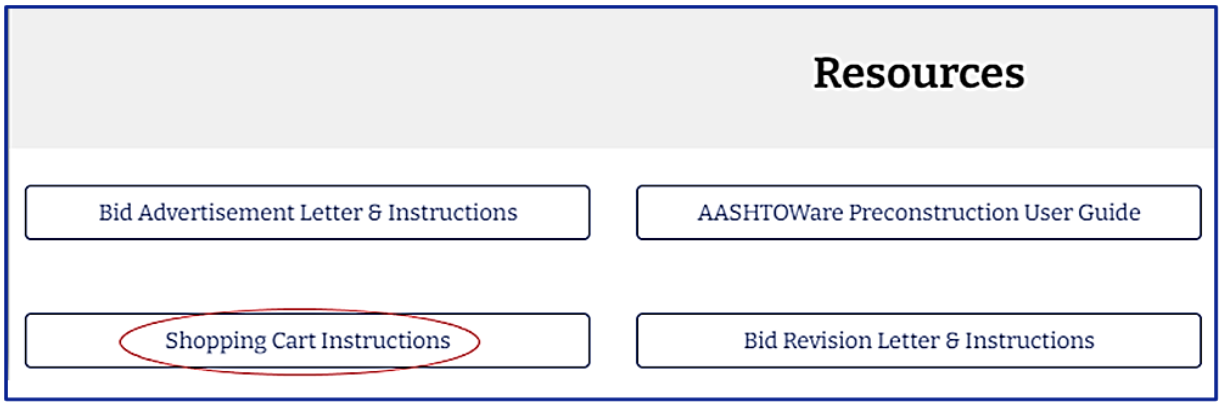
23 CFR Part 630A, Federal Aid Project Authorization

For forms, see the CDOT online forms library
About CDOT – CDOT Forms Catalog

2.29 Shopping Cart for Construction Contract

After the project is authorized by the Office of Financial Management and Budget (OFMB) for advertisement, the Resident Engineer will create a Shopping Cart (SC) in the Systems, Applications and Products in Data Processing (SAP) Portal. The SC 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 SC using the instructions provided in the Employee Hub, under the Construction Contract Services Unit's "Resources" links. Use the link, Construction Contract Services – Resources, to open the Construction Contract Services Unit webpage. Click the "Shopping Cart Instructions" button. See figure below.

Figure 2-3 Resources webpage, with Shopping Cart Instructions highlighted



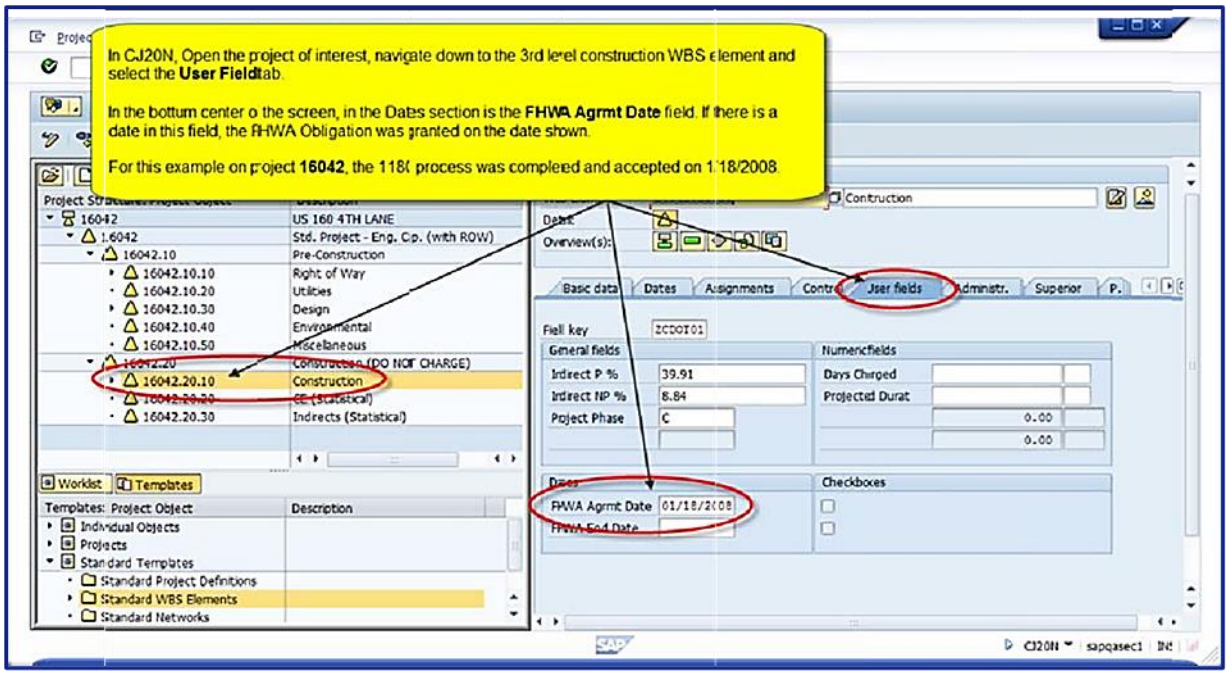
Shopping Carts (SC's) for Bridge & Tunnel Enterprise will need to be created differently and instructions for those SC's are referenced below. For Bridge & Tunnel Enterprise SC's use the following for the Account Assignment details:

- "Fund 538"
- "Fund Center B8800-538"

After you have saved the SC, you'll need to record the SC number for future reference. First you will need to send the SC number to both the Program Engineer and the Business Office and request that they approve, otherwise known as "release", the SC in Systems, Applications and Products in Data Processing (SAP). This release must be completed prior to the project getting advertised. The SC information will also be required on the request advertise letter that will be sent to the Construction Contracts Unit on Colorado Department of Transportation's (CDOT's) CDOT_HQ_CU-ConstructionContractsUnit@state.co.us distribution list.

For federally funded projects, the Shopping Cart should not be started until the Federal Highway Administration "(FHWA) Agreement Date" has been received. SAP will not allow the completion of the Shopping Cart on a federally funded project unless the federal approval and obligation are complete. These requirements are based on 23 Code of Federal Regulations (CFR) 630.106 which states that federal funds shall not be used for costs incurred prior to the date of obligation and agreement. See figure below:

Figure 2-4 Checking FHWA Agreement Date



Key Systems, Applications and Products in Data Processing (SAP) Shopping Cart 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 Shopping Cart is a critical field for ensuring that the Federal Highway Administration (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 a “FHWA Agreement Date”.
3. Based on the “Account Assignment Category”, SAP correctly populates the General Ledger (G/L), “G/L Number”, in the Shopping Cart. Please do not alter or edit the “G/L Number” on a Shopping Cart 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 Shopping Carts or the “FHWA Agreement Date”.
5. If the Shopping Cart is created incorrectly prior to the federal obligation, the Colorado Department of Transportation (CDOT) is in jeopardy of losing the federal funds for the project.
6. Upon award of the project, the Shopping Cart (SC) will be converted into a Purchase Order (PO) by the Agreements Unit.

2.30 Plans and Reproduction Processes

The Project Engineer develops an advertisement package which includes plans, special provisions, bid schedules, cross-sections or other supplemental information if applicable. 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, otherwise known as Ad process, 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).
2. CDOT Construction Staff:
   The CDOT construction staff can wait for transmittal of all documents, but should be involved with the preconstruction handoff at the Final Office Review (FOR) milestone and beyond, leading to advertisement. As Revisions-Under-Ad are completed, the

Repro Unit combines all forms and performs a quality control review; creating a plans file, a specs file, and a bid proposal schedule file. Repro Unit distributes these to shared network folders and notifies Engineering Contracts staff accordingly.

3. Agencies:
   External agencies such as the Federal Highway Administration (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).
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 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 labeled "Contractor's Sets" and are available to the Resident Engineer.

In the case of the Final Office Review (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 File Transfer Protocol (FTP) site. Since files residing on the FTP server are removed after 10 days, project reviewers must get their electronic copies quickly. 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. Final plans, special provisions, and bid schedule, should be placed in a new folder under the shared network folder: ReproJobs\Repro-AD Plans & Specs(Do Not Rename).
Note: When choosing a name for the new folder use the actual project number and Ad date in addition to the sub account.

2.31 Advertisement

The Colorado Department of Transportation (CDOT) typically advertises a project for three weeks. There are situations in which longer or shorter advertisement periods may be appropriate. For federal funded projects looking to use a two week advertisement period, the Program Engineer must request concurrence from the Construction Engineering Services Branch manager.

Two weeks is the minimum advertisement period required by state statute for state funded projects. Three weeks is the minimum advertisement period required by FHWA according to 23 Code of Federal Regulations (CFR) 635.112(b).

An advertisement period of five 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. Via an audit of Stage Gates and Deliverables, as well as other project-level correspondence, ensure that all appropriate design requirements have been met and all clearances, property acquisition work, and permitting activities are at their appropriate levels of completion for Ad.
2. Final checks on project estimate and budget, in coordination with the Resident Engineer, Program Engineer, and region Business Office.
3. Final check on plan set (details, notes), specifications (including any Project Special Provisions), and bid items.
4. The Project Manager (PM) shall then compile the Plans, Specifications & Estimate deliverable package.
5. Approve the Plans, Specifications & Estimate package, including advertisement for bid.
6. Prepare the Plans, Specifications & Estimate delivery schedule.

The project manager is responsible for delivering the documents in a folder to the Repro Unit into the shared network folder ReproJobs\Repro-AD Plans & Specs(Do Not Rename). (See Section 2.27 Bid Package Review). The following should be included:

1. Project bid proposal schedule of items.
2. Plan sheets.
3. Project specifications and special provisions.
4. Cross-sections, if applicable.
5. Earthwork calculations, if applicable.
6. Advertisement letter from Resident Engineer (email).

Note: Supplemental information can be posted in the Business to Government Shared Online Platform (B2G) system with the typical bid solicitation documents at time of project advertisement. Requests to post supplemental information must be emailed to the Construction Contract Services Unit.

To ensure a timely advertisement of the project the Repro Unit requires the Plans, Specifications & Estimate (PS&E) package be submitted prior to advertisement. The deadline is by Monday, 9 a.m. the same week the project is requested to go to Ad. For a Monday holiday, it is then by Tuesday, 9 a.m.

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.

2.31.01 Authorization Letters

Authorization letters must be sent to the Colorado Department of Transportation’s (CDOT’s) CDOT_HQ_CU-ConstructionContractsUnit@state.co.us distribution list. All advertisement authorizations must be received no later than 9 a.m. on the Monday morning before the advertisement date. If Monday is a holiday, they must be received by 9 a.m. on Tuesday following.

The advertisement authorization letter format and procedural instructions are provided on the Employee Hub under the Construction Contract Services Unit’s Resources links. Use the link below to open the Construction Contract Services Unit webpage. Click the “Bid Advertisement Letter & Instructions” button. Construction Contract Services – Resources. See figure below.

Figure 2-5 Resources webpage, with Bid Advertisement Letter & Instructions highlighted

2.31.02 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.

2.31.03 Construction Handoff Meeting

While internal construction staff should have already been engaged on projects for which constructability reviews are appropriate, all projects should include a handoff meeting. A construction handoff meeting is where the key preconstruction staff meets with the construction administration team, which could include consultants. This meeting ideally occurs before project advertisement and must occur prior to construction Notice to Proceed. It is usually an internal meeting that does not include the Contractor.

The purpose of the construction handoff meeting is to position the project team for success in the construction phase through discussing high-risk project elements. This is accomplished by enabling the preconstruction staff to become acquainted with the construction project administration team and establishing points of contact for design support during construction. The meeting is a construction-focused forum where the project aspects most pertinent to construction are discussed in detail. Common agenda items include:

- Review of the construction sequencing or Maintenance of Traffic (MOT)
- The Transportation Management Plan (TMP)
- Public Information Plan Requirements
    - Internal framework of the Emergency Response Communication Tree
- Items in the PMWeb Risk Register:
    - Utility relocations
    - Utilities to be avoided (i.e., overhead power and high pressure gas)
    - Right of way
    - Railroad coordination
    - National Environmental Policy Act (NEPA) or Environmental elements including endangered or protected species
    - Hazardous material mitigation
    - Sensitive stakeholder groups
- Stormwater Management Plan (SWMP) including temporary drainage that may not be covered in the SWMP
- Working hours including night work restrictions

Ideally, construction administration representatives would have also attended other major milestone meetings such as the Field Inspection Review (FIR) and Final Office Review (FOR). However, the handoff meeting is an opportunity to provide, in addition to a project overview, further clarification on any revisions under Ad along with other construction-centric topics within a smaller internal group.

2.32 Plans, Specifications & Estimate (PS&E) Revisions Under Advertisement

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

2.32.01 Instructions to Complete PS&E Revisions Under Advertisement

2.32.01.01 Revision to Bid Documents

The process instructions to revise bid proposals are in the Colorado Department of Transportation (CDOT) Employee Hub under American Association of State Highway and Transportation Officials (AASHTO): Data Program & Project Analysis – AASHTOWare Project.

Open the file titled “AASHTOWare Project Preconstruction User Guide”, under Preconstruction, from the above website for the instructions under Appendix B to revise Bid Proposals.

2.32.01.02 Revision to Project Special Provisions

If there are any changes to the project special provisions, prepare a revised index to reflect the changes. Add a sidebar to identify changes in Microsoft Word.

Note: It is easiest to revise a specification with track changes by creating a new document, copying in the text of the specification from the original document and then begin editing. The new document shall have the same format as the original specs. Using section breaks (next page) instead of page breaks helps with the page numbering. With section breaks, you can break the link between pages with the “Link to Previous” command in the Header/Footer box. Track Change Options: Insertions (None), Deletions (Hidden), Formatting (None), Change Lines (Left Border), Balloons (Never).

Numbering of Pages – Project Special Provisions
The lowercase letter indicates the revision number

- 1a Revision Number 1 under advertisement (Index page)
- 13b Revision Number 2 under advertisement
- 28c Revision Number 3 under advertisement

An uppercase letter indicates an added page.

- 13B

Example: Revised page 13 (no added pages). The numbering of the special provision under Revision Number 1 is 13a.

Example: Page 13 was originally a one-page special provision. After advertisement this special provision needed to be expanded to include more detail and ended up being five pages. The numbering of the special provision under Revision Number 1 is 13a, 13Aa, 13Ba, 13Ca, 13Da.

Note: Specifications added to the project by Revision-Under-Ad shall be added to the end of the specification package without increasing the original page numbering.

Example: The original specification package ends with Page 50. A 10-page Stormwater Management Plan (SWMP) specification is added by Revision-Under-Ad. The page numbering would be as follows for the added pages if the original Page 50 is not revised 50Aa-50Ja. If another three-page specification is added, the numbering is as follows: 50Ka-50Ma.

Deleted specifications by Revision-Under-Ad shall remain in the specification package with a “DELETED” dark diagonal watermark over the original text, created in Microsoft Word. Example below:

Colorado Project No. C 0703-496
Construction Subaccount No. 24620

November 2, 2023

-1-

REVISION OF SECTION 202
REMOVAL AND TRIMMING OF TREES

Subsection 202.12 shall include the following:

Pay Item	**Pay Unit**
Removal of Tree	Each
Tree Trimming	Each

Chipping, stockpiling mulch, and hauling and stockpiling trunks and limbs will not be paid for separately but shall be included in the work. Removal of trees less than 6 inches in diameter at breast height (DBH, approximately 54 inches) will not be paid for separately but shall be included in the work of clearing and grubbing.

All clearing and grubbing directed by the Engineer will be paid for as a lump sum under the clearing and grubbing item.

DELETED

R-1 19

A deleted specification entry shall remain in the Project Special Provisions Index with a revision symbol, a strike through the title of the specification and “(Deleted)” following it. The revised Project Special Provisions Index page number is re-numbered.

Example: A first Revision-Under-Ad: The original specification package containing page 19 is being replaced. The replacement page is numbered 19a. It shows the revision date and (R-1) symbol. Accordingly, the Project Special Provisions Index is revised and re-numbered as page 1a; the title of the original specification remains with an (R-1) symbol identifying the revised page number, in this case 19a.

2.32.01.03 Revision to Standard Special Provisions

If there are any changes to the Standard Special Provisions, prepare a revised Index to reflect the changes. Add a sidebar to identify changes in Microsoft Word.

If a Standard Special Provision needs to be updated with a more current one, use the date that the Standard Special was approved for use by the Specification Committee in the “Date” column on the revised Index. The latest Standard Special Provision is identified by the date in the upper right-hand corner of each page.

Deleted (not replaced) Standard Specials by Revision-Under-Ad shall remain in the specification package with a “DELETED” dark diagonal watermark over the original text; with those pages to be watermarked copied from the Ad package. A deleted Standard Specials entry in the Standard Special Provisions Index shall remain there with a strike through the title of the original specification and (Deleted) following it, and a revision symbol. Accordingly, the Standard Special Index is re-numbered as page 2a.

2.32.01.04 Revision to Plan Sheets

The Title Page identified as plan sheet 1 (one) or 2 (two) will be included with each revision where plan pages are added, revised or deleted. Fill out the block in the border to identify the Date, Comments (what is being revised) and Initials of the Engineer of Record.

The Index of Sheets on the Title Page shall include a revision number symbol next to the revised sheets. An added plan sheet will be inserted in the plans in the most logical location.

12A Added plan sheet after sheet 12 and before 13.

The plan sheet numbers will not be revised when a plan sheet is replaced or deleted. The Sheet Revision block will reflect the change. An entire sheet deleted shall remain in the plans package with a “DELETED” dark diagonal watermark over the original content; with those sheets to be watermarked copied from the Ad package. If only some text is to be deleted, a replacement sheet is used, the text remains with a strikethrough.

Use the Revision Letter number to identify when the revision is made. Example: (R-1) noted next to a change indicates this change was made with Revision-Under-Advertisement Number 1 documents.

Note: Optional—For extra attention and possible ease in identifying the revision, use a “revision cloud” around the change. Evaluate the impact of the revision cloud to the overall clarity of the sheet. Use at designers’ discretion.

2.32.02 Documentation for Plans, Specifications & Estimate (PS&E) Revisions Under Advertisement

Revisions are to be publicly posted at least 10-calendar-days before the scheduled bid opening/letting date. When a Revision is needed within 10-calendar-days of the scheduled bid letting date, a bid letting deferral is also required to extend the bid letting date so the Revision can be posted 10-calendar-days prior to the new bid letting date.

See the instructions below for how to request having a Revision issued and the process time needed for quality control reviews.

All requests for posting a Revision are to be emailed to the Colorado Department of Transportation's CDOT_HQ_CU-ConstructionContractsUnit@state.co.us email list. Prior to submitting this request for posting, a Quality Control (QC) review of all revision documents is required through the Reproduction Unit per the following:

1. To initiate the QC review the Project Engineer must save all the revision files in a PDF file format that meet the state's web accessible compliance requirements for publicly posted documents in the network shared drive folder at public\REPROJOBS\Repro-AD Plans & Specs(Do Not Rename). The Project Engineer will then send an email to the group email "Repro_Unit" requesting the quality control review be performed.
2. After the Project Engineer receives email confirmation the quality control review is completed, they will send an email to the group email CDOT_HQ_CU-ConstructionContractsUnit@state.co.us requesting the Revision be issued with a copy of the approved Revision Letter attached. The Reproduction Unit will notify the Construction Contract Services Unit that the Revision is ready to post. The approved Revision will then be posted in the Colorado Department of Transportation's (CDOT's) Business to Government Shared Online Platform (B2G) system with all the other project bid solicitation documents.

Note: The QC review process applies to all Revisions including bid letting deferrals; changes to bid proposal schedules, specifications or plans, or all. Depending on the Revision complexity and corrections to Revision documents found from QC review, **one-two business days may be required to complete the QC review**. As a result, Revisions should be submitted for the QC review a couple days in advance of the 10-calendar-day deadline identified above to ensure they can be processed on time.

Example below of Revision Request Email:

Date:

From: (automatically filled in by email)

Dept:

Telephone No:

To: See below

Subject: Revision Number 1 MB 9999-999 (include project sub account)

Please find attached the following revision letter for Project _____

Distribution:
CDOT_HQ_CU-ConstructionContractsUnit@state.co.us
Region Transportation Director (RTD)
Program Engineer
and any other region Project Team Members as needed.

Revision Letter Format:

Address the actual Revision Letter to "All Holders of Plans for Project No_____." The Revision number 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 copy distribution list:

Federal Highway Administration (FHWA), Colorado Division Operations Engineer (if FHWA has project oversight)
Reprographics Unit
Construction Contract Services
Engineering Estimates
Records Center
Project Manager
Resident Engineer

The Revision Letter shall include the following in the order specified:

1. Reason(s) for Revision.

List the reasons for the need to revise the project plans and specs. 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 schedule, and state that the revised schedule Electronic Bidding System (EBSx) bid proposal file or EBSx amendment file must be used (see revision 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. If the project has been deferred, call attention to the new bid opening date and revised EBSx file (see revision example).
7. Federal Highway Administration (FHWA) approval
   If the project has FHWA oversight, identify the 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 (two) 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.

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 the Construction Contracts Services Unit for help.

Example below of Revision Request Letter:

[Project Name, i.e., MB 9999-999]
[Systems, Applications and Products in Data Processing (SAP) #, i.e., 10000]
State Highway (SH) 99, North of the Big Hole

Date: [Current Date]

To: All Holders of Plans for Project Number {MB 9999-999}

Subject: Revision Number [1, 2, or 3, etc.] (to be acknowledged in all bid proposals)

Reason(s) for Revision:

____Plan or Spec. Correction ___Commencement or completion time change

____Biddable quantity changes ___ Add or delete specs

____Add or delete plan sheet ___ New Davis Bacon wage rates

____Funding availability ____Other (explain)_____

Bid Proposal:

Revised Schedule. Prospective bidders must submit their bids on the revised Electronic Bidding System (EBSx) bid proposal schedule. The EBSx revised bid proposal and/or EBSx amendment files are posted in the Colorado Department of Transportation (CDOT) Business to Government Shared Online Platform (B2G) system.

(Or)

No revisions to Schedule.

Project Special Provisions:

Pages 1a and 2a: Revised Index
Page 16a: Added Cross-Sections

Pages 50a-56a: Deleted Section 253 – Asbestos Containing Material Management

...etc.

(Or)

N/A.

Standard Special Provisions:

Page 3a: Revised Date on Standard Special Provision Revision of Section (ROS) 106-Quality Of Hot Bituminous Pavement (Nov. 7, 1996)

...etc.

(Or)

N/A.

Plan Sheets:

Sheet 1: Updated Revision Block
Sheet 8: Deleted Item and Revised Quantity
Sheet 10: Added Item
Sheet 12: Deleted Item
Sheet 21: Changed Note
...etc.

(Or)

N/A.

It is requested that you substitute the enclosed revisions in your copy of plan documents and destroy those sheets superseded by this transmittal.

The Department will open bids for this project on (Bid Opening Date) as previously advertised.

(Or)

The Department has delayed the bid opening ___weeks for this project. Bids will be opened on (Bid Opening Date). A new Electronic Bidding System (EBSx) bid proposal file has been posted in the Colorado Department of Transportation (CDOT) Business to Government Shared Online Platform (B2G) system for the revised bid opening date. Bidders must use the new EBSx bid proposal file to submit bids.

If Federal Highway Administration (FHWA) Oversight:
This revision has been approved by _____, FHWA Colorado Federal Aid Division Operations Engineer.

This revision is authorized by (Professional Engineer-II (two) authorizing Revision).

cc: FHWA, Colorado Division Operations Engineer (if FHWA has project oversight)

Reprographics Unit
Construction Contract Services
Engineering Estimates
Records Center
Project Manager
Resident Engineer

2.33 Re-Advertisement

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

The Colorado Department of Transportation (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% over or 20% under the Engineer's 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 the award of the project.

If a project's low bid is greater than 115% or less than 80% of the "Detailed Engineer's Estimate", it will be discussed with the apparent low bidder and the Engineering Estimates & Market Analysis Unit (EEMA) Unit 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% of the engineer's estimate (greater than 125% on projects under one million dollars) in accordance with Colorado Revised Statute (CRS) 43-1-113(16).
2. Lack of funding to award the project at the amount bid. Contact the 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.

In the event of a re-advertisement, the project manager shall work with their region Business Office and Program Reporting and Transparency Office (PRTO) representative to ensure that the PMWeb and Systems, Applications and Products in Data Processing (SAP) milestone dates are appropriately adjusted, particularly to reflect the revised Advertisement and Late Ad dates. It is critical that these dates be updated as soon as practicable so that the re-advertised project may be included on the Go Sheet for the contracting community.

Additional Resources:

23 Code of Federal Regulations (CFR) Part 635A, Contract Process

Colorado Department of Transportation (CDOT) Procedural Directive 303.01, Award of Contract – Justification of Bids

2.34 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.

Step One

Step one is to send an email 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 & 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 the Engineering Estimates & Market Analysis Unit (EEMA) in a spreadsheet format containing quantities, estimated unit prices, and product extensions. 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.

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 and Budget, Project Budget Unit (Pam Thomson, Eric Ehrbar, and Darrell Johnson), Office of Financial Management and 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 Change Modification Order (CMO) line in the Transport 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 Construction Engineering (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.

2.35 Go Sheet

The Go Sheet is published on a weekly or bi-weekly cadence (depending on construction season) to inform Contra**c**tors about upcoming bid openings for Colorado Department of

Transportation (CDOT) construction projects. The Go Sheet includes information most pertinent for the contracting community, including advertisement and letting dates; anticipated construction budget; contract type; and project manager contact information.

Go Sheet – Triggers for Project Inclusion

Information populating the Go Sheet currently originates from Systems, Applications and Products in Data Processing (SAP) and is checked against data contained in PMWeb. The Scheduled Ad date (otherwise known as the Business Manager's Ad date) in SAP must be consistent with the Ad date listed in the PMWeb project schedule—discrepancies in these data may delay a project's inclusion in the Go Sheet. Current triggers for inclusion are as follows:

- 180 days prior to the Business Manager's Ad date for CDOT projects.
- 90 days prior to Ad date for local agency projects.

As the PMWeb workflows and interface continue to mature, the Go Sheet will eventually switch to being populated by data fully contained within PMWeb, with SAP data as a check.

It is critical that Advertisement and Late Advertisement dates are monitored and updated in both

SAP and PMWeb by the project manager, particularly as a project nears its 180-day window prior to Ad. As the Go Sheet is public-facing and is regularly utilized by the contracting community, its accuracy and reliability is key to CDOT's current and future success.

The "ZJ44" SAP transaction may be used to generate a draft Go Sheet as an individual user. The published version of the Go Sheet is found on Business – Scheduled Bid Openings. Given that the published Go Sheet undergoes an additional Quality Control (QC) process prior to publication (conducted by the Program Reporting and Transparency Unit), information obtained from the "ZJ44" function should be treated as For Information Only by end-users unless it is contained on the publicly-posted version. Questions may be directed to CDOT's Program Reporting & Transparency Office.

2.36 Mandatory Pre-Bid Conferences

If the Residency chooses, the Residency can require potential bidders to attend a CDOT information meeting while a project is under Advertisement. The primary reasons for requiring such a meeting should be focused on risk associated with CDOT, the Contractor, or a third party. There may be one large aspect which is difficult to understand or explain through the contract documents, or there may be multiple smaller aspects warranting pre-bid discussion. Some examples of reasons would be items such as:

1. A particularly difficult to execute or understandable phasing plan.
2. A challenging work environment (work in the mountains, over a river, hazardous materials, etc.).
3. A new or unique bridge design. Perhaps with some new bridge type or specifications.
4. A new, long, or complicated specification.
5. A new or unique project delivery method such as Design Build and Construction Manager/General Contractor (CMGC).

In the event the design team feels a mandatory pre-bid conference is warranted, the following are required:

1. Include in the specification package the appropriate project special provision worksheet titled “Notice to Bidders” or “Notice to Bidders – Signature Project”. Modify the specification, as stated in the instructions, to require a mandatory pre-bid meeting.
2. List who from the company should attend in the Notice to Bidders.
3. Have every individual attending the meeting sign in with their name (print and sign), the company they are employed by, and their title with the company.
4. The design team should have a presentation prepared and present to the potential bidders the specifics of the items warranting the meeting. The presentation should include a statement that questions asked during the meeting may be shared in the Form 1389 – Project Showing Question and Answer Details.
5. The Colorado Department of Transportation (CDOT) should have a person recording meeting minutes. The meeting minutes will become part of the project file. Questions from the Contractors that are answered should be written down and included in the Form 1389 – Project Showing Question and Answer Details for the project.

2.37 Cut Back and Multiple Schedule Projects

Over Budget Less Than 10%

If the project has a final total cost estimate from the Cost Estimating Unit less than 10% over Commission Budget or Project Budget, the Program Engineers have the option of going to advertisement over budget, or deciding to cut back the project before advertisement and then add work back in if lower than expected bids are received and a request to retain bid surplus funds is made as described in the Construction Manual Section 103.5 and the Project Development Manual Section 2.35.

Guidelines to Cut Back Projects Before Going to Ad:

1. Get all clearances for the original length of work and show original length of work on plans.

2. The region Civil Rights Office (CRO) will review the original project estimate and any subsequent cut back project estimates for establishing Disadvantaged Business Enterprise (DBE) goals, and take into consideration any differences, before determining the final contract DBE Goal for the project.
3. Instead of deleting portions of the plans, line out items on the plans and tabulations which were in areas cut back or eliminated from the work. Other options such as separate tabs or clearly identified footnotes are also acceptable. Add notes on the plans at each location cut back that “Work may be added if funds become available”. This ensures that all bidders are aware at the time of bid that work may be added in later. Lined out items should be work similar to the work in the remainder of the plans. The region must submit a request to retain funds as per Construction Manual Section 103.5 and the Project Development Manual, Section 2.35. This request should document that cut back locations and items were clear on the plans, and the note about work being added if funds become available was in the plans.
4. If work is added to the contract, the bid schedule, revised to include the proposed added work, will need to be analyzed for material unbalancing according to subsection 102.07(5). The Engineering Estimates Unit will perform the material unbalancing analysis using the additional quantities shown on the plans. If material unbalancing is detected, the proposed added work will not be pursued.
5. If work is added to the contract, that work will be added by Change Order. The Change Order shall include all items of work to be modified or added for the additional work. The region CRO will be advised of any change order adding work to a project when a contract is awarded under a Good Faith Effort (GFE) process.
6. Project extensions at a later date are highly discouraged. If pursued, project extensions must meet the criteria laid out in the Construction Manual, Section 120.7.7.3.

Over Budget 10% or Greater

If the project has a final total cost estimate from the Cost Estimating Unit that is 10% or greater over the Commission Budget or Project Budget, then

The Region Transportation Director (RTD) may approve the option to reduce the Project Scope to fit within budget.

(Or)

The RTD may seek approval (Commission, Metropolitan Planning Organization (MPO), or transfer funds as appropriate) to amend the budget.

(Or)

The region shall prepare a set of plans with multiple schedules. Contractors would be required to submit a bid for each of the multiple schedules:

1. Schedule A would be for the entire original project.
2. Schedule B would be for the project after project reductions are identified and made.
3. Schedule C (if used) would be for a third, even smaller, project when bids are unpredictable.
4. Include the project special provision, Multiple Bid Schedules, to identify that the project has multiple schedules.
5. The maximum estimate spread between schedules should be 15% for two schedules, or 30% for three schedules. Greater deviations must be approved by the Chief Engineer before advertisement. The minimum estimate spread between schedules should be 5%. Do not use more than three schedules.
6. The region Civil Rights Office (CRO) must be specifically advised that there will be multiple schedules advertised when a Disadvantaged Businees Enterprise (DBE) goal is requested. Contract DBE Goals shall be established by the region Civil Rights Office for each of the different schedules. These goals may or may not be the same. Examples of multiple schedule projects:
    a. Overlay project with bid schedules for 2 miles and 2.5 miles.
    b. Bridge project with and without landscaping.
    c. Shouldering project with embankment only and with surfacing included.

Award procedure when the “Multiple Schedules” process is used: Prior to the bid opening, the Design project manager must provide the max bid amount to the Cost Estimating Services manager and the award officer to determine the highest bid that would meet the Project or Commission Budget. This bid amount will be considered the Maximum Acceptable Bid. For example:

1. The Project or Commission Budget minus Force Account, Minor Contract Revision (MCR), Construction Engineering (CE), Project Engineering, Right of Way (ROW), Utilities and all other non-bid items = Maximum Acceptable Bid.
2. This Maximum Acceptable Bid will be announced immediately prior to bid opening.

If a bidder does not bid on all schedules, his or her bids will be rejected and set aside.

At the bid opening, the Maximum Acceptable Bid will be announced. Then the total bid will be read for the smallest schedule (Schedule B or C) for each bidder. After all bids for the smallest schedule have been opened and read, the apparent low bidder for that schedule will be announced. Then, if one or more bids on the next larger schedule (Schedule A or B) is at or less than the Maximum Acceptable Bid, then the bids for that schedule will be read for each bidder and the apparent low bidder for that schedule announced. Then, if one or more bids on the largest schedule (Schedule A) is at or less than the Maximum Acceptable Bid, the bids for that schedule will be read for each bidder and the apparent low bidder for that

schedule announced. Bids will be read only for the smallest schedule if none of the bid schedules receives a bid at or less than the Maximum Acceptable Bid. The project selection process shall use the following guidelines unless otherwise established in the project special provisions:

1. If only the smallest schedule receives one or more bids at or under the Maximum Acceptable Bid, select the low bid for that schedule.
2. If the low bid for the smallest schedule is over the Maximum Acceptable Bid, but results in a total cost less than 110% of the Project or Commission Budget, select the low bid for that schedule.
3. If the low bid for the smallest schedule is over the Maximum Acceptable Bid, and results in a total cost greater than 110% of the Project or Commission Budget, pursue either Commission Action or other appropriate means to supplement the funding. Appropriate means to supplement the budget are described in Section 1.03.03 of the Project Development Manual. Otherwise, adjust and re-advertise the project.
4. If two or more schedules receive one or more bids at or under the Maximum Acceptable Bid, select the low bid for the larger schedule.

American Association of State Highway and Transportation Officials (AASHTOWare)
Note: When using multiple schedules and requiring the Contractors to bid on all of the schedules, separate Prime Projects must be set up in Transport, e.g., 14980A, 14980B, and 14980C.

Projects which use multiple bid schedules as described above must include the following special provisions:

1. Multiple Bid Schedules based on the worksheet found at the Innovative Contract Provisions webpage listed below.
2. Commencement and Completion of Work based on the appropriate one of the three worksheets found at the Innovative Contract Provisions webpage listed below.

The Alternative Delivery Program webpage is found at Business – Alternative Delivery Program, Design-Build & Construction Manager, General Contractor.