# MEMORANDUM

**DEPARTMENT OF TRANSPORTATION**
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**Date:** January 31, 2013

**TO:** All Users of the *CDOT Project Development Manual*

**FROM:** Richard Zamora, Project Development Branch Manager

**SUBJECT:** Rewrite of the *CDOT Project Development Manual*

A task force recently reviewed and rewrote the *CDOT Project Development Manual*. This was an extensive undertaking that required teamwork and cooperation from numerous CDOT employees in many regions and departments. I wish to publicly thank everyone involved.

The purpose of the *CDOT Project Development Manual* is to provide a comprehensive, easy-to-use overview of CDOT project procedures, including guidelines on how to address situations that may be encountered in the course of developing a project. The manual is intended to assist new engineers, designers and consultants. The rewritten manual is effective immediately.

This release of the *Project Development Manual* is in electronic format only and may be accessed via the CDOT Design and Construction Project Support web page at: http://www.coloradodot.info/business/designsupport/bulletins_manuals/project-development-manual

Creating an electronic only version enabled us to include additional files in the document which would not have been available in a printed version. Features and files in the electronic version include hyperlinks, Excel spreadsheets, CatEx timeline charts and SAP work instructions.

The Project Development Branch publishes an assortment of guides and manuals intended to assist engineers in the vital task of successfully completing a construction project. Suggestions and comments are always welcome.

If you have questions regarding the *CDOT Project Development Manual*, contact Larry Brinck at (303) 757-9474 or Ryan Sorensen at (303) 757-9326.

# 2013 PROJECT DEVELOPMENT MANUAL


COLORADO
Department of Transportation

**A PDM in Transition and CDOT's Transition to Electronic Documentation**

Project Management related content in the Project Development Manual ("PDM") is transitioning to the CDOT Program/Project Management website: (https://www.codot.gov/business/project-management). Eventually, much of this content will again transition to CDOT's new project management software platform (called OnTrack) that is currently under development. When the transition is complete, the PDM will be revised to reflect only the remaining content with the acknowledgement that CDOT is in the process of transitioning to the use of technology to improve project delivery, including the use of electronic rather than paper records.

Two Procedural Directives, PD 21.1 and PD 508.1, issued in May and June 2019, provide the basis for CDOT's record retention and eSealing eConstruction effort. These two directives apply to CDOT employees and to contractors, consultants and local agencies who develop, transfer, augment, or are in any way involved with or responsible for CDOT project records. They apply to all CDOT projects including local agency and Innovative: P3, Design-Build and CMGC projects.

The main requirements of CDOT's directives are as follows. Please review the entire directives for more comprehensive guidance.

- CDOT's EDMS for Project Records
    - Bentley ProjectWise Explorer is the Electronic Document Management System (EDMS) for archiving all electronic Project Records set forth in the CDOT Record File Plans.
    - If project consultants are using Aconex, the PM and CDOT Resident Engineer must develop a phased approach to migrate records into ProjectWise Explorer on an ongoing basis within 45 days of the project final acceptance.
- CDOT Record File Plans. CDOT's Record File Plans contain a list of the public records that are required to be retained, as well as the electronic folder in ProjectWise Explorer where they will be archived. For local agencies, contractors and consultants, a link to the CDOT Record File Plans is included in all Project Share sites.
- Adobe Sign: CDOT's Electronic Signature Software for Project Records.
    - Adobe Sign is the electronic signature and professional seal software selected by CDOT and required for use on Project Records.

- For all Project Records that do not require a CDOT Controller/State Controller signature, Adobe Sign shall be used for both eSignatures and eSeals on Project Records. Note that Adobe Sign is permissible for use on contract modification orders ("CMO") given that CMOs do not require a signature by the Office of the State Controller. Adobe Sign work flows for Project Records will significantly cut down time routing paper records for signature, and will automatically archive the signed Project Record in ProjectWise.

- Professional Engineer Sealing. All CDOT, local agency and consulting Engineers must utilize electronic sealing (rather than mechanical sealing on paper) by January 2020 unless an exception request and approval is granted by the Chief Engineer. Beginning January 2021, no exemptions will be granted to the electronic sealing requirements.

- Sealed Project Records must be retained in ProjectWise Explorer in conformance with the CDOT Record File Plans.

- Unless otherwise notified by the Chief Engineer, Adobe Sign is CDOT's approved electronic workflow signature software for "Project Records." This includes the use of Adobe Sign for sealing with the professional engineer seal (see Procedural Directive 508.1 below, which sets forth requirements for sealing). Adobe Sign may not be utilized for any document which requires a signature from the CDOT Controller or State Controller.

- CDOT's Sealing requirements are dictated by and adhere to the Sealing requirements for licensed engineers set forth in the AES Board Rules, 4 CCR 730-1, which have the effect of law. The AES Board Rules dictate which documents require a Seal. These include Record Sets, Contract Modification Orders, VECP's M&S Standards and changes thereto.

- Responsibilities
    - Engineer in Responsible Charge: Must seal respective documents for work within their scope of work, including local agencies. Must ensure that all seals are obtained on the record set. This includes the limitation of scope for each seal.
    - The Engineer in Responsible Charge on a local agency project with COOT oversight is required to Seal all documents within the scope of their work. They shall be responsible for depositing the Seal Record Set into ProjectWise within 45 days of the award.

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**Section 4 Traffic**

**Section 5 Structures**



**Section 6 Materials**



**Section 7 Right of Way & Utilities**

**Section 8 Additional Project Development Considerations**

# INTRODUCTION

The main purpose of the *CDOT Project Development Manual* is to provide a quick, easy-to-use overview of situations or dilemmas that might be encountered in the course of developing a project. The manual is intended to assist new engineers, designers and consultants by:

identifying and describing the activities related to project development from conception to award, and

establishing a uniform application of processes and procedures for use department-wide.

This manual is organized and indexed following the structure of CDOT Form 1048, Project Scoping/Clearance Record. The text is divided into eight sections each covering an important aspect of Form 1048. Each chapter is accompanied with examples, explanations and exceptions. References to additional reading resources are provided at the end of many sections. As a part of revising this manual, Form 1048 also has been restructured.

When the manual refers to the Resident Engineer (Professional Engineer II), it is understood that the Resident Engineer typically delegates project management responsibilities to other positions based on the type of project and available expertise. Concurrently, when a reference is made to an individual such as the Right-of-Way Manager, it is understood that individual also delegates as appropriate.

Project development changes over the course of time, and at any given time there is discussion about what it is. As such, users are encouraged to submit processes, procedures, forms, outlines, flowcharts and suggestions for consideration into future revisions of this manual.

This effort represents a rewrite of the entire manual. The manual will continue to be revised as methods, policies, processes, procedures, guidelines and the Department's organizations and preconstruction environment change. If updates or changes to the manual are required, new Design Bulletins will be published and posted on the CDOT internet site (http://www.coloradodot.info/business/designsupport/bulletins_manuals/design-bulletins/current). It is the user's responsibility to keep the manual current by inserting the revisions as they are issued.

# ACKNOWLEDGMENTS

The Project Development Branch thanks all Colorado Department of Transportation personnel who contributed and reviewed material for *The CDOT Project Development Manual.*

Special acknowledgment is made for the contributions from these subject matter experts who, based on their expertise and knowledge, were asked to review sections of this manual and without whose contribution this manual would not be complete:

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# ACRONYMS COMMON TO CDOT

| | |
|---|---|
| 3R | Resurfacing, Restoration, Rehabilitation |
| AASHTO | American Association of State Highway and Transportation Officials |
| ADA | Americans with Disabilities Act |
| ADT | Average Daily Traffic |
| AQCC | Air Quality Control Commission |
| AQCM | Air Quality Congestion Mitigation |
| BAMS | Bid Analysis and Management System |
| BLM | Bureau of Land Management |
| CBC | Concrete Box Culvert |
| CDOT | Colorado Department of Transportation |
| CFR | Code of Federal Regulations |
| CMGC | Construction Manager/General Contractor |
| COFRS | Colorado Financial Reporting System |
| CRS | Colorado Revised Statutes |
| DBE | Disadvantaged Business Enterprise |
| DHV | Design Hour Volume |
| DOR | Design Office Review |
| DOW | Division of Wildlife (Colorado) |
| DRCOG | Denver Regional Council of Governments |
| DSR | Design Scoping Review |
| DTD | Division of Transportation Development |

| | |
|---|---|
| EA | Environmental Assessment |
| EEO | Equal Employment Opportunity |
| EIS | Environmental Impact Statement |
| EPA | Environmental Protection Agency |
| ESAL | Equivalent Single Axle Load |
| FAA | Federal Aviation Administration |
| FAPG | Federal Aid Policy Guide |
| FHWA | Federal Highway Administration |
| FIPI | Finding-in-the-Public-Interest |
| FIR | Field Inspection Review |
| FMV | Fair Market Value |
| FONSI | Finding of No Significant Impact |
| FOR | Final Office Review |
| FTA | Federal Transit Administration |
| HAZMAT | Hazardous Materials |
| HCM | Highway Capacity Manual |
| HES | Hazard Elimination System |
| HOV | High-Occupancy Vehicle |
| HTF | Highway Trust Fund (Federal) |
| HUTF | Highway Users Tax Fund (State) |
| IGA | Inter-Governmental Agreement |
| IRIS | Inventory Road Information System |
| ISA | Initial Site Assessment |

| | |
|---|---|
| ISTEA | Intermodal Surface Transportation Efficiency Act |
| IVHS | Intelligent Vehicle Highway System |
| JBC | Joint Budget Committee |
| MHT | Method of Handling Traffic |
| MMS | Maintenance Management System |
| MOA | Memorandum of Agreement |
| MOU | Memorandum of Understanding |
| MPO | Metropolitan Planning Organization |
| MUTCD | Manual on Uniform Traffic Control Devices |
| NCHRP | National Cooperative Highway Research Program |
| NEPA | National Environmental Policy Act |
| NHS | National Highway System |
| NPDES | National Pollutant Discharge Elimination System |
| OFMB | Office of Financial Management and Budget |
| OJT | On-the-Job Trainee |
| PPPP | Project Priority Programming Process |
| ProMIS | Project Management Information System |
| PS&E | Plans, Specifications and Estimate |
| PSI | Preliminary Site Investigation |
| PUC | Public Utilities Commission |
| ROD | Record of Decision |
| ROW | Right of Way |
| RPEM | Region Planning and Environmental Manager |

| | |
|---|---|
| RTD | Region Transportation Director |
| SAFETEA-LU | Safe, Accountable, Flexible, and Efficient Transportation Equity Act – A Legacy for Users |
| SHPO | State Historic Preservation Office |
| STIP | Statewide Transportation Improvement Program |
| TCP | Traffic Control Plan |
| TEA-21 | Transportation and Efficiency Act for the 21st Century |
| TIP | Transportation Improvement Program |
| TPR | Transportation Planning Region |
| UDBE | Underutilized Disadvantaged Business Enterprises |
| UMTA | Urban Mass Transportation Administration |
| USACE | U. S. Army Corps of Engineers |
| USC | U. S. Code |
| USDA | U. S. Department of Agriculture |
| USDOT | U. S. Department of Transportation |
| USFWS | U. S. Fish and Wildlife Service |
| VMT | Vehicle Miles Traveled |
| WASHTO | Washington Association of State Highway and Transportation Officials |

# Section 1
# Scoping, Budgeting and Programming

August, 2023 version

COLORADO
Department of Transportation

# Table of Contents



COLORADO
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# 1.0 Project Development and Management

## 1.01 Project Development Manual Purpose

At its core, the purpose of the Project Development Manual (PDM) is to describe the most common Colorado Department of Transportation (CDOT) processes predominantly within the preconstruction phase of the project lifecycle. While PDM guidance will bleed into the construction phase in the interest of content completeness and for reader convenience, the CDOT Construction Manual is the general authority for CDOT processes after preconstruction.

Likewise, while the PDM content can overlap with technical guidance documents, other manuals are the authoritative sources of the technical information required to successfully complete preconstruction activities. For example, the CDOT Roadway Design Guide, Bridge Design Manual and Drainage Design Manual are the go-to resources for each of these respective disciplines. Content within the PDM, in general, will overlap slightly with other resources or be wholly unique. A prime example of this being “Section 3 – Environmental”. CDOT has many other available environmental resources, yet, the guidance within “Section 3 – Environmental” was specially formulated by environmental staff for Project Managers (PM’s) and is found in no other document in its entirety.

### 1.01.01 Key Definitions and Concepts

#### 1.01.01.01 Project Management

Project management is the discipline of organizing and managing resources in a way that facilitates the successful project delivery within defined scope, quality, time and cost constraints. At CDOT, project management responsibilities will be applied in three phases:

Phase 1: Planning

Phase 2: Preconstruction

Phase 3: Construction

A project which is effectively managed has a clearly defined scope and strategy which is well executed, monitored, and controlled. In the end, the results meet stakeholder expectations.

#### 1.01.01.02 PM’s

The preconstruction PM for any given project is responsible for the following:

1. Development of the detailed Scope of Work (SOW), independent Work Hour Estimate (WHE) and the Independent Cost Estimate (ICE) through in-depth coordination with each specialty unit involved with the preconstruction tasks.
2. Development of the project schedule, with coordination from each specialty unit involved with the preconstruction tasks.
3. Coordination with the Resident Engineer and region Business Office on the budgeting phases and funding (as described in “Section 1.03”).
4. Coordinating staff assignments to ensure work is done in a manner which meets the objectives of the project. PMWeb’s role assignments functionality can assist to this end.
5. Ensuring that all of the work is being completed at an acceptable quality level, on time, within budget and scope.
6. For the purpose of this resource document, a project’s technical staff shall refer to those assigned the oversight or direct application of engineering principles, or both to a project.

Where applicable, a licensed Engineer in this capacity will assume all appropriate professional liability associated with the exercising of engineering decisions. For further information on professional engineering responsibilities or liability, or both, please refer to Colorado Department of Transportation (CDOT) Procedural Directive PD 0508.1 Requirements for Use of Professional Engineer's Seal.pdf. More information on sealing requirements is provided in Section 2.

### 1.01.01.03 Resident Engineer

For the purposes of this resource, the Resident Engineer refers to the supervisor of an engineering staff assigned the task of applying technical expertise to a project from scoping through construction. The Resident Engineer may delegate project management activities and tasks, as deemed appropriate. The Project Manager (PM) will work under their direct supervision and be responsible for the successful coordination, oversight and completion of all project-management-related activities detailed within these guidelines.

The appointment of project management responsibilities to any particular person does not transfer license liability which otherwise resides with licensed Professional Engineers involved on a project, for example, the Engineer of Record for a design discipline or, the Professional Engineer in Responsible Charge of construction. For further information on professional engineering responsibilities or liability or both, please refer to the CDOT Procedural Directive PD 0508.1 Requirements for Use of Professional Engineer's Seal.pdf.

## 1.01.01.04 Steps of Good Project Management

Successful project management relies on the following work processes:

1. **Initiate** – Define what is to be done to meet the requirements of the project; Authorize the work on the project; establish the project team; define the authority, responsibility, and accountability of the project team; establish the scope of the project; communicate with all project team members and region management personnel, as appropriate; utilize the project delivery plan to document this process.
2. **Plan** – Develop a project schedule defining what must be done and by whom, how will it be done, when must it be done, how much it will cost and what will be done with it; establish contingency plans; establish communication plans.
3. **Execute** – Perform the technical work and implement the project plan.
4. **Monitor and Control** – Assess the quantity and quality of the work; comparing where the project is to where it is supposed to be per the project schedule; taking action to correct for any deviations in the project plan updating the project schedule as needed; perform iterations of steps one, two and three, as needed.
5. **Close** – Identifying and documenting lessons learned; identify and document pitfalls for future projects; share lessons learned and pitfalls identified with colleagues; celebrate your accomplishments.

To assist Project Managers (PM's), CDOT has developed and provided a variety of tools. The primary project management tool is PMWeb. PMWeb allows the PM to assign project roles and create project records for the Project Delivery Plan, Communication Plan, Lessons Learned, Project Update, Cost Estimation, and so forth. Ultimately, successful project management is up to the PM's.

**Additional Resources:**

Support for using PMWeb to manage projects: PMWeb Home.

## 1.01.01.05 Avoiding Project Management Pitfalls

Lessons learned can offer insights making way for a smooth transition to a more project management-oriented organization. Examples of project management pitfalls include the following:

1. **No time to plan** – You have little chance of guiding your project towards successful completion if you do not have a plan. Failing to plan is planning to fail and in the end requires more effort putting out fires and cleaning up messes.
2. **Mum's the word** – Err on the side of over-communicating with the people who must do the work in the development of the plan.
3. **Inflexibility** – Be prepared to revise the plan – the plan **will** change!
4. **Control freak** – Stay in the know but do not attempt to serve as a single point of knowledge for the project.
5. **My precious data** – Disseminate information generously because people are more likely to want to stay in the loop than out.
6. **Didn't see that coming** – Identifying and documenting risks is like putting up lighthouses to guide projects to safe harbor.

# 1.02 Statewide Planning, Funding and Budget Process

## 1.02.01 Overview and Budget Authority

### 1.02.01.01 Statewide Transportation Improvement Plan (STIP)

Federal Regulations require that state transportation departments develop a STIP. STIP contains capital and non-capital transportation projects (see Process for Project Creation Guidance Final.doc) proposed for funding under 23 Code of Federal Regulations (CFR) 450, subparts B and C; as well as 23 US Code (USC) 134 and 135. Per these regulations, Colorado Department of Transportation (CDOT) develops a four-year STIP on an annual basis offering a four-year horizon of active transportation projects.

Federal regulations require each STIP to be fiscally constrained. All federally funded transportation projects must be included in STIP. It is Transportation Commission policy to include state funded projects and local projects with CDOT oversight in STIP.

### 1.02.01.02 Project Planning and Budget Process

Systems, Applications and Products in Data Processing (SAP) is an Enterprise Resource Planning (ERP) system that CDOT installed in 2006. SAP is the financial system of record for CDOT and provides information through interfaces to other state of Colorado systems including the Colorado Operations Resource Engine (CORE) and the Colorado Personnel and Payroll System (CPPS). Some functions the system is used for include:

1. Payroll
2. Human Resources
3. Budget
4. Project Systems
5. Work Orders
6. Project Financials
7. Purchasing
8. Inventory

CDOT also owns an additional SAP system called Public Budget Formulation (PBF) which includes the Planning Functions (including the Statewide Transportation Improvement Plan (STIP), Revenue Forecasting, Resource Allocation, Asset Management and Maintenance Level of Service (MLOS).

The first step in the planning process is inclusion in the long-range Statewide Transportation Plan. This plan covers a minimum 20-year planning horizon. Colorado's plan is developed by staff in the Division of Transportation Development (DTD). Instead of a list of projects, the plan looks at long-range visions, strategies, and goals for specific transportation corridors throughout the state. This plan is also updated every four years as required by regulations included in 23 US Code (USC).

Once a project is consistent with the visions, goals, and strategies of the Statewide Plan, it can be included in the Statewide Transportation Improvement Plan (STIP). Projects in STIP are linked to specific plan corridors or pools. Projects are included in STIP based on priorities determined by the Colorado Department of Transportation (CDOT) regions' Transportation Planning Regions (TPR's) and Metropolitan Planning Organizations (MPOs).

In addition, CDOT has developed a 10-Year Plan which includes high priority projects that will be included in STIP as funding becomes available. This list is developed with CDOT planning partners across the state and sets priorities for major projects outside of the asset management project lists.

Once a project is included in both the Statewide Plan and STIP, it can be budgeted.

### 1.02.01.03 Funding Sources Typical Projects

State, federal, and local funding sources are used to provide for all modes of transportation including aviation, transit, bicycle, pedestrian, rail, bridge replacement, and highways. Colorado's highway construction program is primarily funded through the Federal Highway Users Trust Fund, the Colorado Highway Users Tax Fund, and special legislation.

Projects that are funded completely with state funds are considered Non-Participating projects. The projects have different project delivery requirements then projects that are funded with Federal funds, Participating.

Many of the funding types have specific uses and constraints. For example, Highway Safety Improvement Program (HSIP) funds can only be used for specific types of safety improvements which are also included in the safety plan. Additionally, some funds that are tied to state or federal legislation may have to be encumbered or spent prior to a specific date. If you are not sure about uses for funding types in your project you can talk to your region asset manager, region Program Reporting Transparency Office (PRTO) Rep, or your region business manager.

### 1.02.01.04 Revenue Forecasting

Revenue forecasts include all “reasonably anticipated” revenues known to be available to the Colorado Transportation Commission to fund capital improvements, maintenance, and operations for existing and expanded facilities and services of the state of Colorado’s transportation system.

Every four to six years, Congress passes a new surface transportation act. For resource allocation purposes, it is assumed that the federal program will continue at the same funding level and contain the same program categories.

Because of the uncertainty of revenue, especially those variable sources such as state legislation, the availability of funds may impact a project delivery schedule.

### 1.02.01.05 Asset Management and 10 Year Vision Plans

In most cases, a project need will be identified from one of Colorado Department of Transportation’s (CDOT’s) planning lists: Asset Management, Safety Plan, Freight Investment Plan, and so forth. CDOT currently has the 10-Year Vision Plan and asset lists to help regions focus on priorities and needs.

### 1.02.01.06 Asset Management Program

CDOT's Asset Management Program develops and implements risk-based strategies to ensure the department's limited funding is applied to the right project, for the right asset, at the right time. Applying the correct treatment can extend the life of an asset in a cost efficient way. Preservation is much cheaper than reconstruction.

The asset programs managed by CDOT include:

1. Surface Treatment
2. Bridges
3. Maintenance
4. Buildings
5. Intelligent Transportation Systems (ITS’s)
6. Road Equipment
7. Culverts
8. Geohazards

9. Tunnels
10. Traffic Signals
11. Walls
12. Rest Areas

The Colorado Department of Transportation (CDOT) has developed its Transportation Asset Management Plan (TAMP) to define a framework for implementing asset management strategies. The most recent Transportation Asset Management Plan is published on CDOT's Transportation Asset Management webpage.

Each year the Transportation Commission approves the planning budgets for the asset program. The asset managers at Headquarters and within the region use the budget to create a prioritized project list. The region asset managers maintain the project lists and the region budget allocations. The region business manager can help identify the region asset managers.

## 1.02.01.07 Developing the Statewide Transportation Improvement Plan (STIP)

Development and ongoing maintenance of STIP is managed by staff in the Division of Transportation Development (DTD), in coordination with the Office of Financial Management and Budget (OFMB) at CDOT Headquarters. DTD and OFMB work closely with region planners, located in each CDOT region, to ensure that projects are included and updated as necessary. In turn, the region planners also work closely with their respective region Business Offices and engineering staff, as well as with local officials and representatives from each Transportation Planning Region (TPR).

All STIP projects must be consistent with specific Statewide Plan Corridor Visions before they can be included in STIP. CDOT budget categories and strategies must also be selected for each STIP project. The connection is made in the projects' master data in Systems, Applications and Products in Data Processing (SAP) and verified by DTD staff for consistency with the Statewide Plan.

At the beginning of any STIP development cycle, region planners must follow the process laid out in the Project Priority Programming Process (4P) guidelines on (STIP webpage). This process sets forth the parameters for ensuring an open public process for including projects in STIP. Region planners work with planning partners in TPR's to prioritize transportation projects for the next STIP cycle. The 4P process requires each CDOT region to hold individual meetings with each TPR, and then hold a joint meeting with all of its TPR's to set project priorities. Region planners may elect to also meet with individual counties, but this is not required.

Once priorities are selected, projects are entered in Systems, Applications and Products in Data Processing (SAP) and included in the draft Statewide Transportation Improvement Plan (STIP) document. Fiscal constraint is verified by the Office of Financial Management and Budget (OFMB) before requesting the Transportation Commission (TC) to release the Draft STIP for public review and comment.

After public review and comment, the Commission holds a public hearing to gather final comments on the draft document. Any necessary changes are made to the draft and submitted to the Commission for adoption. The adopted STIP is then forwarded to the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) for final approval.

Table 1.02 Below is a summary of the **Annual Development Schedule**:

| **Month(s)** | **Step in the Process** |
|---|---|
| June to September | Project Priority Programming Process (4P) meetings |
| October to November | Joint Transportation Planning Region (TPR) meetings |
| December to February | Regions submit projects for the draft STIP |
| March | Draft STIP released for public comment |
| April | Statewide Transportation Advisory Committee (STAC) discussion of draft STIP<br>Public hearing with the TC for draft STIP |
| May | TC adopts STIP |
| June | FHWA/FTA approve STIP |
| July 1 | New STIP effective |

## 1.02.01.08 STIP Projects

The STIP contains two types of projects: Regionally Significant and STIP Pool projects. A Regionally Significant project is assigned a unique STIP number pertaining to one STIP Project. Typically, a Regionally Significant project is a larger project and is considered significant to the TPR, or region, it serves.

Some Regionally Significant projects are set up as a STIP Pool in order to provide better transparency to the public regarding the phases for the project. The STIP parent project will be titled for the overall project, for example, I25 North, and each subproject below the parent will pertain to the larger project as part of the whole, for example, Segment 5.

More often, however, Statewide Transportation Improvement Plan (STIP) Pool projects are location-specific projects that are listed under a parent STIP number. Examples would be a region's Surface Treatment or Bridge On-System Pools. STIP Pools provide more flexibility for both budgeting and STIP amendments.

See Samples of Both Regionally Significant Projects and STIP Pools.pdf.

### 1.02.01.09 Fiscal Constraint

STIP must be fiscally constrained to be approved by the Federal Highway Administration (FHWA) and and Federal Transit Administration (FTA). The Colorado Department of Transportation (CDOT) looks for constraint by CDOT region, CDOT program, and fiscal year for federal and state dollars only. Local dollars are not constrained.

Fiscal constraint for STIP is determined in Systems, Applications and Products in Data Processing (SAP) by calculating program budget pool amounts against what is STIP'd and budgeted. Funding program amounts are determined through program distribution. These amounts are loaded and stored in Program Budget Pools in the FM Module in SAP after Program Distribution is adopted by the Transportation Commission. As transactions occur in the FM budget pools, fiscal constraint is based on the adjusted totals using the following formula:

Unbudgeted = Amount Programmed in STIP minus Budgeted

Unprogrammed = Budget Pool minus Unbudgeted total from above

This remaining unprogrammed amount is what is still available to the STIP toward other projects. Budget actions must also be constrained to both the STIP and Regional Pool. Within a STIP Pool, a STIP Work Breakdown Structure (WBS) element may be budgeted more than it is programmed, as long as the parent STIP maintains fiscal constraint.

Fiscal constraint may be verified daily by using the STIP Reconciliation Report available in the CDOT Application for Reporting (CAR) system. Region planners and Business Office staff can assist you if you have trouble finding or using this report.

### 1.02.01.10 STIP Amendments, Administrative Modifications, and Transportation Improvement Program (TIP) Amendments

Once STIP is adopted, it can be modified as needed. There are three types of STIP changes: STIP amendments, administrative modifications, and TIP amendments. For detailed information, please refer to the STIP Amendment Guidance on (STIP webpage). A brief summary of each type of modification is provided below.

**Statewide Transportation Improvement Plan (STIP) Amendments:**

Must go through a 30-day public involvement process and then be approved by the Transportation Commission. After the Commission approves these amendments, they are forwarded to Federal Highway Administration (FHWA) and Federal Transit Administration (FTA).

For amendments that occur outside of a Metropolitan Planning Organization (MPO)-area there are four different actions that can trigger an amendment:

- More than $5,000,000 is added to or subtracted from the original approved budget
- Environmental finding is necessary
- Major scope change, such as adding more than one mile of pavement reconstruction
- New standalone projects that are Regionally Significant

**STIP Administrative Modifications:**

Are minor changes to STIP projects that do not fall under any of the amendment requirements. These administrative modifications may be processed without a public comment period or Commission or FHWA and FTA approval. These changes are effective in one business day.

**Transportation Improvement Program (TIP) Amendments:**

Metropolitan Planning Organizations (MPOs) must follow separate federal regulations to develop and amend their TIPs. Once a MPO Board/Council adopts a TIP, it must be approved by the governor. The governor also approves any TIP amendments that are made. In Colorado, the governor has delegated authority to the Colorado Department of Transportation (CDOT) executive director to approve TIP amendments (the governor still approves new TIPs.

TIP amendments are incorporated into STIP administratively once approved by the governor, or their delegate. However, TIP amendments may take up to four months to be completed by the MPO, depending upon each MPO's individual process. Once a TIP amendment is approved by the MPO Board and submitted to CDOT, it is aggregated on a monthly basis and passed along to the executive director for approval. Afterwards, this is sent to FHWA and FTA for informational purposes.

## 1.02.01.11 Statewide Transportation Improvement Plan (STIP) Reports

There are several STIP reports available for your use in the Colorado Department of Transportation (CDOT) Application for Reporting (CAR). The most common reports are the STIP Summary Report and the Reconciliation Report. If a user has any questions about how to

pull a report, they can reach out to a Statewide Transportation Improvement Plan (STIP) manager in either the Division of Transportation Development (DTD) or the Office of Financial Management and Budget (OFMB), as well as their region planner.

**STIP Summary Report:**

The STIP Summary Report details the funding for all STIP projects in the current STIP. It shows the STIP number, the project description, the fund program and fund source, and the amount of funding by fiscal year. Since STIP can be amended on a daily basis, this report reflects STIP by providing current STIP information on a day-to-day basis. The report is sorted by Colorado Department of Transportation (CDOT) region and then by STIP number. The report allows you to see all the funding programmed to a specific STIP number in one place. Each week, updated versions of the STIP Summary Report and Enhanced STIP Summary Report are posted on the external CDOT site (STIP webpage).

**STIP Reconciliation Report:**

The purpose of the STIP Reconciliation Report is to show that STIP is fiscally constrained. The report shows funding for STIP projects broken down by CDOT region, funding program, and fiscal year. This report also shows budget action totals taken against any given STIP number within specific funding programs.

The Reconciliation Report provides a very good snapshot of each funding program overall. It provides crucial information concerning how much money has been programmed in STIP versus how much has been budgeted and what is remaining both to budget or program. However, using the Reconciliation Report to track specific STIP project information is not recommended because information is sorted by funding program and not by STIP projects.

**Access to Reporting:**

The STIP Summary Report may be found online (STIP webpage). It is updated weekly. The STIP and the STIP Reconciliation Report may also be found in the CDOT Application for Reporting (CAR) via the Systems, Applications and Products in Data Processing (SAP) portal on the internal website. Region planners and OFMB STIP managers can help the user if they need assistance in accessing this or other reports.

## 1.02.01.12 STIP Resources

The DTD and Office of Financial Management and Budget (OFMB) manage STIP and provide guidance to the regions regarding STIP development and amendments. If you need assistance with STIP, please contact the DTD STIP manager.

**Additional Resources:**

Statewide Transportation Improvement Plan (STIP) information on (STIP webpage)

Statewide Transportation Plan (2045) on Your Transportation Priorities site

10-Year Vision on Your Transportation Priorities site

Transportation Asset Management on Programs site

## 1.02.02 Special Topics in Statewide Planning and Budget

### 1.02.02.01 Statewide Bridge & Tunnel Enterprise (BTE) and Funding Advancements for Surface Transportation and Economic Recovery (FASTER)

**Background:**

The legacy Colorado Bridge Enterprise was formed in 2009 by the Funding Advancements for FASTER legislation (Senate Bill 09-108) to accelerate the repair, reconstruction, and replacement of rapidly deteriorating bridge infrastructure throughout the state. Subsequently, the passage of a landmark transportation bill (Senate Bill 21-260) renamed Colorado Bridge Enterprise to BTE or Enterprise, and expanded the scope of the Enterprise to include tunnel projects in 2021. Per Colorado Revised Statutes (CRS) 43-4-805, BTE operates as an autonomous government-owned business within the department charged with financing, repairing, reconstructing, and replacing any designated (poor-rated) bridge in the state and completing tunnel projects.

BTE is constituted as an Enterprise per Article X, Section 20 of the Colorado Constitution, which allows BTE to impose a bridge safety surcharge fee, bridge and tunnel impact fee, and bridge and tunnel retail delivery fee to accomplish its business purpose. Enterprise status also allows the program to issue revenue bonds and enter into agreements with governmental and non-governmental agencies for loans or grants. Projects funded through BTE have unique requirements designed to maintain statutory compliance and the program's Enterprise status. General inquiries on BTE or requests for support can be directed to the Enterprise's shared mailbox at: cdot_bteadmin@state.co.us.

**BTE Oversight and Staffing:**

BTE has a Board of Directors (BOD), or board, that is independent of the Colorado Transportation Commission. The board manages the business and affairs of the Enterprise and consists of the members of the Transportation Commission, as determined pursuant to

Section 43-1-106(1), Colorado Revised Statutes (CRS) The board appoints, with the consent of the Colorado Department of Transportation (CDOT) executive director, an Enterprise director who directs or manages overall Enterprise staff and functions. An organization chart illustrates, Statewide Bridge & Tunnel Enterprise (BTE) Organizational Chart.pdf.

To execute and achieve the goals of an independent government-owned business and maintain statutory compliance, BTE staff participate in the development of a project from concept through completion. BTE will assign a staff member(s) to each project to serve as a technical expert and primary liaison to CDOT region staff. BTE staff will support the region by:

1. Providing input on individual project goals, scope, budget, structure design, procurement, and schedule to maintain consistency with program objectives;
2. Performing BTE Project Eligibility Reviews of project features at appropriate intervals during development to ensure that only eligible project features are funded through the BTE;
3. Coordinating project budget requests;
4. Tracking the performance of each project through monthly schedule reporting and advising the BTE Schedule Change Control Board (SCCB); and
5. Assisting with other policies, procedures, and processes that are unique to BTE funded projects.

The SCCB acts in an advisory capacity to the board, the BTE director and BTE staff, with the goal of addressing underperforming projects, as determined through monthly schedule analysis, in accordance with the applicable BTE guidance documents. Information on the BTE project schedule reporting process is provided later in the BTE section.

**Policy Directive BE16.0 and Procedural Directive BE16.1:**

If it is anticipated that a project will be BTE funded, BTE staff should be contacted prior to any planning activities to review project eligibility, priority, program resource availability, and other unique considerations for BTE projects. Detailed BTE roles and responsibilities along with other pertinent requirements for BTE projects are outlined in a Policy Directive PD BE 016.0 Oversight of Funding for State Bridges and Tunnels.pdf and a Procedural Directive PD BE 016.1 Management of Funding and Selection of Bridge and Tunnel Projects.pdf.

## 1.02.02.02 BTE Project Requirements

**Scope for BTE Funded Projects:**

A project must meet specific criteria to be eligible for the Statewide Bridge & Tunnel Enterprise (BTE) funding. Policy Directive BE16.0 and Procedural Directive BE16.1 outline these criteria and the prioritization and selection process for bridge and tunnel projects funded through the Enterprise. BTE funding can only be used for projects to repair, rehabilitate, reconstruct, or replace “designated bridges” as defined by the statute. It should be noted that there is no legislative mandate for BTE to address every designated bridge, and that other funding sources can also be used for this purpose. However, BTE strives to address as many bridges as possible with the resources available. Designated bridges must meet the three following criteria:

1. Rated poor based on the National Bridge Inspection Standards rating scale,
2. Classified as a major structure (over 20’-0” span), and
3. Located on the state highway system (Colorado Department of Transportation (CDOT)-owned).

Funding can also be used for projects to repair, maintain, or enhance tunnels that are located on the state highway system. BTE bridge funding is intended to be used for in-kind bridge replacements so non-bridge scope should be limited to what is necessary to replace or rehabilitate the bridge and bring the bridge up to current roadway and structural standards. For tunnel projects, the Project Manager (PM) should restrict BTE-funded tunnel scope to what is required to repair, maintain, or enhance the tunnel asset. Scope items outside of the tunnel, such as roadway approach work, should be limited to the extent possible. Complex projects involving an alignment shift or Environmental Assessment, or Environmental Impact Statement compliance have unique eligibility considerations, so contact should be made with BTE staff early in the project planning process.

To the extent possible or practical, the PM should avoid increasing the project scope during the project development process. Such a change in scope may create the need for additional funds, a different type of funding, or both for the project.

**Eligibility Review:**

To ensure that Enterprise eligibility requirements are met, projects will go through the BTE Project Eligibility Review process. These reviews should begin early in the project planning process and should be revisited as the project scope is refined. The assessments include reviewing the Scope of Work (SOW), plans, specifications, cost estimates, and all other pertinent project information (studies, National Environmental Policy Act (NEPA) documents, and so forth). BTE guidance documents will be used to determine the split of BTE eligible and ineligible scope items. In cases where no eligibility guidance exists, it may be necessary to use engineering judgment or experience to determine the split of eligible and ineligible items. The BTE project liaison or delegate will perform the initial eligibility review and review findings

with region staff to gain consensus. Federal Highway Administration (FHWA) and Attorney General's Office involvement may be warranted for projects with unique or complex scope elements. After a consensus is reached by all stakeholders, the Statewide Bridge & Tunnel Enterprise (BTE) Project Eligibility Review, which will formally document the BTE funding limits, will be memorialized in an eligibility review memo by BTE staff.

In cases where BTE funding is being used to perform bridge or tunnel work as part of a larger project, or if a project is found to have ineligible scope items, the Project Manager (PM) will be required to set up a combination project with a unique project subaccount number(s) to delineate eligible and ineligible scope items into separate projects. A proportional share of items applying to both scopes, such as mobilization, traffic control and so forth, should be assigned to each subaccount. When setting up the combination project, the larger of the two projects will be assigned as the parent project.

The BTE project liaison will be available to advise the region on the proper delineation of eligible and ineligible items throughout this process as requested

**Setting Up a BTE Project in Systems, Applications and Products in Data Processing (SAP):**

Setting up BTE projects in SAP requires the PM to use different identification codes than Colorado Department of Transportation (CDOT) projects, as shown below. To simplify the process, use the BTE Capital Engineering Projects template to auto-populate these fields. Please note that tunnel projects or bridge preventative maintenance projects that will be capitalized to a CDOT asset, not a BTE asset, will require that the project is set up as a CDOT project with a unique provider code to apply the appropriate accounting treatment. Please contact the BTE project liaison for any questions related to BTE funded project setup.

1. Fund Number: 538 is the Fund Type
2. Fund Center: 400
3. Project Prefix: FBR
4. Org Group: B8800-538 is the Responsible Cost Center
5. Profit Center: 5000-538 instead of the normal CDOT value 5000-010
6. Investment Profile: Z00992 instead of the normal CDOT value of Z00990
7. Unlike typical CDOT projects, budget actions for funding BTE projects will be completed by BTE staff and Office of Financial Management and Budget at Headquarters rather than at the regional level.

**Schedule and Schedule Change Control Board (SCCB):**

Statewide Bridge & Tunnel Enterprise (BTE) staff uses a programmatic schedule to track the performance of ongoing and planned bridge and tunnel projects and report to SCCB as outlined in Procedural Directive 16.1. The phases or activities included in the schedule for each project will be determined based on the selected project delivery method and other project specific considerations. The pertinent preconstruction phases (right of way, utilities, design, environmental, and miscellaneous) and the construction phase are typically included, however, the appropriate phases will be identified through coordination between region and BTE staff.

BTE staff will coordinate with region staff to baseline each established milestone or activity as required based on BTE guidance documents. Once the project baseline is established, the schedule is updated monthly with physical progress achieved to date for milestones or activities using input requested from region staff. BTE requests monthly schedule updates from Project Managers (PM's) through use of Google Forms and emails sent from a shared email account, cdot_bteadmin@state.co.us. When a PM completes a form and submits, the responses will be reviewed by BTE staff and incorporated into the schedule.

The schedule calculates key metrics such as Earned Value (EV), Planned Value (PV) and Schedule Performance Index (SPI). These metrics are calculated at the phase, project, regional and program levels and are reported to regional leadership and SCCB. A SCCB meeting is held every two months to review the schedule and discuss the status of underperforming projects. Adjustments to the project baseline schedule require approval from the SCCB. BTE staff are responsible for facilitating the SCCB meeting and can assist the region with the preparation of baseline schedule change requests upon request.

**Project Funding Requests:**

BTE staff will follow the guidance outlined in its policy directives when evaluating and recommending projects for funding to the BTE Board of Directors (BOD). These requests are presented monthly (on an as needed basis) at the BTE BOD meeting, via the BTE budget supplement process. BTE staff circulate a monthly call for budget supplement requests to region staff. Requests and all supporting documentation are due to BTE staff on the third Wednesday of each month for a budget supplement that will be considered by the BOD in the subsequent month.

For inquiries on the BTE budget supplement process or to be added to the email distribution list, please contact BTE staff at cdot_bteadmin@state.co.us.

When requesting a design phase budget supplement, BTE requests the following supporting documentation:

1. Work hour project cost estimating worksheet to estimate in-house and consultant costs.
2. Project expenditure forecast showing the month and fiscal year of expenditures.

When requesting a construction phase budget supplement, Statewide Bridge & Tunnel Enterprise (BTE) requests the following supporting documentation:

1. Work hour project cost estimating worksheet to estimate in-house and consultant costs.
2. Construction Engineering (CE) worksheet to determine the project specific CE rate.
3. AASHTOWare/TRNS*port estimate.
4. Independent cost estimate for each consultant task order (completed by in-house personnel).
5. Project expenditure forecast showing the month and fiscal year of expenditures.

The Work Hour and Project Cost Estimate Worksheet and CE Calculation Worksheet can be found in the Bridge and Tunnel Enterprise Resource Web Folder of multiple documents.

Requests to add additional budget to a project will be subject to the Policy Directive PD 0703.0 Annual Budget, Project Budgeting and Cash Management.pdf guidelines and the project transaction Project Related Transactions matrix in the e-February 2023 TC – PD 703.0 Matrix – FINAL.xls established by the Office of Financial Management and Budget (OFMB).

Depending on the amount of the requested increase, some requests may require approval from the Executive Management Team (EMT) or Board of Directors (BOD). For example, a project needs additional construction phase funding due to a change condition. If the cumulative value of this request and prior requests to increase the budget is under the Policy Directive 703.0 staff authority threshold, the fund transfer can be completed in Systems, Applications and Products in Data Processing (SAP) at the discretion of BTE and OFMB staff. If the cumulative value of the budget increase(s) exceeds the Policy Directive 703.0 threshold, EMT or BOD's approval will be required to process the request. In this case, BTE staff will request EMT approval in coordination with OFMB and will process the budget action in SAP if the request is approved.

If BOD approval is required, the request for additional funds will be submitted to BOD for approval via the monthly BTE budget supplement process. If the request is approved by the BOD, BTE staff will process the budget action in Systems, Applications and Products in Data Processing (SAP) in coordination with the OFMB.

In addition to Statewide Bridge & Tunnel Enterprise (BTE) requirements above there are additional items that need to be provided to your Business Office to support a request for an increased budget for construction are:

1. Current project financial statement (Form 65 Project Financial Statement)
2. Current overs/unders report
3. Draft Form 90 Contract Modification Order (CMO)

**Adding Other State or Local Funding Sources**:

For project planning purposes, it should be assumed that other state or local agency funds cannot be used for a BTE funded project unless a combination project is being utilized. The Project Manager (PM) will be required to set up a combination project with a unique project subaccount number(s) to delineate eligible and ineligible scope items into separate projects. Other state or local agency funding sources can be used to fund non-BTE eligible scope items through the project containing the ineligible scope items. The combination project will be entered in AASHTOWare/TRNS*port and the project with the largest budget will be the parent project, regardless of funding source.

**Federal Participation:**

BTE's primary revenue sources, the Funding Advancements for Surface Transportation and Economic Recovery (FASTER) Bridge Safety Surcharge, Bridge and Tunnel Impact Fee, and Bridge and Tunnel Retail Delivery Fee, are state funding sources. Therefore, projects that are solely BTE funded may be exclusively state funded, however, BTE projects can be partially funded through federal funding sources. Common examples include:

1. Projects that are awarded federal discretionary grant funding.
2. Projects that were initially funded by Federal Highway Administration (FHWA) and ultimately transferred to BTE and completed using BTE funding.
3. Projects funded through financing programs with FHWA funds obligated for debt service payments.

Please coordinate with the BTE project liaison to determine whether a project has federal funding sources.

**Construction Engineering (CE) Pool Exemption:**

BTE projects are required to be CE Pool Exempt as approved by the chief financial officer and Chief Engineer to avoid the comingling of funding sources. Being Pool Exempt, BTE does not

include the base rate, which is the major deviation from the guidance presented under 1.03.03.07 Construction Engineering (CE) & indirects. Like Colorado Department of Transportation (CDOT) projects, Statewide Bridge & Tunnel Enterprise (BTE) projects do not have a fixed CE rate and the CE cost is calculated on a project-by-project basis using the estimated cost for in-house and consultant construction engineering.

For projects with direct-to-project CE charges, in-house and consultant project personnel are required to charge their time directly to the construction phase of the project rather than to the region CE Pool. Since all construction engineering expenditures associated with BTE projects are direct-to-project, all work must be estimated and budgeted accordingly. The charges that need to be accounted for in the estimate include, but are not limited to the following:

1. CDOT personnel charges to the project phase, including benefits (timesheet charges);
2. Consultant task orders for post design services and construction engineering;
3. Indirect charges at the current rate agreed to with the FHWA (applied to both internal charges and consultant charges); and
4. Materials test costs from the central lab.
5. See 1.03.04.06 Construction (Work Breakdown Structure (WBS) - XXXXX.20.10) for comprehensive list of eligible construction phase costs.

All CE costs should be estimated on the Work Hour and Project Cost Estimate Worksheet and the CE Calculation Worksheet as part of the process for estimating the budget request for the construction phase budget supplement. These worksheets can be found in the Bridge and Tunnel Enterprise Resource Web Folder of multiple documents. The previous subsection contains additional information regarding BTE project funding requests.

When developing the CE estimate, all meetings required throughout the construction phase should be considered. This includes, but is not limited to, the following:

1. Partnering
2. Preconstruction
3. Presurvey
4. Bridge demolition
5. Preerection
6. Prepour
7. Prepaving

8. Regular coordination and scheduling meetings, and
9. Any other meetings the project is expected to require

When estimating the actual hours required for construction engineering, the following personnel and support units should be considered to ensure all potential charges are estimated:

1. Resident Engineer
2. Project Engineer
3. Inspectors (overtime for non-exempt employees should be considered)
4. Testers (overtime for non-exempt employees should be considered)
5. Region Materials Lab (site visits, Independent Assurance Tests (IAT's), deck pour assistance, submittals)
6. Region Utilities Unit
7. Central Lab Headquarters (HQ) test costs for samples submitted to HQ for testing
8. Staff Bridge
    a. Fabrication inspections
    b. Construction assistance
    c. Required project acceptance final bridge review
9. Bridge Designer – Staff Bridge or consultant as applicable
    a. Review of shop drawings
    b. Construction assistance
10. Staff Geotechnical Personnel
11. Environmental Group Support (National Pollutant Discharge Elimination System (NPDES), Threatened and Endangered (T&E) inspections)
12. Public Relations Support
13. Finals Engineers
    a. Processing Change Modification Orders (CMO's) in Site Manager
    b. Finals package review and check
14. Staff Branches (Area Engineers and Assistant Area Engineers)
    a. CMO review/assistance

b. Other assistance

15. Consultant Construction Staff
16. Other Staff as Required

The Program Reporting Transparency Office has developed a Construction Management (CM) Staffing Tool, in the Tools Catalog of the Project Management site, to assist project teams with developing cost estimates.

**Colorado Department of Transportation (CDOT) Indirect Charges:**

CDOT indirect charges are collected at the current rate for all work charged on Statewide Bridge & Tunnel Enterprise (BTE) projects.

**Setting up a BTE Project in AASHTOWare and in Systems, Applications and Products in Data Processing (SAP) Form 65 Project Financial Statement:**

Bridge & Tunnel Enterprise projects need to be set up in AASHTOWare/TRNS*port and SAP in accordance with CDOT's preconstruction guidance. Further details and user guides can be found on the AASHTOWare project website.

Once a Form 65 has been created for a BTE project, it is critical that the correct estimated amounts are on the Form 65. If inconsistencies are found, please reach out to Projects and Grants Accounting in the Division of Accounting and Finance.

The customer email address for inquiries is dot_projectsandgrantsaccounting@state.co.us or additional resources can be found on their Compliance for Accounting & Finance.

**Asset Transfer from CDOT to BTE:**

In accordance with intergovernmental agreements between BTE and CDOT, the Enterprise is responsible for the future maintenance of the bridges that are funded through the program. To accomplish this, BTE is required to take ownership of these bridge assets as follows:

1. For a bridge that is repaired or rehabilitated and maintains its existing structure number, the ownership transfer will occur upon completion of design and prior to the commencement of construction through a BTE Board of Directors resolution.
2. For a bridge that is replaced, a new structure number is created and BTE ownership of the new bridge is recognized upon project completion through an annual BTE Board of Directors resolution.

Statewide Bridge & Tunnel Enterprise (BTE) staff will facilitate the asset transfer and recognition processes. For tunnel projects, asset ownership is not transferred.

## 1.02.02.03 Shopping Carts for BTE Projects

A shopping cart required for BTE projects will need to be created differently than a typical Colorado Department of Transportation (CDOT) capital engineering project.

**General Requirements:**

For any shopping cart created for a BTE project, a key difference is that “Plant 7001” needs to be used rather than the Plant of your region. Unfortunately, the plant field in Service Request Management (SRM) for shopping carts is not an editable field. If a Plant other than 7001 is entered and saved incorrectly, the shopping cart will need to be rejected and a new shopping cart created with the correct plant.

BTE shopping cart releases are available for all Program Engineers statewide to complete. They are also available for all Business Office managers to complete for the second required release. The intent is for the responsible region to approve their own shopping carts.

**Shopping Cart for Construction Engineering (CE) Services:**

The General Ledger (GL) account number for BTE projects will be based on whether there are federal funds on the project or if it is state funded only.

1. GL number for BTE funded projects is 4192000010
2. GL number for BTE projects with federal participation is 4192000011

A caveat is that even though your project may not have a separate federal funding source, such as FABL1CE or FL1CE, it still may have federal funds associated with debt service payments, which would require the shopping cart to get set up as federal participation. Additional information on federal participation in BTE projects can be found in the previous BTE subsection.

## 1.02.02.04 Other Funding Sources and Special Project Designations

**Emergency Projects:**

An emergency is an unexpected event creating an immediate threat to public health, welfare, or safety, the functioning of state government, or preservation or protection of property which requires immediate response. There is insufficient time to obtain a written waiver of the requirements for issuance of a commitment voucher pursuant to this fiscal rule before requiring

goods or services to respond to the emergency. If a situation does not pose an immediate threat to the public health, welfare, or safety, the functioning of state government, or preservation or protection of property, it is not an emergency and these procedures cannot be used.

Fiscal Rule 2-2 of the State of Colorado Fiscal Rules allow Colorado Department of Transportation (CDOT) to make disbursements for emergency procurements upon presentation of invoices, receipts or other statements describing goods or services purchased and the amount to be paid. Goods and services necessary to respond to an emergency may be procured immediately, without issuing a commitment voucher or obtaining a written waiver from the state controller where all of the following conditions are met:

a. The nature of the threat requires an immediate response and there is insufficient time to issue a commitment voucher;

b. The procurement is authorized by the individual who has final executive authority for an agency, or his or her delegate;

c. The procurement is made with such competition as is practicable under the circumstances;

d. A commitment voucher is executed as soon as possible to define future performance obligations, if any, of the vendor and state, as required by fiscal rules; and

e. The agency notifies the Office of the State Controller in writing as soon as possible of the circumstances, goods and services purchased, and the dollar amount of the commitment.

In an emergency, only those goods and/or services that are necessary to respond to the emergency may be acquired without the execution of a state contract. Emergency procurements shall be made with such competition as is practicable under the circumstances. Once the emergency is ended, conventional contracting techniques must be used for any remaining work.

By declaring an emergency it is recognized by the state controller, CDOT controller, and CDOT upper management that time is of the essence. Because time is critical, the most cost effective procedure from a budget perspective may not be the most prudent course of action. The Project Manager (PM) must first focus on alleviating the immediate threat to the public health, welfare or safety, the functioning of state government, or the preservation or protection of property. The PM must also make wise use of the state's resources.

A written report of emergency services or purchases must be made to the agency Chief Financial Officer (CFO) and the state controller no later than the end of the next business day. Fiscal Rule 2-2 grants the executive director the authority to obtain goods and services in an

emergency without execution of a state contract. The executive director has delegated that authority to the deputy executive director and the Chief Engineer. Only the executive director or one of the delegates may declare an emergency pursuant to Fiscal Rule 2-2.

When an emergency occurs, the region authority, Region Transportation Director (RTD) or maintenance superintendent, should be notified of the nature of the emergency.

The region authority will:

1. Draft a written declaration of the emergency to be signed by the executive director or their delegate detailing the immediate threat which requires an immediate response per Fiscal Rule 2-2. This notice shall detail the limits of the emergency work and the contracting method to be used for any work which will be required subsequent to the immediate emergency.
2. Designate a Project Manager (PM) who is the Colorado Department of Transporation (CDOT) employee authorized to acquire the resources necessary to prudently respond to the emergency. The PM is also responsible for oversight of the Contractor's activities.

The PM will:

1. Solicit three bids to procure a Contractor for the emergency work. In the event the emergency will not allow for such solicitation of three bids, they must document the reason why and all steps taken to ensure the process is as competitive as is practical.
2. Contact the region authority periodically to provide progress updates.
3. No later than the end of the next business day after the emergency occurs, forward the written authorization to use the emergency procurement process signed by the executive director or their delegate to the state controller.
    a. Written request: The PM must submit a written request for emergency contracting to the Chief Engineer. The written request must include the items listed below.
        i. A justification that an emergency exists in accordance with Fiscal Rule 2-2 (above). The explanation must be complete enough to describe the problem and how it qualifies as an emergency.
        ii. An explanation of why the normal procurement procedures will not permit procurement of a Contractor quickly enough to address the emergency. (The request should state the time that will be required to obtain a Contractor using the normal procurement process and why the emergency requires a quicker response). Please note the Engineering

Contracts manager may authorize a two week Ad for projects when circumstances warrant an abbreviated advertisement period. Therefore an explanation must show why a two week Ad period would not permit a sufficient response to the emergency.

iii. The scope of the emergency work, the limits of the project and the estimated cost including Construction Engineering (CE) and indirects.

b. Report to controller: The Project Manager (PM) must make a written report of the circumstances and the nature and value of the commitments to the Colorado Department of Transportation (CDOT) controller and to the state controller.

4. No later than the end of the next business day after the emergency occurs, submit a written request for emergency contracting to the Engineering Contracts Unit.

Commensurate with the circumstances of the emergency, the most competitive process possible should be utilized to select a Contractor. The following procedures will be used:

1. Preliminary Investigation: The PM will perform the preliminary investigation and determine the best course of action. This involves determining what work needs to be done, how much needs to be done, and how it will be paid. For many emergency responses, the rapid response required and the unknown details of the work will dictate that the work be measured and paid for on a force account basis. The cost of the work can be estimated using pay items and quantities, independent cost analysis, or a combination of both. The following items must be determined:

    a. The scope and nature of the emergency work.

    b. Start date and time frame for completion.

    c. Pay items and estimated quantities (where appropriate).

    d. Estimated total construction phase cost, which includes construction costs with CE base rate applied, CE direct-to-project charges, and indirects. See “Section 1.03.03.06” Project Estimate for more details.

    e. Method of measurement and basis of payment.

2. Solicitation: As circumstances allow, bids shall be solicited by phone or email from at least three qualified Contractors that can respond quickly. It is acceptable to solicit a bid from a Contractor already working in the area. If the circumstances of the emergency, such as time constraints, limited interest, or lack of qualification makes it impractical to solicit three bids, these reasons must be documented on a project by project basis.

Note: Issuance of a Change Modification Order (CMO) to add the emergency work to an existing project with a Contractor constructing a project nearby is prohibited. If the work was not contemplated by the original solicitation for that Contractor, then it is beyond the scope and the price agreed to in that contract. A violation of Colorado Department of Transportation (CDOT) procedures and state statutes applicable to government contract bidding would result if CDOT disregarded this prohibition. In such a situation, the work must be done under a separate contract. A nearby Contractor may do the work, but a new contract would be needed for the new work.

3. Force Account Work: If a force account is necessary, all Standard Specifications for Road and Bridge Construction, as amended (Standard Specifications) shall apply. Such work shall be paid for in accordance with “Subsection 109.04” of the Standard Specifications. If there are extenuating circumstances that make it impossible to do so, clear evidence documenting the specific circumstances that prohibit compliance with the Standard Specifications must be produced and authorized by the Region Transportation Director (RTD) in writing. This is required for any emergency project that exceeds labor and equipment rental rates or any emergency project that cannot provide certified invoices to document fair prices. For example, the emergency may justify non-stop work activity for a short duration, which generally warrants higher rates.

   Contact the Engineering Estimates and Market Analysis Unit of the Construction Engineering Branch, as needed, for assistance in providing the required evidence. Force account work on emergency projects may not continue for more than two weeks without express written consent of the executive director, the deputy executive director or the Chief Engineer. In no event shall force account work on an emergency project be continued beyond one month.

4. Work Authorization: A written authorization on CDOT Form 105 Speed Memo, must be given to the Contractor performing the emergency work prior to the commencement of work. The speed memo must either provide the Contractor notice that the Standard Specifications apply to the work to be performed or clearly state the agreed upon rates for labor and equipment. The Contractor and the Project Manager (PM) or Project Engineer must sign and return the speed memo before proceeding. The written authorization must also include the following:

   a. Scope of work and project limits
   b. The required time to start work
   c. Expected duration of the work
   d. Estimated quantities

e. Method of measurement

f. Estimated total cost of the work

Finally, all speed memos must include the following statement at the end of the memo, “By signature below, the Contractor agrees to perform the work and be compensated as detailed above.”

5. Contracting Information: As soon as practical, the Project Manager (PM) must submit the following information to the Engineering Contracts Unit for the preparation and execution of the emergency contract:

    a. A copy of the request for emergency contracting approved by the Chief Engineer.

    b. All required procurement documentation and a description of the method used to select the Contractor, including an explanation if less than three Contractors were solicited, and a detailed justification if there was any deviation from department policy.

    c. The basis of payment for the contract:

        i. When the work is to be paid on an agreed unit price, submit the agreed prices, units, and estimated quantities, including justification for using the agreed unit price.

        ii. When a force account is used, documentation for payment must be submitted in accordance with “Subsection 109.04” of the Standard Specifications. If the hourly rates to be paid for labor and equipment exceed those that would be paid in accordance with “Subsection 109.04”, submit the agreed to rates and the justification for using the higher rates.

6. Contract.

    a. Payment prior to contract signing: Disbursement may be made upon receipt of invoices, receipts or other statements describing the goods or services utilized and the amount to be paid. However, a contract must be executed as soon as possible to define future performance obligations.

    b. Preparation and execution of contract: The Engineering Contracts Unit will prepare and execute the appropriate contract document as soon as practical after the emergency occurrence.

7. Administration of the Emergency Contract: The appropriate Colorado Department of Transportation (CDOT) region will administer the contract for the emergency work in accordance with CDOT policies and procedures.

8. Immediate Response: This procedure is to be used for immediate response to the emergency situation. Once the situation no longer constitutes an immediate threat to public health, welfare, or safety, the functioning of state government, or preservation or protection of property, it is no longer an emergency. Continuing work after dealing with the emergency requires evaluation of the situation and a decision of what contracting method to use for work subsequent to the emergency. Any misuse of the emergency contracting procedure may result in personal liability for the Colorado Department of Transportation (CDOT) employee who directs a Contractor to complete unauthorized work.

## 1.03 Project Scope, Schedule and Budget

Project Managers (PM's) will maintain the project scope, schedule, and budget within PMWeb. The planning level information is needed to create estimates for the total cost of a project for implementation into the Statewide Transportation Improvement Program (STIP). The scope, schedule and budget should be updated within PMWeb at a minimum after the Design Scoping Review (DSR) meeting, Field Inspection Review (FIR) meeting, Final Office Review (FOR) meeting, and the Engineer's final estimate for bid.

### 1.03.01 Project Creation via Systems, Applications and Products in Data Processing (SAP) and PMWeb

#### 1.03.01.01 Office of Financial Management and Budget (OFMB) and SAP Project Creation

Project creation is required in SAP and PMWeb. See below for who completes each required step. Projects require a large amount of descriptive information including brief descriptions of the work being performed and geographic information, routes, mile points and structure information.

**Please use the OFMB CJ20N Supplemental Guidance.doc for help setting up projects in SAP CJ20N.**

SAP Steps for new projects (click on link below to go to work instructions).

Project Creation ZJ08 Work Instructions

#### 1.03.01.02 Projects set up in PMWeb

To initiate PMWeb project set up, contact your region Program Reporting Transparency Office (PRTO) representative after the project has been set up in SAP CJ20N.

## 1.03.01.03 Description of Procedure for Project Creation

After a project has been identified as a need (likely from a planning list) and is part of the current Statewide Transportation Improvement Plan (STIP), it should be set up in Systems, Applications and Products in Data Processing (SAP). Although one project usually covers all phases, sometimes it becomes necessary to create multiple projects under one STIP number.

The following definitions will help determine what types of projects you are working on and how to get them set up in SAP and PMWeb.

Companion Project: a group of projects related to each other but having individual Project Control Numbers (PCN's) and advertised separately. This could mean a design project that goes to construction using multiple PCN's. This could also be multiple phases of an alternative delivery project. The "primary" project is often the design project or the project that is expected to be open the longest. Companion projects have common begin and end dates, but have unique advertisement dates and scopes from other companion projects.

Combo Project: a set or group of projects that will be advertised together but have different funding sources and individual PCN's. An example would be a Bridge Enterprise (BE) project advertised with another project. The "primary" project is usually the project with the largest funding package. Combo projects also have common project deliverables, scopes and other project details.

- When entering into PMWeb maintain the project delivery plan and deliverables in the primary project.
- All projects will need to have a scope, the construction task dates, an estimate and forecast entered into PMWeb.

Related projects: a set of projects that are not advertised together and not necessarily connected financially with other projects, but it may be beneficial for Colorado Department of Transportation (CDOT) to package information together. Some examples are Safer Main Streets, Vision Zero.

The Project Manager (PM) begins the process in SAP with Transaction Code ZJ08. ZJ08 starts a workflow that is routed to the Office of Financial Management and Budget (OFMB), the person who initiates ZJ08, and the Region Business Office. See the online SAP work instructions for more details on project creation steps and information required in SAP. Checklists provided in SAP training website show the participants and order for the SAP workflow.

Project Description (Name) – ZJ08

Please refer to the naming convention guidance below:

## Universal Naming Convention Guidelines:

> This document will provide guidance and walk users through the naming convention for the Statewide Transportation Improvement Plan (STIP), Metropolitan Planning Organization (MPO) Transportation Improvement Programs (TIP's) and Colorado Department of Transportation (CDOT) Engineering projects.

CDOT has undertaken the task to achieve a naming consistency between the STIP, the MPO TIP's, and CDOT engineering projects. The ultimate goal is to allow recognition of CDOT projects regardless of which document is used.

In general, the primary name of the project should be recognized in all three types of documents. For example, everyone recognizes Central 70, I25 North, or the I25 South Gap projects. Examples of smaller projects include US 550 Ouray to Ridgway, or US 6 Clifton to Palisade.

Engineering projects ultimately become subprojects to this main project by the nature of the individual project. This would include phases of a project, various locations for the main project, and so forth.

Given the various system requirements between each organization and within Systems, Applications and Products in Data Processing (SAP), the following is offered as guidance for filling out the information needed in **ZJ08 in SAP**.

**Project Description** – 40 Character Limit
This should be used as a main identifier for a project. This is the name that should be consistent with the STIP and TIP's.

**Geographic Location** – 60 Character Limit
Location information including place names and mileposts should be included here.

**Proposal Of Work** – 70 Character Limit
This can include phase information, type of work, and so forth.

See illustration of how the information is concatenated for submission to the Federal Highway Administration (FHWA):

Submission to the FHWA.pdf

**Abbreviations, Acronyms, And Common Notations:**

New guidelines provided for Americans With Disabilities Act (ADA) compliance limits the use of some abbreviations commonly used by Colorado Department of Transportation (CDOT). The Federal Highway Administration (FHWA) prefers no abbreviations in the information submitted to them for project authorization or obligation. However, there are certain place name abbreviations that can still be used. For highway designations, it is recommended that hyphens not be used as a character-saving measure. For example, use Colorado (CO) CO 83, not CO-83. Use Interstate (I) I70, not I-70. See the table below:

**Table 1.03.01 Examples of Abbreviations**

| Term | Abbreviation |
|---|---|
| Colorado | CO |
| County Road | CR |
| Interstate | I |
| Milepost | MP |
| Phase | PH |
| Road | RD |
| State Highway | CO |
| Street | ST |
| United States (US) Highway | US |

**Project Designators (General Location) – ZJ08:**

The project designators are the general location of the project which is used to generate the project number. If you choose a highway segment, then the system will then generate a

number after that highway segment in sequential order. An example project number 0504-055 is on Highway 50 segment 4 (between La Junta and Kansas) and is the fifty-fifth project on this segment.

**Project Prefix:**

The business manager will designate the project prefix to be used on the project during this process. It will depend on the primary scope, location and funding for the project. For example, IM for an Interstate Maintenance project, FBR for a Faster Bridge project, NH for a National Highway. Please refer to The Crosswalk spreadsheet Updated 06/2023 for selecting the correct prefix.

**Other Project Creation Information:**

1. Region Code: Select the region overseeing the project. For projects not created in the region, select ST. Do not select HQ. For Bridge Enterprise (BE) projects use the region the project is located in.
2. Advertised By:

   L Local – This is a project that is advertised by a local agency (not Colorado Department of Transportation (CDOT)). If None is chosen above, a reason must be given from the pull-down menu.

   N None – The project is design only or a study and will not go to Ad. Combo projects may also use this designation for one of the projects.

   S State – This is a project advertised by CDOT and will go to Ad. If you choose this option, the Business Manager (BM) must enter an Ad date into Systems, Applications and Products in Data Processing (SAP).

   Z Shelf – Choose this option for a project that will be worked on in advance of funding for construction being identified. The Project Manager (PM) must also choose a Shelf level from the drop down menu. The BM will enter a Shelf date in the BM Tab.

   See Project Manager Shelf Level.pdf
3. State and Federal Improvement Codes: These attributes describe the fundamental purposes or activity of that project. The list of eligible activities is exhaustive. For more information or assistance in identifying the proper selection, contact the Office of Financial Management and Budget (OFMB).
4. Construction Engineering by:

C – Consultant/Contractor: This is a unique situation. Use only if requested by the Resident Engineer.

L – Local: Construction oversight by local agency.

O – Other: Use only if requested by the Resident Engineer.

S – State: This is standard for Colorado Department of Transportation (CDOT) projects.

X – For conversion purposes. Do not select.

5. Geographic Location, Terrain Type, Proposal of Work.
6. Project Personnel:
    a. This information is key if someone needs to contact the appropriate party during any part of the project development process.
    b. The people entered are tied to their organization code and are what is used when Systems, Applications and Products in Data Processing (SAP) sends workflows for key processes in the project development.
    c. The organization codes associated with the project personnel need to be correct; and if there is more than one organization involved in the project there is an alternate Org code.
    d. The Business Office also enters in Cost Center codes for the project which should correspond to the Residency responsible for the project. This may need to be modified if the Residency responsible for design varies from the Residency responsible for construction.
7. On System or Off System: If it is on a state highway, then it is On System. If it is on a city or county road or not on a highway, then it is Off System.
8. Project Delivery Method: Utilize the drop down menu to select the Project Delivery Method (sometimes referred to as the Contracting Method).
9. Planned Length and Planned Unit: Are not tied to the information given in the Online Transportation Information System (OTIS) at this time. Make sure the Planned Length entered matches the mileposts in OTIS. This information goes into the Form 463 Design Data.
10. Procurement Methods:
11. Location Details:

a. Follow the Systems, Applications and Products in Data Processing (SAP) work instructions to complete Geographic Information System (GIS) (Esri), Data in Project Manager (PM) Tab.

b. Route, beginning and ending reference points, lane quantity, facility type, functional type, and population. The Division of Transportation. Development (DTD) has this information for highways on Colorado Department of Transportation's (CDOT's) Intranet in Data Access – Transportation Data Set and Online Transportation Information System (OTIS).

c. Systems, Applications and Products in Data Processing (SAP) will carry the project location information to other forms such as the Form 463, Fiscal Management Information System (FMIS), ProjectWise project description, and ZJ40 Project Tracker.

12. Railroad Designator Code: If there are railroads near the project, use the pull-down menus to select which ones may be involved.

13. County Details, Congressional Districts, Structure Identification (ID) Details, Metropolitan Planning Organizations (MPO's), Transportation Planning Regions (TPR's), and Commission Districts and information:

    Must press "Calculate County Percentages" and "Calculate Congressional District Percentage" buttons. This information is calculated automatically based on the project limits entered in OTIS.

**Advertisement Dates:**

The Advertisement Date is the milestone where construction funds are authorized and obligated for the project. This date also serves as the commencement of the period when a project is open for job showings and acceptance of bid proposals.

The future bidding opportunities webpage:
See Scheduled Bid Openings on BidExpress.

The bid advertisement webpage:
See Bid Advertisement Calendar on Current & Future Bidding Opportunities.

CDOT recognizes three types of Advertisement, or Ad, dates, for use in project schedules. These Ad dates are recognized in CDOT's business application system, SAP:

1. Initial Planned Ad date: Ideally this is the Ad date that each region puts forth before July 1 of every year for the upcoming fiscal year's projects going to bid or when the project is created. This date is entered into SAP by the region business manager.

2. Current Planned Ad date: This is the Ad date which is current and officially agreed to by the Region Transportation Director (RTD). The Current Planned Ad date will match the Initial Planned Ad date until such time during the course of the fiscal year that the Region Transportation Director (RTD) has concurred with the necessity to change. Changes to the Current Planned Ad date are entered into Systems, Applications and Products in Data Processing (SAP) by the region business manager.
3. Business Manager Scheduled Ad date: This is the date that will be displayed in the Go Sheet and is a working Ad date generated by the Resident Engineer based on the most current scheduling information. This Ad date primarily serves as a barometer of progress in the total project. When indicated by a Scheduled Ad date which exceeds the Current Planned Ad date, the Resident Engineer will conduct a further assessment of the project and give consideration to a revision to the Current Planned Ad date (including consulting with the appropriate region and project personnel).

The Project Manager (PM) should review CJ20N in SAP after the project is created to be sure all the data is accurate and inform the Business Office of any revisions.

After the project is created in SAP, an email message will be sent to key region personnel involved indicating the process is complete and show the project information including the 5-digit project code.

The PM needs to add a template to the project before funds can be added to the project in SAP. See the SAP training internal website for work instructions on adding a template to a project. A project cannot be seen in ZJ40 until the template is added.

## 1.03.02 Project PreScoping and Scoping

### 1.03.02.01 Scoping a Project

Planned projects are most often identified through an asset management list or a planning list as a need. An initial construction budget is identified at the planning stage, prior to the project being transmitted to a residency for preconstruction delivery. The scoping process will consider the required specialty unit coordination items, overall design complexity, project limits, timeline for milestones, opportunities for added value, and anticipated risks throughout the preconst-tion and construction phases. The PM will work closely with the specialty group leads, maintenance section, and the construction Project Engineer to develop a detailed Scope of Work (SOW) for the design of the project. Any project assumptions made while developing the scope should be documented. Scope and limits will typically be adjusted based on funds allocated to projects.

The scoping process will also identify opportunities to include other asset project needs into the project scope to take advantage of geographic similarity and to potentially save on mobilization costs and traffic control during construction. As one example, a surface treatment project may also include major asset work such as a bridge deck rehabilitation or bridge replacement, if such work makes sense to complete as a single effort. For this reason a prescoping meeting is often advisable, ideally held prior to the design phase budget of the project being finalized. In this way, substantial adjustments to the project scope may be made as early as possible into the preconstruction process; so that level of effort, project schedule and construction budget may be right-sized heading into the scoping meeting.

The need for preconstruction consultant services is best identified at the prescoping stage, based on internal Colorado Department of Transportation (CDOT) staff availability and any specialized design services that may be necessary. This is discussed in more detail below.

**Project Delivery Plan:**

The preconstruction Project Manager (PM), in consultation with their Resident Engineer, is responsible for the assemblage and distribution of the project delivery plan via PMWeb. The project delivery plan consists of the following elements:

1. Project Scope
2. Staff Roles and Responsibilities
3. Schedule
4. Deliverables within Stage Gates
5. Estimate Capture
6. Risks
7. Procurement Plan
8. Communication Plan

The project delivery plan should be predicated by individual communications between the PM and CDOT specialty leads, as early in the prescoping/scoping process as practicable. It serves as a record of the understanding of the scope and schedule of the design effort to facilitate accountability for all team members. Moreover, the distribution of the project delivery plan gives each internal CDOT partner the ability to outline their understanding of the project risks and opportunities. Finally, the conversations surrounding the project delivery plan are a great opportunity to identify any outside consultant needs.

**Additional Resources:**

The Project Delivery Plan in PMWeb

### 1.03.02.02 Independent Work Hour Estimate (WHE)

An independently created WHE is required for every Colorado Department of Transportation (CDOT) design project. This requirement holds regardless of the labor being performed by internal CDOT staff, external consultants, or a combination of the two labor sources. On projects with consultant contracts, the WHE along with the Scope of Work (SOW) and documented assumptions shall serve as the basis for the negotiation of the work hours agreed to with the consulting firm(s).

The principal goal of the preconstruction WHE is to attach hours per major task and specialty to the preconstruction process, as well as to arrive at a first estimate of preconstruction funding needed for the design phase. A strong WHE lends significant credibility to the project development process, and it demonstrates that the Project Manager (PM) and the project team have thought through the necessary staff and financial resources to successfully deliver the design for advertisement and construction. Furthermore, the WHE process facilitates the important conversations between the PM and the specialty units as the anticipated work hours and tasks are refined.

As consultant needs are identified by the team members, the SOW and major tasks contained in the WHE will be utilized to solicit those consultant services. CDOT expects that the consulting firm(s) will come to the table with their own WHE, based on their expertise and their understanding of the SOW as presented. The PM, in consultation with their Resident Engineer (RE) and applicable specialty lead(s), will then enter into negotiations with the awarded consultant team to arrive at the final, negotiated work hours and estimated cost for design services.

### 1.03.02.03 Requirements and Guidance for Independent Cost Estimates (ICE's)

The Project Engineer will develop a preliminary ICE for the project, including estimates for each phase of the project (right of way, utilities, design, environmental, miscellaneous and construction). The RE/PM should consider the phase and respective personnel resources (in-house or consultant), and take advantage of the completed WHE and final negotiated hours/costs with the consultants, if needed. The phased estimates will include any respective consultant services for the project.

The Project Engineer and Resident Engineer will review the ICE with the Program Engineer and make revisions, where appropriate. Any revisions made to the cost estimate must be reviewed with affected specialty units before finalizing.

The governing assumptions behind the Work Hour Estimate (WHE) and Independent Cost Estimate (ICE) should be part of the Project Development Plan (PDP) as these products are finalized. Significant adjustments to the Scope of Work (SOW) later in the preconstruction process may necessitate a revisiting of the PDP and those governing assumptions.

### 1.03.02.04 Resources for Developing a WHE/ICE

A Work Hour Estimation Tool has been developed by Colorado Department of Transportation's (CDOT's) Program Reporting Transparency Office, and has the ability to produce a draft and/or final ICE.

Additionally, the trainings listed below may be found in SOCLearns:

- Work Hour Estimation Process
- Work Hour Estimation: Scope of Work
- Professional Service Contracting with Task Orders
- Negotiation Fundamentals

### 1.03.02.05 Project Delivery Plan in PMWeb

Prior to the adoption of PMWeb, the CDOT Form 1048 Project Scoping/Clearance Record was utilized as a scoping-level design checklist. This form is now superseded by the project delivery plan within PMWeb, the components of which may serve as a useful agenda outline for a prescoping or scoping meeting for the project.

Project Managers (PM's) may also use the Stage Gates/Deliverables functionality within PMWeb to manage key project work products or deliverables. These deliverables may include those identified within in the original Form 1048 along with any additional deliverables the PM desires to track during the life of the project. The Stage Gates/Deliverables functionality allows project stakeholders to:

- Identify key project deliverables that will be managed during the life of the project.
- Assign owners or those responsible for the identified deliverables.
- Associate deliverables with tasks in the project schedule to establish completion timeframes for each deliverable.
- Allow deliverable owners to input planned completion dates to help Project Managers (PM's) manage their schedules/figure out where conversations may need to happen to keep things on track.

Expected use of Stage Gates/Deliverables functionality varies by region. Users should reach out to their regional Program Reporting Transparency Office (PRTO) representative for any clarification around regional use of Stage Gates/Deliverables functionality.

## 1.03.02.06 Project Estimate

The project estimate is the summary of total costs for a project for all phases of project delivery. The costs are broken out into phases identified as Right of Way (ROW), Utilities, Design, Environmental and Miscellaneous (RUDEM). Additionally, the project estimate will include projected costs for construction of the project and the Construction Engineering (CE) and indirect costs. The ROW and utility phases may not be able to be estimated until after the Field Inspection Review (FIR) Plan level.

Likely, the project will have a construction project budget already identified from the planning process. This is known as the “planning level estimate”. The planning level estimate is the total cost allocated to deliver the entire project, not just the construction phase.

**Table 1.03.02 Example Project Planning Budget $8,000,000**

| Phase | Planned Amount |
|---|---|
| ROW | $500,000.00 |
| Utilities | $10,000.00 |
| Design | $250,000.00 |
| Environmental | $20,000.00 |
| Miscellaneous | $ - |
| Construction Contract | $5,995,605.00 |
| CE Base Rate 1.75% | $104,923.09 |
| CE DTP charges | $400,000.00 |
| Indirect rate 12% | $719,472.60 |
| Total | $8,000,000.69 |

This planning level estimate is utilized until the preconstruction project development process has progressed to be able to assign pay items and quantities. No later than the Final Office Review (FOR) the pay items and quantities should be entered into AASHTOWare to develop the project estimate. Project estimates of construction costs should be adjusted as the scope is refined, as staffing costs are determined, and as project design progresses. The Project Manager (PM) should work with the Engineering Estimates & Market Analysis (EEMA) team beginning no later than the FOR to refine the construction project estimate.

Project estimates should be recorded in a PMWeb Estimate Capture record at each major milestone or if the scope is changed significantly.

**Additional Resources:**

Project Cost Planner Tool can be used to develop planning level estimates through the Field Inspection Review (FIR) level estimate.

Creating an Estimate Capture Record Estimate Captures in PMWeb.

Engineering Estimates & Market Analysis to request a construction project estimate.

Business Center Engineering Estimates & Market Analysis has Cost Data Book, Item Code Book, and Construction Cost Index Data.

Estimate Review by Engineering Estimates and Market Analysis (In “Section 2.27” of this manual).

## 1.03.02.07 Construction Engineering (CE) and Indirects:

Below is an example of how to include CE and indirect charges in the total construction project cost:

Construction contract: $2,000,000

1.75 percent CE base rate: $35,000

Consultant: $100,000

Colorado Department of Transportation (CDOT) staff: $50,000

Total before indirects: $2,185,000

Indirects (12 percent): $262,200

Total budget needed: $2,447,200

**Additional Resources:**

Cost Allocation Plan | ICAP Annual Renewal Packet and Rate Sheet

## 1.03.03 Budgeting at the Project Scale

### 1.03.03.01 Budgeting Basics

Before any phases of a project can be budgeted, a scope, and project estimate (phased, as appropriate) are required. This assures that the Resident Engineer, specialty units, region Business Office and region management all have the same understanding of the project scope and the anticipated costs to move the project through the project development process. Prior to a project being budgeted, project staff can charge their time to their home cost center utilizing function code 1150.

### 1.03.03.02 Budgeting

Once a template is added to the project in Systems, Applications and Products in Data Processing (SAP), the Project Manager (PM) can notify the Business Office that the project is ready to be budgeted. See “Section 1.04” for estimations for the preconstruction phases for a project.

### 1.03.03.03 Background

Federal-aid highway funds are authorized by Congress to assist the states. They provide for the construction, reconstruction, and improvement of highways and bridges on eligible federal-aid highway routes and for other special purpose programs and projects.

Projects utilizing federal funds must meet specific federal program requirements, at present, Colorado Department of Transportation (CDOT) requires all highway projects it constructs to conform to the federal standards. Doing so ensures consistency and allows for the possibility of adding federal funds to a project that initially, is funded without any federal funds. Federal funds are made available to the department for expenditure on highway related construction projects. Routine highway maintenance activities such as snow removal or filling potholes do not meet these criteria.

### 1.03.03.04 Definitions

NCAT: NCAT, as noted in SAP, prevents time/labor charges from hitting the phase, at timesheet entry. The region Business Office will need to unset Ncat to allow payroll charges after federal authorization is given. The region Business Office should be notified if the Resident Engineer wants to allow payroll charges. Some projects do not want payroll charges to a particular phase.

NOPT: NOPT (No postings) as noted in SAP stops all financial postings to the project. Nothing can be charged to this phase including purchase requisitions or direct charges.

Encumbrance: An encumbrance is a binding obligation to pay.

Preconstruction phase encumbrances are generally for Right of Way (ROW) acquisition, utility agreements, and consultant task orders.

Construction phase encumbrances are for the contract with the Contractor, Construction Engineering (CE) and indirects costs calculated for the project.

Intergovernmental Agreements (IGA's) encumber funds for all phases for the local agency on local agency projects.

## 1.03.03.05 Authorization, Advance Construction, and Obligation

Authorization is when the Office of Financial Management and Budget (OFMB) sends the budget action to the Federal Highway Administration (FHWA) and they formally approve the start of the project. It ensures that FHWA has agreed that the Colorado Department of Transportation (CDOT) can spend the funds identified for the project. Charges cannot be made against a phase until the funds are authorized. It is further important to note that if federal aid is requested, state authorization is not initiated and not authorized until the federal authorization is received. Work performed on unauthorized projects is not legitimate and could become the personal liability of the individual authorizing such work. The budget will sit in "advance construction" until expenditures occur.

Advance Construction (AC) allows states to begin a project even in the absence of sufficient federal-aid obligation authority to cover the federal share of project costs. It is codified in Title 23, Section 115. AC eliminates the need to set aside full obligational authority before starting projects. As a result, a state can undertake a greater number of concurrent projects than would otherwise be possible. In addition, AC helps facilitate construction of large projects, while maintaining obligational authority for smaller ones. At some future date when the state does have sufficient obligation authority, it may convert an advance-constructed project to a federal-aid project by obligating the permissible share of its federal-aid funds and receiving subsequent reimbursements. Advance construction allows a state to conserve obligation authority and maintain flexibility in its transportation funding program.

Obligation is a formal commitment by FHWA to reimburse participating costs on a project. This allows CDOT to bill for these eligible activities. It draws down the state's balance of both apportionment and obligation ledgers. CDOT is limited in total to the "obligation limitation".

**Procedure to budget funds:** The initiating region must ensure that the project is properly listed in the Statewide Transportation Improvement Plan (STIP) and within the fiscal constraints imposed by the STIP. Each project budget action is individually processed and verified against its approved STIP line item. Each project is budgeted by phase

(Right of Way (ROW), utility, design, environmental, construction, miscellaneous) and provider (federal, state, or other (local)).

**Identify the sources of funding for the project:** For federal funds there are subcategories that have to match the characteristics of the project such as interstate maintenance and bridge-on system. The Office of Financial Management and Budget (OFMB) reviews the annual federal appropriation bill by category, comparing the appropriations with the authorizations calculating the percentage obligation limits for Colorado by program. Based upon these calculations, Colorado Department of Transportation (CDOT) regions and the Metropolitan Planning Organizations (MPO's) are allotted funds to spend on actual projects by subcategory. It is from these allotted funds or additional funding provided by a local government that a project receives obligated funding.

The regional Business Offices must ensure that the project funds from the various federal categories, as well as state or local, or both highway funds, are applied in a suitable mix based on estimates from the Project Manager (PM).

Funds to be budgeted must be in the current year's Statewide Transportation Improvement Plan (STIP). The business manager will determine whether or not the project's budget requires Transportation Commission (TC) action by referencing the e-February 2023 TC – PD 703.0 Matrix – FINAL.xls.

All budget actions are processed daily and, if commission action is required, immediately scheduled for the next budget supplement submission to the TC. The cutoff for budget actions inclusion in a supplement is one week preceding the TC scheduled Meeting. These Budget Actions will remain in a pre-posted status until the commission's approval of the Budget Supplement.

After verifying the overall project description, including location and work type with the requested funding and ensuring each budget action is linked to a viable STIP number, OFMB applies first and second level approvals to the budget action and determines the budget document type.

OFMB enters the approved budget request into the Systems, Applications and Products in Data Processing (SAP) system which automatically generates the corresponding requests for phase authorization/obligation.

- **Non-federal-aid phases** are authorized and obligated immediately upon budget action approval in SAP.
- **Federal-aid phase** authorizations requests are submitted daily for review and approval by Federal Highway Administration (FHWA) Colorado Division via the outbound FHWA Fiscal Management Information System (FMIS). The approved

federal authorization is received from the Federal Highway Administration (FHWA) via the inbound Fiscal Management Information System (FMIS) interface.

The process of requesting federal-aid authorization is differentiated by nonconstruction and construction phases of work:

1. Preconstruction:

   For the preconstruction phases of a federal-aid project, Office of Financial Management and Budget's (OFMB's) final approval of a budget action in Systems, Applications and Products in Data Processing (SAP) prompts a request to FHWA for federal authorization/obligation via the outbound FMIS interface. Once authorization is granted by FHWA and recorded in FMIS, the FHWA phase authorization date(s) is auto-populated in SAP via the inbound FMIS interface.

   The Right of Way (ROW) phase requires no further budgetary action by the region. Actual acquisition, however, must be authorized by ROW staff upon completion and approval of the ROW Plans. ROW staff will notify the region, via Form 462a Right of Way Plan Approval that ROW acquisition may occur.

   The utility phase requires no further budgetary action by the region, but the region must also submit utility agreements to the Utility Engineer for processing.

   The design, environmental and miscellaneous phase requires no further budgetary action by the region.

   Note: project phases are automatically set to NCAT or NOPT in SAP (see definitions above) when created. The Project Manager (PM) will notify the Business Office if they want payroll charges or other charges to be allowed to the preconstruction phases after budgeting and obligation are complete.

2. For the construction phase budgeting of a federal-aid construction project (In "Section 2.30" of this manual).

3. Budgeting Timing Before Authorization:

   Budgeting construction funds is usually in advance of the authorization process. Budgeting construction funds can occur when the current Statewide Transportation Improvement Plan (STIP) year begins for the construction phase designated or when the funds are completed in the STIP process. If additional funds for Construction are required, the budgeting request may initiate the change in the STIP process. Construction budget requests should be submitted to the region Business Office no later than 45 days prior to the Ad date.

4. Authorization: See Plans, Specifications and Estimate Approval (FORM 1180) (in "Section 2.30" of this manual) for construction funds obligation process.

## 1.03.03.06 Budgeting Phases

Budgeting is done by project phases. Guidance as to what charges should be considered in these phases are as follows. These are identified in Systems, Applications and Products in Data Processing (SAP) by the Work Breakdown Structure (WBS) elements which are designated below as the project 5-digit code shown as XXXXX and then the WBS coding. All project estimates submitted must be within 10 percent of the corresponding budget action.

**Right of Way (ROW) (Work Breakdown Structure (WBS) – XXXXX.10.10):**

This may not be part of the initial budget until the project is further into the process such as at the field inspection review meeting when the amount of ROW can be determined.

ROW costs include the cost of property acquisition, access control, and easements. Also included is the cost of contingencies (salaries, contracts, potential litigation, and miscellaneous expenses) associated with the acquisitions and relocations.

Colorado Department of Transportation (CDOT) staff charges or consultant task order charges are generally not included in this phase but are accounted for in the design phase of the project. If the design phase is closed and there is still ROW work being completed, then this phase will need to take into account charges needed to do the work.

Prior to the Right of Way Plan Review (ROWPR) meeting, all Survey/ROW staff time and consultant charges related to survey or ROW plans shall be charged to the D-phase of the specific project using the functional area code for Survey or ROW. Once the ROWPR meeting has been conducted and acquisition needs have been identified, staff time for ROW appraisal and acquisition relocation shall be determined and budgeted to the R-phase of the project.

For alternative delivery (Design Build or Construction Manager/General Contractor (CMGC)) projects or more complex ROW acquisitions, the R-phase may need to be budgeted with preliminary funding to allow for ROW staff to charge time to conduct meetings with landowners, or to allow for setting up vendor task orders for early appraisals to expedite acquisition post ROWPR. After the ROWPR is completed, the R-phase budget will be increased based on the ROWPR estimate of costs.

Project monumentation charges shall be direct-to-project prior to final project closeout and initiation of the Form 950M Project Final Data/Project Closure request. Contact your Business Office in the event there are costs incurred after a project has been closed to allow charging to the Construction Engineering (CE) Cost Center and Work Breakdown Structure (WBS) –

XXXXX.20.20). The requirement is to complete the monumentation within one year of final acceptance to meet the project closure requirements.

**Utilities (wbs – XXXXX.10.20):**

This may not be part of the initial budget until the project is further into the process such as at the field inspection review meeting when utilities can be identified.

The U-phase is intended only for actual costs of relocating utilities and shall not include any time charges. Utility costs include the cost for removals, installations, modifications, and relocation of utilities required to construct a project, including the associated design and agreement processing. The cost may be partially or fully the responsibility of the utility owner, depending on the type of project funding, utility company, right of way occupancy held, and local agency-utility arrangement (See “Section 7 Right of Way (ROW) and Utilities”).

Railroad agreements will be funded under the utility phase of a project.

Research, correspondence, and negotiations with irrigation companies, ditch riders, and associated parties are often accomplished via the Utilities Unit, and negotiated settlements with irrigation companies or end users or both may be funded within the utilities phase of the project. Colorado Department of Transportation (CDOT) staff or consultant task order charges are generally not included in this phase but are accounted for in the design phase of the project. If the design phase is closed and there is still utility work being completed, then this phase will need to take into account charges needed to do the work. It is not unusual for the utility phase to remain open as the project moves into construction as utility relocations are completed and terms outlined in standard utility agreements are fulfilled.

**Design (WBS – XXXXX.10.30):**

Design costs include survey, design, and other engineering work required to develop a complete set of project plans and specifications. For consultant-designed projects, the cost of these professional services needs to be included.

The Work Hour Estimate (WHE) and Independent Cost Estimate (ICE) should be submitted to the Business Office when requesting the funds for this phase.

When estimating this phase, the current indirect rate needs to be taken into account and applied to CDOT staff salary with benefits and consultant task orders.

All design functions including most specialty groups that work on projects shall charge staff time to the D-phase and use the applicable functional area code. The specialty groups that shall charge time to the D-phase may include but are not limited to Staff Bridge, Traffic, Environmental, Utilities, Hydraulics, Right of Way (ROW), Intelligent Transportation System

(ITS) and Survey. If your specialty does not have a specific functional area code such as the Business Office or Equal Employment Opportunity (EEO)/Region Civil Rights Support, then functional area 1720 shall be used for timesheet coding.

Hours worked related to construction after a project is advertised shall be charged direct-to-project to the project's C-phase Work Breakdown Structure (WBS) – XXXXX.20.10) using the applicable functional area code. Once a project has proceeded to advertisement the Business Office will open the construction (WBS – XXXXX.20.10) for direct-to-project charges to allow staff time charges and lock the D-phase WBS to prevent staff time charges to the D-phase. In instances where charges to the D-phase will continue after the project has been awarded, or in the case of an unsuccessful bid process, the Project Manager (PM) may request that the business office unlock the D-phase with Program Engineer approval.

For local agency projects, all local agency costs (both preconstruction and construction costs) shall be coded to the indirect cost center using the local agency functional area code, 1340. This functional area code should be used when any time is spent working on local agency project delivery so that the Colorado Department of Transportation (CDOT) can get an accurate accounting of costs to deliver the local agency program. Construction Engineering (CE) cost centers shall not be used for local agency construction costs.

**Environmental:**

All environmental work specific to projects, including all National Environmental Policy Act (NEPA) activities, shall be charged direct-to-project. Consultant task orders and CDOT staff time charges for work related to categorical exclusions shall be charged to the D-phase (WBS – XXXXX.10.30) using the environmental functional area code.

CDOT staff time charges for work related to Environmental Assessments (EA's) or Environmental Impact Statements (EIS's) shall be budgeted and charged to the E-phase (WBS – XXXXX.10.40). This is because an EA or Environmental Impact Statement (EIS) is a bigger and more time-consuming process that is beyond a Categorical Exclusion (CATEX) provided for normal program delivery.

If there are environmental charges for inspections or other environmental related activities during construction, those charges will be charged direct-to-project C-phase (WBS – XXXXX.20.10). Environmental activities post construction will be charged to the home cost center using the environmental functional area code.

**Miscellaneous (WBS – XXXXX.10.50):**

The M-phase shall be used to charge staff time for activities related to a study or grant writing. Examples can include a Planning and Environmental Linkage (PEL) that does not result in an

environmental clearance, or any other type of study that is not immediately anticipated to result in specific design or construction activities. For example, a corridor freight study, safety study, or intersection study, and so forth.

**Construction (WBS – XXXXX.20.10):**

Construction estimates should include the cost of the bid items, CDOT staff cost, consultant task order costs for Construction Engineering (CE) and post-design construction services, and the current base CE and indirect rates. If design services will be required during construction those costs must be included in the CE direct-to-project estimate.

The following CE costs shall be charged to the C-phase of a project:

- Costs associated with delivery and support of projects under construction
- Consultant CE task orders
- Reproduction costs
- Advertising cost for Notice of Final Settlement Environmental Inspections or other environmental related activities during construction

The following subclassifications of CE costs are to be charged direct-to-project (WBS – XXXXX.20.10) using the applicable functional area code:

- Any hours worked related to the construction project after a project is funded, authorized by the Federal Highway Administration (FHWA) if applicable, and advertised to allow for time charges related to project showings and mandatory prebid meetings, as well as any coordination with construction management consultants prior to bid opening and award.
- Field Engineering and Inspection: Colorado Department of Transportation (CDOT) staff time, expenses, materials, supplies, per diem and lodging, and other costs incurred for work performed on the job site or at the plant by the Resident Engineer and other staff assigned to the project. This includes staff work checking of evaluations, dimensions, and quantities, staking, computation of quantities and periodic reports.
- Consultant construction support task orders, including construction management, inspection, design under construction, or other applicable Construction Engineering (CE) related costs. Office Engineering: Salaries, salary additives, materials, supplies, and other costs incurred for work performed in checking shop drawings, checking pay items, making plan revisions, checking change orders, performing project reviews, authorizing contract payments and other district and central office efforts, including

that of clerical staff and Finals Administrators, relative to specific project determination.

- Construction Material Testing and Inspection: Colorado Department of Transportation (CDOT) staff time, expenses, materials, supplies, and other costs incurred in making tests and inspections of materials incorporated in highway construction projects.
- Environmental Support: CDOT staff time, expenses, materials, supplies, and other costs incurred for Inspections, monitoring, and mitigation oversight.
- Intelligent Transportation System (ITS) Support: CDOT staff time, expenses, materials, supplies, and other costs incurred for inspections, and testing and validation of ITS networks, systems, devices.

**Construction Statistical (Work Breakdown Structure (WBS) – XXXXX.20.20:**

Project monumentation charges shall be direct-to-project prior to final project closeout and initiation of the Form 950M Project Final Data/Project Closure request. Contact your Business Office in the event there are costs incurred after a project has been closed to allow charging to the Construction Engineering (CE) Cost Center and (WBS – XXXXX.20.20). The requirement is to complete the monumentation within one year of final acceptance to meet the project closure requirements.

**PMWeb Forecasting at the Project Level**

Project forecasting in PMWeb allows Project Managers (PM's) the ability to assign an overall cost estimate for their project along with establishing an estimate of how project costs will be distributed over time (formerly known as a drawdown). Forecasting in PMWeb is required given the data is used to manage and track CDOT's statewide program and cash balance.

Two records are used to complete a project forecast in PMWeb.

- The Estimate Capture Record should be completed first. This record is used to capture the construction estimate prior to award to provide the basis for construction contract forecast (drawdown) generation. Project Managers (PM's) can use tools such as the Project Cost Planner Tool, Phase Estimate Worksheets, Engineering Estimates & Market Analysis Unit (EEMA) Estimates, or other independent methods to determine the project estimate.
- The Forecast Record should be created following the entry of the estimate capture record. Forecast records (previously drawdowns) provide a monthly spread of estimated construction contract expenditures on projects. Accurate forecasts enable CDOT to more effectively plan to use cash and deliver more projects.

Forecast records require the following before being created:

1. A project schedule with the construction phase identified. The construction phase for a project is identified by selecting Construction from the dropdown menu in the Forecasts column in the project schedule for the schedule task used to identify the construction phase duration of the project. Making this Construction selection establishes the timeframe that will be used to generate the forecast.
2. A dollar value, which will be pulled from:

- The latest approved estimate capture record (see above). This dollar value is used for projects prior to the project being awarded.
- The construction contract, less expenditures (Systems, Applications and Products in Data Processing (SAP) Form 65 Project Financial Statement, line 7, Proj'd To Compl), once it is post-award.

Once the two requirements above have been met, the PM can create the forecast record in PMWeb. When creating the forecast record a “spend curve” will need to be identified. The spend curve determines how costs will be distributed throughout the construction phase of a project. The spend curve choices are:

- Back-loaded curves assume higher spending at the end of the date range.
- Front-loaded curves assume higher spending at the beginning of the date range.
- Bell curves assume higher spending in the middle of the date range.
- Linear curves assume consistent spending throughout date range.

Estimate capture or forecast, or both records will need to be updated throughout the life of the project. The estimate capture record should be updated any time the overall project cost changes. The forecast record should be updated anytime the construction schedule changes or there is a change to the cost curve, or both (how costs will be distributed during the construction phase).

Estimate capture and forecast record update requirements vary from region to region. At a minimum, these records should be revisited/updated at the following times during a project lifecycle:

1. Project Creation in Systems, Applications and Products in Data Processing (SAP)/PMWeb: A project's first estimate capture and forecast records should be entered in PMWeb when the project is created in SAP.

2. Field Inspection Review (FIR) Update: The estimate capture and forecast records should be updated at FIR after all FIR changes have been agreed to by project stakeholders.
3. Final Office Review (FOR) Update: The estimate capture and forecast records will be updated after all notes from the FOR meeting have been agreed to and the Engineering Estimates & Market Analysis Unit (EEMA) estimate has been incorporated.
4. Advertisement: Update the anticipated construction phase estimate (estimate capture record) and forecast (forecast record) before processing the Form 1180 Standards Certification and Project Plans, Specifications & Estimate Approval using the latest engineer's estimate (line 7, Project Commitment Amount, from Form 65 Project Financial Statement).
5. Decision to Award: The estimate capture and forecast record should be updated after the decision to award, utilizing actual bid costs.

Project Change Requests: A project's estimate capture and forecast records should be updated anytime a project scope, schedule or budget change, or both gets approved; if these changes will likely impact a project's total cost or how costs will be distributed across the project's construction phase, or both.

Monthly Construction Forecast Refreshes: Once a project enters the construction phase, the project's forecast record should be updated monthly, by the second Monday of the month. This enables more accurate statewide management of project costs (for example, management of actual costs versus estimates).

Detailed instructions for estimate capture and forecast record entry/updates can be found on the PMWeb site. Please reach out to your regional Program Reporting & Transparency Office (PRTO) representative with any questions around generating forecasts in PMWeb.

**Additional Resources:**

Creating an Estimate Record. See Estimate Captures in PMWeb.

Creating a Forecast Record. See Forecasts in PMWeb.

## 1.03.04 Developing the Project Schedule

### 1.03.04.01 Project Scheduling

Project Scheduling is the task of defining tasks, milestones and relationships between work activities. Tasks will have a duration, and milestones represent major achievements or decision points in a project. Milestones are a single day, they do not have a duration. Scheduling is an inexact process in that it tries to predict the delivery of the project using task durations and logical relationships. While it may not be possible to predict with exact certainty the duration or progression of a project, there are techniques and best practices that can increase the accuracy of an approximate timeline estimate. Project schedules are most effective when the project activities are well-defined and appropriately linked. Project schedules are not static; as projects progress, the Project Manager (PM) should update the schedule and task dependencies accordingly.

PM's must maintain a basic schedule in PMWeb for every project. The schedule should be developed using the region schedule template in PMWeb, but at a minimum will have the seven standard milestones.

The schedule will progress through project delivery and each version will be defined below:

**Initial Schedule**: The project schedule before the project team approves it during the Project Development Plan (PDP) approval process.

**Working Schedule**: The approved project schedule throughout delivery that will include a combination of planned and completed tasks.

**Baseline Schedule**: The approved project schedule recorded at the Field Inspection Review (FIR) or only modified using proper change control procedures for use in analysis and improvement of future project schedules. Project control procedures vary by region but should be completed using the PMWeb project changes record.

**Additional Resources:**

Project Changes Record in Project Changes in PMWeb

### 1.03.04.02 Initial Schedule

The PM will create an initial project schedule that identifies key project milestones and related activities. The purpose of this schedule is to identify:

1. And specify actual activities in the schedule to ensure adequate planning of the work has been achieved, as well as to permit accurate monitoring and evaluation of the project's progress. These activities may be identified during the prescoping phase of the project through the development and refinement of the Scope of Work (SOW) and Work Hour Estimate (WHE), as described above.
2. The need for Colorado Department of Transportation (CDOT) or consultant personnel resources, or both.
3. Activities that are critical in ensuring the timely achievement of project deadlines.
4. Associated dates with respect to the deliverables of other project specialty groups.
5. Deadlines from CDOT management or region work plans.
6. Critical processes such as the Statewide Transportation Improvement Plan (STIP)/Transportation Improvement Program (TIP)/Long Range Plan amendments and project budgeting.
7. Milestones to allow region management to easily track project progress.

As a minimum, project milestones for Design-Bid-Build (DBB) will include the following:

1. Design Scoping Review (DSR)
2. Field Inspection Review (FIR)
3. Final Office Review (FOR)
4. Advertisement Date
5. Late Ad
6. Begin Construction
7. End Construction

The Ad date can be replaced by a shelf date if the project does not have funding for construction.

Additional milestones may be added, as needed, based on the complexity of individual projects or for project re-advertisements. For projects involving consultants, the project schedule should include milestones and activities related to the contracting/task order process (Scope of Work (SOW), Statement of Interest (SOI), Request for Proposal (RFP), short list, interviews, consultant selection and a notice to proceed). Where applicable, the project schedule should also include appropriate milestones and activities related to the administration of Intergovernmental Agreements (IGA's). Different milestones should be considered for alternative delivery methods.

**Table 1.03.04 Project Delivery Methods with Associated Project Milestones**

| Design-Bid-Build – milestones in order from top to bottom | Construction Manager/General Contractor (CMGC) – milestones in order from top to bottom | Design-Build – milestones in order from top to bottom |
|---|---|---|
| Scoping | Scoping | Scoping |
| Field Inspection Review (FIR) | FIR | SOI |
| Final Office Review (FOR) | FOR | Draft RFP |
| Ad | Ad/(Construction Agreed Price Proposal (CAPP) | Final RFP |
| Late Ad | Late Ad/CAPP | Late final RFP |
| . Begin construction | Begin construction | Begin construction |
| End construction | End construction | End construction |

## 1.03.04.03 Setting the Late Ad Date

The late Ad date is an indicator of the latest possible date a project must go to advertisement to allow a project to meet important deadlines, regional goals, stakeholder commitments, build restrictions, or spending requirements. The late Ad date normally corresponds to the latest a project can go to Ad and still be delivered within the planned construction season.

**Who do you consult with?**

When setting your late Ad date you need to consult with your Program Engineer, Resident Engineer, regional business manager and region Program Reporting & Transparency Office (PRTO) representatives, and region asset managers.

**What things do you need to consider?**

Weather and seasonality: Is there a window of opportunity to build your project? Consider animal nesting or migration, stream flows and weather.

Funding restrictions: Does the money need to be encumbered by a specific time? Is there a must-spend-by date (for example Archaeological Resources Protection Act (ARPA) funds).

Events: Bike races, school year, harvest, holidays, tourist season, and so forth.

Special material needs and lead times.

Have you made any commitments to stakeholders where timing is involved?

Risks: Third party, such as railroad, utilities.

**Other timing to consider when looking at project scheduling:**

Project Managers (PM's) should plan to advertise their project a minimum of 2 months prior to the critical construction start date.

The following are average times to consider when scheduling a project and setting the Start Construction milestone:

- Ad 3 weeks
- Letting 1 week
- Award 1 month

The PM will develop an initial schedule with input from the Resident Engineer, specialty units and other team members. The schedule should be reviewed and endorsed through the Project Development Plan (PDP) process in PMWeb. The PM owns the preconstruction schedule but many tasks, their durations and relationships are defined by the specialty units that complete them**.**

The Colorado Department of Transportation (CDOT) specialty unit managers, or designees, will be invited by the PM for a design scoping review meeting but correspondence should precede this meeting for project schedule and work hour estimate input. For both in-house and consultant design projects, CDOT specialty unit managers, or designees, will participate in the scoping activities when the project involves their discipline or when requested by the PM. CDOT specialty unit managers will review the project in advance and prepare any information that may be needed for the scoping meeting, for example, the Structural Engineer would review and present existing bridge information on projects involving structures.

The entire project team including the Resident Engineer (RE), Colorado Department of Transportation (CDOT) specialty unit managers and other team members will review the initial project schedule on both in-house and consultant design projects, and recommend changes as needed to accommodate the project work activities identified for the subject discipline.

Team members may recommend additions to the minimum milestones as needed for the specific needs of the project. For example, on a retaining wall project that requires extensive geotechnical work that will be in the critical path, additional milestones pertaining to this work may be recommended. Another example would be adding a Right of Way Plan Review (ROWPR) meeting milestone for projects with Right of Way (ROW) as a critical path. The Project Manager (PM) should accommodate the specialty units when adding and monitoring milestones.

As mentioned above, the PM will provide the initial schedule and workhour estimate to all key specialties (Bridge, ROW, Environmental, Traffic, Materials) for final resolution of any potential conflicts of logic or deliverables through the Project Development Plan (PDP) endorsement process in PMWeb. After the schedule is endorsed, it will be referred to as the working project schedule. At the Field Inspection Review (FIR), the working project schedule will be baselined.

A step by step outline of the project schedule, policies surrounding the schedule and the PDP endorsement process can be found at the following links:

Outline of Project Schedule Project Schedule in PMWeb

Outline of Project Delivery Plan Project Delivery Plan in PMWeb

A schedule can be created and maintained in any file but many benefits result from not only having the milestone schedule within PMWeb but the detailed schedule. The benefits include availability to project team, relaying due dates from the schedule to the deliverables in Stage Gates and log of distribution or workflow approval.

The region management team (at a minimum, the Program Engineer, ROW manager and environmental manager and Resident Engineer) will review and approve the initial schedule, including milestone dates, critical path activities and specific deliverables. The Ad date reflected in the schedule will be addressed at this time and, if agreed to, will be accepted as the project initial planned Ad date for use in the project set-up.

Upon review by the region management team, the PM will make any necessary modifications to the initial schedule and preliminary workhour estimate. These modifications will be the last changes to either document. The PM will save and refer to these files as the initial project schedule and final workhour estimate.

### 1.03.04.04 Working Schedule

This project schedule details both planned and actual project activities, durations and resource allocations. This schedule is updated regularly by the Project Manager (PM) and reflects actual progress of work activities throughout the duration of the project. At any time, a comparison may be made between the working and baseline schedules to assess the progress of a project. The PM should perform a comparison, at least monthly, to assist with the identification and management of unanticipated obstacles, risks and opportunities.

A project schedule is prepared to monitor the progress of preconstruction activities and to determine the estimated date for the advertisement of the project. The PM should provide a copy of the working project schedule to all internal specialty units at every milestone meeting.

The working project schedule is managed by the PM and used to monitor important events and activities required to complete the design, right-of-way acquisition, environmental clearances, utility work, and other associated tasks required to finalize design of a project. The PM will monitor the schedule to ensure important dates are met to successfully progress the delivery and advertise the project.

The PM should give priority attention to all critical path tasks but extra attention should be given to tasks that often require considerable time such as right-of-way acquisition, complex bridge design, consultant selection, environmental investigations, local agency agreements, utility and railroad agreements, and hazardous materials mitigation.

A PMWeb schedule is required to monitor milestones and key tasks. A Microsoft Project Schedule (MS) can be used in addition to the PMWeb schedule if a PM is more comfortable with the scheduling tool but there are benefits to only maintaining a single schedule within PMWeb. These tools are used to establish a project schedule, critical path and milestones. Using PMWeb, the project team can coordinate assigned deliverables for each member that are assigned to schedule tasks and provide updated “due dates” corresponding with the linked schedule task.

The PM will manage the working project schedule and coordinate project progress with the project design team and all affected parties. The project team will be informed of activity schedule changes and accomplishments in order to coordinate plan development. Strategies should be developed for resolving critical path activity delays. The PM will inform affected parties of any changes to the schedule and adjustment to the advertisement date with the team Input functionality within a PMWeb Project Change Record. More information on this Project Change Record can be found at:

Project Changes in PMWeb.

### 1.03.04.05 Baseline Schedule

Within PMWeb, the baselined schedule is the project schedule agreed upon by all project team members at Field Inspection Review (FIR). This schedule is created to accurately compare the project delivery plan prior to starting work and the progressed schedule throughout delivery. The desire is to identify impacts, expose risks and make schedule adjustments for future projects that better align to the actual delivery. The baseline schedule should only be updated after the region change control approval has been obtained. Contact the Program Reporting & Transparency Office (PRTO) rep for specifics of statewide and regional guidance for changes to the baseline schedule. The majority of Colorado Department of Transportation (CDOT) projects do not meet the baseline change guidance and the baseline schedule remains unchanged throughout the duration of the project.

Developing and managing a project schedule includes the following activities:

1. Conduct the project design scoping before preliminary design by initiating a Design Scoping Review (DSR) – See "Section 1.02" and "Section 2.01".
2. Develop a proposed project schedule, preferably within 30 days after the DSR.
3. Coordinate, monitor and update the project schedule with other appropriate milestones such as request and receipt of the survey, FIR, Final Office Review (FOR), and advertisement date.
4. Update any changes to these dates in PMWeb.

If the Project Manager (PM) is also maintaining a schedule outside of PMWeb that schedule needs to be stored in a shared drive so all team members can view it. Any changes to the schedule should be communicated with all of the project team members.

**Additional Resources:**

See Controlling Our Critical Path.pdf guide on Other Design Documents | Safety Selection Guide.

## 1.04 Consultant Selection and Contracting Process

When the state does not have adequate resources (such as qualified personnel, adequate staff, specialized expertise, or ample time) to perform a task, consultant services are contracted. A professional consultant is a licensed Professional Engineer, licensed professional architect, licensed landscape architect, licensed industrial hygienist, or licensed surveyor. A qualified and experienced consultant in relation to the expected

Scope of Work (SOW) is obtained according to an approved selection process through the Engineering Contract Services Unit.

The method for obtaining a professional consultant to do a specific SOW or Non-Project Specific (NPS) consultant services shall comply with applicable federal and state laws governing the services of consultants, as outlined in the Colorado Department of Transportation (CDOT) Procedural Directive 400.1, Obtaining Professional Consultant Services, and 23 Code of Federal Regulations (CFR) Section 172, Administration of Engineering and Design Related Services.

The Engineering Contracts program manager is responsible for the prequalification and coordination in the selection of a consultant and developing a contract between the state and the selected consultant. The Engineering Contract Services Unit facilitates the selection process. The Resident Engineer shall evaluate the consultant's performance on projects.

## 1.04.01 Obtaining a Consultant Contract

CDOT's consultant selection process is not required for individual Project Managers (PM) to execute NPS or non-fund encumbering task orders. This is because a consultant selection process is followed to establish the master NPS contracts necessary for multiple NPS task orders to be written without individual consultant selection processes. To access a consultant via NPS:

- CDOT must have an active NPS contract with the consultant desired.
- The total value of services requested must be less than $500,000. Splitting up services for the same effort into smaller task orders is not permitted. Chief Engineer approval is required to request NPS services in excess of $500,000.
- The PM must request permission from the region NPS contract manager for approval to write a new NPS task order. This is typically done via email.
- The NPS consultant can provide this CDOT point of contact to the PM. The region NPS contract manager will need to know the value of the new task order requested so they can determine if there is enough funding left in the master contract to accommodate. The PM must be aware of the expiration date of the NPS master contract as this will limit the end date of any task order written under the NPS master contract.

The following steps are necessary to obtain an executed project specific consultant contract. The Engineering Contract Services Unit shall perform the steps unless otherwise noted (responsible persons are identified in parentheses after each step):

1. Ensure that the proposed consultant service is consistent with the Colorado Department of Transportation's (CDOT's) Long- Range Plan, Statewide Transportation Improvement Plan, the CDOT budget, and the Obligation Plan (Program Engineer, Resident Engineer and Business Office).
2. Develop the Scope of Work (SOW). For non-fund encumbering (generally, Non-Project Specific (NPS) contracts), the SOW should provide a general description of the anticipated services. For fund encumbering contracts and task orders, the SOW will be project specific and detailed to include all requirements and deliverables. If the consultant is known, the SOW should be reviewed with the consultant and modified as necessary for clarity (Resident Engineer).
3. Prepare an Independent Cost Estimate (ICE) as described in "Section 1.05.01.02" below (Resident Engineer).
4. Prepare a justification memo from the region explaining the need for consultant services.
5. Send the SOW to the region Equal Employment Opportunity (EEO)/Civil Rights Specialist to set the Disadvantaged Business Enterprise (DBE) goals.
6. The Engineering Contract Services Unit contracting officer will prepare the Memo to the Chief to Request Ad and route all necessary documents for signature by the appropriate signature authorities.
7. Fill out the Selection Checklist with essential contract information including the selection panel (Resident Engineer) which is signed and certified by the Program Engineer.
8. Include key events schedule (Resident Engineer and the Engineering Contracts Unit Services staff) in the Request for Proposals (RFP) document.
9. Advertise the RFP and SOW on the CDOT website and BidNet and, as needed, in special journals (contract officer).
10. Coordinate and facilitate selection panels to achieve consensus and make a recommendation to the Chief Engineer (contract officer).
11. Obtain Region Transportation Director's (RTD's) approval of the selection results (Resident Engineer).
12. Obtain the Chief Engineer's approval of the selection results (contract officer).

13. Notify consultants of selection results via e-mail (contract officer).
14. Finalize the Independent Cost Estimate (ICE). The Independent Cost Estimate Form.xls and many other resources are available on the Engineering Contract Services Unit Professional Services (Resident Engineer). Note: For task order contracts, this step is done for each task order request.
15. Verify the consultant has an active master pricing agreement in place, insurance information, and initial cost proposal (consultant audit).
16. Initiate audit liaison review (Engineering Contract Services Unit).
17. Negotiate consultant fee and final contract cost exhibit (contract writer).
18. Prepare final contract and route the contract for approval and signatures. Distribute executed contract (Procurement and Business Offices).
19. Issue the notice to proceed to the consultant (Engineering Contracts staff).
20. Debrief consultants, as requested, on selection results (contract writer).
21. Compile selection documentation and transmit the selection file to the Colorado Department of Transportation (CDOT) Records Center (contract writer).

## 1.04.02 Preparing an Independent Cost Estimate for Consultant Services

### 1.04.02.01 Background

Professional (engineering and architecture) services for CDOT projects are acquired through a qualifications-based process in accordance with the Brooks Act (Title 40 United States Code, Chapter 11, Section 1101-1104). The Brooks Act requires agencies using federal funds for construction projects to promote open competition by advertising, selecting, and negotiating contracts based on qualifications, and at a fair and reasonable price.

State and Federal laws require State Departments of Transportation to develop an ICE, including an independent work hour estimate, as a part of the contracting process for all professional services. An ICE must be completed for all contracts and task orders valued in excess of $100,000.

### 1.04.02.02 Definitions

Assumptions – An important component of an ICE is documenting assumptions relative to the tasks, such as definitions, resource needs, durations, and so forth.

Independent Cost Estimate (ICE) – A cost estimate to accomplish the Scope of Work (SOW), completed by the Colorado Department of Transportation (CDOT) Project Manager (PM). In addition to the cost of labor, an ICE should include fees, material costs, equipment charges, indirect charges and all other costs for a contract.

SOW – A detailed listing of requirements, criteria, and objectives for services that a consultant is expected to provide.

Work Hour Estimate (WHE) – Used to develop the ICE, the estimated consultant labor hours required to complete the established SOW.

### 1.04.02.03 Process

Non-Fund Encumbering Contracts:

Non-fund encumbering contracts are typically Non-Project Specific (NPS) contracts for which specific service needs are defined and executed through Task Orders. A solicitation request for this type of contract to the Engineering Contracts Unit must include an ICE Summary. Although specific work details may be unknown, the ICE should provide a general estimate identifying the number of consultant work hours and cost, to justify the value of the contract to be awarded. The ICE should be formatted using the template found on the Engineering Contracts Professional Services.

Fund Encumbering Contracts/Task Orders:

For fund encumbering contracts or task orders, the ICE is more detailed because the consultant and specific work requirements are known. In this case, the following steps must be completed prior to submitting an ICE with a solicitation request to the Engineering Contracts Unit:

1. ICE (Required (greater than $100,000)) – Upon completion of the SOW the CDOT PM and consultant separately must complete an ICE based on the estimated resources, work hours and other related material/services needed to accomplish all of the required tasks. To simplify the negotiation process, the CDOT PM and the consultant should use an identical format for the work hour estimate. Assumptions should be clearly documented, and all applicable labor, equipment, materials, and other costs should be included.
2. Work Hour/Project Cost Negotiation (Required (greater than $100,000)) – Upon completion of the ICE's, CDOT and consultant PM's should review and negotiate the work hours and project costs, regardless of the magnitude of the differences in the estimates. The basis of the negotiation should address the allocation of resources and work hours, and not solely the total cost. The final work hour distribution and

project cost shall be documented on the Work Hour and Cost estimate Worksheets in the Independent Cost Estimate (ICE) Summary; see below “Number 3”. Copies of the Colorado Department of Transportation (CDOT) and consultant ICE’s should be retained in the project records.

Any changes to the Scope of Work (SOW) as a result of the negotiations should be incorporated in the Final Statement of Work submitted with the solicitation request.

3. ICE Summary (Required (greater than $100,000)) – The Summary will include the initial CDOT ICE as well as a comparison of the CDOT; and
4. Consultant Total Cost estimates, as prepared and prior to negotiation. The ICE Summary **must** be formatted using the template found on the Engineering Contracts Professional Services.

Note: If a Task Order Amendment is of a value greater than $100,000 **Or** a Task Order Amendment revises the collective Task Order value greater than $100,000 for the first time, steps one through four above are required.

## 1.04.03 Obtaining a Construction Manager/General Contractor (CMGC) Contract (Alternate Process)

The following steps are necessary to obtain an executed CMGC contract. The Engineering Contracts Unit shall perform the steps unless otherwise noted (responsible persons are identified in parentheses after each step):

1. Ensure that the proposed CMGC service is consistent with CDOT’s Long-Range Plan, Statewide Transportation Improvement Plan, the CDOT budget, and the Obligation Plan (Program Engineer, Resident Engineer and Business Office).
2. Develop the SOW (Resident Engineer).
3. Prepare a contract cost estimate (Resident Engineer).
4. Prepare CMGC selection request, including the Underutilized Disadvantaged Business Enterprise (UDBE) goals, for the Chief Engineer’s approval for advertisement (Resident Engineer and region Equal Employment Opportunity (EEO)/Civil Rights specialist).
5. Establish a CMGC selection panel per CMGC guidance from the Innovative Contracting Advisory Committee (Resident Engineer).
6. Create a selection schedule (Resident Engineer and the Engineering Contracts Unit staff).

7. Advertise an Invitation for Construction Manager/General Contractor (CMGC) Services on the Internet and, as needed, in special journals (contract writer).
8. Create and distribute the selection information and instruction package to the CMGC and Colorado Contractors Association (CCA) community (contract writer).
9. Coordinate and facilitate selection panels to achieve consensus and make a recommendation to the Chief Engineer (contract writer).
10. Obtain the Region Transportation Director's (RTD's) approval of the selection results (Resident Engineer).
11. Obtain the Chief Engineer's approval of the selection results (contract writer).
12. Notify Contractors of selection results (contract writer).
13. Finalize the Scope of Work (SOW), and for project specific funds-encumbered contracts, negotiate work hours and the cost proposal (Resident Engineer and the Contractor representative), and submit those to the Engineering Contracts Unit. Note: For task order contracts, this step is done for each task order request.
14. Obtain and review the Contractor's financial information, insurance information, and initial cost proposal (contract writer). (Only for Brooks Act CMGC contracts.)
15. Initiate audit evaluation (contract writer). (Only for Brooks Act CMGC contracts.)
16. Analyze audit evaluation report and negotiate Contractor fee and final contract cost exhibit (contract writer). (Only for Brooks Act CMGC contracts.)
17. Prepare final contract and route the contract for approval and signatures. Distribute executed contract (Procurement and Business Offices).
18. Issue the Notice-to-Proceed to the Contractor (Engineering Contracts Unit staff).
19. Debrief Contractors with a CMGC Debrief Template on selection results. In-person debriefs are optional and up to the Resident Engineer (contract writer).
20. Compile selection documentation and transmit the selection file to the Colorado Department of Transportation (CDOT) Records Center (contract writer).

## 1.05 Alternative Delivery

CDOT has embraced alternative delivery to enhance project delivery efficiency and effectiveness. These delivery approaches offer alternatives to the traditional Design-Bid-Build method, allowing for increased collaboration and streamlined project execution. CDOT recognizes that alternative delivery can expedite project schedules, reduce costs, and improve overall project outcomes without compromising safety, ethics or quality.

By leveraging alternative delivery methods, the Colorado Department of Transportation (CDOT) aims to reduce project risk and improve project delivery timelines. These methods enable simultaneous design and construction activities, reducing the overall project duration compared to the sequential approach of Design-Bid-Build. This expedited timeline allows CDOT to deliver critical transportation infrastructure projects more quickly, addressing the growing demands of Colorado's transportation network.

Furthermore, alternative delivery methods provide opportunities for greater collaboration between stakeholders involved in CDOT projects. By involving Contractors and Designers in the early stages of the project, CDOT can benefit from their expertise, leading to optimized designs, increased constructability, and higher quality construction documents. This collaborative approach fosters innovation and creative problem-solving, resulting in improved project outcomes and enhanced value for the public.

1. Project Delivery Methods

- Design-Build
- Streamlined Design-Build
- Construction Manager/General Contractor
- Public Private Partnership

2. Procurement Methods

    - A+B
    - Multiple Bid Schedule
    - Alternate Bid Schedule
    - Project Specific Pre-qualification
    - Design-Bid-Build (DBB) Best Value

3. Innovative Financing

    - Phase Funding
    - Lump Sum Contracts
    - Value Engineering
    - Availability Payment
    - Operate and Maintain

4. Contract Management Techniques

    - Lane Rentals
    - Incentives/Disincentives
    - Liquidated Savings

Colorado Department of Transportation (CDOT) projects using these methods are currently tracked in Systems, Applications and Products in Data Processing (SAP). When the project is created or under design, the alternative delivery method being utilized for the project is to be populated in CJ20N under the Project Manager (PM) Tab and again during the 1180 workflow. Resident Engineers should work closely with the Alternative Delivery Program when considering an alternative delivery method. Resident Engineers shall also report any use of alternative delivery to the Engineering Estimates and Market Analysis Unit once a method has been chosen.

## 1.05.01 Project Delivery Methods

CDOT projects are typically delivered using a Design-Bid-Build (DBB) approach, where CDOT defines the scope and requirements of a construction project by fully completing design documents, either in-house, or with the assistance of design consultants. A construction Contractor is then selected to build the project using the lowest responsible bid as the sole criteria. In traditional DBB delivery, risk is primarily borne by the owner, as preconstruction and construction phases are managed separately, increasing the potential for design errors and omissions that may lead to disputes and delays during the construction phase.

CDOT projects can also be delivered using alternative contracting methods such as Design-Build (DB), Streamlined Design-Build, Construction Manager/General Contractor (CMGC), or Public Private Partnerships (PPP's). These methods have been approved for use by federal regulations, state statutes, and CDOT policies and procedures. To ensure a competitive procurement environment, CDOT follows a rigorous selection process, including a thorough evaluation of proposals, ensuring that the best value for the project is achieved.

**DB** is a contracting method where the owner, CDOT, of a project enters into a single contract, with a DB team, to complete the design and construct the project. The DB team is typically procured using a two-phase process. The first phase is issuing a Request for Qualifications (RFQ) to solicit potential DB teams. Once the RFQ responses have been received and evaluated, the most qualified teams are shortlisted.

A Request for Proposals (RFP) is issued in the second phase. CDOT project team develops and issues the RFP and defines the project scope through a set of technical requirements, and performance based specifications. The shortlisted DB teams are invited to submit a proposal in

response to the Request for Proposals (RFP). The Colorado Department of Transportation (CDOT) evaluates the proposals received from the shortlisted teams against the evaluation criteria set out in the RFP. This evaluation should be done in a transparent and fair manner, considering the specific needs of the project. Once the proposals have been evaluated, CDOT selects a Design-Build (DB) team using a Best Value process where price and other factors such as schedule, past performance, project innovation, design alternatives, aesthetics, and quality management are considered.

DB project delivery offers several benefits over traditional delivery methods for highway construction. One of the main benefits is that it brings together the design and construction phases under a single contract, allowing for better coordination, communication and efficiency. This can lead to faster project delivery times, improved quality control, and potential cost savings. With DB the owner transfers a significant portion of project risks to the DB team, who assumes responsibility for both design and construction, reducing the owner's risk exposure.

**Construction Manager/General Contractor (CMGC)** is a contracting method used where the owner, CDOT, of the project enters into separate contracts with a construction manager and a General Contractor (GC). The construction manager is hired during the preconstruction phase to provide input and guidance on constructability, cost estimation, and scheduling. The GC is contracted for the construction of the project. CDOT can use its in-house design staff or hire a design consultant using the CDOT consultant selection procedures detailed in “Section 1.04”. CDOT also hires an independent cost estimator for the preconstruction phase using a professional services contract.

Procuring a construction manager follows a structured process. Initially, the CDOT project team develops and issues a Request for Proposals (RFP) that outlines the project scope, goals, selection criteria, contractual requirements, and submission instructions. Prequalified Construction Management (CM) firms are solicited to submit proposals. The proposals should demonstrate the firm's understanding of the project, its ability to meet CDOT's objectives, and its relevant experience. CDOT then evaluates the submitted proposals based on predetermined criteria. The teams with the highest ranked proposals are shortlisted. Shortlisted CM firms are invited to participate in interviews to further evaluate their capabilities and suitability for the project. These interviews provide an opportunity for the CM firms to elaborate on their proposals and showcase their expertise. Finally, CDOT awards the contract, based on the evaluation of the proposal and interview, to the CM firm that can provide the best value for the project.

In Streamlined Design-Build the design and construction phases overlap to expedite project delivery. CDOT streamlines the procurement process by prequalifying DB teams based on their qualifications, experience, and capacity. Once selected, the DB team collaboratively develops the project's design and construction plans, maximizing the opportunities for innovation and value engineering. This streamlined approach enables the CDOT to accelerate

project completion, enhance collaboration between stakeholders, and deliver projects that meet Colorado's growing transportation needs.

Construction Manager/General Contractor (CMGC) project delivery offers several benefits over traditional delivery methods. Early involvement of the construction manager allows for valuable input during the design phase, optimizing constructability, cost estimation, and scheduling. The collaborative approach fosters effective coordination and communication, reducing conflicts and ensuring smoother project execution. Value engineering opportunities can lead to cost savings and improved efficiency. Risk ownership in CMGC delivery is typically balanced between the owner and the CMGC team, as the construction manager's early involvement in the project allows for risk identification and mitigation, while the CMGC team assumes responsibility for construction-related risks.

In Public Private Partnerships (PPP's), the Colorado Department of Transportation (CDOT) executes contracts with private entities or developers to design, construct, operate, maintain, and finance large-scale transportation projects in return for monetary compensation derived from the transportation improvement(s). CDOT typically utilizes a two-phase DB process to award PPP's. Solicited PPP's are preferred by CDOT, as opposed to unsolicited PPP's because they provide CDOT with improved levels of risk management, contract negotiation, and Best Value determination.

Several factors are evaluated when determining the most appropriate delivery method for a project, including project complexity, opportunity for innovation, cost and schedule considerations, program and project goals, risk allocation, Contractor capability, and CDOT's capacity to develop, implement and manage the contract.

If a project manager feels that a project could benefit from Contractor input during pre-construction to improve constructability, enhance innovation, shorten schedule, reduce risks or save costs, they should reach out to the Alternative Delivery Program to schedule a meeting to determine if a Project Delivery Selection Matrix Workshop is warranted. If warranted, the Workshop will help to evaluate and select the most appropriate delivery method for the project. It is important to consider this option early in project development and ideally during the scoping phase of the project to maximize potential benefit. The CDOT Alternative Delivery Program is available to assist with facilitating a project delivery selection matrix workshop to determine the most appropriate method for your project and should be contacted anytime alternative delivery is considered. For further information regarding CDOT alternative delivery contracting methods, please visit the program's website: Alternative Delivery Program | Design-Build & Contract Manager / General Contractor.

## 1.06 Entity Agreement (Local Agency & Publicly Owned Agencies

An entity agreement is required when CDOT and an entity have a shared financial interest in a transportation project.

The entity agreement identifies the responsibilities of every party and their respective financial contributions. The agreement enables the transferring of funds between CDOT and the entity. The term, entity, as used here, refers to a local public agency or publicly owned agency, that can legally enter into an agreement with CDOT for a transportation project. The following definitions apply:

**Local Public Agency** is any city, county, township, municipality, or other political subdivision that is empowered to cooperate with the Colorado Department of Transportation (CDOT) in transportation matters. This is usually referred to as a local agency. An agreement between CDOT and a city or county is entered into when a project is within a local public agency's jurisdiction and CDOT administers the federal-state funding. When the entity is a local public agency, the CDOT Colorado Local Agency Program guidelines apply. See the Local Agency Manual in Manuals. And, the 2022 CDOT Local Agency Project Desk Reference.

**Public Agency** is any organization with administrative or functional responsibilities directly or indirectly affiliated with a national, state or local jurisdiction. CDOT may enter into an agreement with another state agency, a federal agency such as the National Forest Service, or a regional agency such as the Denver Regional Council of Governments. The Resident Engineer should work with the entity to determine the parameters of an appropriate agreement whenever an entity or public agency needs to:

1. Maintain or construct a project affecting the state highway system.
2. Provide funds for such a project;
3. Receive funds for such a project or
4. Address other interests that require the entity to coordinate with CDOT on such a project.

The Project Manager (PM) works closely with the Engineering Contracts Services in the Engineering Contracts Branch to establish a contract for the team. These teams are responsible for the execution of an agreement between CDOT and an entity or public agency except for Right of Way agreements (which are done by the regional Right of Way Unit. If there will be utility involvement (the relocation of existing facilities or the installation of new services) the Resident Engineer must coordinate with the region Utilities Engineer to determine if any contracts may be required, and to initiate contract development.

In general, a separate contract with each involved utility will be required for any work by the utility for which CDOT repays the utility, or for utility work incorporated into the project for which the utility repays the project. A utility's reimbursement is determined by the Utility Accommodation Code. The region Utilities Engineer, in consultation with the Resident Engineer, negotiates an appropriate agreement with the utility in coordination with the Engineering Contracts team. Those negotiated terms must then be documented on a formal contract and executed by the authorized parties (Chief Engineer and State Controller).

Any agreement not on an Office of the State Controller (OSC) template must be approved by OSC before being processed by Engineering Contracts Services and then routed for OSC signature. All required utility agreements must be in place before the project being advertised for construction.

The following steps for implementing an original entity agreement or an modification to an entity agreement for a transportation project are performed by the following parties:

Project Manager (PM) Responsibilities:

1. Ensure that the proposed entity agreement is consistent with the Colorado Department of Transportation's (CDOT's) long-range plan, Statewide Transportation Improvement Plan (STIP), the CDOT budget, and the obligation plan. (Program Engineer, Resident Engineer and Business Office).
2. Determine division of work responsibilities for the project (Resident Engineer and entity representative).
3. Prepare and transmit to the Engineering Contracts Services a contract request form, including approved shopping cart for encumbering requests; and if the following is not attached to the cart, include a Form 1243 Local Agency Contract Administration Checklist, completed Exhibit C, Exhibit A: Scope of Work and Purchasing Approval Routing sheet.
4. Review and comment on contract draft.
5. Issue a notice to proceed to entity.

Engineering Contract Writer Responsibilities:

1. Review and analyze contract request, prepare draft contract, and forward draft to region.
2. Revise final draft, if requested and, as appropriate, to address entity concerns (in coordination with the Resident Engineer, Region Business Office, and the Office of State Controller, as needed).
3. Route the entity-signed contract copies for execution.

PM's must review local agency solicitation advertisements prior to publication for consultant professional services. Professional service solicitations must be in compliance with Brooks Act or the Colorado Revised Statute equivalent. These laws require qualification-based selections for all professional services funded by federal or state funds. The local agency Area Engineer shall support any items identified as possible noncompliant by the region's review of an entity-consultant selection process.

Construction solicitations that use traditional invitation for bid methods, the review of bid documents takes place after the low bidder is identified. If the local agency uses alternate delivery, their alternate delivery process must be reviewed and approved by the director of alternate delivery in advance of advertisement.

The documents required to secure concurrence from the Colorado Department of Transportation's (CDOT's) construction contract manager under delegation from the Federal Highway Administration (FHWA) include a financial statement, and Forms 605, 606, 621, 1414, 1415 and 1416 (1414-1416 when a Disadvantaged Business Enterprise (DBE) goal is set for the project) with a request for concurrence to award cover letter. A letter of concurrence will be produced by the construction contract manager once the solicitation process has been reviewed and approved.

For additional information on intergovernmental agreements see the Flowcharts on the Local Agency Manual site.

## 1.07 Post-Award

At the time of award, the construction phase budget will be adjusted so that it matches Form 65 Project Financial Statement exactly. The preconstruction phases have to be closed shortly thereafter (approximately 30 days) or a request with justification has to be made to keep the funds open.

The approved commission budget level is significant in determining the number of authorized actions over the life of a project. Use Systems, Applications and Products in Data Processing (SAP) transaction ZJ20 to access Form 65 which will indicate the Approve Commission Budget. It is from this dollar amount that the 10 percent will be computed for determining if Chief Engineer approval is required for project award during the project bid process. It is also from this amount that the 15 percent will be calculated to establish if Transportation Commission (TC) action is required to increase the project budget or for award of a project at bid.

Any request for additional budget greater than 15 percent of the approved TC budget will be processed through a budget supplement action, which occurs on a monthly basis.

If the budget request is less than 15 percent of the TC approved budget, the Office of Financial Management and Budget (OFMB) may approve the request as an "allotment advice". Allotment advice includes transfers to projects from pools or other projects. An allotment advice is usually processed within a few days. Refer to Policy Directive 703.0.pdf for more information including this Adopted Policy Directive 703.0 Matrix.

Any surplus or deficit amounts will be corrected by the regional business managers with a budget action submitted to the Office of Financial Management and Budget (OFMB) for approval to de-budget or supplement the amount.

## 1.08 FORM 895 – Force Account Construction Method – Finding in the Public Interest (FIPI))

The term, force account construction method, refers to construction work a public agency (typically a local agency) performs on federal or state funded projects using its own forces. Specifically, it means the direct performance of highway construction work by the department, local entity, county, railroad, public utility company, or other agency by use of labor, equipment, materials, and supplies furnished by the agency and used under its contract terms (23 Code of Federal Regulations (CFR) Part 635.203(c)). This section does not apply to work as defined in Colorado Department of Transportation's (CDOT's) Standard Specifications.

Competitive bidding is specifically required by Title 23 US Code (USC) 112. Waiving the requirements should be done only after careful consideration of the effect or precedent that will be set. Projects may be entirely or partially constructed by the force account method only when it is determined that the needs of the public will be better met by not following the general rules.

If circumstances justify a negotiated contract or another unusual method of construction, the policies and procedures prescribed for the force account construction method apply.

A FIPI fully justifying the use of the force account construction method must be prepared and documented on Form 895 Force Account Construction Method Finding in the Public Interest. All supporting documentation must be attached.

The force account construction method may be justified on a federal or state funded project under any one of the following conditions:

1. Emergency work, as defined in "Section 120.8" of CDOT's Construction Manual, is necessary to protect public health and safety, or a major element or segment of a highway or roadway has failed, and competitive bidding is impossible or impractical. Competitive bidding may be precluded because immediate action is necessary to minimize the extent of the damage, to protect remaining facilities, or to restore essential travel as provided in 23 CFR 635.204(b).
2. The inherent nature of the operation makes it cost effective to perform minor adjustments (as determined by the railroad or utility) of railroad and utility facilities by the force account construction method, while the majority of work is performed by competitive bid. See 23 CFR 635.205(b).

3. It is typically cost effective to perform work that is incidental to the main purpose of the project by the force account construction method. The majority of work is still accomplished by competitive bidding.
4. It is also typically cost effective to perform the work by the force account construction method and the agency demonstrates that the circumstances are unusual and unlikely to recur.
5. The construction contract value is under $50,000 and does not justify the costs associated with the competitive bidding process; or there is a lack of bids, or the bids received are unreasonable.

When the force account construction method is considered, it must be justified by a cost effectiveness determination that shows a substantial savings over estimated contract prices.

1. The cost effectiveness determination should compare the detailed cost estimate for work by the force account construction method with the detailed cost estimate of work by the competitive bid method of construction. The estimates for both shall be all inclusive so a fair and equal comparison can be made.
2. The public agency estimate for the force account construction method must include all costs associated with the work and not just the work that will be billed to the project. These costs include non-reimbursable costs that are inherent to the work including labor, overhead, equipment, materials, and supplies.
3. The cost effectiveness determination may be based on unit prices, including all engineering and administrative costs. Unit prices must be based on the cost of performing the work. If the public agency has no set rates for its equipment, it may use the current rental rates specified in “Subsection 109.04(c)” of the Colorado Department of Transportation’s (CDOT’s) Standard Specifications.
4. The cost effectiveness determination must include the overhead costs incurred by the public agency (employee wages, benefits, and equipment costs) and other items subsidized by the taxpayer.
5. To perform work by the force account construction method, the public agency must be adequately staffed and suitably equipped to perform the work cost effectively in the prescribed time.

The following items of documentation, when used to justify the use of force account construction methods by a public agency, must be retained in the project files:

1. Form 895 – Force Account Construction Method – Finding in the Public Interest.
2. Cost effectiveness determination.

3. Evaluation that demonstrates the circumstances are unusual and unlikely to recur.
4. Documentation of the emergency.
5. Documentation demonstrating a lack of bids or bids received were unreasonable.

The region administration process for the force account construction method includes the following procedures.

1. The region investigates the public agency's request to use the force account construction method.
2. The public agency Project Manager (PM) completes a Form 463 Design Data that clearly indicates the method used.
3. The region Program Engineer certifies that the public agency is capable of administering and performing the specified work and assembles the supporting documentation listed on Form 895 – Force Account Construction Method – Finding in the Public Interest.
4. The public agency prepares a set of plans. The minimum plans consist of:
    a. General plan sheets (typical sections, plan and profile) as applicable.
    b. Estimate of quantities (summary of quantities).
    c. Tabulation of bid items, general notes, description of project work type, and location (map).
    d. Special details, as required.
    e. Special Provisions, as required.
5. The public agency obtains all required clearances and permits as applicable on Form 1048 Project Scoping/Clearance Record.
6. Systems, Applications and Products in Data Processing (SAP) shall show that the project will be constructed by the force account construction method, whether state forces or a local agency does the work.
7. The Colorado Department of Transportation's (CDOT's) Office of Financial Management and Budget (OFMB) completes Form 418 after receipt of the signed Form 1180. Obligation must be requested and approved through SAP. For federal aid projects, Form 418 is used to obtain obligation/authorization approval for the construction phase from the Federal Highway Administration (FHWA).
8. For projects that do not go through CDOT's bid process, the region issues a notice to proceed only when all of the following are complete:

a. All documentation justifying the force account construction method is complete.

b. Plans are complete and approved by the Resident Engineer.

c. Obligation authority and funding are cleared by the Resident Engineer.

A copy of the notice to proceed must be sent to the Office of Financial Management and Budget (OFMB) and Projects and Grants for the Colorado Department of Transportation (CDOT) to authorize expenditures for the construction phase.

Blanket approval under force account is given to state forces (with a current limit of $5,000) for certain advance construction signing, temporary construction striping, permanent signing, and permanent striping, all of which have an existing blanket Federal Highway Administration (FHWA) approval.

The Center for Procurement and Contract Services in the Division of Finance and Accounting provides contract support for intergovernmental agreements, agreements with Municipal Planning Organizations and private entities.

**Additional Resources:**

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

For forms, see CDOT on-line forms library: Online Forms Catalog

Construction Manual – updated March, 2022

# Section 2

# Project Development Process

May, 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

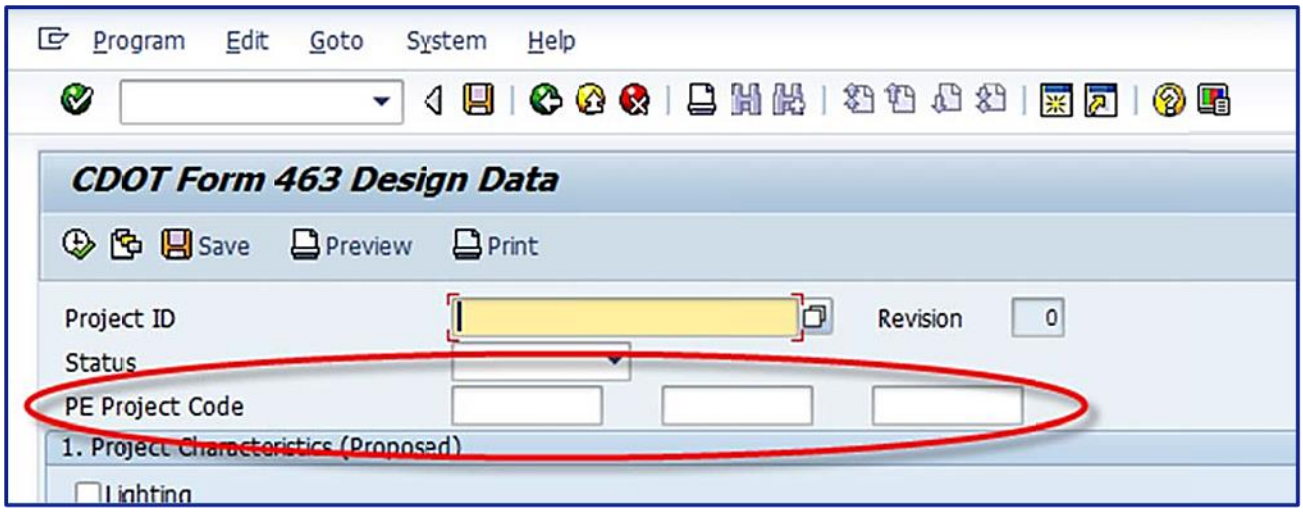
work or extend the project limits. If it is necessary to revise the project limits or the scope of work, then Form 463 must be revised. The Project Limits are changed under the Systems, Applications and Products in Data Processing (SAP) transaction “CJ20N” and is auto-populated into Form 463. The Resident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



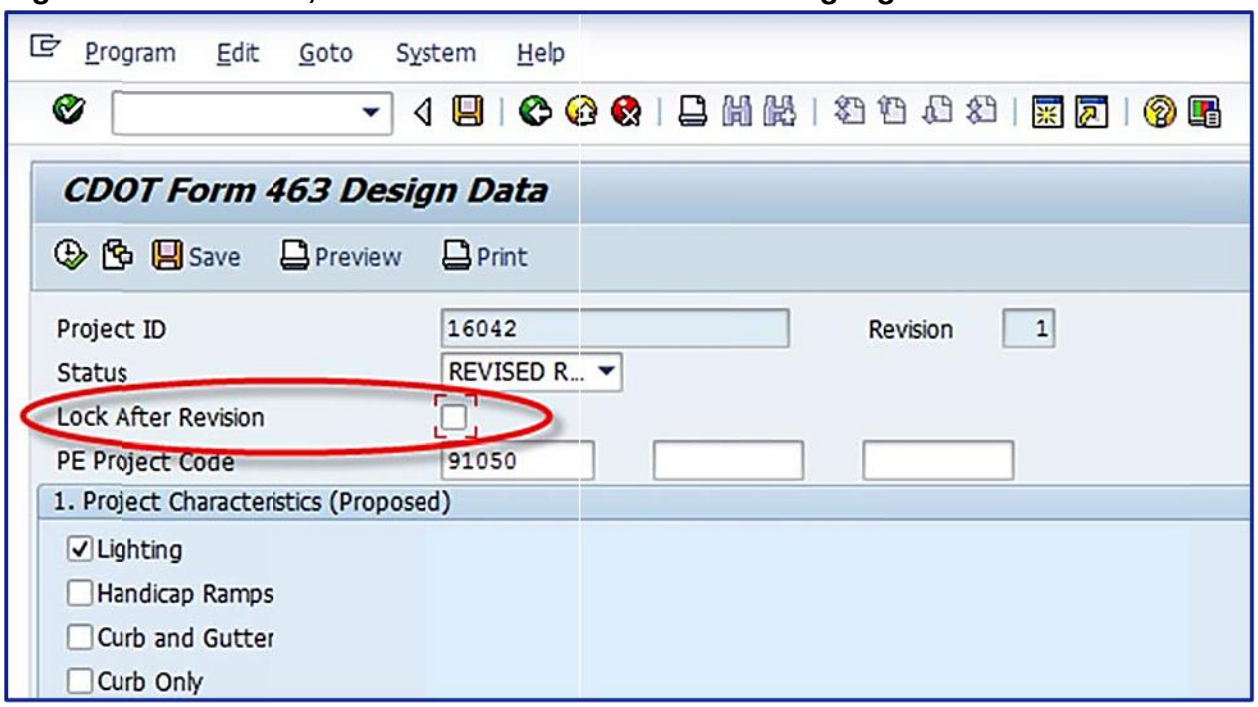
These fields are intended to list any other projects that were used for the preparation or clearing of the construction project. For example, if a separate design project was used such as as a Resurfacing Design pool or a project design corridor. Another example would be if a Right of Way (ROW) acquisition 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
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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)

## 2.010 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

## 2.011 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)

## 2.012 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

# 2.013 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 40 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 40 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.<br>● Investigate technical reports and field data. Develop team focus and objectives. |
| 2. Function Analysis | ● Analyze the project to understand the required outcomes.<br>● 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.<br>● Analyze design alternatives, technical processes, and life-cycle costs. |
| 5. Development | ● Develop the selected alternatives into fully supported recommendations.<br>● Develop technical and economic supporting data to prove the benefits and feasibility of the desirable concepts.<br>● Develop team recommendations including long-term and interim solutions.<br>● 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.<br>● 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.<br>● Post VE analysis activities include the implementation and evaluation of the outcomes of the approved recommendations.<br>● Conduct a VE Close Out meeting to review VE Study results with identified members of the Colorado Department of Transportation (CDOT) and FHWA.<br>● 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)

## 2.014 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.

## 2.015 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

## 2.016 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.

## 2.017 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.

## 2.018 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:

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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

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[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

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Example below:

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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

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**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

## 2.019 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.

## 2.020 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.

# 2.021 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.

## 2.022 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.

## 2.023 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.

## 2.024 Project Control Data (Form 859)

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

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

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

All specific project features, construction requirements, and other special requirements that may impact contract time should also be included in the Form 859. The Resident Engineer is responsible for initiation and completion of this form. 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).
11. Complete the Form 859 four weeks prior to the scheduled advertisement date and receive Program Engineer approval signature.
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

# 2.025 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)

## 2.026 Final Office Review

The Final Office Review (FOR) is 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.

## 2.027 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

## 2.028 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)

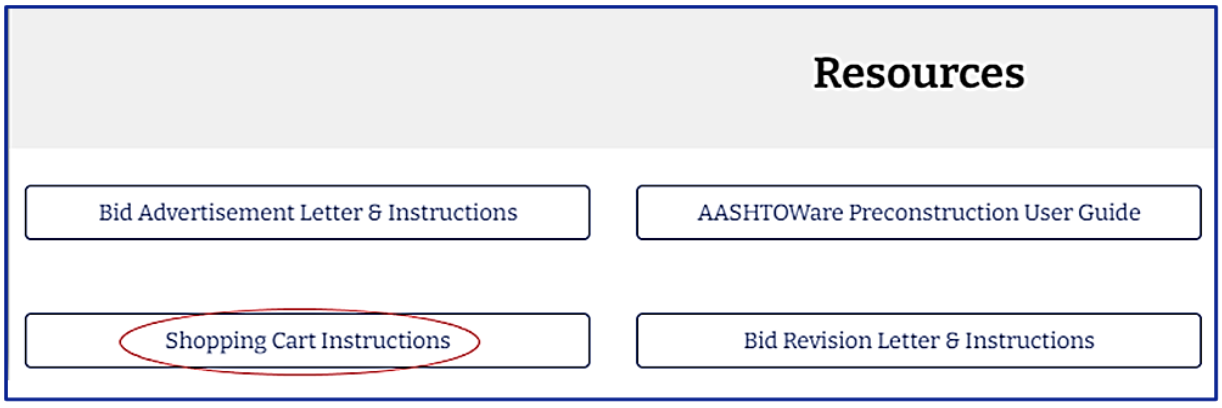
23 CFR Part 630A, Federal Aid Project Authorization

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

## 2.029 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**



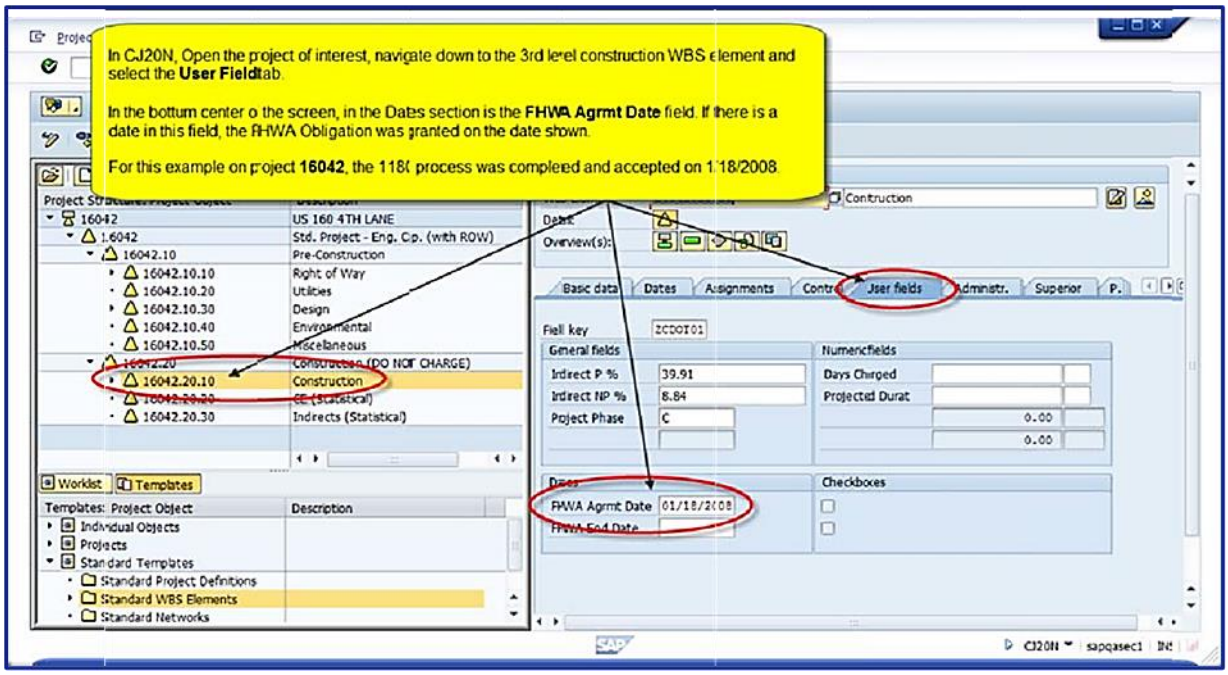
Shopping Carts (SC's) for Bridge & Tunnel Enterprise will need to be created differently and instructions for those SC's are referenced below. For Bridge & Tunnel Enterprise SC's use the following for the Account Assignment details:

- "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.

## 2.030 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.**

## 2.031 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 should 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.

# 2.032 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

## 2.033 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

## 2.034 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.

## 2.035 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.

## 2.036 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.

## 2.037 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.

# Section 3
# Environmental

November, 2023 version


COLORADO
Department of Transportation
Office of the Chief Engineer

# Table of Contents

# 3.01 Introduction

## 3.01.01 Environmental Clearance

Environmental Clearance is required for every project before final design is complete, right of way can be purchased and advertised, or purchased before advertisement This introduction describes how to navigate the environmental clearance process for the National Environmental Policy Act (NEPA) projects**.** Following the introduction are individual sections for each environmental resource, presenting resource-specific information to aid in the clearance process. Information includes a description of the resource, its associated regulations, a list of tasks that should be completed by the environmental resource specialist, a list of tasks to be completed by the Resident Engineer, a general timeline for clearance of each resource, and a list of potential red flags. Red flags are generally considered to be those things that would significantly lengthen the project schedule or be costly to mitigate. These sections are for informational purposes; your regional environmental resource specialist, or the Colorado Department of Transportation (CDOT) Headquarters Division of Transportation Development/Environmental Programs Branch (EPB) resource specialist, will assist you with impact analysis, permitting and mitigation.

More detailed information on the resource clearance processes, and the entire NEPA process, can be found in the CDOT NEPA Manual; your Region Planning and Environmental Manager (RPEM) (region 1 has two people doing this job—a Region Environmental Manager [REM] and a Region Planning Manager [RPM]) or associated region Environmental staff, or CDOT EPB Environmental staff, or both should be consulted on every project.

## 3.01.02 Overview of NEPA

NEPA requires that federal agencies use a systematic, interdisciplinary approach to decision-making when actions may affect the quality of the human environment. NEPA is implemented by the Council on Environmental Quality (CEQ) through Title 40 Code of Federal Regulations (CFR) Section 1500–1508. To address the NEPA responsibilities established by CEQ, the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) jointly issued regulations, Environmental Impact and Related Procedures (FHWA and FTA, 23 CFR 771 Section 771.101–771.131). The FHWA and FTA NEPA process allows transportation officials to make project decisions that balance engineering and transportation needs with social, economic, and natural environment factors.

Transportation projects vary in type, size, complexity, and can have impacts ranging from negligible to significant to both the natural and human environment. To account for the variability of project impacts, there are three basic classes of action that prescribe the level of documentation required in the NEPA process:

Class I—Environmental Impact Statement (EIS)

Class II—Categorical Exclusion (CATEX)

Class III—Environmental Assessment (EA)

Table 3-1 summarizes the definition, examples, requirements, and general schedules for the different classes of action. Most Colorado Department of Transportation (CDOT) projects are completed through the CATEX process. The class of action for larger projects is determined by the Federal Highway Administration (FHWA), in consultation with CDOT (typically the Region Planning and Environmental Manager [RPEM]), through a formal process. More detailed information for each class of action can be found in the CDOT National Environmental Policy Act (NEPA) Manual.

**Table 3-1 NEPA Classes of Action (following pages)**

| Class 1 Environmental Impact Statement (EIS) | Class 2 Categorical Exclusion (CATEX) | Class 3 Environmental Assessment (EA) |
|---|---|---|
| Required for actions likely to have significant environmental effects that cannot be mitigated.<br><br>An EIS details the process through which a transportation project is developed, including consideration of a range of reasonable alternatives and detailed analysis of the potential impacts to the environment resulting from each alternative. | Required for actions that do not individually, nor cumulatively, have a significant environmental effect or have substantial controversy. Necessary environmental studies and compliance with all applicable requirements are still required for the project. There are two types of CATEX's: the programmatic CATEX that the Colorado Department of Transportation (CDOT) can sign as authorized by the Federal Highway Administration (FHWA); and the non-programmatic CATEX that requires FHWA signature. | Required for actions that do not qualify as CATEX, but where there is insufficient information to determine whether the project's impacts warrant an EIS. The EA should concentrate attention on environmental resources with impacts that may be significant or that could be a discerning factor in alternative selection; therefore, this approach should result in a much shorter and more focused document than with an EIS. An EA details the process through which a transportation project is developed. This could include the consideration of a range of reasonable alternatives and detailed analysis of the potential impacts and mitigation effectiveness resulting from each. |

| **Class 1 Environmental Impact Statement (EIS)** | **Class 2 Categorical Exclusion (CATEX)** | **Class 3 Environmental Assessment (EA)** |
|---|---|---|
| Examples include:<br><br>A new, controlled- access freeway/highway<br><br>A project having substantial public controversy on environmental grounds<br><br>New construction or extension of fixed rail transit facilities | Examples include:<br><br>• Pedestrian facilities<br>• Landscaping<br>• Routine maintenance, including resurfacing<br>• Intersection improvements<br>• Bridge replacement/rehab<br><br>Minor widening | Examples include:<br><br>• Actions that are not clearly Class II Categorical Exclusion (CATEX)<br>• Actions that are not clearly Class I Environmental Impact Statement (EIS)<br>• New construction of highway interchange<br><br>Adding capacity |
| Upon completing the EIS, the Federal Highway Administration (FHWA) signs a Record of Decision (ROD) that presents the basis for the determination, summarizes any mitigation measures to be incorporated in the project, and documents any Section 4(f) approval (see Section on 4(f) for further information). No EIS level project can proceed to final design without a signed Record of Decision (ROD). | Colorado Department of Transportation (CDOT) and FHWA approval is required on all CATEX projects. In Colorado, FHWA has "programmatically" delegated approval of some CATEX's to CDOT so that no FHWA signature is required. CATEX's are recorded using CDOT Form 128 Categorical Exclusion Determination, and may have associated documentation. Non-programmatic CATEX's tend to require more documents. No CATEX project can go to ad without a signed CATEX). | In coordination with FHWA, CDOT determines whether a Finding of No Significant Impact (FONSI) is appropriate for a completed EA study or if further study is required in an EIS. No EA project can proceed to final design without a signed FONSI. |

| **Class 1 Environmental Impact Statement (EIS)** | **Class 2 Categorical Exclusion (CATEX)** | **Class 3 Environmental Assessment (EA)**l |
|---|---|---|
| Schedule: An Environmental Impact Statement (EIS) is the longest environmental process. Both the Draft EIS and the Final EIS must go out for public review. These documents require a formal public hearing and legal sufficiency review from the Federal Highway Administration (FHWA) HQ in Washington DC. EIS's can take years to prepare and complete the pre-National Environmental Policy Act (NEPA) and NEPA process. | Schedule: A Categorical Exclusion (CATEX) is typically the shortest environmental process. A clearance can take just a few weeks or up to 1.5 years or more. The typical clearance is four–six months (See the example schedules for a Simple Categorical Exclusion Example and Complex Construction Engineering (CE) Example project). Those CATEX's that require FHWA signature can take longer to clear. These non-programmatic CATEX's are usually more complex projects and time is needed to coordinate with FHWA and other agencies. | Schedule: An Environmental Assessment (EA) can take nine months to two years to complete. Only the Final EA and Finding of No Significant Impact (FONSI) goes out for public review. Legal sufficiency review is done at the local FHWA office in most cases. They do not require a formal public hearing unless requested by the public. |

Additionally, any of these classes of actions could require a re-evaluation of the analysis with FHWA if: there is a change to the design approved by or is similar to the original NEPA document; it has been three years or more since the document was approved and the project is moving on to the next phase of Right of Way (ROW), design or construction; or there has been a change in regulation, policy, the environment, or the project. Sometimes, a quick re-evaluation can document that none of these conditions exist so the project can move forward without risk of surprises during project advertisement. Most re-evaluations move fairly quickly unless there has been a significant change in the project impacts (due to a change in environment or design) or regulation. The re-evaluation is completed during final design by the Region Planning and Environmental Manager (RPEM) (and sometimes FHWA) and must be

signed before the project can advance to advertisement. The Colorado Department of Transportation (CDOT) has Re-evaluation form, Form 1399, to document this process.

## 3.01.03 More on Categorical Exclusion (CATEX's)

CATEX's are by far the most common type of National Environmental Policy Act (NEPA) projects for CDOT and so this section will focus on the process and schedule for that class of action. CATEX's are actions that:

1. Do not induce significant impacts to planned growth or land use for the area.
2. Do not require the relocation of significant numbers of people.
3. Do not have a significant impact on any natural, cultural, recreational, historic or other resource.
4. Do not have significant impacts on travel patterns.
5. Do not involve substantial public controversy on environmental grounds.

It is important to note that even if a project action is listed as a Categorical Exclusion (CATEX), it will not qualify if the criteria listed above is not met. Even if a project is not expected to have significant impacts, a large amount of public controversy on environmental grounds can require an Environmental Assessment (EA) or Environmental Impact Statement (EIS) action as appropriate.

CATEX actions are generally categorized as either programmatic or non-programmatic.

Programmatic actions are those that, based on past experience, do not individually or cumulatively have a significant impact on the environment. Based on this past experience, a Federal Highway Administration (FHWA) signature is not required to clear these projects. A full list of programmatic and non-programmatic actions can be found in FHWA's NEPA implementing procedures (23 Code of Federal Regulations [CFR] Part 771.117) as referenced online on the Programs site under Intergovernmental Agreements, Categorical Exclusions Programmatic Agreement, Updated 2022.

Non-programmatic CATEX's are actions that meet the criteria for a CATEX in the Council on Environmental Quality (CEQ) regulations (CEQ, 40 CFR Section 1508.4) if they are appropriately analyzed, documented, and approved by FHWA. Therefore, FHWA signature is required on the front part (part B) of the Form 128 Categorical Exclusion Determination to clear these projects (more information on Form 128 is included below). Some non-programmatic actions not specifically listed in 23 CFR Section 771.117 may also qualify as a CATEX if it is known that no significant impacts will occur as a result of the action. Detailed information on all CATEX's can be found in CDOT's NEPA Manual.

Provided here are two example Categorical Exclusion (CATEX) schedules. One depicts the timeline for a “simple” CATEX. These are projects with minimal environmental resources present in the project area and do not require much agency coordination. The other depicts a “complex” CATEX. These are projects that may have environmental resources in the project area requiring more intensive agency coordination and mitigation. It should be noted that these are examples and will likely vary depending on the type of project. These timelines are useful to identify the resources with the critical path in the overall project schedule. Some projects will likely include a combination of “simple” and “complex” environmental resource timelines. Project managers must work with the Region Planning and Environmental Manager (RPEM) or resource specialists, or both to create individual project schedules and update them as the project progresses.

Simple Categorical Exclusion Example 030923.pdf

Complex Construction Engineering (CE) Example 030923.pdf

Since CATEX projects have no significant impacts on the environment, National Environmental Policy Act (NEPA) requirements are substantially less stringent than those for an Environmental Assessment (EA) or Environmental Impact Statement (EIS). For example, public involvement and alternatives analysis are not explicitly required, and the level of documentation for Federal Highway Administration (FHWA) approval is greatly reduced. Although not explicitly required for programmatic or non-programmatic CATEX’s, the Resident Engineer should consider some sort of public involvement, particularly for those projects that include Right of Way (ROW) acquisition, construction impacts that affect the public, road closures or detours, etc.

### 3.01.04 Schedule Implications

The length of time required to complete environmental clearances will depend on the necessary class of action, availability and type of funding, resources present and extent of impacts, unexpected changes in project scope/footprint, schedule conflicts with other projects (the Colorado Department of Transportation [CDOT] priority of the project), and even the time of year. The resource sections identify tasks that must be done at a certain time in order to avoid schedule impacts.

### 3.01.05 Project Funding

Most CDOT projects and local agency projects with CDOT involvement have a federal funding source, or a potential for federal funding. In addition to funding, some projects may have another federal nexus such as projects that involve the interstate system or projects that will require a federal permit. All of these projects are required to go through the NEPA process as described above. Additionally, a federal nexus triggers the need to complete a Section 4(f) analysis (see the Section 4(f) resource section for details on Section 4(f) properties). NEPA

and Section 4(f) can require some of the same steps, such as alternatives analysis and public involvement, which are sometimes done concurrently but may require additional time.

Sometimes, but not very often, a project may be funded only with state or local funds and not have any other federal nexus. In these cases, Colorado Department of Transportation's (CDOT's) Environmental Stewardship Guide and some state and federal regulations still require CDOT to consider environmental impacts for projects whether or not there is a federal nexus that requires a formal National Environmental Policy Act (NEPA) review; therefore, CDOT follows the intent and requirements of NEPA on all projects to cover those other environmental regulations, although there is some flexibility regarding how this is conducted if there is no federal nexus. There are some state and federal regulations for some resources that need to be considered regardless of funding; these requirements are described in the specific resource sections of this document.

All projects require the identification of funding sources in order to get the required environmental clearance needed for project advertisement. For larger projects requiring Environmental Assessment (EA's) or Environmental Impact Statements (EIS's), it is only necessary to show that the next phase of a project is funded; this could be final design, Right of Way (ROW), or an actual construction project. However, even when a project is phased, a reasonable plan for obtaining the rest of the funding is required to get a signature for the environmental document. If a funding source cannot be identified, the project may be a good candidate for a Planning and Environmental Linkages (PEL) study. A PEL study does not require a funding source to be identified, but still allows for the project to proceed with alternatives analysis, environmental analysis, or public and agency coordination, or both. Upon identification of a funding source, the information from the PEL study can then be used in the NEPA study, saving time and money. Additional information on PEL's can be found in CDOT's PEL Handbook.

## 3.01.06 Internal Coordination

While every project is different and will present unique environmental challenges, there are basic steps that must be completed for all projects. It will be necessary to coordinate with CDOT region or Environmental Programs Branch (EPB) staff in order to meet certain NEPA milestones such as Scoping; however, it is equally important to the project schedule and budget to continue that coordination through the life of the project.

1. **Early Notice of Impacted Area:**
   As early as possible, the Resident Engineer should prepare a map or aerial photograph with an outline showing the outside extent of possible ground disturbance, to be given to the Region Planning and Environmental Manager (RPEM) or their designee. The RPEM will assign an environmental project manager to the project that can begin work on the clearance process and inform the Engineer of any

issues that should be considered during design. The final extent of the project limits may not be known this early in the process so the study area should include locations that have the potential of being added, if additional funds are found. For example, if Intelligent Transportation Systems (ITS) is needed in the project area and funding could occur in the near future, include that area on the map as “may be added if funded” so that the clearances can be pursued. It is easier to remove an area from the study than it is to add it later. The study area should also include any staging areas and borrow pits needed by the project, if known at this stage of design.

2. **Early Notice of Impacted Right of Way (ROW) Needs:**
   If the Resident Engineer knows that Right of Way (ROW) may be required for the project, advance notice of parcel addresses and extent of the impacted area should be given to the Region Planning and Environmental Manager (RPEM) or their designee. The environmental project manager can then coordinate environmental resource work with the ROW right of entry permission process, including searching appropriate databases for historical resources, hazardous materials, or other environmental issues that may affect the conditions of purchasing the property. In addition, all temporary and permanent easements should be included in the notice to the RPEM.

3. **Immediate Notice if Design Changes:**
   If there are changes to the project design (additions, deletions, or moving a feature) the Resident Engineer should inform the environmental project manager immediately as it may affect the clearances for the project. Some examples of changes that alter a clearance include: moving a noise barrier location or changing its height; changing the elevation of a road or bridge; a change in the roadway alignment; changing the area of disturbance; changing the location of landscaping sprinkler valves; and modifying a design from a retaining wall to a 3:1 slope. This is not an all-inclusive list and the Resident Engineer should inform the environmental project manager of all changes.

National Environmental Policy Act (NEPA) regulations state that actions cannot be taken, such as the purchase of ROW, which would predetermine the outcome of the NEPA analysis. However, environmental staff can begin investigating project impacts as soon as they are given information about project limits. Only a map of the outer most potential project limits is needed for this but preliminary plans are helpful. If any environmental issues are identified within the project area, such as (but not limited to): the project is over one acre and in a Municipal Separate Storm Sewer System (MS4) permitted area; the project has historical resource impacts, the project has prairie dogs living within the project area; or the project is in potential paleontologically rich substrate, then more advanced plan designs are required before all environmental clearances can be obtained. Environmental staff need to see the planned project impacts to determine such things as:

location and design of permanent water quality features; the mitigation of prairie dogs; or location and depth of disturbance for paleontological monitoring during construction. Once these criteria are addressed within the project's plans and specifications, the required environmental clearance can be completed and Right of Way (ROW) can proceed, if needed, so the project can be advertised.

## 3.01.07 Form 128 Categorical Exclusion Determination Approval

The Categorical Exclusion (CATEX) approval form, the Colorado Department of Transportation (CDOT) Form 128, is filled out by region environmental staff in PMWeb. The form is divided into five sections but is generally considered to be divided into a "front part" and "back part". The front part (parts A and B) of Form 128 provides a project description and list of environmental clearances to be completed. If new ROW will need to be acquired as part of the project, the ROW plan authorization and obligation of funds for ROW acquisition cannot begin until the front part (part B) is signed. It may be possible that early acquisition of ROW could be approved even before the front part is complete if it can be shown that it would not predetermine the National Environmental Policy Act (NEPA) decision and if no federal funds will be used for the ROW acquisition. The region's ROW manager should be consulted regarding early acquisition; the ROW Manual outlines options for early acquisition of ROW and environmental clearance requirements if that becomes necessary for a project.

The back part (parts C, D, and E) tracks environmental permits, ensures environmental commitments are in the final plans and specifications, and is needed for project advertisement and obligation of funds for construction. Although this form is primarily used for CATEX approval, signature on the back part (part E) is called the Environmental Project Certification signature and marks the completion of the CATEX process.

For detailed information on how to walk through the CATEX approval process, please see the CDOT NEPA Manual. Information on how to complete the process for programmatic CATEX projects, is located in Section 5.2.4, and for non-programmatic CATEX projects, it is located in Section 5.3.4.

**Additional Resources:**

On CDOT's Programs site: CDOT NEPA Manual

On CDOT's Programs site: Region Environmental Staff

CDOT's Environmental Programs Branch list of staff: CDOT Environmental Programs Branch Organizational Chart

Form 1399 Re-evaluation form: Form 1399_2019_Fillable

Categorical Exclusions Programmatic Agreement, 2022: Categorical-exclusion-programmatic-agreement-2022-update_signed-jf-3.pdf

Planning and Environmental Linkages (PEL) Handbook, 2022: Planning and Environmental Linkages (PEL) Handbook.pdf

### Environmental Resource Information

The following sections provide resource-specific information on the most common environmental resources that need to be analyzed for each project. Information provided for each resource includes what the resource is, who/what regulates it, what is needed from the Resident/Project Engineer, what the environmental resource specialist needs to do in order to complete the clearances, and what potential red flags to the schedule or budget the resource could represent. Your regional resource specialist/Environmental Programs Branch (EPB) specialist, will assist you with impact analysis, permitting, and mitigation for these resources.

## 3.02 4(f) Properties

### 3.02.01 What are Section 4(f) properties?

Section 4(f) properties are (one) publicly owned parks, recreational resources and wildlife/waterfowl refuges, and (two) historic properties regardless of ownership.

### 3.02.02 Why do we evaluate this resource?

49 US Code (USC) 303, United States (US) Department of Transportation Act, prevents the US Department of Transportation from “using” any Section 4(f) properties unless the secretary of the US Department of Transportation (DOT) determines that no feasible and prudent alternative to the use exists, and that the project includes all possible planning to minimize harm to the property. Any project that receives federal funds from the Federal Highway Administration (FHWA) must therefore comply with Section 4(f) requirements.

### 3.02.03 Who regulates this resource?

FHWA provides final approvals. However, the Official With Jurisdiction (OWJ) over the property must be consulted for approval in this process. For historic properties, the OWJ is the State Historic Preservation Office (SHPO) Officer. For publicly-owned parks, recreational resources and wildlife/waterfowl refuges, the OWJ is generally the public entity with most direct control over the property.

## 3.02.04 What does the environmental resource specialist need to do?

1. Identify all historic properties or all publicly owned properties, or both within the project area. This includes those within or part of the transportation system.
2. Identify officials with jurisdiction for each property.
3. Determine if Section 4(f) is applicable to the property and if there is a use for the property.
4. Determine appropriate Section 4(f) evaluation type (e.g., exception, de minimis, programmatic, full) for Section 4(f) property.
5. Complete Section 4(f) evaluations (e.g., exception, de minimis, programmatic, full) including any necessary consultations and approvals.
6. For Section 4(f) de minimis, programmatic, or full evaluations, complete the necessary reviews and approvals with Federal Highway Administration (FHWA).
7. For Section 4(f) exceptions, complete the appropriate site form for each property evaluated and submit to FHWA Colorado Division for their files
8. Document Section 4(f) evaluation process and approvals in project file

## 3.02.05 What does the Resident/Project Engineer need to do?

1. Develop project description and design elements, including the locations and extent of temporary or permanent easements and potential right of way acquisitions.
2. Work with the resource specialist to explore potential alternatives that avoid use of any Section 4(f) properties and develop justifications if avoidance is not possible.
3. When avoidance of a Section 4(f) property can't be accomplished, work with the resource specialist to determine measures to minimize harm to resources where use is anticipated. This can include project scheduling, phasing, possible design variances, and compensation as appropriate.
4. Assure that all measures to minimize harm and avoidance commitments are included in project plans and requirements.

## 3.02.06 What is the general clearance schedule for this resource?

Completing Section 4(f) consultation and document approval may take anywhere from one month to 24 months, depending on the process used, due to the different federal review requirements. Below are general time frames for the different types of Section 4(f) evaluation methods:

For review which leads to avoidance: one month

De minimis: three to six months

Programmatic: three to twelve months

Full evaluation: twelve to twenty-four months

### 3.02.07 What are the red flags for this resource?

1. Public controversy on the project.
2. A determination of adverse effect on a historic property.
3. Access closures or inability to provide for public access to parks/recreational resources during construction.
4. High number of all types of property acquisitions (right of way purchases), large number of Section 4(f) properties where there is a use.
5. Changes to project scope that result in use of Section 4(f) property.
6. Official With Jurisdiction (OWJ) not supportive of project or actively adverse to the project.
7. Design changes.

## 3.03 6(f)

### 3.03.01 What is Section 6(f)?

Section 6(f) of the Land and Water Conservation Fund (LWCF) Act prohibits property acquired or developed with LWCF grants to be converted to a non-recreational purpose. Importantly, Section 6(f) applies to all transportation projects involving possible conversions of the property whether or not federal funding is being utilized for the project. Normally, any federally funded transportation project requiring the conversion of recreational or park land covered by Section 6(f) will also involve Section 4(f).

### 3.03.02 Why do we evaluate this resource?

1. To preserve the intended use of public funds for land and water conservation.
2. To comply with Colorado Department of Transportation's (CDOT's) environmental stewardship policy, which ensures that the statewide transportation system is constructed & maintained in an environmentally responsible, sustainable, and compliant manner.
3. To comply with several legal mandates that pertain to the LWCF, Section 6(f)(3).

### 3.03.03 Who regulates this resource?

Section 6(f) is administered by the Department of Interior National Park Service (NPS). Section 6(f) directs the NPS to ensure that recreational or park lands impacted by a transportation project are compensated with replacement lands of equal value, location, and usefulness. NPS

delegates its authority to Colorado Parks and Wildlife (CPW) to provide initial coordination with CDOT.

## 3.03.04 What does the environmental resource specialist need to do?

1. If Right of Way (ROW) acquisition of public land is anticipated, the specialist will investigate CPW's list of 6(f) grants and list of Land and Water Conservation Fund (LWCF) resources.
2. Upon identification of impacts to 6(f) land, the region's ROW group, in cooperation with the local government land owner, will identify replacement land of equal value, location, and usefulness before a transfer of property under Section 6(f) can occur. More flexibility exists in cases where the total conversion is less than five acres per project phase.
3. Once land has been identified as a comparable replacement, the following steps are required:

    a. The region and the local government must develop a written plan, which demonstrates that the replacement land is acceptable to the local government. The plan must also include any special conditions, mutually agreed to and as deemed necessary, to bring about equal value, location and usefulness in the replacement land.
    b. Upon agreement of a written plan by the region and the local government, the specialist will submit the Section 6(f) Land Replacement Plan to CPW for concurrence. The specialist will coordinate with CPW during the process of the draft and final Section 6(f) evaluations.
    c. Upon acceptance of the written plan, CPW will submit the plan to the National Park Service (NPS) for approval.
    d. Once NPS approval has been obtained, CPW will send a concurrence letter to the Region Planning and Environmental Manager (RPEM) and the local government.

4. The resource specialist will then include information on the Section 6(f) property and the written plan in the Section 6(f) evaluation. The written plan and the CPW concurrence letter should be incorporated into the appendix of the Section 6(f) evaluation.

## 3.03.05 What does the Resident/Project Engineer need to do?

1. Inform and involve ROW as early as possible on any potential impacts to recreational or park lands.
2. Explore alternatives during the design process that minimize or avoid harm to the Section 6(f) resource.

3. If necessary, assist with the location of potential mitigation/replacement land.

### 3.03.06 What is the general clearance schedule for this resource?

Coordination, development and approval of a written plan with Colorado Parks and Wildlife (CPW) and National Park Service (NPS), as described above, can take over a year. Approval of the written plan must occur before the RPEM can issue Environmental Clearance on the front portion (part B) of the Form 128 Categorical Exclusion Determination. The conversion of the Section 6(f) land to a transportation use and the acquisition of the replacement land both occur during the Right of Way (ROW) acquisition phase; some exceptions could apply so work with your Section 6(f) specialist regarding mitigation requirements for impacts to Section 6(f) properties. The Resident Engineer will need to work with the region's ROW group to develop a schedule for the ROW clearance.

### 3.03.07 What are the red flags for this resource?

1. Anticipated ROW acquisition of public land including recreational, wildlife refuge, open space, or otherwise undeveloped could contain 6(f) funded assets.
2. Temporary closure of or loss of access to recreational properties that last longer than six months could affect the use of the 6(f) properties as well as make the 4(f) companion protections have more requirements.

## 3.04 Air Quality

### 3.04.01 What is air quality?

Air quality addresses the emissions of pollutants from transportation systems that can be harmful to human health, other living organisms, or man-made materials. Emissions may also contribute to regional haze and degrade visibility. In addition, Greenhouse Gases (GHG's) cause global warming and climate change. Rising temperatures, fires, droughts, flooding, and severe weather that are exacerbated by climate change stress transportation infrastructure.

Three categories of air pollutants are associated with highway projects: criteria pollutants, Mobile Source Air Toxics (MSAT's), and GHG's. Projects may require air quality analysis of one or more category of these pollutants under federal and state laws and guidance. Applicability depends on factors including where the project is located or the project National Environmental Policy Act (NEPA) classification or both. Details about which laws or guidance, or both apply and how the analysis is conducted are provided in the 2019 Colorado Department of Transportation (CDOT) Air Quality Project-Level Analysis Guidance. The following five paragraphs provide an overview of the air quality analysis, which is completed

under the National Environmental Policy Act (NEPA). The remaining three paragraphs of this section pertain to construction air quality requirements.

Projects developed, funded, or approved under Title 23 US Code (USC) or the Federal Transit Act (49 USC 1601 et seq.) that are in nonattainment areas and some maintenance areas[1] must comply with transportation conformity under 40 Code of Federal Regulations (CFR) 93 (also known as the "conformity rule"). The conformity rule applies to criteria pollutants. Compliance requires showing that the project meets regional and project-level conformity unless the project is exempt from the conformity rule. Projects may be exempt from regional conformity but not project-level conformity. Regional conformity analyses are conducted prior to NEPA, as part of the planning process. In urban transportation planning regions, regional analyses are conducted by the Metropolitan Planning Organization (MPO) and are applied to the MPO's planning process. Project-level conformity analyses include confirming that the regional analysis was completed and may include project-level hot-spot analyses.

Transportation Capacity projects that are Regionally Significant must comply with Colorado Revised Statute (CRS) 43-1-128 if the project environmental decision document (e.g., Finding of No Significant Impact [FONSI]) will be signed after July 1, 2022. The CRS requires that transportation air pollutants (i.e., criteria pollutants, Mobile Source Air Toxics [MSAT's], and Greenhouse Gases [GHG's]) be modeled.

Projects that are classified as Environmental Assessments (EA's) or Environmental Impact Statements (EIS's) must evaluate MSAT's under the Federal Highway Administration's (FHWA's) guidance. An MSAT analysis is either qualitative or quantitative (i.e., require emissions modeling). A general guideline is that projects with Annual Average Daily Traffic (AADT) of 150,000 or more that are in populated areas may need a quantitative analysis. However, an air quality specialist and FHWA must be involved in determining which type of analysis applies. If a project requires quantitative MSAT's analysis and the Colorado Revised Statute (CRS) also applies, MSAT's are only modeled once and the analysis is used to comply with both requirements.

Projects that are classified as EA's or EIS's must evaluate GHG's under Colorado Department of Transportation's (CDOT's) NEPA Manual, as of 2022. GHG project-level analysis requirements may change in 2023 or later. As of 2022, GHG analyses are qualitative for EA's and quantitative for EIS's (i.e., require emissions modeling). If a project requires quantitative GHG analysis and the CRS also applies, GHG's are only modeled once and the analysis is used to comply with both requirements.

[1] As of December 2023, only two maintenance areas in Colorado still need to comply with conformity; those in Steamboat Springs (through 11/24/2024) and Lamar (through 11/25/2025). There is not currently an end date for compliance within the ozone nonattainment area. It is possible that the Environmental Protection Agency (EPA) could designate new nonattainment areas.

Regardless of whether a project is required under law or guidance to do a project-level hot-spot analysis or other type of quantitative analysis, such analyses may be required on a project-by-project basis as recommended by the Colorado Department of Transportation (CDOT) executive management.

**Construction Phase Air Quality Requirements**: Projects must comply with Code of Colorado Regulations (CCR), 5 CCR 1001-5, which contain air quality requirements for emission sources. As a result, Contractors are responsible for submitting a land development Air Pollutant Emissions Notice (APEN) to the Air Pollution Control Division (APCD) prior to construction unless the project will last less than six months and the project footprint is less than 25 acres. If predicted emissions exceed air permit thresholds, an air permit must also be obtained from APCD prior to construction. The APEN form includes detailed information on the Fugitive Dust Control Plan (FDCP). An air permit, if required, will specify the type of dust control measures that were included in FDCP. Projects may also need to submit APEN's and obtain air permits for stationary sources associated with the project, such as concrete batch plants.

**Prior to construction**, projects that must comply with Colorado Revised Statute (CRS) 43-1-128 (projects defined as regionally significant transportation capacity projects in the 10-year plan) will need to monitor transportation criteria pollutants and develop a construction air quality plan. **During construction**, project requirements under the CRS include monitoring particulate matter, reporting monitoring concentrations to the public, alerting the public of exceedances, and implementing the construction air quality plan (e.g., requires mitigating construction emissions).

If the project includes demolishing a bridge or structure, Contractors may need to obtain a demolition permit from APCD of Colorado Department of Public Health and Environment (CDPHE). The permit could come with other requirements, so the construction schedule should allow for the proper handling of these activities. Depending upon the location, city or county, or both permits may need to be obtained prior to demolition.

## 3.04.02 Why do we evaluate this resource?

The 1990 Clean Air Act Amendments were passed by the United States (US) Congress to protect air quality and prevent the violation of National Ambient Air Quality Standards (NAAQS). Since then, federal and state governments have developed requirements for other types of air pollution, including Mobile Source Air Toxics (MSAT's) and Greenhouse Gases (GHG's). Requirements to reduce GHG emissions are meant to slow global warming and climate change.

## 3.04.03 Who regulates this resource?

The United States Environmental Protection Agency (EPA) administers the Clean Air Act Amendments; authorization is delegated to the Air Pollution Control Division (APCD) of the Colorado Department of Public Health and Environment (CDPHE). In addition, the Federal Highway Administration (FHWA), the State of Colorado, and the Colorado Department of Transportation (CDOT) have issued air quality requirements as described in this Section (3.04).

## 3.04.04 What does the air quality specialist need to do?

1. Determine which air quality regulations and guidance apply based on information from the project manager, including the project funding stream and project scope.
2. Provide information on the air quality scope and any analysis required to the environmental project manager for inclusion in consultant contracts, if requested.
3. Coordinate air quality interagency consultation Environmental Protection Agency (EPA), APCD, FHWA and local agencies and Metropolitan Planning Organizations (MPO's) as appropriate.
4. Attend meetings to discuss air quality analyses.
5. Review and approve air quality technical reports, which are prepared by consultants, if applicable.
6. Write project clearance letters or emails, or both (may only be required for Categorical Exclusions [CATEX's]) and review air quality sections of Environmental Assessment (EA) or Environmental Impact Statement (EIS) documents.
7. Prepare General Notes to be included in project plans, if requested.
8. Review applications for CDOT Permits and provide comments/questions regarding the potential air quality impacts of the proposed project or development, if requested.
9. Respond to public inquiries related to air quality.
10. Prepare and submit a conformity concurrence request letter to APCD (after approval of Air Quality Technical Report), when applicable. Concurrence is needed for these scenarios:
    a. Projects in a nonattainment or maintenance area for particulate matter for which the conformity rule applies; the project was not exempt from conformity; and either the project needed quantitative analysis (regardless of National Environmental Policy Act [NEPA] classification) or, for EA's and EIS's, the project did not need quantitative analysis.
    b. Projects that required a quantitative analysis for Mobile Source Air Toxics (MSAT) under FHWA guidance.

## 3.04.05 What does the Resident/Project Engineer need to do?

1. Confirm accuracy of project funding stream.
2. Go over the details of the project scope with the air quality specialist. Confer with the environmental manager, who must confirm whether the project meets the applicability criteria for Colorado Revised Statute (CRS) 43-1-128.
3. For projects requiring project-level conformity air dispersion modeling:
   a. Supply any traffic reports that show existing and future traffic volumes, turning movements, signal timing, and level of service analyses for signalized intersections within the project boundary.
   b. Provide design files (e.g., Computer Aided Design [CAD], MicroStation) showing proposed intersection designs and project roadway configuration, striping, and turning lanes.
4. For projects requiring Mobile Source Air Toxics (MSAT) modeling under Federal Highway Administration (FHWA) guidance or Greenhouse Gas (GHG), or both emissions modeling under the National Environmental Policy Act (NEPA) Manual: Provide the average speed distribution, Vehicle Miles Traveled (VMT) data, and Geographic Information Systems (GIS) data file or spreadsheet with the links being inventoried and hourly annual daily traffic volumes by hour and speeds on each link. If a spreadsheet is submitted, the length of each link, in miles, should be listed.
5. For projects requiring air pollutant modeling under Colorado Revised Statute (CRS) 43-1-128:
   a. If MSAT modeling is required under FHWA guidance and if air dispersion modeling is not required per Colorado Department of Transportation (CDOT) executive management, no additional information needs to be provided. The FHWA MSAT emissions model can also be run for other air pollutants and use the same inputs.
   b. If MSAT modeling is not required under FHWA guidance and air pollutants will be modeled using an emissions model, provide the information that would be used for the FHWA MSAT analysis.
   c. If air dispersion modeling is required per CDOT executive management, provide the information that is required for project-level conformity air dispersion modeling.

## 3.04.06 What is the general clearance schedule for this resource?

If an air quality technical report is not needed, the clearance can generally be provided quickly (e.g., two days). This is true for Categorical Exclusions (CATEX's) that do not need to comply with CRS 43-1-128 and are either exempt from the conformity rule or for which the conformity rule does not apply. Otherwise, an air quality technical report is required and the following schedule applies:

- Project-level analyses and report:
  - eight weeks if modeling is not required;
  - nine weeks if emissions modeling is required;
  - nine months if air dispersion modeling is required

- Preparation of conformity concurrence request letter and submittal to the Air Pollution Control Division (APCD), if applicable: three days
- APCD air quality technical report review and issuance of concurrence, if applicable: eleven business days, minimum

Total = If air quality technical report is needed: eight weeks to more than one year.

### 3.04.07 What are the red flags for this resource?

It is critical that if the conformity rule (40 Code of Federal Regulations [CFR] 93) applies, a project must be accurately described in the most recent Regional Transportation Plan (RTP) and funding be identified and programmed in the Transportation Improvement Program (TIP) or Statewide Transportation Improvement Program (STIP) prior to expected National Environmental Policy Act (NEPA) completion. A letter of conformity concurrence will not be issued by the Air Pollution Control Division (APCD) and the NEPA project cannot be completed until the project sponsor has met these conditions. Another key part of the concurrence is that APCD must agree with the conformity and Federal Highway Administration (FHWA) Mobile Source Air Toxics (MSAT) analyses. Modeling with an air dispersion model rather than an emissions model under 40 CFR 93 or Colorado Revised Statute (CRS) 43-1-128, if required, will have a large impact on how long it takes to complete the air quality analysis. The Region Planning and Environmental Manager (RPEM) or their designee must confirm if the project meets the criteria for a Regionally Significant project to see if the CRS applies. If the CRS applies, additional project funding will be needed to comply with NEPA and construction phase requirements.

## 3.05 Farmland

### 3.05.01 What is farmland?

Farmland is land used for agricultural crop production. Farmland may be classified as prime, unique, that of state importance, and that of local importance. Farmland is classified “prime” mainly based on soil characteristics. Soils that are known to produce a high yield of important crops are considered prime by the Natural Resources Conservation Service (NRCS). The term “unique” refers to the high value crops that a farm produces. Colorado areas that are known for certain crops fall into this category. For example, Palisade peaches or Rocky Ford melons may fall into this category.

## 3.05.02 Why do we evaluate this resource?

The Federal Farmland Protection Policy Act, 7 Code of Federal Regulations (CFR) Part 658, requires federal agencies to consider the adverse effects a project may have on the preservation of farmland. The Act protects “prime” and “unique” farmland. Farmlands of state and local importance also fall under protection of this Act.

## 3.05.03 Who regulates this resource?

The NRCS regulates this resource but coordination with local agricultural extension is also required to determine if a farmland qualifies for protection under the Act.

## 3.05.04 What does the environmental resource specialist need to do?

Complete Form AD 1006 (See National Environmental Policy Act [NEPA] Manual Chapter Nine, Appendix G, Farmland Conversion Impact Rating.pdf; or Form NRCS-CPA-106.pdf, should be used if it is a corridor project.

## 3.05.05 What does the Resident/Project Engineer need to do?

- Work closely with the resource specialist to develop alternatives to avoid prime or unique farmland.
- If avoidance is not possible, prepare an estimate of the number of farmland acres the project will impact.

## 3.05.06 What is the general clearance schedule for this resource?

- Determine if impacted farmlands are prime, unique, or of statewide/local importance: two weeks
- Develop avoidance and minimization alternatives: two weeks
- Prepare Form 1006 and send to the Natural Resources Conservation Service (NRCS): one week
- NRCS has 45 days to respond to the conclusion on Form 1006: 45 days

Total = nine weeks.

## 3.05.07 What are the red flags for this resource?

The NRCS Soil Survey for the area will give the resource specialist a good indication when prime or unique soils are present at the project site. Projects that impact farms that produce

special high value crops are red flags (i.e., Olathe corn, Rocky Ford melons, Palisade peaches).

## 3.06 Floodplains

### 3.06.01 What are floodplains?

A floodplain is lowland adjacent to water bodies such as a river, creek, stream, or lake. Floodplains are designated by the size and frequency of floods large enough to cover them. Flood frequency is often described by the potential occurrence in a given year (percentage probability of flooding each year). For example, the 100-year flood has a one percent chance of occurring in any given year. Floodplains are mapped primarily for the purpose of establishing risk for flood insurance purposes.

### 3.06.02 Why do we evaluate this resource?

Executive Order 11988 Floodplain Management dictates how floodplains should be regulated for federal projects. Floodplains need to be regulated as construction within a floodplain can alter flooding patterns, causing damage to neighboring properties. Damage can be either physical damage as a result of flooding, or financial damage as a result of causing a property owner to have an increase in flood insurance rates.

### 3.06.03 Who regulates this resource?

The Federal Emergency Management Agency (FEMA) manages the regulation of floodplains, in cooperation with local counties and municipalities.

### 3.06.04 What does the environmental resource specialist need to do?

1. Obtain current regulatory floodplain maps, hydrology and hydraulics information.
2. Evaluate whether the geometry of the construction will alter the floodplain, and if so, evaluate opportunity to minimize or eliminate encroachment. When encroachment can’t be changed, perform hydraulic analysis of the channel to determine magnitude of impacts.
3. Work with residency to minimize impacts and ensure that floodway elevation increase is less than one foot. The floodway is the central portion of a flooded area and differs from the floodplain in that it is the portion of the floodplain with higher flow velocities that cause more damage than just inundation.
4. Judge whether a Conditional Letter of Map Revision/Letter of Map Revision (Conditional Letter of Map Revision [CLOMR]/Letter of Map Revision [LOMR]) submittal is necessary for the scope of impact.

5. If needed, prepare a Conditional Letter of Map Revision (CLOMR) submittal prior to advertisement.
6. If needed, prepare a Letter of Map Revision (LOMR) submittal after construction.

### 3.06.05 What does the Resident/Project Engineer need to do?

1. Provide geometry of the roadway, structures or embankments, or both that impinge into the floodplain.
2. For any floodplain impacts, provide channel cross-sections to allow for hydraulic analysis in accordance with the Colorado Department of Transportation (CDOT) Drainage Manual.

### 3.06.06 What is the general clearance schedule for this resource?

Floodplain modification approval can take a variable amount of time, depending upon the complexity.

A simple project, with minimal encroachment into an existing floodplain, with no change to floodway elevation, and no Federal Emergency Management Agency (FEMA) submittal: two to four weeks for evaluation.

A complex CLOMR application can take up to a year. A CLOMR is a submittal of the plans and hydraulic analysis of the planned improvements. This submittal is done prior to construction to get conditional approval of the proposed change. A LOMR is the submittal of the as-built geometry and hydraulic analysis after construction is complete. and the LOMR finalizes the change in the regulatory floodplain.

### 3.06.07 What are the red flags for this resource?

Any detrimental change to a floodplain, horizontally or vertically, on property outside the right of way, will result in the necessity to purchase property rights (either a floodplain easement or purchase acquisition) to allow that change to occur. Any increase of a floodway elevation of one foot or greater is prohibited and will not be approved by FEMA.

## 3.07 Hazardous Materials

### 3.07.01 What are hazardous materials?

The term hazardous materials is an all-inclusive term for materials that are regulated as a solid waste, hazardous waste, and other wastes contaminated with hazardous materials, radioactive materials, petroleum fuels, toxic substances, and pollutants.

## 3.07.02 Why do we evaluate this resource?

The Colorado Department of Transportation (CDOT) strives to identify contaminated facilities early in the project development process to protect worker health and safety, to limit public and environmental exposures, and to comply with laws that require investigation and remediation (clean-up).

Contamination above regulatory levels requires notification of and possible ongoing involvement by various federal, state, or local agencies, depending on the type of contaminant.

## 3.07.03 Who regulates this resource?

Hazardous materials are regulated primarily by the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), although a myriad of other laws and regulations may apply depending on the contaminant, or contaminants present.

For example, when contamination originates from a Leaking Underground Storage Tank (LUST) the Colorado Department of Labor and Employment–Division of Oil and Public Safety (OPS) is usually involved. The Colorado Department of Public Health and Environment (CDPHE) is involved when other waste types are identified, such as releases of chlorinated solvents from dry cleaning or manufacturing facilities, the discovery of uncontrolled landfills, or the location of a project within a Superfund site boundary. Involvement and coordination with other federal agencies, such as the United States Environmental Protection Agency (EPA), United States Army Corps of Engineers (USACE), the Nuclear Regulatory Commission (NRC), the United States Geological Survey (USGS), or local regulatory agencies, or both (county or city health departments) may also be required.

## 3.07.04 What does the environmental resource specialist need to do?

1. For all projects, consult with the Hazardous Materials (HAZMAT) specialist to determine what type of HAZMAT clearance document will be required. Prepare an Initial Site Assessment (ISA) for smaller, less complex projects with no Right of Way (ROW) acquisitions; contract a Modified Environmental Site Assessment (MESA) for larger, more complex projects, or a Phase 1 Environmental Site Assessment, or both if Right of Way (ROW) acquisition is required.
2. If structures (Bridges or buildings) are to be altered or demolished, consult CDOT Property Management on conducting asbestos/heavy metal paint inspections and sampling. In many situations, these requests start with the ROW group during property/building acquisition.The HAZMAT specialist will generally make the request for ISA’s and bridge improvements.
3. Results of the above may include avoidance of contaminated properties, follow-up

site investigations (ex. collect soil and/or groundwater samples during geotechnical sampling), and/or remediation (excavation, disposal, treatment, etc.). Consult Colorado Department of Transportation (CDOT) Property Management during the acquisition phase to assist with this.

4. Prepare or request permitting, if required, for site remediation, structure alteration or demolition, and/or discharge/dewatering of shallow ground water.
5. The resource specialist will notify the Resident Engineer when project specifications and plans need to be modified to include: requiring a materials management plan for minor or suspected contamination (This should be completed as part of three above, prior to going to construction. If it is not completed before going to advertisement, then it is to be completed by the Contractor awarded the project), Force Account contingency funding for possible Hazardous Waste management or disposal, or both and/or Modified CDOT 250 specifications to address known or suspected contamination.
6. Confirm that specifications/plans have been appropriately modified and that permits have been obtained, if necessary.

## 3.07.05 What does the Resident/Project Engineer need to do?

1. Perform a joint site review with the Hazardous Materials (HAZMAT) specialist, if requested.
2. Provide Field Inspection Review (FIR) plans with a clear project footprint.
3. Inform the specialist of:
    a. structure acquisition, modification, or demolition, bridge or storm water system Municipal Separate Storm Sewer System (MS4) modifications,
    b. temporary or permanent Right of Way (ROW) acquisition, subsurface work such as excavations, drilling, caissons, or utilities,
    c. disturbance depths (feet),
    d. suspected groundwater or dewatering?

4. Prepare information needed for environmental permits as requested by the resource specialist.
5. Edit Final Office Review (FOR) plans and specs with modifications requested by the resource specialist.
6. Schedule the resource specialist to attend the ROW project meeting Right of Way Plan Review (ROWPR), pre-bid or preconstruction conference, or both to present and discuss hazardous materials concerns.

## 3.07.06 What is the general clearance schedule for this resource?

- Initial Site Assessment (ISA): one to four weeks
- Modified Environmental Site Assessment (MESA): one to three months
- Phase One Investigation: two to six months

- Asbestos / paint inspection and sampling, if required: one to three months (can be done concurrently with Initial Site Assessment [ISA], Modified Environmental Site Assessment [MESA], or Phase 1, or both)
- Permitting, if required: one to three months
- Additional site investigation or clean-up or both, if required: two months to two years +
- Complete clearance: two weeks to three months (may occur concurrently with permitting and site investigation)

Total = two months to two years +.

### 3.07.07 What are the red flags for this resource?

1. Project is through commercial/industrial corridors that may have contaminated sites or facilities.
2. Project has structure modifications or demolition.
3. Project has Right of Way (ROW) acquisition.
4. Project requires large, deep, or extensive excavation / subsurface work.
5. Project requires dewatering.
6. Ability to access the property.

## 3.08 Historic Properties Clearances (Archaeology, History, Historic Bridge)

### 3.08.01 What are historic properties?

Historic properties are defined as any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). This typically applies to properties that are 50 years or older but may also apply to properties that have achieved significance in less than 50 years.

### 3.08.02 Why do we evaluate this resource?

Section 106 of the National Historic Preservation Act of 1966 requires federal agencies to take into account the effects of their undertakings on historic properties. The Section 106 regulations are published in the Code of Federal Regulations at 36 Code of Federal Regulations (CFR) Part 800, “Protecting Historic Properties,” and provide guidance on requirements federal agencies must meet to comply with the law. Section 106 is a procedural law that involves identifying historic properties, evaluating the effects to properties, and mitigating adverse effects in the context of a federal undertaking.

## 3.08.03 Who regulates this resource?

The question really is about what age ncies are involved in Section 106 consultation. The Colorado Department of Transportation (CDOT) requests concurrence from the State Historic Preservation Office (SHPO) on Section 106 findings. CDOT also identifies other consulting parties who have a demonstrated interest in historic properties; these can include but are not limited to local historic preservation commissions and boards, local historical societies, and in some cases, individuals. Section 106 also requires consultation with American Indian tribes and Native Hawaiian organizations. When there are adverse effects to properties, the Advisory Council on Historic Preservation (ACHP) must be notified and afforded an opportunity to participate in the process. Mitigation for adverse effects is outlined in a Memorandum of Agreement (MOA) that is signed by CDOT, the Federal Highway Administration (FHWA) and SHPO, as well as ACHP if that agency participates in the process and tribal governments or Native Hawaiian organizations if applicable. Consulting parties and tribal governments and Native Hawaiian organizations must also be given an opportunity to be involved in the review and development of the proposed mitigatios and the MOA.

## 3.08.04 What does the environmental resource specialist need to do?

Tasks in the clearance process vary depending on the scale of the project (Construction Engineering [CE], Environmental Impact Statement [EIS], Environmental Assessment [EA]), the resource base in the project area, whether a consultant has been hired to complete tasks, and whether SHPO consultation is necessary. Steps eight, nine and ten are only necessary when there is an adverse effect. The general steps include:

1. File search on ACHP Compass database.
2. Identification of consulting parties and if applicable Indian tribes and Native Hawaiian organizations.
3. Development of Area of Potential Effects (APE).
4. Field survey of project APE to identify historic properties.
5. Prepare survey report and site forms.
6. Prepare site eligibility determinations.
7. Prepare effects determinations, as appropriate.
8. Submit survey report and determinations of eligibility and effects to the SHPO and consulting parties for review.
9. Respond to SHPO/consulting parties/tribal government comments or inquiries (if necessary).
10. Submit adverse effect finding to ACHP.
11. Prepare an MOA for properties that are adversely affected and circulate for signatures from Federal Highway Administration (FHWA), SHPO, CDOT and when appropriate, ACHP and concurring parties.
12. Complete mitigation for adverse effects.

## 3.08.05 What does the Resident/Project Engineer need to do?

1. Provide detailed and updated project description and scope.
2. Provide right of way and temporary and permanent easement information, project plan sheets, conceptual designs, and graphics to assist the resource specialist in evaluating effects to historic properties.
3. Work with the resource specialist on solutions to avoid or minimize effects to historic properties.

## 3.08.06 What is the general clearance schedule for this resource?

Clearance time frames vary depending on the project scope and resource types, and whether consultation with the involving State Historic Preservation Office (SHPO) and consulting parties is necessary. For minor projects, specialists typically need a minimum of eight weeks to clear a project. For more complex corridor projects, the Section 106 process can take up to one year and sometimes longer depending on the type and number of resources, the associated project impacts, and the nature of the consultation. If there are changes to the project scope–including project limits and proposed work, the time frame for Section 106 consultation may have to start again. The following estimates represent general time frames associated with internal clearance processes (not SHPO consultation) and projects that require SHPO consultation and result in specific findings as defined under Section 106:

Projects that meet the requirements of screened undertakings as defined by the Section 106 Programmatic Agreement: resource specialists typically are given four to eight weeks for clearance requests. This assumes that the resource specialist may have other workload deadlines and cannot immediately address the request. Once it has been determined that a project meets the criteria of a screened undertaking, the time frame to actually provide a clearance can be one to five days or sooner; (no historic properties affected or no adverse effect: 100 calendar days (inclusive of specialist's research and coordination as well as SHPO review time).

Adverse Effect: 285 to 320 calendar days (inclusive of specialist's research and coordination as well as SHPO review time).

## 3.08.07 What are the red flags for this resource?

There are a variety of issues that could cause delays in the Section 106 clearance process, including:

1. Tight project schedules,
2. Changes in project scope and limits,
3. Inadequate project information, and

4. State Historic Preservation Office (SHPO) or consulting party, or both disagreement over findings.

It is particularly important to provide the specialist adequate time and project information if SHPO consultation is required. SHPO requires 30 days to review projects. If consultation has begun and project scope changes (due to inaccurate or new information) then the consultation period will have to start over again.

# 3.09 Migratory Birds

## 3.09.01 What are Migratory Birds?

Migratory Birds are bird species included on the United States Fish and Wildlife Services (USFWS) List of Migratory Birds and are protected by the provisions of the Migratory Bird Treaty Act (MBTA). Migratory Birds generally refer to bird species that are native to the United States which migrate over international boundaries. Over 1000 species are included on the list, including many common species. In Colorado, all species except the house sparrow, feral pigeon, common starling, and non-migratory game birds like pheasants, gray partridge, and sage grouse, are protected. (USFWS maintains the list of migratory birds, both adding and removing species on a regular basis, and is also responsible for enforcement of MBTA.

MBTA makes it unlawful to pursue, hunt, take, capture, kill, possess, sell, purchase, barter, import, export, or transport any migratory bird, or any part, nest, or egg of any such bird, unless authorized under a permit issued by the Secretary of the Interior. “Take” is defined in regulations as: “pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect.” If a person is found in possession of a protected species or its parts or products (including eggs and nests), or if you remove an active nest, you are automatically in criminal violation of the law. Nests are determined to be active when an egg is laid. The USFWS generally does not provide permits for migratory bird takes associated with construction activity. Construction managers are required to take measures to avoid causing takes of migratory birds. The Colorado Department of Transportation (CDOT) implements increased restrictions on project activities (through the 240 Project Special Provision) during periods when migratory bird nesting activity is most likely, between April 1 and August 31 of any given year. Migratory bird takes can potentially occur during clearing and grubbing of vegetation or during construction activities on bridges or culverts (i.e., overlays, bridge demolition).

## 3.09.02 Why do we evaluate this resource?

MBTA is the primary legislation in the United States (US) to conserve migratory birds. Migratory birds provide a variety of beneficial functions including bird-watching, hunting, and

photography. These activities contribute nearly $40 billion annually to local economies throughout the United States. Penalties for taking a migratory bird or migratory bird nests are criminal and expensive.

## 3.09.03 Who regulates this resource?

The United States Fish and Wildlife Service has the legal responsibility to maintain healthy migratory bird populations and enforce the provisions of the Migratory Bird Treaty Act (MBTA). The Service is authorized by more than 25 primary conventions, treaties, and laws to ensure the conservation of migratory birds.

## 3.09.04 What does the environmental resource specialist need to do?

1. Determine if migratory bird or migratory bird nests are likely to occur on a project site.
2. Determine if construction activities are likely to occur during periods of the year when migratory birds are nesting.
3. The resource specialist can sometimes remove inactive nests or install nest exclusion devices to ensure that migratory birds do not begin using structures as a nest site.
4. Provide and revise the Section 240 Project Special Provision for the Protection of Migratory Birds.
5. Assist Contractors and consultants on implementing nest surveys as appropriate and maintaining nest free work sites without causing takes.

## 3.09.05 What does the Resident/Project Engineer need to do?

Design

1. Incorporate Section 240 specification in project specification packages.
2. Budget for nest prevention, removal and monitoring activities.
3. Incorporate resource specialist notes/specs.

Construction

1. Contact resource specialist to address migratory birds.
2. Manage project construction to assure all aspects of MBTA notes, the Section 240 Project Special Provision, and plan sheets are followed by the Contractor.

## 3.09.06 What is the general clearance schedule for this resource?

Unless stated elsewhere, migratory bird nest prevention, removal, monitoring is only required during the migratory bird nesting season (April 1–August 31).

Clearances are obtained during the environmental review process. Migratory bird clearances are conditional on the timing and location of the individual project and specifics are addressed through the inclusion of the Section 240 Specification and appropriate general notes as recommended by the resource specialist.

### 3.09.07 What are the red flags for this resource?

1. The presence of migratory birds has the potential to delay projects since active nests must be monitored until they can be determined to be inactive and then removed. Under some situations, construction work may also have to be stopped if nests are found active during construction, and may only resume when the nests are determined to be inactive.
2. Projects that involve clearing and grubbing of vegetation or construction activity on bridge or culverts have the potential to cause a migratory bird take. Some bridge structures are too large for any known, practical implementation of nest removal or nest exclusion activities or have extensive nesting habitat in places difficult to monitor. Other projects could impact grassland or woodland migratory bird species depending on the extent of clearing and grubbing. Sometimes these problems require phasing a project to avoid activity during the April 1–August 31 breeding season.
3. Projects that start after April 1 and before August 31 require survey and monitoring for bird nesting activity using a credentialed wildlife biologist on a two times per week basis until construction begins in the impacted area. The project can avoid bi-weekly monitoring if nest-building prevention methods are implemented such as netting, or if the areas can be cleared (or trees cut down) prior to April 1. Hiring a wildlife biologist results in additional costs to a project.
4. Projects that are not advertised until after April 1, but are given a notice to proceed before August 31, could find active migratory birds already on-site before the Contractor has an opportunity to prevent the establishment of active nests.

## 3.10 Noise Analysis

### 3.10.01 What is noise analysis?

Noise is defined as unwanted or excessive sound. Projects are evaluated to determine whether noise analysis is necessary. Some projects require a memorandum to show that analysis is not necessary, usually to show that travel lanes are not shifting closer to sensitive receptors so much that the horizontal distance is halved. If a project requires analysis, a noise technical report documents it. These types of projects may require analysis:

- Adding roadway capacity (e.g., via new pavement or restriping),
- Changing the vertical profile,

- Removing shielding such that a line-of-sight is exposed between a receptor and the roadway,
- Adding an auxiliary lane (except a turn lane),
- Making interchange modifications,
- Moving a travel lane horizontally closer to sensitive receptors, and
- Adding or substantially altering a weigh station, rest stop, ride-share lot, or toll plaza.

Evaluation of abatement, most commonly a noise wall, is required if the noise analysis shows that noise will be impacted. A noise impact occurs if the project increases noise by ten decibels or more over existing background noise or if future noise levels meet or exceed the Noise Abatement Criteria (NAC). The NAC pertain to outside activities and land uses for six categories of noise receptors (activity categories A through G), except as noted here:

- A: 56 decibels—areas of serenity;
- B: 66 decibel—residential;
- C: 66 decibels—examples include parks, trails, campgrounds, churches, schools, and auditoriums;
- D: 51 decibels—selected noise sensitive indoor activity category C land uses;
- E: 71 decibels—examples include hotels, offices, and restaurants; and
- F: no NAC—examples include industrial, agriculture, shops, and government managed land; and
- G: no NAC—undeveloped lands that are not permitted

Noise abatement that is determined to be feasible and reasonable must be constructed at the same time as the project aspects that triggered the noise analysis. If the project sponsor cannot afford the abatement, the project cannot be built.

## 3.10.02 Why do we evaluate this resource?

As defined in 23 Code of Federal Regulations (CFR) 772, the Federal Highway Administration (FHWA) requires that noise is evaluated for projects that require FHWA approval, regardless of funding sources, and for projects funded with federal-aid highway funds.

Although adherence to 23 CFR 772 is only required for federal or federal-aid highway projects, Colorado Department of Transportation (CDOT's) Environmental Stewardship Guide broadens the applicability of traffic noise analyses. As described in the 2020 CDOT Noise Analysis and Abatement Guidelines, CDOT requires noise analyses for some state, local, and public-private partnership projects overseen by CDOT or requiring CDOT approval:

- Projects that add capacity via through lanes, if the lane(s) requires additional pavement beyond the existing roadway geometry profile. The existing profile includes medians and inside shoulders.
- Projects that are adjacent to prior projects to which 23 Code of Federal Regulations (CFR) 772 applied and for which noise abatement was built, if the current project meets any Type I criteria.

## 3.10.03 Who regulates this resource?

Noise analysis and mitigation is regulated by the Federal Highway Administration (FHWA). Construction noise is regulated by the State of Colorado. Some local municipalities also have noise ordinances. The project must comply with whichever construction noise regulation that is more stringent during project construction.

## 3.10.04 What does the environmental resource specialist need to do?

1. Determine if a noise consultant needs to provide any documents (i.e., a noise memorandum or technical report). A technical report is required if an analysis is required.
2. If a memorandum is required, work with the noise consultant and project manager to ensure that correct receptor locations are used in the distance calculations.
3. If analysis is required:

    - Work with the noise consultant to determine where field noise measurements will be taken and which receptors should be included in the noise model, if requested.
    - Review noise technical reports and noise models.
    - If noise abatement is recommended, work with the noise consultant and project manager to survey property owners, who make the final decision on whether abatement will be built.
    - If noise abatement will be constructed, review final-design level noise reports and noise model, which will provide engineering with noise barrier dimension details and siting for final design.
    - After noise wall construction has begun, enter the year provided by the project manager into the Staff Bridge asset management database.

## 3.10.05 What does the Resident/Project Engineer need to do?

1. Provide clarification about the project scope, when needed, to help the noise specialist determine if a noise memorandum or noise analysis is needed.

2. If a memorandum is required, work with the noise specialist and noise consultant to ensure that correct travel lane edge locations are used in the distance calculations.
3. If a technical noise report is required:

    - Provide existing and final design plan sheets including terrain, elevations, planned roadway elements, adjacent buildings.
    - Provide existing and design year traffic volumes, and vehicle fleet mixes.
    - Provide guidance on noise barrier material selection, clear zone requirements, and final barrier siting, utilities, other critical items affecting location.
    - Coordinate the owner survey of any recommended noise barriers with noise specialist; this determines if it gets built.
    - Coordinate public outreach for noise abatement with noise specialist, if necessary (e.g., noise barrier appearance).
    - Notify the noise specialist when noise wall construction begins, so that the specialist can enter the year noise wall construction began into the Staff Bridge asset management database.

## 3.10.06 What is the general clearance schedule for this resource?

If a project does not require a noise analysis, it also does not require a noise technical report and noise barriers would not be considered. If the project will shift travel lanes horizontally towards noise sensitive receptors, a memorandum may be needed to show that a noise analysis is not required.

- Project does not require noise report or noise memorandum: two days
- Project requires noise memorandum: two weeks
- Project requires noise technical report:
    1. Project-level analyses and report: eight to nine weeks
    2. Owner survey, if needed: five weeks
    3. Public outreach, if needed: two weeks

Total = If noise technical report is needed: eight weeks minimum but could be many more.

## 3.10.07 What are the red flags for this resource?

1. Public disagreement with project noise technical report (e.g., units of high-density housing may not be accurately reported in the noise report, triggering remodeling after the noise report becomes public).
2. High existing noise levels, which could lead to noise barriers being recommended even if the project itself does not cause noise impacts.

3. Building a new road in a new location would make it more likely that noise levels would increase by 10 decibels or more, which could lead to noise barriers being recommended even if the Noise Abatement Criteria (NAC) are not being exceeded.

## 3.11 Noxious Weeds

### 3.11.01 What are noxious weeds?

Noxious weeds are alien aquatic and terrestrial plant species that have been designated by rule as being noxious and meet one or more of the following criteria: (a) Aggressively invades or is detrimental to economic crops or native plant communities; (b) Is poisonous to livestock; (c) Is a carrier of detrimental insects, diseases, or parasites; (d) The direct or indirect effect of the presence of this plant is detrimental to the environmentally sound management of natural or agricultural ecosystems.

### 3.11.02 Why do we evaluate this resource?

The Federal Noxious Weed Act and the Colorado Noxious Weed Act mandate control or eradication, or both of designated noxious weeds.

### 3.11.03 Who regulates this resource?

The Colorado Department of Agriculture governs Colorado's noxious weed program.

### 3.11.04 What does the environmental resource specialist need to do?

1. For Environmental Assessment (EA) or Environmental Impact Statement (EIS) projects, the consultant or Contractor will be required to submit a noxious weed management plan.
2. Look for noxious weed infestations at scoping and inform the Resident Engineer of the need for an herbicide treatment pay item.

### 3.11.05 What does the Resident/Project Engineer need to do?

1. Work with the resource specialist and landscape architect to calculate area, species, and bid item hours.
2. Include treatment area on Stormwater Management Plan plan sheets, if necessary.

### 3.11.06 What is the general clearance schedule for this resource?

There are no formal clearances for this resource.

### 3.11.07 What are the red flags for this resource?

Wildlife issues may restrict timing and location of herbicide application.

## 3.12 Paleontology

### 3.12.01 What is paleontology?

Paleontology is the study of plant and animal life of past geologic time, including its evolutionary history, and its paleoecological interrelationships. This area of study does not include prehistoric human remains and their associated cultural artifacts (e. g., stone tools, pottery), which are the domain of archaeology.

### 3.12.02 Why do we evaluate this resource?

The Historical, Prehistorical, and Archaeological Resources Act (Colorado Revised Statute [CRS] 24-80-401 et al.) (State Antiquities Act) protects all fossils on state-owned lands and lands controlled by any subdivision of state government. Title to fossils on state-owned lands is reserved to the state. Permits are required to collect, damage, or destroy fossils covered under the State Antiquities Act. While the requirement to locate and assess the scientific importance of fossils on state-owned lands is not stated explicitly in the law, it is implicit in the requirement to avoid any damage to, destruction or removal of the resource without a permit.

### 3.12.03 Who regulates this resource?

The Office of the State Archaeologist, Colorado (OSAC) administers the State Antiquities Act.

### 3.12.04 What does the environmental resource specialist need to do?

1. Identify potentially fossiliferous deposits and previously recorded fossil localities within the project limits.
2. If required, conduct on-the-ground reconnaissance for previously unrecorded fossil localities within the project limits.
3. Determine the scientific significance of any recorded fossil localities within the project limit.
4. Using Field Inspection Review (FIR)/ Final Office Review (FOR) level plans, determine the location and scope of impacts to any scientifically significant fossil localities within the project limits.
5. Using FIR/FOR level plans, determine the probable location and scope of impacts to presently buried, scientifically important fossils.

6. Develop a plan for preconstruction or during construction, or both for mitigation of construction impacts to scientifically important fossils.

### 3.12.05 What does the Resident/Project Engineer need to do?

**Design**

Incorporate all general notes and special revisions to Subsection 107.23 (Archaeological and Paleontological Discoveries) identified by the resource specialist that provide direction to the Contractor to construct the project in compliance with the State Antiquities Act.

**Construction**

Manage project construction to assure that all general notes and special revisions to Subsection 107.23 are followed by the Contractor.

### 3.12.06 What is the general clearance schedule for this resource?

It may take between eight and ten weeks to clear this resource. More time may be required if weather conditions are not conducive to any needed surveys.

### 3.12.07 What are the red flags for this resource?

1. Project is located at least partially on lands administered by federal agencies, which have additional resource specialist report and interagency coordination requirements.
2. Project has Right of Way (ROW) acquisition, requiring rights of entry acquisition in order to permit performance of on-the-ground reconnaissance (if necessary).
3. Clearance request is issued during winter/spring months when snow cover may prevent performance of on-the-ground reconnaissance (if necessary).
4. Project requires large, deep, or extensive excavation/subsurface work.
5. Project is located near well-known fossil localities.

## 3.13 Senate Bill 40 (SB 40)

The Colorado Department of Transportation's (CDOT's) requirements under SB 40 are defined in a Memorandum of Agreement (MOA) between the Colorado Departments of Natural Resources (DNR) and CDOT. Colorado Parks and Wildlife (CPW) is the office within DNR that reviews plans and provides certification for actions that fall under the jurisdiction of SB 40. Programmatic and non-programmatic certifications are dependent on the types of projects and potential to impact state waterways. General and special conditions are addressed within the MOA for incorporation

into project plans and specifications. Project specific conditions may be provided by Colorado Parks and Wildlife (CPW) for non-programmatic projects requiring formal certification.

## 3.13.01 What does the environmental resource specialist need to do?

1. Review Field Inspection Review (FIR) and Final Office Review (FOR) level plans to identify project impacts to streams that fall under Senate Bill (SB) 40 jurisdiction.
2. Develop measures to mitigate potential impacts to water quality, fishery reproduction, wildlife resources, and wetlands.
3. Assure incorporation into project plans any general notes to address timing restrictions and Best Management Practices (BMP's) to reduce resource impacts, and specifications that incorporate by reference all SB 40 General, Specific and Certification Conditions.
4. Submit project summary letter that addresses alternatives considered, mitigation measures, reclamation/revegetation plan along with applicable plan sheets and cross sections, Section 404 Permit application, and SB 40 application (non-programmatic only).

## 3.13.02 What does the Resident/Project Engineer need to do?

**Design**

Incorporate all general notes, specifications, and any required plan sheets identified by the resource specialist that provide direction to Contractor to construct the project in compliance with SB 40 conditions.

**Construction**

Manage project construction to assure all aspects of SB 40 notes, specifications, and plan sheets are followed by the Contractor.

## 3.13.03 What is the general clearance schedule for this resource?

SB 40 Certification can be initiated with FIR or FOR level plans provided that activities that impact SB 40 resources are defined and finalized. Once the plan sheets that show the general notes, specifications, and impact specific sheets are developed, the associated letter and application forms can be prepared. If a project requires a Section 404 Permit applicable correspondence with the United States Army Corps of Engineers (USACE) should be attached.

- Application preparation: five days
- CPW response: 30 days

Total = 35 days (from receipt of necessary design information).

### 3.13.04 What are the red flags for this resource?

1. The Senate Bill (SB) 40 Application must be submitted to Colorado Parks and Wildlife (CPW) between the Field Inspection Review (FIR) and Final Office Review (FOR) and as close to FIR as practicable.
2. Seasonal restrictions to avoid trout spawning, avian and/or threatened and endangered species may conflict with engineering schedules that identify maximum work days or completion dates.

## 3.14 Environmental Justice and Equity

### 3.14.01 What is Environmental Justice and Equity?

Environmental justice (EJ) is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Equity in transportation seeks fairness in mobility and accessibility to meet the needs of all community members.

### 3.14.02 Why do we evaluate this resource?

1. To maintain compliance with federal Executive Order 12898, and Colorado Senate Bill 21-260, as well as United States Department of Transportation (DOT) Order 5610.2(b).
2. To comply with the Colorado Department of Transportation's (CDOT's) environmental stewardship policy, which ensures that the statewide transportation system is constructed & maintained in an environmentally responsible, sustainable, and compliant manner.
3. To comply with several legal mandates that pertain to environmental justice and equity.

### 3.14.03 Who regulates this resource?

Federal requirements of EJ are administered by the the Federal Highway Administration (FHWA) and state requirements of equity are administered by CDOT. Federal EJ requirements state that any project which has disproportionately high and adverse impacts on low income or minority communities must be approved by FHWA Headquarters. State equity requirements are that "disproportionately impacted communities" (low income, minority, cost-burdened

households), must be given the opportunity to fully participate in transportation decisions that affect health, quality of life, and access.

## 3.14.04 What does the environmental resource specialist need to do?

1. All projects must be given to an environmental specialist to analyze if the project is exempt from Environmental Justice (EJ) or equity analysis.
2. If the project has actions that require EJ or a state equity analysis, the specialist will determine if populations protected by federal EJ requirements are present in the study area.
3. Once populations protected by EJ or by state equity requirements are identified within the study area, proactive efforts to ensure meaningful opportunities for public participation must occur.
4. If populations protected by EJ are within the study area, then the project actions must be analyzed to determine if the actions would have disproportionately high and adverse impacts on low income or minority communities.
5. If there is a disproportionately high and adverse effect on an EJ population, after taking benefits and mitigation into account, Federal Highway Administration (FHWA) will approve the proposed action only if it determines no such practicable measures exist to avoid or reduce the disproportionately high and adverse effect.

## 3.14.05 What does the Resident/Project Engineer need to do?

1. Inform and involve the environmental team for proactive public involvement as early as possible—especially for all projects which require residential or non-residential relocations.
2. Explore alternatives during the design process that minimize or avoid harm to populations protected by EJ or equity.

## 3.14.06 What is the general clearance schedule for this resource?

Coordination, development and approval of a written EJ and equity memo, with the appropriate public involvement as described above, can take up to six months. Approval of the final EJ and equity memo must occur before the Region Planning and Environmental Manager (RPEM) can issue Environmental Clearance on the top portion of the Form 128 Categorical Exclusion Determination.

## 3.14.07 What are the red flags for this resource?

1. The project primarily negatively impacts low-income or minority communities, or both and cost-burdened household populations.

2. The project will require relocations and/or acquire residential or minority owned businesses or businesses that serve a specific demographic.
3. The project will remove a community service (i.e., free medical clinic, library, post office, etc.) or remove or change access to employment, grocery stores, and other essential services.

# 3.15 Social Resources

## 3.15.01 What are Social Resources?

Social resources generally refer to the built human environment and can include land use, visual resources, and socioeconomics. **Land use** is defined as the way land is developed and used for various activities (e.g., residential, commercial, industrial, parks, etc.). **Visual resources** include the viewers (e.g., neighbors and travelers), features that define the character of an area, and visual quality of the area. The visual characteristics can be natural features, vistas, vegetation or mountains, but also urban characteristics such as architecture, skylines, or other elements that define the character of the landscape. **Socioeconomics** include a variety of factors that may affect an area's economy including employment and tax base, access to businesses, housing stock, property value, public services, infrastructure and utilities.

## 3.15.02 Why do we evaluate this resource?

**Land use**—Zoning, future land use and growth management areas, conservation easements, urban infrastructure service boundaries, annexation plans, and past, existing and future development trends can affect transportation needs.

**Visual resources**—Visual resources and aesthetics are important because they are unique to each area and may be associated with strong emotions in viewers. Such special places often provide a sense of place or community to the residents of an area, attract tourism by leaving an impression and help drive its economy.

**Socioeconomics**—Transportation projects can have an effect on the ability to access employment, grocery stores, and other essential services. If a project needs additional right of way it could affect the availability of housing and employment.

## 3.15.03 Who regulates this resource?

**Land use** is regulated by the local agency (city, town, or county). **Visual resources** and **socioeconomics** are regulated by the Federal Highway Administration (FHWA) and the Colorado Department of Transportation (CDOT).

### 3.15.04 What does the environmental resource specialist need to do?

The resource specialist will evaluate impacts and determine if mitigation measures are necessary. Since social resources tend to be more qualitative, dynamic, and intangible, public involvement and coordination with local communities may be required to gather adequate information to address these resource areas. Visual resources should also be coordinated with the planning team to be evaluated early in the National Environmental Policy Act (NEPA) process through public involvement to determine community values and needs. For visual resources, refer to the Programs site, Visual Impact Assessment (VIA) Guidelines, and complete the scoping questionnaire to determine the project impacts, if any, and if visual impact assessment is necessary.

### 3.15.05 What does the Resident/Project Engineer need to do?

The Engineer should ensure recommended mitigation measures are incorporated into the design and specifications and carried out through construction. It is important to remember that mitigation measures were developed as part of the stakeholder involvements as commitments to the community to avoid, minimize or mitigate project impacts.

### 3.15.06 What is the general clearance schedule for this resource?

This clearance can require an analysis of the population impacted by the project, additional public involvement, revised design, and consultation with Federal Highway Administration (FHWA). This entire process can take up to six months.

### 3.15.07 What are the red flags for this resource?

1. The project will acquire and relocate residences or businesses.
2. The project will drastically change the land use pattern, impact the views of neighbors or travelers or both, or alter the visual character of the community.

## 3.16 Threatened and Endangered Species

### 3.16.01 What are threatened and endangered species?

An endangered species is an animal or plant species in danger of extinction throughout all or a significant portion of its range. A threatened species is an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. A proposed species is an animal or plant species proposed in the Federal Register for listing under Section Four of the Endangered Species Act (ESA).

A candidate species is an animal or plant species defined by the United States Fish and Wildlife Service (USFWS) as “plants and animals for which the Fish and Wildlife Service has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act (ESA), but for which development or a proposed listing regulation is precluded by other higher priority listing activities. Conservation of these species is important because they are by definition species that may warrant future protection under ESA.” Designated critical habitat, based on the physical or biological features essential to the conservation of the species, may be included with the listing of a species.

## 3.16.02 Why do we evaluate this resource?

The Endangered Species Act of 1973, as amended (16 US Code [USC] 1531 et seq.), provides for the protection and conservation of threatened and endangered plants,animals and their habitat. ESA requires federal agencies to ensure that actions they authorize or fund will not jeopardize the continued existence of any listed species, or result in the destruction of designated critical habitat for listed species.

## 3.16.03 Who regulates this resource?

Each Colorado Department of Transportation (CDOT) project is evaluated for impacts to wildlife, including species listed as threatened and endangered by the USFWS, and various other species listed by other resource agencies. Impacts from projects are assessed through the development of Biological Evaluations or Biological Assessments. These documents help determine the effects a project will have on listed species or critical habitat or both, and also determine if consultation with the USFWS is necessary.

## 3.16.04 What does the environmental resource specialist need to do?

1. Conduct site inventory.
2. Conduct literature review.
3. Prepare Biological Evaluation/Biological Assessment.
4. Submit Biological Evaluation/Biological Assessment with “effects” determination to the USFWS, as necessary.

## 3.16.05 What does the Resident/Project Engineer need to do?

1. Work with resource specialist to determine impacts, and assist in the avoidance and minimization of impacts. Develop mitigation measures as necessary.
2. Provide plan sheets to include in the Biological Evaluation/Biological Assessment.

### 3.16.06 What is the general clearance schedule for this resource?

- On-site and literature review: one week to several months (dependent on season)
- Prepare biological document: one month
- USFWS review and concurrence: four months.

Total = six weeks to several months.

### 3.16.07 What are the red flags for this resource?

1. Avoidance of impacts to listed species may require design modifications or timing restrictions.
2. Any project that "may affect" a species or critical habitat will require further coordination with the USFWS. This additional coordination may lengthen the clearance process by 16 weeks.
3. Not all surveys can be conducted all year round. Some species can only be surveyed at specific times of year. Surveying for plants is especially problematic as they are only blooming for a short time.

## 3.17 Water Quality

### 3.17.01 What is water quality?

Water quality analysis includes all the surface water and groundwater in or affected by the project area. Water quality analysis can vary if the project area is in a Municipal Separate Storm Sewer System (MS4) permit area or if it is near impaired waterways. The Colorado Department of Transportation's (CDOT's) MS4 permit includes seven different programs: construction sites, Permanent Water Quality (PWQ), illicit discharge, industrial facilities, public education and outreach, pollution prevention and good housekeeping, and wet weather monitoring. Some MS4 programs are implemented statewide and not just in MS4 permit areas.

Please see your region or Environmental Programs Branch (EPB) water quality specialists, CDOT National Environmental Policy Act (NEPA) Manual, or the specific program guidance for more information on these programs and other water quality permits used to protect water quality.

**Note:** For projects on federal or American Indian lands, federal permits are needed. Contact your resource specialist for the appropriate forms and templates.

## 3.17.02 Why do we evaluate this resource?

**Clean Water Act (CWA) Sections 303(d), 401, and 402**—The CWA established the basic structure for regulating discharges of pollutants into navigable waters. It provides the statutory basis for the National Pollutant Discharge Elimination System (NPDES) permit program and the basic structure for regulating the discharge of pollutants into waters of the United States (US). The CWA also requires the identification of waters for which technology-based effluent limitations and other required controls cannot meet water quality standards (i.e., impaired waters).

**Safe Drinking Water Act (SDWA)(40 Code of Federal Regulations [CFR] Parts 141–143)**—SDWA protects public health by regulating the nation's public drinking water supply and protecting drinking water and its sources. The Colorado Department of Transportation (CDOT) is a stakeholder in the Colorado Source Water Assessment and Protection (SWAP) program mandated by SDWA.

**Erosion and Sediment Control on Highway Construction Projects (25 CFR 650 Subpart B)**—All highways funded in whole or in part by the Federal Highway Administration (FHWA) must be designed, constructed, and operated according to standards that will minimize erosion and sediment damage to the highway and adjacent properties and abate pollution of surface and groundwater resources.

**Colorado Water Quality Control Act (Colorado Revised Statutes [CRS] Title 25, Article Eight)**—The Colorado Water Quality Control Act protects and maximizes the beneficial uses of state waters and regulates pollutant discharges into state waters. It created the Colorado Discharge Permitting System (CDPS) to regulate discharges to Colorado’s state waters.

## 3.17.03 Who regulates this resource?

It is the responsibility of the United States Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division (WQCD) to regulate water quality and issue permits.

## 3.17.04 What does the environmental resource specialist need to do?

1. Determine if the project is in a Municipal Separate Storm Sewer System (MS4) area and if so, proceed with necessary mitigation and engineering notes for project plans.
2. Determine if the project disturbs over an acre or is part of a larger common plan of development. If so, obtain a Stormwater Construction Permit (SCP) from the Colorado Department of Public Health and Environment (CDPHE) or a General Construction Permit (GCP) from the United States Environmental Protection

Agency (EPA). Work with the Project Engineer to insert the appropriate notes and specifications.
3. Determine if the project area discharges to an impaired waterbody.
4. Determine if Permanent Water Quality (PWQ) control measures are needed by identifying the project disturbance amount and added impervious area, and if impaired waters are nearby.
5. If PWQ applies then complete a Permanent Water Quality orm.
6. Ensure the project plans include a Stormwater Management Plan (SWMP), regardless of project size.

## 3.17.05 What does the Resident/Project Engineer need to do?

1. Consult the decision matrix to determine if water quality modeling is necessary and if so, which model is appropriate.
2. If the project is in an MS4 area, insert notes and specs to follow the program(s) requirements.
3. Work with the water quality specialist to determine if PWQ is required and if so, incorporate early in design and complete the PWQ Form and any maintenance agreements/Intergovernmental Agreements (IGA's). See the Permanent Water Quality Section for additional information.

## 3.17.06 What is the general clearance schedule for this resource?

Between ten days and two months to acquire permits and complete PWQ Form(s) and reports (after design is far enough along to make conclusions). There are multiple Colorado Discharge Permitting System (CDPS) or National Pollutant Discharge Elimination System (NPDES) permits that may be required, depending on the project details and location. Please see your region or Environmental Programs Branch (EPB) water quality specialist.

## 3.17.07 What are the red flags for this resource?

1. The receiving water body is on the 303(d) list or has a Total Maximum Daily Load (TMDL).
2. Project is within a Municipal Separate Storm Sewer System (MS4) area. Coordination with local agencies must be done.
3. Project is within federal or Tribal lands. Different permits are required.
4. PWQ is required.

# 3.18 What is Permanent Water Quality?

## 3.18.01 What is Permanent Water Quality?

Permanent Water Quality is one of the seven programs in the Colorado Department of Transportation's (CDOT's) Municipal Separate Storm Sewer System (MS4) Permit. The intent of the program is to protect environmental surface waters from highway runoff once construction is complete and in perpetuity. Requirements for the Permanent Water Quality program can be estimated during the National Environmental Policy Act (NEPA) and Design phases.

## 3.18.02 Why do we evaluate this resource?

Permanent Water Quality is the only MS4 Program that spans all project delivery phases, and Maintenance. The earlier it is considered, the easier it is to meet milestones throughout the project. Although exact project boundaries won't be known during NEPA or Design, Permanent Water Quality requirements can be assessed generally. When in doubt, default to including Permanent Water Quality in a project early and removing it in a later phase.

## 3.18.03 Who regulates this resource?

The Colorado Department of Public Health & Environment, Water Quality Control Division and region eight Environmental Protection Agency regulate this resource.

## 3.18.04 What does the environmental resource specialist need to do?

1. Use the Permanent Water Quality webpage as a resource for required forms and processes: Programs, Permanent Water Quality.
2. Use and share the Permanent Water Quality Program Manual with the Resident/Project Engineer. This document outlines requirements per project delivery phase and includes detailed descriptions of tasks related to these requirements.
3. Contact the Headquarters Permanent Water Quality program managers as soon as a project is identified if you need assistance.

## 3.18.05 What does the Resident/Project Engineer need to do?

1. Contact the environmental resource specialist as soon as a project is identified.
2. Use the Permanent Water Quality Form to assess Municipal Separate Storm Sewer System (MS4) permit requirements, the Permanent Water Quality Program Manual for milestones in each project phase, and the Permanent Water Quality Checklist to

establish transfer from Design to Construction Engineers. Visit the Permanent Water Quality (PWQ) program website for these items: Programs, Permanent Water Quality.
3. Contact region water quality specialists and Headquarters Permanent Water Quality managers as resources as early and as often as needed.

### 3.18.06 What is the general clearance schedule for this resource?

Project Engineer and water quality specialist can complete Permanent Water Quality Form to assess requirements in the National Environmental Policy Act (NEPA) or Design, or both. The form takes ten minutes to complete. Headquarters Permanent Water Quality Program managers are available to assist as needed.

### 3.18.07 What are the red flags for this resource?

1. Project is inside the Colorado Department of Transportation (CDOT) Municipal Separate Storm Sewer System (MS4) area.
2. Project disturbs more than one acre.
3. Project increases impervious surface by 20% or more.
4. Project is in the Cherry Creek Drainage Basin.
5. Project drains to an impaired stream for a CDOT pollutant of concern.
6. Project is part of an Environmental Assessment (EA) or Environmental Impact Statement (EIS).

## 3.19 Stormwater Management Plans (SWMP's)

### 3.19.01 What are Stormwater Management Plans?

An SWMP is a written plan included in the project plan set that outlines recommended and required control measures and Best Management Practices (BMP's) used to protect "waters of the state" and "waters of the US" by minimizing pollutants coming from the project site. The SWMP must be implemented prior to the start of a construction project (i.e., before ground is broken) and revised as construction proceeds. For public emergency projects, a SWMP needs to be completed no later than 14 days after commencement of construction activities.

The SWMP needs to be prepared in accordance with good engineering, hydrologic, and pollution control practices. A minimum of nine elements plus their subcomponents make up a SWMP. During design, CDOT prepares components six–eight and it is up to the Contractor prior to construction to provide the rest to the Project Engineer for approval because many of these items noted are not known until the project has been awarded.

The components include, but are not limited to:

1. Qualified Stormwater Manager
2. Spill Prevention and Response Plan
3. Materials Handling
4. Potential Pollutants
5. Implementation of Control Measures
6. Site Description/Narrative
7. Site Map
8. Final Stabilization and Long-Term Stormwater Management Permanent Water Quality (PWQ) Inspection Reports

**Note:** For projects on federal or American Indian lands a federal permit and plan are needed. Contact your resource specialist for the appropriate forms and templates.

## 3.19.02 Why do we evaluate this Resource?

See Section 3.17.02.

## 3.19.03 Who Regulates this Resource?

It is the responsibility of the United States Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division (WQCD) to regulate water quality, issue permits, and enforce permit requirements. Occasionally, local agencies have their own requirements that also need to be followed.

The stormwater discharge associated with construction activities permit (aka the Stormwater Construction Permit [SCP]) and the Construction General Permit (CGP) require that a stormwater plan be prepared and implemented. This pertains to all projects that disturb one or more acres of land or is part of a larger common plan of development.

The Colorado Department of Transportation (CDOT) requires a Stormwater Management Plan (SWMP) for all projects, even those that disturb less than one acre, to aid in water resource protection and environmental stewardship. Local agencies may also have stormwater requirements for the project, regardless of the acreage disturbed.

## 3.19.04 What does the environmental resource specialist need to do?

1. Provide the SWMP template to the project designer.
2. Design the SWMP and site map with expected phasing (if consultant is not used, coordinate with the Engineer on who will do the drafting).
3. Review the Stormwater Management Plan (SWMP) and site map for accuracy, then relay the needed changes to the Engineer (in each development phase).

4. Ensure that a Stormwater Management Plan (SWMP) certified individual provides final approval of the SWMP and a water quality clearance to the environmental project manager for the 128 Form Categorical Exclusion Determination. The certified SWMP individual must be a Colorado Department of Transportation (CDOT) Environmental Unit employee.

## 3.19.05 What does the Resident/Project Engineer need to do?

1. Ensure the resource specialist is part of the project design team and is invited to all Scoping, Field Inspection Review (FIR) and Final Office Review (FOR) meetings.
2. Select a SWMP certified individual to design the SWMP. The SWMP Certification class is provided by CDOT.
3. Receive the SWMP template from the CDOT Water Quality (WQ) or Landscape Architecture website or from the resource specialist.
4. Ensure the SWMP designer enters project specific data, such as the project description, into the SWMP template.
5. Add the SWMP to the plan set.
6. Make revisions requested by the SWMP reviewer throughout project development.

## 3.19.06 What is the general clearance schedule for this resource?

1. Design SWMP and site map: approximately 10 hours (under one acre), 40–80 hours (over one acre). The actual time will vary depending on the number of plan sheets (i.e., project complexity) in the project design and how many revisions are necessary.
2. Review SWMP and site map—then type and send notes (in each stage of development-scoping, FIR, FOR, Final): approximately 4 hours each stage (under one acre), 10–20 hours each stage (over one acre).

Total time it takes to complete the clearance for this resource (including meetings and final approvals) = approximately 30 hours (under one acre), 150 hours (over one acre).

## 3.19.07 What are the red flags for this resource?

1. Changes to the scope of work or the addition of project components throughout design can cause delays and re-work of the project SWMP.
2. Allocation of adequate time for the resource specialist to review the SWMP at design milestones.
3. Specifically for projects over one acre, the SWMP should be included in project design plans as early as possible (preferably at FIR) to allow for adequate time to meet the various Stormwater Construction Permit (SCP) permit requirements.

# 3.20 Wetlands

## 3.20.01 What are wetlands?

Wetlands are defined as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted to thrive under anaerobic soil conditions. Wetlands generally include swamps, marshes, fens, and riparian areas. Projects that have potential to impact wetlands require a Wetland Delineation to identify their location within the landscape in order to avoid and minimize impacts to these sites during construction. Unavoidable impacts to wetlands require documentation in a wetland finding that considers alternatives, quantifies impacts, and identifies mitigation measures to compensate for wetland losses.

Unavoidable impacts to certain wetlands will also require a permit verification from the United States Army Corps of Engineers (USACE). Two categories of permits exist. A Section 404 nationwide permit is generally the simplest permit under the Section 404 program**.** USACE lists a total of 54 nationwide permits authorizing various activities nationwide. In order to obtain a nationwide permit, the activity must meet the requirements of one of these 54 permits. The second category of Section 404 Permit is the individual permit. Individual permits are used for more significant impacts to wetlands and involve a public interest review and a public notice process. This is a more complex and detailed process than obtaining a Section 404 nationwide permit.

## 3.20.02 Why do we evaluate this resource?

The Clean Water Act was passed by the United States (US) Congress in 1977 to protect the physical, biological, and chemical quality of waters of the US, including certain wetlands. Wetlands provide a variety of beneficial functions and services, including improving water quality, reducing flood intensity, providing habitat for fish and wildlife, and fostering recreational and educational activities. Under federal regulations**,** activities that involve a discharge of dredged or fill material into certain wetlands are regulated under Section 404 of the Clean Water Act.

## 3.20.03 Who regulates this resource?

USACE and the United States Environmental Protection Agency (EPA) regulate impacts to certain wetlands.

## 3.20.04 What does the environmental resource specialist need to do?

1. Conduct field wetland delineations and Global Positioning System (GPS) wetland boundaries or flag wetland boundaries for Survey Unit.
2. Prepare a wetland delineation report for United States Army Corps of Engineers (USACE) submittal that identifies wetland types, boundaries, and areas.
3. Provide wetland polygons for designer to include in project plan sheets.
4. Develop and incorporate measures into project plans to address avoidance and protection of existing wetlands.
5. Develop a mitigation plan (i.e., wetland bank, onsite, offsite, in lieu fee) to compensate for wetland losses.
6. Prepare a programmatic or non-programmatic wetland finding once impacts and mitigation opportunities are known.
7. Secure Federal Highway Administration (FHWA) or Environmental Programs Branch (EPB) approval of the wetland finding.
8. Prepare appropriate permit application materials for the USACE permit.

## 3.20.05 What does the Resident/Project Engineer need to do?

### Design

1. Incorporate wetland delineation boundaries into plans.
2. Quantify wetland impacts based on consideration of measures to avoid and minimize impacts.
3. Incorporate resource specialist notes/specs, and
4. Prepare design of mitigation plan for wetland impacts, if appropriate.
5. Provide plan sheets showing wetlands and project footprint to include in the permit application letter.
6. If mitigation will be onsite, provide plan sheets of the mitigation site.

### Construction

1. Contact resource specialist to address wetlands during preconstruction conference and flag wetlands in the field.
2. Manage project construction to assure all aspects of wetland notes, specifications, and plan sheets are followed by the Contractor.

## 3.20.06 What is the general clearance schedule for this resource?

Wetland delineations can only be performed during the active growing season (approximately April through September).

Wetland finding preparation and approval (following the revisions to the Final Office Review (FOR) Plans to include impacts and mitigation measures): Approximately three weeks.

Development of wetland mitigation opportunities (following the Field Inspection Review [FIR], depending on level of impact, availability of mitigation opportunities, and Designer assistance): one to three months.

**For Individual Permits**

- Preparation of application package and submittal to United States Army Corps of Engineers (USACE): three months
- USACE application review, public notice process, and issuance of permit: six months to one year

Total = nine months to one year three months.

**For Nationwide Permits**

- Preparation of nationwide permit application letter and USACE Form and submittal to USACE: one month
- USACE application review and issuance of permit verification: 45 days

Total = 2.5 months.

## 3.20.07 What are the red flags for this resource?

1. Projects that are scoped in the winter and advertised in the spring do not allow for determination of wetland boundaries and restrict preparation of a wetland delineation.
2. Wetland findings cannot be prepared until project plans have been developed to the level where impacts are finalized and appropriate mitigation measures developed.
3. Write up projects (i.e., resurfacing, culvert repairs) generally do not include detailed surveys that show wetland boundaries that may be subject to impact. These types of projects must address protection and avoidance of impacts through notes, specifications, and requirements for the resource specialist to flag wetland boundaries and require Contractor protection of wetland areas.
4. If a project requires authorization under an individual permit, a project schedule can be affected. After USACE receives an application for an individual permit, the process may take six months to a year.

# Section 4

# Traffic

March, 2024 version

COLORADO

Department of Transportation

Office of the Chief Engineer

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# 4.01 Traffic Data

The Form 463, Design Data, provides a section for information on traffic data for both the current and future (usually 20 years, but can be less) average daily traffic, design hourly volume, and the percentage of trucks. This information, along with the highway functional classification, is used to determine the appropriate design standards (e.g., typical sections or travel lanes) for a project.

The project manager is responsible for obtaining the latest traffic data. Traffic data is available from the Division of Transportation Development (DTD) or is accessible at Colorado Department of Transportation's (CDOT) Online Transportation Information System. For non-CDOT controlled roadways, the local Transportation Planning Region (TPR) or Metropolitan Planning Organization (MPO), such as the Denver Regional Council of Governments, may furnish traffic data.

The project manager will usually request any turning movement volumes from the Division of Transportation Development.

The following items consist of traffic information that should appear on the Form 463, the Title Sheet, or elsewhere on the plans as appropriate:

1. Traffic data – includes projected and existing average daily traffic, design hourly volume, percentage of trucks and directional traffic distribution (Form 463, Title sheet, Traffic Movement Diagram plan sheet).
2. Roadway functional classification – such as interstate, freeway, collector, or arterial can be obtained from the DTD web page referenced above (Form 463).
3. Terrain type – obtained from the same web page (Form 463).
4. Number of lanes – geometric design type or typical section, can be determined from the CDOT Design Guide, the Transportation Research Board (TRB) Highway Capacity Manual, or associated software (Form 463, Typical Sections, Plan and Profiles).

**Additional Resources:**

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

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

State Highway Access Code

For forms, see CDOT online forms library CDOT Forms Catalog

## 4.02 Request and Analyze Crash Data

The Traffic Safety & Engineering Services (TSE) Branch periodically reviews the safety performance of all roads on the state highway system and identifies locations that have the potential for crash reduction. This data is available to the Designer through the TSE Branch.

Under Section 148 of Title 23, United States Code (23 USC 148), each state is to maintain the Highway Safety Improvement Program (HSIP) by surveillance and identification of crash locations statewide. This program is part of the state's overall Statewide Safety Program and is administered by the TSE Branch.

In the Colorado HSIP developed by the Colorado Department of Transportation (CDOT), a program is described to reduce the number and severity of traffic crashes on all public roadways, including non-state-owned roads and roads on tribal land. All crash reports are supplied to the Department of Revenue (DOR) by the Colorado State Patrol and other local law enforcement agencies. DOR, in turn, provides information and makes crash report data available to CDOT for safety performance measures and engineering analysis.

The TSE Branch, with crash data supplied by DOR, is responsible for identifying locations that have the potential for crash reduction. Some of the methods of identifying highway and traffic safety issues are:

1. Safety Performance Functions (SPF) / Level of Service of Safety (LOSS) analysis
2. Network Screening
3. Crash Pattern Recognition and Diagnostics
4. Road Safety Audits (RSA)
5. Prioritization Studies

As part of the Operations Evaluation process (see Section 4.12), a safety analysis is routinely provided by the Region Traffic Engineer or the TSE Branch on all highway type projects, such as non-interstate routes, interstate, "safety enhancement" type and Resurface, Restoration and Rehabilitation (3R) type.

**Additional Resources:**

23 US Code (USC) Section 148, Highway Safety Improvement Program

23 Code of Federal Regulations (CFR) Part 655F, Traffic Control Devices on Federal-Aid and Other Streets and Highways; Part 924, Highway Safety Improvement Program; Part 1205, Highway Safety Programs; Determinations of Effectiveness

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

## 4.03 Turning Movements Request

Traffic volume data are used to analyze the level of service of proposed designs as described in Section 4.01. Average daily traffic volumes and design hourly volumes are usually projected for 20 years for each traffic movement at an at-grade intersection or interchange.

The project manager will initiate a request to the Division of Transportation Development for turning movement volumes prior to designing the intersection or interchange. The request will be in email or letter form adequately describing the location and type of data needed.

It is important that the request properly describes the proposed improvement so that any new traffic patterns can be predicted. The request should also include a list of alternative design concepts, if applicable. If the current project is part of a corridor, then the overall corridor traffic should be used in the prediction.

In urban locations it is desirable to have peak hour traffic counts both in the morning and in the evening, so that the design hourly volume is properly selected.

It may be necessary for the Division of Transportation Development to conduct a current traffic count at the site prior to applying an expansion factor. In some areas, the local agency may have a current count and may have a planning model predicting traffic.

The Division of Transportation Development may provide a traffic diagram (see Section 4.04) to the Designer showing the requested traffic information.

On larger projects or corridor projects, a traffic model may be prepared, based on future growth and land uses, to forecast the expected volumes. The project manager may include this modeling need in the Design Engineer's scope of work.

The turning movement volumes should be documented in the project file, or in the intersection or interchange report, as supporting documentation for the chosen design.

**Additional Resources:**

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

Colorado Department of Transportation (CDOT) Roadway Design Guide Business – Bulletins and Manuals – CDOT Roadway Design Guide 2023

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

## 4.04 Traffic Movement Diagram

The traffic movement diagram illustrates, in the plans, the design traffic volume predicted for each movement within an intersection or interchange. It is used as data to confirm acceptable levels of service and to justify design features such as turning lanes and storage lengths.

The traffic movement diagram is a graphic representation of the data received from the request that is described in Section 4.03. The diagram is placed on the plan sheet showing the proposed intersection or interchange design and provides a permanent record, in the plans, of the data that justified the design features of the intersection or interchange.

The diagram will show the design hourly volume for each movement within the intersection or interchange. The diagram may also show the current average daily traffic and the current hourly volume. The diagram will show the current year and the 20-year projection of traffic movements. Signal project movements may be projected for 10 years.

The project manager is responsible for assuring that the traffic movement diagram and data are placed on the appropriate plan sheet, as needed. Placing the diagram on the plan sheet provides permanent documentation of the traffic data used for design of the project.

If the turning movement data will be more than two years old at the time of advertisement, the Division of Transportation Development should be contacted for updated information, and the design assumptions for the new traffic predictions should be verified.

**Additional Resources:**

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

Colorado Department of Transportation (CDOT) Roadway Design Guide Business – Bulletins and Manuals – CDOT Roadway Design Guide 2023

Transportation Research Board (TRB) Highway Capacity Manual

## 4.05 Signal Warrants

A thorough investigation of traffic conditions, crash history, and physical characteristics of the location is necessary to establish warrants for the installation of a traffic signal. Warrants should be established prior to any engineering work, since the design criteria for a signalized intersection will be different from that of a stop-controlled intersection.

The Region Traffic Engineer will conduct the signal warrant study for the roadway intersection together with all the necessary calculations, documentation and traffic signal warrant justification for each location.

The Region Traffic Engineer shall certify that warrants have been met by documenting them in the form of a letter justifying the need for traffic control signals. Traffic Control Signals can be justified when warrants are met as indicated in the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), Part IV. The letter should state which of the warrants as shown in the MUTCD are applicable. It is important to note that a location meeting signal warrants does not automatically mean that installation of a traffic signal is the solution. Engineering judgment should be exercised before making a final decision.

**Additional Resources:**

23 Code of Federal Regulations (CFR) Part 655F

23 US Code (USC) 109(d), Standards

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

## 4.06 Intersection and Interchange Design

Project design should efficiently and safely move traffic through various conflict points arising at the crossing of highways.

The crossing of two or more highways can be accomplished in three manners: at-grade intersections, grade separations, and interchanges. The most common at-grade intersection configurations are “4-leg,” “T,” and “Y,” with or without separate auxiliary lanes or channelization. At-grade intersections require some form of traffic control, which could range from stop signs or traffic signals to a modern roundabout. Grade separations allow one roadway to pass over another with no provision for turning movements. Interchange design allows for one roadway to pass over another with turning movements. Common interchange types are “diamond”, “cloverleaf”, “directional”, “urban”, “Y”, and “trumpet”. The decision to use interchanges depends on traffic counts, highway classification and access requirements.

Concepts, including signal warrants and truck-turn templates, for use in intersection design can be found in the References listed at the end of this section. Truck-turn templates account for the off-tracking of large vehicles as they turn through at-grade intersections.

The project manager is responsible for the justification and design of new or modified intersections or interchanges. The use of the Intersection Control Assessment Tool (ICAT) to

compare alternatives and recommend the preferred configuration is required when significant changes are being made. This includes any intersection, ramp termini, or interchange (new intersection, widening/reconstruction corridor project, or work requiring an access permit that affects an intersection) when 1) The intersection includes at least one roadway designated as a state highway or part of the national highway system, 2) The intersection will be designed or constructed using state or federal funding, 3) the intersection is included in Access Control Plans, Planning and Environmental Linkages (PEL), Corridor Planning Studies, or Traffic Impact Studies (TIS), 4) requested by the Region Traffic Representative (RTR), or 5) there are significant modifications to the operation of the interchange or intersection.

Use of the Intersection Control Assessment Tool (ICAT) shall **Not** be required when the proposed work does not include any geometric or capacity changes to the intersection design such as (but not limited to): resurfacing pavement projects, striping projects, routine maintenance projects, traffic signal retiming projects (that do not include adding a phase), a proposed Right-in/Right-out (RIRO) intersection that meets the Colorado State Highway Access Code, or signal maintenance projects (to upgrade deficient equipment). A waiver eligibility form must be completed by the project manager and submitted to the RTR, and if approved, the project shall be exempt from ICAT requirements. Region and Headquarters Traffic Engineers can assist with the application of the ICAT.

Turning movements are discussed in Section 4.03 and signal warrants in Section 4.05 of this manual.

For a new or modified intersection justification, factors usually addressed are:

1. Traffic factors include: capacity, turning movements, signal warrants, cause of crashes and their type and frequency, the needs of pedestrians and bicycle users when justified in urban or rural areas.
2. Physical factors include: topography, improvements, physical requirements, and physical constraints.
3. Economic factors include: the cost of the improvements and economic effects on abutting businesses.
4. Human factors include: driving habits, decision and reaction times, driver expectations, and natural paths of movement.

When signal warrants are not initially met but are expected to be met in the future, the Region Traffic Engineer should specify the requirements that must be met to justify signalization of the intersection.

For new or modified intersection design, the following data is required for initiating a final design:

1. Basic data – relative to traffic, physical and economic factors.
2. Preliminary design – aerial photos (when available), topographic maps, preliminary sketches of plan and profiles for alternative designs. Preferred alternative should be determined no later than the Field Inspection Review stage.
3. Comparative costs – cost estimates of alternative designs.
4. Selection of suitable design – from the standpoint of traffic adequacy and economy and safety considerations.
5. Final plans – design approval of intersection configuration, complete calculations, plan and profiles, traffic flow diagrams showing the design hourly volume and the design year of all anticipated traffic movements, and proposed construction Traffic Control Plan.

For interchange design, the above factors also apply, along with addressing highway classification, character and composition of traffic, design speed, and degree of access control. Design of new interchanges or modification to existing interchanges are subject to additional approval and reporting requirements. All new or modified interchanges in Colorado must be reviewed and approved following the policy set forth in the Colorado Department of Transportation (CDOT) Policy Directive 1601.0, Interchange Approval Process, and the procedures outlined in CDOT Procedural Directive 1601.1, Requests for Interchange Access and Modifications to Existing Interchanges on the State Highway System.

Procedural Directive 1601.1 outlines the level of detail a traffic study related to new or modified interchanges must include depending on the type of improvement. Additionally, Federal Highway Administration (FHWA) approval is required for new interchanges or modification to existing interchanges along the interstate system. State Departments of Transportation (DOT's) must submit requests for proposed changes to interstate access to their FHWA Division Office for review and action under 23 US Code (USC) 106 and 111(a), and 23 Code of Federal Regulations (CFR) 625.2(a). FHWA's Policy on Access to the Interstate System may be referenced for additional information.

**Additional Resources:**

23 CFR Part 771

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

AASHTO A Policy on Design Standards – Interstate System

Bicycle and Pedestrian Facilities (see Section 2.10 of this manual)

Colorado Department of Transportation (CDOT) Roadway Design Guide Business – Bulletins and Manuals – CDOT Roadway Design Guide 2023

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

Transportation Research Board (TRB) Highway Capacity Manual

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

Intersection Control Assessment Tool (ICAT) – Onbase – ICAT Training

## 4.07 Traffic Signal Plan

A traffic signal plan is used to establish control of vehicular and pedestrian traffic flow at intersections, consistent with the assumptions used in Section 4.06 Intersection and Interchange Design. Prior to design of signal plans, the project manager confirms that the signals are warranted and that documentation is in the project file.

Traffic signal plans will include a complete geometric layout of the intersection showing the location of the traffic signal poles, conduit, signal cabinet, power source, and existing utilities. A sketch of the signal faces, a phasing diagram, a legend, general notes pertaining to the signalization, and a summary of approximate quantities will be included.

The Project Traffic Engineer or a consultant prepares the signal plan according to the decisions made at the Design Scoping Review and the Field Inspection Review meetings. The Region Traffic Engineer reviews and approves signal plans.

The project manager will be responsible for providing an updated intersection layout to the Project Traffic Engineer to use in designing the signal plan.

The Project Traffic Engineer completes all the necessary calculations for documentation of the signal warrant study, prepares the traffic signal design, computes quantities, drafts specifications, and completes drawings for the final signal plans. The Project Traffic Engineer also certifies that all traffic plans conform to the MUTCD and CDOT S-Standard Plans. Some signal installations may need to conform to the local entity specifications, if they are a part of an integrated signal system.

**Additional Resources**:

23 Code of Federal Regulations (CFR) Part 655

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

Federal Highway Administration (FHWA) 23 US Code (USC) 120

Transportation Research Board (TRB) Highway Capacity Manual

## 4.08 Lighting Plan

A lighting plan is prepared by a qualified engineer to provide roadway lighting for improved driver vision at night and to enhance the safety of pedestrian and vehicular traffic.

The purpose of roadway lighting is to improve nighttime highway safety by reducing the possibility of motor vehicle collisions with pedestrians, fixed objects, or obstructions on the roadway. The quantity of light does not necessarily indicate a good lighting system. What's important is to provide effective lighting. Effective lighting refers to the ability of the light to provide contrast between objects and background so that motorists can detect conflicts in sufficient time to take evasive action. Many interrelated factors contribute to effective lighting, such as reducing glare to help improve driver performance.

The Colorado Department of Transportation (CDOT) Roadway Design Guide provides a description of illumination, including design guides, methods, and types. Design software may be available through the Region.

Warrants for lighting are outlined in the AASHTO Informational Guide for Roadway Lighting. Warrants are not required for minimum interchange lighting.

The CDOT Lighting Design Guide should be used when preparing lighting plans or determining lighting warrants. The CDOT Lighting Design Guide is based on the Illuminating Engineering Society of North America (IESNA) Lighting Handbook Tenth Edition, the American National Standard Practice for Design and Maintenance of Roadway and Parking Facility Lighting/ Illuminating Engineering Society (ANSP/IES RP-8-18) and the AASHTO 2005 Roadway Lighting Design Guide. It represents the current recommended practice for roadway lighting and includes criteria for typical applications found in the state of Colorado. The CDOT Lighting Design Guide should be used in conjunction with the latest version of these three references. Exceptions to these guidelines should be thoroughly evaluated and documented in accordance with CDOT's design exception policies.

All projects that include lighting installation or modification require plans and specifications that show the type and locations of the lighting equipment and a summary of quantities. The lighting design will be incorporated into the final plan set by the project manager.

The following documentation and procedures are to be followed for the design of highway lighting:

1. The project manager, through the Region Utility Engineer, will coordinate with the utility company to ensure proposed materials are compatible with utility inventories. If applicable, a lighting agreement will be negotiated between Colorado Department of Transportation (CDOT) and the local agency.
2. The Region Utility Engineer will designate the power source locations and negotiate with the utility company to supply the power.
3. In special lighting situations (e.g., use of ornamental or decorative lighting), the state and federal shares of costs shall not substantially exceed the estimated cost of conventional highway lighting, unless such special lighting is within the scope of the project (such as enhancement projects or historical areas) or is otherwise justified by the public interest. The project manager will negotiate the local share, if any, of special lighting costs.

The following information will be shown on the lighting plan:

1. Circuit type, voltage, and location of power source.
2. Luminaire type, lumens, and locations.
3. Light standard type, mounting height, bracket arm type and length, and foundation details.
4. Size and location of electrical conduit, conductor size, location of direct burial cable, and locations of pull boxes and junction boxes.

All final plans for lighting should be reviewed by a qualified Lighting or Electrical Engineer for proper wiring or other electrical details.

**Additional Resources**:

CDOT Roadway Design Guide Business – Bulletins and Manuals – CDOT Roadway Design Guide 2023

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

Illuminating Engineering Society of North America (IESNA) Lighting Handbook

AASHTO Lighting Guide

The American National Standard Practice for Design and Maintenance of Roadway and Parking Facility Lighting/Illuminating Engineering Society (ANSP/IES RP-8-18)

Colorado Department of Transportation (CDOT) Lighting Design Guide Business – Bulletins and Manuals – 2020 CDOT Lighting Design Guide

## 4.09 Permanent Signing and Pavement Marking

The proposed final signing and pavement marking plan will be included in the project Plans, Specifications, and Estimate package.

The Project Traffic Engineer or a consultant is responsible for the design of the signing and pavement marking plans for the construction project. Signing and marking should be considered during the early phases of project design, especially for interchange projects, which require effective signage to be constructable.

The preparation of permanent signing and pavement marking plans includes the following activities:

1. Plan sheets showing the roadway, edge of traveled way, shoulders, structures, and topography are drafted for traffic engineering plans by the Designer, and electronic files provided to the Project Traffic Engineer or consultant, when required.
2. The Project Traffic Engineer or consultant collects and tabulates the field inventory of existing traffic controls.
3. The Project Traffic Engineer or consultant draws existing signs on the plan sheets.
4. The Project Traffic Engineer or consultant locates and places the required traffic controls, such as pavement markings or signs, on the plans.
5. The Project Traffic Engineer or consultant prepares the traffic plan that includes the tabulations of signing and striping quantities.
6. The Project Traffic Engineer or consultant prepares required specifications and special provisions.

The Project Traffic Engineer or consultant submits the traffic plans and specifications to the project manager for incorporation into the final plan set .

**Additional Resources:**

23 Code of Federal Regulations (CFR) Part 655F

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

CDOT S-Standard Plans

Colorado Department of Transportation (CDOT) Roadway Design Guide Business – Bulletins and Manuals – CDOT Roadway Design Guide 2023

CDOT Standard Specifications for Road and Bridge Construction

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

CDOT Pavement Marking Practices Guide Safety – Traffic Documents and Publications – CDOT Pavement Markings Practices Guide

CDOT Sign Design Manual Safety – Traffic Documents and Publications – CDOT Guide Sign Design Manual

## 4.10 Construction Transportation Management Plans

A Transportation Management Plan (TMP) lays out a set of coordinated strategies and describes how these strategies will be used to manage the work zone impacts of a project. The scope, content, and degree of detail of a TMP may vary based on the expected work zone impacts of the project. All projects must comply with the Region's Lane Closure Strategies. The Region Traffic Engineer must approve all work that does not comply with the Region's Lane Closure Strategies (Safety – Lane Closure Strategies).

The components of the TMP will depend on whether it is a "significant project." A significant project is defined as one that, alone or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts at a location for three or more consecutive days with either intermittent or continuous lane closures. A significant project impacts the traveling public at the metropolitan, regional or the interstate level and has a moderate to very high level of public interest. It will directly impact a moderate to very large number of travelers and will have moderate to very high user cost impacts. A TMP may consist of the following components:

1. Traffic Control Plan (TCP) – **Required Component**

   Traffic control devices are all types of signs, signals, and temporary or permanent pavement markings that are used on streets or highways to regulate, warn, or guide traffic during the construction phase of a project. Traffic control is also required for maintenance, utility, and emergency operations. The safety of all forms of transportation such as cars, trucks, pedestrians, and bicycles should be considered throughout the construction phases of the project.

   All construction plans that require temporary signing, signals, and pavement marking shall have a Traffic Control Plan layout sheet (which may be a reference to one or

more of the cases illustrated in the CDOT S-Standard Plans) showing the different phases of construction and the locations of signs, signals, and pavement marking. The Traffic Control Plan (TCP) shall be consistent with the provisions of the Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction, CDOT M&S Standard Plan, Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD), and any applicable incident management plans. A tabulation of pavement markings, signing quantities, schedule of construction traffic control devices, and project specifications are also required.

The Traffic Control Plan may be developed by the Region Traffic Unit or a consultant. Coordination with the region, local agencies, utility companies, railroads, and entities is essential during project development. The Region Traffic Engineer or designee is responsible for reviewing Traffic Control Plans. The project manager is responsible for providing the construction phasing plan and ensuring that a Traffic Control Plan is included in the final plan set.

2. Transportation Operations – **Required Component**

The Transportation Operations component of the Transportation Management Plan (TMP) consists of compliance with the Region's Lane Closure Strategies. (The Region Traffic Engineer must approve all work that does not comply with the Region's Lane Closure Policy.) In addition, Transportation Operations strategies should be identified that will be used to mitigate impacts of the work zone on the operation and management of the transportation system within the work zone impact area. Typical Transportation Operations strategies may include, but are not limited to, demand management, corridor/network management, work zone safety management, and traffic/incident management and enforcement.

More strategies are listed in the "Work Zone Safety and Mobility Rule Procedures Document", CDOT Work Zone Safety and Mobility Rule Procedures Document.pdf. The scope of the Transportation Operations component should be determined by the project characteristics, and the identified transportation operations and safety strategies.

3. Public Information (PI) – **Required Component for Significant Projects**

The PI component of the TMP includes communications strategies that inform affected road users, the general public, area residences and businesses, and appropriate public entities about the project, the expected work zone impacts, and the changing conditions on the project. The PI component may be customized by use of the "Public Information Services" project special provision worksheet (Business – Recently Issued Special Provisions). This may include motorist information strategies. The scope of the

PI component should be determined by the project characteristics and the identified public information and outreach strategies. Public information should be provided through methods best suited for the project and may include, but not be limited to, information on the project characteristics, expected impacts, closure details, and commuter alternatives.

Preparation and implementation of a Transportation Management Plan (TMP) for a highway project includes:

1. The Project Traffic Engineer will prepare a Traffic Control Plan (TCP), Transportation Operations, and Public Information (PI) (optional for non-significant projects) to be included in the Plans, Specifications and Estimate package, including project special provisions for traffic control, general notes, and pay items for all traffic control devices, when requested by the project manager. Transportation Operations strategies must be specified in the general notes and include all contract language, plan sheets, and specifications required to implement the selected strategies. Projects requiring a PI component must utilize the Public Information Services project special provision worksheet.
2. The project Traffic Engineer will select traffic control devices that conform to the version of the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) adopted by the Transportation Commission and amended by the Colorado Supplement for Colorado Department of Transportation (CDOT) use, the CDOT Guidelines on Variable Message Signs, the Standard Specifications, and the CDOT S-Standard Plans.
3. Work zone speed limits shall be set in accordance with the procedures established by CDOT Form 0568 CDOT Temporary Speed Limit Reduction Form 568 (or in an online tool if available), in CDOT's Update on Signing for Double Fines memo, and any others communicated to the Region Transportation Directors and Branch heads.
4. The project manager will ensure adherence to all parts of the CDOT Work Zone Safety Guidelines for Engineering and Maintenance:

**Additional Resources**:

23 Code of Federal Regulations (CFR) Parts 630J and 655F

CDOT S-Standard Plans

CDOT Guide Signing Practices and Procedures

CDOT Work Zone Safety and Mobility Rule Procedures Document

## 4.11 Engineering Judgment and the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) Request Options

The controlling federal document for designing roadway signage is the MUTCD, published by the Federal Highway Administration (FHWA). In some cases, deviations from the standards set forth in the MUTCD are allowed on the basis of engineering judgment.

The MUTCD contains two basic types of statements, Standard statements and Guidance statements. Standard statements contain the word “shall” and are considered mandatory. Guidance statements contain the word “should” and are considered suggestions. Under certain circumstances, a Project Engineer may deviate from a Standard statement based on engineering judgment.

However, deviations may be allowed only if the deviation is location or site-specific. For example, a Project Engineer may use engineering judgment to justify specifying narrower signs in the median of a specific portion of a project where signs of standard width would protrude into the travel lane. The Project Engineer would only need to document the reasons in the project files to justify the decision.

Any deviation using engineering judgment can affect only a specific area of the project; deviations from the MUTCD standard cannot be made on a project, corridor, area, or statewide basis. For example, a Project Engineer cannot use engineering judgment to justify using unique sign layouts on a corridor project, because the decision could have corridor, region, or statewide implications. Instead, to make changes on a project-wide basis, the Project Engineer could make use of one of the MUTCD requests:

1. Request for Interpretation
2. Request for Permission to Experiment
3. Request for Interim Approval
4. Request for Change

A request for interpretation involves asking the Federal Highway Administration (FHWA) to render an official opinion on the application and operation of standard traffic control devices, official meanings of standard traffic control devices, or the variations from standard device designs.

A request for permission to experiment involves asking FHWA’s permission to field test or evaluate a new traffic control device, its application or manner of use, or a provision not specifically described in the MUTCD.

A request for interim approval involves asking Federal Highway Administration (FHWA) for interim use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in the Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD). However, any other jurisdiction that desires to use a traffic control device for which FHWA has issued an interim approval must still request permission from FHWA.

A request for change involves asking FHWA to consider use of a new device to replace a present standard device, an additional device to be added to the list of standard devices, or a revision to a traffic control device application or placement criteria.

All requests must be submitted to the FHWA Office of Transportation Operations MUTCD team for consideration (see MUTCD Section 1A.10 for details). All Colorado Department of Transportation (CDOT) requests should be developed with the assistance of the appropriate Region Traffic Engineer and the Headquarters (HQ) Traffic Safety and Engineering Services Branch. Requests submitted by local entities in Colorado do not require CDOT approval or involvement. However, the FHWA does provide CDOT Traffic Safety and Engineering Services with a copy of the local entity's request and FHWA's reply. CDOT Region personnel who become aware of a pending request by a local entity should inform the appropriate Region Traffic Engineer, as well as the State Traffic Engineer, to ensure the CDOT is informed of the request.

Should you have any questions, or should you require assistance in submitting a request, contact the Safety and Traffic Engineering Branch.

**Additional Resources:**

Manual on Uniform Traffic Control Devices for Streets and Highways

## 4.12 Operations Evaluation (formerly Transportation Systems Management and Operations [TSM&O])

Beginning January 1, 2016, all projects with a Design Scoping Review on or after February 1, 2016, require a TSM&O Evaluation. On January 21, 2021, the TSM&O Evaluation was renamed to the Operations Evaluation and deployed as an OnBase web tool. The Operations Evaluation is an evaluation that consists of three parts, a Safety Analysis, an Operations Analysis, and an Access Management Analysis. The purpose of the Operations Evaluation is to analyze the project area. This analysis enables the making of project-specific recommendations related to safety and mobility to the project team. To initiate the Operations Evaluation, the project manager will take the following steps:

- Create your project in PMWeb and enter information in all of the required project tab fields for the Operations Evaluation.
- An Operations Evaluation request will be automatically generated in PMWeb and sent to the OnBase Operations Evaluation Tool.

The Operations Evaluation will be reviewed and coordinated by a Region Traffic Representative Liaison (RTRL) (Professional Engineer II Traffic Engineer). The RTRL will then assign the evaluations to the appropriate region, access managers, and headquarters personnel.

The Operations Evaluation has two levels for each analysis for Traffic Operations, and Safety. Level One Analyses generally take two–four weeks and are typically conducted by the region traffic teams. The Operations Evaluation has one level of analysis for Access Management. The Access Management Analysis generally takes two–four weeks and is typically conducted by the region access manager.

After the Operations Evaluation analyses are complete, you will receive a notification from PMWeb that recommendations are available for your concurrence.

Level One Analyses should be conducted before, during, or right after the Design Scoping Review Meeting so recommendations can be agreed to and included in the design for the Field Inspection Review (FIR).

Level Two Operations and Level Two Safety Analyses can be done by consultants or headquarters staff. Level Two Analyses should be conducted before the FIR meeting so recommendations can be discussed at the meeting, agreed upon, and included in the final design.

If there are project technology needs or impacts to technology resulting in new or replacements, please refer to 4.13 Systems Engineering Analysis (SEA) for how to proceed.

## 4.12.01 Background

The Transportation Systems Management and Operations (TSM&O) Reorganization Report of May 2013 recommended that all Colorado Department of Transportation (CDOT) projects conduct an operational analysis to ensure improved systematic and integrated delivery of statewide operations. Per federal regulations, the Federal Highway Administration (FHWA)-CDOT Stewardship Agreement, and CDOT policy, CDOT is required to conduct safety analyses and operational engineering analyses as applicable on CDOT Projects. The Operations Evaluation combines all these analyses—safety, operational, and access—into one coordinated process to ensure that every CDOT project considers improvements for the safety and efficiency of the traveling public.

Another purpose of the Operations Evaluation is to enhance regional partnerships that support collaborative investment and implement Transportation Systems Management and Operations (TSM&O) strategies that benefit the region and its stakeholders. This requires collaboration by Maintenance, Access, Regions, Operations, Safety, Access Management, Federal Highway Administration (FHWA), and other stakeholders to identify and consider operational strategies for implementation early in the project lifecycle. This will help provide the ability to implement new or additional operational strategies at the opportune time during the project lifecycle. Additionally, the Operations Evaluation creates enhanced opportunities to provide safety improvements, accountability to stakeholders, increased ability to document and reference lessons learned, and streamline business processes while increasing system reliability.

After three years of use, the Operations Evaluation support group identified a significant opportunity for automation that would lead to improved tracking, coordination, communication, and documentation. Between 2019 and 2021, the Operations Evaluation support group led an initiative to evolve the Operations Evaluation into an OnBase web tool. This initiative was completed on January 20, 2021. Now, all new projects or projects on the shelf for more than two years must be entered into the Operations Evaluation web tool for analysis or exemption.

## 4.12.02 Operations Definition

Operations at the Colorado Department of Transportation (CDOT) refers to several innovations and strategies used to improve the volume and flow of traffic to maximize the efficiency and benefit/cost of our roadways. These strategies include the use of traffic control devices, use of shoulders, narrow lanes, variable speed, traffic incident management, quick clearance, adaptive and efficient signal timing, traffic control, demand management (metering), appropriate and pertinent speeds, alternative and innovative intersections, and coordinated work and response efforts. CDOT is committed to improving system operations and safety and is implementing this formal process, the Operations Evaluation, building these strategies into CDOT’s roadway projects.

## 4.12.03 Roles and Responsibilities

### 4.12.03.01 Project Manager

To the project manager, this process will look somewhat similar to the current process for the Safety Assessment report, whereby the project manager requests an evaluation, receives recommendations, reports, and documentsfrom the OnBase web tool and sent to the project PMWeb portal when the Evaluation is complete. The project manager considers the recommendations that can be integrated into the scope of the project and concurs on which recommendations will be in the final design. The project manager will be responsible coordinating with the Region Traffic Representative Liaison (RTRL) for the status of the

Operations Evaluation process, and discussing recommendations for implementation with their project manager.

The project manager is also responsible reporting in PMWeb on what recommendations were integrated into the design of the project and which recommendations were constructed during the Finals process.

### 4.12.03.02 Region Traffic Representative Liaison

The Region Traffic Representative Liaison (RTRL) referred to in the process is the Traffic Engineer (Professional Engineer II) assigned to the project being evaluated. The RTRL is the single point of coordination for the Operations Evaluation for the project. The RTRL reviews the project request, project documentation, and coordinates with the project manager in this role. The RTRL then assigns Region Traffic Representatives (RTR's) to complete the Level One Safety Operations, and Access Analyses. When the RTR's complete their analyses, the RTRL's review the Level One analyses to determine if Level Two analyses are warranted. The RTRL's will assign region or headquarters staff to conduct the analysis. The RTRL's can also assign a region RTR for Level Two and hire a consultant to do the analysis coordinating with the Operations Evaluation Support Groups.

### 4.12.03.03 Region Traffic Representative and Access Managers

The RTR referred to in the process is the Traffic Engineer assigned to the project being evaluated. In this role the RTR completes the Level One Safety or Operations Analyses, or both. There could be two or more RTR's assigned to a project evaluation.

The region access manager is the access manager RTR assigned to the project being evaluated. The region access manager RTR will complete the access management analysis.

The RTR's also provide support to the project manager and coordinate and consolidate the key recommendations of the Evaluation from the Operations Evaluation support groups, Safety, Operations, and Access Management. The RTR will be the lead for documenting recommendations from the Safety, Operations, and Access Management. And for more information conducting the Systems Engineering Analysis (SEA) see it detailed in Section 4.13 Systems Engineering Analysis.

The Region Access Manager (RAM) is the access manager RTR assigned to the project being evaluated. The region access manager RTR will complete the access management analyses.

### 4.12.03.04 Operations Evaluation Support Groups

The Operations Evaluation support group consists of Headquarters (HQ) Traffic, Safety, Operations, and Access Management (infrastructure). Each specialty is responsible for providing detailed analysis and recommendations for each of its respective disciplines. The Operations Evaluation support group will coordinate directly with the Region Traffic Representative Liaisons (RTRL's) and Region Traffic Representatives (RTR's). The Operations Evaluation support groups will also be responsible for reviewing and following up with the regions on the overall effectiveness of the process.

**Additional Resources:**

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

Design Bulletin DB 2014-3, Milestone Dates in Systems, Applications and Products in Data Processing (SAP) Business – Design Bulletins – Milestone Dates in SAP Project Builder (CJ20N)

Design Bulletin DB 2016-1 Business – Design Bulletins – Transportation Systems Management and Operations (TSM&O) Evaluation

Design Bulletin DB 2021-2 Business – Design Bulletins – Operations Evaluation (formerly TSM&O)

Design Bulletin DB 2021-3 Business – Design Bulletins – Systems Engineering Analysis (SEA) Process

## 4.13 Systems Engineering Analysis

SEA is a project delivery process for technology. This includes any technology that impacts the safety or efficiency of the roadway. The SEA process takes project managers step by step through the design of technology using templates. It is structured to prompt and document critical discussions at the proper time in design. It is also intended to reduce risk by facilitating additional planning during the design phase.

Project managers will take the following steps to initiate the SEA process:

- During prescoping, complete the Technology/SEA Assessment template. All projects must complete and submit this form which is in OnTrack. This document can also be found on the Intelligent Transportation Systems (ITS) & Network Services site.
- SEA Documents Website (Programs – SEA Documents). This template will walk a project manager through determining if a project has technology and therefore

requires a Systems Engineering Analysis (SEA). Even if a project does not have technology and no SEA is required, it is still important to document that no additional SEA documentation is required.

- If an SEA is required, the Technology/SEA Assessment template will guide the Project Manager (PM) through determining which of the 10 additional required SEA documents already have an existing document that can be modified to be project specific. If there is no previously prepared work, the PM will need to develop the document using the templates which can be found on the ITS & Network Services Branch website Programs – Systems Engineering Analysis (SEA).
- The remaining 10 SEA documents build on each other. In PMWeb, the SEA deliverables are tied to particular stage gates to ensure the documents are prepared at the correct time. The submission schedule can also be referenced using the Intelligent Transportation Systems (ITS) & Network Services – Document Submission Website (Programs – SEA Document Submission). For templates of all SEA documents reference the ITS & Network Services – SEA Documents website Programs – SEA Documents.
- The date of the completion of the SEA process will need to be populated in the Form 1180.

### 4.13.01 Background

The SEA is required per 23 Code of Federal Regulations (CFR) 940. Historically it has been housed in the Operations Evaluation Tool. On September 1, 2021 the SEA was removed from the Operations Evaluation Tool and moved to PMWeb

The SEA is a project delivery process for technology making OnTrack the appropriate tool for the SEA process. The SEA process was revamped in 2021 through the collaborative work of a project team led by the ITS & Network Services Branch involving subject matter experts from all five regions and Headquarters (HQ). This effort was sponsored by the Federal Highway Administration (FHWA) who was another integral component of the team.

The revamp was structured to ensure compliance with 23 Code of CFR 940. Another objective was to ensure consistent technology design at the Colorado Department of Transportation (CDOT) through the use of the ITS Architecture Plan. The SEA focuses on the design of technology and ensures appropriate planning is in place for the technology to remain useful for its full lifecycle. This is why the SEA prescribes planning maintenance and asset management resources before the technology is implemented. The ultimate goal of the SEA is to ensure money and time spent deploying technology results in successful systems along with the longevity of technology solutions.

## 4.13.02 Roles and Responsibilities

### 4.13.02.01 Project Managers

The Project Managers (PM's) are responsible for determining the need for a Systems Engineering Analysis (SEA) on a project through the use of the Technology/SEA Assessment template. If no SEA is needed, the PM only needs to complete the top portion and submit the form for verification of the correct assessment. No additional SEA documentation will be needed.

Should an SEA be required, the PM is responsible for preparing and submitting all 10 additional SEA documents. If the PM needs additional help, they can reach out to the Intelligent Transportation Systems (ITS) & Network Services Branch or the SEA Lead for support.

The PM will also be responsible for completing the Form 1180 which documents completion of the SEA process.

### 4.13.02.02 ITS & Network Services Branch

The Branch will be timely in their reviews of submitted SEA templates. The Branch will also maintain the ITS specifications published on the ITS & Network Services Branch – Specifications website (Programs – Specifications and Standard Procedures). These specifications will have to be referenced in completing the SEA documentation.

### 4.13.02.03 SEA Lead

The SEA lead will be the point of contact in the ITS & Network Services Branch to support PM's going through design. The SEA lead will coordinate all review of SEA documents, compile all comments, and return comments to the PM. This position will also assist PM's as they prepare SEA documents. This includes explaining the templates and the ITS Architecture Plan, coordinating support for the ITS & Network Services Branch, and any other additional support a project may need.

### 4.13.02.04 Federal Highway Administration (FHWA)

The FHWA Project Level Stewardship and Oversight Agreement (when applicable) will provide additional instructions on FHWA involvement with the SEA.

**Additional Resources:**

Design Bulletin DB 2021-3 Business – Design Bulletins – Systems Engineering Analysis (SEA) Process

Intelligent Transportation Systems (ITS) & Network Services SEA website, Programs – Systems Engineering Analysis (SEA) for additional information.

# Section 5 Structures

June, 2024


COLORADO

Department of Transportation

Office of the Chief Engineer

# Table of Contents

## 5.01 Introduction

This section provides guidance for preliminary engineering plan submittal and approval for buildings, major and minor bridges, snow sheds, tunnels, geotechnical structures featuring wall systems or ground improvement systems, and hydraulic structures.

## 5.02 Major Structure (Bridge)

Major structures are bridges and culverts with a total length of greater than 20 feet, inclusive of all spans, barrels, and cell separations. Retaining walls with both a total length greater than 100 feet and a maximum exposed height at any section of over 5 feet are assets that will be inspected but walls do not have a major or minor category. The length is measured along the centerline of roadway for bridges and culverts, and along the top of the wall for retaining walls. Overhead sign structures (sign bridges, cantilevers and butterflies extending over traffic), tunnels and high mast light standards also are structures which are tracked assets and inspected but don't have major/minor categories.

Refer to the Colorado Department of Transportation (CDOT) "CDOT Bridge Design Manual", Section 3, for minimum design loading. All structures should be analyzed individually for the optimal design. Any substantial costs for deviation from the most economical design need to be considered in the structure selection process and must be agreed to by the Resident Engineer. The selection of a bridge rather than a large culvert is determined from estimated construction and maintenance costs, structural aesthetics, hydraulic needs, and environmental considerations.

For bridges over waterways and culverts carrying waterways, please refer to the "CDOT Drainage Design Manual". Hydraulic design of the bridge or culvert opening shall be completed by a licensed Hydraulic Engineer, or under the direct supervision of a Hydraulic Engineer licensed in the state of Colorado.

The Resident Engineer is responsible for submitting to the Project Structural Engineer the preliminary information including the following:

1. Current and proposed roadway and waterway plans, profiles, and cross-sections for both upper and lower features, with alignment data.
2. Bridge situation sheet with all topography including contours, utilities, and railroads (bridge site data).
3. Any hydraulics report, right of way restrictions, and selected guardrail types.
4. Any region design recommendations, including deviations from M Standards.
5. Requirements for electrical conduit, lighting, and utility locations.
6. Corridor aesthetics, environmental consideration, and architectural concepts, if applicable.
7. Request a foundation report from the Geotechnical group and arrange for access, traffic control, and the locations for drilling to be surveyed.

This information should be delivered to the Project Structural Engineer as early in the project after scoping as possible. Typically this information should be delivered prior to the Field Inspection Review (FIR) so all structural decisions can be made prior to commencing final design.

Any subsequent revisions to the roadway alignments or profiles shall be transmitted to the Project Structural Engineer without delay.

The Project Structural Engineer's responsibilities include:

1. Review preliminary alignments and bridge site data.
2. Prepare structure selection reports or a wall selection report, or both, including appropriate engineering and economic studies.
3. Prepare structure layouts and specific details that reflect a recommended structure type, size, and location.
4. Request foundation report from the Resident Engineer. See Section 5.08.

For a complete description of responsibilities, see the Programs – "Policies & Procedures" section of the Colorado Department of Transportation (CDOT) "CDOT Bridge Design Manual".

The following is a brief overview of the bridge design process outlining the responsibilities of the Project Structural Engineer:

1. Preliminary Bridge Design
    a. Attend Design Scoping Review meeting.
    b. Obtain and review bridge site data.
    c. Review preliminary alignment to determine structure location
    d. Determine conceptual structure layout and alternative structure types.
    e. Prepare engineering and economic recommendations.
    f. Prepare general layouts and special details.
    g. Prepare selection report outlining all design criteria and restrictions and recommended structure.
    h. Prepare drawings for foundation investigations.
    i. Attend the FIR and make required revisions to layout.
    j. Obtain structure numbers

2. Final Bridge Design
    a. Design all structural elements.
    b. Prepare all structural plans and specifications.
    c. Provide independent design, detail, and quantity check.
    d. Attend Final Office Review and make required revisions to Plans and Specification. At the discretion of the Resident Engineer, a separate structure Final Office Review or a

structure advance plan review meeting may be held prior to the overall project Final Office Review.

e. Provide final structural submittal (i.e., the final detail letter, final design notes, independent design check notes, field package and rating package), see “Policies & Procedures, Section E.4” of the Colorado Department of Transportation “(CDOT) Bridge Design Manual”.
f. Provide revised plans and specifications as per the Final Office Review (FOR) comments for construction.

3. Construction Support
    a. Review shop drawings.
    b. Provide information and support for any Requests for Information (RFI’s) or other construction issues.

The Resident Engineer should compare the roadway and bridge plans to verify grade, alignment and clearances.

**Additional Resources:**

“CDOT Bridge Design Manual”

“CDOT Bridge Detailing Manual”

American Association of State Highway and Transportation Officials “(AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications”

“AASHTO Manual for Bridge Evaluation”

“CDOT Bridge Rating Manual”

“CDOT Drainage Design Manual”

## 5.03 Minor Structure (Culvert)

A culvert is used in lieu of a bridge based on estimated construction and maintenance costs, when either alternative is viable hydraulically. There will be instances where a culvert structure will provide superior hydraulic performance to a bridge structure, or where particular permit requirements are more easily fulfilled using a culvert structure. For culvert sizing and other design requirements, refer to the “CDOT Drainage Design Manual”.

A culvert is considered a major structure if it has an opening measured along the center of the roadway greater than 20 feet between the inside faces of the outside walls or spring lines of arches. It

may also include multiple pipes, where the clear distance between the centerlines of the exterior pipes plus the radius of each of the exterior pipes is greater than 20 feet.

For all non-standard structures the Resident Engineer should expect a structure selection report from the Project Structural Engineer.

All culverts not included in the Colorado Department of Transportation (CDOT) Miscellaneous & Safety (M&S) Standard Plans shall be designed by the Project Structural Engineer. The Project Structural Engineer will request a foundation exploration and foundation report as required.

Hydraulic design of a drainage structures shall be completed by a qualified Engineer with knowledge of hydrology and hydraulics. Larger or more complex drainage structures, or both; for example, complex concrete box culverts, storm sewers and channel improvements may require additional specialization and support.

The following procedures and documentation are required when designing a culvert or concrete box culvert on the project:

1. When selecting pipe material, designers shall use the recommendations of the “CDOT Pipe Material Selection Policy”.
2. For major structures, the hydraulic designer will provide adequate designs for both a culvert or bridge alternatives. The roadway, structural designers, and environmental permitting specialists will determine the most economical alternative.
3. A cost comparison should be made to determine what structure alternative is the best choice to be constructed. Project grade adjustments should be included in the cost comparison alternatives.
4. Obtain structure numbers.

**Additional Resources:**

“CDOT Roadway Design Guide”

“CDOT Drainage Design Manual”

“CDOT Bridge Design Manual”

“CDOT Bridge Detailing Manual”

“American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications”

“CDOT Pipe Material Selection Policy”

## 5.04 Major Structure – Unusual

An unusual bridge is one involving: (1) difficult or unique foundation characteristics, (2) new or complex designs with unique operational or design features, (3) exceptionally long bridge spans, (4) unique or unusual construction requirements, or (5) designs with procedures that depart from currently recognized acceptable practices.

Examples of unusual bridges include cable-stayed, suspension, arch, segmental concrete, movable, or truss bridges. Other examples are bridge types that deviate from American Association of State Highway and Transportation Officials (AASHTO) bridge design standards or AASHTO guide specifications for highway bridges such as: bridges requiring abnormal dynamic analysis for seismic design; bridges using three-dimensional computer analysis; bridges with spans exceeding 500 feet; and bridges with major supporting elements of “ultra” high strength concrete or steel.

Unusual structures are:

1. Buildings;
2. Snow sheds;
3. Tunnels;
4. Geotechnical structures featuring new or complex wall systems or ground improvement systems;
5. Hydraulic structures that involve complex stream stability countermeasures, designs, or design techniques that are atypical or unique; or
6. Unusual hydraulic structures, such as those serving large storm drainage systems, stormwater pumping facilities, dams or levees.

Federal Highway Administration (FHWA) Washington Headquarters shall approve all movable bridges and unusual bridges, tunnels, hydraulic structures, and geotechnical structures. A Structure Selection Report should be submitted to the FHWA for review and approval. On federal aid projects, the FHWA Division Office shall approve all other bridges (not included in the previous sentence) that have an estimated total deck area greater than 125,000 square feet and all bridges on the National Highway System, major hydraulic structures, and major geotechnical features.

The Resident Engineer shall submit a “Structure Selection Report” as well as the “Field Inspection Review” and “Final Office Review” plans to the FHWA. The Project Structural Engineer will provide the Resident Engineer with plans for bridges, earth retaining structures, and tunnels. The local FHWA Division will review those submittals and may forward them to the Washington Headquarters for approval as appropriate.

The Resident Engineer must coordinate the required submittals with the Project Structural Engineer. The Structure Selection Report submitted with the initial request for review and approval shall include

environmental concerns and suggested mitigation measures, and studies of alternate spans and bridge types.

**Additional Resources:**

Colorado Department of Transportation “(CDOT) Bridge Design Manual”

“American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications”

## 5.05 Minor Structures

Minor structures are structures that are 20 feet or less along the centerline of roadway. Culverts must be 4 feet in diameter or greater to be considered a minor structure. Culverts that are less than 4 feet in diameter are included in the maintenance group’s responsibilities. Design requirements and deliverables are similar to Major Structures.

## 5.06 Pedestrian Overpasses & Underpasses

Pedestrian facilities should be provided where pedestrian volume, traffic volume, or other conditions merit their use. These facilities are usually located in central business districts centers, factory areas, school zones, athletic fields, parks, and other major activity centers.

Pedestrian separation, either over or under the roadway, is usually desirable at freeways or expressways where cross streets are terminated or where conditions impose an extreme inconvenience or safety hazard to pedestrians due to heavy vehicle traffic. They are also desirable at locations where the need for a pedestrian crossing is otherwise warranted and the separation is economically and environmentally feasible.

When designing pedestrian overpasses and underpasses, the requirements should be the same as for any other highway structure where the same geometric and architectural considerations should be considered (see Section 5.02 of this manual). The Resident Engineer is responsible for providing the Project Structural Engineer with the preliminary geometric layout, vertical profiles, and cross-sections for the location of the structure. Additionally, topography of the surrounding area should be provided in electronic format.

The Project Structural Engineer is responsible for reviewing and commenting on the proposed alignments submitted and preparing a structure selection report including a general layout for the selected structure with appropriate widths, clearances, and accommodations for the physically handicapped. The Project Structural Engineer shall request that the appropriate foundation investigations be completed.

The design of pedestrian overpasses and underpasses should accommodate accessibility for the physically handicapped, and bicycle traffic, where warranted.

Public safety features such as vertical clearance, fencing and lighting should be included in the design of the structures. Design criteria for overpasses and underpasses are in the Colorado Department of Transportation “(CDOT) Roadway Design Guide”. Pedestrian underpasses could be categorized as a “Major” or “Minor” structure. Pedestrian overpasses are considered a “Miscellaneous” structure for asset management purposes.

**Additional Resources:**

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

“CDOT Bridge Design Manual”

“CDOT Bridge Detailing Manual”

“CDOT Bridge Rating Manual”

“Design of Pedestrian Overpass and Underpass to Accommodate the Handicapped, Publication N5040.38, Federal Highway Administration (FHWA)”

“Pedestrian and Bicycle Accommodations and Projects, Code of Federal Regulations, Title 23 Highways, Part 652”

“AASHTO LRFD Bridge Design Specifications”

“AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities”

“AASHTO Guide Specifications for Design of Fiber Reinforced Polymer (FRP) Pedestrian Bridges”

“AASHTO Load and Resistance Factor Design (LRFD) Guide Specifications for the Design of Pedestrian Bridges”

“CDOT Roadway Design Guide”

## 5.07 Architectural & Aesthetic Treatments

Aesthetically pleasing structures should be compatible with their surroundings and include features and treatment that prove to be enduring. Care must be exercised when incorporating architectural features and aesthetic treatment in a structure because most structures will be in service 75 to 100 years.

Corridors typically have an existing architectural-aesthetic theme developed during the National Environmental Policy Act (NEPA) process or from a local entity preference. The Project Structural Engineer and Resident Engineer will determine the structure specific architectural treatment guidelines. An architect may be consulted for ideas on features and treatments.

Preliminary design and architectural details must be documented in the “Structure Selection Report” (see Section 5.09 of this manual).

Visually appealing structures should be adopted and developed early before final design commences because inclusion of these details is not easily accomplished after the structure design has begun. Some aesthetically pleasing features can be incorporated in a structure at low cost while others increase cost significantly. New or untried features and treatments must be thoroughly investigated before they are incorporated into a structure. Aesthetics are important in high-profile, frequently viewed structures.

**Additional Resources:**

Colorado Department of Transportation “(CDOT) Bridge Design Manual”

“Bridge Aesthetics Around the World, Transportation Research Board (TRB) National Research Council, 1991”

“Bridgescape: The Art of Designing Bridges”, Frederick Gottemoeller, 1998

## 5.08 Foundation Investigation & Recommendation

The foundation investigation gathers data and provides foundation design criteria and support recommendations based on existing subsurface conditions. Typical requests include foundation studies for bridges, major concrete box culverts, high-mast lighting, sign structures, sound walls, and retaining walls. Investigation requests should be made at the conceptual stage of structure design so that preliminary foundation recommendations are available for inclusion in the Structure Selection Report prepared by the Project Structural Engineer.

When a boring or a geotechnical study is required, the Project Structural Engineer will send a foundation investigation request, including the proposed general layout, to the Resident Engineer. A copy of the request and the general layout will be sent to the Geotechnical Program manager. Locations of the structure borings may be included in the request but the locations will follow the “Geotechnical Design Manual “and American Association of State Highway and Transportation Officials (AASHTO) requirements.

The Resident Engineer will be responsible for obtaining access. The Resident Engineer or survey crew will arrange for traffic control. When the Resident Engineer has completed the access and traffic

control has been arranged, they shall notify the Geotechnical Engineer and the Project Structural Engineer in writing. The Resident Engineer will have the final boring locations surveyed for inclusion in the report.

Any questions the Geotechnical Engineer may have related to the boring locations shall be addressed to the Project Structural Engineer. The Geotechnical Engineer is responsible for examining the site and scheduling utility locates, as required.

The Geotechnical Engineer will analyze subsurface data and provide an engineering geology plan sheet and geotechnical report.

The Geotechnical Engineer should be included in the Design Scoping Review and should participate in the follow-up and resolution of any structural problems identified.

**Additional Resources:**

Colorado Department of Transportation “(CDOT) Bridge Design Manual”

“CDOT Bridge Detailing Manual”

“American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications”

## 5.09 Structure Selection Report

A structure selection report documents the important factors that lead to the recommended selection and establishes the basis upon which the final structure design will proceed. The selection report is needed to document the good stewardship of funds as well.

During the conceptual and preliminary design stages of a project, the Project Structural Engineer shall develop a structure selection report for all structures in accordance with “Policies & Procedures” section of the “CDOT Bridge Design Manual”.

Selection of the best structure type alternative may be based in part on the lowest cost, but other requirements to be considered include:

1. Site requirements (topography, alignment)
2. Safety (during construction, traffic, detours)
3. Structural (future widening, foundation conditions)
4. Environmental (appearance, wetlands, public exposure)
5. Construction (ease of construction, false work, season)
6. Hydraulics (stream flow, bank and pier protection, culvert alternates, scour)
7. Life cycle costs (maintenance, durability)

8. Accelerated Bridge Construction requirements
9. Other (commitments to officials and community, team studies)

The Resident Engineer will provide the Project Structural Engineer the information required to prepare a structure layout, structure selection report, and final design. See Section 5.02 of this manual.

Prior to commencing the final structure design, the Project Structural Engineer will prepare and distribute a structure selection report, including an economic analysis, to the Resident Engineer. The Resident Engineer shall make distribution within the region and to the Federal Highway Administration (FHWA). The structure selection report should be reviewed and approved prior to the Field Inspection Review meeting or as soon as possible thereafter prior to commencing final design.

## 5.010 Retaining Walls

Retaining walls are used primarily for retaining soils or roadway cuts and fills to create a grade change. They are also used when it is necessary to contain the roadway fill within the available Right of Way (ROW), as well as other applications.

Retaining walls are classified into three categories according to basic mechanisms of retention and source of support:

1. An externally stabilized system uses a physical structure to hold the retained soil, e.g., Cast-in-Place concrete wall.
2. An internally stabilized system uses soil reinforcement to make the retained soil self-supporting, e.g., Mechanical Stabilized Earth Walls or Soil Nail Walls.
3. A hybrid or mixed system combines elements of both externally and internally stabilized systems.

Factors affecting the selection of a retaining wall are:

1. Spatial constraints—functions of a wall, space limitations, proposed profile.
2. Behavior constraints—earth pressure, water table, foundation pressure.
3. Economic considerations—environmental, aesthetic.

Retaining walls should be designed to resist corrosion, deterioration, and other environmental factors compromising the durability of the wall. Permanent retaining walls should be designed for a minimum service life of 75 to 100 years.

The Project Structural Engineer in cooperation with the Resident Engineer will be responsible for the selection and design of the best-suited wall type. Where appropriate, alternative wall designs may be

developed. The Project Structural Engineer will request a foundation investigation and foundation report.

The required documentation for the wall selection report is outlined in the Colorado Department of Transportation “(CDOT) Bridge Design Manual”, “Policies & Procedures” section.

The default wall design and design alternative documentation provided by the Project Structural Engineer will include:

1. Default design—defined to mean the best wall obtained from the selection process (see the “CDOT Bridge Design Manual”, Programs – “Policies & Procedures” section).
2. Design alternatives—the products of the design selection process (see the “CDOT Bridge Design Manual”, Appendix 11A). For a proprietary wall, refer to Section 2.022 “Proprietary Items” in this manual.

**Additional Resources:**

“CDOT Bridge Design Manual”

“CDOT Bridge Detailing Manual”

“American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications”

## 5.011 Noise Walls

The Resident Engineer, in cooperation with the Project Structural Engineer, will be responsible for the selection of the best-suited wall type. Based on the noise analysis, the Resident Engineer will provide the Project Structural Engineer with the alignment, height, and configuration. The Project Structural Engineer will be responsible for the structural design and requesting the foundation investigation. The Resident Engineer will need to review the structural plans for any potential conflicts with buried utilities.

**Additional Resources:**

“CDOT Bridge Design Manual”

“CDOT Bridge Detailing Manual”

“AASHTO LRFD Bridge Design Specifications”

“AASHTO Guide Specifications for Structural Design of Sound Barriers”

## 5.012 Analysis of Structures to be Resurfaced

A structural analysis/review is performed before a structure is resurfaced because resurfacing may affect the load carrying capacity of the structure, vertical clearance, effective bridge rail height, bridge expansion devices, or a combination thereof. Additional pavement can be placed on a structure if there is adequate load carrying capacity. The total thickness of asphalt after resurfacing shall be typically limited to 3 inches on the structure. Thicknesses greater than 3 inches will generally require a re-rating of the structure.

The Resident Engineer will request recommendations from the Project Structural Engineer for resurfacing of structures.

The Project Structural Engineer will send a surfacing recommendation memo to the Resident Engineer. The memo will include conditions related to the structure resurfacing (milling restrictions/overlay limits), Bridge Preventative Maintenance (BPM)-funded repairs to maintain the integrity of the riding surface or other structural integrity requirements, existing waterproofing membrane conditions, and existing bridge rail safety levels as well as recommended safety levels to maintain roadway safety. Bridge rail replacements are not eligible items for BPM funding.

The Resident Engineer will inform the Project Structural Engineer of the final proposed resurfacing method.

**Additional Resources**:

Colorado Department of Transportation “(CDOT) Bridge Design Manual”

## 5.013 Determine Existing Structural Capacity

An existing structure must meet criteria as established by the Federal Highway Administration (FHWA) and CDOT, if it is to be left in place.

The Resident Engineer will furnish the Project Structural Engineer pertinent data involving the existing structures and proposed design.

The Resident Engineer shall request recommendations from the Project Structural Engineer regarding the adequacy of the existing structure and recommendations and documentation according to the CDOT Bridge Design Manual for repair or replacement.

The Resident Engineer shall compare the bridge width with the requirements shown on the Form 463, Design Standards, to determine adequacy of the bridge width.

The decision to leave bridges that are narrower than the proposed roadway should be documented.

**Additional Resources:**

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

"CDOT Bridge Design Manual"

## 5.014 Crashworthy Bridge Rail

Federal Highway Administration (FHWA) approved crashworthy bridge rail must be provided on all new bridges. Rehabilitated bridges on all projects, regardless of funding, should use crashworthy bridge rail.

Crashworthy rail is defined as crash tested in accordance with the "National Cooperative Highway Research Program Report 350", American Association of State Highway and Transportation Officials "(AASHTO) Manual for Assessing Safety Hardware (MASH)", or rail which has been approved by the FHWA as being equivalent to crash-tested rail. FHWA is primarily relying on CDOT to define the crash-worthiness of their existing rail.

The Project Structural Engineer will provide a recommendation to the Resident Engineer regarding the test level of the existing bridge rail and the probable test level required. The general highway system provides a Test Level 3.I. The Resident Engineer is responsible for determining whether to install new bridge rail or to leave the existing bridge rail in place.

Approved documentation for variances and design decisions shall be in the project file.

The following bridge rails are required for new or rehabilitated bridges on the following roadway classifications:

1. Type 9 or Type 10 MASH, or other approved crash-tested bridge rail
2. Local roads under the jurisdiction of counties or cities may use approved crash tested rail per their standards or safety requirements

When a bridge also serves pedestrians or cyclists and the posted speed limit is greater than 45 Miles Per Hour (MPH), a barrier to shield them from the traveled way and a pedestrian rail at the bridge edge may be warranted as determined by the Resident Engineer.

Working drawings with currently approved bridge rail are available from the Bridge Design and Management Branch.

Detailed drawings of bridge rail with revisions or modifications are to be included in the Construction Plans as determined by the Resident Engineer.

**Additional Resources**:

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

“American Association of State Highway and Transportation Officials (AASHTO) Guide for Selecting, Locating, and Designing Traffic Barriers”

“AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications”

“AASHTO Roadside Design Guide”

“AASHTO Standard Specifications for Highway Bridges”

## 5.015 Vertical Clearance of Structure

All highway projects shall meet or exceed minimum vertical clearances according to guidelines set by the FHWA and the Colorado Department of Transportation (CDOT). These clearances shall pertain to all overpasses, underpasses, railroad and transportation facilities, bicycle and pedestrian facilities, overhead lines, sign bridges, signal mast arms, navigational streams, channels, and canals. The Resident Engineer is responsible for determining the appropriate clearances.

Vertical clearance applies to the full pavement width, including provisions for future widening and overlay. A formal variance is required if less clearance than the minimum is achieved.

Minimum vertical clearances are listed in the “CDOT Roadway Design Guide”, Chapter 6.

The Resident Engineer must verify vertical clearances for all phases on detours and traffic shifts. Clearances to falsework and shoring during construction should be considered. If minimum clearances cannot be maintained during construction, appropriate signing shall be included in the plans. Vertical clearances shall be shown on the highway construction plans for all structures.

**Additional Resources**:

“23 CFR Part 625, Design Standards for Highways”

“AASHTO Policy on Geometric Design of Highways and Streets”

“AASHTO Guide for the Development of Bicycle Facilities”

“AASHTO LRFD Bridge Design Specifications”

“AASHTO Standard Specifications for Highway Bridges”

Colorado Department of Transportation “(CDOT) Bridge Design Manual (Section 2)”

## 5.016 Accelerated Bridge Construction (ABC)

For construction projects that include one or more bridges, CDOT has developed a tool for evaluating Accelerated Bridge Construction (ABC) techniques, to determine whether or not they are appropriate for any given project.

The materials for an ABC evaluation can be downloaded at the internet link given below. The materials are compressed in a zip file. Download the materials; unzip the files; and save the files to your local computer.

Business – Accelerated Bridge Construction Documents

The accelerated bridge construction methodology is to be evaluated for all projects that will contain one or more bridges and will be included in the “Structure Selection Report”. After completion of the evaluation, a justification letter must be written and added to the project file explaining why, or why not, an ABC technique will be used on the project. The justification letter should include materials completed during the ABC evaluation. The design team may choose to work with the designated Staff Bridge Engineer for guidance and information regarding the use of the ABC materials.

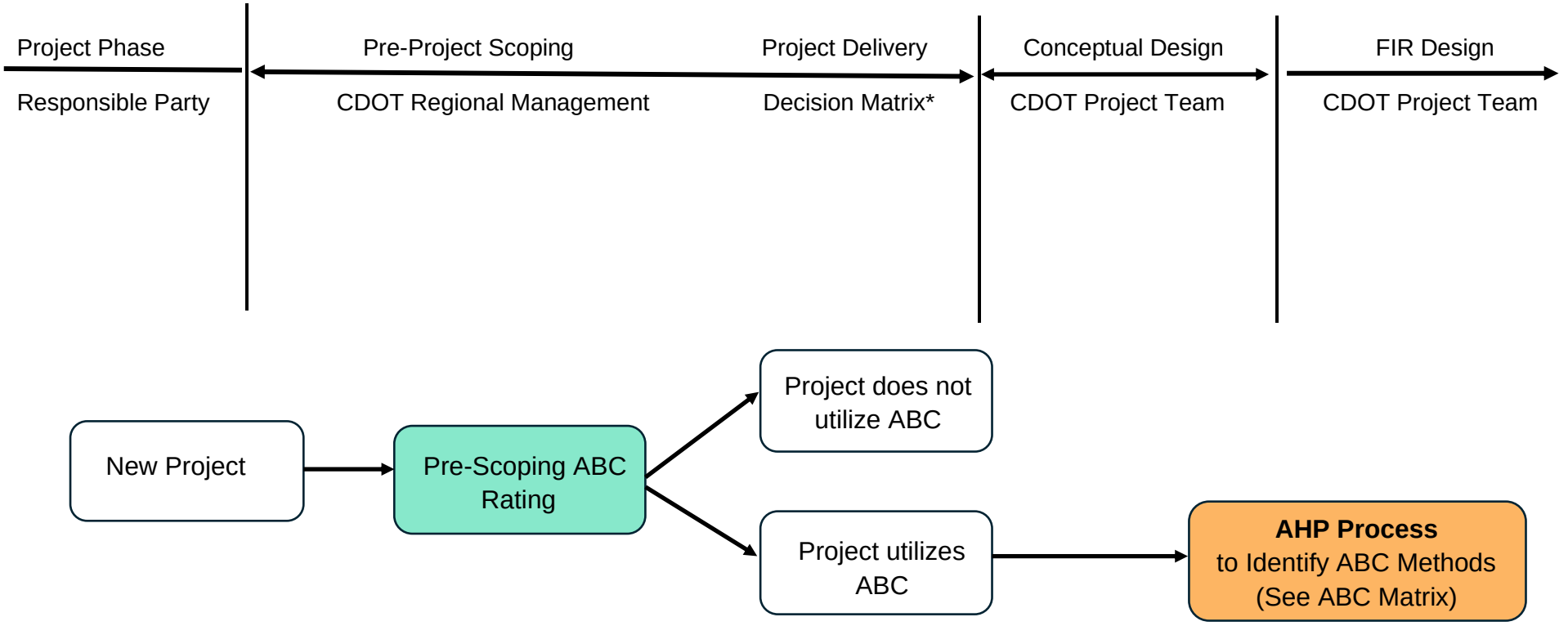
The document, “CDOT_ABC_Selection_Overview”, contains an overview of the ABC process. The process is a two-phase approach. One phase is a cursory evaluation as to whether or not ABC is appropriate for a given project. The second phase is an in-depth evaluation as to what type of ABC technique will be employed.

This cursory evaluation is to be done during the scoping phase using the spreadsheet, “CDOT_Prescoping_ABC_Rating_Attachment_B.” If the results of the cursory evaluation show that an ABC technique is appropriate for the project, the design team may move on to a more in-depth evaluation using the ABC Decision Making software to determine which ABC method best meets the project’s goals and constraints. If the in-depth evaluation is required, the design team shall schedule a meeting with all specialty groups including but not limited to: Staff Bridge, Utilities, Environmental, Traffic, Hydraulics, etc., to execute the ABC Decision Making software. The results of the software are to become part of the project files.

The above information is represented graphically in Figure 5-1. This is the same diagram that is included in the document titled, “ABC_Workflow_Attachment _A”.

**Figure 5-1 ABC Evaluation & Decision Making Matrix Workflow**

# Accelerated Bridge Construction (ABC) Evaluation & Decision Matrix Workflow




*Contracting methods can work hand-in-hand with ABC delivery. Depending on the particular goals of the project and complexity of the ABC method, some contractual tools may be more beneficial than others. For each project the Delivery Decision Matrix should be completed after the Pre-Scoping ABC Rating Form has been completed. Some contractual tools are listed below:

| **Innovative Contracting Tools** | A+B Contract Provision | Contract in Calendar Day: | Fixed Completion Date Contract | Incentive-Disincentive Provision | Lane Rental Provision | Value Engineering Specification | Design Build Contract Delivery Method | CM/GC Contract Delivery Method |
|---|---|---|---|---|---|---|---|---|

**Note to Readers:** A long description of information conveyed in Figure 5.1 follows.

Data-based information conveyed through infographic elements. All information falls under a title "Accelerated Bridge Construction (ABC) Evaluation & Decision Matrix Workflow". A process flow diagram depicts four project phases in sequence, and the responsible party associated with each phase: The first phase is pre-project scoping and the responsible party is the Colorado Department of Transportation (CDOT) regional management. The second phase is project delivery with the responsible party designated by the Decision Matrix[1]. The third phase is conceptual design and the responsible party is the CDOT project team. The fourth and final phase is Field Inspection Review (FIR) design with the CDOT project team being the responsible party.

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[1] Footnote for Decision Matrix. Contracting methods can work hand-in-hand with ABC delivery. Depending on the particular goals of the project and complexity of the ABC method, some contractual tools may be more beneficial than others. For each project the Delivery Decision Matrix should be completed after the Pre-Scoping ABC Rating Form has been completed. Some contractual tools are listed as follows: A+B Contract Provision; Contract in Calendar Day; Fixed Completion Date Contract; Incentive-Disincentive Provision; Lane Rental Provision; Value Engineering Specification; Design Build Contract Delivery Method; Construction Manager/General Contractor (CMGC) Contract Delivery Method.

A process flow matrix depicts phases of project evaluations.

The first phase is new project.

The second phase is pre-scoping ABC rating.

The third phase is comprised of two possible outcomes. One of which is the project does not utilize ABC. The other possible decision is the project utilizes ABC.

The fourth phase occurs only if the other possible decision just mentioned (project utilizes ABC) is chosen. This fourth phase being the Analytic Hierarchy Process (AHP) Process to Identify ABC Methods (See ABC Matrix).

# Section 6
# Materials

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COLORADO
Department of Transportation
Office of the Chief Engineer

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# 6.01 Pavement Analysis for Distress

An existing pavement's condition and measured distresses are analyzed and a pavement design, either full reconstruction or rehabilitation, is developed for each individual project.

A pavement analysis is performed by the region Materials Engineer to determine the existing pavement condition and to determine the type of new pavement or rehabilitation will be required on the project.

The principal factors in choosing pavement type or treatment are subgrade and bedrock properties, traffic volume, climate, material properties and a Life Cycle Cost Analysis (LCCA).

The two types of pavements used are portland cement concrete pavement (rigid) and hot mix asphalt (flexible). A LCCA, will be prepared for all appropriate projects with more than three million dollars in material cost. The analysis will compare full reconstruction, rehabilitation, or both of rigid or flexible pavements, Alternative pavement designs and life cycle costs are discussed in "Section 6.05" of this manual.

The Resident Engineer must be in contact with the region Materials Engineer at the inception of the project to allow sufficient time to perform a detailed pavement analysis and LCCA if required. The region Materials Engineer will prepare the distress reports, pavement analysis and design, and pavement justification report. The region Materials Engineer reviews the analysis and design performed when it is prepared by a consultant.

After a proposed project involving pavements has been scoped, the region Materials Engineer performs the following:

1. Field Condition Survey and Preliminary Soil Survey Investigation.
2. Selection of Pavement Design.
3. Pavement Justification including LCCA if required.

The region shall retain a copy of the pavement justification in the project file and send a copy to the Pavement Design Unit's manager.

**Additional Resources:**

Colorado Department of Transportation (CDOT) Pavement Design Manual (latest edition and any applicable addendums to the Pavement Design Manual)

CDOT Roadway Design Guide

## 6.02 Preliminary Soil Survey

The preliminary soil survey includes drilling soil samples for one or more of the following: proposed pavement reconstruction, rehabilitation, widening, new roadway alignment, or changes in grade cut and fill areas. Additional information on the preliminary soil survey requirements for pavement design purposes can be found in Chapter 4 of the Colorado Department of Transportation (CDOT) Pavement Design Manual. If the project will consist of roadway widening, new alignments, or changes in grade cut and fill areas, it is recommended that Soils & Geotechnical Services also be consulted during project development, or scoping, or both. See Section 6.03 of this manual.

The preliminary soil survey is required to examine sites of proposed cut and fill areas in order to identify potential or existing groundwater problems, soil issues, design parameters, and support characteristics that are pertinent to the design and performance of pavements. A more detailed geotechnical investigation should be conducted to evaluate those same elements as they relate to structures such as Concrete Box Culverts (CBC's), bridges, and retaining walls, or potential geohazards (see Sections 6.03 and 6.04 of this manual).

The region Materials Engineer or the Resident Engineer usually initiates the request to the region Materials personnel for preliminary soil survey investigation and drilling soil samples for the proposed projects.

If the equipment available to region personnel is not capable of drilling to the prescribed depth of a cut area or performing the needed drilling methods or procedures, the Soils & Geotechnical Services within Materials & Geotechnical Services or a commercial drilling Contractor may be needed to provide the drilling services and sampling needed.

Region Materials and Materials & Geotechnical Services personnel perform a variety of field evaluations and laboratory tests to characterize the pavement and pavement conditions, classify and group soils, characterize subsurface conditions, and complete CDOT forms, and soil test reports with laboratory data. Region Materials will work with project personnel or consultants to ensure soil profile information obtained during the preliminary soil survey information is provided to the project design manager or Resident Engineer overseeing the design and delivery of the project as necessary.

Region Materials personnel will ensure the following actions are taken to collect and document information required for project design:

1. Research files for existing reports on proposed sites.
2. Examine sites of proposed projects and identify need for utility clearances.

3. Assign or perform drilling of proposed locations and collect samples of subsurface materials.
4. Assign or perform laboratory testing of samples.
5. Prepare reports and provide recommendations of pavement types, pavement rehabilitation, soil and base stabilization, etc.
6. Provide soil survey results to the Resident Engineer; The Resident Engineer will assure incorporation of the information into the design plans.
7. Ensure that reports and plan sheets are submitted to the appropriate agency.

The region Materials Engineer should coordinate with the Materials & Geotechnical Services soils lab manager at the inception of the project to allow sufficient time to perform the necessary soil testing (soil classification testing and R-value tests) needed for pavement analysis and design. The region Materials Engineer will review the analysis and design when it is prepared by a consultant.

The region should retain a copy of the soil profile and test results in the project file.

During the design phase of the project, if it is determined that additional data or samples are needed, they will be obtained and a supplemental report submitted.

**Additional Resources:**

Colorado Department of Transportation (CDOT) Pavement Design Manual (latest edition) as well as any applicable addendums

## 6.03 Geotechnical Services

The Soils & Geotechnical Services of the Materials & Geotechnical Services performs a variety of field and laboratory testing, data analysis, and prepares engineering geology plan sheets and geotechnical reports. They work with and alongside the Geohazards Services (Section 6.04) to support projects with all non-pavement (materials) project needs.

The Soils & Geotechnical Services supports the regions with:

1. Foundation support (bridges, culverts, walls, non-standard lighting and signal design, etc.).
2. Roadway foundation and settlement analysis for new embankment fill greater than five feet in vertical height.

3. Infrastructural distress that may include cracking or movement of existing embankments, pavement settlement, pavement heave, wall distress, as well as supporting the Geohazards Services with landslides and sinkholes.
4. Specialty geotechnical laboratory testing not performed by Colorado Department of Transportation (CDOT) labs.
5. Construction related geotechnical issues (such as caving soils, unforeseen conditions, groundwater, etc.).
6. Non-destructive geophysical studies for underground conditions such as bedrock rippability, groundwater table locations, buried utilities, abandoned culverts, etc.
7. Reviews and comments on consultant geotechnical proposals, reports, and recommendations.
8. Please reach out to the Soils & Geotechnical Services manager if there is an item not listed above and you are unsure. Project geological challenges are too numerous to provide an exhaustive list.

**Requirements for geotechnical studies should be discussed with the Soils & Geotechnical Services manager, or representative, during the project development and scoping phase so staffing and schedule can be evaluated for the project**.

During the kickoff phase, when it is determined that a geotechnical study is required, the CDOT Project Engineer will send a request for a geotechnical exploration to the Soils & Geotechnical Services manager and copy the Resident Engineer. The request should include a set of plans showing the proposed overall design (all structures, embankment, new roadway alignment, etc.) in plan layout and cross section, the project schedule, and the need-by date for the final geotechnical recommendations. If proposed plans are not available, the geotechnical exploration may be delayed or additional explorations (and associated costs) may be needed. Additional personnel to be included in discussions and copied on the request may include the:

- Headquarters (HQ) Bridge Unit Lead/Project Structural Engineer involving all foundation designs for bridges, walls, culverts, lighting, and signals.
- Regional Materials Engineer involving all pavement related designs.
- Regional Hydraulics Engineer involving all waterway, drainage, and culvert designs.
- Geohazards Services manager involving all rockfall, rockcut, blasting, and hazard mitigations (see Section 6.04).

Soils & Geotechnical Services is responsible for supporting the entire statewide roadway network; therefore, two to four months may be required for scheduling, completion of drilling, lab testing, and report preparation once it is determined geotechnical services are needed on the project. In many cases, it may be recommended that consultant geotechnical services are used on projects. This may allow for an accelerated project schedule and combining material testing and design (pavement) with foundation geotechnical work. The Project or Resident Engineer should contact the Soils & Geotechnical Services manager when using a consultant to allow for support in managing their geotechnical consultant by reviewing cost estimates, work hours, statement of work, proposals, reports, and other services to ensure compliance with Colorado Department of Transportation (CDOT) standards and regulations.

The project geotechnical personnel is typically responsible for:

1. Continued communication with project staff to understand the project needs and how they relate to geological challenges.
2. Examination of site for egress, schedules, and utility clearance, if needed.
3. Performance of field studies (i.e., drilling, mapping, etc.), sampling operations, and geotechnical laboratory testing.
4. Preparation and review of engineering geology plan sheet(s) and report(s) for project design staff to reference.

The project is typically responsible for:

1. Providing right of way clearance and agreements with landowners for entry, field work, and exit of personnel and equipment.
2. Providing all needed permitting required by state and local agencies, and private stakeholders.
3. Organizing communication with Environmental Services along with providing all environmental clearances and approvals for proposed geotechnical work.
4. Providing project needs, including proposed layouts and dimensions of all structures and roadways. It is understood that project goals, design details, and needs change as design progresses. Any changes should be communicated as soon as possible to allow for the most efficient use of time and resources.
5. Traffic control funding, either by private Contractors or via internal personnel (depending on availability).
6. Funded and valid project charge number for time, materials, and travel expenses.

**Additional Resources:**

Colorado Department of Transportation (CDOT) Geotechnical Design Manual

CDOT Bridge Design Manual

CDOT Roadway Design Guide

CDOT Field Materials Manual (latest edition)

American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) Bridge Design Specifications for Highway Bridges

## 6.04 Geohazard Services

The Geohazards Program provides expertise in the geotechnical engineering and geologic hazard (geohazard) fields. This involves data collection, interpretation, analysis, review and design work that direct the planning, design, construction and maintenance of civil engineering and environmental projects for CDOT with respect to rock excavation and geohazard mitigation or management. The engineers and scientists in this program provide geological expertise for rockfall, rockslide, debris flow, embankment distress, and landslide geological hazard mitigation, design, construction and planning. This Program develops and maintains the statewide geohazard management system for tracking known hazard sites, directing funds, identifying statewide hazard mitigation projects, and supporting non-mitigation projects that may be affected by an existing geohazard. The Program also provides emergency services for geological hazards, highway embankment, slope and subgrade failures. The Geohazards Program works collaboratively with the Soils & Geotechnical Program to help support soils and geotechnical engineering needs statewide.

It is important to recognize that geohazards are sporadic and unpredictable. They can occur at any time from almost any location along a slope. The purpose of implementing geohazard mitigation is to reduce the risk from a known hazard at a specific location.

Geohazards Services supports the regions with:

1. Identifying and assessing geologic hazards that may affect CDOT projects.
2. Design recommendations for mitigation and resilience measures to manage the effects of geohazards.
3. Rock slope excavation design guidance.

4. Response to emergency geohazard events that have impacted the transportation network.

5. Reviews and comments on consultant geohazard and rock excavation proposals, reports, and recommendations.

6. Please reach out to the Geohazards Services manager if there is an item not listed above and you are unsure of the potential hazard effects on a project. Project geological challenges are too numerous to provide an exhaustive list.

**Requirements for managing geohazards on Colorado Department of Transportation (CDOT) projects should be discussed with the Geohazards Services manager, or representative, during the project development and scoping phase so staffing and schedule can be evaluated for the project**.

Geohazards Services is responsible for supporting the entire statewide transportation network. In many cases, it may be recommended that consultant geohazards services are used on projects. The Project or Resident Engineer should contact the Geohazards Services manager when using a consultant to allow for support in managing their consultant by reviewing cost estimates, work hours, statement of work, proposals, reports, and other services to ensure compliance with CDOT standards and regulations and best practices. This work is often combined with geotechnical services work and performed by the same consultant.

Geohazard Services personnel or consultant representative is typically responsible for:

1. Continued communication with project staff to understand the project needs and how they relate to geological challenges.

2. Examination of site for egress, schedules, and utility clearance, if needed.

3. Performance of field studies (e.g., drilling, mapping, aerial reconnaissance etc.).

4. Preparation and review of hazard mitigation design sheet(s) and report(s) as applicable for project design staff to reference.

5. Field layout of mitigation systems

The project is typically similarly responsible for items as described in Section 6.03 Geotechnical Services.

**Additional Resources:**

CDOT Geotechnical Design Manual

Colorado Department of Transportation (CDOT) Bridge Design Manual

CDOT Roadway Design Guide

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

CDOT Standard Specification for Highway Bridges

## 6.05 Life Cycle Cost Analysis

Life Cycle Cost Analysis (LCCA) of alternative pavement designs is an economic analysis performed to examine two or more pavement designs for new construction, reconstruction, or pavement rehabilitation. The LCCA is prepared for all appropriate reconstruction or rehabilitation projects with material costs greater than three million dollars by comparing flexible and rigid designs and various other parameters. For new construction and reconstruction projects, the pavement structure will be designed for both flexible and rigid pavements. On resurfacing and rehabilitation projects, various methods to restore the roadway structure are considered. The Resident Engineer will provide accurate project limits, proposed typical section width, up-to-date traffic counts, and a project description with available budget. The region Materials Engineer will determine preliminary pavement type and thickness for each alternative prior to the Field Inspection Review (FIR). The Resident Engineer will develop preliminary quantities for the different pavement types. When possible, the life cycle costs for each alternative should be based on actual quantities.

Based on information provided for the LCCA, if one alternative is projected to cost more than 10 percent than the other alternative the selection is made by the region Materials Engineer. A comparison that yields results within 10 percent will require a decision by the Pavement Type Selection Committee or alternative bidding.

Refer to the Pavement Design Manual for more details on the LCCA and Pavement Type Selection Committee (PTSC) processes.

**Additional Resources:**

CDOT Pavement Design Manual (latest edition)

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

## 6.06 Pavement Justification Report

The Pavement Justification Report documents the analysis and procedure the region used to arrive at the selected pavement type or rehabilitation method.

The report should include the following:

1. An analysis supporting the pavement type selection or rehabilitation method.
2. Life cycle cost analysis of alternate designs.
3. Pavement distress survey of existing pavements.
4. Pavement thickness calculations of alternate designs.
5. Final recommendations for typical sections.
6. Surfacing plan. Any additional information used to determine and justify the pavement type.

The region Materials Engineer shall approve the pavement justification report and submit the report to the appropriate Program Engineer, Resident Engineer and the Pavement Design Program manager near the date of the Field Inspection Review (FIR). The pavement justification report shall be maintained in the region's project records.

**Additional Resources:**

Colorado Department of Transportation (CDOT) Pavement Design Manual (latest edition)

# SECTION 7

# RIGHT OF WAY AND UTILITIES

# 7.01 RIGHT OF WAY INVOLVEMENT

CDOT has the responsibility for the acquisition of right of way on all federal and state projects. At times, outright acquisition (i.e. fee acquisition), permanent and/or temporary easements are necessary to accommodate certain aspects of design and construction (including MS4 requirements and utilities). The identified types of acquisition, either individually or collectively, comprise what is referred to as right of way (ROW) acquisition. Such acquisition of ROW should be fully completed before a ROW clearance can be issued to facilitate advertisement of the project. However, a conditional clearance may be granted in some limited circumstances.

It is important that the right of way acquired be sufficient for construction and needs such as clear vehicle recovery areas (clear zone), widening when future traffic volumes warrant it, and enhancements. The width of the ROW is available for each project prior to construction. The width depends on the cross-section elements of the highway, topography, land use, environmental constraints, structures and ultimate development of the area. All permanent features should be constructed within fee acquisition areas or permanent easements. Temporary easements are acquired where access is needed to an owner's (remaining) property for construction purposes, and the area within a temporary easement should be restored to its original condition after construction. Restoration is typically done by compensating the owner for the damage done to the property. However, there are instances where CDOT may make the repairs directly. Typically, permanent physical changes in the form of grade changes or permanent public improvements are not allowed within temporary easement areas.

### 7.01.01 Responsibilities

As part of the project development process, the Resident Engineer is responsible for:

1. Coordination with the ROW Manager and other specialty unit managers to mutually determine an acceptable advertisement date or shelf date;
2. Creation and funding of a ROW phase in SAP based upon a ROW estimate submitted by the ROW Manager;
3. Identification of preliminary survey and right of way needs at the scoping meeting;
4. Submitting a survey request to the Region Survey Coordinator;
5. Furnishing comprehensive design information such as embankment toes, structure limits, road approach design, hydraulic needs (e.g. MS4 ponds), needed replacement of utility easements, impacts to signage, etc. at the time of the Field Inspection Review (FIR);

6. Assisting the Right of Way Plans Supervisor in completing the Right of Way Plan Review (ROWPR) checklist and helping make sure that all design impacts, and associated right of way needs, are fully reflected in the ROW plans;
7. Identification of ROW impacts and necessary ROW acquisitions well in advance of the Final Office Review (FOR). If this does not occur, then significant changes to the ROW plans could become necessary at the FOR, which in turn, would necessitate updated or new valuations, new offers, or both. Major changes at, or following, the FOR often require that the project schedule be adjusted to accommodate the unforeseen acquisition of additional right of way. Post-FOR changes are discouraged, since they often adversely affect and delay the right of way clearance.
8. Coordination of all IGAs or Maintenance Agreements. All of these agreements should be finalized and fully executed prior to requesting ROW clearance.

The Right of Way project development process can be divided into various categories or work activities. The following overview is provided to assist in visualizing the process that takes place during a project that involves ROW acquisition of private properties for public purposes.

NOTE:The right of way phase must be budgeted, obligated, and funded in SAP before right of way charges can be incurred. Before a right of way phase can be created, an estimate of ROW costs needs to be entered by the ROW Manager.

### 7.01.02 Environmental Elements

1. Public involvement.
2. When an Environmental Assessment (EA) or Environmental Impact Statement (EIS) is prepared, ROW is often asked to estimate the cost of ROW acquisition and to identify the number and type of business and residential relocations.
3. Environmental clearance by either: (a) Form 128 clearance for categorical exclusions; (b) FONSI (Finding of No Significant Impact) for Environmental Assessments; or (c) Record of Decision for Environmental Impact Statements.
4. 4(f) and 6(f) resources: These are certain historic and park resources which cannot be impacted unless an appropriate study concludes that there is no reasonable and prudent alternative but to impact the resource. Mitigation is required under 6(f), but not 4(f). Impacts to these types of resources can significantly increase the time required to acquire ROW, as environmental clearance is needed before the ROW acquisition can begin.
5. Hazmat investigation: Phase I in all cases and Phase II as necessary.

### 7.01.03 Field Survey and ROW Plans

1. Conduct a pre-survey conference.

2. Prepare field survey, establish control, prepare topography studies, and identify structures.
3. Obtain title research to identify existing ownerships and easements.
4. Prepare ownership mapping.
5. Prepare ROW plans that depict intended right of way acquisitions:
   a. Procure copies of recorded easement documents identified in the title research.
   b. Determine existence and impact of utility easements and agreements.
   c. Determine if existing utilities need to be relocated.
   d. Review easements of record still in existence on property to be acquired.
6. Consider advertising devices:
   a. All signs on the project will be inventoried and indicated on all plan sheets
   b. Signs in fee acquisition areas must be acquired as a part of the right of way process.
7. Consider access control:
   a. Coordinate with Region Access Coordinator.
   b. Determine if access control is required, and, if so, where.
   c. Identify existing and new access points on all plans.
8. Determine location of necessary easements.
9. Determine purpose and nature of easement for:
   a. Toes of slopes;
   b. Drainage and MS4 requirements;
   c. Utilities; and
   d. Driveway construction or reconstruction.
10. Determine possible relocations and uneconomic remnants.
11. Hold a Right of Way Plans Review. On projects requiring acquisition of right of way or easements, the Region Right of Way Manager shall hold a Right of Way Plans Review as deemed necessary to determine that the proposed right of way and easement limits are sufficient to construct and maintain the project. The Review is done immediately preceding authorization to appraise and acquire. The meeting shall be held with the Resident Engineer and the following:
    a. Design Project Manager,
    b. Region Utilities Engineer,
    c. Environmental Project Manager,
    d. Region Access Manager,
    e. Region ROW Plans Supervisor,
    f. ROW Plans Project Manager,
    g. Region Surrvey Coordinator,
    h. ROW Acquisition Supervisor,
    i. ROW Acquisition Agent,
    j. Property Appraiser and
    k. Review Appraiser.

12. The Region Right of Way Manager or Survey Coordinator shall determine whether the right of way plans are sufficiently complete in accordance with the Right of Way Plans Review Guidelines:
    a. Right of way plans shall not be submitted for authorization until after the Right of Way Plans Review has been conducted and all parties agree as to the right of way to be acquired.
    b. After a project has been authorized for appraisal and acquisition, design revisions that affect right of way will not be considered for approval by ROW Services until the revision has been justified by the office initiating the revision and concurrence has been received from the Resident Engineer, Region Survey Coordinator or the Region Right of Way Manager, and the Region Program Engineer.
    c. While sometimes unavoidable, design revisions which necessitate changes to the ROW plans often lead to scheduling impacts and can result in advertisement date revisions or unnecessary requests for conditional right of way clearances.
13. Prepare engineer's estimate for ROW acquisition and relocation
14. Obtain verification of environmental clearance and obtain ROW plan authorization
15. Prepare control diagrams for field construction.
16. File ROW plans with the County.
17. Monument the new ROW boundaries in the field.

### 7.01.04 Authorization of Right of Way Projects

1. Requirements for project authorization:
   The Region Program Engineer is responsible for the obligation of right of way funds and establishing the spending authority under Function 3114. The following steps must be completed before authorization can proceed to the acquisition or relocation stage under Functions 3111 or 3109. Steps include:
   a. Environmental clearance;
   b. Field Inspection Review held by Region;
   c. Preparation of right of way plans and descriptions;
   d. Right of Way Plan review;
   e. Hardship parcels (H-Parcels) approved by FHWA;
   f. Acquisition Stage Relocation Plan prepared (7-b Study); and
   g. Sufficient funds obligated by the Region.
2. Issuance of Form 462: After the steps in a, have been met, the Right of Way Program in Project Development shall issue a Form 462, Right of Way Plan Approval, authorizing the entire project for Functions 3111, Function 3109, or both as applicable.

### 7.01.05 Value Findings and Appraisals

1. Value findings (Waiver Valuations) are prepared by a right of way agent for right of way purchases valued up to $10,000 and in certain limited circumstances, up to $25,000.
2. Appraisals prepared by a CDOT qualified appraiser are required for acquisitions over $10,000 and complicated acquisitions under $10,000. In certain limited circumstances, a value finding may be substituted for an appraisal, for compensations up to $25,000.
3. Appraisal requirements apply to both CDOT and the owner's appraisals.
4. The Owner is notified of the statutory right to obtain a second appraisal. The first appraisal is CDOT's appraisal and the second appraisal is the owner's appraisal that will be paid for by CDOT.
5. The Owner may accompany CDOT's appraiser on inspection.
6. CDOT reviews and approves of CDOT's appraisal.
7. CDOT review appraiser issues a determination of Fair Market Value (FMV).
8. CDOT reviews the owner's appraisal.
9. CDOT Issues an amended determination of Fair Market Value, if warranted.

### 7.01.06 Acquisition Process for Parcels and Easements

1. CDOT will make a prompt written offer to the Landowner. The amount of the offer shall not be less than:
   a. CDOT's review appraiser's determination of Fair Market Value; or
   b. CDOT's Value Finding determination.
2. Good faith negotiations begin and require a minimum of 30 days to complete.
3. Last written offer made, then the property owner must be afforded a minimum of 10 days to review it.
4. Final offer of settlement is made and requires a minimum of 10 days for the property owner's review.
5. Memorandum of Agreement - Any commitments to the property owners must be established in a written Memorandum of Agreement and be communicated to the Resident Engineer for inclusion in the plans. The ROW agent and the construction project engineer in the Residency should coordinate with each other so that the project engineer is fully aware of any commitments made to property owners, such as fence-type gates, excess dirt, or moving a tree.
6. Permits must be obtained by property owners for all new accesses and changes to existing accesses made by the property owner.
7. Administrative settlement: This is any settlement in excess of CDOT's approved estimate of compensation (FMV), reached prior to filing a parcel for a condemnation proceeding.

8. Owner retention of improvements: CDOT acquires all realty within a required right of way. Upon request by an owner, at CDOT's discretion, it may permit an owner to retain improvements they made that were acquired at CDOT's determined salvage value.
9. Payment: Payment must be received either by the property owner, escrow agent or the Court for legal possession to be obtained (see number 12 below).
10. Summary statement of elements of compensation: This is a written statement of the amount established by CDOT as just compensation, summarizing the basis of the acquisition offer. The statement must set forth adequate information so that an owner can make a reasonable judgment concerning the amount of the offer.
11. Condemnation – filed by the Attorney General's Office – can take a couple weeks up to three months for an Immediate Possession hearing to be scheduled;
12. Hearing for Immediate Possession – this short hearing (1/2 day or less) is the acquiring party's opportunity to provide a valid public transportation purpose for acquisition of the property rights sought. This hearing almost always results in the acquiring entity winning "immediate possession" of the needed property rights. Very oftern, the property owners have a higher opinion as to the value of their property. The subsequent valuation trial is the place for the value to be argued and decided by the Court or jury. After the immediate possession hearing, the full amount offered for the property that was in escrow with the Court is available to the property owner;
13. Valuation Trial – while almost all filed condemnation cases are resolved in a settlement reached after the Immediate Possession hearing, cases that remain unresolved go to a valuation trial. Scheduled months after the immediate possession hearing, the valuation trial process can go on for months or years; and
14. Legal Settlement: This is any settlement in excess of CDOT's approved estimate of compensation (FMV), reached by the legal representative (attorney) to CDOT after a condemnation action is filed with the court as noted in number 12 above.

### 7.01.07 Relocation

1. Region Right of Way Unit will complete an Acquisition Stage Relocation Plan. Completion of this plan is required before FMV's can be approved by the Region Transportation Director or his authorized designee (e.g. Region ROW Manager).
2. Region Right of Way Unit will meet with property owners and tenants to explain the relocation program.
3. Notices to vacate are issued: Initial 90-day notice issued at the same time as the offer to acquire the real estate interests and the final 30-day notice to vacate is issued as of closing or upon obtaining possession.
4. Region Right of Way Unit will inspect the area being acquired (property), inventory personal property to be moved, and present relocation benefit eligibility.

Region Right of Way personnel will discuss issues such as estimate of property and replacement costs with affected landowners and tenants.

5. Advisory services assistance: Region Right of Way Unit will assist displaced property owners and tenants in obtaining alternate facilities.
6. Region Right of Way Unit will provide applicable relocation benefits to displacee and arrange for moving all personal property from any land acquisition or easement.

### 7.01.08 Property Management

1. Environmental inspection and abatement.
2. Demolition, if not performed by CDOT's contractor.

### 7.01.09 Project Management

1. All federal-aid projects must meet the requirements of Title 23, United States Code, and the FHWA must review and approve selected state actions on federal-aid projects. This includes actions related to: public hearings; relocation assistance; right of way acquisition; and plans, specifications, and estimates. For CDOT to be reimbursed for eligible project costs by the FHWA, certain requirements must be met. Reimbursement for eligible project costs is based on the requirements set forth in the "Uniform Act." Title II and Title III of the Act contain the requirements with which the acquiring agency must comply.

### 7.01.10 Right of Way Clearance of Projects for Construction

1. Before any federal-aid project can be advertised for construction, the Federal Highway Administration requires a letter certifying that all right of way has been acquired and relocation carried out. All exceptions must be stated along with what action is being carried out to clear the project and a conditional ROW specification must be included in the bid package.
2. On all projects under the jurisdiction of CDOT procedures, all non-conditional clearance letters will be presented in writing by the Region Right of Way Manager to the Resident Engineer with a copy to the Federal Highway Administration and the Right of Way Program in Project Development. Conditional Right of Way clearances shall be written by the Region Right of Way Manager, but require the approval of the CDOT Project Development Branch Manager. For right of way clearance on all local agency projects, the Region must receive a certification clearance letter from the local public agency and forwardit to Right of Way Program Manager in Project Development. The Region must monitor the acquisition process in sufficient depth to ensure that all applicable state and federal laws, rules, and regulations were adhered to by the local public agency. After all the necessary documentation has been received,

the Region Right of Way Manager will issue a clearance letter under the certification acceptance procedure.

3. CDOT has overall responsibility for the acquisition, management, and disposal of real property on federal-aid projects. This responsibility includes assuring that acquisitions and disposals by CDOT are made in compliance with state and federal laws and regulations.
4. CDOT has the authority to enter into written agreements with other state, county, municipal, or local public land acquisition organizations or with private consultants to carry out federal regulations. The organizations, firms, or individuals must comply with the policies and practices of CDOT. CDOT is required by federal regulations to monitor real property acquisition activities to assure compliance with state and federal law. CDOT is also responsible for informing these organizations of all such requirements and for imposing sanctions in cases of material non-compliance.

**Additional References:**

1. CFR 23, Part 710.201 through 713.308, Right of Way issues
2. CDOT Right of Way Operations Manual
3. Federal-aid Policy Guide
4. FHWA Right of Way Project Development Guide
5. Fifth Amendment, U.S. Constitution
6. ASTM E1527 – 05 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process
7. ASTM E1903 – 11 Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process
8. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

# 7.02 PERMITS REQUIRED TO WORK ON GOVERNMENT LAND

Permits or other agreements are required whenever the Department or a Contractor is required to do work outside the right of way or easement area that has been previously obtained from other government entities. Permit areas include property owned or under the authority of the United States Bureau of Land Management, United States Forest Service, United States Bureau of Indian Affairs, United States Bureau of Reclamation, the National Parks Service, the State of Colorado Board of Land Commissioners, the State Division of Wildlife, and State Division of Parks and Outdoor Recreation. Property owned by other state agencies such as the Department of Corrections, Department of Institutions, Department of Military Affairs, or State Patrol, is usually handled by the Division of State Buildings in the Department of General Support Services.

For highway construction work to be performed on property that is owned by any of the above-referenced agencies, the agreement of that agency by special use permit, easement, or other document is required. The Resident Engineer, through the Region Right of Way Manager and the Right of Way Program in Project Development, will apply for the required document from the pertinent agency after considering that agency's concerns and expectations. The agency may issue the permit or easement, turn down the request, or ask that it be revised.

The above-referenced agencies require their approval, by special use permit, highway easement deed, property grant, or other document before any work related to construction can begin; this includes environmental clearances, utility relocations, surveying, and related work. Requirements, roles, authorities, planning, coordination, etc. for federal lands (Bureau of Land Management and Forest Service) are described in a memorandum of understanding titled "Memorandum of Understanding Related to Activities Affecting the State Transportation System and Public Lands in the State of Colorado." A current copy can be obtained from the Environmental Programs office in the Project Development Branch.

The Resident Engineer is responsible for initiating and coordinating with the Region Right of Way Manager, and either the Region Utility Engineer, the Region Planning/ Environmental Manager, or both, when applicable, to provide the necessary information to obtain the special use permit, highway easement deed, grant, or other document. The Region Right of Way Manager is responsible for securing the right of way clearances and submitting the necessary information to the Right of Way Program in Project Development to make application for access to state and federal lands.

Necessary information includes the plans, appraisals, and right of way acquisition documents.

## 7.02.01 SPECIAL USE PERMITS

### 7.02.01.01 State of Colorado Land (Land Board)

Right of Way Program personnel in Project Development make the application directly to the State Board of Land Commissioners, which includes the following material:

1. State Land Board application form
2. Half-sized plan sheet showing the State Land Board parcels
3. The determination of fair market value and value finding (or appraisal)
4. Legal description of the parcels including a copy in electronic format

## 7.02.02 BUREAU OF LAND MANAGEMENT, FOREST SERVICE, OR OTHER FEDERAL PROPERTY

Right of way plan sheets upon which the parcels and easements to be acquired are highlighted or crosshatched are prepared by the Region Survey Coordinator. The Right of Way Program in Project Development uses these maps to prepare the following:

1. The application to FHWA, which is reviewed and then forwarded to the agency that owns the property.
2. The Highway Easement Deed with stipulations, which is forwarded for the signatures of the Chief Engineer and Chief Clerk before being submitted to FHWA for final execution.

The Region Right of Way Manager clears the right of way for construction following the issuance of the letter of consent by the owner or agency.

Please refer to the most recent Interagency Agreements between CDOT, FHWA, USFS, and BLM which outlines the roles and responsibilities of each agency in the process described above.

**Additional References:**

1. 23 CFR 660A, Special Programs, Forest Highways
2. CDOT *ROW Manual*, Chapter 2
3. CDOT Survey Manual
4. Memorandum of Understanding, United States Forest Service and Bureau of Land Management, August-September 1995
5. CRS 38-50-101 ff, Survey Plats and Monument Records – General Provisions
6. CRS 38-51-101 ff, Survey Plats and Monument Records - Minimum Standards for Land Surveys and Plats
7. CRS 38-52-101 ff, Survey Plats and Monument Records - Colorado Coordinate System

# 7.03 UTILITY INVOLVEMENT

CDOT has established procedures for coordinating with utility companies when utilities may be impacted by a project. Numerous conditions result in the need to relocate utilities or coordinate construction around utilities, such as:

1. A utility may conflict with proposed construction.
2. Road construction may provide a convenient opportunity to place new utilities or upgrade existing ones.
3. Existing unsafe or hazardous conditions may easily and economically be mitigated during construction.
4. Certain non-aesthetic visual impacts may be replaced with a more acceptable solution.

A utility is a private or publicly owned line, facility or system for producing, transmitting, or distributing communications, cable television, power, electricity, light, heat, gas, oil, crude products, water, steam, waste, stormwater not connected with highway drainage, or any other similar type of commodity which directly or indirectly serves the public [23 CFR Part 645.105 Utility Relocations, Adjustments, and Reimbursement, Definitions].

CRS 38-5-101, Eminent Domain Act; CRS 43-1-225, Transportation Act; and other state laws and Constitutional provisions give utilities the right to construct their lines within highway right of way, provided they meet CDOT's established criteria (see 2CCR 601-18 *CDOT Utility Accommodation Code*). As a result, many utilities are located adjacent to or within the highway right of way. Relocation or modification of such utilities to facilitate construction is normally accomplished at the utilities' expense unless the utility has a property interest in their current location. Pursuant to 43-1-225(2)(b), C.R.S.: "The cost of relocating utility facilities owned by any governmental subdivision of the state of Colorado or abutting landowner on the federal-aid primary or secondary or secondary systems or on the interstate system, including extensions thereof within urban areas, shall be a cost of highway construction."

Prior to advertisement of any construction project, the Region Utility Engineer must issue a Utility Clearance in accordance with 23 CFR Part 635.309(b), Physical Construction Authorization. This clearance certifies that all conflicts with the utility companies involved with the project have been addressed in the Plans, Specifications and Estimate package or satisfactorily resolved.

The utility clearance letter is directed to the Federal Highway Administration (FHWA) on projects with FHWA oversight. On projects where CDOT has oversight, the clearance letter is directed to the Resident Engineer.

The Region Utility Engineer is the liaison between the Resident Engineer and all utilities affected by the project.

The Region Utility Engineer's duties include, but are not limited to:

1. Identifying, verifying, and locating known utilities within project limits.
2. Identifying and verifying utility conflicts.
3. Coordinating necessary utility relocations.
4. Negotiating necessary utility agreements and permits.
5. Drafting project utility specifications.
6. Issuing project utility clearance.
7. Processing utility billings.

The Resident Engineer is responsible to:

1. Ensure that existing utility lines and any utility relocation requirements are accurately shown and identified in the Plans, Specifications, and Estimate package.
2. In consultation with the Region Utility Engineer, make further investigations as needed to verify utility conflicts.
3. Ensure that any utility involvement, including utility phases of work (see below) is properly scoped, programmed, budgeted, and authorized.

The Headquarters Utility Unit in the Safety and Traffic Engineering Branch does the following:

1. Advises the Resident Engineer or Region Utility Engineer on utility issues.
2. Assists with developing or processing utility agreements.
3. Assists with obtaining utilities authorizations as needed.

Utilities phase authorization (function 3988) is required prior to incurring costs on any utility relocation work for which the utility owner will be directly reimbursed out of federal-aid project funds. The region must initiate the authorization process by indicating a phase start date and estimated phase costs in the budgeting data system. The Office of Financial Management and Budget (OFMB) will compile this data in its Quarterly Obligation Plan, which it then submits to FHWA for phase authorization approval. To obtain timely authorization, the Region must meet the submission deadlines specified by OFMB.

Agreements for utility services to the project site, such as water and sewer to a rest area, or electric power to a lighting system, are treated as construction, rather than utility phase costs, and therefore do not require utility phase authorization.

Utility phase authorization is also not required for utility work that will be performed by the Contractor on the utility owner's behalf, or coordinated through that Contractor by means of a plan force account item. In either case, such expenses are treated as construction phase costs.

Utility relocations at project expense will be documented by:

1. A Form 690, Standard Utility Agreement, if the owner has or will have performed the work and be reimbursed by CDOT; or
2. A Form 691, Contractor Adjusted Utility Agreement, if the work will be incorporated into the highway contract and performed by CDOT's Contractor on the utility owner's behalf.

For non-reimbursable utility relocations, CDOT and the utility owner should execute a letter of understanding for the agreed-upon work, the timeframe for completion, coordination requirements, and the utility's responsibility for costs.

In some instances, CDOT and the utility owner may find it to be more efficient or economical to have utility work that is the owner's responsibility (cost) incorporated into the highway contract and performed by the Contractor. In such cases, CDOT and the owner may enter an agreement for CDOT to perform the work and for the owner to reimburse the project.

A Form 333, Utility Permit, or a Form 1284, Utility Relocation Permit, shall be issued to cover all relocation work. The permit may incorporate any related agreement and shall include all necessary terms and conditions for the utility work to be accomplished at a time convenient to and in coordination with the highway project.

The utility clearance letter should include, at a minimum:

1. A list of involved utilities
2. Whether the work will be performed at project expense
3. If at project expense, type of agreement and estimated cost
4. Contract force account work if any
5. Utility specification attached, when required

Utility clearance activities include:

1. The Region Utilities Engineer attends the scoping meeting to assess the potential for utility involvement.
2. The Region Utilities Engineer investigates and identifies all utility owners that have facilities within the project limits.

3. After the preliminary Form 463, Design Data, has been issued, the Region Utility Engineer contacts the utility owners for base maps or other information on existing utilities.
4. The Resident Engineer plots existing utilities as accurately as possible onto preliminary plans, using base maps, survey utility locates as marked in the field, or other available data. Subsurface utility engineering techniques, such as electromagnetic detection methods, should be used to verify or supplement base map data for buried utility lines.
5. The Region Utilities Engineer furnishes preliminary plans to utility owners and conducts a Utility Field Inspection Review, in coordination with the project Field Inspection Review, to verify existing utility lines and identify potential conflicts.
6. If necessary to verify conflict or to develop relocation requirements, the Region Utilities Engineer and Resident Engineer will arrange further investigations, such as pot holing. At critical locations, subsurface utility engineering techniques such as non-destructive vacuum excavation methods should be used to visually identify and determine the precise horizontal and vertical location of buried utility lines.
7. The Resident Engineer incorporates all necessary relocation details into the final project plans.
8. If the utility must relocate, the Region Utilities Engineer determines the eligibility of reimbursement based on state or federal laws or regulations, in consultation with Statewide Utilities Engineer as needed.
9. The Region Utilities Engineer negotiates the Standard Utility Agreement, Contractor-Adjusted Utility Agreement, or other form of agreement as may be necessary to cover the utility work. The Region Utilities Engineer transmits agreements requiring approval by the Chief Engineer, Attorney General, Controller, or a combination thereof to Headquarters Utilities unit for review and further processing.
10. The CDOT Headquarters Utilities unit verifies utility phase authorization status as necessary, assembles the executed agreement packages, issues the Notice to Proceed and distributes the executed agreement packages after Headquarters Procurement reviews the agreement for compliance, and routes the agreement for approval of the Chief Engineer and CDOT Controller.
11. The Region Utilities Engineer obtains the utility's concurrence on all non-reimbursable utility relocation requirements.
12. The Region Utilities Engineer furnishes the FHWA, the Resident Engineer, or both with utility clearance and specification, and coordinates any necessary utility permits as outlined earlier in this section.

**Additional References:**

1. AASHTO Policy on Geometric Design of Highways and Streets
2. AASHTO Guide for Accommodating Utilities within Highway Right of Way
3. AASHTO Policy on the Accommodation of Utilities Within Freeway Right-of-Way
4. AASHTO Roadside Design Guide
5. Program Guide, Relocation and Accommodation on Federal-Aid Highway Projects, Sixth Edition, January 2003
6. *Highway/Utility Guide*, Publication No. FHWA-SA-93-049, June 1993
7. USC 23 Section109(l), Standards; Section 111, *Agreements Relating to Use of and Access to Rights-of-Way - Interstate System*; Section123, Relocation of Utility Facilities
8. CDOT Policy Directive 390.0, Accommodation of Utilities Within State Highway System ROW
9. CDOT Procedural Directive 512.1, Project Scoping and the Design Scoping Review (DSR)
10. CFR 23 Part 635C, Physical Construction Authorization
11. CDOT Utility Code
12. See http://www.coloradodot.info/business/permits/utilitiesspecialuse for current forms

# 7.04 RAILROAD INVOLVEMENT

This section prescribes procedures for advancing projects involving work on railroad facilities by CDOT contractors or railroad forces.

Work within the railroad right of way, whether by CDOT personnel or by a CDOT contractor involves the following preliminary steps:

1. As early in the process as possible, contact the Railroad Program Manager (RPM) and get his input and guidance on the project requirements. The RPM will coordinate with the Resident Engineer to develop solutions for expected, and unexpected, railroad issues. Both Union Pacific and BNSF have requested that they not be contacted directly by project personnel without prior permission being given. While this may seem like an inconvenience, it generally results in a smoother process since the RPM has additional resources and information to facilitate the project and generally has a good relationship with the railroad.
2. The RPM will advise the railroad of the pending project and provide them with copies of the planned work at the design level plan stage. The railroad will charge for plan review services.

   NOTE: Plan review services and/or preliminary engineering services are initiated via a Task Order issued under the terms of the master agreement with the railroad. Once the RPM is advised that such services are needed, he will begin the process of acquiring the necessary paperwork for the Task Order. The Resident Engineer will be required to prepare a Purchase Requisition for the amount of the PE (usually $20,000.00) and have it ready by the time the Task Order is ready for processing by HQ Purchasing.

3. For soil sampling, maintenance, demolition, or construction the railroad will require the appropriate right of entry documentation along with corresponding fees. Proof of insurance, whether for CDOT or a Contractor will also be required (see note below). It is not uncommon for railroad-specific insurance to be a required purchase even though CDOT is self-insured. Most of the contact information for the two main Class 1 railroads in Colorado will be available on their websites. It is very important that the Resident Engineer do the research necessary to acquire the needed documents. If railroad specific insurance must be purchased, the Resident Engineer will be required to prepare a Purchase Requistion for the required amount to be issued a check to send in with the required documents before the railroad will grant a right of entry.
   NOTE: Documentation for CDOT self-insurance can be obtained through HQ Risk Management – they are familiar with the railroad requirements.

When the Contractor is required to perform work on railroad facilities or within the railroad company's right of way, the Contractor must obtain a right of entry from the railroad which includes obtaining railroad-highway insurance protection for the Contractor's operations on behalf of the railroad company, as stipulated in the railroad

agreement. The railroad company shall also be contacted for work on grade-separated crossings of railroad right of way or work that encroaches upon the railroad's right of way.

An agreement between the railroad and the state is usually required on all projects that will alter an existing railroad facility or that will encroach on railroad right of way.

When a highway project involves work on railroad property or a railroad crossing, the following documentation and procedures are usually necessary:

1. The Resident Engineer holds a field diagnostic meeting to describe the proposed work and identify the impacts to the railroad. All appropriate agencies need to attend, e.g. CDOT design, railroad track foreman, signal foreman, etc. The railroad will develop a cost estimate for any required work by the railroad, including estimating the cost of required railroad flagging.
2. The Resident Engineer develops project plans that depict and describe any railroad encroachments, defines construction responsibilities between railroad and highway, and submits plans for acceptance by the railroad through the RPM.
3. If the railroad-highway agency agreement will provide for direct reimbursement of any costs to the railroad from federal-aid highway funds, the Resident Engineer will coordinate with the RPM to obtain federal authorization (function 3987). NOTE: this process is seldom used.
4. The RPM prepares and negotiates a draft agreement and ultimately submits the final agreement, including a railroad estimate, for approval by the railroad. The executed agreement is signed by all involved parties before being approved by the Controller.
5. The RPM prepares and submits a Public Utilities Commission application when required, such as at-grade railroad crossings and overpasses or underpasses. The application is not necessary for minor railroad encroachments that do not alter the crossing, i.e., bridge overlays. For local agency projects, that entity is responsible for this activity.
6. The plans and specifications need to detail all the requirements of the Contractor related to the railroad work, e.g. coordinate railroad flagging and obtaining a Contractor’s Right-of-Entry from the railroad. The Right-of-Entry requires the Contractor to provide proof of Public Liability and Property Damage Insurance for itself and for any subcontractors. The Contractor shall also obtain Railroad's Protective Liability and Property Damage Insurance on behalf of the railroad. Evidence of the coverage shall be furnished to CDOT and to the railroad.

If there are charges during construction for which the project will be billed by the railroad, the appropriate arrangements should be made with the Region business office to do so expeditiously. Late payment of railroad billings will incur additional costs, such as late payment fees and may result in delayed processing of other paperwork by the

railroad. The business office should pay all invoices as quickly as possible to avoid late fees. There have been instances where unpaid invoices in one Region impacted the approval of projects in another Region.

Railroad flagging requirements, for both preconstruction and construction phases, are complex. Please contact the CDOT Railroad Program Coordinator for the current estimated rate, documentation, and scheduling procedures.

NOTES:

1. Early coordination with the railroad company and with the RPM is critical since it may take up to a year or more to obtain clearances and a written agreement.
2. Projects which have undergone railroad plan review and then are later "shelved" should NOT be assumed to be ready for AD just because the plans were reviewed and approved. Typically a second review process by the railroad is required to verify that no changes were made.
3. Very often, especially in rural areas, the railroad will have existing signal lines attached to poles adjacent to the tracks. When these lines follow the tracks under a highway structure the demolition of the structure will require the lines be either moved or buried prior to the commencement of work. This will require scheduling by the railroad and can take as long as 18 months to accomplish. Recognition of this situation is therefore of prime importance.
4. For projects that eliminate an at-grade crossing, the railroad may be required to pay 5% of the theoretical structure. The Resident Engineer should work with the RPM on when this should be pursued with the railroads.

### 7.04.01 DRAINAGE PROJECT SPECIAL NOTE:

For projects that affect drainage upstream from a railroad, there are special requirements:

1. The railroad should be notified as early as possible (scoping phase);
2. The hydraulics report should include, at a minimum, cross-referenced locations, i.e., both highway and railroad mileposts, etc. The RPM can work with Hydraulics to provide this information.
3. The hydraulics report should also assess and evaluate downstream (i.e., railroad) flow impacts – if no material flow changes are expected it should clearly state this.

### 7.04.02 RAILROAD CLEARANCE

Prior to advertisement of any construction project, the Region Utility Engineer must issue a Railroad Clearance in accordance with 23 CFR Part 635.309(b), Physical

Construction Authorization. This clearance certifies that impacts with the railroad companies involved with the project have been addressed in the Plans, Specifications and Estimate package or satisfactorily resolved. The Region Utilities Engineer furnishes the FHWA, the Resident Engineer, or both with railroad clearance and Railroad Requirements specification. The railroad clearance letter is directed to the Federal Highway Administration (FHWA) on projects with FHWA oversight. On projects where CDOT has oversight, the clearance letter is directed to the Resident Engineer.

The statement will be one of these types:

1. There is no railroad involvement within the limits of this project.
2. The railroad has no work on this project, but was notified and has approved the plans.
3. The railroad work on this project has been completed prior to the advertisement of the CDOT work.
4. The railroad work has been arranged to be undertaken and completed as required for proper coordination with the physical construction schedules of the CDOT project work.

**Additional References:**

1. 23 CFR Part 140I, Reimbursement for Railroad Work; Part 646A Railroad-Highway Insurance Protection, and Part 646B, Railroad-Highway Projects
2. FHWA Railroad - Highway Grade Crossing Handbook
3. Joint BNSF/UP Guidelines for Grade Separation Projects

# SECTION 8

# ADDITIONAL PROJECT DEVELOPMENT CONSIDERATIONS

# 8.01 AMERICANS WITH DISABILITIES ACT STANDARDS

Through the implementation of the provisions of the document "ADA Accessibility Requirements in CDOT Transportation Projects," CDOT has established uniform standards to ensure projects on new and existing transportation facilities conform with the Americans with Disabilities Act (ADA) and are made accessible to persons with disabilities, including wheelchair and limited-sight users.

Facility design shall be in compliance with the 1991 Americans with Disabilities Act Accessibility Guidelines (ADAAG) or standards that may replace the 1991 ADAAG. ADAAG applies to safety rest areas, designated interest points, curb cuts with truncated domes, pedestrian overpasses, underpass structures, pedestrian ramps, and designated points of pedestrian concentration for controlled roadway crossing. In addition, the Resident Engineer should seek to eliminate hazards within sidewalk areas such as poles, signs, and vertical edge drop-offs. Signing and pavement marking for persons with disabilities and van accessible parking shall be added in new and reconstructed parking areas.

New facilities shall meet the current standards for persons with disabilities whenever a new highway project is constructed. When an existing highway is to be reconstructed, all new facilities will accommodate persons with disabilities. If a facility is altered through resurfacing or other means, the alterations must meet current ADA standards provided in the document *ADA Accessibility Requirements in CDOT Transportation Projects*: *http://www.coloradodot.info/business/designsupport/policy-memos/ADA%20Accessibility%20Requirements%20in%20CDOT%20Transportation%20Projects%2010-20-2003%20.pdf/* . During construction, ADA temporary access and facilities shall be addressed.

If the Resident Engineer is uncertain about whether, or to what extent, a particular accessibility feature is required, the Resident Engineer will consult with the CDOT ADA Coordinator. All decisions regarding compliance with ADA Accessibility Requirements will be documented in the project file.

In consultation with the CDOT ADA Coordinator in the Center for Equal Opportunity (Headquarters), the Resident Engineer will be responsible for incorporating the design and implementation of all facilities in compliance with the ADA. These requirements should be identified in the early stages of design, such as the Design Scoping Review and be included in the design plans for both new facilities and existing facilities to be reconstructed.

The Resident Engineer will provide proper plans, checklists, standards, and details as required by CDOT and federal guidelines related to accommodations for persons with disabilities.

**Additional References:**

1. 42 USC, Subchapter 2--Public Services (Title II), Americans With Disabilities Act of 1990
2. 28 CFR Part 35, Nondiscrimination on the Basis of Disability in State and Local Government Services
3. *CDOT M&S Standard Plans*
4. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*
5. *CDOT Policy Directive 605.0 Comprehensive Accessibility for Persons with Disabilities*
6. *ADA Accessibility Requirements in CDOT & Local Agency Transportation Projects, October 2003.*
7. *U.S. Architectural and Transportation Barriers Compliance Board (Access Board), Americans With Disabilities Act Accessibility Guidelines for Buildings and Facilities*
8. *Designing Sidewalks and Trails for Access – FHWA-HEP-99-006 HEHE/8-99/(5M)E*
9. Americans With Disabilities Act Access Board, http://www.access-board.gov

## 8.02 DETOUR DESIGN

Detours are any temporary routing of traffic off its usual course, including the use of existing alternate routes or use of modified lanes on available pavement. Detours are designed to safely and efficiently move traffic while providing an adequate construction work area.

Detour design should include speed, clear zone, horizontal and vertical alignment, typical section (e.g., lane width, superelevation and shoulder design), horizontal and vertical sight distance, clearance, curve radii, any needed temporary barrier with properly designed end terminals, surfacing requirements, approach ties, environmental mitigation and construction traffic control.

The designer should consider vertical clearance to overhead structures such as bridges or false work, especially when utilizing shoulders where clearance is often less.

A detour should provide adequate area for the construction work around which the detour is being built. Adequate space should be provided for the Contractor to work without impeding the flow of detour traffic. When planning a detour, the designer should consider running speed, barrier widths, required offset to barriers, and clear distance to construction activities including typical construction sign placement. Temporary drainage is also an integral aspect of a detour design. The length of detour should be designed according to the surrounding topography considering duration of detour and amount of traffic demand.

Detours should be designed so that the motorists pass safely through the construction when work is taking place next to the travel way, and so that construction workers are provided with a safe work area. Construction work area should be large enough that work does not delay or impact traffic whenever conditions and economics permit. Priorities for providing a proper detour are:

1. Safety of motorists and workers
2. Adequate construction work area
3. Reasonable detour design speeds
4. Adequate roadway capacity
5. Economical detour design
6. Consideration of vehicles that exceed legal weight and height limitations
7. Proper drainage during construction to prevent hydroplaning

The transitions between the roadway alignment and the detour alignment should be as smooth as possible. It is desirable to maintain the lane width and geometric design speed properties of the main roadway. The detour should be designed with a speed as close to the original speed of the main roadway as is reasonably possible. The designer should anticipate the level of motorist compliance with the reduced speed in a detour zone, when deciding on the detour design speed. When safety consideration warrants, the detour posted speed may be lower than the design speed.

A higher detour design speed will increase the likelihood that vehicles that are not in compliance with the lower detour posted speed can traverse the work zone without causing a crash or endangering highway workers and other motorists. The design speed should not be used to control motorist behavior, when this can be more safely accomplished with regulatory signs and enforcement. The location of the detour and the likelihood of the drivers' anticipating reduced speed in the detour should be considered. The maximum speed differential and details of detour design presented in Section 3.5 of *The CDOT Roadway Design Guide* should be followed. A procedure for determining work zone speed limits is explained in a memo by J. Siebels and W. Reisbeck dated April 4, 1997, and should be followed. Also see the September 25, 2009 Policy Memorandum on Work Zone Safety for guidance on completion of the CDOT Form 568 and reduction of speed limits in work zones (http://www.coloradodot.info/library/traffic/traffic-manuals-guidelines/lane-close-work-zone-safety/work-zone-safety-mobility/WZ-Safety-Improvments_9-25-09_%20FINAL.pdf/view ).

The Resident Engineer is responsible for scoping and designing the detour. For proper project documentation, the Form 518, Detour Design Data, will be completed. The design should include all proper pay items for the detour, including provisions for maintenance, removal, and disposal of the detour. For consultant or entity projects, the engineer of record shall complete the Form 518. On projects with federal oversight, the designer shall meet all federal standards and obtain FHWA concurrence with the design. If the detour includes temporary detour pipes to allow the passage of flow during construction, then Region Hydraulics Engineer should be consulted on the size of the pipes to minimize the possibility of overtopping during construction.

Signing and striping for the detour should be included in the Traffic Control Plan (see Section 4.10 of this manual). The Region's Traffic Engineering Unit should be informed of the detour design and posted speed, and should receive adequate plan sheets after the Field Inspection Review to allow a proper Traffic Control Plan to be developed.

*The AASHTO Policy on Geometric Design of Highways and Streets* provides useful information for maintenance of traffic through construction areas.

For projects that require construction of temporary drainage detour structures over streams and waterways, refer to the *CDOT Drainage Design Manual*.

**Additional References:**

1. CDOT Standard Plan S-630-1
2. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*
3. CDOT *Drainage Design Manual*
4. *NCHRP – Report 581 – Design of Construction Work Zones on High Speed Highways*
5. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

## 8.03 AIRPORT AND HELIPORT CLEARANCES

Airway-highway flight area clearances must be adequate for the safe movement of air and highway traffic. The expenditure of public funds for any related airport and highway improvement must be in the public interest.

Airport flight area clearance should be considered when a highway project is within 20,000 feet of an airport or within 5,000 feet of a heliport or exceeds 200 feet in height above the ground.

The Resident Engineer will seek to eliminate existing and avoid new substandard airway-highway clearances when developing the PS&E. The clearances apply to such objects as overhead signs, light standards, vehicles moving on the highway, over-crossing structures, and fencing adjacent to the airport or heliport. Impacts of construction operation activities such as crane placement should be considered.

The Resident Engineer will notify the airport or heliport of any conflict that might apply and coordinate with airport officials in notifying the Federal Aviation Administration (FAA) of these potential conflicts. This notification should occur as early in the design process as possible. The Resident Engineer may need to file a FAA Form 7460-1 as required by Federal Aviation Regulation (FAR) Part 77 (77.17) for those locations off the airport where construction may impact airport operations or access. The FAA will determine if there is any hazard to air navigation and respond accordingly to the person who submitted the FAA Form 7460. The Resident Engineer should contact the CDOT Division of Aeronautics for assistance or questions regarding the FAR Part 77 or the process of filing a FAA Form 7460. A copy of the form can be accessed from the FAA website at http://www.faa.gov/forms/ .

Documentation shall be provided by the coordinating airport official to the FAA; all information submitted by the official will be reviewed by the Federal Highway Administration (FHWA) to determine if clearances provided are sufficient. The FHWA will advise the FAA of its findings and give its concurrence. When conflicts cannot be resolved, the region FHWA shall refer its recommendations to the Federal Highway Administrator.

The FHWA issues a Finding in the Public Interest based on compliance with flight area clearances that conform to FAA standards. FAA guidelines also apply to military and private airports with the same rules and regulations as apply to public airports/heliports.

The FAA notifies the Resident Engineer of acceptable mitigating actions.

**Additional References:**

1. 23 CFR Part 620 A, Highway Improvements in the Vicinity of Airports
2. *CDOT Roadway Design Guide*
3. 14 CFR Part 77, Objects Affecting Navigable Air Space
4. Federal Aviation Administration Advisory Circular AC 70/7460-2K *Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace* http://www.faa.gov/regulations_policies/advisory_circulars/

# 8.04 SAFETY REST AREAS

Safety rest areas with parking facilities separated from the highway are provided as a place for the motorist to stop and rest for short periods of time. The Resident Engineer is responsible for scoping and design of safety rest area projects.

Safety rest areas usually provide one or more of the following: drinking water, toilets, tables and benches, telephones, information facilities, and other facilities for travelers. The facility may be located at a scenic location and include historic or scenic information.

Safety rest areas will provide full consideration and accommodation for persons with disabilities. They should have controlled entrance and exit highway connections with proper signing, restroom facilities, parking areas for both passenger cars and large semi-trailer vehicles, adequate lighting, adequate source of water, and proper disposal of sewage. The designer should consider environmental issues in the design process and implement pollution prevention and energy efficiency (P2/E2) in the operation and maintenance of rest areas. Examples include installation of low-water-use toilet and sink facilities; energy efficient lighting, cooling, and heating; and collection and detention of stormwater runoff using appropriate water quality BMPs. A multi-disciplinary team of design, construction, environmental, maintenance, landscaping, and right of way personnel should select the optimal site based on factors such as safety, materials, utility, drainage, water quality, energy efficiency, economy, and scenic value. These factors may be determined by examination of aerial photos and by ground reconnaissance.

The Resident Engineer shall coordinate the buildings for Rest Areas with the State Buildings Program delegate at the CDOT Property Management Office for the review and coordination of plans and contractual procedures for the construction, management, and maintenance of CDOT owned buildings. Compliance with local and State Building codes can be coordinated with the architects in the CDOT Property Management Office.

The Resident Engineer shall coordinate with the Region's Traffic Engineer to incorporate in the rest area any chain-up or chain-down stations that may be needed nearby.

Consideration for a public-private partnership with a local government or chamber of commerce for inclusion of an information kiosk as part of the building may be of benefit for travelers and the surrounding community.

FHWA oversight may apply to safety rest area development.

**Additional References:**

1. 23 CFR Part 752.5, 752.7 and 752.8 Safety Rest Areas
2. Americans with Disabilities Act Guidelines
3. AASHTO Guide for Development of Rest Areas on Major Arterials and Freeways
4. CDOT Lighting Design Manual
5. CDOT New Development and Redevelopment Stormwater Management Program Manual, 2004
6. CDOT webpage for information on existing CDOT Rest Area Locations http://www.dot.state.co.us/TravelInfo/Facilities/RestAreas/
7. Safety Rest Areas: Planning, Location and Design, USDOT, FHWA, 1981
8. CDOT Policy Directive 605.0 Comprehensive Accessibility for Persons with Disabilities

# 8.05 RAILROAD DESIGN

Railroad-Highway projects fall into two specific categories based upon the origin of the project: The first category includes projects whose sole purpose is to improve the safety at an at-grade crossing. These are commonly known as Section 130 projects, named after their original federal legislation in 23 U.S.C. 130. The second category includes projects in which the crossing improvements are part of a larger, primarily highway construction, project. Examples include the replacement of an overpass, or the widening of an existing roadway, which then requires a widened at-grade crossing. This second category of projects is the subject of this section of the manual.

Highway projects that have a railroad component or will involve railroad participation are developed with the primary emphasis on the highway improvements and only secondarily on railroad involvement. The proper methodology is more fully set out in Section 7.04 *Railroad Involvement* of this manual.

The Resident Engineer's responsibilities for railroad-highway projects are:

1. Develop preliminary and final railroad plans.
2. Prepare documents and specifications to assure compliance with railroad agreement requirements.
3. Obtain approvals and appropriate signatures from the railroad company, the Department, and other agencies (such as Attorney General or State Controller).
4. Prepare railroad flagging, coordination, and railroad insurance specifications.

The Railroad Program Manager, in the Safety and Traffic Engineering Branch, is responsible for preparing the railroad contract for review by the railroad and other agencies. Coordination among the CDOT Railroad Program Manager, Resident Engineer, and Region Utility Engineer is necessary in the preparation of preliminary and final plans. Contact the Railroad as soon as possible and discuss with them the project schedule and scope. The Railroads have a detailed process for executing agreements with outside agencies, so allow extra time for these steps. Currently the Union Pacific Railroad (UPRR) is the only railroad that requires payment for their review of CDOT's design. See Section 7.04 *Railroad Involvement* of this Manual for guidance on what needs to be included in the project costs and addressing the review time for railroads in the project schedule.

The Resident Engineer is responsible for review of railroad work that impacts the state highway system, including the design and traffic control. When projects are off the state highway system, the involved local agency is responsible for these activities. Any work on railroad property, by railroad forces, will be done by the force account method of

construction, the procedures for this type of construction will apply (see Section 1.11 of this manual). Work done on railroad property by a contractor selected by CDOT will be handled by normal contractor procedures.

The documentation required for railroad-highway projects is:

1. Approved Form 463, Design Data
2. Executed Contracts between CDOT, the local agency, and the railroad, as applicable
3. Railroad flagging insurance protection certificate
4. Public Utilities Commission application
5. Force account justification and Finding in the Public Interest, when required
6. Project Special Provisions
7. Cost Estimate and general plan sheet from involved railroad company
8. Right of way and utility clearances, as appropriate
9. Notice to Proceed letter

Railroad-highway projects shall follow similar development processes as regular highway projects (scoping, Field Inspection Review and the Final Office Review). At a minimum, an abbreviated plan set of project plans will be prepared for the project and will include a cost estimate and general plan sheet for the railroad work. Plans for the railroad work may be incorporated into a larger project.

It is recommended that the Resident Engineer:

1. Allow adequate lead time since the contract process may take more than a year for clearance. The railroads will require submission and approval of 100% plans before any contract can be successfully executed.
2. Make early communication with the Railroad Program Manager and the railroad company and recognize that railroads have specific rights that trump CDOT's rights in most cases.
3. Do not presume an existing contract will cover new work. Typically, even if the scope of work for a new project is covered by an existing agreement, the railroads will require a new agreement to be prepared and executed.

**Additional References:**

1. 23 CFR Parts 140 I, Reimbursement for Railroad Work; 646 A, Railroad-Highway Insurance Protection; 646 B, Railroad-Highway Projects
2. 23 USC 109, Standards; 130, Railway-Highway Crossings
3. *FHWA Railroad-Highway Grade Crossing Handbook, USDOT FHWA-Revised Second Edition, August 2007* (available from the FRA website) http://www.fra.dot.gov/downloads/safety/HRGXHandbook.pdf
4. *CDOT Roadway Design Guide*
5. *AASHTO Policy Guide for Geometric Design of Highways and Streets*
6. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*
7. [Joint] *BNSF Railway / Union Pacific Railroad Guidelines for Railroad Grade Separation Projects* (available from either railroad website in PDF format) http://www.uprr.com/aboutup/operations/specs/attachments/grade_separation.pdf
8. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

# 8.06 TRANSIT ACCOMMODATIONS

Transit accommodations for the purpose of increasing capacity can include the construction of lanes or other improvements for the exclusive use of buses, trucks, trains, emergency vehicles, and high-occupancy modes of transportation. The intent is to reduce single occupancy vehicle usage and encourage the use of multi-modal transportation that is linked as a system to move people in high-occupancy vehicles.

Parking facilities are an important means to accommodate individuals using transportation services and must meet the needs of persons with disabilities.

On federal aid projects, the Federal Highway Administration (FHWA), CDOT, metropolitan planning organizations, and the Federal Transit Administration (FTA) shall coordinate with each other on any projects involving public transit to facilitate project selection, approval, and completion.

Transit should be considered in both the planning and the design processes. The planning process would focus on major capital investments and issues, such as light rail or commuter rail lines, high-occupancy vehicle lanes, or major expansions to bus systems. The design process would not only consider project decisions made in the planning process but would also scope smaller items that would help accommodate and facilitate transit service delivery, such as park and ride lots and bus stops, pads, and shelters.

At the scoping stage, the Resident Engineer should be thinking about future mass-transit needs and incorporating elements into the plans. It is important to be careful not to construct a project in a way that precludes future options. At this stage, the Resident Engineer should be talking with the Region Program Engineer, Planning Manager, Region Transportation Director, and other Regions on long-range planning necessary to incorporate transit elements into the plans.

The Resident Engineer is responsible for the completion of any highway construction plans that involve high-occupancy vehicle lanes, parking facilities, bus pull-outs, etc.

The decision to implement transit accommodations is usually a joint effort between the FHWA, FTA, the metropolitan planning organizations, the local transit agency, responsible local officials, and CDOT.

Appropriate design standards and plans, and project decision type documentation should be sent to the FHWA when appropriate and to transportation agencies for review and advisement.

**Additional References:**

1. 23 CFR Part 810A, Mass Transit and Special Use Highway Projects, General and 810B, Highway Public Transportation Projects and Special Use Highway Facilities
2. 23 USC Section 134, Metropolitan Planning; Section 137, Fringe and Corridor Parking Facilities; Section 142, Public Transportation
3. *AASHTO Policy on Geometric Design of Highways and Streets*
4. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*
5. *Pedestrian Safety Guide for Transit Agencies, February 2008, FHW A Report No. FHWA-SA-07-017.*

# 8.07 IRRIGATION COMPANY AGREEMENT

An irrigation company agreement is required to document the owner's consent to proposed highway construction within the company's right of way. The agreement authorizes CDOT to enter upon the property and to construct and maintain the proposed structure or ditch shown on the CDOT plans.

An irrigation company agreement is a legal document signed by the irrigation company owner and CDOT, that describes the proposed work and sets forth the applicable terms and conditions of the agreement.

An agreement is required for all CDOT projects on which an irrigation (or ditch) company is present and whose facilities will be affected by the proposed construction.

The work is usually at project expense because:

1. The owner may hold prior or overlapping property rights within state right of way, or
2. The owner is protected by statute from actions that would permanently impair the facility.

The Resident Engineer is responsible for the design of the irrigation structure and ditch. The Region Utilities Engineer (RUE) pursues and coordinates the signing of the agreement between the ditch company and CDOT. The RUE may assist with any special terms and conditions of the agreement. The Hydraulics Engineer performs or reviews the hydraulic structure design and may recommend alternative structure designs.

Documentation necessary (attached):

1. Form 1028a, Irrigation Company Agreement for Construction
2. Structure Selection Costs
3. Ditch Company Coordination Information
4. The Resident Engineer needs to adhere to the Procedure for Irrigation Company Agreement (included below).
5. An original copy of the Irrigation Company Agreement shall be sent to CDOT HQ Central File

**Additional References:**

1. CRS 37-86-101 ff, Rights-of-Way and Ditches
2. CDOT *Roadway Design Guide*

**PROCEDURE FOR IRRIGATION COMPANY AGREEMENT**

1. At the scoping stage of the project:

   a. Identify all irrigation structures involved and their owners.

   b. Determine the water rights of these irrigation structures and their characteristics such as capacity, freeboard, and/or other operating requirements.

   c. Meet with the representatives of these structures, discuss the proposed CDOT construction and the possible impact on or conflict with their existing structures and customer obligations.

   d. Record and retain pertinent data (see "Ditch Company Coordination Information").

2. Develop a preliminary structure design plus one or more structure alternates, together with cost comparisons (see "Structure Selection Costs"). Support with adequate survey data and hydraulic analysis for each design alternate. Present to the irrigation company board of directors and obtain their verbal consent to begin developing plans for the facility. Be prepared to discuss the following for each alternate:

   a. Estimated costs and cost differences between types of structures that will impact the tax paying public.

   b. Safety problems such as guardrail, "narrowing of roadway" illusion or ditch cleaning activity near roadway.

   c. Maintenance problems, snow problems with guardrail, deck rehabilitation, abutment backfill stabilization, etc.

   d. Operating requirements such as debris, freeboard, scour, and project schedule vs. ditch operating schedule.

   e. Other terms and conditions as may be requested by the owner. Unusual requests such as liquidated damages, insurance coverage, or indemnification, may require legal advice (coordinate with Attorney General via HQ Utilities Unit, Safety and Traffic Engineering Branch).

3. When the structure plan is finalized, prepare and submit for owner's approval for the following:

   a. CDOT Form 1028, Irrigation Company Agreement for Construction, referring to attached exhibits, and including any other terms and conditions requested by the owner and acceptable to the Department.

   b. Structure plan (identified as Exhibit A) depicting only structure information of interest to the company. The plan sheet note, and schematic of the structure on the plan sheet, should suffice. Avoid details subject to change during design or construction, which technically may void the agreement.

   c. If the agreement imposes a further contractual responsibility on the State's construction contractor, such as work schedule restrictions or liability for delays, attach a copy of the Project Special Provision (identified as Exhibit__).

d. If requested by the owner, a structure cross-section, which should not be attached to, nor referenced as part of the agreement.

4. After the owner has signed the agreement, obtain signature of Region Transportation Director or designated representative. Execute two original-signature agreements if the owner requests an original. Forward one original agreement including all attachments to CDOT Records Center (legal). Furnish copies to the Resident Engineer, Region Utility Engineer, HQ Utilities Unit, and others as needed.

5. If the owner will not sign the Form 1028 agreement (for example, if they demand cash compensation over and above the cost of the improvements), consult the Region Right of Way Manager and HQ Utilities for guidance on whether to pursue a condemnation action, or negotiate a specialized agreement.

**STRUCTURE SELECTION COSTS**
**EXAMPLE**

BRIDGE:

| | |
|---|---|
| Average cost of bridge per square foot x required size | = $_____ |
| Required guardrail at bridge site | = $_____ |
| Rough Detour Costs | |
| PLACE embankment required cu. yd. x average cost | = $_____ |
| REMOVE embankment cu. yd. x average cost | = $_____ |
| Ditch drainage structures (temporary pipe) | = $_____ |
| Additional signing required for detour estimates | = $_____ |
| Total Cost of Bridge | $_____ |

---

CONCRETE BOX CULVERT:

| | |
|---|---|
| Average cost of CBC per sq ft x required size and length | = $_____ |
| Guardrail not required if clear zone is addressed | = N/C |
| Detour not required if use of roadway embankment is used | = N/C |
| Total Cost of CBC | $_____ |

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IMPRESS ON DITCH COMPANY THAT THEY ARE TAXPAYERS AND YOU ARE TRYING TO GET THE MOST ROADWAY SURFACE FOR THE TAX DOLLARS SPENT.

**DITCH COMPANY COORDINATION INFORMATION**

PROJECT NUMBER/CODE_____ DATE_____

PROJECT LOCATION _____

NAME OF DITCH COMPANY _____

NAME OF DITCH (if not same as company) _____

MAILING ADDRESS _____

_____

TELEPHONE NUMBER _____

DITCH COMPANY CONTACT PERSON _____ PHONE_____

DESIGN FLOW _____ NORMAL FLOW _____ STORM RUNOFF _____

REQUIRED FREEBOARD _____TIME OF YEAR DITCH IS DRY _____

IF DITCH HAS OVERFLOWED, WHERE AND WHAT WAS DISCHARGE _____

SPECIAL MAINTENANCE PROBLEMS: _____

_____

WHEN IS CANAL DREDGED? (I.E., YEARLY, ONCE EVERY TWO YEARS) _____

ANTICPATED DEPTH OF DREDGE FROM EXISTING _____

REQUIRED ACCESS TO DITCH RIDER'S ROAD _____

TYPE OF VEHICLES _____

IS THE CANAL ON FEE TITLE OWNERSHIP OR AN EASEMENT? _____

WIDTH _____

ENGINEER FOR DITCH COMPANY _____

ATTORNEY FOR DITCH COMPANY _____

TYPE AND SIZE OF EXISTING STRUCTURE _____

IS EXISTING SIZE ADEQUATE? _____

---

TYPE & APPROXIMATE SIZE OF PROPOSED STRUCTURE (CLEAR SPAN, PIER OF WEBB WALL) _____

CANAL CROSS-SECTION REQUIRED? _____ DITCH LINING REQUIRED? _____

DECREED FLOW _____

---

# 8.08 CLIMBING AND PASSING LANES

Climbing lanes are extra lanes provided on highways with long, steep grades for slow moving vehicles. A passing lane can be provided where sight distances or traffic conditions limit passing opportunities on two-lane highways, including rolling and flat terrain. A highway section with a climbing or passing lane is not considered a three-lane highway, but a two-lane highway with an extra lane. Climbing lanes generally are not used on freeways and multi-lane highways because these highways usually have the capacity to handle the traffic volume with slow moving vehicles.

The requirements for establishing climbing lanes are usually based on traffic volume, capacities, percent of trucks, grades, speeds, and level of service. Climbing lanes should be considered when a 10 mile per hour or greater speed reduction is expected for a typical heavy truck provided the percentage of trucks and traffic volumes justify the expenditures as outlined in the CDOT *Roadway Design Guide* and in the *AASHTO Policy Guide on Design of Highways and Streets*. Safety is a primary justification for the addition of passing lanes. Accident history should be reviewed for climbing and passing lanes. The *Highway Capacity Manual* is used for these analyses of grades on two-lane highways.

Where terrain conditions permit, a passing lane should be added when there are high traffic volumes or significant segments of passing sight distance restrictions due to vertical and horizontal curves. Passing lanes should have the same lane width as the travel lanes and should be tapered in and out as prescribed in the *Roadway Design Guide*.

When a climbing or a passing lane is required, a plan and profile will be developed. A graph showing the relationship between rate and length of grade for several reductions in speed will be used to develop the plan and profile. A sketch of the profile with the grades is needed to find the length and location of the climbing lanes, together with a deceleration and acceleration chart (see the *CDOT Roadway Design Guide*). Justification for climbing lanes where the critical length of grade is exceeded may be considered from the standpoint of highway capacity. Critical length of grade is the maximum length of a designated upgrade on which a loaded truck can operate without an unreasonable reduction in speed.

**Additional References:**

1. Transportation Research Board (TRB) Highway Capacity Manual - Special Report 209
2. AASHTO Policy on Geometric Design of Highways and Streets

# 8.09 STOCKPASSES, LANDOWNERS' ACCESS, WILDLIFE CROSSINGS AND MACHINE PASSES

Stockpasses, landowner accesses, wildlife crossings, and machine passes provide a safe passage of livestock, wildlife or farm machinery from one side of the highway to the other side by means of an underpass.

A stockpass usually consists of a standard box culvert at least 6 feet wide and 7 feet high; an 84-inch culvert; or a 5'-10" x 7'-8" structural plate arch culvert. The stockpass allows livestock to move beneath the roadway for grazing or transporting. In addition, wildlife movement for mid and large size animals may benefit from the placement of a stockpass or wildlife undercrossing. The Region's Environmental Program Manager should be consulted for proper sizing of structures to accommodate wildlife in the area. A machine pass should be large enough for the expected farm machinery or vehicles that will use the underpass.

Economic justification should be determined for all proposed stockpasses. Property appraisals should be obtained both with and without the proposed structures. All federal aid projects require stockpass justifications when stockpasses are constructed on the project. The designer should determine if the required stockpass facility could be consolidated with a drainage culvert or bridge, if these features exist on the project. It is desirable to extend the required structure outside of the clear zone to eliminate the need for guardrail.

The Resident Engineer is responsible for justifying the need for stockpasses, wildlife crossings and machine passes in the Design Scoping Review, and for providing all necessary support data.

Justification data should include:

1. Number of livestock that would use the stockpass.
2. Frequency of crossing by the livestock or machinery.
3. Whether the stockpass or machine pass will also be used for drainage.
4. If a stockpass or machine pass were not provided, would a large drainage structure still be required.
5. The cost of the stockpass, owner access, wildlife crossing, or machine pass, excluding savings on eliminating or reducing the drainage structure.
6. Type of wildlife crossing the roadways.

**Additional References:**

1. CDOT *Roadway Design Guide*
2. CDOT *Drainage Design Manual*
3. CDOT *M & S Standard Plans*
4. Report No. CDOT-DTD-UCD-2003-9 *Identifying the Best Locations along Highways to Provide Safe Crossing Opportunities for Wildlife*

# 8.10 EXPERIMENTAL ITEMS

This section provides guidelines for the use of experimental features on CDOT construction projects. An experimental item is a method, material, or practice that is not a CDOT or an industry standard. A minor change to adapt specifications to a single project is not considered an experimental feature.

An experimental feature must have preliminary approval by a Program Engineer, the Research Engineer, or a technical committee. The experimental feature must be monitored after construction and reports made to a technical committee for a decision on future use.

The Resident Engineer must confirm that the requirements of *CDOT Procedural Directive 1401.1, Product Evaluation and Experimental Features,* are met before an experimental feature is incorporated into a CDOT construction project.

A proposed experimental feature is documented by a statement of purpose, the specifications affected, a description of the field monitoring to be conducted, and the extent of use (number and size of projects). After the experimental feature is constructed and monitored, the results and recommendations are reported to the appropriate technical committee. Documentation responsibility is outlined in *Procedural Directive 1401.1*.

The Department of Transportation Development, Research Branch, must review proprietary items used as an experimental feature, for research, or as a distinctive type of construction in the highway process.

Refer to *Procedural Directive 1401.1* for details on this process.

**Additional References:**

1. 23 CFR Part 635D, General Material Requirements
2. Propriety Items (see Section 2.24 of this manual)

# 8.11 DISPOSAL OF EXCESS MATERIAL OFF PROJECT SITE

Usually soil and aggregate materials developed on a construction project should be used during construction or placed within the project boundaries. The intent is to provide an efficient use of the material and avoid excessive hauls. This can allow the Contractor to best determine use of the material.

Whenever a project has provisions for a mandatory site for the disposal of excess material off the project right of way or beyond a reasonable distance from the project limits, a Finding in the Public Interest by the Department must be documented.

If the Department procures a disposal site for excess material, the Resident Engineer is responsible for obtaining an economical site, considering environmental impact. Whenever the Department mandates a disposal site, the Resident Engineer must assure there is adequate area or volume available to accommodate the disposal. If there is not, the disposal site should be selected by the Contractor. The Resident Engineer must also address erosion control requirements and any royalty fees imposed by the U.S. Government, when disposing of material from public lands. When the Contractor procures a disposal site, it will be his responsibility to obtain a site that will comply with all federal, state and local laws.

The mandatory disposal site designated by the Department will be documented by the Resident Engineer with a Finding-in-the-Public-Interest letter approved by the Program Engineer. The plans and agreements shall provide for any required restoration, erosion control features, and site improvements.

**Additional References:**

1. 23 CFR Part 635.407, Use of Materials Made Available by a Public Agency

# 8.12 MANDATORY SOURCE OF MATERIALS OR MATERIALS FURNISHED BY A PUBLIC AGENCY

Usually, contracts for highway projects specify that the Contractor furnishes all materials to be incorporated in the work.

When it is in the public's interest, CDOT can require the Contractor to use material furnished by CDOT or a public agency or obtained from sources designated by the public agency.

Materials can be natural materials from local sources, such as borrow or aggregates used for roadway construction, or any material purchased by the Department and furnished to the Contractor for mandatory use on the project.

To be eligible for federal participation costs, any material, other than local natural materials made available by a public agency, must be acquired by a competitive bidding process (23 CFR Part 635.407 explains natural materials).

Material furnished by a public agency for a construction project shall meet the specification requirements on the project. Material furnished that has a monetary value to the project must be approved as being in the public interest. If the project has CDOT oversight, use of such materials must be approved by the Department, and if Federal oversight, by FHWA.

When the Department or other public agency requires the Contractor to use material furnished to them, the Resident Engineer is responsible for preparing a Finding in the Public Interest justifying the use of this mandatory source, and for monitoring, inspecting, and approving the public agency's material sources.

The Resident Engineer is responsible for assuring that the use of public agency furnished materials follows the rules and regulations applicable to such use (see 23 CFR Part 635 B&D). A Finding-in-the-Public-Interest letter documenting the cost effectiveness, specifications, location, and reasons that the material furnished to the project is in the best interest of the public shall be placed in the project file.

Requirements for creating a mandatory source of materials are:

1. Natural materials (borrow/embankment) must be based on environmental considerations and meet specifications.
2. The location and unit prices of natural material must be stated on the plans or in the special provisions.

3. Materials other than natural material must have been acquired on the basis of competitive bidding and must be listed in the special provisions of the project for the benefit of all prospective bidders.
4. Federal participation will be limited to the unit cost of such material to the Department.
5. The Contractor must use the designated source of materials to be eligible for federal participation.
6. All costs of material shall be reviewed and approved by the Engineering Estimates and Market Analysis Unit.

FHWA Contract Administration Core Curriculum Participant's Manual and Reference Guide offers the following:

*Current FHWA policy requires that the contractor must furnish all materials to be incorporated in the work, and the contractor shall be permitted to select the sources from which the materials are to be obtained. Exceptions to this requirement may be made when there is a definite finding, by the STA and concurred in by the Division Administrator, that it is in the public interest to require the contractor to use materials furnished by the STA or from sources designated by the STA. The exception policy can best be understood by separating State-furnished materials into the categories of manufactured materials and local natural materials.*

*Manufactured Materials. When the use of State-furnished manufactured materials is approved based on a public interest finding, such use must be made mandatory. The optional use of State-furnished manufactured materials is in violation of our policy prohibiting public agencies from competing with private firms. Manufactured materials to be furnished by the State must be acquired through competitive bidding, unless there is a public interest finding for another method, and concurred in by the Division Administrator.*

*Local Natural Materials. When the STA owns or controls a local natural materials source such as a borrow pit or a stockpile of salvaged pavement material, etc., the materials may be designated for either optional or mandatory use; however, mandatory use will require a public interest finding and the Division Administrator's concurrence.*
*In order to permit prospective bidders to properly prepare their bids, the location, cost, and any conditions to be met for obtaining materials that are made available to the contractor shall be stated in the bidding documents.*

*Summarizing FHWA policy for the mandatory use of borrow or disposal sites:*

1. *Mandatory use of either requires a public interest finding and the Division Administrator's concurrence,*
2. *mandatory use of either may be based on environmental consideration where the environment will be substantially enhanced without excessive additional cost, and*
3. *where the use is based on environmental considerations, the discussion in the environmental document may be used as the basis for public interest finding.*

*Factors to justify a public interest finding should include such items as cost effectiveness, system integrity, and local shortages of material.*

When an agency is recovering reimbursement of cost, it is important to follow the force account construction method procedures in Section 1.11. The following items are preparatory to documenting the use of public agency material, including state furnished materials:

1. A letter of intent from the entity requesting a Finding in the Public Interest to purchase materials or equipment through its own bidding procedures, if applicable.
2. A submittal of a price or cost proposal for the items.
3. A technical and audit evaluation by the Engineering Estimates and Market Analysis Unit for cost effectiveness.
4. A Form 895, Force Account Construction Method - Finding in the Public Interest, certifying the entity's qualifications with concurrence by the Region Program Engineer.
5. A Notice to Proceed issued by Agreements in the Contracts and Markets Analysis Branch and administered by the Resident Engineer, if reimbursement is applicable and only when executed in a proper and timely manner prior to purchase of the material.

The Region will notify the agency with clearance to proceed with "advance purchase of materials," if appropriate.

Force account construction method is defined in Section 1.11.

**Additional References:**

1. 23 CFR Part 635D, General Material Requirements
2. FHWA Contract Administration Core Curriculum Participant's Manual and Reference Guide 2006
   http://www.fhwa.dot.gov/programadmin/contracts/coretoc.cfm
3. 23 CFR Part 635B, Force Account Construction
4. 23 USC 112, Letting of Contracts
5. Traffic Data (See Section 4.01 of this manual)

## 8.13 Context Sensitive Solutions

Incorporate *Context Sensitive Solutions* (CSS) into your design processes. CSS is a project development approach in which designers recognize and evaluate the affected community's values and objectives in relation to the design of the project. These community values may be scenic, aesthetic, historic, environmental, etc. in nature.

Key elements of CSS (from NCHRP Report 480):

1. The project satisfies the purpose and needs as agreed to by a full range of stakeholders. This agreement is forged in the earliest phase of the project and amended as warranted as the project develops.
2. The project is a safe facility both for the use and the community.
3. The project is in harmony with the community and preserves environmental, scenic, aesthetic, historic, and natural resource values of the area.
4. The project exceeds the expectations of both the designers and stakeholders and achieves a level of excellence in people's minds.
5. The project involves efficient and effective use of resources (such as time, budget, and community) of all involved parties.
6. The project is designed and built with minimal disruption to the community.
7. The project is seen as having added lasting value to the community.

CDOT's design professionals determine which design solutions best fit, given the site's condition and context.

**Additional References:**

1. National Cooperative Highway Research Program (NCHRP) Report 480

# 8.14 PROVIDING SUPPLEMENTAL DATA TO CONTRACTORS

On 3D designed projects, CDOT provides supplemental 3D data to Contractors for information only at Project Advertisement. Referencing Transportation Research Board (TRB) Report SPR 1680 prepared for the Michigan Department of Transportation, CDOT has determined that the overall benefit of the statewide policy of providing 3D data at Project Advertisement for information only and not part of the Contract outweigh the risks to the Department. The central benefit of this practice as documented in SPR 1680 is the reduction of bid prices stemming from all bidders being supplied with better bidding information.

When Contractors are not supplied with available 3D data, they often allocate significant resources towards recreating a 3D project model based off cross sections either before Award for bidding or after to facilitate construction. After using designer data to more efficiently create their own 3D model, Contractors gain efficiencies during construction through reduced staking by loading the data directly to an automated machine or into a machine operator.

CDOT has deep experience with 3D modeling and determining which projects are good candidates for 3D modeling. As a result, the Resident Engineer or Project Manager will continue to determine which projects are good candidates for 3D design. Electronic information beyond the Contract package is not expected to be provided to Contractors on projects that are not deemed as good candidates for 3D modeling by CDOT staff.

To provide additional information about the 3D data being provided when it is available and make clear that the supplemental 3D data is not part of the Contract, CDOT staff is to include project special provision worksheet 102ppod or Revision of Section 102 - Project Plans and Other Data.

For file distribution, it is recommended that Project Staff place the supplemental files in a central location like Google Drive in lieu of attempting to distribute flash or hard drives to all bidders. To streamline file distribution, project staff may create a PDF for posting to B2G with the drive link or download instructions if staff decide to use an FTP site rather than Google Drive.

### 8.14.1 DESIGN CONSIDERATIONS

1. 3D Modeling Quality Assurance:

   The Quality Assurance (QA) of 3D models is critical just as QA is with all other elements of design. CDOT is developing the suggested QA procedure specific to OpenRoads Designer (ORD) projects. Once complete, this procedure will be posted at:

   https://www.codot.gov/business/designsupport/cadd

2. Data Density for 3D Engineered Models

   Template Drop Intervals:

   a. Everywhere along the alignment (Except complex design areas) - 10-foot intervals,
   b. Complex design areas (Intersections, etc.) – one-foot intervals,
   c. Additional template drops should occur at:
      i. Event Points defined in the horizontal alignment.
      ii. External Control Points - (Point Control, location where multiple corridors interact, locations where the proposed alignment tie with the existing alignment, Parametric Constraints, template transition, superelevation transition stations, and End Condition Exception).

3. Electronic Deliverables:

   a. Project Alignments
      i. LandXML file generated of all Proposed Geometry, including proposed Horizontal & Vertical geometry.

   b. Surfaces – LandXML files of the following:
      i. Existing Terrain Model – Triangles Only
      ii. Finished Grade Terrain Model – Both Triangles and Features
      iii. Subgrade Terrain Models – Both Triangles and Features

c. DGN files:
   i. 3D Components of the Project Design Model
   ii. ROW
   iii. Topo
   iv. Additional files include – Discipline Design Files
   v. Other Files – As needed per project

4. File Naming Convention:
   LandXML Files

   a. Alignments – JPC#_Alignments.xml
   b. Surfaces:
      i. JPC#_Existing Ground.xml
      ii. JPC#_Finished Grade.xml
      iii. JPC#_Subgrade_Alignment Name.xml

   CADD Drawing Files

   c. DGN files:
      i. 3D Components - JPC#RDWY_3DModel_Components.dgn
      ii. Topo – JPC#SURV_Topo.dgn
      iii. ROW – JPC#ROW_Design.dgn

   d. Additional files include – Discipline Design Files:
      i. Roadway:
         - Roadway Design - JPC#RDWY_Design.dgn
         - Alignments – JPC#RDWY_Alignments_GEO.dgn
         - Stationing – JPC#RDWY_Stationing.dgn
         - Cross Sections – JPC#RDWY_Design_XSEC.dgn
      ii. Drainage – *JPC*#HYDR_Design.dgn
      iii. Bridge – *JPC*#BRDG_Design.dgn
      iv. Utilities – *JPC*#UTIL_Design.dgn
      v. Striping – *JPC*#TRAF_Striping.dgn
      vi. Other Files – As needed per project