MEMORANDUM

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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.

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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

1.00 Form 1048, Project Scoping/Clearance Record

Form 1048, Project Scoping/Clearance Record comprises a review list that can be used to document the design scoping process, to monitor status toward PS&E approval, and to sign-off on final clearances prior to advertisement of a project. See Section 2.01 for a more detailed discussion of Form 1048.

See previous section labeled “Form 1048” for a recent version of the form. If changes have been made, the current version of Form 1048 is found at:

http://www.coloradodot.info/library/forms/word-forms/cdot1048.doc/view

1.01 STATEWIDE TRANSPORTATION IMPROVEMENT PROGRAM

Federal Regulations require that State Transportation Departments develop a Statewide Transportation Improvement Program (STIP). The STIP contains capital and non-capital transportation projects proposed for funding under Title 23 (highways) and Title 49 (transit) of the U.S. Code as well as all regionally significant transportation projects that require an action by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA).

In July 2012, the President signed Moving Ahead for Progress in the 21st Century (MAP-21). The STIP is developed under current federal regulations (23 USC).. Currently, the development of a new STIP is required at least every four years and must contain a minimum four-year listing of Federal-Aid Projects. The STIP must be approved by the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA). At the Transportation Commission's direction, Colorado develops a STIP which includes six years of projects. The current STIP covers FY2012–FY2017. However, this current STIP expires June 30, 2015.

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

1.01.01 Project Planning & Budget Process

SAP is an Enterprise Resource Planning (ERP) system that CDOT installed in 2006. A German company, SAP is an acronym for "Systems, Applications and Products in Data Processing." SAP is the financial system of record for CDOT, and provides information through interfaces to other state of Colorado systems including the Colorado Financial Reporting System (COFRS) and the Colorado Personnel and Payroll System (CPPS). Some of the 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 STIP, Annual Budget, 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 of 20 years. 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 USC.

Once a project is consistent with the visions, goals, and strategies of the Statewide Plan, it can be included in the STIP. Projects in the STIP are linked to specific to Plan corridors or pools. Projects are included in the STIP based on priorities determined by the CDOT Regions and Transportation Planning Regions.

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

1.01.02 Developing the STIP

Development and ongoing maintenance of the STIP is managed by staff in the Office of Financial Management and Budget at CDOT Headquarters. OFMB works 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 the STIP. CDOT budget categories and strategies must also be selected for each STIP project. The connection is made in the projects' master data in 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. This process sets forth the parameters for ensuring an open public process for including projects in the STIP. Region Planners work with planning partners in the TPRs 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 TPRs 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 into SAP and included in the draft STIP document. Fiscal constraint is verified by OFMB prior to requesting the Transportation Commission 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 FHWA and FTA for final approval.

Below is a summary of the development schedule.

June – September	4P meetings
October – November	Joint TPR meetings
December - February	CDOT Regions submit projects for the draft STIP
March	Draft STIP released by TC for public review and comment Notice of public hearing sent out
April	STAC discussion of draft STIP Public hearing for draft STIP
May	Transportation Commission adopts and FHWA/FTA approves STIP
July 1	New STIP effective

1.01.03 STIP Projects

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

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.

Below are samples of both Regionally Significant projects (Figure 1-1) and STIP Pools (Figure 1-2).

CDOT Region	STIP ID	STIP ID Description	STIP WBS D	STIP WBS Description	Funding Program	Fund Source	Fund Type	STIP Phase	2012 Current	2013 Current	2013 Rolled	2014 Current	2015 Current	2016 Current
01	SCF6747	US 285: Deer Creek Interchange	SCF6747.99	US 285: Deer Creek Interchange	Regional Priority Program	S	SHF	C	1	0	0	0	0	0
	SCF7004	Forest Highway (Guanella Pass) PFH 80-1(3) & 2(5)	SCF7004.99	Forest Highway (Guanella Pass) PFH 80-1 (3) & 2(5)	Federal Lands	F	FL	C	21,000	1,000	0	0	0	0
	SDN4999	SH 119: Main Street-South Widening (Black Hawk)	SDN4999.99	SH 119: Main Street-South Widening (Black Hawk)	Discretionary	F	STA	C	2,200	0	0	0	0	0
					Gaming	L	L	C	86	0	0	0	0	0
						M	GAME	C	44	0	0	0	0	0
					Regional Priority Program	L	L	C	2,200	0	0	0	0	0
						S	SHF	C	48	0	0	0	0	0

Figure 1-1
Regionally Significant Project

STIP ID	STIP ID Description	STIP WBS ID	STIP WBS Description	Funding Program	Fund Source	Fund Type	STIP Phase	2012 Current	2013 Current	2013 Rolled	2014 Current	2015 Current	2016 Current
		SR15098.030	US385: Cheyenne Wells Sidewalk & Lardscaping Improvements	Enhancement	F	STE	C	0	0	0	289	0	0
					L	L	C	0	0	0	72	0	0
SR15193	R1 Regionwide TSM-RPP Pool	SR15193.003	Regionwide Safety/TSM HES PE Pool	Regional Priority Program	S	SHF	D	250	250	0	0	0	0
SR15215	R1 Surface Treatment Program Pool	SR15215.000	R1 Surface Treatment Program Pool	Surface Treatment	F	STA	C	2,803	5,037	0	5,248	18,683	28,264
					S	SHF	C	583	1,047	0	1,091	3,884	5,875
		SR15215.001	I-70 West: Eisenhower-Johnson Memorial Tunels Resurfacing	Surface Treatment	F	SHF	C	0	0	0	2,070	0	0
					S	STA	C	0	0	0	430	0	0
		SR15215.019	PE & Design Pool (Non-DRCOG Area)	Surface Treatment	F	STA	D	304	510	0	600	0	0
					S	SHF	D	63	106	0	125	0	0
		SR15215.020	PE & Design Pool (DRCOG Area)	Surface Treatment	F	SHF	D	607	401	0	331	0	0
					S	SHF	D	126	83	0	69	0	0
		SR15215.022	I-70 East: Tower Road to Colfax Avenue	FASTER - Safety Projects	S	FAS	C	3,900	0	0	0	0	0
				Regional Priority Program	S	SHF	D	0	350	0	0	0	0
				Surface Treatment	F	STA	C	4,967	0	0	0	0	0
					S	SHF	C	1,033	0	0	0	0	0
		SR15215.027	SH71: North of Limon-North	Surface Treatment	F	STA	C	9,138	0	0	0	0	0
					S	SHF	C	1,899	0	0	0	0	0
				Unobligated	F	NHD	C	1,009	0	0	0	0	0
					S	SHF	C	157	0	0	0	0	0
		SR15215.043	I-25 South: El Paso County Line-North PM Treatment	Surface Treatment	F	SHF	C	2,484	0	0	0	0	0
					S	STA	C	516	0	0	0	0	0

Figure 1-2
STIP Pool Project

1.01.04 Fiscal Constraint

The STIP must be fiscally constrained in order to be approved by FHWA and FTA. 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 is determined in SAP. Funding Program amounts are determined through Resource Allocation. These amounts are loaded and stored in Budget Pools in the FM Module after Resource Allocation is adopted. 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 STIP into other projects. Budget actions must also be constrained to both the STIP and Regional Pool. Within a STIP Pool, a STIP 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 BEx (Business Explorer software). Region Planners and Business Office staff may be able to assist you if you have trouble finding or using this report.

1.01.05 STIP Amendments

Once the STIP is adopted, it can be amended as needed. There are three types of STIP changes – Policy, Administrative, and TIP amendments. Amendments are submitted by the CDOT Region Planners and approved through OFMB.

1.01.05.01 CDOT Policy Amendments

Policy amendments must go through a 30 day public involvement process and then be approved by the Transportation Commission. OFMB oversees the process for public comment as well as submits pending policy amendments to the Commission for approval each month. After the Commission approves these amendments, they are forwarded to FHWA and FTA for concurrence. The following excerpt from the *CDOT Process for Public Involvement and Approval of TIP/STIP Policy Amendments and Administrative Actions* details items which may trigger the need for a policy amendment:

1. Adding projects to, or deleting projects from, the STIP pools for the following Funding Programs:
   a. 7th Pot – all amendments need to be policy (not currently in pools)
   b. Earmarks – all amendments need to be policy
   c. Bridge On System
      i. Any new project totaling $2.5M or more is a policy amendment
      ii. Any funds added to an existing project that makes the total $2.5M or more is a policy amendment
   d. RPP
      i. Any new project totaling $2.5M or more is a policy amendment
      ii. Any funds added to an existing project that makes the total $2.5M or more is a policy amendment
   e. Faster Safety
      i. Any new project totaling $2.5M or more is a policy amendment
      ii. Any funds added to an existing project that makes the total $2.5M or more is a policy amendment

The following details apply to the programs listed above:

The $2.5M threshold would be the total of the project cost in the six STIP years; any amendment that will bring a project's total cost to $2.5M or more will be considered a policy amendment at that time.

1.01.05.02 CDOT Administrative Actions

Administrative Actions are minor changes to STIP projects that do not fall under any of the Policy Amendment requirements. These amendments may be processed without Commission or FHWA and FTA approval. Public review and comment is not required and these changes are effective in one business day.

1.01.05.03 TIP Amendments

Metropolitan Planning Organizations (MPOs) must follow separate federal regulations to develop and amend their TIPs. Once an 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 CDOT Executive Director to approve TIP amendments (the Governor still approves new TIPs). TIP amendments are incorporated into the STIP administratively once approved by the Governor, or his delegate. However, TIP amendments may take up to four months to be completed by the MPO, depending upon each MPO's individual process.

In summary, amendments fall into the following timeline depending on the type of amendment.

1. Administrative Amendments
   a. Overnight process
2. Policy Amendments
   a. Up to 60 day process requiring TC approval
3. TIP Amendments
   a. Up to 4 months depending on MPO processes
   b. Overnight once approved by CDOT Executive Director

1.01.06 STIP Reports

There are several STIP reports available for your use. The most common reports are the Daily STIP Report and the Reconciliation Report.

1.01.06.01 Daily STIP Report

The Daily STIP Report details the funding for all STIP projects in the current STIP. The report itself is a derivative of an Excel spreadsheet providing project basics. It shows the STIP number, the project description, the fund source, and the amount of funding by fiscal year. Since the STIP can be amended on a daily basis, this report reflects the STIP by providing current STIP information on a day-to-day basis. The report is sorted by 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. Two versions of the Daily STIP report are posted daily on the external CDOT website at http://www.coloradodot.info/business/budget

1.01.06.02 STIP Reconciliation Report

The purpose of the STIP Reconciliation Report is to show that the 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 the 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.

Also, the STIP Weekly Reconciliation Report provided to FHWA only shows the current and future years of the STIP that require fiscal constraint (the first four years of the STIP), and excludes programs that are not constrained, such as transit. The Reconciliation report is sorted by CDOT Region, Funding Program, Fiscal Year, and STIP number.

1.01.06.03 Access to Reports

The Daily STIP report may be found online at http://www.coloradodot.info/business/budget. The Reconciliation report may be found in CAR via the SAP Portal on the internal website. Region Planners and OFMB STIP Managers can help you if you need assistance in accessing this or other reports.

1.01.07 STIP Resources

OFMB manages the STIP and provides guidance to the Regions regarding STIP development and amendments. If you need assistance with the STIP, please call 303-757-9262.

1.01.08 Additional References:

1. OFMB's "BPS Team Overview Training"
2. OFMB Policy and Procedure Manual - http://intranet.dot.state.co.us/business/ofmb/other/current/ofmb-policy-manual-4-11/view
3. Statewide Long-Range Plan Guidebook
4. On-line Budgeting class through TETP http://intranet.dot.state.co.us/employees/Training/tetp

1.02 ESTIMATED INITIAL PROJECT COST AND SCHEDULE

Estimates need to be made for the total cost of a project for implementation into the Statewide Transportation Improvement Program (STIP), for the Design Scoping Review and later for Field Inspection Review, Final Office Review, and through the engineer's final estimate for bid. This section will address the initial budgeting effort.

1.02.01 Budgeting Basics:

1.02.01.01 Work-Hour Estimate:

This estimate details the personnel work-hours projected to complete the project activities reflected in the project schedule. When labor rates are applied, the Work-Hour Estimate represents a significant portion of the Project Estimate. The Work-Hour estimate is required on all projects prior to the obligation of project funds. On projects with consultant contracts, the Work-Hour Estimate along with the Scope of Work should serve as the basis for the negotiation of final work-hours.

1.02.01.02 Project Estimate:

The Project Estimate is the summary of total costs for a project. This is broken out into Phases identified as ROW, Utilities, Design, Environmental and Miscellaneous (RUDEM) phases (see below). Additionally, the Project Estimate will include projected costs for Construction of the project. At initial budgeting the construction budget may not be relevant. The ROW and utility phases may not be able to be estimated until after the FIR plan level.

1.02.01.03 Indirects:

A brief discussion of how the CE and indirect charges work at CDOT is shown in the text box below.

How Construction Engineering and Indirects are used at CDOT

The current CDOT rate for the CE pool is 10.0%, which on a CDOT CE POOL project covers the Salary and Benefits of CDOT personnel and/or consultant task orders who charge directly to the project. The indirect rate of 90.0% is then added to the costs to cover the costs of CDOT personnel time who do not

charge their time directly to the project.

That indirect rate for federally participating projects is broken out further to **74.51% Participating Indirects** (the FHWA will pay this percentage) and **15.49% non-participating indirects** (FHWA does not pay these costs) which totals to the 90.0%. The indirect rate for non-participating projects is still 90.0%. The logic is the total indirect amount required does not change based on whether the project is participating and non-participating.

The 10.0% for Salary and benefits (or consultant task orders) for construction oversight plus 90.0% indirects is how we get to the typical rate of 19.0% for the total CE charges.

10.0% Construction engineering+(10.0%*90.0%) indirects = 19.0% total CE charges.

Example:

For CE pool project, the CE amount used to cover CDOT's costs for construction engineering is based on how much is paid to the Contractor. If the Contractor gets paid $1,000,000 for his work that month, CDOT would draw from the project the following amount to cover our costs:

1. $100,000.00 for the Direct Personnel charges to the project (10.0% of $1,000,000)
2. $90,000.00 for the Indirect Personnel costs (90.0% of $100,000)

For a Federally participating project the indirects would be broken up as follows:

1. $74,510.00 FHWA pays (74.51% of $100,000)
2. $15,490.00 CDOT pays (15.49% of $100,000)

This same approach needs to be used for CE POOL exempt projects but just on a project by project basis. For projects with all CDOT personnel the rate will probably be less than 23.95%. If it is all consultant, the rate will be higher than 24%.

See Region Business manager for current rates.

1.02.02 Timesheet Reports:

There are time sheet reports now available to see the salary, benefits, and indirects that are charged to the pre-construction phase of projects since June 1, 2008. These will help with future estimating for preconstruction phases and for tracking monthly charges against a project. The time sheet reports are available through the Portal (not SAP) and there are work instructions available for these reports in the portal.

1.02.03 Budgeting Phases

Budgeting is no longer on a project basis but is done by Project Phases. STIPs and budgeting in SAP are done by Phases. Guidance as to what charges should be considered in these phases are as follows. These are identified in 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.

ROW (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.

CDOT staff charges or consultant task order charges are generally not included in this phase but are accounted 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.

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.

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 and Utilities).

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

CDOT staff or consultant task order charges are generally not included in this phase but are accounted 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.

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.

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

Any design support needed during construction should be charged under the Construction Engineering Cost Center and not the design phase.

For Local Agency projects, this will only include the design work that will be included in the Intergovernmental Agreement (IGA) with the Local. It will exclude any CDOT salary charges.

Environmental (WBS – XXXXX.10.40)

This phase is set up for CDOT staff (Resident Engineer) and consultant charges on major Environmental document charges such as Environmental Assessments (EA) and Environmental Impact Statements (EIS).

The intent is for this phase is to not include any charges required for CDOT projects that are Categorical exclusion and will not include CDOT environmental staff review. In most regions the CDOT environmental staff time is charged to their cost center.

Miscellaneous (WBS – XXXXX.10.50)

This phase is to be used at the discretion of the Region.

Construction (WBS – XXXXX.20.10)

Construction estimate should include the cost of the bid items, force account and the current CE and indirect rates. Check with your business office on the current rates.

CDOT staff or consultant task order charges should not be accounted for here unless it is a CE exempt project such as a FASTER Bridge (Bridge Enterprise) project.

Construction Statistical (WBS – XXXXX.20.20)

There is no funding required for this or budget. This is for tracking charges in the CE cost accumulation center on time sheets only.

1.02.04 Pre-project Budgeting:

Before a project can be budgeted, a good schedule 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. In order to accomplish this in a proficient and satisfactory manner, the following tasks must be completed:

Preliminary project scoping activities for a given fiscal year if possible should be conducted prior to May 1st of each prior fiscal year. This allows for budgets and ad dates to be entered into the system by May 1st and better estimated ad dates for the Chief Engineer's objectives.

Region scoping pools will be established by each Region. In order to address costs associated with these pre-budget activities, each Region has scoping pools set up. Current scoping pools are cost centers and are R#PSP-010 so for example R1 is R1PSP-010, R2 is R2PSP-010, etc...

The Resident Engineer will create a draft baseline schedule that identifies key project milestones and related activities. Depending on the complexity of the project, the initial schedule may not be able to be accurately forecasted beyond the FIR phase of the project. The purpose of this schedule is to:

1. Identify 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.
2. Identify the need for CDOT and/or consultant personnel resources.
3. Identify activities that are critical in ensuring the timely achievement of project deadlines.

4. Identify associated dates with respect to the deliverables of other project specialty groups.
5. Identify specific deadlines from CDOT Management or Region work plans.
6. It must consider critical processes such as STIP/TIP/Long Range Plan amendments and project budgeting.
7. Identify specific milestones to allow Region management to easily track project progress.

As a minimum, project milestones will include the following (order may vary):

1. Completed Survey
2. Prelim. Horiz. and Vert. Alignments
3. Prelim. Hydraulic Information
4. Structure Selection Report
5. Field Inspection Review (FIR)
6. Form 128 Signature (Top Portion)
7. Final ROW Plans
8. Final Office Review (FOR)
9. Environmental Clearance
10. Right of Way Clearance
11. Utility Clearance
12. Final PS&E
13. Shelf Date
14. Advertisement Date

Additional milestones may be added, as needed, based on the complexity of individual projects. For projects involving consultants, the project schedule should include milestones and activities related to the contracting/task order process, i.e. SOW, SOI, RFP, Short List, Interviews, Consultant Selection and Notice to Proceed. Where applicable, the project schedule should also include appropriate milestones and activities related to the administration of IGAs.

The Resident Engineer will be responsible for the development of a preliminary work-hour estimate for the project. This work-hour estimate will be required on all projects, regardless of personnel involved (State or consultant) and shall represent reasonable work-hours needed to complete all project activities. On projects which involve consultant contracts, the work-hour estimates shall be done independently of any consultant-provided estimate and shall serve as a resource in work-hour negotiations.

The Resident Engineer will provide a copy of the baseline schedule and preliminary work-hour estimate to all internal specialty units at least two weeks prior to the project Scoping Review Meeting. The CDOT specialty unit manager will be notified by the RE of project scoping activities on all projects. For both in-house and consultant design projects, the CDOT specialty unit manager, or designee, will participate in the scoping activities when the project involves their discipline or when requested by the RE. The CDOT specialty unit manager will review the project in advance and prepare any information that may be needed for the scoping meeting, i.e. the structural engineer would review and present existing bridge information on projects involving structures.

The CDOT specialty unit manager will review the baseline 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.

1. The specialty unit manager 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.
2. The CDOT specialty unit manager will participate in the development of the consultant scope-of-work and write the portions pertaining to their discipline as needed or assigned by the RE/PM.
3. The specialty unit manager will provide review and comments to the RE/PM on the final draft of the consultant scope-of-work.

The CDOT specialty unit manager will provide the RE/PM with an independent work-hour estimate to accomplish the specialty project work. Critical assumptions on which the estimate is based will be included in the submittal. The specialty unit manager will attend work-hour negotiation meetings, or provide consultation, as requested by the RE/PM or Agreements on consultant design projects. Project schedule review comments and work-hour estimates may be prepared the CDOT specialty unit manager's designee, but will be reviewed and submitted to the RE/PM by the specialty unit manager.

The Resident Engineer will be responsible for coordinating the project Scoping Review Meeting. (Refer to Section 2.01 for specific details on the Scoping Review Meeting.) This meeting shall include representatives from all appropriate specialties. The purpose of this meeting will be to discuss the scope of the proposed project and to identify appropriate project Work Breakdown Structure (WBS) elements, work activities, durations and relationships, as well as to thoroughly assess the draft baseline schedule and preliminary work-hour estimate. The Resident Engineer and the other specialties

will consider current work load factors and future projects that may have an impact on their work activities and durations. Feedback obtained from the Scoping Review Meeting will be used by the Resident Engineer and accurately reflected in the draft baseline schedule and preliminary work-hour estimate.

The Resident Engineer will provide the revised draft baseline schedule and work-hour estimate to all key specialties (Bridge, ROW, Environmental, Traffic, Materials, etc.) for final resolution of any potential conflicts of logic or deliverables. Upon this review, any changes will be incorporated by the Resident Engineer.

A Region Management team (as a minimum, the Program Engineer, ROW Manager and Environmental Manager and Resident Engineer) will review and approve the draft baseline schedule and preliminary work-hour estimate, 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 Resident Engineer will make any necessary modifications to the draft baseline schedule and preliminary work-hour estimate. These modifications will be the last changes to either document. The RE/PM will save and refer to these files as the final baseline schedule and final work-hour estimate. These final documents shall not be altered at any time during the remainder of the project.

The Resident Engineer will develop a preliminary cost estimate 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). The phased estimates will include any respective consultant services for the project.

The CDOT specialty unit manager will participate in the development of the consultant scope of work and write the portions pertaining to their discipline as needed or assigned by the RE/PM. The specialty unit manager will provide review and comments to the RE on the final draft of the consultant scope-of-work. Alternatively, the specialty unit manager may provide the RE with a separate consultant scope of work and preliminary cost estimate for consultant services that the specialty unit manager may choose to directly contract for.

The CDOT Specialty Unit manager will provide the Resident Engineer with a cost estimate for each phase of the project, as appropriate, to accomplish the

specialty project work. Construction, right of way, and utility cost estimates will be rough at this phase of the project. The Specialty Unit managers will be responsible for updating these cost estimates and keeping the RE/PM informed of significant changes throughout the project design.

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

The Resident Engineer will provide the Initial Planned Ad date and project cost estimate to the RTD and Region Business office. This will be done by July 1 of each year for all planned projects. The Region Business Office will use this project information for entry into CDOT's business management system (SAP). These ad dates will be used for the Chief Engineer's objectives.

The Resident Engineer will develop a closure document that will include the baseline schedule and work-hour estimate, along with documented assumptions and risks associated with the project scope and schedule and any other relevant information used in developing the project schedule. This document will be kept in the project files with copies provided to the RTD, Program Engineer, and appropriate Specialty Unit managers. This may be done after scoping up to the FIR for complex projects.

1.02.05 Additional References:

1. CDOT Procedural Directive 512.1 – Project Scoping and the Design Scoping Review (DSR)
2. Estimate Review by Engineer Estimates and Market Analysis (see Section 2.27 of this manual).
3. OFMB Policy and Procedures Manual - http://intranet.dot.state.co.us/business/ofmb/other/current/ofmb-policy-manual-4-11/view

1.03 FUNDING SOURCES AND RESOURCE ALLOCATION

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.

Major sources of the Colorado Highway Users Tax Fund are the motor fuel taxes, drivers' license fees, and motor vehicle registration fees. The motor fuel taxes constitute approximately 75 percent of the fund.

CDOT prepares resource allocation projections that reflect revenues for a minimum of a 20-year period to match the timeframe of the Long-Range Transportation Plan.

1.03.01 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 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.

Financial constraint of the Statewide Transportation Improvement Program (STIP) works through the "highest use" concept. Projects are programmed in the STIP with the highest priority federal funding source that each project qualifies to use. The highest federal funding category is the Interstate, and the next highest federal funding category is the National Highway System. By funding each project with the highest funding source for which it qualifies, the Office of Finance, Management and Budget enables Regions to select projects based on need, not federal funding type.

The transaction in SAP that shows the funding priority for a project is ZF20. The Region business office determines the funding priority.

These ratios are entered in ZF20 in SAP but not everyone has access to this transaction. The Resident Engineer should work with the business office to enter data in Trns*port.

1.03.02 Resource Allocation

For state transportation purposes, the State of Colorado is divided into several different geographic regions. There are 11 Transportation Commission districts.

The Transportation Commission allocates the available revenues to the six CDOT Engineering Regions through the use of Investment Categories. These categories are:

1. Safety
2. Mobility
3. System Quality
4. Program Delivery
5. FASTER

All funds are allocated to the six CDOT Engineering Regions based on results of performance modeling or appropriate formula consistent with Transportation Commission decisions. Metro Planning has been allocated statewide based on the federal funding level. Enhancement funds were allocated to the six CDOT Engineering Regions based on a revenue distribution formula after a statewide allocation was made for program administration.

1.03.03 Special Funding Sources

From time to time the Transportation Commission establishes special funding sources, for example, the 7th Pot or contingency funds.

1.03.04 Program Implementation

Resource Allocation for the Statewide Long-Range Plan is implemented through the Long-Range Plan “control total” planning allocations approved by the Transportation Commission.

1.03.05 Additional References:

1. OFMB Policy and Procedures Manual - http://intranet.dot.state.co.us/business/ofmb/other/current/ofmb-policy-manual-4-11/view

1.04 PROJECT CREATION AND FINANCES

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

ZJ08 – Initiate Project Creation – PM
(ZJ08 Initiate Project Creation)
(http://vupweb.dot.state.co.us/gm/folder-1.11.29385?mode=EU&originalContext=1.11.30034)

SBWP – Complete Project Manager Tab – PM
(SBWP Complete CJ20N) (http://vupweb.dot.state.co.us/gm/folder-1.11.32630?mode=EU&originalContext=1.11.30034)

CJ20N – Enter GIS details in SAP Project Manager – PM
(GIS Project Limits) (http://vupweb.dot.state.co.us/gm/folder-1.11.29337?mode=EU&originalContext=1.11.30034)

CJ20N – Create Project Structure from Standard Template –
(Add Template) (http://vupweb.dot.state.co.us/gm/folder-1.11.29381?mode=EU&originalContext=1.11.30034)

FMMEASURE – Maintain Funded Program for Project
(FMMEASURE) (http://vupweb.dot.state.co.us/gm/folder-1.11.28338?mode=EU&originalContext=1.11.30034)

CJ20N Release Project (CJ20N) -
Release project (http://vupweb.dot.state.co.us/gm/folder-1.11.29333?mode=EU)

Use the link to SAPTraining for SAP checklists for full list of transactions and workflow steps. SAP checklists for project processes (http://vupweb.dot.state.co.us/gm/folder-1.11.33901?mode=EU).

1.04.01 Description

After a project has been scoped and is part of the current STIP, a project is ready to be created in SAP. Although one project usually covers all phases, sometimes it necessary to create multiple projects under one STIP number. For example, the Resident Engineer may create a project for design and a separate project for construction. The Resident Engineer should confer with the Business Office to ascertain if there will be any benefits or deterrents to fragmenting the STIP line item into more than one project.

The Resident Engineer begins the process in SAP with Transaction Code ZJ08. ZJ08 starts a workflow that is routed to 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. SAP Checklists provided in SAP training website show the participants and order for the SAP workflow.

KEY ITEMS TO KNOW FOR PROJECT CREATION - These fields combined, are the project information sent to FHWA via the Financial Management Information System (FMIS) and so it is key to have it as accurate as possible.

PROJECT DESCRIPTION (NAME) – ZJ08

The project name will be based on the information supplied with the request for the project using SAP transaction code – ZJ08. The information should be as descriptive as possible using state roads or federal highways and cities or counties.

PROJECT DESIGNATORS (General Location) – ZJ08

The Project Designators is 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. Example project number 0504-055 is on Highway 50 segment 4 (between La Junta and Kansas) and is the 55th project on this segment.

PROJECT PRE-FIX

The business manager will designate the Project Pre-fix 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 is Interstate Maintenance, FBR is Faster Bridge project, NH is National Highway.

OTHER PROJECT CREATION INFORMATION (fields with a check mark are required)

1. Region Code – Select the Region overseeing the project. For projects not created in the Region, select Statewide (ST). Do not select HQ.
2. Federal System Code:
   - I – Interstate
   - N – NHS Non Interstate
   - O – Other Federal Aid Highway
   - X – For conversion purposes (do not use)
   - Z – Not on any federal aid highway (local agency off system projects for example)
3. Advertised By:

   None – The project is design only or a study and will not go to Ad

State – This is a project advertised by CDOT and will go to ad. If you choose this option, the business manager must enter an ad date into SAP.

Local – This is a project that is advertised by a Local Agency (not CDOT).

If None is chosen above, a reason must be given from the pull down menu.

4. Federal Improvement Code

   Choose an option that best corresponds with the majority of funding or work. For example, if the project is mainly bridge funds then select "bridge replacement (either added capacity or no added capacity)." FHWA will review the code to make sure the work is in line with the funding.

5. State Improvement Code

   The selection here should be similar to the Federal Improvement code based on the funding available.

6. Oversight Designator

   A – CDOT administered – This is the majority of the projects.

   N – Full FHWA (NHS) The Resident Engineer is responsible for determining whether the project is under CDOT or FHWA oversight. The oversight responsibilities are outlined in the Stewardship Agreement between the FHWA Colorado Division and CDOT. Unless the STA/FHWA agreement differs, full FHWA involvement projects will tend to be new construction or reconstruction projects on Interstate routes with an estimated value greater than $1 million. The Resident Engineer can contact the FHWA for further guidance.

   O- Other – This is almost never used. FHWA will indicated if it is needed.

   X- Full FHWA (Non-NHS) – This is rarely used. FHWA will indicate if it is needed.

7. Construction Engineering by:

   C- Cons/Contr – This is a unique situation. Only use if told to do so.

   L- Local – Construction oversight by Local Agency.

   O- Other – Only use if instructed to use for special reasons.

   S- State - This is standard for CDOT projects.

   X- For conversion purposes – Do not select

8. Geographic Location, Terrain Type, Proposal of Work.
   a. For the Geographic Location be as precise as possible (similar to, if not exactly the name of the project) by naming the Federal or State road and the city or county (i.e. – CR 520/CR 616 on SH 69 in Huerfano County).
   b. For terrain type the options are: Level, Mountainous, Plains, Rolling or Urban.
   c. For Proposal of Work list the major activity to be completed (e.g. – Intersection Design, Drainage improvements, Surface Treatment or Safety improvements).

9. % construction complete – this is usually zero

10. Remark or Comments – Add more information here if needed.

11. PROJECT PERSONNEL

   a. This information is key if someone needs to contact appropriate party during any of the project development process.
   b. The people entered are tied to their organization code and are what is used when 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 are 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 in-charge of the project.

12. 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 OFF SYSTEM.

13. CONTRACT DELIVERY METHOD

    a. Design-bid-build is our traditional method for projects.
    b. Other options – Refer to Innovating contracting manual.

14. PLANNED LENGTH AND PLANNED UNIT:

    are not tied to the information given in OTIS at this time. Make sure the Planned Length entered matches the mileposts in OTIS. This information goes into Form 463.

15. INNOVATIVE CONTRACTING METHODS

    Check all that may apply to your project. Update as needed as project develops. Refer to Innovative Contracting manual as needed.

16. LOCATION DETAILS

    a. Exit SAP and go into OTIS to enter this information
    b. Route, beginning and ending reference points, lane quantity, facility type, functional type, and population.DTD has this information for highways on CDOT's Intranet in Data Access – Transportation Data Set and OTIS.
    c. SAP will carry the project location information to other forms such as Form 463, FMIS, ProjectWise project description, and ZJ40 Project Tracker.

17. RAILROAD DESIGNATOR CODE –

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

18. County Details, Congressional Districts, Structure ID Details, MPO's, TRP;s, and Commission Districts, and TIP information –

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

19. Other fields such as "Completed construction date" are not required at project creation and can be ignored.

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. 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 prior to July 1st 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 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 RTD has concurred with the necessity to change. Changes to the Current Planned Ad date are entered into SAP by the Region Business Manager.
3. Scheduled Ad date.

   This is the date that goes into the Go Sheet.

   This 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 Resident Engineer 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 Resident Engineer 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.

1.04.02 Budgeting and Obligation

Once a template is added to the project in SAP, the Resident Engineer can notify the business office that the project is ready to be budgeted. See Section 1.02 for estimations for the Preconstruction Phases for a project.

1.04.02.01 Background:

Federal-aid highway funds are authorized by Congress to assist the States 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 as outlined below and as a practical matter, at present, CDOT requires all highway projects it constructs to also 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 pot holes do not meet these criteria

1.04.02.02 Definitions:

NCAT: NCAT prevents time/labor charges from hitting the phase, at time sheet entry. The Region Business Office will need to unset NCAT to allow labor 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) 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.

> Pre-Construction Phase encumbrances are generally for 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) encumber funds for all phases for the Local Agency on Local Agency projects.

1.04.03 Obligation:

Obligation is the same as authorization. It ensures that FHWA has agreed that CDOT can spend the funds identified for the project. Charges cannot be made against a phase until the funds are obligated. 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.

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 (ROW, Utility, Design, Environmental, Construction, Miscellaneous, etc.) and provider (i.e. 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. 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, CDOT Regions and the Metropolitan Planning Organizations (MPOs) are allotted funds to spend on actual projects by sub-category. 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 and/or local highway funds, are applied in a suitable mix based on estimates from the Resident Engineer.

Funds to be budgeted must be in the current year's STIP. It should be noted that moving funds currently budgeted into a project that are from the same fiscal year is considerably easier than moving funds from a prior fiscal year. For example, if the project needs funds moved from Design to Construction, it will be much easier if the Design funds are in the current fiscal year STIP. If the funds are from a prior fiscal year, they will have to be de-budgeted, rolled forward in the TIP and in the STIP, and re-budgeted into the construction phase.

Determine whether or not the project's budget requires Transportation Commission action. Budget items requiring Commission approval are:

1. Initial Project Budget Actions from certain programs not already approved by Commission as a whole. (i.e., RPP, BRS, FBR)
2. Projects involving Earmarks or Discretionary Funding
3. Local Overmatch not already projected or 100% locally funded projects
4. Strategic Projects (7th Pot)
5. Additional Funding above 15% of prior TC approved Budget

All Budget Actions are processed daily and, if Commission action is required immediately scheduled for the next supplement. The cutoff for Budget Actions inclusion in a Supplement is the 25th of the month preceding the T.C. 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 ensures 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 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 and obligations requests are submitted daily for review and approval by FHWA Colorado Division via the outbound FHWA Fiscal Management Information System (FMIS). The approved federal authorization/obligation is received from FHWA via the inbound FMIS interface.

The process of requesting Federal aid obligation/authorization is differentiated by non-construction and construction phases of work.:

1. Pre-Construction

   For the pre-construction phases of a Federal-aid project OFMB's final approval of a budget action in 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 PS via the inbound FMIS interface.

   The Right of Way phase requires no further budgetary action by the Region. Actual acquisition, however, must be authorized by Staff ROW upon completion and approval of the ROW plans. Staff ROW notifies 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 (see definitions above) when created. Resident Engineer 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 Obligation of a Federal-aid construction project (See Section 2.30):
3. Budgeting Timing before obligation:

   Budgeting construction funds is usually in advance of the authorization/obligation process.

   Budgeting construction funds can occur when the current STIP year begins for 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.
4. Obligation – See Section 2.30 Form 1180 section for construction funds obligation process.

1.04.04 After Award of Low Bidder

At the time of award, the construction phase budget will be adjusted so it matches Form 65 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 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 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 Transportation Commission 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 Transportation Commission approved budget, OFMB may approve the request as an "allotment advice." Allotment advices include transfers to projects from pools or other projects. Allotment advices are usually processed within a few days.

Any surplus or deficit amounts will be corrected by the Regional Business Managers with a Budget Action submitted to OFMB for approval to de-budget or supplement the amount. If the Regional Business Office wishes to retain this surplus amount, the business office must request an approval to retain the surplus funds from the Chief Engineer. The request must be submitted to the Bids and Awards section by Monday, NOON, following the Letting Day. See Section 2.36 for additional information on retaining surplus bids.

1.04.05 Supplementing the Budget

There are many reasons that project phase budgets need to be supplemented, including additional work or overruns. In those instances, the Resident Engineer will work with the Region Program Engineer and the Business Office to find sources.

Many requests to add funds to a project do not require Transportation Commission approval. However, in those cases that do require Transportation Commission approval, the Resident Engineer needs to be aware that supplementing a project can take months. See Section 1.01 requirements on STIP/TIP, and Transportation Commission Action (PD 707.1).

The Region should make as few presentations to the Transportation Commission as possible on any given project If there is any likelihood that several phases such as utilities and right of way are going to run over budget, both requests should be calculated and communicated to the Region Program Engineer as soon as the Resident Engineer has solid figures.

1.04.06 Day-to-Day Financial Management

The Resident Engineer should check their projects in either ZJ40 or ZF70 in SAP to determine the current status of the project funding, expenditures, and encumbrances. It is recommended to use the timesheet report available through the Portal and run the report as needed to see which CDOT employee charges to their project(s) and the indirects that hit the project(s) budget.

If any phase of a project goes into deficit, payment for any phase of the project to a third party will not be processed. For example, if the design phase goes into deficit after the project is awarded in construction, the contractor cannot be paid. The Resident Engineer needs to be aware of CDOT purchasing requirements, rules, and directives. State Procurement, CDOT Procurement, and the Center for Accounting offer training applicable to the financial aspects of running a project. There is an On-line budgeting class available through the Transportation Engineering Training Program (TETP).

1.04.07 Additional References:

1. OFMB Policy and Procedures Manual - http://intranet.dot.state.co.us/business/ofmb/other/current/ofmb-policy-manual-4-11/view
2. PD 707.1 – Annual Budget Process
3. FHWA A Guide to Federal-Aid Programs and Projects http://www.fhwa.dot.gov/federalaid/projects.pdf
4. Title 23, United States Code (23 U.S.C.) Title 23, Highways, of the Code of Federal Regulations (23 CFR) – 630.106 (Project Authorizations (FMIS) Preconstruction)
5. The FHWA/CDOT Stewardship Agreement) http://www.coloradodot.info/business/permits/accesspermits/references/stewardship-agreement.pdf
6. TETP On-line budget training
7. SAP Training website

1.05 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 is obtained according to an approved selection process through the Engineering Contracts Unit Program in the Contracts & Market Analysis Branch.

This process is also followed when Construction Manager/General Contractor or CMGC services contractor is required for CMGC delivery. If CMGC services that require a Contractor produce any stamped design plans or lead a formal Value Engineering Study, Brooks Act compliance per the Consultant Selection process will be required. If no Brooks Act compliance is required for the CMGC process, please follow the alternate process for CMGC projects.

The method for obtaining a professional consultant to do a specific scope of work or non-project-specific consultant services shall comply with applicable federal and state laws governing the services of consultants, as outlined in CDOT Procedural Directive 400.1, Obtaining Professional Consultant Services, and 23 CFR Section 172, Administration of Engineering and Design Related Services.

The Agreements Program Manager in the Contracts & Market Analysis Branch 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 Agreements Program facilitates the selection process. The Resident Engineer shall evaluate the consultant's performance on projects.

1.05.01 Obtaining a Consultant Contract

The following steps are necessary to obtain an executed consultant contract. The Agreements Program 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 CDOT's Long-Range Plan, Statewide Transportation Improvement Program, the CDOT budget, and the Obligation Plan (Program Engineer, Resident Engineer and Business Office).

2. Develop scope of work (Resident Engineer).
3. Prepare a contract cost estimate (Resident Engineer).
4. Prepare consultant selection request, including the Underutilized Disadvantaged Business Enterprise (UDBE) goals, for the Chief Engineer's approval for advertisement (Resident Engineer and Region EEO/Civil Rights Specialist).
5. Establish a selection panel (Resident Engineer).
6. Create selection schedule (Resident Engineer and the Engineering Contracts Program Staff).
7. Advertise Invitation for Consultant Services on the Internet and, as needed, in special journals (contract writer).
8. Create and distribute the selection information and instruction package to the consultant community (contract writer).
9. Coordinate and facilitate selection panels to achieve consensus and make a recommendation to the Chief Engineer (contract writer).
10. Obtain RTD's approval of the selection results. (Resident Engineer)
11. Obtain the Chief Engineer's approval of the selection results (contract writer).
12. Notify consultants of selection results (contract writer).
13. Finalize scope of work, and for project-specific funds-encumbered contracts, negotiate work-hours and the cost proposal (Resident Engineer and the consultant representative), and submit those to the Agreements Program. **Note:** For task order contracts, this step is done for each task order request.
14. Obtain and review the consultant's financial information, insurance information, and initial cost proposal (Consultant Audit).
15. Initiate audit evaluation (Consultant Audit Program).
16. Analyze audit evaluation report and negotiate consultant fee and final contract cost exhibit (contract writer).
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 consultant (Agreements Program Staff).
19. Debrief consultants, as requested, on selection results (contract writer).
20. Compile selection documentation and transmit the selection file to the CDOT Records Center (contract writer).

The Resident Engineer is responsible for the submittal of the Contract Certification and Contractor Evaluation forms that are part of the Colorado State Controllers Contract Management System (CMS). See Section 1.06 Contract Certification and Evaluation Requirements for Colorado Contract Management System (CMS).

1.05.02 Obtaining a CMGC Contract (Alternate Process)

The following steps are necessary to obtain an executed CMGC contract. The Agreements Program 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 Program, the CDOT budget, and the Obligation Plan (Program Engineer, Resident Engineer and Business Office).
2. Develop scope of work (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 EEO/Civil Rights Specialist).
5. Establish a CMGC selection panel per CMGC guidance from the Innovative Contracting Advisory Committee (Resident Engineer).
6. Create selection schedule (Resident Engineer and the Engineering Contracts Program Staff).
7. Advertise Invitation for 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 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 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 scope of work, 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 Agreements Program. **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 (Agreements Program Staff).
19. Debrief contractors with 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 CDOT Records Center (contract writer).

The Resident Engineer is responsible for the submittal of the Contract Certification and Contractor Evaluation forms that are part of the Colorado State Controllers Contract Management System (CMS). See Section 1.06 Contract Certification and Evaluation Requirements for Colorado Contract Management System (CMS).

1.06 CONTRACT CERTIFICATION AND EVALUATION REQUIREMENTS FOR COLORADO CONTRACT MANAGEMENT SYSTEM (CMS)

As stated in Section 1.05, the Project Manager is responsible for the submittal of the Contract Certification and Contractor Evaluation forms that are part of the Colorado State Controller's Contract Management System (CMS). (See Section 1.05 Consultation Selection and Contracting Process).

1.06.01 Contract Management System

Colorado's Contract Management System was created under direction of Senate Bill 07-228. The law was enacted to facilitate tracking, evaluation and reporting of vendor performance. The requirements are now codified as Colorado Revised Statutes, see C.R.S. §§ 24-102-205, 24-102-206, 24-103.5-101, and 24-105-102.

1.06.02 Form Use Required

The Project Manager is required to complete forms associated with the Contract Management System when a contract meets all of the following criteria:

1. Personal services contract
2. Value greater than $100,000
3. Entered into after July 1, 2009

State Controller Fiscal Rule 3-1, Section 2.27 defines "personal services contract" as follows:

> "A contract between an Agency or Institution of Higher Education [IHE] and another party, where the other party provides personal services for the benefit of the Agency or Institution of Higher Education or a third party. An individual or entity performing services under a personal services contract is an independent contractor and not an employee of the State."

Personal services contracts include the following categories:

1. Construction contracts (including those entered into using forms provided by the Office of the State Architect)
2. Grants contracts
3. Individual task orders when evaluated separately by the Agency or IHE

4. Master task orders when evaluated by the Agency or IHE
5. Information technology contracts
6. Interagency contracts (no evaluation required)
7. Intergovernmental contracts, including grants
8. Mixed procurements where the service component is greater than $100,000
9. Multi-party contracts
10. Outsource agreements
11. Price agreements for services
12. Professional services as defined in CRS §24-30-1402(6)
13. Purchase orders for services greater than $100,000
14. Purchased services as defined in CRS §24-50-502(3)

For contracts that meet the above criteria, eight separate forms are available. Five of these forms are mandatory and three are optional depending on additional requirements. The forms and requirements are listed in Table 1-1.

Table 1-1 Forms Summary

Project Engineers may use the Contract Management System to track other types of contracts, which do not fall within the definition of “personal services contract,” but are not required to complete the forms for these other types of contracts. A complete list of all contract types is included in Table 1-2 Forms Use and Certification Applicability per Contract Type.

Table 1-2 Form Use and Certification Appl

1.06.03 Contract Completion

By statute, the Project Engineer is required to finalize the evaluation of the contractor and enter the evaluation in the Contract Management System within 30 days after contract completion.

For construction contracts, “contract completion” means the later of the following two occurrences:

1. The end of the contractor warranty period, occurring one year following the date of the Notice of Substantial Completion, or as otherwise provided in the construction contract.
2. The completion of the public notification requirements under CRS §38-26-107.

For all other contracts, "contract completion" means the date upon which the contractor has finished all of his performance obligations, including submission of the final invoice, AND the earlier of the following two occurrences:

1. The Project Engineer has accepted the contractor's performance and agreed upon the final payment to the contractor.
2. Six months have elapsed after the contractor submitted his final invoice.

1.06.04 Use of Forms in a "Typical" Personal Service Contract

The following hypothetical scenarios illustrate how the Contract Management System forms would be used during these contract stages:

1. Solicitation Stage
2. Pre-contract Execution
3. Executed Contracts
4. Multi-year contracts
5. End of the Full Contract Period
6. Construction Contracts Equal to or Greater than $500,000

1.06.04.01 Solicitation Stage

1. Responding vendors are requested to provide vendor disclosure information as part of their bid/proposal.
2. The Vendor Disclosure Statement form may be attached to the solicitation with appropriate instruction for completion of fields.
3. The Sole Source Justification and Certification form, if applicable, may be scanned and attached to the CMS record when the record is created.
4. If applicable, the Personal Services Certification form prepared by the Division of Human Resources may be scanned and attached to the CMS record when the record is created.

1.06.04.02 Pre-contract Execution

1. Ensure that the Statement of Work includes:
   a. Performance measures and standards tied to the work to be performed.

   b. Accountability language tied to the performance measures and standards.
   c. Monitoring requirements tied to the performance measures and standards.
   d. Resolution methods specific to the work to be performed.
2. If using the Performance Measures and Standards Certification for Original Contract form, maintain the form as part of the official contract file or scan the form and attach it to the CMS record when the record is created.
3. Complete the field in CMS asking if the contract has been certified.

1.06.04.03 Executed Contracts

1. Create a contract record in CMS.
2. Include vendor disclosure information in appropriate record fields.
3. Attach scanned Vendor Disclosure Statement form, if applicable (optional but recommended).
4. Begin monitoring of contractor's performance obligations in the contract Statement of Work

1.06.04.04 Multi-year Contracts

Annually On or Before Each 12-month Anniversary of Contract Effective Date:

1. Annual Certification. If using this form, maintain it as part of the official contract file. The form may be scanned and attached to the CMS record when the record is created.
2. Complete recertification fields in CMS.
3. Use of the INTERIM Contractor Performance Evaluation Worksheet is optional. The form is provided as an aid in gathering information in support of contract completion, recertification and vendor evaluation. Project Engineers should incorporate the use of this form (or a similar form) as part of their own contracting process.
4. Assignment of an interim rating at the end of each contract term is recommended. If such rating is assigned, record the interim rating and date the rating was assigned in a CMS Notes field.

1.06.04.05 End of the Full Contract Period

1. Complete the FINAL Contractor Performance Evaluation form.
2. Attach the scanned FINAL Contractor Performance Evaluation form to the CMS record.
3. Send the FINAL Contractor Performance Evaluation form to the contractor for review.

4. Update the CMS record with the contractor's response to its evaluation and rating, if any.
5. Enter the final rating into the appropriate CMS record field.
6. The FINAL Contractor Performance Evaluation form and contractor's response, if any, shall be posted on the public website.

1.06.05 Construction Contracts Equal to or Greater than $500,000**

(**Note that Project Engineers entering into construction contracts with a dollar value over $100,000.00 also must comply with the requirements of the preceding stages.)

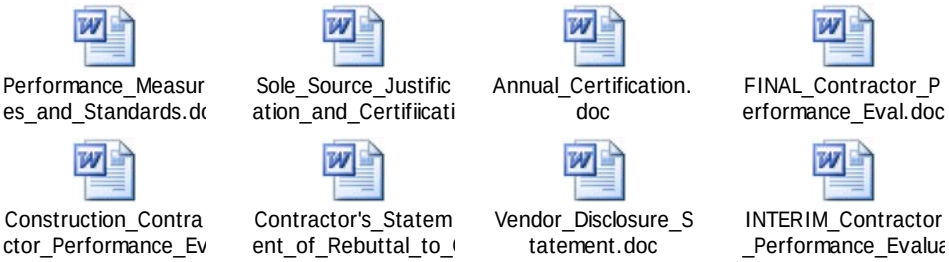
Prior to completion of the construction contract:

1. Complete and sign the Construction Contractor Performance Evaluation Report form.
2. Attach the scanned Construction Contractor Performance Evaluation Report form to the CMS record.
3. Send form to the contractor for review.
4. Update CMS record with the contractor's response to its evaluation and rating, if any.
5. Enter final rating into appropriate CMS record field.

1.06.06 Forms

The eight forms are embedded here for convenience. More recent copies, if any, may be found at:

http://www.colorado.gov/dpa/dfp/sco/contracts/Contract_Administration/WebPages/Current_Processes_&_Forms.htm



1.06.07 Additional References:

1. Colorado's Contract Management System and Vendor Performance Statutes Form Completion - Technical Assistance Guide – May 2010 http://www.colorado.gov/dpa/dfp/sco/contracts/Contract_Administration/Current_Processes_Forms/Technical_Assitance_Guide.pdf

1.07 PRE-CONSTRUCTION PROJECT (OR DESIGN) SCHEDULE

1.07.01 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:

1. Phase I: Pre-Project Budget – see Section 1.02
2. Phase II: Design
3. Phase III: Construction (not included in this manual)

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 the anticipations and expectations of the stakeholders.

1.07.02 PROJECT SCHEDULING

Project Scheduling is the task of defining relationships between work activities having duration, events without duration that indicate a significant completion, and milestones that represent major achievements or decision points in a project. Scheduling is an inexact process in that it tries to predict the future. While it may not be possible to predict with certainty the duration of a project, there are techniques that can increase the accuracy of a reasonable timeline estimate. Project schedules are most effective when the project activities are well-defined and appropriately linked.

1.07.03 WORK BREAKDOWN STRUCTURE (WBS)

Within the Project Schedule, the WBS defines and organizes the scope of a project in a hierarchical structure. The hierarchical structure of a WBS includes a list of project activities which are critical to the scheduling, estimating and budgeting processes of Project Management. In order to be included in the WBS, project activities must meet the following criteria:

1. Must have a definable beginning and end,
2. Must have a finite duration, with at least one start and one end date,
3. Must have an associated level of effort,

4. Must have a state of completion that can be estimated and
5. Must have a reviewable deliverable at completion of the task/subtask

1.07.04 PROJECT ACTIVITIES AND RELATIONSHIPS

Project activities are the most detailed element of a project schedule and address the following:

1. Who is going to do the work?
2. When is the work going to be done and how much time will the work require?
3. How much is the work going to cost?
4. How is the work going to be accomplished?

Relationships of project activities must be established within the project schedule so that an order of completion and dependencies on one another are clearly represented.

1.07.05 PROJECT MANAGER

The Project Manager for any given project is responsible for the following:

1. Ensuring that all of the work is being completed on time, within budget and scope, and at the correct performance level.
2. Coordinating staff assignments to ensure work is done in a manner which meets the objectives of the project.

It is recommended that the Project Manager not be assigned to perform the engineering or technical work of a project. Technical work should be the assignment of a project's technical staff. This differentiation is pointed out because when conflicts arise, the technical work typically takes priority and management of the work becomes secondary.

For the purpose of this resource document, a project's technical staff shall refer to those assigned the oversight and/or direct application of engineering principles to a project. Where applicable, a licensed engineer in this capacity shall assume all appropriate professional liability associated with the exercising of engineering decisions. For further information on Professional Engineering responsibilities and/or liability, please refer to CDOT Procedural Directive 508.1 – Professional Engineer's Stamp.

1.07.06 RESIDENT ENGINEER

For the purpose 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. It is recommended that the Resident Engineer serve as the Project Manager for projects 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 Resident Engineer may delegate Project Management activities and tasks, as deemed appropriate, but should retain the appointment as Project Manager and responsibility for their successful completion. 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, i.e. lead designer, construction project engineer, etc. For further information on Professional Engineering responsibilities and/or liability, please refer to CDOT Procedural Directive 508.1 – Professional Engineer's Stamp.

1.07.07 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; Consider a Team Charter for complicated projects.
2. PLAN – Define what must be done and by whom, how will it be done, when must it be done, how much will it cost and what will be done with it; Establish contingency plans.
3. EXECUTE – Commence performance of the technical work and implementation of 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; Taking action to correct for any deviations in the project plan; Perform iterations of Steps 1, 2 and 3, as needed.
5. CLOSE – Identifying lessons learned; Identify pitfalls for future projects; Celebrate your accomplishments.

1.07.08 PITFALLS

By acknowledging lessons learned from others, our transition to a more Project Management-oriented organization can occur more smoothly. Examples of Pitfalls include the following:

1. You cannot control your project if you do not have a plan.
2. Involve the people who must do the work in the development of the plan.
3. Be prepared to revise the plan – the plan WILL change!
4. Do not attempt to serve as a single point of knowledge for the project.
5. Disseminate information…nobody ever complains that they are being told too much, but they usually resent being told too little.
6. Identifying and documenting risks is like putting up lighthouses…fewer shipwrecks.

1.07.09 BASELINE SCHEDULE – (See Section 1.02)

This schedule details anticipated project activities, durations and resource allocations and is developed prior to the commencement of any project activities. At the point of acceptance by all project participants, a finalized version of the baseline schedule is saved by the Resident Engineer and remains unchanged throughout the duration of the project.

1.07.10 WORKING SCHEDULE

This schedule details actual project activities, durations and resource allocations. This schedule is updated regularly by the Resident Engineer 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 Resident Engineer should perform a comparison, at least monthly, to assist with the identification and management of unanticipated obstacles.

1.07.11 WORK-HOUR ESTIMATE – (See Section 1.02)

This estimate details the personnel work-hours projected to complete the project activities reflected in the project schedule. When labor rates are applied, the Work-Hour Estimate represents a significant portion of the Project Estimate. The Work-Hour estimate is required on all projects prior to the obligation of project funds. On projects with consultant contracts, the Work-Hour Estimate along with the Scope of Work should serve as the basis for the negotiation of final work-hours.

1.07.12 PROJECT ESTIMATE – (See Section 1.02)

The Project Estimate is the summary of total costs for a project. This estimate is often broken out into ROW, Utilities, Design, Environmental and Miscellaneous (RUDEM) phases. Additionally, the Project Estimate will include projected costs for Construction of the project. Reasonably accurate Project Estimates are important, as budgets and project limits are often established from them.

A project schedule is prepared to monitor the progress of preconstruction activities and to determine a reasonable date for the advertisement of the project.

The project schedule is developed by the Resident Engineer 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 Resident Engineer will monitor the schedule to ensure important dates are met to successfully advertise the project.

The Resident Engineer should give priority attention to critical path 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.

Microsoft Project is used to establish the project schedule, critical path and milestones. Using Microsoft Project, the Resident Engineer and the Specialty Units can coordinate production milestones for completion of assigned tasks.

The Resident Engineer needs to consider the availability of funds when determining schedules. For example, preliminary engineering should not be started until funds have been budgeted and obligated for the design phase, and a project may not be advertised until funds are available for construction, particularly if federal aid is involved. In addition, local agencies may provide funds and their processes and time constraints for providing these funds have to be considered.

The Resident Engineer will develop the 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 Resident Engineer will inform affected parties of any changes to the schedule and adjustment to the advertisement date.

Developing and managing a project schedule includes the following activities:

1. Conduct the project design scoping prior to preliminary design by initiating a Design Scoping Review – See Sections 1.02 and 2.01.
2. Develop a proposed project schedule, preferably within 30 days after the Design Scoping Review.
3. Coordinate, monitor and update the project schedule with other appropriate milestones such as request and receipt of the survey, Field Inspection Review, Final Office Review, and advertisement date.
4. Update any changes to these dates in Microsoft Project.

The project schedule should be saved on a server within the Region or as a shared file on a personal computer so that specialty units and other members of the design project team may review the schedule. Any changes to the schedule or notes to be added should be coordinated through the Resident Engineer.

For Programming and Budgeting of funds refer to Sections 1.02, 1.03 and 1.04:

1.07.13 Additional References:

1. CDOT Procedural Directive 512.1, Project Scoping and the Design Scoping Review (DSR) at the following link:
   http://intranet/resources/policy-procedure/documents/0512-1/view
2. SAP Workflows at the following site:
   http://vupweb.dot.state.co.us/gm/folder-1.11.33901?mode=EU
3. OFMB Policy and Procedures Manual -
   http://intranet.dot.state.co.us/business/ofmb/other/current/ofmb-policy-manual-4-11/view
4. Controlling our Critical Path guide found at the following link:
   http://www.coloradodot.info/business/designsupport/design-docs/Controlling_Our_Critical_Path.pdf/view

1.08 INNOVATIVE CONTRACTING

Innovative contracting differs from conventional contracting by using alternative techniques to provide CDOT with quality transportation facilities. It is a process of systematic decision-making, risk management, strategy development, and goal identification that creates a competitive procurement environment, which promotes innovation and partnership between CDOT and all others involved.

Innovative contracting, applied successfully, can result in an effective and efficient delivery of programs and projects in less time, with less disruption, at less cost, but without compromising safety and the environment. The needs of CDOT, funding providers, designers, constructors, stakeholders, and end users are all blended into cooperative partnerships focused on meeting or exceeding customer expectations. These aligned efforts are the foundation of Innovative Contracting.

The choices of Program and Project Delivery are varied. To assist in making these choices, consideration should be given to: identifying and defining the complexity of the program or project; the program or project goals; the allocation of risk; the availability of funding; the capability and experience of contractors, and CDOT's ability to develop, implement and manage the contract.

The assignment of risk between CDOT and the Contractor will assist in determining which option or provision is best suited for use with a program or project. Low risk allocation to CDOT may equate to a high risk allocation to the contractor, and vice versa. Understanding which risks can and must be controlled by CDOT, and which risks can and should be shared with the contractor, will result in an efficient and effective bid package, a competitive bidding environment, and overall lower costs. The CDOT Innovative Contracting Staff is available to assist with determining the best Project Delivery method for your project and should be contacted anytime innovative contracting is considered.

The four major categories of Innovative Contracting include:

1. Project Delivery Methods (Design-Build, Modified Design-Build, CMGC, etc…),
2. Procurement Methods (A+B, Multiple Bid Schedule, Alternate Bid Schedule, etc…),
3. Contracting Methods (Phase Funding, Lump Sum Contracts, Value Engineering), and
4. Contract Management Techniques (Lane Rentals, Incentives/Disincentives, Liquidated Savings).

All CDOT Projects using any Innovative Contracting technique are currently tracked in SAP. When the project is created or under design, the innovated contracting methods are to be populated in CJ20N under the PM tab. During the 1180 workflow, there is another screen that asks for this information again. In addition, all Resident Engineers should report any innovative contracting technique to the appropriate entity, as described in the "Reporting" Section in the CDOT Innovative Contracting Manual and to the Engineering Estimates and Market Analysis Unit early in design development.

For further information regarding CDOT Innovative Contracting techniques, please refer to the CDOT Innovative Contracting Guidelines, and the CDOT Design-Build Manual.

Additional References:

1. CDOT Design-Build Manual
2. CDOT Innovative Contracting Guidelines
3. CDOT Innovative Contracting Website
   http://www.coloradodot.info/business/designsupport/innovative-contracting-and-design-build
4. Policy Memo 21 Guidelines for Ensuring Bidding Competition, March 11, 2010

1.09 ENTITY AGREEMENT (LOCAL AGENCY, INTER-GOVERNMENTAL, INTER-AGENCY, PUBLIC/PRIVATE)

An entity agreement is required when CDOT and an entity have a shared 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 public agency, local public agency, established publicly owned organization or private interest that can legally enter into an agreement with CDOT for a transportation project.

The following definitions apply:

Local Public Agency

Local Public Agency is any city, county, township, municipality, or other political subdivision that is empowered to cooperate with 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 agencies 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 CDOT Local Agency Manual: http://www.coloradodot.info/business/designsupport/bulletins_manuals/2006-local-agency-manual .)

Public Agency

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.

Public Owned Organization

Public Owned Organization is a company, corporation, or enterprise that has publicly traded stock; this could include utilities, railroads, or any other public company. CDOT may enter into these agreements to relocate utilities and railroads, and for projects such as a bicycle path in railroad right of way. A public company may contribute funds to transportation projects.

Private Interest

Private Interest is a privately held company, landowner, or developer. CDOT

may enter into an agreement with a private interest to provide improved access to a state highway and as part of local development plans.

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; or
3. Address other interests that require the entity to coordinate with CDOT on such a project.

The Agreements Program in the Contracts and Market Analysis Branch is responsible for the execution of an agreement between CDOT and an entity or public agency except for the following types of agreements:

1. Railroad and utility agreements (which are done by the Utilities and Railroad Programs in the Safety and Traffic Engineering Branch)
2. Safety grant contracts (which are done by the Safety, Planning and Grants unit, also in the Safety and Traffic Engineering Branch)
3. Right of Way agreements (which are done by the Regional Right of Way Unit, often as part of a larger document such as an Inter-Governmental Agreement (IGA).

If there will be utility involvement (i.e., 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. The Region Utilities Engineer, in consultation with the Resident Engineer, negotiates an appropriate agreement with the utility and processes that agreement for approval via Agreements Program personnel. All required utility agreements should be in place prior to the project being advertised for construction. Copies of utility agreements are on file with the Resident Engineer, Region Utilities Engineer, Region Business Office, and Records Management in the Administrative Service Center.

The following steps for implementing an original entity agreement or an amendment to an entity agreement for a transportation project are performed by the Agreements Program personnel unless otherwise noted:

1. Ensure that the proposed entity agreement is consistent with CDOT's Long-Range Plan, State-wide Transportation Improvement Program (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 Agreements Program a contract request, including budget, encumbrance, scope of work (e.g., Form 463), preconstruction checklist, and construction list (Resident Engineer in coordination with Region Business Office).
4. Review and analyze contract request, prepare draft contract, and forward draft to Region
5. Review and comment on contract draft (Resident Engineer in coordination with Region Business Office)
6. Send final draft copies to the entity (in coordination with the Region Business Office)
7. Revise final draft, if requested and, as appropriate, to address entity concerns (in coordination with the Resident Engineer, Region Business Office, and the Attorney General, as needed)
8. Check local agency resolution or other authorization document to ensure funding commitment and signature authority
9. Route the entity-signed contract copies for execution.
10. Distribute executed contract (Procurement and Region Business Office)
11. Issue Notice to Proceed to entity (Agreements Program personnel).

The Agreements Program is also responsible to review entity-consultant selection processes and contracts and entity-contractor bids for compliance with federal aid funding requirements. The review process must occur before any of the following take place: (1) an entity-consultant selection is advertised; (2) an entity-consultant agreement is executed; and (3) an entity-contractor bid is awarded. The steps in this review process are:

1. For consultant selections: Prior to the selection, the entity shall submit its consultant-selection procedures and the proposed consultant contract to the Agreements Program (entity in coordination with the Resident Engineer). (Currently Jefferson County and Denver consultant procurement procedures have been approved by CDOT under the Local Agency Certification Acceptance process and do not need review).
2. For contractor selections: Prior to the advertisement, the entity shall submit its bid procedures to the Region, which may at its discretion, forward it to the Agreements Program for review. Prior to the award, the bid results, a financial

statement, and all required bid forms from the low bidder must be sent to the Agreements Program with a request for concurrence in award (entity in coordination with the Resident Engineer)

3. Review and analyze the entity's submissions.
4. Send the entity either notice of approval of the entity's submissions or send the entity advice on the required revisions to bring the submissions into compliance with the federal aid funding guidelines.

1.10 PROJECT DELIVERY METHODS

CDOT projects are typically delivered using a Design-Bid-Build 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 a low-bid process. In Design-Bid-Build, CDOT retains most of the risks, and very few risks are transferred to the contractor.

CDOT projects can also be delivered using innovative project delivery methods such as Design-Build, Modified Design-Build, Construction Manager/General Contractor (CMGC), or Public Private Partnerships (PPPs). All these methods are approved for use by Federal Regulations, State Statutes, and CDOT policies and procedures (See CDOT Innovative Contracting Guidelines and CDOT Design-Build Manual).

In Design-Build, CDOT defines clear project scope and requirements through initial design documentation, and then procures both the final design and the construction through the evaluation of technical proposals, price, or both. The project is typically procured using a two phase process by producing Request for Qualifications (RFQ), and Request for Proposal (RFP) documents. The project is awarded using a Best Value process, where price and other factors are considered. Some of these other factors may include schedule, past performance, qualifications, project scope, project approach, design alternatives, innovations, aesthetics, and quality management plan.

Design-Build projects can significantly vary in the amount of design included in the RFP and risks allocated to the design-build team, but the key element in each project is a single source of responsibility for CDOT through one contract for both the design and the construction. The major advantages for using Design-Build are better risk mitigation, and shortening the project delivery schedule by overlapping the project design phase with the project construction phase.

In Construction Manager/General Contractor (CMGC), CDOT executes two separate contracts: one with a design consultant and one with a Construction Manager who also takes the role of a General Contractor. The design consultant is selected using normal CDOT consultant selection procedures. CDOT awards the CMGC contract to the CM firm based on Best Value. The responsibility of reviewing the design for constructability, administering the construction contract, and executing the work is transferred to the CM firm for a guaranteed maximum price. The CM firm works with the design consultant to ensure innovation, cost savings, and a reduced delivery schedule. CDOT does have flexibility with design staffing when using the CMGC delivery method. CDOT can use in-

house staff for the design, a hybrid of consultant and in-house staff, or utilize a consultant for the entire design. It is recommended that the overall project manager not be the designer to ensure an objective role in the decisions that are made and the direction of the project.

The use of CMGC requires SEP-14 approval from FHWA headquarters. CDOT currently has a programmatic SEP-14 agreement with FHWA for eight projects that could be expanded through the Project Development Branch.

In Public Private Partnerships (PPPs), 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 Design-Build process to award PPPs. Solicited PPPs are preferred by CDOT, as opposed to un-solicited PPPs because they provide CDOT with improved levels of risk management, contract negotiation, and Best Value determination.

Additional References:

1. CDOT Design-Build Manual (2006)
2. CDOT Innovative Contracting Guidelines (2006)
3. CDOT Innovative Contracting website: http://www.coloradodot.info/business/designsupport/innovative-contracting-and-design-build
4. CDOT Policy Directive 504.0
5. 2 CCR 601-15 Rules to Establish Requirements for Procurement by CDOT of Design-Build Contracts for Transportation Projects
6. 23 CFR Part 636

1.11 FORCE ACCOUNT CONSTRUCTION METHOD (FORM 895)

The term “Force Account Construction Method” refers to construction work a public 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 CFR part 635.203(c)). This Section does not apply to Planned Force Account items of work as defined in CDOT’s Standard Specifications.

Competitive bidding is specifically required by title 23 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 herein for the force account construction method apply.

A Finding in the Public Interest (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 23CFR 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 23CFR 635.205(b).

3. It is 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 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 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.
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 completes a Form 463 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.
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. 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. 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 FHWA.
8. For projects that do not go through the CDOT 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 OFMB and Projects and Grants for 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 FHWA approval.

Additional References:

1. 23 CFR Part 635B, Force Account Construction
2. CDOT Policy Directive 387.0, Construction by Public Agencies
3. For forms, see CDOT on-line forms library
   http://www.coloradodot.info/library/forms

1.12 CONSOLIDATED PROJECTS

Construction projects conceived independently of one another and having different types of work or funding may be consolidated into a single project for the purpose of bid and award of the construction work and to allow for more efficient construction management. In 1990, the Federal Highway Administration (FHWA) and CDOT agreed to eliminate the combination process (i.e., two separate project numbers advertised together). Trns*port allows for consolidation of projects, which was found to be a more efficient way of managing the project. It should also be noted that SiteManager® does not handle combination projects. (SiteManager is a registered trademark of the American Association of State Highway and Transportation Officials.)

Consolidated projects are used to:

1. Increase the total construction bid amount of small projects (less than $100,000) to allow more interest for contractor bids.
2. Place multiple or sequenced projects under the control of a single general contractor for considerations such as traffic control, scheduling, decreased mobilization costs, and remote locations.

Consolidation allows for construction of a project that is beneficial to several entities with multiple, varied funding sources. Projects are best consolidated early in the design phase. In some cases, it may be appropriate to consolidate construction projects later in the development process; however, this involves additional steps and approvals and may delay the project. The consolidation must be completed prior to the project being advertised for bids.

Plans, specifications and estimates shall be prepared under a single project number. When federal funds contribute to a consolidated project or design is done with federal funds, federal rules and regulations apply to the entire project.

All proposals submitted must be prepared under a single project number, including single bid quantities and single pay estimate of quantities. All funding sources are commingled and each funding source participates at the authorized prorata. Consolidation of construction projects may be more efficient due to lower engineering and administration costs as a percentage of total project costs.

Pay quantities and tabulations can be accumulated and reported at the project level rather than at the component project level. Trns*port allows for the items to be identified in multiple ways:

1. Pay items can be billed and paid using a common proportion of federal, state, and local funds regardless of location within the project, using an agreed upon percentage split.
2. The pay items can also be isolated by category, each category is then capable of unique funding.
3. Individual items can be isolated and funded uniquely.

The Resident Engineer will initiate the appropriate budget requests for funding distribution in SAP to consolidate funds. A Form 950, Project Closure, should be prepared in SAP for closing a project being absorbed in consolidation. Closure should be coordinated with the Business Office.

Additional References:

1. 23 CFR Part 635.111, Tied Bids
2. CDOT Trns*Port Client-server
3. CDOT Trns*Port PES/LAS manual
4. Pay Estimates: http://www.coloradodot.info/business/payestimates
5. For forms, see CDOT on-line forms library
   http://www.coloradodot.info/library/forms

1.13 SIGNATURE PROJECTS

A Signature Project is one that has a complex feature that is unique or different from most CDOT projects. The complex feature requires extra consideration by CDOT when estimating the project and by bidders when bidding the project. The size of a project should not be a factor in its designation as a signature project, only its complexity. Aspects to consider in determining this designation include, design features, constructability, and innovative delivery methods. Few CDOT projects require this designation.

The Region Program and Resident Engineers are responsible for designating Signature Projects. The following criteria should be considered in their determination:

1. Will there be less than 8 hours of productive work time each day?
2. Will there be significant work outside normal work hours?
3. Will the use of state of the art technology be required?
4. Is current cost comparison data unavailable?
5. Will an alternative bid method be used? Examples are:
   a. Cost + Time
   b. Modified Design Build
   c. Alternate Bridge Design
   d. Multiple Bid Schedules
6. Will there be unusual or limited access to the work site (e.g. tunnel, mountain pass)?
7. Will Escrow of Proposal Documents be required?

The Region Program and Resident Engineers should use engineering judgment in designating Signature Projects. The existence of one or two of the triggers identified above does not automatically require the project to be designated as a Signature Project. It is the region's responsibility to make an informed determination when considering this classification.

Signature Projects shall be so designated by the Resident Engineer in a memo to the project file. A copy of the memo shall be e-mailed to the Program Engineer and the Engineering Estimates Program Manager.

A constructability review should be conducted by the region to define risks and potential costs associated with the project. The constructability review should include members of the contracting community and occur shortly after the Field Inspection Review stage of design (See Section 2.18).

A Value Engineering (VE) analysis is required for federally funded projects over $40 million. A VE analysis often leads to money and time savings, a more constructible project, and lower impacts to the traveling public. Although not required for projects under $40 million, it is a good practice to perform a VE on projects that have complexities, or elements that may benefit from a VE analysis. Examples are projects that have major structures, complex design or construction, challenging constraints, difficult technical issues, external influences and unique or complicated functional requirements, competing community and stakeholder objectives, etc. (See Section 2.15.)

A minimum advertisement period of five weeks should be used. During the minimum 5 week ad, bidders shall be required to have a project showing within the first 3 weeks after advertisement. During the showing the bidder may ask questions with regard to the plans and the project. Those questions should be handled according to section 102.5.2 of the Construction Manual. The longer advertisement time should allow CDOT enough time to summarize the questions from the showings, identify any areas of concern, and prepare answers to the questions. If possible, the summary should include questions asked subsequent to the showings. The Engineering Estimates Program Manager should be invited to the project showings.

Additional References:

1. CDOT Construction Manual

1.14 *FASTER* BRIDGE ENTERPRISE PROJECTS

1.14.01 Background

Legislation titled "Funding Advancements for Surface Transportation and Economic Recovery" (FASTER) was enacted in 2009 to increase the state's ability to improve structures and roadway safety in Colorado.

A major component of the bill was the creation of the Bridge Enterprise (BE). The term Enterprise means "a nonprofit entity that dedicates derived funding specifically to the functions of the enterprise." A key point: these Bridge Enterprise funds are not directed to CDOT, but to the Bridge Enterprise. This funding goes specifically to the replacement, rehabilitation, repair, and maintenance of eligible structures in the State of Colorado.

According to the legislation, structures that are structurally deficient or functionally obsolete and have been designated as poor by the Department are eligible for transfer to the BE. Every year the list of bridges meeting this eligibility requirement will change.

To prevent these funds from being included in the calculation of the State's funding limits established by the TABOR legislation, structures must be transferred as assets from CDOT to the BE, and the funds used for these bridges must be tracked separately. Generally State funds are not to be used for these bridges in order to protect the enterprise status of the BE. The statutes allow federal funds and a small amount of state funds to be used for the BE, and occasionally OFMB may elect to use this small allowance of State funds. For project planning purposes it should be assumed that CDOT or Local Agency funds cannot be used for bridges transferred to the BE without an additional project set up in combination with the BE project.

1.14.02 Bridge Enterprise Projects

A Bridge Enterprise project must meet specific criteria and any increase to the cost of the project or additional type of funding must be approved by the Bridge Enterprise Board before moving forward. Funding for a Bridge Enterprise project can be either FASTER Bridge funds only, or may have a combination of Federal Bridge and FASTER bridge funds included. The Bridge Enterprise Board will indicate what type and the amount of funding is approved for the project.

1.14.03 Scope for a Bridge Enterprise Funded Project

Projects that will use the FASTER bridge funds need to have the scope of the project for any non-bridge work limited to work that is necessary to replace or rehabilitate the bridge and bring the bridge up to current roadway and structural standards. This may include portions of roadway approaches that require work to facilitate the bridge rehabilitation or replacement.

Restrict the scope of the Bridge Enterprise Project to that of replacing the bridge and the approaches as needed to replace or rehabilitate the bridge. Avoid increasing the project scope during the project development process. Such a change in scope may cause the need for additional funds, a different type of funding, or both for the project.

1.14.04 Adding a Non Bridge Enterprise Related Type of Funding

The method to develop, advertise and construct a project with a combination of BE and CDOT roadway funds is laid out in Design Bulletin 2010-8, Combined BE and CDOT funded projects.

When considering the scope and requirements of a Bridge Enterprise Project, keep in mind that adding another type of funding from either a Local Agency or CDOT roadway funds, will increase the complexity and difficulty of the project dramatically.

1.14.05 Federal Participation on the Bonding Process (Fund 542)

A quick discussion on the Federal participation for the BE Binding is as follows. The FHWA chose to participate in the Bridge Enterprise Bonding process with a $20 million dollar annual contribution with the intent to cover a portion of the annual debt services to bond the money. That $20 million dollar contribution allowed the BE bonds to get a better interest rate since on the Bond market due to the FHWA involvement in the funding process.

That $20 million dollar annual contribution requires the BE bonded projects to be treated as federal participation. Generally that means these BE projects are required to follow the 1180 process and the stewardship agreement for the administration of the project. Generally for the advertisement process, it means the FHWA obligation to participate on the projects must be completed and the purchase requisition for the project needs to be created as federally participating. Examples will follow:

1.14.06 Critical Differences between CDOT Projects and BE Projects

Funds used for the Bridge Enterprise are not the same as CDOT projects and have unique conditions and categories. Here are some of the main differences that need to be kept in mind.

1.14.06.01 Significant Differences in SAP

1. Fund Numbers 538, 540 or 542 are the fund types for Bridge Enterprise. The typical value for the fund center is 400 for CDOT projects
2. Project Prefix: FBR is correct for Bridge Enterprise projects
3. Org Group: B8800-538 is the Responsible Cost Center for BE projects
4. Profit Center 5000-538 instead of the normal CDOT value 5000-010
5. Investment Profile is Z00992 instead of the normal CDOT value of Z00990
6. Unlike typical CDOT projects, budget actions for funding BE projects will completed by OFMB at Headquarters rather than at the regional level.

1.14.06.02 Purchase Requisitions

1. Release Strategy: Bridge Enterprise PR 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 still for the responsible region to approve their own regional Purchase Requisitions.
2. Plant: 7001 is always used for Bridge Enterprise projects rather than your regional plant designation.

1.14.06.03 Assets for Bridge Enterprise Projects:

A difference with the Bridge Enterprise is that once the existing bridge is transferred to the Bridge Enterprise, the existing bridge and any new bridge resulting from replacement, become assets of the Bridge Enterprise not CDOT. Existing bridges must be transferred to the Bridge Enterprise before any Bridge Enterprise funds are used for design or construction.

1.14.06.04 CE Pool Exempt:

Because the construction cost for these projects must be kept separate from normal CDOT funds, the CDOT CE Pools cannot be used to fund the Construction engineering costs of the BE projects.

1.14.06.05 CDOT Indirects

CDOT Indirects charges will still be collected at the current rate for CDOT staff working on BE projects. Those indirects will be applied for any payroll charges or consultant task orders used.

1.14.06.06 PES TRNS•PORT categories differences:

Different standard categories will be used in TRNS•PORT to identify and separate BE items from typical CDOT funded sources. Category examples are shown below:

	Bridge Enterprise Items	All Other
Roadway	0250, 0251	0200
Single Bridge	0350	0300
Multiple Bridges	0351, 0352, etc.	0301, 0302, etc.
Construction Engineering Bid Items	0450	0400
Indirects	1125	1100

1.14.07 Technical Bridge Enterprise Requirements

1.14.07.01 Creation in SAP

There are significant differences in the process of adding the WBS structure for a BE project. Please use the following link to SAP Work Instructions to add the standard template for a BE project.

BE%20Template%20 WI.pdf

1. The first key step is Step 5 in the work instructions which requires the Profit Center Field at the project definition level to be changed from the normal value of 5000-010 to the BE value of 5000-538 (See Figure 1-3). That change will propagate the correct profit center throughout the template after the new template is added.

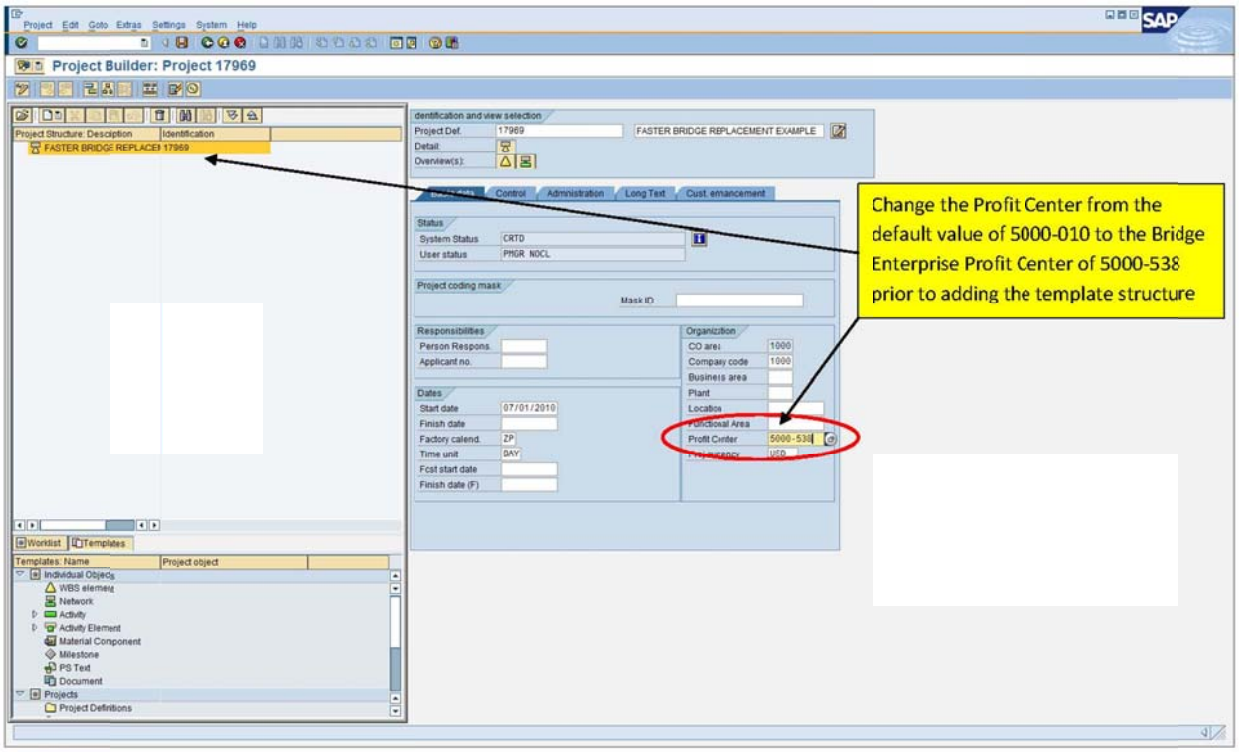


Figure 1-3
Profit Center Value

2. The second key step is Step 17 in the work instructions which requires the Responsible Cost Center to be entered as B8800-538 instead of the typical RE Org code (R5112-010 for example). (See Figure 1-4.) This will ensure billings against the project are billed against the BE group and not CDOT cost centers.

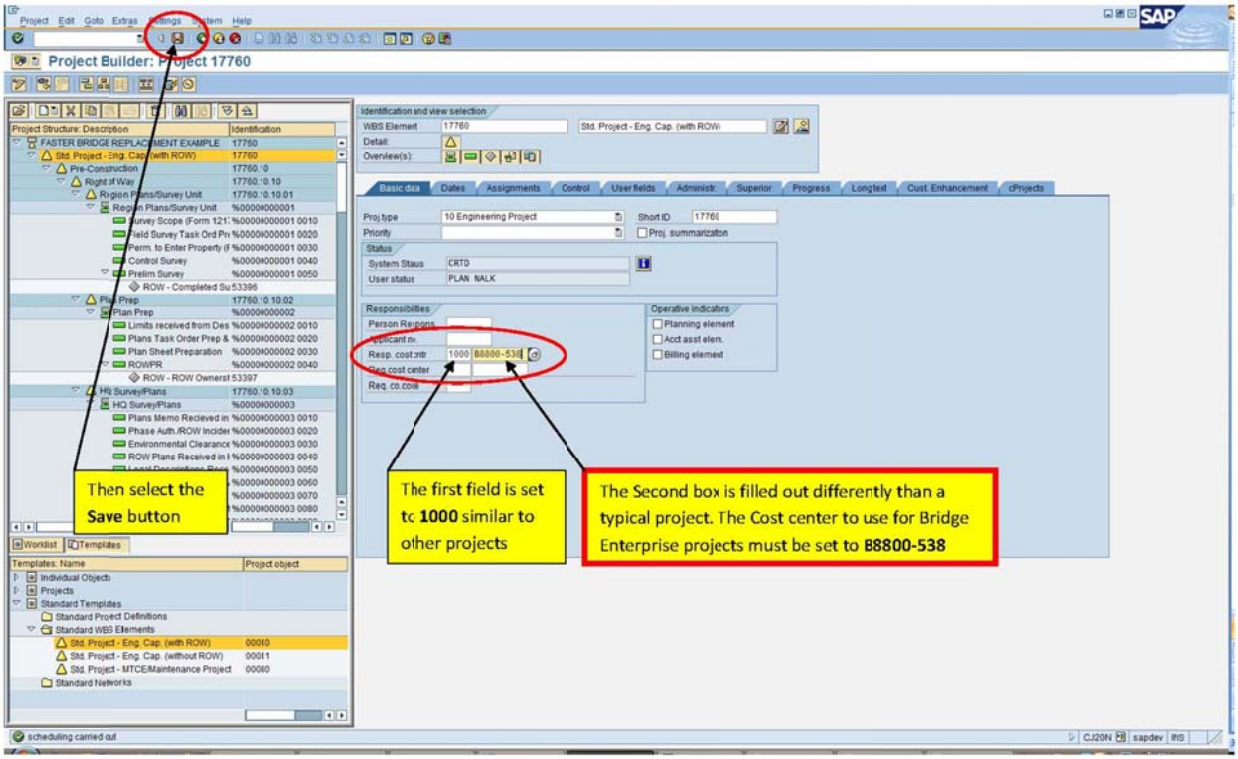


Figure 1-4
Responsible Cost Center

3. It is highly recommended that the Resident Engineers have the business office review the project template before "releasing" the template structure in CJ20N. If it is released and it is not correct, a new project would need to be created with the correct template set up structure for a BE project for the project to get processed correctly as a BE project. Review the following Resource Guide (See Figure 1-5, pages 1 through 6) on what to check for prior to releasing the BE template structure in CJ20N.

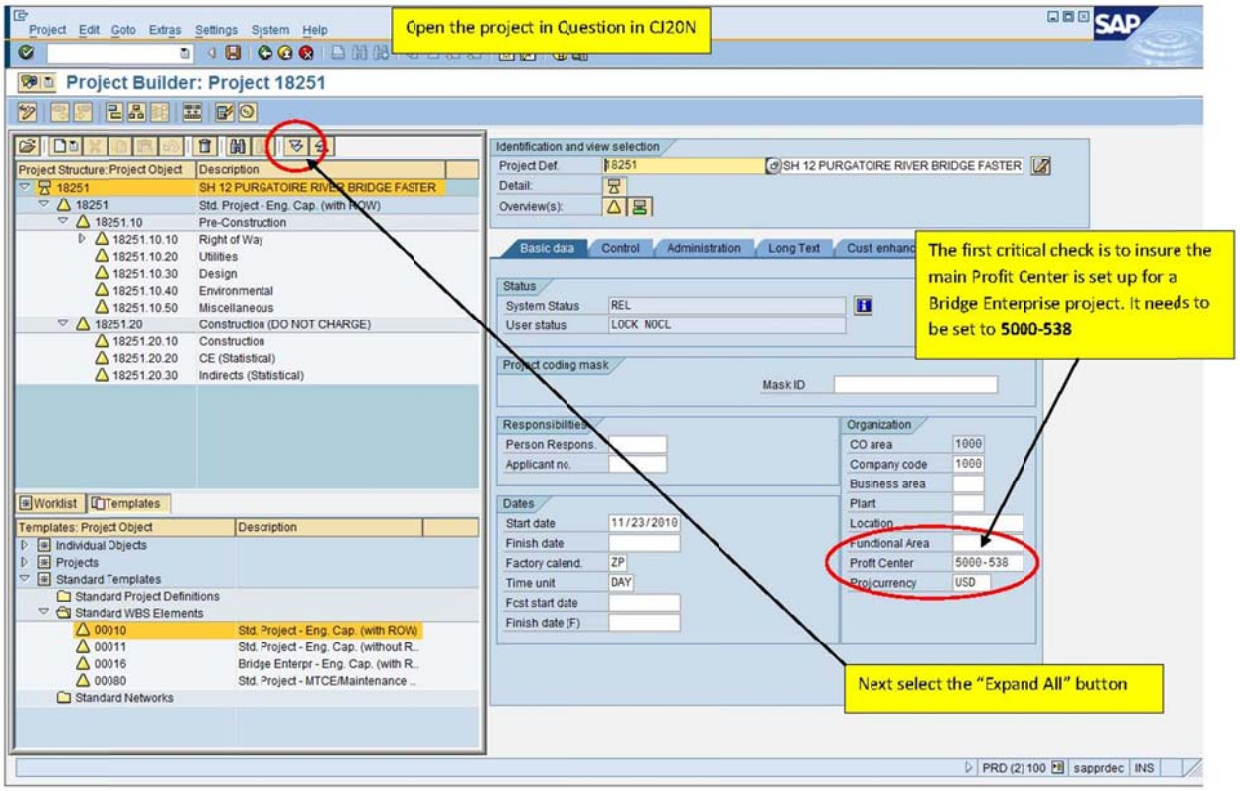


Figure 1-5, Page 1 of 6
BE Project Resource Guide

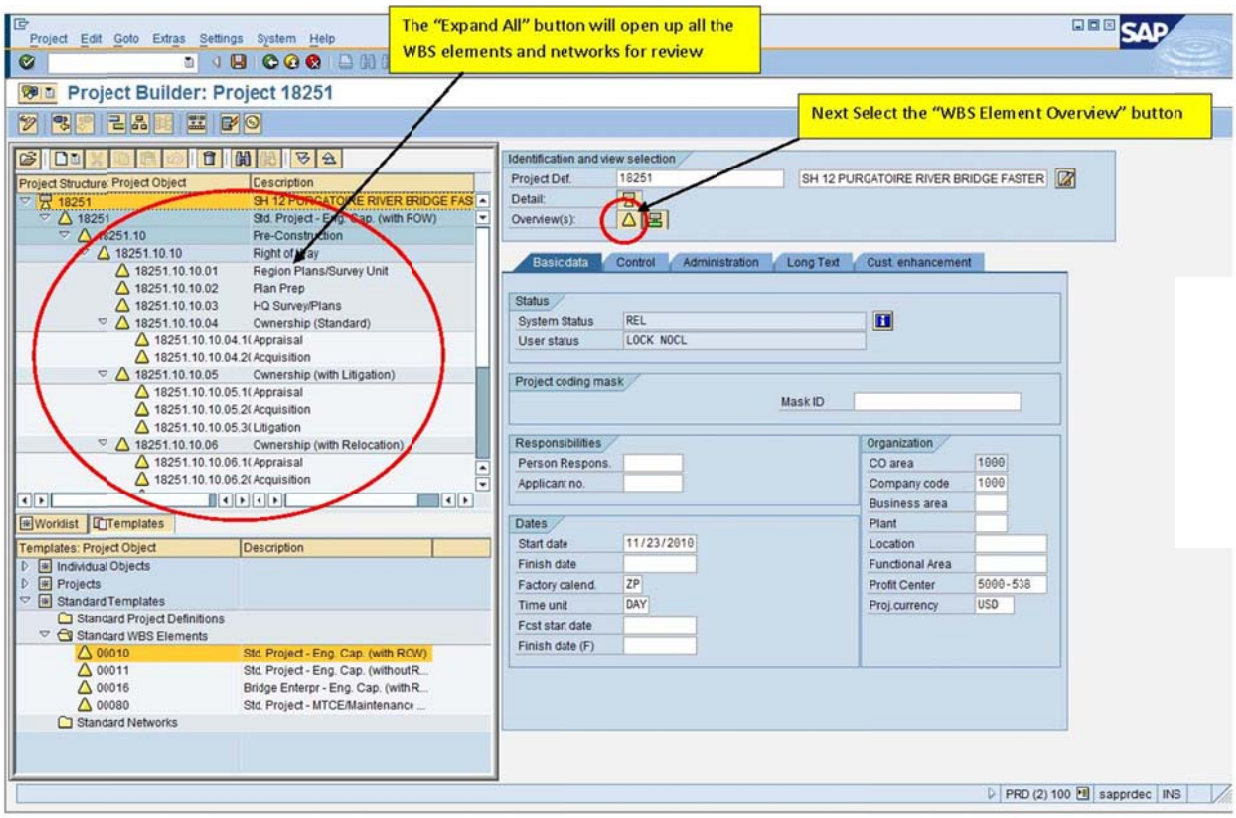


Figure 1-5, Page 2 of 6
BE Project Resource Guide

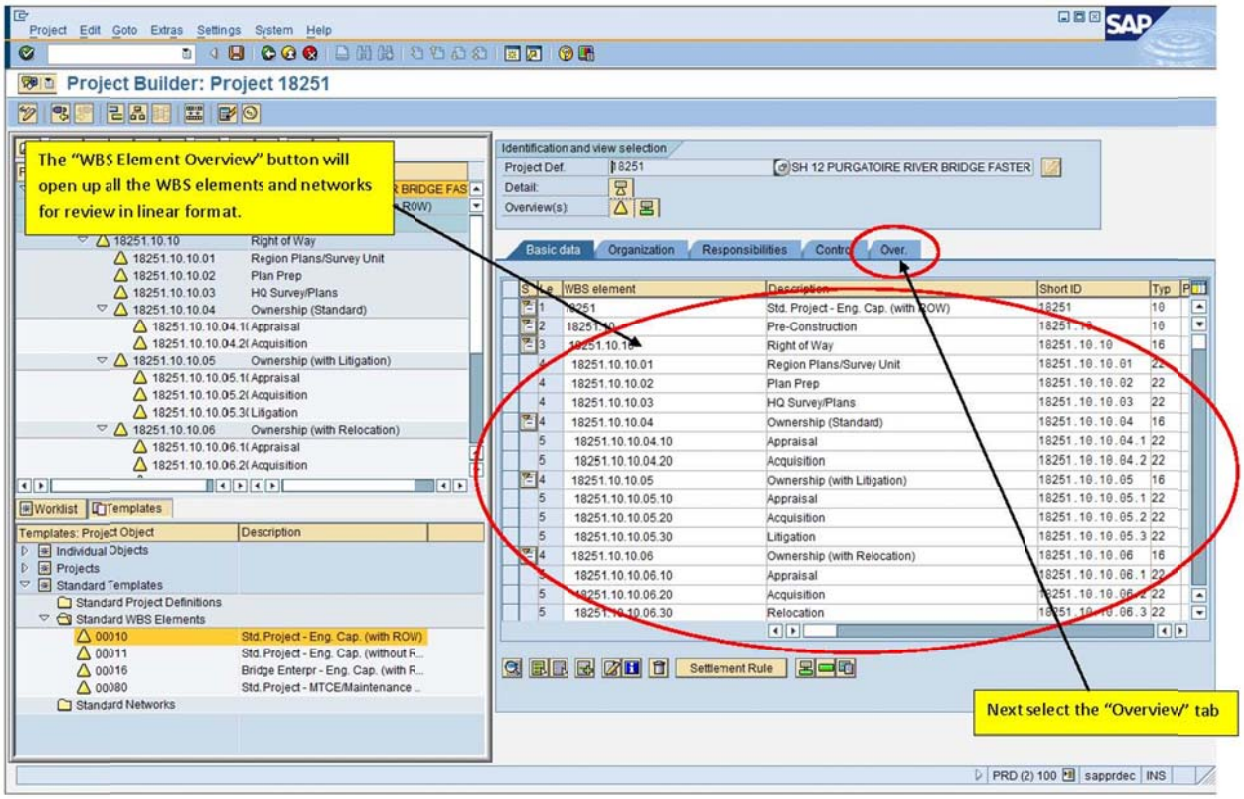


Figure 1-5, Page 3 of 6
BE Project Resource Guide

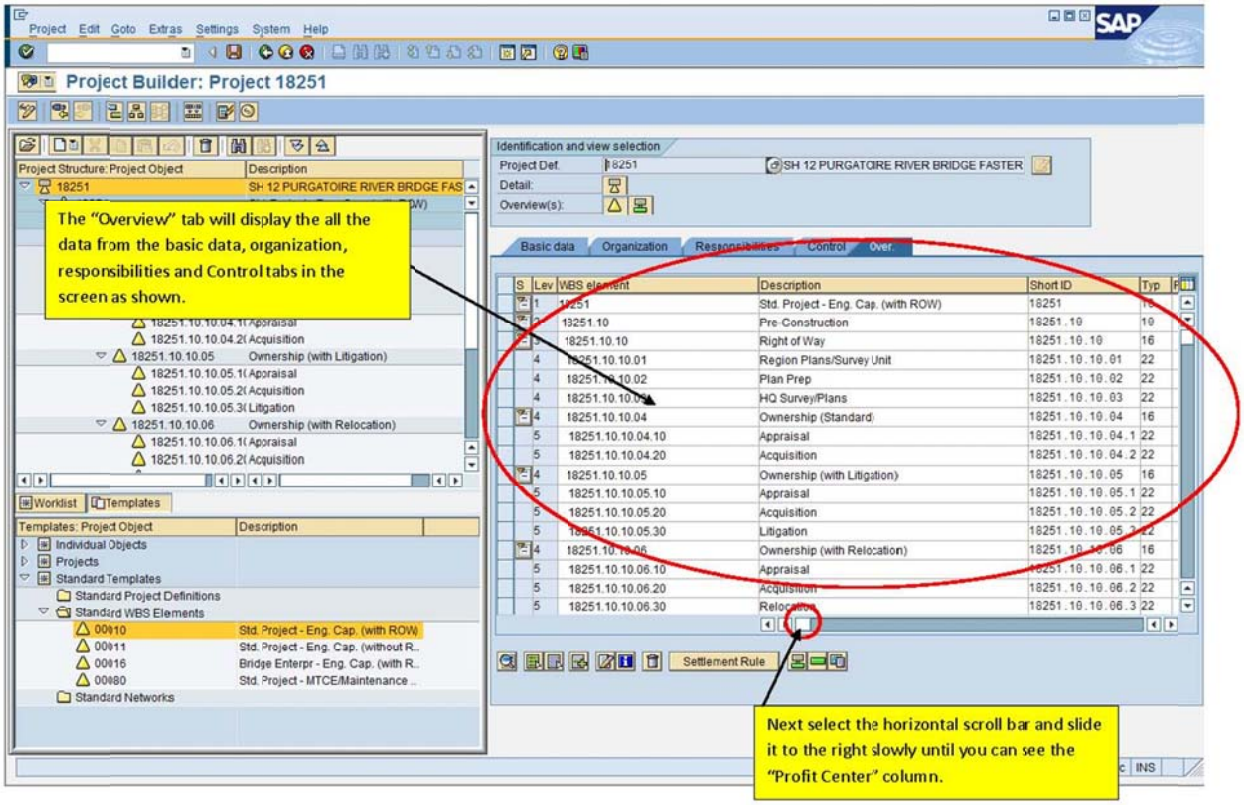


Figure 1-5, Page 4 of 6
BE Project Resource Guide

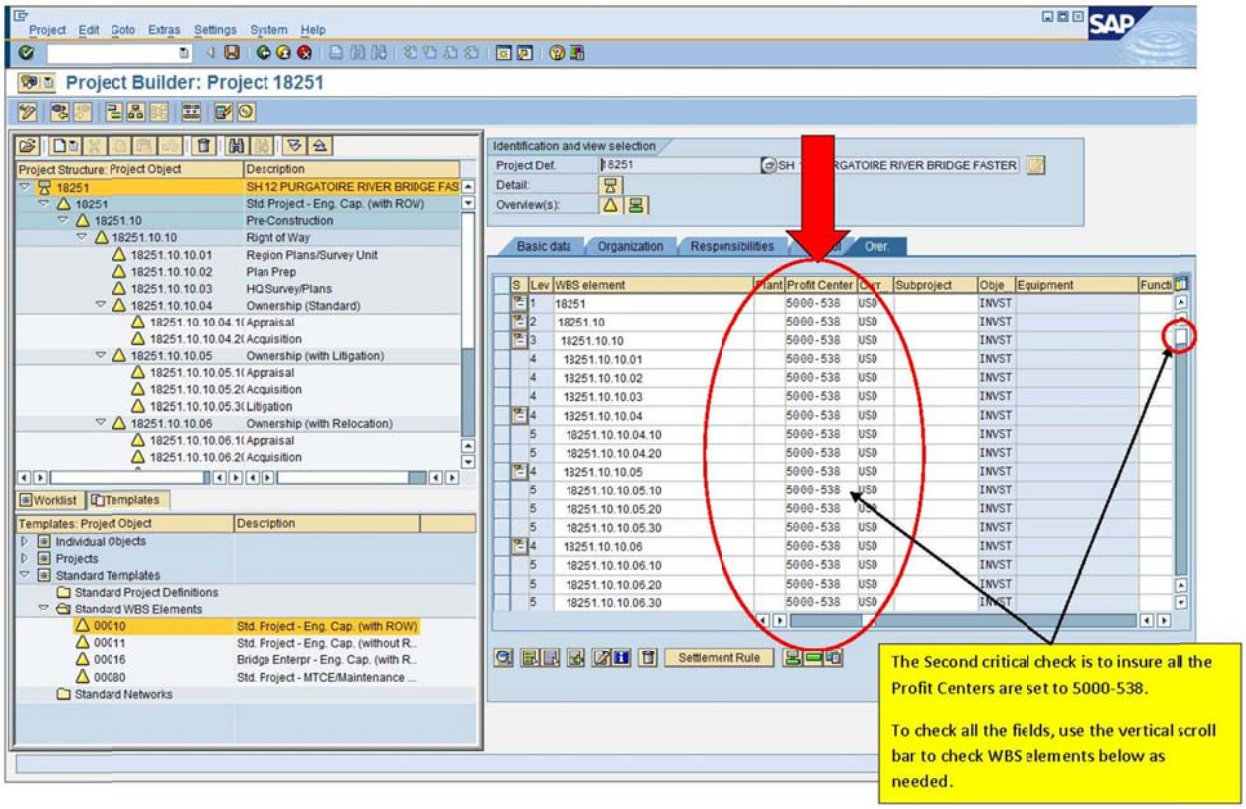


Figure 1-5, Page 5 of 6
BE Project Resource Guide

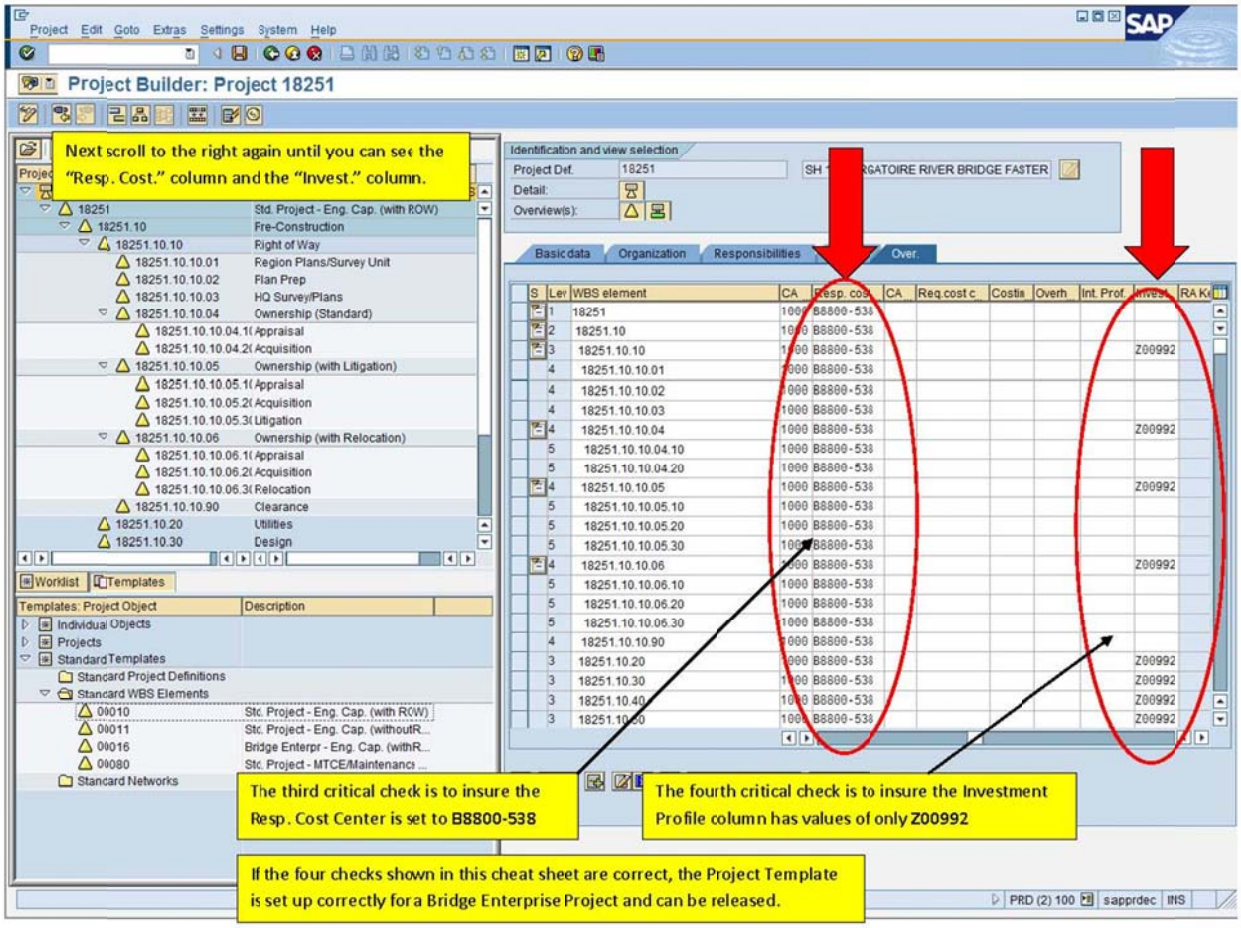


Figure 1-5, Page 6 of 6
BE Project Resource Guide

1.14.07.02 Construction Engineering is (CE) Pool Exempt

Bridge Enterprise projects are required to be CE Pool Exempt. The project personnel will need to charge their time directly to the construction phase of the specific project rather than to the Region Construction Engineering Pool.

Typically on CDOT projects, the construction budget is reduced to cover only the Prime Contractor commitment amount. Since the CDOT employees will be charging directly against the construction budget, the Resident Engineer will need to estimate and set aside sufficient construction budget to cover all the costs associated with the Construction Engineering (CE) on the project. The charges that need to be accounted for in the estimate include the following:

1. CDOT personnel charging to the project including benefits.
2. Construction Engineering task orders for Consultant Services.
3. Indirect charges at the current rate agreed to with the FHWA (applied to both internal charges and consultant charges).
4. Materials test costs from central lab.

A brief discussion of how the CE and indirect charges work at CDOT is shown in the text box below.

How Construction Engineering and Indirects are used at CDOT

The current CDOT rate for the CE pool is 10.0%, which on a CDOT CE POOL project covers the Salary and Benefits of CDOT personnel and/or consultant task orders who charge directly to the project. The indirect rate of 90.0% is then added to the costs to cover the costs of CDOT personnel time who do not charge their time directly to the project.

That indirect rate for federally participating projects is broken out further to **74.51% Participating Indirects** (the FHWA will pay this percentage) and **15.49% non-participating indirects** (FHWA does not pay these costs) which totals to the 90.0%. The indirect rate for non-participating projects is still 90.0%. The logic is the total indirect amount required does not change based on whether the project is participating and non-participating.

The 10.0% for Salary and benefits (or consultant task orders) for construction oversight plus 90.0% indirects is how we get to the typical rate of 19.0% for the total CE charges.

10.0% Construction engineering+(10.0%*90.0%) indirects = 19.0% total CE charges.

Example:

For CE pool project, the CE amount used to cover CDOT's costs for construction engineering is based on how much is paid to the Contractor. If the Contractor gets paid $1,000,000 for his work that month, CDOT would draw from the project the following amount to cover our costs:

1. $100,000.00 for the Direct Personnel charges to the project (10.0% of $1,000,000)
2. $90,000.00 for the Indirect Personnel costs (90.0% of $100,000)

For a Federally participating project the indirects would be broken up as follows:

1. $74,510.00 FHWA pays (74.51% of $100,000)
2. $15,490.00 CDOT pays (15.49% of $100,000)

This same approach needs to be used for CE POOL exempt projects but just on a project by project basis. For projects with all CDOT personnel the rate will probably be less than 23.95%. If it is all consultant, the rate will be higher than 24%. See the Excel worksheets referenced below for more information on how to calculate on a project by project basis.

All these Construction Engineering costs for the project need to be estimated accurately so sufficient budget is set aside to cover the anticipated costs. The indirect rate will be applied to both the Employee payments including benefits as well as any Consultant Construction Engineering Task orders.

When developing the construction engineering estimate, meetings to be included in the construction engineering charges are: partnering, preconstruction, pre-paving, pre-pour, pre-survey**,** bridge demolition, pre-erection, dispute resolution meetings, weekly scheduling meetings, and any other meetings the project is expected to require. When estimating the actual hours required for the CE estimate, the following personnel and support units should be considered to ensure all potential charges are estimated:

1. Resident Engineer (site visits and meetings)
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, IATs, deck pour assistance, submittals, etc.)
6. Region Utilities unit
7. Central Lab (HQ) test costs for samples submitted to Headquarters 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 (NPDES, T & E inspections)
12. Public Relations Support
13. Finals Engineers
    a. Processing CMOs in Site Manager
    b. Finals package review and check
14. Staff Branches (Area Engineers and Asst. Area Engineers)
    a. CMO review/assistance
    b. Dispute resolution assistance
15. Consultant Construction Staff.

    Based on whether the construction phase of the project is state funded or has federal participation, <u>choose the correct Excel worksheet below</u> to develop the estimated Construction Engineering costs of the project.

For the purposes of choosing which excel form to use, the key difference is whether there is a federal funding source to cover the Indirects.

If the construction phase is funded solely with any combination of the following, use the 'all state BE funded' spread sheet:

1. FAB538
2. FAB540
3. FAB542

If there are FHWA funds in addition to the BE funds listed above, you need to use the "BE_Federal Participating' worksheet for your estimate. For example, a fund type that would require the participating worksheet is FABL1CE in SAP or FL1CE in Trns•port PES.

State Funded:

CE est wksht - all state BE Funded.xls

Federal Participation:

CE est wksht - BE_Federal Partcip.xl

A key point to note on the CE services Task order portion of this estimate sheet is you will not be able to process the Task Order for CE services until after the 1180 process is completed on the PS and E package. Once you have obtained the Federal obligation of participation, you can also submit the TO for processional services to hopefully get that in place prior to the project getting awarded and the notice to proceed given to the contractor. Use the estimated value in the above spread sheet, but keep in mind any amount you short yourself there, will be taken from the available budget for your internal charges.

1.14.08 Purchase Requisitions (PR) For Construction and Construction Consultant Task Order

The purchase requisition required for Bridge Enterprise projects will need to be created differently from a typical CDOT capital engineering project.

1.14.08.01 PR for BE Project

For any Purchase Requisition (PR) created for a BE project, a key difference is the “Plant 7001” needs to be used rather than the plant of your region. Unfortunately, the plant field in SAP for PRs is not an editable field. So if a Plant other than 7001 is

entered and saved incorrectly, the PR will need to get closed and a new PR created with the correct plant.

If you ever have PR for a BE project that does not have a “Release Strategy” tab, the error is likely an incorrect plant was used.

1.14.08.02 PR for CE Services

For Purchase Requisitions (PR) for Construction engineering services, there will now be a pre-requisite step prior to starting the PR in SAP. An email will need to be sent to the Outlook distribution group “*HQ-OFMB-Project Accounting Bid and Award Unit” to have them set up the G/L number on the SAP Project validation table. Once that step has been completed, the PR for CE services can be created correctly so that the billings operate as required. The G/L Account number for the Bridge Enterprise projects will be based on whether there are Federal funds on the project or if it is bridge enterprise state funded only.

1. G/L number for Bridge Enterprise funded projects is 4192000010
2. G/L number for Bridge Enterprise projects with Federal participation is 4192000011

See the attached screen shot for an example of both a state funded PR (Figure 1-6, Page 1 of 2) and Federal participating PR (Figure 1-6, Page 2 of 2). A quick caveat is even though your project may not have a separate Federal funding source such as FABL1CE or FL1CE, it likely still has federal money involved with the ‘debt services’ which would require the PR to get set up as federal participation. The only instance of a BE project not being federally participating would be if the fund was fund 538 or 540.

"State Funded" Bridge Enterprise Purchase Requisition for CE services

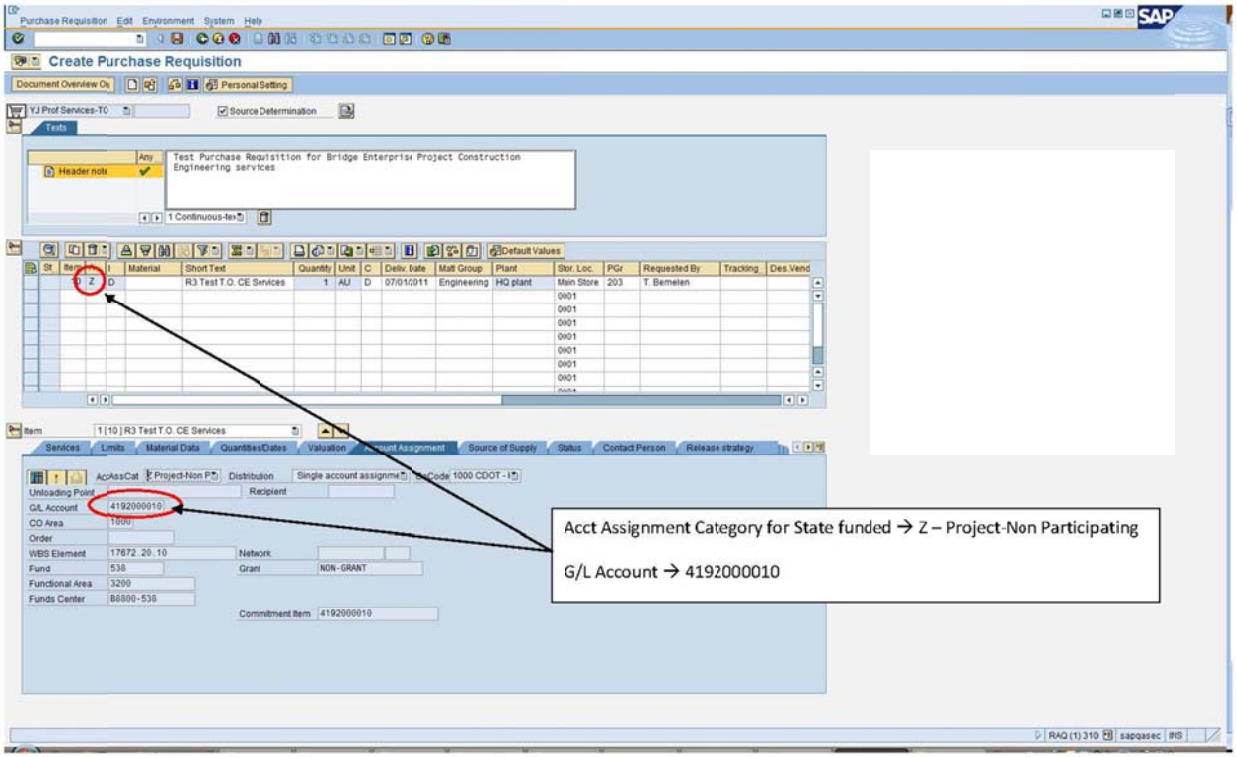


Figure 1-6, Page 1 of 2
PR Creation

Federally Participating Bridge Enterprise Purchase Requisition for CE Services

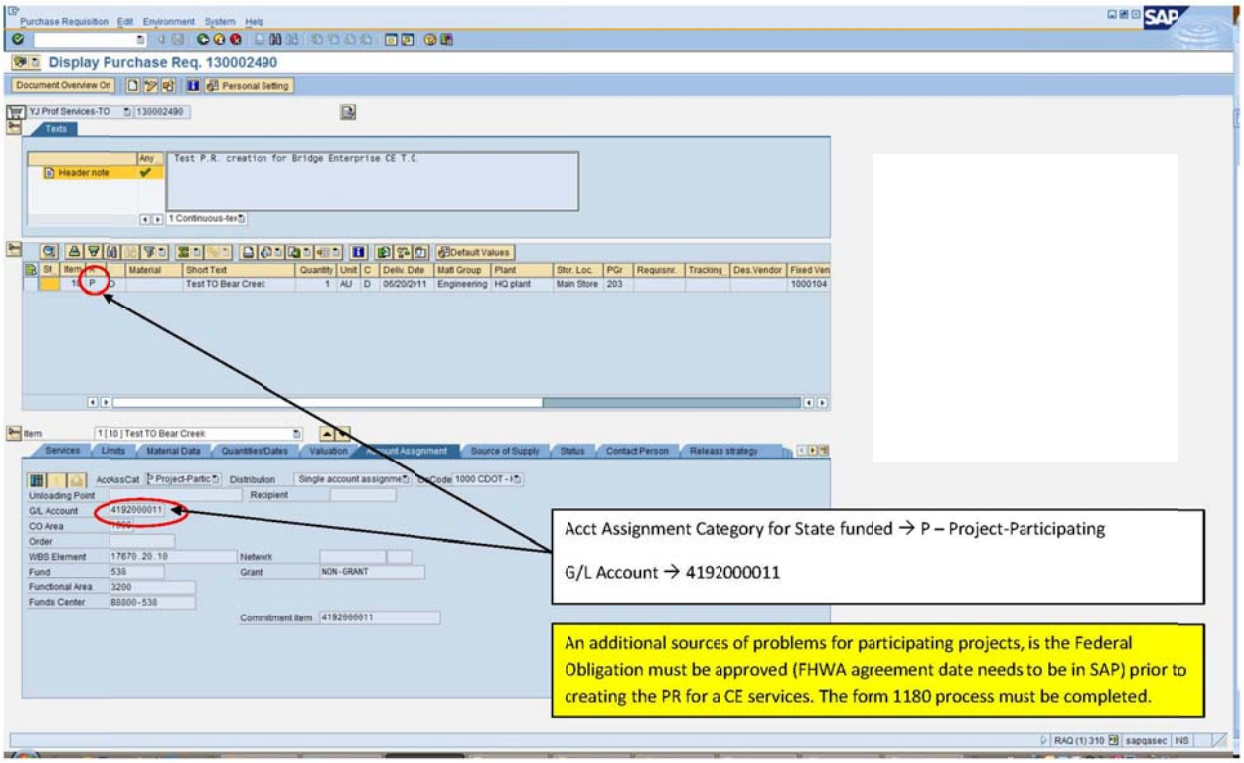


Figure 1-6, Page 2 of 2
PR Creation

1.14.08.03 SAP Release Strategy

The SAP release strategy for a Bridge Enterprise PR is slightly different. The PRs are available to be approved and released by any Program Engineer statewide for the first release and any Business Manager statewide for the second release. The responsible regions should normally release their own PRs. See the example of the release window for a Bridge Enterprise project (See Figure 1-7).

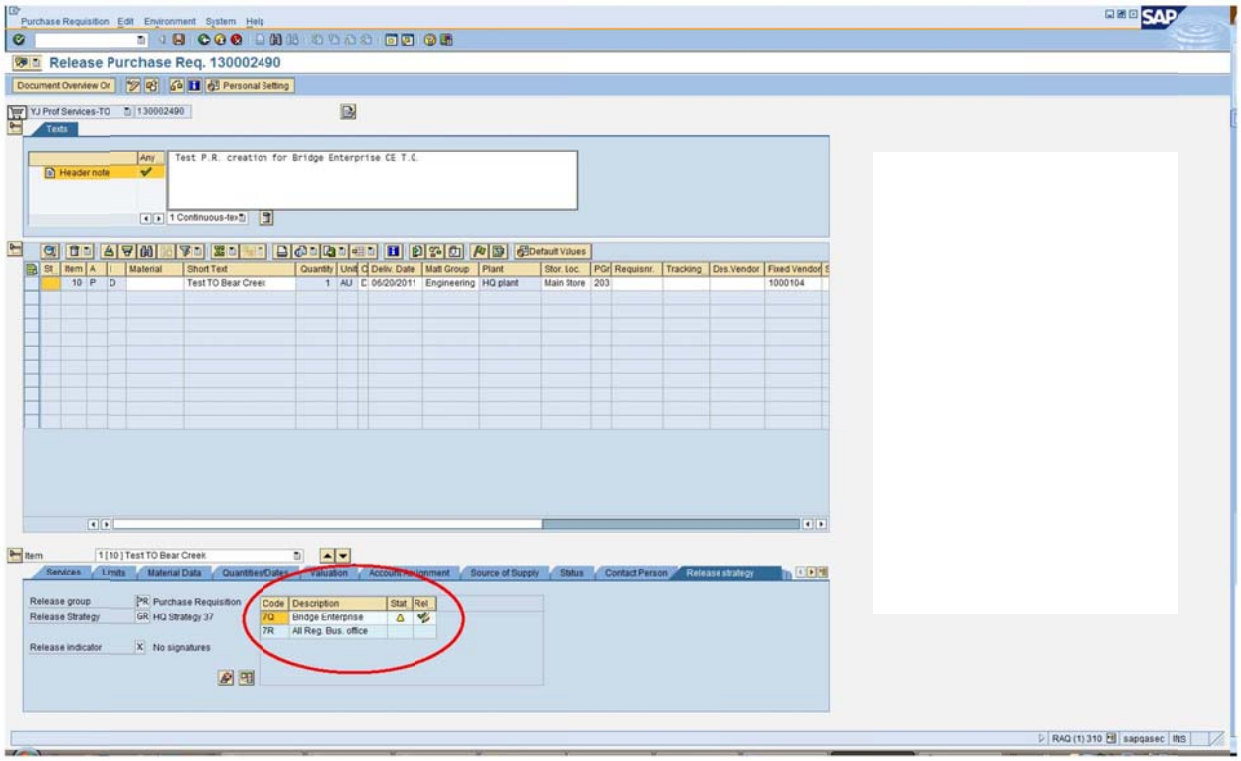


Figure 1-7
Release Strategy

1.14.09 Check of TRNS*PORT PES, Form 65 and SAP

The anticipated costs of the CE and indirects, which were calculated previously, must be incorporated into the overall cost estimate in PES (trns*port) and on Form 65 Project Financial Statement. The value is not entered directly, but as a percentage. The estimated value of CE costs is added into the PES (trns*port) estimate and Form 65 via a percentage calculation, similar to how CE costs for the CE pool are included in the cost of the estimate, basically as a percentage of the estimated cost of the project.

Once the Engineer's Estimate has been reviewed by the Cost Estimates Unit and the estimated costs are firm for the CE and indirects, a correct version of Form 65 may be generated that matches up with the PES (trns*port) Estimate for the total construction estimate. This will be required prior to submitting the project's 1180 to the FHWA. Use the amounts shown in the Excel estimating spreadsheet to enter in the CE Pool percentage in PES (Trns*port) and calculate the Indirects in the 1100 category above.

1.14.10 Immediately Before Requesting 1180:

There are two places where the CE Pool Percentage is needed to calculate the estimate amount correctly on the 1180. The first location is the in Trns•port PES at the category levels. The Resident Engineer is responsible for entering this value. The second location is in SAP via CJ20N on the custom fields "Accounting" tab. The only group authorized and expected to enter this value is OFMB or the SAP Project Systems BPX. The percentage for the CE Pool calculation in SAP will reset every night to the current CE Pool rate. This field is important to get corrected the same day that you start the form 1180. The exact amount of CE Pool and indirects calculated from the percentage entered into SAP and Trns•port may have a small rounding difference. Let your business manager know that they may not match exactly.

1.14.11 After Project Is Awarded:

Once the project is awarded to the low bidder, the percentage for CE used to set aside the construction budget required for the Personal charging to the project directly will need to change in SAP based upon the percentage in conjunction with the Contractor's commitment amount instead of the engineer's estimate. The percentage for CE Pool will now need to be recalculated again and the new percentage based will need to be entered in SAP accounting tab (the percentage does not need to be changed in Trns•port after award). The indirects will be automatically calculated in the system (currently set at 90.0).

The following screensshots show how to check that the project is set up correctly in Trns•port, PES, and SAP so that the CE costs will calculate correctly. Based upon your project having Federal Bridge funds along with the BE funds or if your project is BE funded only, choose <u>one</u> of the following documents to check your PES set up in conjunction with the SAP form 65.

The following screenshots show how to check that the project is set up correctly in TRNS*port, PES, and SAP so that the CE costs will calculate correctly. Choose <u>one</u> of the following documents depending on whether the project is totally state-funded

through Bridge Enterprise (Figure 1-8) or there are federal funds in the project (Figure 1-9).

For help with this complicated process, contact Tony Bemelen, Project Systems Support in the Contracts and Market Analysis Branch, or train a person in the region to become the expert in this process to help others in the region.

SAP check – CJ20N accounting tab – The screenshot below is an example of the accounting tab in CJ20N prior to the project getting awarded.

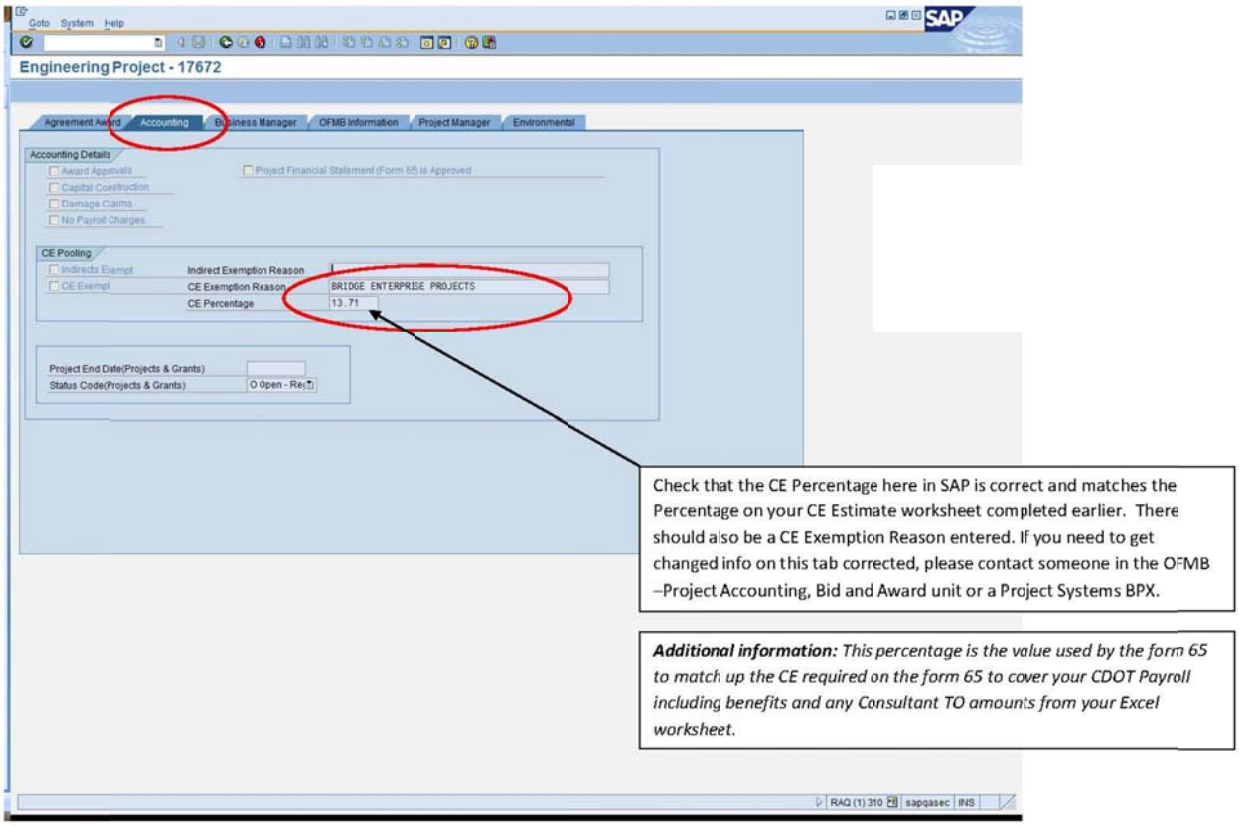


Figure 1-8, Page 1 of 7

TRNS*PORT PES review - The screenshot below is an example of PES project 17672-bid. This is the Categories Tab.

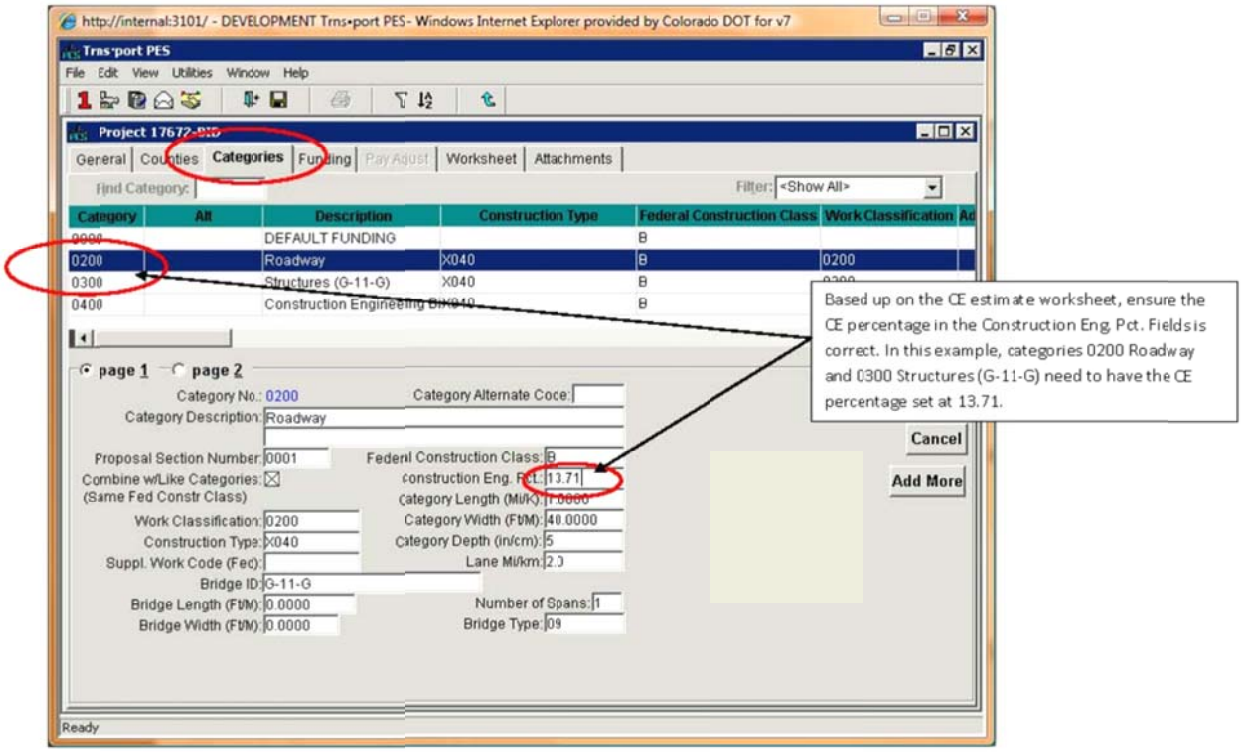


Figure 1-8, Page 2 of 7

TRNS*PORT PES review - The screenshot below is an example of PES project 17672-bid. This is the Categories Tab.

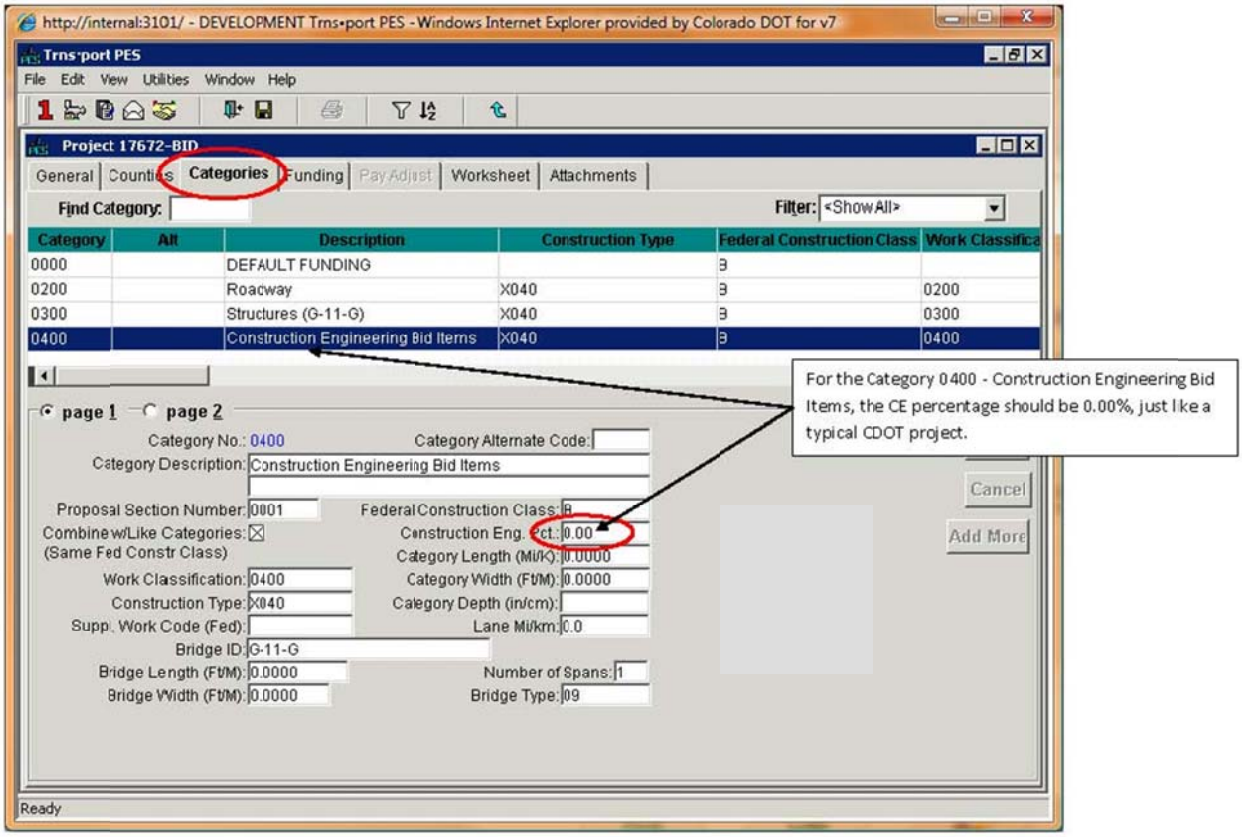


Figure 1-8, Page 3 of 7

TRNS*PORT PES review - The screenshot below is an incorrect example of PES project 17672-bid. This is the Funding Tab.

Fund source for CE Bid Items - Another item that should be checked in regards to the Category 0400 Construction Engineering Bid items is on the Funding tab. Ensure the Fund Code for the 0400 category is set up the same as the other bid categories. It should not be CEPOOL.

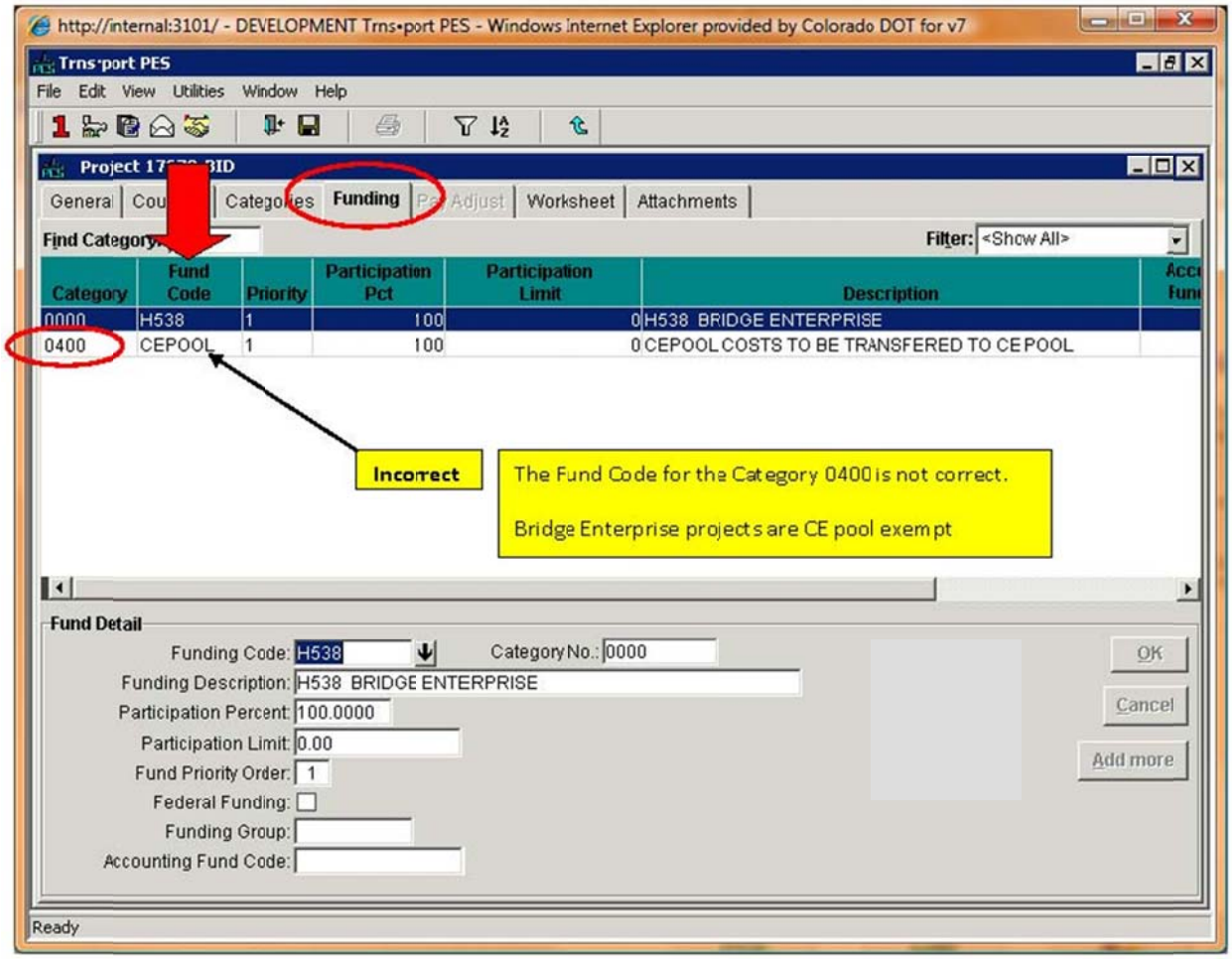


Figure 1-8, Page 4 of 7

TRNS*PORT PES review - The screenshot below is a corrected example of PES project 17672-bid. This is the Funding Tab.

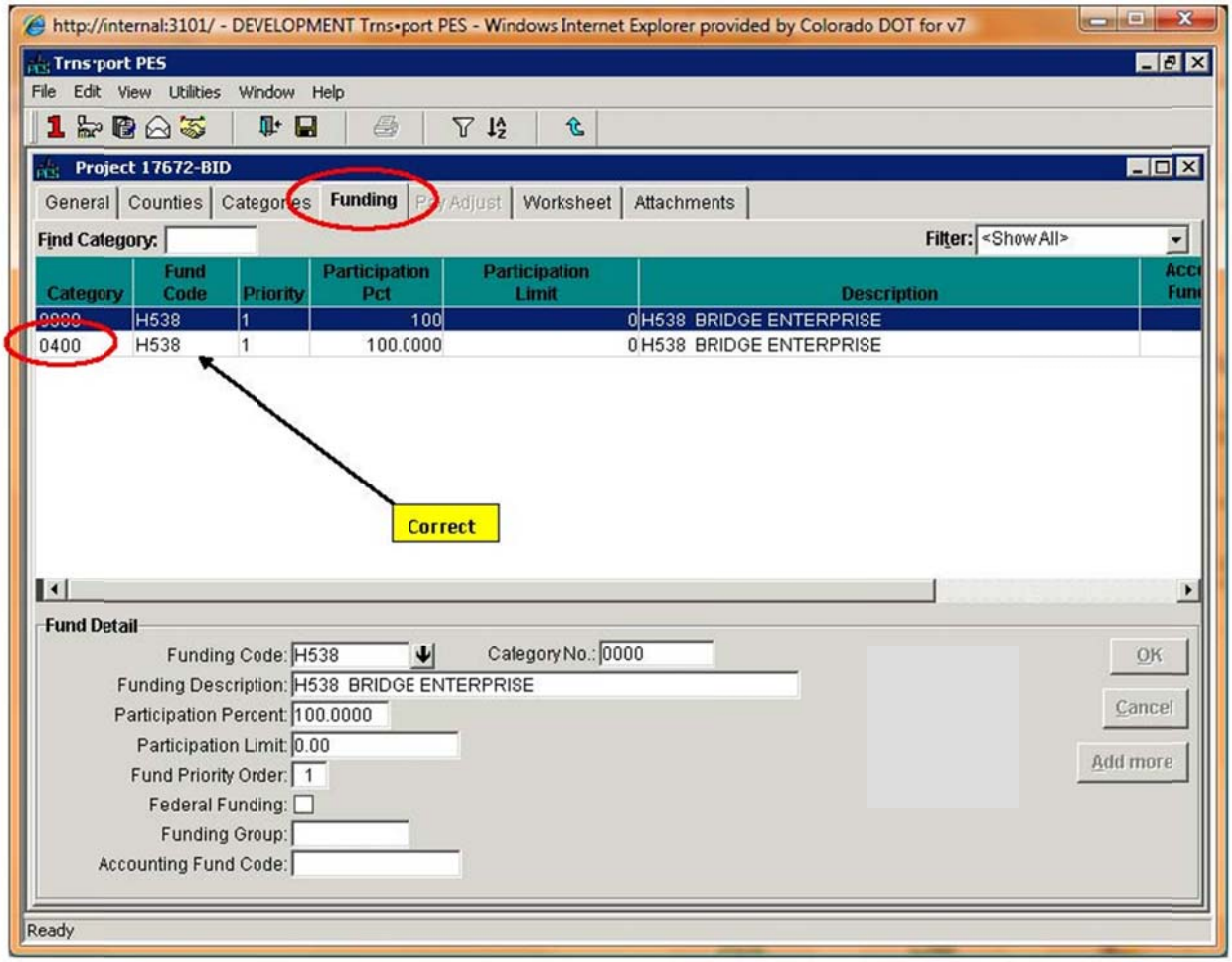


Figure 1-8, Page 5 of 7

TRNS*PORT PES review - The screenshot below is an example of PES project 17672-NONBID. This is the Worksheet Tab.

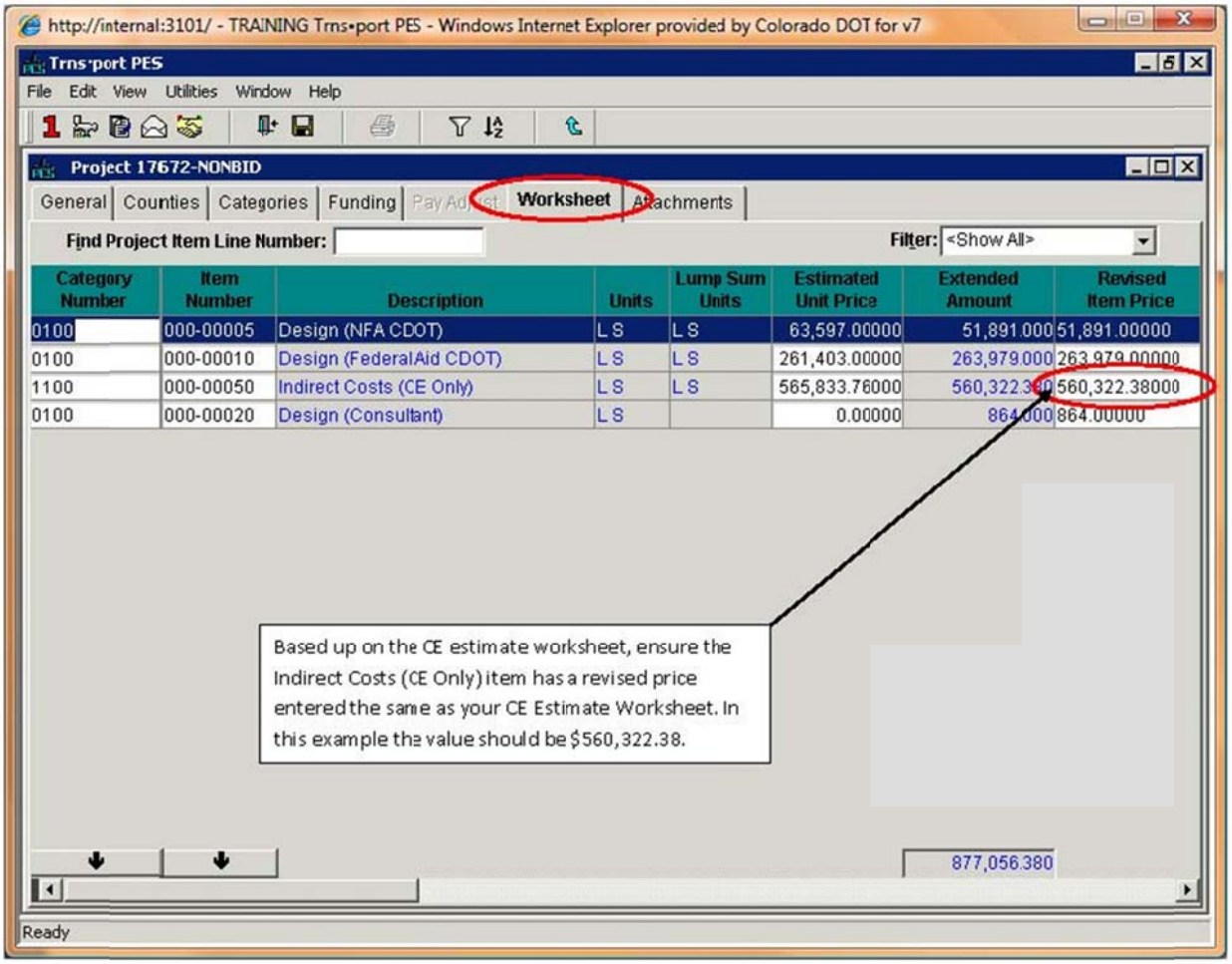


Figure 1-8, Page 6 of 7

Form 65 Check

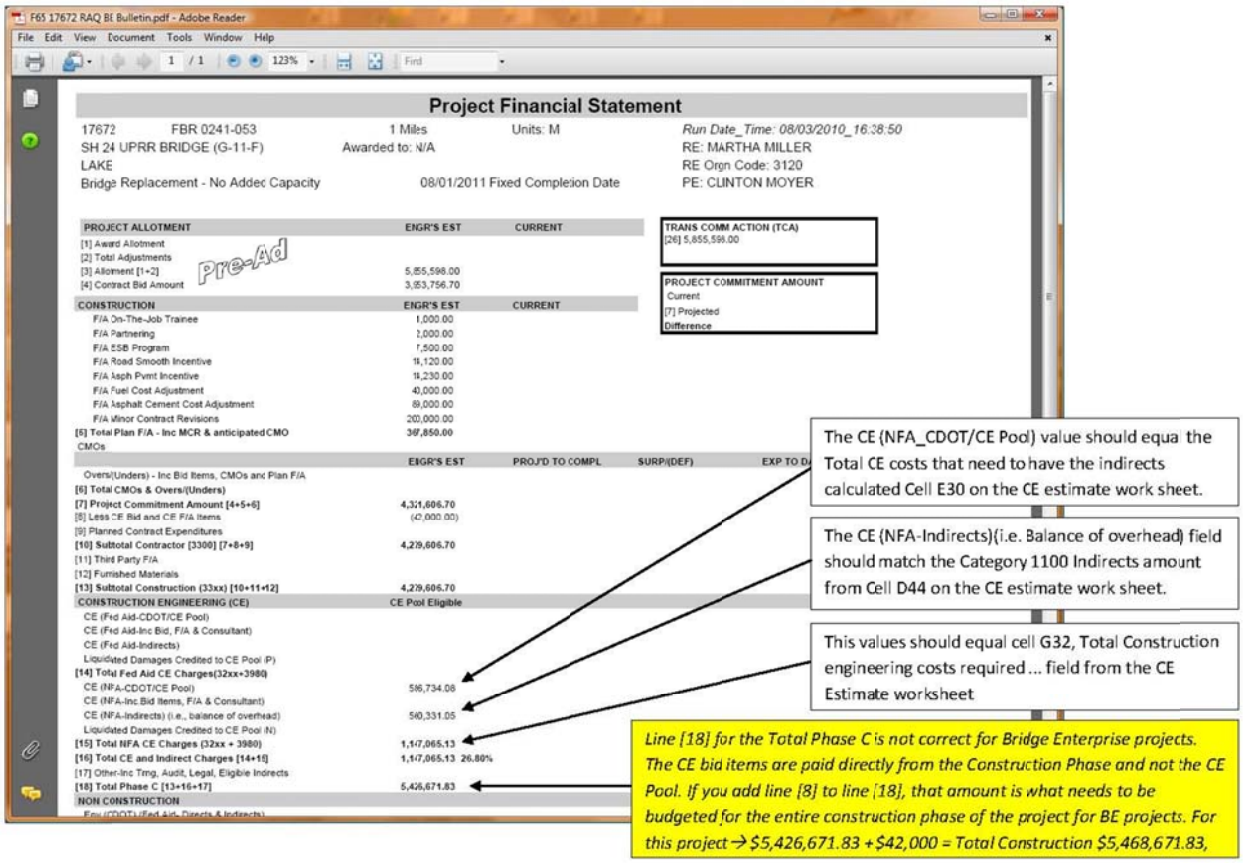


Figure 1-8, Page 7 of 7

Accounting tab CJ20N Custom tab - The screenshot below is an example of CJ20N on the Accounting custom tab.

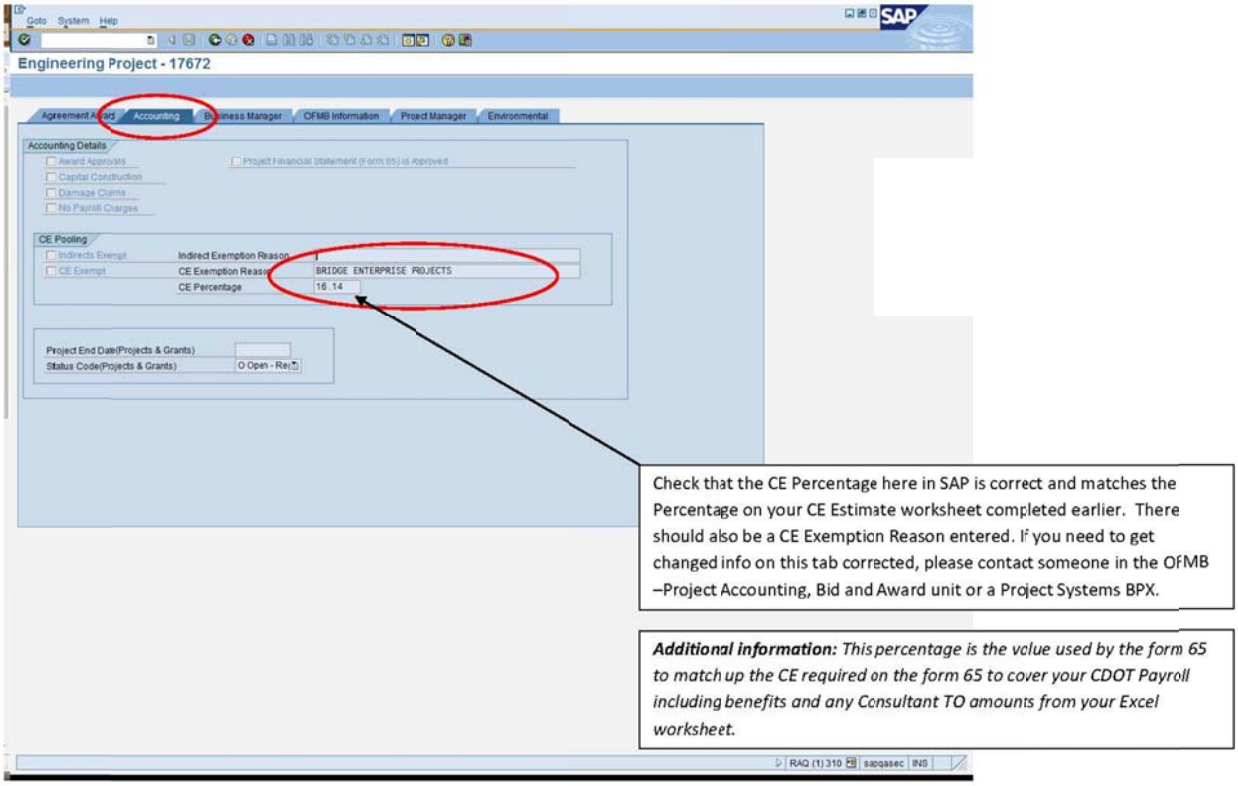


Figure 1-9, Page 1 of 7

TRNS*PORT PES review - The screenshot below is an example of PES project 17672-bid. This is the Categories Tab.

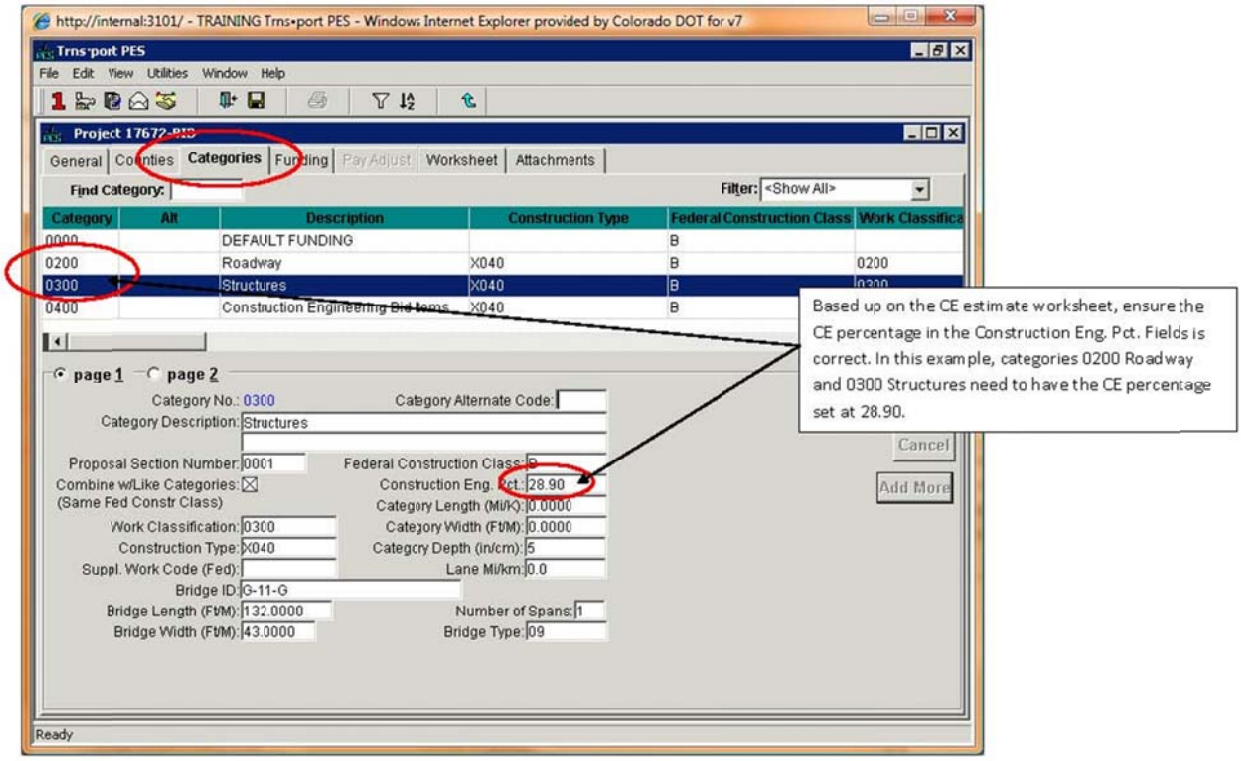


Figure 1-9, Page 2 of 7

TRNS*PORT PES review - The screenshot below is an example of PES project 17672-bid. This is the Categories Tab.

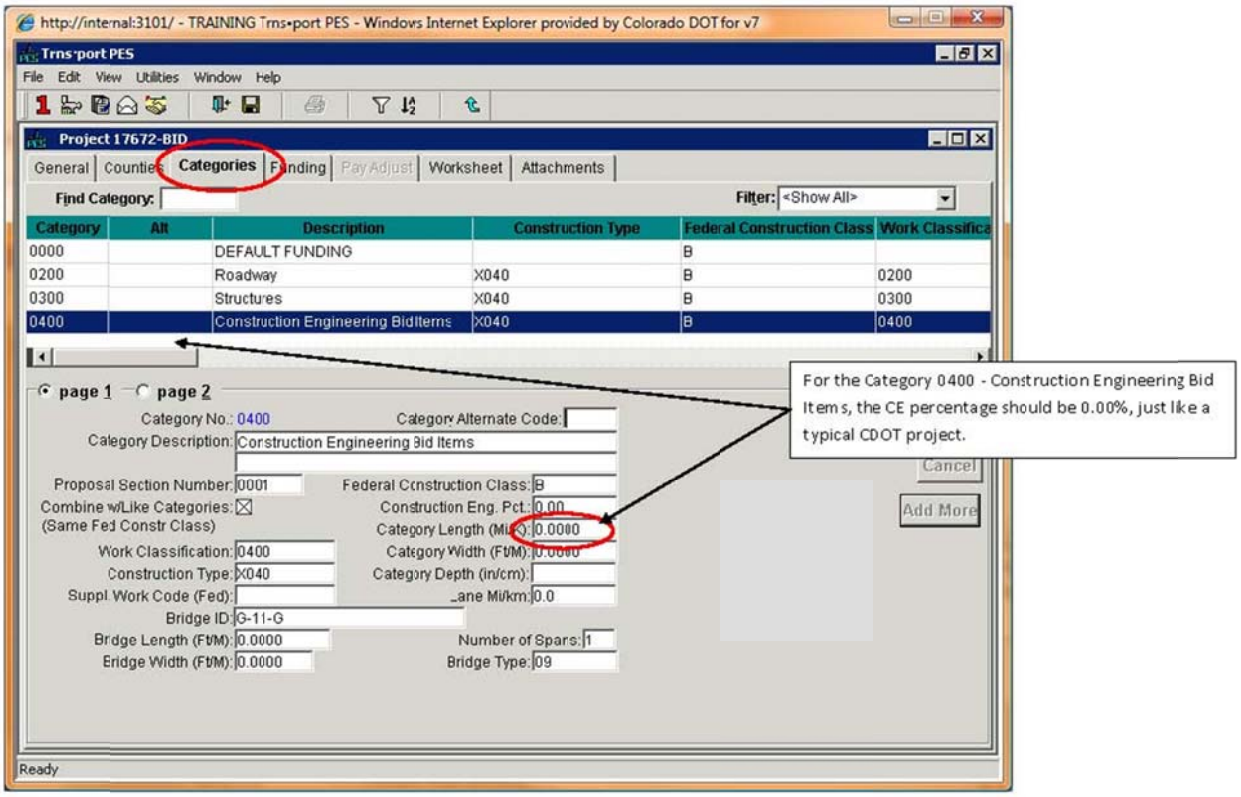


Figure 1-9, Page 3 of 7

TRNS*PORT PES review - The screenshot below is an incorrect example of PES project 17672-bid. This is the Funding Tab.

Fund source for CE Bid Items - Another item that should be checked in regards to the Category 0400 Construction Engineering Bid items is on the Funding tab. Ensure the Fund Code for the 0400 category is set up the same as the other bid categories. It should not be CEPOOL.

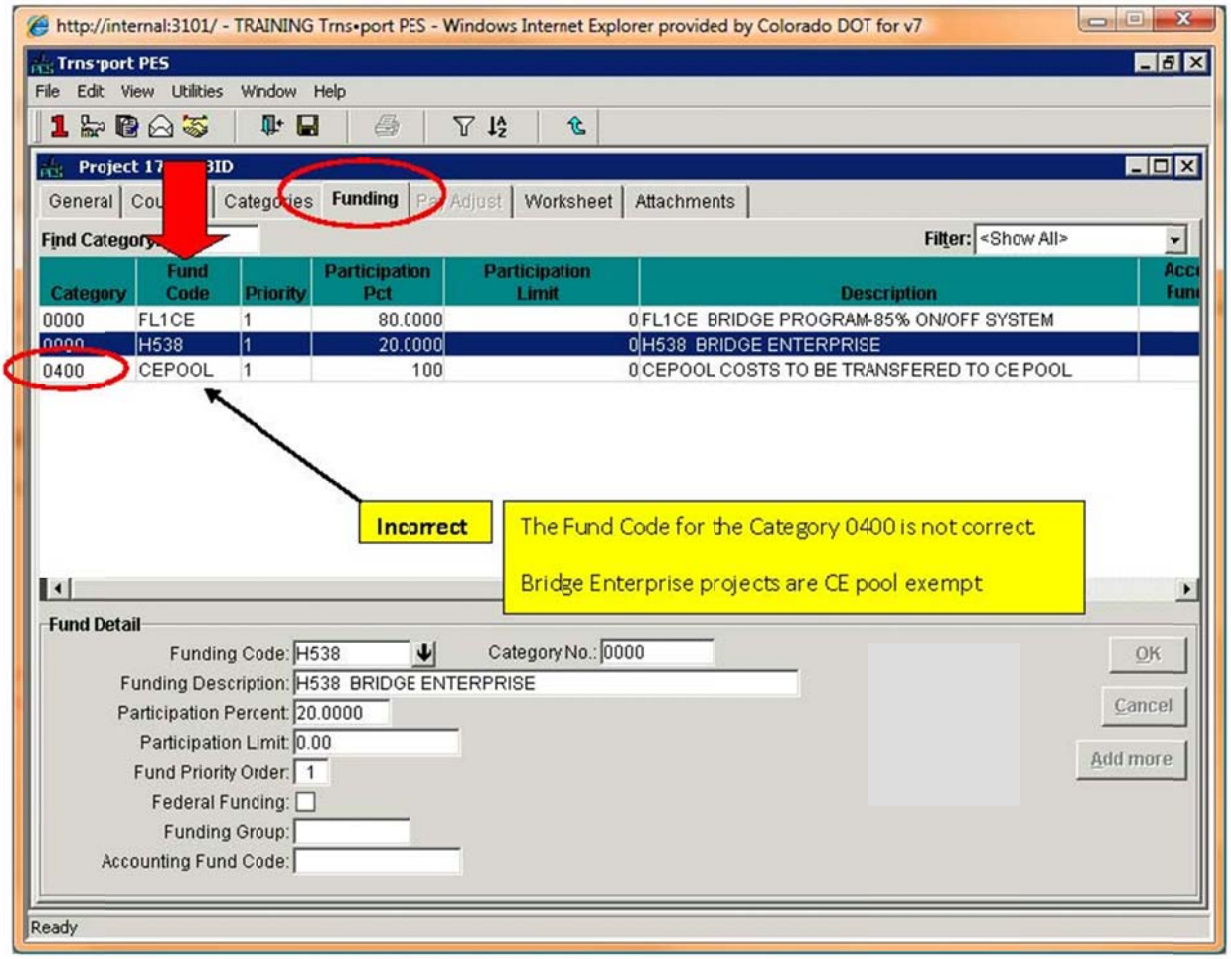


Figure 1-9, Page 4 of 7

TRNS*PORT PES review - The screenshot below is a corrected example of PES project 17672-bid. This is the Funding Tab.

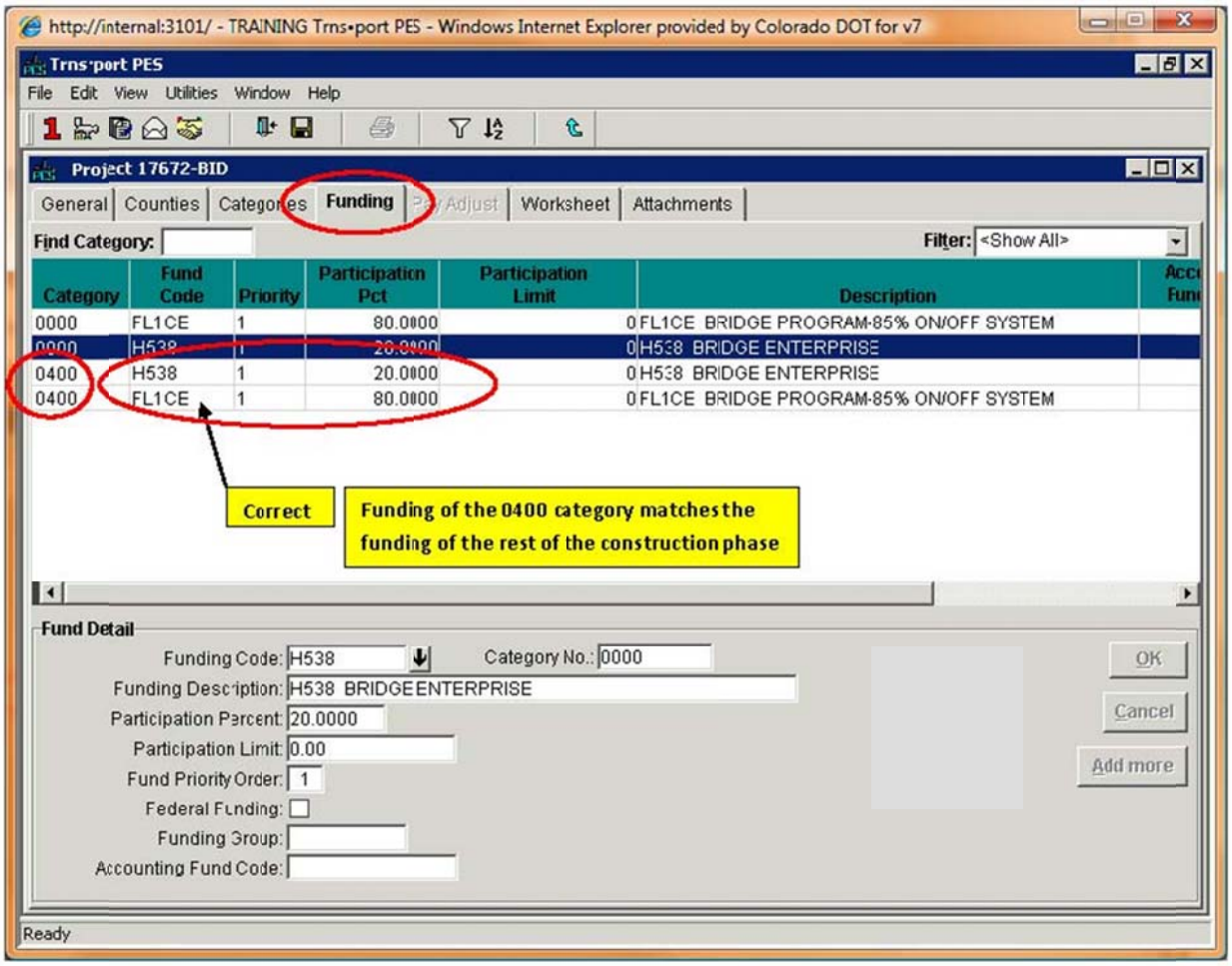


Figure 1-9, Page 5 of 7

TRNS*PORT PES review - The screenshot below is an example of PES project 17672-NONBID. This is the Worksheet Tab.

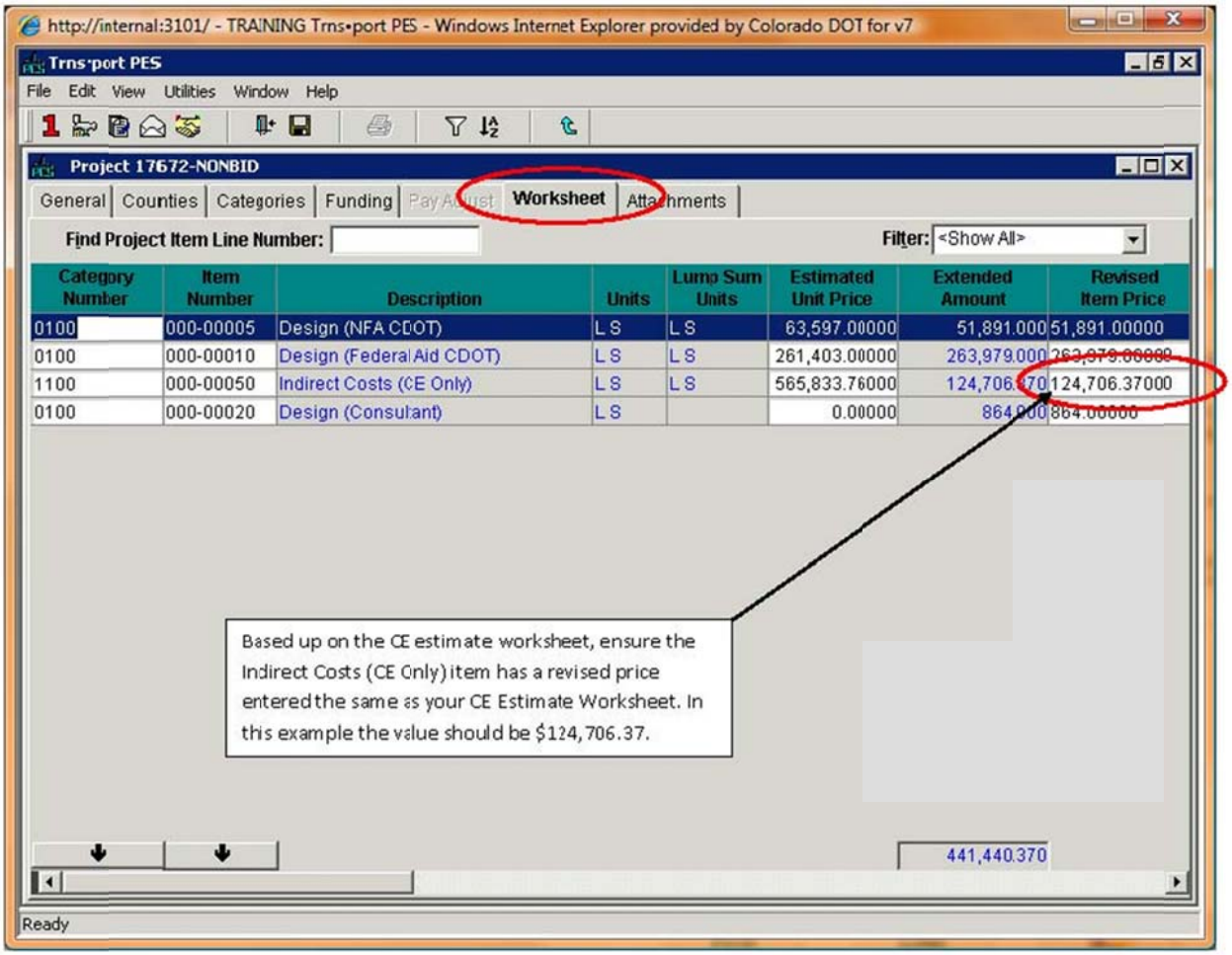


Figure 1-9, Page 6 of 7

Form 65 Check

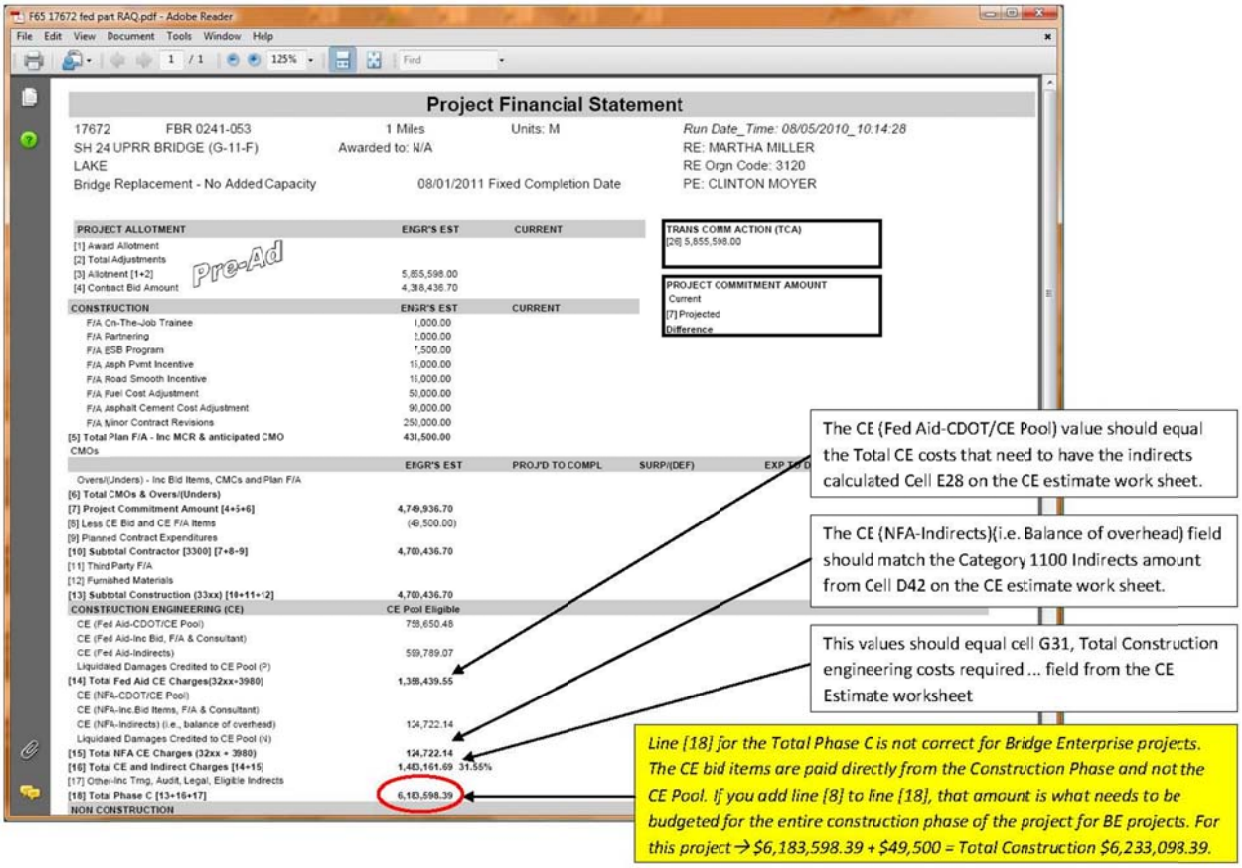


Figure 1-9, Page 7 of 7

1.14.12 Project Signs for *FASTER* Projects

All projects funded with FASTER money shall have special signs identifying them as FASTER projects. The signs are to be erected at each major approach to the project. There will normally be a minimum of two of these signs on the project. Since there may be special circumstances, the Resident Engineer should consult the Region Traffic

Engineer on the number and locations of signs. The sign layout consists of two panels, a W21-1a “Workers Sign” sign mounted on a special FASTER sign.

Signs shall be mounted on 6 X 6 timber posts for a temporary installation in accordance with the applicable S-Standards. These signs will be paid for using bid item 630-80344, Construction Traffic Sign (Special).

The sign layout can be accessed via the HQ Safety and Traffic Engineering Branch website under the link to the CDOT Sign Library webpage at: http://www.coloradodot.info/library/traffic/traffic-manuals-guidelines/fed-state-co-traffic-manuals/cdot-sign-library.html.

SECTION 2

PROJECT DEVELOPMENT PROCESS

2.01 DESIGN SCOPING REVIEW

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

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

2.01.01 Form 1048, Project Scoping/Clearance Record

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

2.01.02 Design Scoping Review (DSR) Meeting

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

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

2.01.03 DSR Invitees

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

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

2.01.04 Conduct of the DSR Meeting

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

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

2.01.05 DSR Meeting Records

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

2.01.06 Additional References:

1. 23 CFR Part 625, Design Standards for Highways

2.02 STAGE CONSTRUCTION (FUTURE CAPACITY CONSIDERATIONS)

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

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

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

2.03 EXISTING TYPICAL SECTION

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

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

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

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

Additional References:

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

2.04 PROPOSED TYPICAL SECTION

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

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

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

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

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

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

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

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

Additional References:

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

2.05 DESIGN DATA (FORM 463)

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

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

2.05.01 Safety Evaluation

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

2.05.02 Preparing Form 463 in SAP

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

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

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

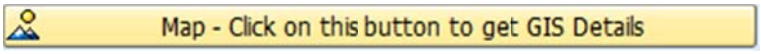
Design data on Form 463 includes, but is not limited to:

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

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

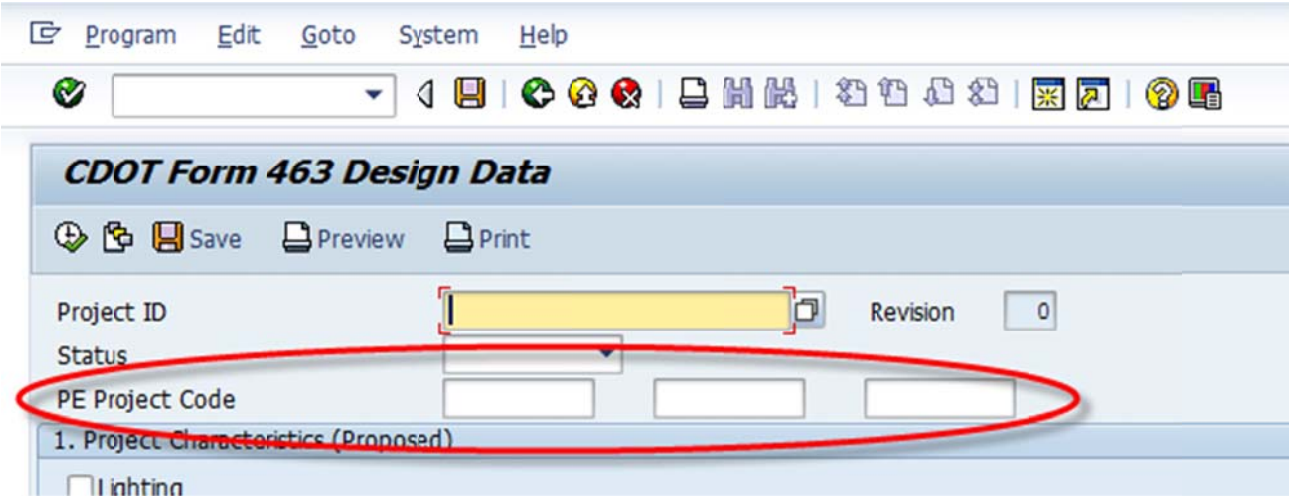
When a project reaches the Field Inspection Review stage, the information on the preliminary Form 463 should be complete and the Resident Engineer should not change the scope of work or extend the project limits. If it is necessary to revise the project limits or the scope of work, then Form 463 must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

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

the 

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

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

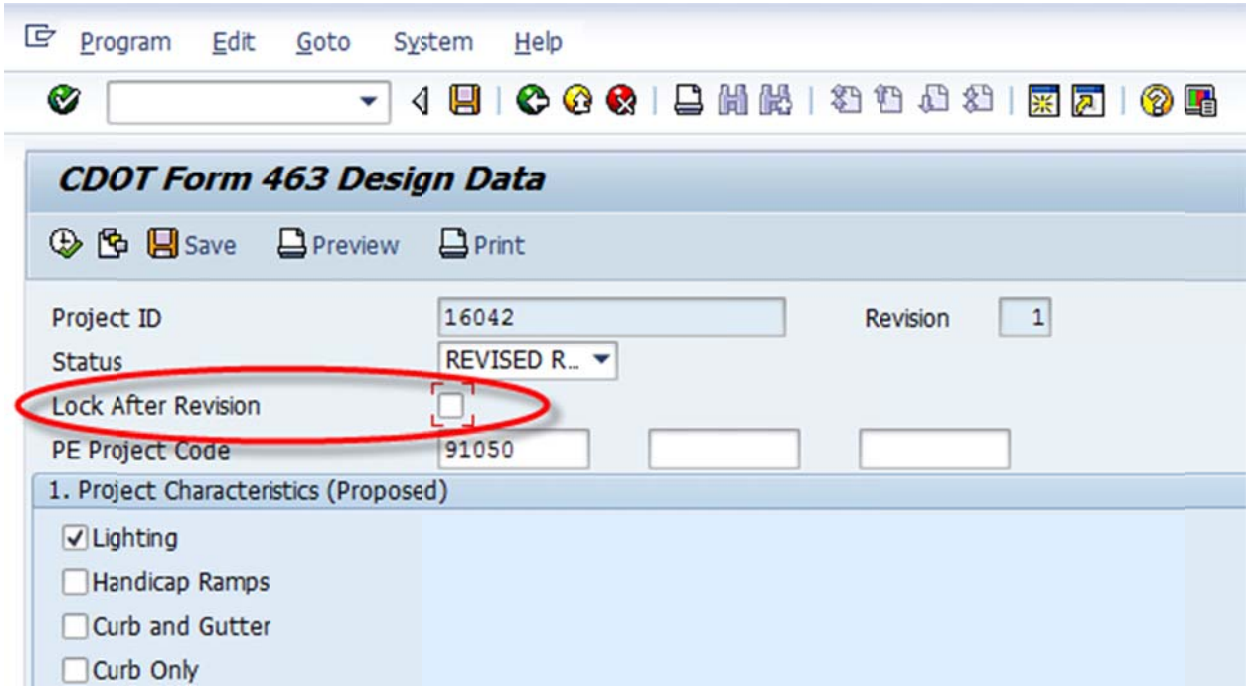


These fields are intended to list any other projects that were used for the preparation or clearing of the construction project. Generally speaking, if a separate design project was used such (like a Resurfacing Design pool or a project design corridor). Another example would be if a ROW acquisition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

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

2.05.03 Revising Form 463 in SAP

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



2.05.04 Final Form

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

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

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

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

2.05.05 Summary

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

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

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

2.05.06 Additional References:

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

2.06 DESIGN EXCEPTION (VARIANCE) (FORM 464)

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

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

2.06.01 Agreement between Forms 463 and 464

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

2.06.02 Additional Resources

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

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

2.06.03 Discovering Non-conformities

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

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

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

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

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

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

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

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

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

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

2.06.04 No Variance Required

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

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

2.06.05 Design Exception Request

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

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

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

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

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

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

2.06.06 Additional References:

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

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

2.07.01 Purpose of 3R Program

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

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

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

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

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

Restoration and Rehabilitation:

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

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

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

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

2.07.03 3R Design Procedures

2.07.03.01 Design Scoping Review for 3R Projects

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

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

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

2.07.03.02 Safety Evaluation for 3R Projects

A Safety Evaluation performed by the HQ Safety and Traffic Engineering Branch should be done for all 3R projects and will result in either a Traffic Operational Analysis (TOA) or Safety Assessment Report (SAR). The Resident Engineer will contact the HQ Safety and Traffic Engineering Branch to request a Safety Evaluation. This can be requested through the HQ Safety and Traffic Engineering Website. This Branch will determine the level of analysis required and will provide the Resident Engineer either a TOA or a SAR. A TOA is an accident history report with a brief recommendation section. A SAR is a comprehensive analysis of the accident history, can take up to 6 months to complete, and will include specific recommendations. The Project Team should start the Safety Evaluation process at the earliest possible stages of the project (DSR or earlier), so that if recommendations are made in the Safety Evaluation, there will be enough time to incorporate those recommendations into the project plans.

If a Safety Evaluation (TOA or SAR) is not obtained, these 3R procedures do not apply. The project team must evaluate all 13 geometric design criteria for the entire project and complete design exception variance requests in accordance with Section 2.06.

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

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

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

2.07.03.04 Safety Issues Related to Geometric Design Criteria

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

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

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

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

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

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

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

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

2.07.03.06 Structural Recommendations for Overlay Work

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

2.07.03.07 Completion of the Preliminary Design Data (Form 463)

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

2.07.03.08 Resurfacing Program Funding Limitations

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

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

2.07.03.09 Safety Enhancement Funding

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

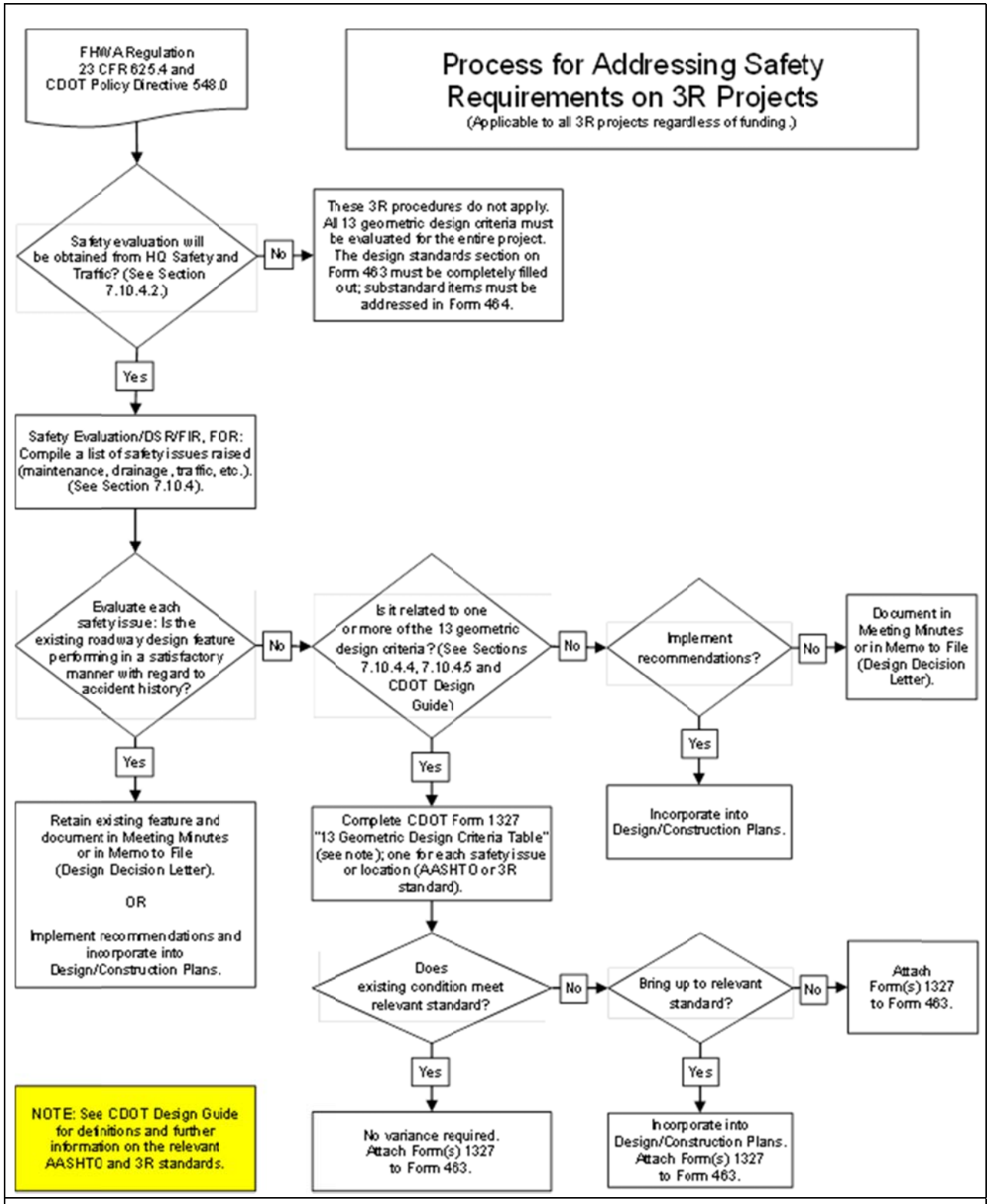


Figure 2-1 3R Projects Flowchart

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

COLORADO DEPARTMENT OF TRANSPORTATION **DESIGN EXCEPTION VARIANCE REQUEST**	FHWA Oversight ☐ Yes ☒ No	Project Code 14122
Project name SH 99 Neptune to Venus	Date 10/10/2004	Project Number NH 099-121
Type (check all that are applicable) ☐ New construction ☐ Restoration ☒ Resurfacing ☐ Rehabilitation ☐ _____ ☐ Reconstruction ☒ Safety ☐ Enhancement ☐ _____ ☐ _____	Revised 11/11/2004	Region 1

Part 1 – Complete A through H for all projects.

A. Short project description (☒ see CDOT Form 463 for more detailed description) Resurface SH 99 from Neptune Road to Venus Avenue. Safety Work per recommendations in Safety Evaluation to include guardrail, minor widening, and slope flattening.	☐ AASHTO standards apply ☒ 3R standards apply ☐ Other:_____

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

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

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

E. Description of adjoining sections: (☒ see CDOT Form 463) Other:	☒ same as existing project ☒ same as proposed project

F. Accident data Source: Safety Assessment Report	G. Cost
Most recent statewide accident rate (calendar year) for this functional class / facility: (per million vehicle-miles of travel) a) 2.31 b) _____ Latest accident rate for this highway (usually 3 years): 5 years a) 1.41 b) _____	Estimated item cost if built to full standard $ 400000 Estimated item cost with exception $ 200000 + difference in cost: $ 200000

H. Other (as needed)

Part 2 – Appropriate signatures required.

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

Required for Federal-oversight projects only

Approved by (FHWA Division Administrator)	Date
B. ☐ Not approved ☐ Approved with conditions	Conditions/comments

Previous editions are obsolete and may not be used.

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

CDOT Form #0464 08/04

2.07.04 Additional References:

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

2.08 SAFETY REVIEW (INCLUDING CLEAR ZONE DECISIONS)

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

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

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

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

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

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

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

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

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

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

Additional References:

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

2.09 ROADSIDE BARRIER DESIGN AND REVIEW

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Additional References

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

2.10 BICYCLE AND PEDESTRIAN FACILITIES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Additional References:

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

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

2.11 HYDRAULIC DESIGN (EROSION CONTROL AND STORMWATER)

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

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

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

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

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

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

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

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

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

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

Additional References:

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

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

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

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

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

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

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

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

Additional References:

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

2.13 CDOT MAINTENANCE INPUT

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

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

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

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

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

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

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

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

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

Additional References:

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

2.14 FIELD SURVEY (FORM 1217)

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

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

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

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

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

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

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

right of way purchases, and stake parcels, and easements.

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

Additional References:

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

2.15 VALUE ENGINEERING (DURING DESIGN PHASE)

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

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

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

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

2.15.01 Definitions

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

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

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

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

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

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

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

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

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

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

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

2.15.02 Value Engineering Analysis Required

FHWA requires a VE analysis on:

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

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

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

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

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

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

2.15.03 Value Engineering Analysis Recommended

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

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

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

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

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

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

2.15.04 When should a VE analysis be conducted?

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

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

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

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

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

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

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

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

For bridge projects, the VE Analyses must:

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

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

2.15.06 How may consultants be used to conduct VE analyses?

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

2.15.07 What are CDOT's responsibilities?

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

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

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

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

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

2.15.08 Additional References:

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

2.16 DESIGN PROJECT MANAGEMENT AND REGION PLAN STATUS REVIEW

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

2.16.01 Design Phase Responsibilities

2.16.01.01 Target the Current Planned Ad Date

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

2.16.01.02 Maintain Good Communications

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

2.16.01.03 Review Project Cost Estimates

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

2.16.01.04 Convey Scope or Budget Changes

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

2.16.01.05 Discuss Any Potential Impact on Ad Date

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

2.16.01.06 Communicate Any Decisions on Ad Date

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

2.16.01.07 Update Working Schedule

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

2.16.02 Region Plan Status Meeting

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

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

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

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

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

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

1. Current Project Budget

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

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

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

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

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

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

2.17 FIELD INSPECTION REVIEW

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

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

2.17.01 Authority

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

2.17.02 Required Items

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

2.17.02.01 Scoping, Budgeting, and Planning

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

2.17.02.02 Environmental Clearance Document

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

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

2.17.02.03 Traffic

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

2.17.02.04 Materials

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

2.17.02.05 Right of way

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

2.17.02.06 Utilities

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

2.17.02.07 Hydraulics

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

2.17.02.08 Wetlands

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

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

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

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

2.17.02.09 Survey

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

2.17.02.10 Preliminary Cost Estimate

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

2.17.03 Included Categories

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

2.17.03.01 Required on all plans

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

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

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

2.17.03.02 Desired items

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

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

2.17.03.03 Optional items

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

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

2.17.04 Distribution of plans

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

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

2.17.05 Participation

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

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

Staff Bridge Branch may conduct a separate Field Inspection Review.

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

2.17.06 Conduct of the review

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

2.17.06.01 Scoping, Budgeting and Planning

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

2.17.06.02 Environmental

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

4. Permit requirements.

2.17.06.03 Traffic

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

2.17.06.04 Structures

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

2.17.06.05 Materials

1. Stabilization Report and Life Cycle Cost Analysis (if available)
2. Materials Recommendation Report
3. Quality incentives
4. FIPIs for proprietary items, if any

2.17.06.06 Right of way

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

2.17.06.07 Utilities

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

2.17.06.08 Agreements, justifications, and approvals status

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

2.17.06.09 Survey

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

2.17.06.10 Hydraulics

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

2.17.06.11 Others

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

2.17.07 Field Inspection Review follow-up

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

2.17.07.01 Distribute FIR Minutes

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

2.17.07.02 Address Unanswered Questions

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

2.17.07.03 Update Project Schedule

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

2.17.07.04 Update Form 463

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

2.17.07.05 Revise project plans:

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

2.17.07.06 Follow up on Wetland requirements:

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

2.17.07.07 Prepare information for Right of way requirements

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

2.17.07.08 Follow-up on Utility Issues

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

2.17.08 Combination Field Inspection Review-Final Office Review

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

2.17.09 Additional References:

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

2.18 CONSTRUCTABILITY REVIEWS

2.18.01 Introduction

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

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

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

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

2.18.02 Project Scoping CR - PSCR

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

2.18.03 30 Percent Project CR – 30 Percent PCR

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

2.18.04 90 Percent Project CR – 90 Percent PCR

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

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

2.18.05 Post Construction CR

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

2.18.06 Procedures

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

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

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

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

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

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

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

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

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

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

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

Constructability Review Checklist

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

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

Sheet	Issue	Clear	PE	RE

NOTICE OF CDOT CRANE CONSTRUCTABILITY REVIEW

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

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

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

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

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

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

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

   User Name: yogib

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

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

2.19 DESIGN OFFICE REVIEW (STATUS MEETING)

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

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

2.20 DESIGN DECISION LETTER

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

Design decision letters should be:

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

Additional References:

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

2.21 ON-THE-JOB TRAINEE APPROVAL

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

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

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

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

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

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

Table 2-1
OJT Training Goal

Additional References:

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

2.22 DISADVANTAGED BUSINESS ENTERPRISE GOALS

2.22.01 Introduction

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

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

2.22.02 Certification

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

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

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

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

2.22.03 Project Goals

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

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

2.22.04 Outreach

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

2.22.05 Funding

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

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

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

For additional guidance please contact your area engineer.

2.22.06 Administration

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

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

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

2.22.07 Additional References:

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

2.23 SPECIAL PROVISIONS

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

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

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

2.23.01 Standard Specifications

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

2.23.02 Standard Special Provisions

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

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

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

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

2.23.03 Project Special Provisions

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

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

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

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

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

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

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

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

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

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

The following outlines the procedures for preparation of special provisions:

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

2.23.04 Additional References:

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

2.24 PROPRIETARY ITEMS

2.24.01 Construction Contracts

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

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

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

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

1. CDOT certifies that such patented or proprietary item is essential for synchronization with existing transportation facilities; or
2. CDOT certifies that no equally suitable alternative exists; or
3. Such patented or proprietary item is used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes.

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

Written approval by either FHWA or CDOT, as appropriate, is required when the contract specifies the use of a proprietary product or uses a single brand name. See the attached flowchart, PROCESS FOR PREPARING “FINDING IN THE PUBLIC INTEREST” (FIPI) DOCUMENTS FOR PROPRIETARY ITEMS, for the process to follow for project specific, Region-wide, and State-wide approvals. (See Figure 2-2.)

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

Copies of approved Region-wide and State-wide 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.

See Figure 2-2 for a diagram of the approval process for use of proprietary items on a project.

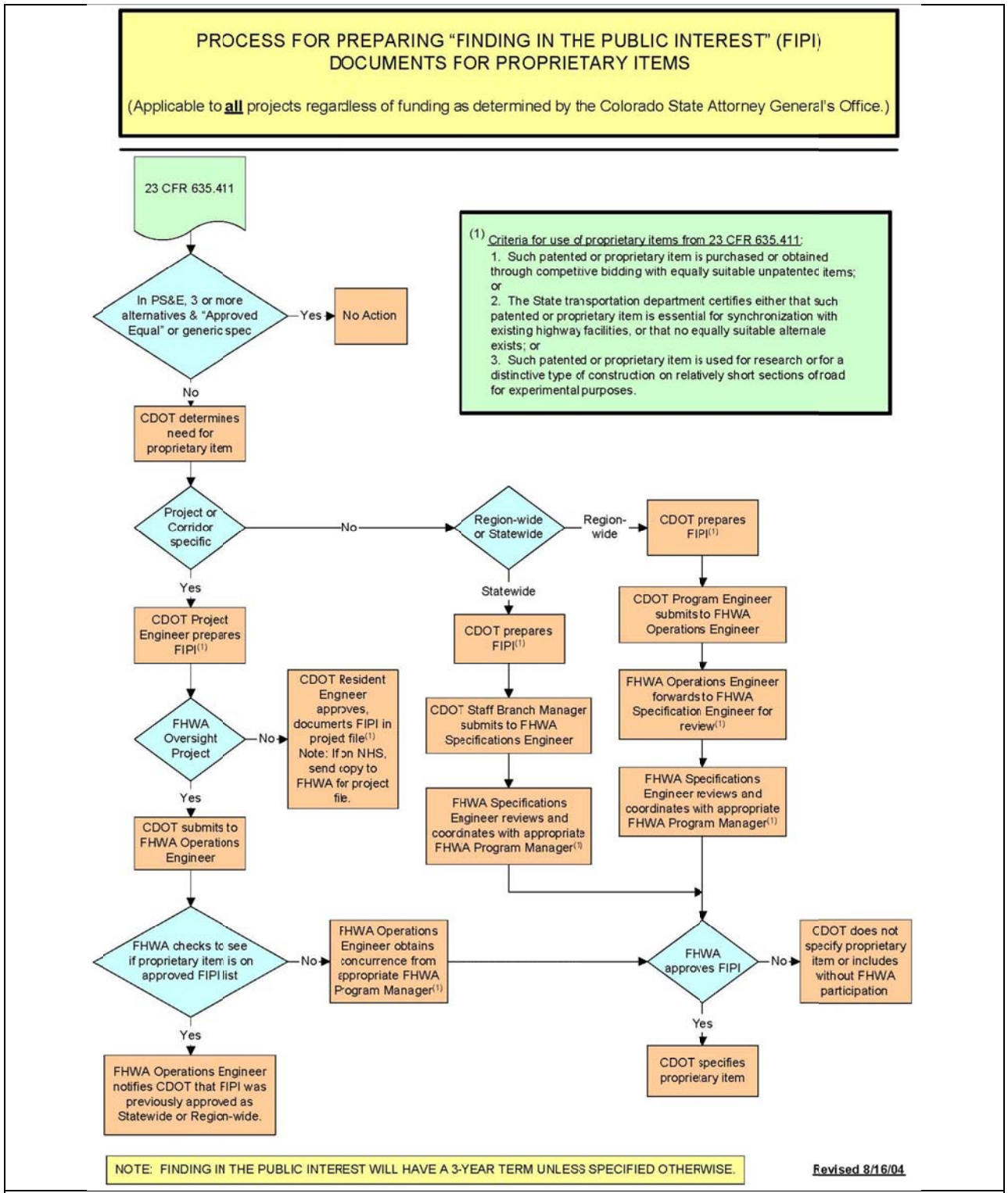


Figure 2-2
FIPI Flowchart

2.24.02 Procurement Contracts

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

A Sole Source Certification Form

http://cdot/business/procurement/Documents/PurchManual_MOD_2007.pdf (page 45) shall be completed only for sole sources of goods or services. This certification does not apply to situations classified as "Emergency Procurement" covered by CRS 24-103-206.

2.24.03 Additional References:

1. 23 CFR Part 635.411, Material or Product Selection
2. FHWA Contract Administration Core Curriculum Participant's Manual and Reference Guide 2006
   http://www.fhwa.dot.gov/programadmin/contracts/coretoc.cfm

2.25 PROJECT INFORMATION TECHNOLOGY NEEDS

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

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

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

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

2.26 PROJECT CONTROL DATA (FORM 859)

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

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

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

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

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

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

The procedures for preparing the Form 859 are:

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

Additional References:

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

2.27 ESTIMATE REVIEW BY ENGINEERING ESTIMATES AND MARKET ANALYSIS UNIT

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

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

EEMA activities include:

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

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

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

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

2.27.01 Estimate Security

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

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

2.27.02 Additional References:

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

2.28 FINAL OFFICE REVIEW

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

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

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

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

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

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

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

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

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

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

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

2.29 BID PACKAGE REVIEW (FORM 1299)

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

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

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

A complete PS&E set of plans shall include:

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

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

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

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

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

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

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

Additional References:

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

2.30 PLANS, SPECIFICATIONS AND ESTIMATE APPROVAL (FORM 1180)

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

Obligation:

SAP Steps:

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

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

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

Authorization is requested from FHWA once OFMB receives:

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

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

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

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

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

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

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

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

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

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

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

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

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

Additional References:

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

2.31 PURCHASE REQUISITION FOR CONSTRUCTION CONTRACT

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

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

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

Link to ME51N – Create a Construction Project PR Resource guide

ME51N - Federally Funded Construction

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

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

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

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

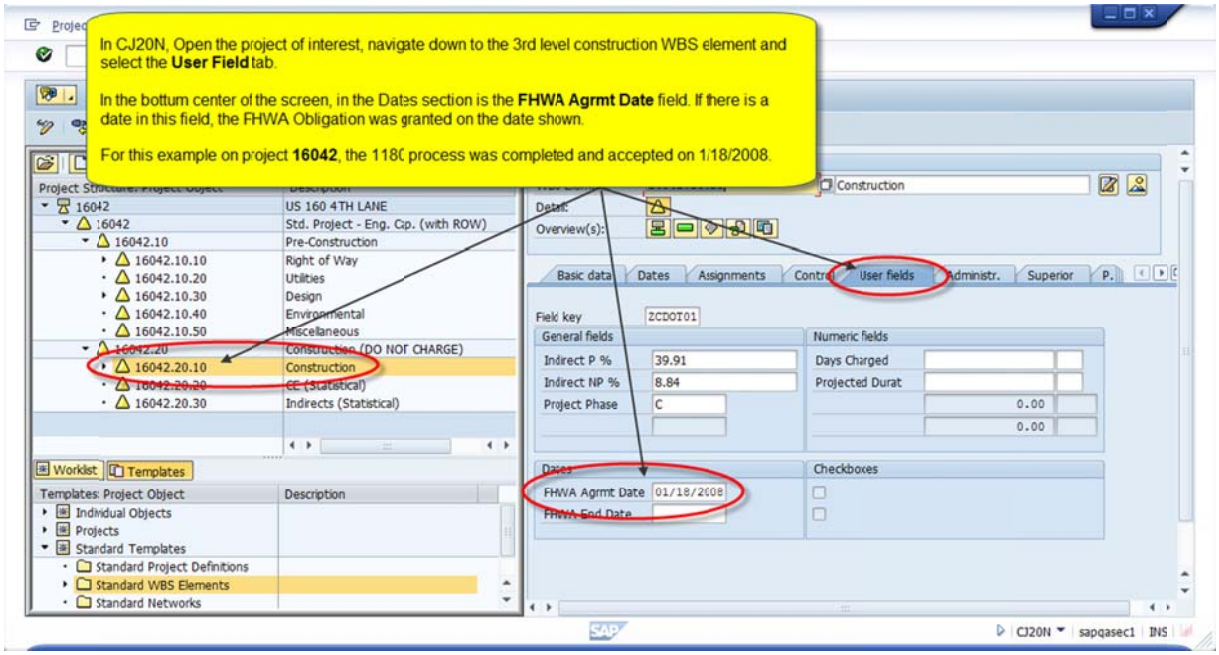


Figure 2-3
Checking FHWA Agreement Date

2.31.01 Key SAP Purchase Requisition Points

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

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

2.31.02 Additional References:

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

2.32 PLANS AND REPRODUCTION PROCESSES

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

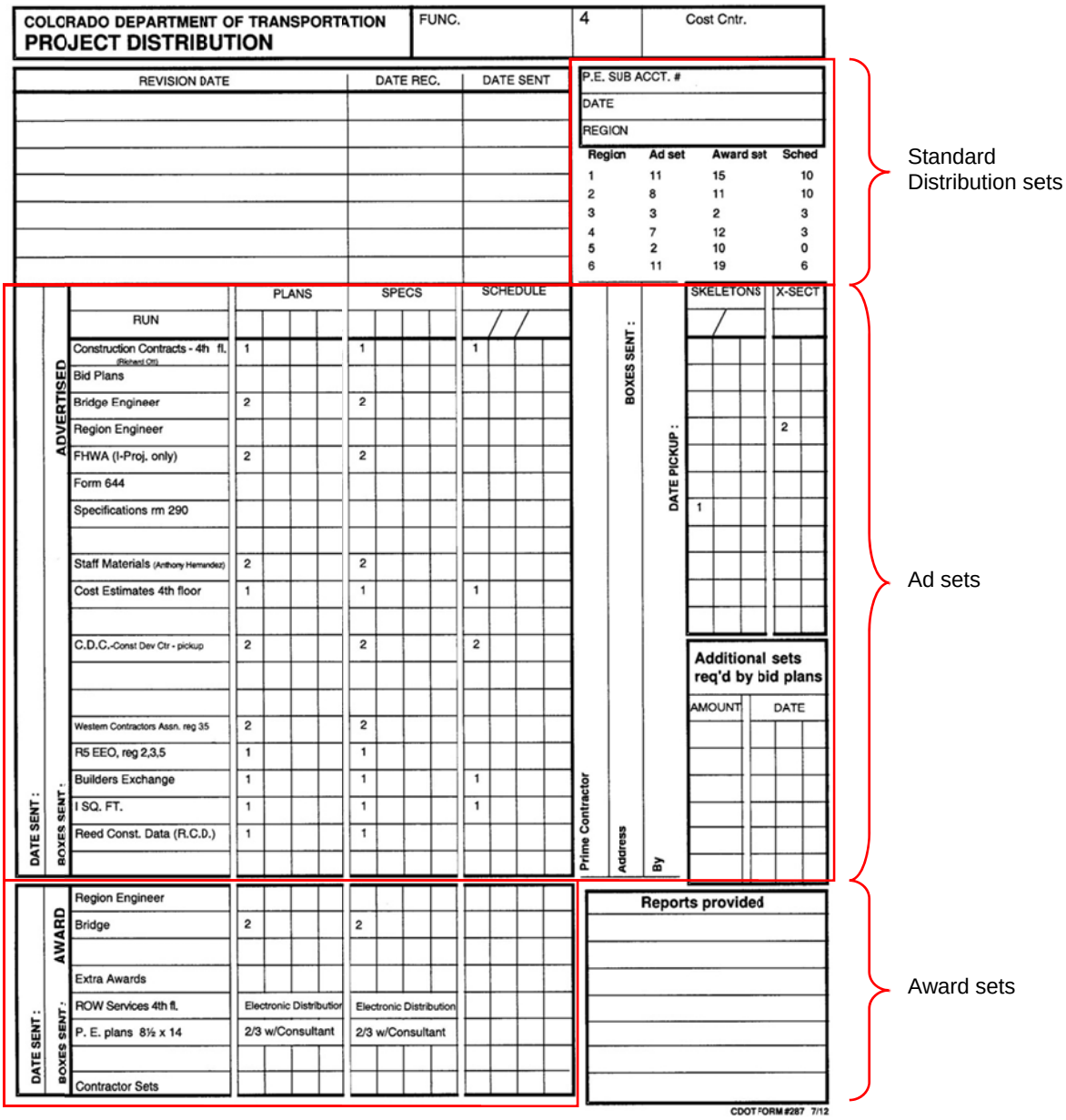
1. CDOT Project Staff:
   Supporting the advertisement (Ad) process, the CDOT Project Staff answers Contractor's questions and submits-revisions-under-ad and requests for bid deferrals. This group needs the Ad documents and revisions-under-ad as soon as possible, just in case there are immediate Contractor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

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

2.32.01 Form 287 Project Distribution

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

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



COLORADO DEPARTMENT OF TRANSPORTATION
PROJECT DISTRIBUTION

FUNC. | 4 | Cost Cntr.

REVISION DATE	DATE REC.	DATE SENT

P.E. SUB ACCT. #
DATE
REGION

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

Standard Distribution sets

ADVERTISED — DATE SENT: / BOXES SENT:

RUN	PLANS	SPECS	SCHEDULE
Construction Contracts - 4th fl. (Richard Ott)	1	1	1
Bid Plans			
Bridge Engineer	2	2	
Region Engineer			
FHWA (I-Proj. only)	2	2	
Form 644			
Specifications rm 290			
Staff Materials (Anthony Hernandez)	2	2	
Cost Estimates 4th floor	1	1	1
C.D.C.-Const Dev Ctr - pickup	2	2	2
Western Contractors Assn. reg 35	2	2	
R5 EEO, reg 2,3,5	1	1	
Builders Exchange	1	1	1
I SQ. FT.	1	1	1
Reed Const. Data (R.C.D.)	1	1	

Prime Contractor / Address / By — BOXES SENT: / DATE PICKUP:

SKELETONS	X-SECT
1	2

Additional sets req'd by bid plans

AMOUNT	DATE

Ad sets

AWARD — DATE SENT: / BOXES SENT:

	PLANS	SPECS	SCHEDULE
Region Engineer			
Bridge	2	2	
Extra Awards			
ROW Services 4th fl.	Electronic Distribution	Electronic Distribution	
P. E. plans 8½ x 14	2/3 w/Consultant	2/3 w/Consultant	
Contractor Sets			

Reports provided

Award sets

CDOT FORM #287 7/12

Figure 2-4
Example Form 287

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

COLORADO DEPARTMENT OF TRANSPORTATION
PROJECT DISTRIBUTION

FUNC.	4	Cost Cntr.

REVISION DATE	DATE REC.	DATE SENT

P.E. SUB ACCT. #
DATE
REGION

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

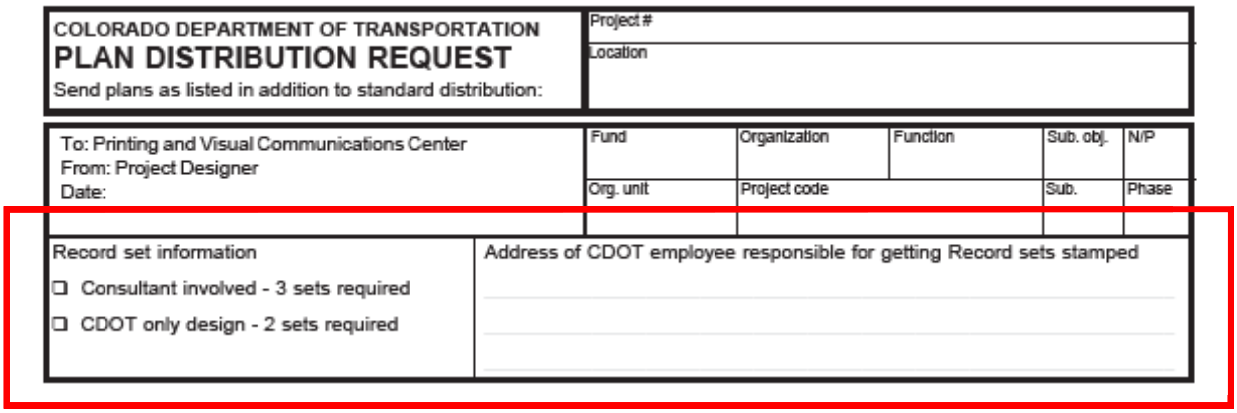
	FLANS	SPECS	SCHEDULE	SKELETONS	X-SECT
RUN			/ /	/	
Construction Contracts - 4th fl. (Richard Ott)	1	1	1		

SENT :

Figure 2-5
Top Part of Form 287

2.32.02 Form 644 Plan Distribution Request

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



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

Project #
Location

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

Fund	Organization	Function	Sub. obj.	N/P
Org. unit	Project code		Sub.	Phase

Record set information
- ❑ Consultant involved - 3 sets required
- ❑ CDOT only design - 2 sets required

Address of CDOT employee responsible for getting Record sets stamped

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

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

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

Resident Engineer

2 Set(s) plans and special provisions. (2 sets of full size plan sheets, upon request ONLY.) **Send by UPS except Reg. 6, no P.O. box.**

Address:

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

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

Other (1/2 size prints, unless otherwise requested)

____Set(s) plans and special provisions to : _____

Address:

____Set(s) plans and special provisions to : _____

Address:

Figure 2-8
Form 644: Copies for External Agencies

2.32.03 Form 155 Reproduction Work Order

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

COLORADO DEPARTMENT OF TRANSPORTATION
REPRODUCTION WORK ORDER Shaded areas for PVCC use only

SAP assigned order #

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

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

Receipt date
Required date
Description of job/Project #

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

Requested by	Authorized/approved signature	CDOT Forms approval

Deliver to (address)	Requestors phone #	Add'l mailing information

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

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

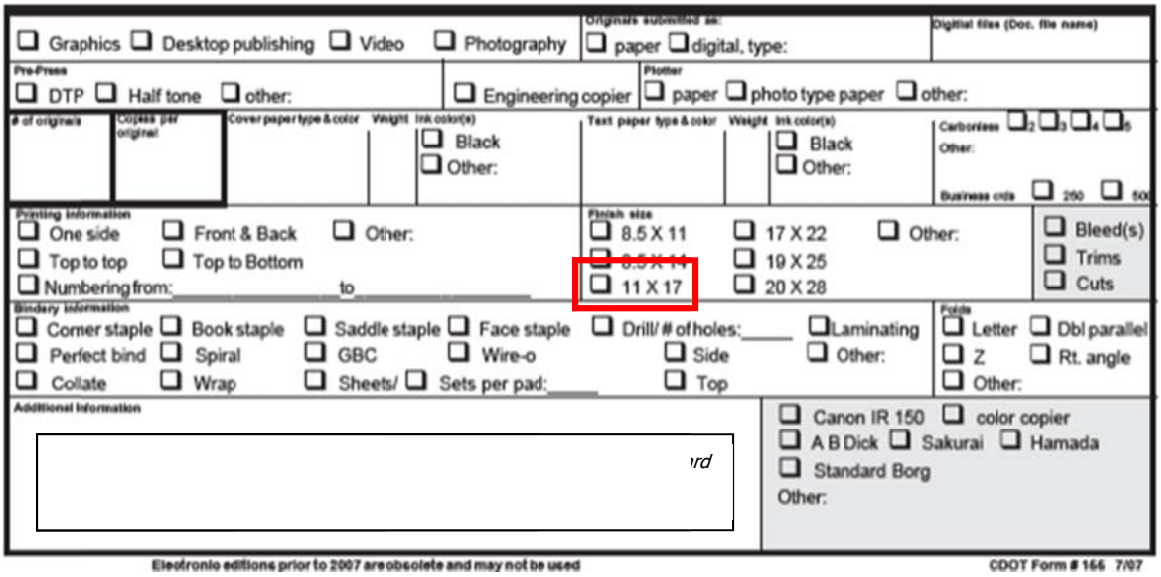

Graphics Desktop publishing Video Photography
Originals submitted as: paper digital, type:
Digital files (Doc. file name)
Pre-Press: DTP Half tone other:
Engineering copier
Plotter: paper photo type paper other:
# of originals
Copies per original
Cover paper type & color
Weight
Ink color(s): Black Other:
Text paper type & color
Weight
Ink color(s): Black Other:
Carbonless 2 3 4 5
Other:
Business cards 250 500
Printing information: One side Front & Back Other: Top to top Top to Bottom Numbering from: to
Finish size: 8.5 X 11 17 X 22 Other: 11 X 17 19 X 25 20 X 28
Bleed(s) Trims Cuts
Bindery information: Corner staple Book staple Saddle staple Face staple Drill/ # of holes: Laminating Perfect bind Spiral GBC Wire-o Side Other: Collate Wrap Sheets/ Sets per pad: Top
Folds: Letter Dbl parallel Z Rt. angle Other:
Additional Information
Canon IR 150 color copier A B Dick Sakurai Hamada Standard Borg Other:
Electronic editions prior to 2007 are obsolete and may not be used
CDOT Form # 166 7/07

Figure 2-10
Form 155: Printing Instructions

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

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

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

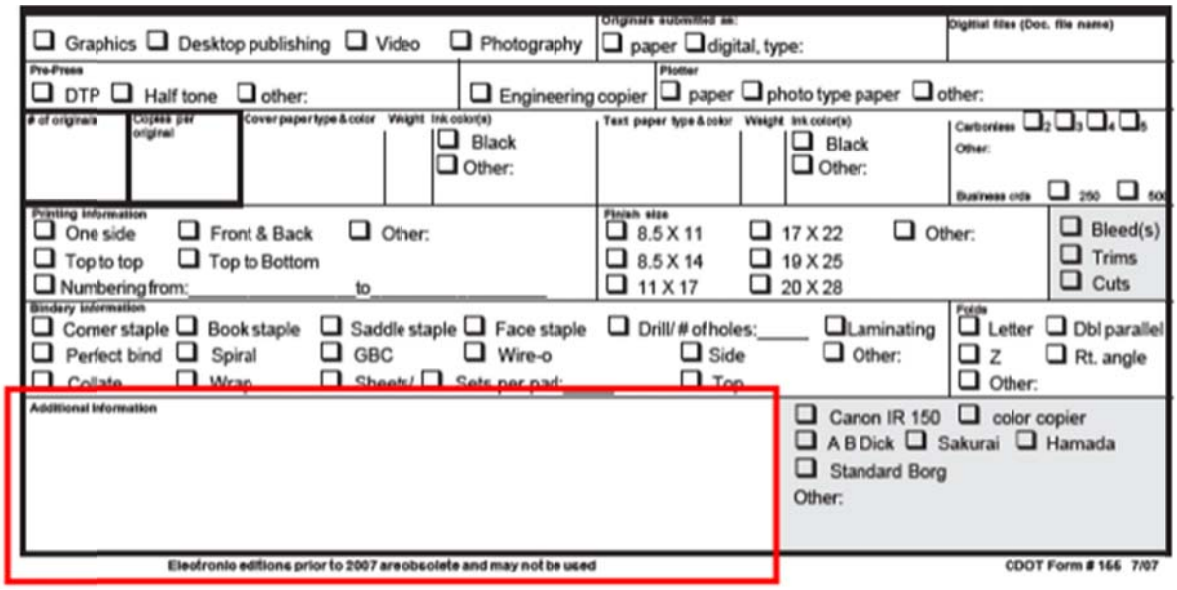

Graphics Desktop publishing Video Photography
Originals submitted as: paper digital, type:
Digitial files (Doc. file name)
Pre-Press: DTP Half tone other:
Engineering copier
Plotter: paper photo type paper other:
# of originals
Copies per original
Cover paper type & color
Weight
Ink color(s): Black Other:
Text paper type & color
Weight
Ink color(s): Black Other:
Carbonless 2 3 4 5
Other:
Business cards 250 500
Printing information: One side Front & Back Other: Top to top Top to Bottom Numbering from: to
Finish size: 8.5 X 11 17 X 22 Other: 8.5 X 14 19 X 25 11 X 17 20 X 28
Bleed(s) Trims Cuts
Bindery information: Corner staple Book staple Saddle staple Face staple Drill/ # of holes: Laminating Perfect bind Spiral GBC Wire-o Side Other: Collate Wrap Sheets/ Sets per pad: Top
Folds: Letter Dbl parallel Z Rt. angle Other:
Additional Information
Canon IR 150 color copier A B Dick Sakurai Hamada Standard Borg Other:
Electronic editions prior to 2007 are obsolete and may not be used
CDOT Form # 166 7/07

Figure 2-11
Form 155: Ordering Additional Sets

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

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

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

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

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

2.33 ADVERTISEMENT

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

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

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

The activities that lead up to project advertisement are:

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

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

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

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

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

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

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

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

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

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

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

Use the following to determine the Plan Price:

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

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

2.33.01 Authorization Letters

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

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

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

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

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

2.33.02 Bid Opening Deferral

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

2.34 PS&E REVISIONS UNDER ADVERTISEMENT

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

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

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

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

Project Manager
Resident Engineer

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

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

Region Transp. Dir.
Program Engineer

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

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

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

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

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

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

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

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

EXAMPLE OF REVISION REQUEST E-MAIL:

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

TO: See Below

Subject: Revision No. 1 HB 9999-999

Please find attached the following revision letter for Project _____.

Distribution:

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

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

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

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

2.35 RE-ADVERTISEMENT

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

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

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

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

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

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

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

Additional References:

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

2.36 RETAINING BID SURPLUS FUNDS

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

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

2.36.01 Step One

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

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

2.36.02 Step Two

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

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

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

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

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

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

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

SECTION 3

ENVIRONMENTAL

3.01 INTRODUCTION

3.01.01 Environmental Clearance

Environmental Clearance is required for every project before advertisement. This introduction describes how to navigate the environmental clearance process for 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 resource specialist, or headquarters specialist, will assist you with impact analysis, permitting and mitigation.

More detailed information on resource clearance processes, and the entire NEPA process, can be found in the CDOT NEPA Manual, and your Region Planning and Environmental Manager (RPEM) or associated region environmental staff, and CDOT headquarters environmental staff should be consulted on every project.

3.01.02 Overview of NEPA

The National Environmental Policy Act (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] § 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 § 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. After reviewing the needs in the project area, FHWA, in consultation with CDOT (typically the RPEM), will decide which class of action is appropriate. More detailed information for each class of action can be found in the CDOT NEPA Manual. Most CDOT projects are completed through the CatEx process.

Class I (EIS)	**Class II (CatEx)**	**Class III (EA)**
Required for actions likely to have significant environmental effects that cannot be mitigated. 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.	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 CatExs: the programmatic CatEx that CDOT can sign as authorized by 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, including consideration of a range of reasonable alternatives and detailed analysis of the potential impacts resulting from each.

Class I (EIS)	Class II (CatEx)	Class III (EA)
Examples include: • A new, controlled-access freeway/highway • A project having public controversy • New construction or extension of fixed rail transit facilities	Examples include: • Pedestrian facilities • Landscaping • Routine maintenance, including resurfacing • Intersection improvements • Bridge replacement/rehab • Minor widening	Examples include: • Actions that are not clearly Class II (CatEx) • Actions that are not clearly Class I (EIS) • New construction of highway interchange • Adding capacity
Upon completing the EIS, 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).	CDOT and FHWA approval is required on all CatEx projects. In Colorado, FHWA has "programmatically" delegated approval of some CatExs to CDOT so that no FHWA signature is required. 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.
Schedule: An 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 FHWA HQ in Washington DC. EISs can take years to prepare and complete.	Schedule: A 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 4-6 months (See the example schedules for a simple and complex project). Those CatExs that require FHWA signature can take longer to clear. These non-programmatic CatExs are usually more complex projects and time is needed to coordinate with FHWA.	Schedule: An EA can take nine months to two years to complete. Only the Final EA 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.

Table 3-1
NEPA Classes of Action

Additionally, any of these classes of actions could require a re-evaluation of the analysis with FHWA if: it has been three years or more since the document was approved; the project is moving on to the next phase of 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 RPEM and must be signed before the project can advance to Advertisement. CDOT has a re-evaluation form (Form 1399) to expedite this process.

3.01.03 More on CatExs

CatExs are the most common type of NEPA projects for CDOT and so this section will focus on the process and schedule for that class of action. CatExs 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.

It is important to note that even if a project action is listed as a 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 can require an EA or EIS action as appropriate.

CatEx actions are generally categorized as either Programmatic or Non-Programmatic.

Programmatic actions are those that, based on past experience, generally do not have a significant impact on the environment. Based on this past experience FHWA signature is not required to clear these projects. A full list of Programmatic actions can be found online under the Categorical Exclusions Programmatic Agreement, 2011.

Non-programmatic CatExs are actions that meet the criteria for a CatEx in the CEQ regulations (CEQ, 40 CFR § 1508.4) if they are appropriately analyzed, documented, and approved by FHWA. Therefore, FHWA signature is required on the top part of the Form 128 to clear these projects (More information on Form 128 is included below.). Some Non-Programmatic actions are specifically listed in Part D of 23 CFR§771.117, but non-listed actions 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 CatExs can be found in CDOT's NEPA Manual.

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 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

The type of funding identified for all phases of a project will have a direct effect on how it is evaluated. If a combination of funding sources is being used, the most stringent policy should be followed.

1. Federal Funding**:**
   Projects with Federal funding, or a potential for Federal funding, or any Federal nexus such as projects that involve the Interstate system or projects that will require a Federal permit, 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.

2. State or Local Funding**:**
   CDOT's Environmental Stewardship Guide directs CDOT to consider environmental impacts for projects whether or not there is a Federal nexus; therefore, CDOT follows the intent and requirements of NEPA on all projects although there is some flexibility regarding how this is conducted if there is no Federal nexus. For example, Section 4(f) analysis does not need to be completed if there is no Federal nexus.

   Although not legally necessary when no Federal nexus is present, a public involvement process could be advantageous, especially if the project is controversial. Additionally, Colorado recognizes what are known as "1041 regulations" which allow local agencies, if they have applied for and received the designation, to regulate land use and development activities within their jurisdiction. Thus, a meaningful public involvement process can be used as a tool

for building consensus for transportation projects.

3. Unknown Funding Source**:**
   All of the above classes of action require the identification of funding sources in order to get the required environmental clearance needed for project advertisement. For larger projects, EAs or EISs, 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 decision document (i.e., top part of the Form 128, the Finding of No Significant Impact for an EA, or the Record of Decision for an EIS). 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 impact assessment, and/or agency coordination. 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 PELs can be found in the Planning and Environmental Linkages (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 Division of Transportation Development environmental 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 RPEM. The RPEM will assign an environmental 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.

2. Early Notice of Impacted ROW Needs:
   If the Resident Engineer knows that ROW may be required for the project, advance notice of parcel addresses and extent of the impacted area should be given to the RPEM. The environmental 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.

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 manager 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 manager of all changes.

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 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: the project is over one acre and in a municipal separate storm sewer system (MS4) permitted area; 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 needs 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 ROW can proceed, if needed, so the project can be advertised.

3.01.07 Clearing a Categorical Exclusion

In addition to information on how to complete a CatEx, two example schedules are provided. One depicts the timeline for a "simple" CatEx. These are projects with little to no 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.

Simple Categorical Exclusion Example.pd

Complex Categorical Exclusion Example.pd

Since CatEx projects have no significant impacts on the environment, NEPA requirements are substantially less stringent than those for an EA or EIS. For example, public involvement and alternatives analysis are not explicitly required, and the level of documentation for FHWA approval is greatly reduced. Although not explicitly required for Programmatic or Non-Programmatic CatExs, the Resident Engineer should consider some sort of public involvement, particularly for those projects that include ROW acquisition, construction impacts that affect the public, road closures or detours, etc.

3.01.08 Form 128 CataEx Approval

The CatEx approval form, Form 128 is entered by Region environmental staff into SAP. The form is divided into five sections but is generally considered to be divided into a “top part” and “bottom part.” The top 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 top part is signed. It may be possible that early acquisition of ROW could be approved even before the top part is complete if it can be shown that it would not predetermine the NEPA decision and if no federal funds will be used for the project. The Region’s ROW Manager should be consulted regarding early acquisition.

The bottom 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 bottom part 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. For information on how to complete the process for Programmatic CatEx projects, see Section 5.2.4, and for Non-Programmatic CatEx

projects, see Section 5.3.4. The approval process for Non-Programmatic CatEx projects is the same as that for regular Non-Programmatic projects.

3.01.09 ADDITIONAL REFERENCES:

1. CDOT NEPA Manual — CDOT
   http://www.coloradodot.info/programs/environmental/nepa-program/nepa-manual
2. List of region environmental staff
   http://www.coloradodot.info/programs/environmental/contacts-region.html
3. List of headquarters environmental staff
   http://www.coloradodot.info/programs/environmental/environmental-contacts.html
4. Form 1399 Re-evaluation form
   http://www.coloradodot.info/library/forms/cdot1399.doc/
   http://www.coloradodot.info/library/forms/cdot1399.doc/view
5. Categorical Exclusions Programmatic Agreement, 2011
   http://www.coloradodot.info/programs/environmental/resources/agreements/CE%20Programmatic%20Agreement%202011.pdf/view
6. Planning and Environmental Linkages (PEL) Handbook
   http://www.coloradodot.info/programs/environmental/planning-env-link-program/pel-handbook-december-2012

Environmental Resource Information

The following sections provide resource-specific information on all 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 Engineer and the environmental resource specialist to complete the clearances, and what potential red flags to schedule or budget the resource could represent. Your regional resource specialist, or headquarters 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 (1) publicly owned parks, recreational resources and wildlife/waterfowl refuges, and (2) historic properties regardless of ownership.

3.02.02 Why do we evaluate this resource?

49 U.S.C. 303 prevents the U.S. Department of Transportation from “using” any Section 4(f) properties unless the secretary of the U.S. 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 FHWA must therefore comply with Section 4(f) requirements.

3.02.03 Who regulates this resource?

Federal Highway Administration 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 Officer (SHPO). For publicly-owned parks, recreational resources and wildlife/waterfowl refuges it 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 and/or all publicly owned properties 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) process for Section 4(f) property.
5. Complete Section 4(f) evaluations including any necessary consultations and approvals.
6. Complete Section 4(f) site form for each property evaluated.
7. Submit Section 4(f) site form to CDOT Environmental Programs Branch (EPB) Section 4(f) specialists.
8. Document Section 4(f) evaluation process and approvals in project file.

3.02.05 What does the Resident Engineer need to do?

1. Develop project description and design elements
2. Work with 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: 3 to 6 months

Programmatic: 3 to 12 months

Full evaluation: 12 to 24 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. 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 Act (LWCFA) 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 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 LWCFA, 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 State Parks (CSP) to provide initial coordination with CDOT.

3.03.04 What does the Environmental Resource Specialist need to do?

1. If ROW acquisition of public land is anticipated, the specialist will investigate CSP's list of 6(f) grants and list of LWCFA 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:
4. 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.

5. 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 the CSP for concurrence.
6. The specialist will coordinate with the CSP during the process of the draft and final Section 6(f) Evaluations.
7. Upon acceptance of the written plan, CSP will submit the plan to NPS for approval.
8. Once NPS approval has been obtained, CPS will send a concurrence letter to the RPEM and the local government
9. The resource specialist will then include information on the Section 6(f) property and the written plan in the Section 4(f) evaluation. The written plan and the CSP concurrence letter should be incorporated into the appendix of the Section 4(f) evaluation.

3.03.05 What does the Resident Engineer need to do?

1. Inform and involve right-of-way (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.

3.03.06 What is the general clearance schedule for this resource?

Coordination, development and approval of a written plan with CSP, as described above, can take up to a year. Approval of the written plan must occur before the RPEM can issue Environmental Clearance on the top portion of the Form 128. The conversion of the Section 6(f) land to a transportation use and the acquisition of the replacement land both occur during the ROW acquisition phase. 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.
2. Temporary closure of or loss of access to recreational properties that last longer than six months.

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 beings, other living organisms, or man-made materials. Emissions may also contribute to regional haze, alter certain characteristics and benefits provided by the atmosphere, and degrade visibility. In essence, to protect the health of humans and other organisms, to protect the structural integrity of man-made materials, and to preserve visibility of scenic vistas, it is important to prevent degradation of air quality.

There are a total of six criteria used to evaluate air quality pollutants on transportation projects as established by the National Ambient Air Quality Standards (NAAQS). Additionally, on EA/EIS level projects, Mobile Source Air Toxics (MSATS) are also evaluated.

In areas of nonattainment or (attainment/maintenance) for a criteria pollutant of concern, a project must acquire a conformity concurrence from Air Pollution Control Division (APCD) to prove that regional and project-level conformity analyses have adequately met air quality budgets and show that no violation of the NAAQS is expected as a result of the project implementation. Regulation defining transportation conformity (40CFR93) specifically describes the requirements of both region-level conformity and project-level (hotspot) conformity analyses.

If a project is located completely outside of the nonattainment or attainment/maintenance area boundary, or is determined to be exempt from conformity rules because it is not regionally significant, no conformity analyses are required. However, hotspot analyses may be required for NEPA purposes as recommended by FHWA.

Contractors are responsible for acquiring an Air Pollution Emissions Notice (APEN) from APCD during construction phases of a project if the project emissions will occur longer than six months in duration and/or the project footprint is greater than 25 acres with fugitive dust or other air pollutants being generated during construction operations or batch plant activities.

3.04.02 Why do we evaluate this resource?

The 1990 Clean Air Act Amendments were passed by the U.S. Congress to protect air quality and prevent the violation of NAAQS. Transportation Conformity, which applies

to areas of the state where the NAAQS have been violated in the past, requires that all federally funded transportation projects and projects of regional air quality significance be described and modeled for regional conformity. A fiscally constrained regional transportation plan must be prepared by the area MPO and must have funding included in the Transportation Improvement Program (TIP).

3.04.03 Who regulates this resource?

The U.S. Environmental Protection Agency (EPA) administers the Clean Air Act Amendments and authorization is delegated to the Colorado Department of Public Health and Environment- APCD.

3.04.04 What does the Environmental Resource Specialist need to do?

1. Scope the project and determine conformity applicability, regional significance and funding.
2. For large projects, coordinate air quality interagency consultation with EPA, APCD, FHWA and local agencies and MPOs as appropriate.
3. Prepare project-level CO hot spot analyses or provide guidance and quality assurance on consultant analyses and documentation.
4. Define mitigation measures
5. Review traffic reports (existing/future volumes) and identify congested signalized intersections.
6. Prepare and submit a conformity concurrence request letter to APCD, including graphics (after receipt of Air Quality Technical Report).

3.04.05 What does the Resident Engineer need to do?

1. 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.
2. Provide plan sheets showing intersection and project roadway configuration, striping, and turning lanes.
3. Confirm accuracy of project funding stream.
4. Go over the details of the project scope with the Region/EPB AQ Specialist.

3.04.06 What is the general clearance schedule for this resource?

If conformity is required:

- Project-level analyses and documentation: two to four weeks

- Preparation of conformity concurrence request letter and submittal to APCD: three days
- APCD application review and issuance of concurrence: two weeks, minimum

Total = six weeks

3.04.07 What are the red flags for this resource?

It is critical that a project located within a nonattainment or attainment/maintenance area for defined pollutants of concern be accurately described in the most recent RTP and funding be identified and programmed in the TIP prior to expected NEPA completion. A letter of conformity concurrence will not be issued by APCD and the NEPA project cannot be completed until the project sponsor has met these conditions.

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 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 NEPA Manual Chapter 9, Appendix G), or Form NRCS-CPA-106 should be used if it is a corridor project.

3.05.05 What does the Resident Engineer need to do?

1. Work closely with the resource specialist to develop alternatives to avoid prime or unique farmland.
2. 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 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 (CLOMR/LOMR) submittal is necessary for the scope of impact.
5. If needed, prepare CLOMR submittal prior to advertisement.
6. If needed, prepare LOMR submittal after construction.

3.06.05 What does the Resident Engineer need to do?

1. Provide geometry of the roadway, structures and/or embankments that impinge into the floodplain.
2. For any floodplain impacts, provide channel cross-sections to allow for hydraulic analysis in accordance with the 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 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. CDOT strives to identify contaminated facilities early in the project development process to protect worker health and safety, to limit public exposure, and to comply with laws that require investigation and remediation (clean-up).

3.07.02 Why do we evaluate this resource?

Contamination above regulatory levels requires notification of and possible ongoing involvement by various federal, state, or local agencies, dependent 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 Environmental Protection Agency (EPA), Army Corps of Engineers (ACOE), the Nuclear Regulatory Commission (NRC), the US Geological Survey (USGS); and/or local regulatory agencies (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, prepare an Initial Site Assessment (ISA) for smaller, less complex projects with no ROW acquisitions, or contract a Phase I Investigation

for larger, more complex projects with ROW acquisition.. Resource specialist will determine the appropriate level of investigation for each project.

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.
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.).
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 (to be completed by the contractor awarded the project), Force Account contingency funding for possible Hazardous Waste management and/or disposal, 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 Engineer need to do?

1. Perform a joint site review with the environmental specialist, if requested.
2. Provide FIR plans with clear project footprint.
3. Inform the specialist of:
   a. structure acquisition, modification, or demolition, bridge or storm water system (MS4) modifications,
   b. temporary or permanent 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 FOR plans and specs with modifications requested by the resource specialist.
6. Schedule the resource specialist to attend the pre-bid and/or pre-construction conference to present and discuss hazardous materials concerns.

3.07.06 What is the general clearance schedule for this resource?

- ISA: one to four weeks

- Phase 1 Investigation: two to six months
- Asbestos / paint inspection and sampling, if required: one to three months (can be done concurrent with ISA and Phase 1)
- Permitting, if required: one to three months
- Additional site investigation and/or clean-up, if required: -2 months to 2 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 ROW acquisition.
4. Project requires large, deep, or extensive excavation / subsurface work.
5. Project requires dewatering
6. Ability to access 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 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 State Historic Preservation Officer (SHPO) regulates historic properties but discussion with consulting parties is also a critical part of the Section 106 process. CDOT requests concurrence from the SHPO on Section 106 findings. 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 that is signed by CDOT, FHWA and SHPO, as well as ACHP if that agency participates in the process. Consulting parties must also be given an opportunity to be involved in the review and development of 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 (CE, EIS, EA), the resource base in the project area, whether a consultant has been hired to complete tasks, and whether SHPO consultation is necessary. Steps 8, 9 and 10 are only necessary when there is an adverse effect. The general steps include:

1. File search on Office of Archaeology and Historic Preservation (ACHP) Compass database
2. Field survey of project area of potential effects
3. Prepare survey report and site forms
4. Prepare site eligibility determinations
5. Prepare effects determinations, as appropriate
6. Submit survey report and determinations of eligibility and effects to SHPO and consulting parties for review
7. Respond to SHPO/consulting parties comments or inquiries (if necessary)
8. Submit adverse effect finding to ACHP
9. Prepare Memorandum of Agreement (MOA) for properties that are adversely affected and circulate for signatures from FHWA, SHPO, CDOT and when appropriate, ACHP and concurring parties
10. Complete mitigation for adverse effects

3.08.05 What does the Resident Engineer need to do?

1. Provide detailed and updated project description and scope.
2. Provide right-of-way and easement information, project plan sheets, conceptual designs, and graphics to assist resource specialist in evaluating effects to historic properties.
3. Work with 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 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. The following estimates represent general time frames associated with internal clearance processes (not involving 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: one to five days (can be less depending on the nature of the project)

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. SHPO and/or consulting party 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. The USFWS maintains the List of Migratory Birds, both adding and removing species on a regular basis, and is also responsible for enforcement of the MBTA.

The 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. 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?

The Migratory Bird Treaty Act (MBTA) is the primary legislation in the U.S. 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 a taking a migratory bird or migratory bird nests are criminal and expensive.

3.09.03 Who regulates this resource?

The U.S. Fish and Wildlife Service has the legal responsibility to maintain healthy migratory bird populations and enforce the provisions of the 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 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 biweekly 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. Noise analysis and mitigation considerations are necessary when a federal project causes noise levels to increase by either adding roadway capacity, changing the vertical profile, adding an auxiliary lane, making interchange modifications, or moving the roadway pavement horizontally closer to sensitive receptors to cause an impact of either ten decibels or more over existing background noise or noise levels over the Noise Abatement Criteria (NAC). The NAC for Colorado generally pertains to outside activities and land uses, and are categorized as:

A: areas of serenity <56decibels;
B: residential <66 decibels;
C: parks, trails, campgrounds, churches, schools, auditoriums <66 decibels;
D: special sound sensitive indoor NAC C uses;
E: Commercial and developed property <71 decibels; and
F: industrial, warehouse, agricultural non-noise sensitive uses, no threshold.

3.10.02 Why do we evaluate this resource?

As defined in 23 CFR772, Federal Highway Administration (FHWA) requires that noise analysis is conducted for federal projects and noise abatement is considered for those projects that exceed the Noise Abatement Criteria. Traffic noise compliance is detailed for Colorado NEPA and highway projects under CDOT Noise Analysis and Abatement Guidelines (2011).

3.10.03 Who regulates this resource?

Noise analysis and mitigation is regulated by FHWA. Also, many local municipalities have noise ordinances that must be addressed during the noise clearance process.

3.10.04 What does the Environmental Resource Specialist need to do?

1. Determine if noise analysis is required
2. Conduct/review TNM model for project noise levels.
3. Conduct field noise measurements.
4. Conduct TNM mitigation modeling to define physical noise abatement measures.
5. Complete Noise Abatement Determination Form

6. 1209 for each impacted receptor considering feasibleness/reasonableness for mitigation.
7. If noise abatement is warranted, survey impacted property owners for mitigation approval (new federal requirement).
8. Provide engineering with noise barrier dimension details and siting for final design.

3.10.05 What does the Resident Engineer need to do?

1. Provide existing and final design plan sheets including terrain, elevations, planned roadway elements, adjacent buildings.
2. Provide existing and design year traffic volumes, and vehicle fleet mixes.
3. Provide guidance on noise barrier material selection, clear zone requirements, and final barrier siting, utilities, other critical items affecting location.
4. Coordinate, in cooperation with specialist, public outreach for noise mitigation if necessary (owner approvals, noise barrier appearance, etc.).

3.10.06 What is the general clearance schedule for this resource?

- Noise level and mitigation analyses: minimum two weeks
- Public outreach: two weeks

Total = four weeks minimum

3.10.07 What are the red flags for this resource?

1. Public disagreement with project, high existing noise levels, and/or receptors located uphill of the roadway will make mitigation efforts more challenging.
2. Assure that mitigation analyses are documented by analyst signed, Form 1209 for each impacted receptor site regardless of final mitigation recommendation.

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 and/or eradication 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 EA or 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 Resident Engineer of the need for an Herbicide Treatment pay item

3.11.05 What does the Resident Engineer need to do?

1. Work with Resource Specialist and Landscape Architect to calculate area, species, bid item hours.
2. Include treatment area on Storm Water 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 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 limits.
4. Using FIR/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 and/or during construction mitigation of construction impacts to scientifically important fossils.

3.12.05 What does the Resident Engineer need to do?

Design

1. 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

1. 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 will take between seven and nine weeks to clear this resource.

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 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.

3.13 SENATE BILL 40 (SB 40)

3.13.01 What is SB 40?

The SB 40 guidelines outline various best management practices designed to minimize impacts to State waterways during and after construction or maintenance activities. The guidelines are applicable to any projects on or adjacent to streams that fall under the jurisdiction of SB 40. The extent of SB 40 jurisdiction includes the stream bed proper, its immediate banks, and associated riparian areas that contribute to stream food chain support.

3.13.02 Why do we evaluate this resource?

SB 40 (33-5-1014-107, Colorado Revised Statutes as amended) requires any agency of the State of Colorado to obtain wildlife certification from the Colorado Division of Parks Wildlife (CPW) when the agency plans construction in “any stream, its banks, or tributaries”. Although SB 40 emphasizes the protection of fishing waters, it also includes provisions to protect and preserve all fish and wildlife resources associated with streams in Colorado.

3.13.03 Who regulates this resource?

CDOT’s requirements under SB 40 are defined in a Memorandum of Agreement (MOA) between the Colorado Departments of Natural Resources (DNR) and CDOT. The 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 CPW for non-Programmatic projects requiring formal Certification.

3.13.04 What does the Environmental Resource Specialist need to do?

1. Review FIR/FOR level plans to identify project impacts to streams that fall under 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 BMPs 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).

3.13.05 What does the Resident Engineer need to do?

Design

1. 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

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

3.13.06 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 USACE should be attached.

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

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

3.13.07 What are the red flags for this resource?

1. The SB 40 Application must be submitted to the CDOW at least 90 days prior to construction according to State Statute (at least 45 days before advertisement and an additional 45 between advertisement and start of construction).
2. Seasonal restrictions to avoid trout spawning, avian and/or threatened and engendered species may conflict with engineering schedules that identify maximum work days or completion dates.

3.14 SOCIAL RESOURCES

3.14.01 What are Social Resources?

Social resources generally refer to the built human environment and can include land use, visual, socioeconomics, and environmental justice (EJ). 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 features that define the character of an area. These can be natural features, vistas, or viewsheds, but also urban characteristics such as architecture, skylines, or other characteristics that create a visual definition. 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. EJ is the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws and policies.

3.14.02 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 - Visual resources and aesthetics are important because of their uniqueness and the strong emotion they inspire in human viewers. Such special places often provide a sense of community to the inhabitants of an area and may attract tourism and 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.

EJ is guided by Title VI of the Civil Rights Act of 1964, as amended and Executive Order 12898 on Environmental Justice.

3.14.03 Who regulates this resource?

Land use is regulated by the local agency (city, town, or county). Visual resources and socioeconomics are regulated by FHWA and CDOT. EJ is regulated by the Environmental Protection Agency.

3.14.04 What does the Environmental Resource Specialist need to do?

The resource specialist will evaluate impacts and determine if mitigations 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.

3.14.05 What does the Resident Engineer need to do?

The engineer should incorporate any recommended into the design and specifications.

3.14.06 What is the general clearance schedule for this resource?

There are no formal clearances required for these resources.

3.14.07 What are the red flags for this resource?

1. The project primarily impacts low-income and/or minority communities.
2. The project will acquire minority owned businesses or businesses that serve a specific demographic.
3. The project will drastically change the land use pattern or visual character of the community.
4. The project will remove a community service (i.e. free medical clinic, library, post office, etc.)

3.15 STORMWATER MANAGEMENT PLANS (SWMP)

3.15.01 What are Stormwater Management Plans?

A Stormwater Management Plan (SWMP) is written guidance included in the plan set that outlines recommended and required best management practices (BMPs) the project will utilize to protect Waters of the State by minimizing pollutants in runoff coming from the project site. The SWMP must be implemented at the start of a construction project (i.e., before ground it broken).

A SWMP consists of seven parts plus their subcomponents, including a site map that shows the location of best management practices to be used on site.

Regulation 61 of the Colorado Water Quality Control Act, regulated by the Colorado Department of Health and Environment (CDPHE), requires a Stormwater Construction Permit (SCP) be obtained for all projects that disturb one or more acres of land. This SCP requires the development of a SWMP for the project.

CDOT also requires a SWMP for projects less than one acre of disturbance to aid in water resource protection.

Local Agencies may also have SWMP requirements for the project, regardless of the acreage disturbed.

3.15.02 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 SWMP and site map for accuracy, then relay the needed changes to the Engineer (in each development phase)
4. Provide final approval of the SWMP and a water quality clearance to the environmental project manager for the 128 Form.

3.15.03 What does the Resident Engineer need to do?

1. Ensure the resource specialist is part of the project design team and is invited to all Scoping, FIR and FOR meetings.
2. Receive SWMP template from the CDOT WQ website or from the resource specialist

3. Enter project specific data, such as the project description, into the SWMP Template
4. Add the SWMP to the plan set
5. Make revisions requested by the resource specialist throughout project development

3.15.04 What is the general clearance schedule for this resource?

- Design SWMP and site map: approximately 10 hours (Under one acre), 40 hours (Over one acre)

- Review SWMP and site map – then type and send notes (in each stage of development - scoping, FIR, FOR, Final): approximately eight hours each stage (Under one Acre), 20 hours each stage (Over one acre)

Total time it takes to complete the clearance for this resource (including meetings and final approvals) = approximately 60 hours (Under one acre), 150 hours (Over one acre).

3.15.05 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 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 (preferable at FIR) to allow for adequate time to meet the various SCP permit requirements.

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 4 of the ESA. A candidate species is an animal or plant species defined by the 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 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 the ESA.” Critical habitat, based on the physical or biological features essential to the conservation of the species, may be included with the listing of a wildlife or fish species; such as the Colorado River Basin for razorback sucker, Colorado pikeminnow, humpback chub, and bonytail chub.

3.16.02 Why do we evaluate this resource?

The Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.), provides for the protection and conservation of threatened and endangered plants, animals and their habitat. The 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 CDOT project is evaluated for impacts to wildlife, including species listed as threatened and endangered by the United States Fish and Wildlife Service (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 and/or critical habitat, and also determines 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 USFWS, as necessary.

3.16.05 What does the Resident 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
3. 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 week
- USFWS review and concurrence: four weeks

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 will be “likely to adversely affect” a species or critical habitat will require further coordination with the USFWS. This additional coordination may lengthen the clearance process by 12 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. CDOT has seven different water quality programs associated with the MS4 permit: construction sites, new development and redevelopment, illicit discharge, industrial facilities, public education and involvement, pollution prevention and good housekeeping, and wet weather monitoring. Please see the your region or headquarters water quality specialists, NEPA Manual, or the specific program guidance for more information on these programs and the various permits associated with them. If a project is not in an MS4 permit area, it is not subject to those regulations but may require a construction permit if it will disturb over an acre.

3.17.02 Why do we evaluate this resource?

Clean Water Act (CWA) 401and 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 US.

Safe Drinking Water Act (SDWA)(40 CFR Parts 141–143) - The SDWA protects public health by regulating the nation's public drinking water supply and protecting drinking water and its sources. CDOT is a stakeholder in the Colorado Source Water Assessment and Protection (SWAP) program mandated by the SDWA.

Erosion and Sediment Control on Highway Construction Projects (25 CFR 650 Subpart B) - All highways funded in whole or in part by 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 8) - The Colorado Water Quality Control Act protects and maximizes the beneficial uses of state waters and regulates water quality.

3.17.03 Who regulates this resource

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

3.17.04 What does the Environmental Resource Specialist need to do?

1. Determine if project is in MS4 area and if so proceed with necessary permits and mitigation and engineer 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 construction stormwater permit and determine new development and redevelopment program requirements.
3. If new development and redevelopment applies then complete permanent water quality form.

3.17.05 What does the Resident 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 programs requirements.
3. Determine if permanent Water Quality is required and if so incorporate early in design and complete the PWQ Form.

3.17.06 What is the general clearance schedule for this resource?

Between 10 days and two months to acquire permits and complete PWQ Form (after design is far enough along to make conclusions), dependent on PWQ report completion and required permits. There are multiple permits that may be required dependent on the project details. Please see your region or headquarters 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.
2. Permanent Water Quality (PWQ) is required.

3.18 WETLANDS

3.18.01 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 will also require a permit from the U.S. Army Corps of Engineers (USACE). There are two types of permits. A Section 404 Nationwide Permit is generally the simplest permit under the Section 404 program. The USACE lists a total of 50 nationwide permits authorizing various activities nationwide. In order to obtain a nationwide permit, the activity must meet the requirements of one of these 50 permits. Section 404 Individual Permits are issued following a full public interest review of an individual permit application. A public notice is distributed to all known interested persons. After evaluating all comments and information received, final decision on the application is made. This is a much more complex and detailed process than obtaining a Section 404 Nationwide Permit.

3.18.02 Why do we evaluate this resource?

The Clean Water Act was passed by the U.S. Congress in 1977 to protect the physical, biological, and chemical quality of Waters of the U.S., including wetlands. Wetlands provide a variety of beneficial functions that improve water quality, reduce floodwater intensity, provide habitat for fish and wildlife, and foster recreational and educational activities to name a few. Under federal regulations, activities that impact wetlands specifically the discharge of dredge and fill material into wetlands is regulated under Section 404 of the Clean Water Act.

3.18.03 Who regulates this resource?

The USACE regulates impacts to wetlands.

3.18.04 What does the Environmental Resource Specialist need to do?

1. Conduct field Wetland Delineations and GPS wetland boundaries or flag wetland boundaries for Survey Unit.
2. Prepare Wetland Delineation for 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 conceptual Mitigation Plan (i.e. wetland bank, on site, offsite, in lieu fee) to compensate for wetland losses.
6. Prepare Wetland Finding once impacts and mitigation opportunities are known
7. Secure FHWA or EPB Certification of Wetland Finding
8. Prepare appropriate permit application materials for the USACE permit.

3.18.05 What does the Resident 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
5. Provide plan sheets showing wetlands and project footprint to include in the permit application letter.
6. If mitigation will be on-site, as opposed to off-site mitigation or banking, 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.

3.18.06 What is the general clearance schedule for this resource?

Wetland Delineations can only be performed during the active growing season (~April through September).

Wetland Findings preparation and approval (following the revisions to the FOR Plans to include impacts and mitigation measures) : Approximately three weeks.

Development of Wetland Mitigation opportunities (following the 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 USACE: three months
- USACE application review, public notice process, and issuance of permit: four to six months

Total = seven to nine months

For Nationwide Permits

- Preparation of Nationwide Permit application letter and submittal to USACE: two weeks
- USACE application review and issuance of permit: two weeks

Total = four weeks

3.18.07 What are the red flags for this resource?

1. Projects that are scoped in the winter and are advertised in the Spring do not allow for determination of wetland boundaries and restrict preparation of a Wetland Delineation. The USACE is allowed up to 45 days to provide approval of Wetland Delineations and will not approve outside the growing season.
2. Wetland Findings cannot be prepared until Project Plans have been developed to the level where impacts are finalized and appropriate mitigation measures developed. Section 404 Permits and Wetland Findings must contain identical information for approval by USACE and FHWA.
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 type 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.

SECTION 4

TRAFFIC

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 Resident Engineer is responsible for obtaining the latest traffic data. Traffic data is available from the Division of Transportation Development (DTD) or is accessible at http://apps.coloradodot.info/dataaccess/. 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 Resident Engineer 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 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 & Profiles].

Additional References:

1. *AASHTO Policy on Geometric Design of Highways and Streets*
2. CDOT Procedural Directive 512.1, *Project Scoping and the Design Scoping Review (DSR)*
3. State Highway Access Code
4. For forms, see CDOT on-line forms library http://www.coloradodot.info/library/forms

4.02 REQUEST AND ANALYZE CRASH DATA

The Safety and Traffic Engineering Branch periodically reviews the safety performance of all roads on the state highway system and identifies locations that have the potential for accident reduction. This data is available to the designer.

Under the Federal-aid Highway Act, each state is to maintain the Hazard Elimination Program by surveillance and identification of accident locations on all federal aid roads and streets. This program is part of the state's overall Statewide Safety Program and is administered by the Safety and Traffic Engineering Branch.

In the Colorado Highway Safety Improvement Plan developed by CDOT, a program is described to reduce the number and severity of traffic accidents and to decrease the potential for accidents. All crash data is supplied to the Department of Revenue by the Colorado State Patrol and other local law enforcement agencies. The Department of Revenue, in turn, provides information and makes accident reports available to CDOT for analysis.

The Safety and Traffic Engineering Branch, with crash data supplied by the Department of Revenue, is responsible for identifying locations that have the potential for accident reduction. Some of the methods of identifying highway and traffic safety issues are:

1. Accident frequency distribution
2. Accident rate
3. Accident severity
4. Pattern Recognition
5. Roadway Diagnostics
6. Safety Performance Functions

The *Accidents and Rates on State Highways* book (http://staging.coloradodot.info/library/traffic/traffic-manuals-guidelines/safety-crash-data/accident-rates-books-coding) is another important tool used in the analysis and selection of locations for traffic accidents and associated rates. The two sources for producing this report are the electronic traffic volume data bank from the Division of Transportation Development and the electronic crash data gathered and maintained by the Safety and Traffic Engineering Branch.

Safety Assessment Reports are provided by the Safety and Traffic Engineering Branch on all highway type projects, such as rail-highway, non-interstate routes, interstate, "safety enhancement" type and 3R type. When requested, the accident summaries are

provided by either the Region Traffic Engineer or the Safety and Traffic Engineering Branch. Use the Safety Engineering and Analysis website <http://internal/stafftraffic/safety_engineering_group/index.html> to: submit requests for new Safety Assessment Reports, accident information, and graphs; view completed reports and studies; or get information on accidents and rates.

Additional References:

1. 23 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
2. CDOT Procedural Directive 548.1*, Safety Considerations on Resurfacing & 3R Type Projects*
3. 23 USC Section 109(e), Standards; Section 152, Hazard Elimination Program
4. *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 Resident Engineer 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 e-mail 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 Resident Engineer 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 References:

1. *AASHTO Policy on Geometric Design of Highways and Streets*
2. *CDOT Roadway Design Guide*
3. 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 Resident Engineer 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 References:

1. *AASHTO Policy on Geometric Design of Highways and Streets*
2. *CDOT Roadway Design Guide*
3. Transportation Research Board (TRB) *Highway Capacity Manual*

4.05 SIGNAL WARRANTS

A thorough investigation of traffic conditions, accident 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 of 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 References:

1. 23 CFR Part 655F
2. 23 USC 109(d), Standards
3. *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 Resident Engineer is responsible for the justification and design of new or modified intersections or interchanges. 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 accidents 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 interchange design, the above factors also apply, along with addressing highway classification, character and composition of traffic, design speed, and degree of access control. For the interchange design and approval process, see *CDOT Policy Directive 1601.0, Interchange Approval Process*.

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.

Additional References:

1. 23 CFR Part 771
2. *AASHTO Policy on Geometric Design of Highways and Streets*
3. Bicycle and Pedestrian Facilities (see Section 2.10 of this manual)
4. *CDOT Roadway Design Guide*
5. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*
6. *Transportation Research Board (TRB) Highway Capacity Manual*
7. For forms, see CDOT on-line forms library
   http://www.coloradodot.info/library/forms

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 Resident Engineer 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 Resident Engineer 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 *Manual on Uniform Traffic Control Devices for Streets and Highways (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 References:

1. 23 CFR Part 655
2. AASHTO Policy on Geometric Design of Highways and Streets
3. FHWA 23 USC 120
4. 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 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 Ninth Edition* and the American Association of State Highway and Transportation Officials (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 two 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 Resident Engineer.

The following documentation and procedures are to be followed for the design of highway lighting:

1. The Resident Engineer, 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 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 Resident Engineer 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 pullboxes 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 References:

1. *CDOT Roadway Design Guide*
2. *AASHTO Policy on Geometric Design of Highways and Streets*
3. *IESNA Lighting Handbook*
4. *AASHTO Lighting Guide*
5. *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.

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 guide 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 Resident Engineer for incorporation into the final plan set .

Additional References:

1. 23 CFR Part 655F
2. *AASHTO Policy on Geometric Design of Highways and Streets*
3. *CDOT S Standard Plans*
4. *CDOT Roadway Design Guide*
5. *CDOT Standard Specifications for Road and Bridge Construction*
6. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*

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 (http://www.coloradodot.info/library/traffic/traffic-manuals-guidelines/lane-close-work-zone-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 marking 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 TCP shall be consistent with the provisions of the CDOT Standard Specifications for Road and Bridge Construction, CDOT M&S Standard Plans, Manual on Uniform Traffic Control Devices (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 Resident Engineer 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 (TO) – **Required Component**
   The TO component of the 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, TO 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 TO 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 Procedures" document (http://www.coloradodot.info/library/traffic/traffic-manuals-guidelines/lane-close-work-zone-safety/work-zone-safety-mobility/WZSM_Procedures.pdf/view). The scope of the TO 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 (http://www.coloradodot.info/business/designsupport/construction-specifications/2011-Specs/project-special-provision-work-sheets/626pis.docx/view). 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 TMP for a highway project includes:

1. The Project Traffic Engineer will prepare a TCP, TO, and 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 Resident Engineer. TO 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 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 http://www.coloradodot.info/library/forms/cdot0568.pdf/view, in CDOT's Update on Signing for Double Fines memo, and any others communicated to the Region Transportation Directors and Branch Heads.
4. The Resident Engineer will ensure adherence to all parts of the CDOT Work Zone Safety Guidelines for Engineering and Maintenance:

Additional References:

1. 23 CFR Parts 630J and 655F
2. CDOT S Standard Plans
3. CDOT Guide Signing Practices and Procedures

SECTION 5

STRUCTURES

5.01 MAJOR STRUCTURE – BRIDGE

This section provides guidance for preliminary engineering plan submittal and approval for buildings, bridges, snow sheds, tunnels, geotechnical structures featuring wall systems or ground improvement systems, and hydraulic structures.

Major structures are bridges and culverts with a total length of 20 feet or greater and retaining walls with both a total length greater than 100 feet and a maximum exposed height at any section of over 5 feet. 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 major structures.

Refer to the *CDOT Bridge Design Manual*, Section 3, for minimum design loading. Major structures should be analyzed individually for the optimal design. Any substantial costs for deviations from the most economical design need to be considered in the structure selection process and must be agreed to by the Resident Engineer. The construction 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 requirements, please refer to the CDOT Drainage Design Manual. Hydraulic design of the bridge opening shall be completed by a licensed hydraulic engineer, or by a hydraulic engineer under the supervision of a hydraulic engineer with a P.E. license.

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.

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 concept study, including appropriate engineering and economic studies.
3. Prepare structure layouts and specific details that reflect a specific structure type, size, and location.
4. Prepare structure selection reports and/or wall selection reports.
5. Request foundation report from the Resident Engineer. See Section 5.06.

For a complete description of responsibilities, see Section 19.1 of the *CDOT Bridge Design Manual*.

The following is a brief overview of the bridge design process outlining the responsibilities of the Project Structural Engineer:

1. Structure concept study
   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.

2. Preliminary bridge design
   a. Review bridge site data.
   b. Prepare engineering and economic recommendations.
   c. Prepare general layouts and special details.
   d. Prepare selection report.
   e. Prepare drawings for foundation investigations.
   f. Attend Field Inspection Review (FIR) and make required revisions to layout.

3. 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 Subsections 19.1.4D and 19.1.4E of the *CDOT Bridge Design Manual*.

f. Provide revised plans and specifications as per the FOR comments for construction.

The Resident Engineer should compare the roadway and bridge plans to verify grade, alignment and clearances.

Additional References:

1. CDOT *Bridge Design Manual*
2. AASHTO LRFD *Bridge Design Specifications*
3. AASHTO *Manual for Bridge Evaluation*
4. CDOT *Bridge Rating Manual*
5. *CDOT Drainage Design Manual*

5.02 MAJOR STRUCTURE – CULVERT

A culvert is used in lieu of a bridge based on estimated construction and maintenance costs, when either alternative is viable hydraulically.

A culvert is considered a major structure if it has an opening measured along the center of the roadway of 20 feet or more 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 20 feet or more.(See CDOT *Bridge Detail Manual*, Section 1.4 Structure Number, Figures 1.4-3, -4, -5 & -6.)

http://www.coloradodot.info/library/bridge/bridge-manuals/bridge-detail-manual/01_general_instructions.pdf/view

For structures equal to or exceeding 20 feet, the Resident Engineer must contact the Project Structural Engineer for a structure selection report if the M Standard Plans can't be used. If the M Standard Plans do apply, it is up to the Resident Engineer to determine if a structural selection report would be beneficial.

All culverts not included in the *CDOT M&S Standard Plans* shall be designed by the Project Structural Engineer. The Project Structural Engineer will request a foundation exploration and foundation report.

For culverts over the waterways requirements, refer to the *CDOT Drainage Design Manual*.

Hydraulic design of a drainage structure, such as a concrete box culvert, shall be completed by a qualified engineer with knowledge of hydrology and hydraulics. However, this knowledge requirement varies according to the complexity of design. Larger drainage structures, for example, concrete box culverts, storm sewers and channel improvements, shall be designed by an engineer specialized in that field.

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 and structural designers 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.

Additional References:

1. CDOT *Roadway Design Guide*
2. CDOT *Drainage Design Manual*
3. CDOT *Bridge Design Manual*
4. AASHTO *LRFD Bridge Design Specifications*
5. CDOT Pipe Material Selection Policy.

5.03 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, or (4) 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 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.

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 Divison 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 References:

1. CDOT *Bridge Design Manual*
2. AASHTO *LRFD Bridge Design Specifications*

5.04 PEDESTRIAN OVERPASSES AND 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, 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 5.01 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 *CDOT Roadway Design Guide*.

Additional References:

1. AASHTO *Policy on Geometric Design of Highways and Streets*
2. CDOT *Bridge Design Manual*
3. *Design of Pedestrian Overpass and Underpass to Accommodate the Handicapped*, Publication N5040.38, FHWA

4. *Pedestrian and Bicycle Accommodations and Projects*, Code of Federal Regulations, Title 23, Highways, Part 652
5. AASHTO *LRFD Bridge Design Specifications*
6. AASHTO *Guide for the Planning, Design and Operation of Pedestrian Facilities*
7. AASHTO *Guide Specifications for Design of FRP Pedestrian Bridges*
8. AASHTO *LRFD Guide Specifications for the Design of Pedestrian Bridges*
9. CDOT Roadway Design Guide

5.05 ARCHITECTURAL AND 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 some structures could be in service 50 to 75 years.

Corridors typically have an existing architectural-aesthetic theme developed during the 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 5.07 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 References:

1. CDOT *Bridge Design Manual*
2. *Bridge Aesthetics Around the World*, Transportation Research Board (TRB) National Research Council, 1991
3. *Bridgescape – The Art of Designing Bridges*, Frederick Gottemoeller, 1998

5.06 FOUNDATION INVESTIGATION AND RECOMMENDATION

The foundation investigation gathers data and provides foundation 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 with approximate locations for the structure borings will be sent to the Geotechnical Program Manager.

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, he 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 References:

1. CDOT *Bridge Design Manual*
2. AASHTO *LRFD Bridge Design Specifications*

5.07 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.

During the conceptual and preliminary design stages of a project, the Project Structural Engineer shall develop a structure selection report for all major structures in accordance with Section 19 of the *CDOT Bridge Design Manual*. For a structure selection report for major culverts, see Section 5.02.

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. 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 5.01 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 FHWA. The structure selection report should be reviewed and approved prior to the Field Inspection Review meeting.

5.08 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 R.O.W, 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.
2. An internally stabilized system uses soil reinforcement to make the retained soil self-supporting.
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 *CDOT Bridge Design Manual*, Section 5.

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*, Subsection 5.6).
2. Design alternatives -- The products of the design selection process (see the *CDOT Bridge Design Manual,* Subsections 5.4 and 5.5).

For a proprietary wall, refer to Section 2.24 Proprietary Items in this manual.

Additional References:

1. CDOT Bridge Design Manual
2. AASHTO LRFD Bridge Design Specifications

5.09 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 References:

1. CDOT *Bridge Design Manual*
2. AASHTO *LRFD Bridge Design Specifications*
3. AASHTO *Guide Specifications for Structural Design of Sound Barriers*

5.10 ANALYSIS OF STRUCTURES TO BE RESURFACED

A structural analysis is performed before a structure is resurfaced because resurfacing may affect the load carrying capacity of the structure, its vertical clearance, its bridge rail height, its 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 limited to 3 inches on 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, recommended repairs to maintain the integrity of the riding surface, existing water proofing membrane, and bridge rail upgrades to maintain roadway safety.

The Resident Engineer will inform the Project Structural Engineer of the final proposed resurfacing method.

Additional References:

1. CDOT *Bridge Design Manual*

5.11 DETERMINE EXISTING STRUCTURAL ADEQUACY

An existing structure must meet criteria as established by 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 References:

1. For forms, see CDOT on-line forms library
   http://www.coloradodot.info/library/forms
2. CDOT Bridge Design Manual

5.12 CRASHWORTHY BRIDGE RAIL

FHWA approved crashworthy bridge rail must be provided on all new bridges. Rehabilitated bridges on all projects, regardless of funding, shall use crashworthy bridge rail unless a variance is approved. The variance shall include an analysis based on criteria presented in the *CDOT Bridge Design Manual*, Section 2.

Crashworthy rail is defined as crash tested in accordance with the *National Cooperative Highway Research Program Report 350*, *AASHTO Manual for Assessing Safety Hardware* (MASH), or rail which has been approved by the FHWA as being equivalent to crash-tested rail.

The Project Structural Engineer will provide a recommendation to the Resident Engineer regarding the replacement of existing bridge rail. 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 7 or Type 10M on National Highway System (NHS) and non-NHS state highways projects.
2. Type 3 or any approved crash tested bridge rail on local roads. Type 3 has limited applications because of its 27-inch height. Therefore, CDOT has elected to use type 10M for all new construction requiring a steel bridge rail on the state highway system.

When a bridge also serves pedestrians or cyclists and the posted speed limit is greater than 45 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 or Staff Bridge.

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 References:

1. 23 CFR Part 625, *Design Standards for Highways*
2. AASHTO *Guide for Selecting, Locating, and Designing Traffic Barriers*
3. AASHTO *LRFD Bridge Design Specifications*
4. AASHTO *Roadside Design Guide*
5. AASHTO *Standard Specifications for Highway Bridges*

5.13 VERTICAL CLEARANCE OF STRUCTURE

All highway projects shall meet or exceed minimum vertical clearances according to guidelines set by the FHWA and 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 false work 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 References:

1. 23 CFR Part 625, *Design Standards for Highways*
2. AASHTO *Policy on Geometric Design of Highways and Streets*
3. AASHTO *Guide for the Development of Bicycle Facilities*
4. AASHTO *LFRD Bridge Design Specifications*
5. AASHTO *Standards Specifications for Highway Bridges*
6. CDOT *Bridge Design Manual* (Section 2)

5.14 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 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.

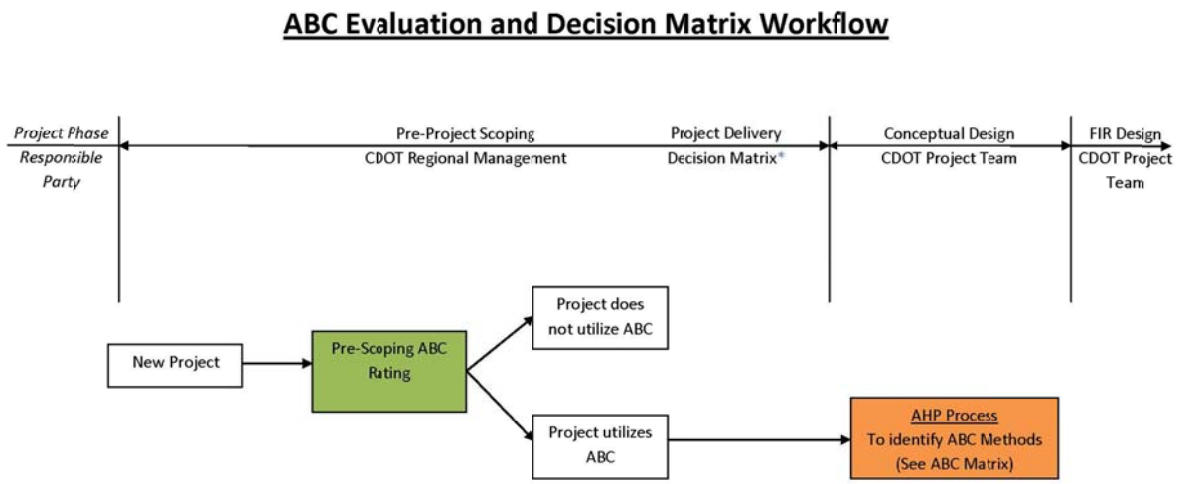
http://intranet/engineering/staff-bridge/accelerated-bridge-construction/view

The accelerated bridge construction methodology is to be evaluated for all projects that will contain one or more bridges. 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."



*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 maybe 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 Days	Fixed Completion Date Contract	Incentive-Disincentive Provision	Lane Rental Provision	Value Engineering Specification	Design Build Contract Delivery Method	CM/GC Contract Delivery Method

Figure 5-1
ABC Evaluation and Decision Making Matrix Workflow

SECTION 6

MATERIALS

6.01 PAVEMENT ANALYSIS FOR DISTRESS

Existing pavement conditions are analyzed for distress. The proposed pavement type is selected and the required thickness is determined for the subbase, base course, and pavement surfacing.

A pavement analysis and an existing condition survey are done on all projects that have paving or resurfacing, with the exception of minor patching. 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 resurfacing required on the project.

The principal factors in choosing pavement type or treatment are soil characteristics, traffic volume and types, climate, life cycle costs, and construction considerations.

The two types of pavements used are Portland cement concrete pavement (rigid) and hot mix asphalt (flexible). A life cycle cost analysis, supporting the pavement type selection will be prepared for all appropriate projects with more than $2 million in material cost for the pavement including any subbase and base course material. The analysis will compare concrete to asphalt pavements, compare alternative rehabilitation techniques, or both. 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 Materials Engineer at the inception of the project to allow sufficient time to perform a detailed pavement analysis. The Materials Engineer will prepare the pavement analysis, distress reports, and the pavement justification letter. The Region Materials Engineer reviews the analysis 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 Field Investigation
2. Selection of Pavement Design
3. Pavement Justification

The Region should retain a copy of the pavement justification in the project file.

Additional References:

1. CDOT *Pavement Design Manual*
2. CDOT *Roadway Design Guide*
3. CDOT Policy Directive 1400.0, *Surface Treatment Program*

6.02 PRELIMINARY SOIL SURVEY

The preliminary soil survey includes drilling soil samples for one or more of the following: proposed pavement rehabilitation, widening, new roadway alignment, or changes in grade cut and fill areas described in the CDOT Field Materials Manual. Additional information on the preliminary soil survey can be found in the Soil Survey section in Chapter 200 of the Field Materials Manual.

The investigations are needed to examine sites of proposed cut and fill areas, ground water problems, embankment failures, and soil problems related to pavement condition and structures such as CBCs, bridges, and retaining walls. These investigations provide information for pavement design.

The Region Materials Engineer (RME) 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 Geotechnical Program of the Materials and Geotechnical Branch or a commercial drilling contractor will be requested to provide drilling services.

Region Materials and Materials and Geotechnical Branch personnel perform a variety of field and laboratory tests and analyze data, CDOT Forms, and soil test reports. Region Materials will work with project personnel or consultants to ensure soil profile plan sheets are prepared.

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 recommendation of pavement types, pavement rehabilitation, soil and base stabilization, etc.
6. Provide soil survey results and boring log information 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 and Geotechnical Branch Soils Lab Manager at the inception of the project to allow sufficient time to perform the R-value test 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 References:

1. CDOT *Field Materials Manual* (Latest Edition)
2. CDOT *Pavement Design Manual* (Latest Edition)

6.03 FOUNDATION INVESTIGATION AND DRILLING

Geotechnical investigations include drilling for various structures and preparation of a final report with appropriate foundation recommendations.

Geotechnical investigations are needed to examine sites of proposed structures such as bridge foundations (piling, caissons, or spread footings), concrete box culverts, retaining walls, ground anchors, high-mast lighting, sound barriers, traffic signs, and highway related buildings.

The Materials and Geotechnical Branch provides assistance in areas such as foundation construction related problems during pile driving, caisson construction, and footing excavations.

The Project Structural Engineer will send a request for foundation investigation and drilling to the Resident Engineer, and will send a copy of the request to the Geotechnical Program Manager.

Requests for drilling and geotechnical studies should be submitted during the design phase together with site plan sheets and cross-sections as needed. Four to six weeks is usually required for completion of drilling, lab testing, and report preparation

The Staff Geotechnical Program performs and documents the following as requested:

1. Researches files for existing reports on proposed sites.
2. Examines sites of proposed structures and identifies any need for utility clearances.
3. Performs drilling at proposed locations and collects samples of subsurface materials.
4. Assigns laboratory testing of samples.
5. Prepares foundation report and specifies type and bearing capacity of recommended foundation.
6. Prepares the Engineering Geology Plan Sheets.
7. Submits report and plan sheet to the Resident Engineer and Project Structural Engineer.

Additional References:

1. CDOT *Bridge Design Manual*
2. CDOT *Roadway Design Guide*
3. CDOT *Field Materials Manual*
4. AASHTO *LRFD Bridge Design Specifications for Highway Bridges*

6.04 GEOTECHNICAL STUDIES

Suitable foundation systems should be designed for structures, and corrective or preventive measures taken for other geotechnical problems.

The Geotechnical group (Geotechnical Program and Soils/Foundation Program) of the Materials and Geotechnical Branch performs a variety of field and laboratory tests, analyzes data, and prepares engineering geology plan sheets and various types of geotechnical reports.

The Materials and Geotechnical Branch is involved in:

1. Foundations for bridges, culverts, retaining walls, ground anchoring, high-mast lighting.
2. Roadway embankment settlement studies.
3. Embankment and backslope failure.
4. Pavement subgrade stabilization.
5. Soil laboratory testing.
6. Environmental geologic problems, including wetland investigations.
7. Foundation construction related problems (such as pile driving, caisson misalignment, footing excavation).
8. Remote sensing for underground conditions such as bedrock and water table locations, buried tanks and utilities, buried foundations, stream scour, all using ground penetrating radar and other geophysical techniques.
9. Rockfall problems.
10. Ground water problems.
11. Low-altitude high-resolution aerial photography.
12. Space constraint identification such as limited right of way, steep terrain, wetlands and streams, existing high-value land uses, soft foundations, and contaminated soils.

During the design phase, when the need for drilling or a geotechnical study is required, the Project Structural Engineer should make a request to the Resident Engineer and Geotechnical Program Manager of the Materials and Geotechnical Branch in writing, and should include a set of plans showing approximate locations of required soundings for structures.

Typical requests are for foundation studies for bridges, culverts, and retaining walls. Requests should be done at the conceptual stages for inclusion in the Structure Selection Report prepared by the Bridge Design and Management Branch. The Resident Engineer and Design Engineer must review the geotechnical reports with the

Geotechnical Engineer and Project Structural Engineer to ensure that issues such as consolidation are accounted for in the design.

The Geotechnical group of the Materials and Geotechnical Branch conducts and prepares the following studies for bridges and other related structures:

1. Examines site and schedules a utility clearance, if needed.
2. Performs drilling and sampling operations and laboratory tests.
3. Determines required foundation type and prepares report stating the type and bearing capacity of foundation to be used.
4. Prepares and reviews engineering geology plan sheet and reports, and submits them to the Project Structural Engineer or Resident Engineer.

In addition to the usual foundation problems such as those with bridges or culverts, a project may involve a number of other features that may have foundation concerns or geologic hazards. The Materials and Geotechnical Branch personnel should be included in the Design Scoping Review to identify these types of problems and should participate in the follow-up and resolution of the problems identified.

The Resident Engineer should contact the Consultant Management section of the Materials and Geotechnical Branch when using a consultant.

Additional References:

1. CDOT *Bridge Design Manual*
2. CDOT *Roadway Design Guide*
3. CDOT Procedural Directive 512.1, *Project Scoping and the Design Scoping Review (DSR)*
4. CDOT *Standard Specification for Highway Bridges*

6.05 LIFE CYCLE COST ANALYSIS

Life cycle cost analysis of alternative pavement designs is an economic analysis performed to examine two or more pavement structures for new construction, reconstruction, or resurfacing of a project. Life cycle cost analysis is performed for all new construction and major reconstruction projects that have sufficient pavement quantity or thickness to justify considering alternatives. Various pavement designs can also be considered for restoration, resurfacing, and rehabilitation of existing pavement structure.

Life cycle cost analysis is prepared for all appropriate projects comparing concrete to asphalt pavements, comparing alternative rehabilitation techniques, or both. An economic analysis supporting the pavement type selection will be prepared for all appropriate projects with more than $2 million initial pavement cost including any base and sub-base material. A pavement structure will be designed for each option and life cycle costs will be studied. When comparing pavement designs, all alternatives being considered should be analyzed over the same period; i.e., compare a 40-year asphalt alternative to a 40-year concrete alternative. Alternative designs must also have the same levels of reliability and serviceability loss.

For new construction and reconstruction projects, the pavement structure will be designed for both asphalt and concrete to provide accurate quantities as a basis for the life cycle cost analysis. 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 to the Region Materials section. The Region Materials section 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.

Based on preliminary quantities, if one alternative is clearly more cost effective (comparison that yields a difference greater than 10 percent), a selection is made by the Region Materials Engineer. A comparison that yields results within 10 percent may be considered to indicate equivalent designs. When the alternatives have comparable life cycle costs or the type of project warrants further investigation, a Constructability Review and a complete Field Inspection Review design should be done for each alternative pavement. The life cycle costs for each alternative should be based on actual quantities.

In most cases, a final alternative is selected by the Region Materials Enigneer after the Field Inspection Review, and the project proceeds with the final design based on the selected pavement design. In some cases it may be appropriate to have the Pavement Type Selection Committee (PTSC) make the final materials type selection. However, PTSC pavement type selection may take up to two months to complete. In other cases it may be best to have bidders submit alternative bids for each pavement type.

Refer to the Pavement Design Manual for more details on the Life Cycle Cost Analysis (LCCA) and PTSC processes.

Additional References:

1. CDOT *Pavement Design Manual*
2. 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 its selection of pavement type or rehabilitation method.

The report should include the following:

1. An analysis supporting the pavement type selection or rehabilitation method.
5. Life cycle cost analysis of alternate designs.
6. Pavement distress survey of existing pavements.
7. Pavement thickness calculations of alternate designs.
8. Final recommendations for typical sections.
9. 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 FIR. The Pavement Justification Report shall be maintained in the Region's project records.

Additional References:

1. CDOT *Pavement Design Manual*

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.

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		$_____

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)

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1.04 PROJECT CREATION AND FINANCES

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

ZJ08 – Initiate Project Creation – PM
(ZJ08 Initiate Project Creation)
(http://vupweb.dot.state.co.us/gm/folder-1.11.29385?mode=EU&originalContext=1.11.30034)

SBWP – Complete Project Manager Tab – PM
(SBWP Complete CJ20N) (http://vupweb.dot.state.co.us/gm/folder-1.11.32630?mode=EU&originalContext=1.11.30034)

CJ20N – Enter GIS details in SAP Project Manager – PM
(GIS Project Limits) (http://vupweb.dot.state.co.us/gm/folder-1.11.29337?mode=EU&originalContext=1.11.30034)

CJ20N – Create Project Structure from Standard Template –
(Add Template) (http://vupweb.dot.state.co.us/gm/folder-1.11.29381?mode=EU&originalContext=1.11.30034)

FMMEASURE – Maintain Funded Program for Project
(FMMEASURE) (http://vupweb.dot.state.co.us/gm/folder-1.11.28338?mode=EU&originalContext=1.11.30034)

CJ20N Release Project (CJ20N) -
Release project (http://vupweb.dot.state.co.us/gm/folder-1.11.29333?mode=EU)

Use the link to SAPTraining for SAP checklists for full list of transactions and workflow steps. SAP checklists for project processes (http://vupweb.dot.state.co.us/gm/folder-1.11.33901?mode=EU).

1.04.01 Description

After a project has been scoped and is part of the current STIP, a project is ready to be created in SAP. Although one project usually covers all phases, sometimes it necessary to create multiple projects under one STIP number. For example, the Resident Engineer may create a project for design and a separate project for construction. The

Resident Engineer should confer with the Business Office to ascertain if there will be any benefits or deterrents to fragmenting the STIP line item into more than one project.

The Resident Engineer begins the process in SAP with Transaction Code ZJ08. ZJ08 starts a workflow that is routed to 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. SAP Checklists provided in SAP training website show the participants and order for the SAP workflow.

KEY ITEMS TO KNOW FOR PROJECT CREATION - These fields combined, are the project information sent to FHWA via the Financial Management Information System (FMIS) and so it is key to have it as accurate as possible.

PROJECT DESCRIPTION (NAME) – ZJ08

The project name will be based on the information supplied with the request for the project using SAP transaction code – ZJ08. The information should be as descriptive as possible using state roads or federal highways and cities or counties.

PROJECT DESIGNATORS (General Location) – ZJ08

The Project Designators is 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. Example project number 0504-055 is on Highway 50 segment 4 (between La Junta and Kansas) and is the 55th project on this segment.

PROJECT PRE-FIX

The business manager will designate the Project Pre-fix 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 is Interstate Maintenance, FBR is Faster Bridge project, NH is National Highway.

OTHER PROJECT CREATION INFORMATION (fields with a check mark are required)

1. Region Code – Select the Region overseeing the project. For projects not created in the Region, select Statewide (ST). Do not select HQ.
2. Federal System Code:
   - I – Interstate
   - N – NHS non interstate
   - O – Other federal-aid highway
   - X – For conversion purposes (do not use)

Z – Not on any federal-aid highway (local agency off system projects for example)

3. Advertised By:

None – The project is design only or a study and will not go to Ad

State – This is a project advertised by CDOT and will go to ad. If you choose this option, the business manager must enter an ad date into SAP.

Local – This is a project that is advertised by a Local Agency (not CDOT). If None is chosen above, a reason must be given from the pull down menu.

4. Federal Improvement Code

Choose an option that best corresponds with the majority of funding or work. For example, if the project is mainly bridge funds then select "bridge replacement (either added capacity or no added capacity)." FHWA will review the code to make sure the work is in line with the funding.

5. State Improvement Code

The selection here should be similar to the Federal Improvement code based on the funding available.

6. Oversight Designator

A – CDOT administered – This is the majority of the projects.

N – Full FHWA (NHS) The Resident Engineer is responsible for determining whether the project is under CDOT or FHWA oversight. The oversight responsibilities are outlined in the Stewardship Agreement between the FHWA Colorado Division and CDOT. Unless the STA/FHWA agreement differs, full FHWA involvement projects will tend to be new construction or reconstruction projects on Interstate routes with an estimated value greater than $1 million. The Resident Engineer can contact the FHWA for further guidance.

O- Other – This is almost never used. FHWA will indicated if it is needed.

X- Full FHWA (Non-NHS) – This is rarely used. FHWA will indicate if it is needed.

7. Construction Engineering by:

C- Cons/Contr – This is a unique situation. Only use if told to do so.

L- Local – Construction oversight by Local Agency.

O- Other – Only use if instructed to use for special reasons.

S- State - This is standard for CDOT projects.

X- For conversion purposes – Do not select

8. Geographic Location, Terrain Type, Proposal of Work.

a. For the Geographic Location be as precise as possible (similar to, if not exactly the name of the project) by naming the Federal or State road and the city or county (i.e. – CR 520/CR 616 on SH 69 in Huerfano County).
b. For terrain type the options are: Level, Mountainous, Plains, Rolling or Urban.

   c. For Proposal of Work list the major activity to be completed (e.g. – Intersection Design, Drainage improvements, Surface Treatment or Safety improvements).

9. % construction complete – this is usually zero
10. Remark or Comments – Add more information here if needed.
11. PROJECT PERSONNEL
    a. This information is key if someone needs to contact appropriate party during any of the project development process.
    b. The people entered are tied to their organization code and are what is used when 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 are 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 in-charge of the project.
12. 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 OFF SYSTEM.
13. CONTRACT DELIVERY METHOD
    a. Design-bid-build is our traditional method for projects.
    b. Other options – Refer to Innovating contracting manual.
14. PLANNED LENGTH AND PLANNED UNIT:

    are not tied to the information given in OTIS at this time. Make sure the Planned Length entered matches the mileposts in OTIS. This information goes into Form 463.
15. INNOVATIVE CONTRACTING METHODS

    Check all that may apply to your project. Update as needed as project develops. Refer to Innovative Contracting manual as needed.
16. LOCATION DETAILS
    a. Exit SAP and go into OTIS to enter this information
    b. Route, beginning and ending reference points, lane quantity, facility type, functional type, and population.DTD has this information for highways on CDOT's Intranet in Data Access – Transportation Data Set and OTIS.
    c. SAP will carry the project location information to other forms such as Form 463, FMIS, ProjectWise project description, and ZJ40 Project Tracker.
17. RAILROAD DESIGNATOR CODE –

    If there are railroads near the project, use the pull-down menus to select which ones may be involved.
18. County Details, Congressional Districts, Structure ID Details, MPO's, TRP;s, and Commission Districts, and TIP information –

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

19. Other fields such as "Completed construction date" are not required at project creation and can be ignored.

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. 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 prior to July 1st 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 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 RTD has concurred with the necessity to change. Changes to the Current Planned Ad date are entered into SAP by the Region Business Manager.
3. Scheduled Ad date.

   This is the date that goes into the Go Sheet.

   This 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 Resident Engineer 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 Resident Engineer 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. Once a template is added to the project in SAP, the Resident Engineer can notify the business office that the project is ready to be budgeted. See Section 1.02 for estimations for the Preconstruction Phases for a project.

1.04.02 Federal Authorization and Budgeting

Federal-aid highway funds are authorized by Congress to assist States with the construction, reconstruction, and improvement of highways and bridges on eligible routes and for other special purpose programs and projects. To be eligible for federal funds, projects must meet program requirements as outlined in Section 1.04.03. CDOT requires all highway projects to conform to these federal standards to ensure consistency and to allow for the possibility of adding federal funds to a project that initially is funded without any federal funds. Routine highway maintenance activities such as snow removal or repairing pot holes do not qualify for federal aid.

1.04.02.01 Background:

Federal funding to state transportation projects must be authorized by FHWA prior to initiating any work on a project. Requests for federal aid must be supported by a documented Project Cost Estimate as described in Title 23CFR 630.106. The process of developing an early Project Cost Estimate also provides a foundation for a sound project management plan. These requirements are described in the guidance document: "Controlling Our Critical Path: A CDOT Guide to Better Project Management Practices," and can be found on CDOT's website at:

http://www.coloradodot.info/business/designsupport/design-docs/Controlling_Our_Critical_Path.pdf/

1.04.02.02 Definitions:

Assumptions – An important component of the Project Cost Estimate process is documenting assumptions relative to the project tasks, i.e. definitions, resource needs, durations, etc.

Project Cost Estimate – The estimated total cost (in dollars) to complete the scope of work for a design and/or construction project. The Project Cost Estimate should include separate sections for the various project phases including ROW, Utilities, Design, Environmental, and Construction phases. The estimate should include all project costs (i.e., materials, equipment, labor, engineering, construction, and indirect charges).

Scope of Work – A detailed listing of criteria and objectives required for a project.

Work-Hour Estimate – An estimate of labor hours to complete project tasks in accordance with the established scope of work for a design and/or construction project. Work-hour estimates including both internal and external personnel are required for all projects.

1.04.02.03 Process:

The Resident Engineer must develop a Project Cost Estimate, based on the Scope of Work and assumptions, to request FHWA authorization of federal funds. The Project Cost Estimate should indicate whether work-hours are for internal or external personnel, and should include the labor rates and costs associated with each.

Note**:** If a consultant is to serve as the Project Engineer on a FHWA Oversight Construction Project (See Construction Bulletin CB 2010-9, "Guidance for When the Project Engineer is a Consultant"), the Regional Engineer/Project Manager shall submit a separate request for approval from their respective FHWA Operations Engineer prior to contracting such services.

A Project Cost Estimate Worksheet is provided below:

Requirements for the authorization request to FHWA depend on whether projects are staffed with internal (CDOT/Local Agency) resources only, or if they include external (Consultant) resources, as noted below.

A) For projects staffed EXCLUSIVELY with CDOT and Local Agency Resources, the FHWA submittal only needs to include the Project Cost Estimate. Design costs may be represented as a percentage of the total construction cost estimate, based on historical and inflationary data.

B) For projects staffed INCLUSIVE of Consultant Resources, the FHWA submittal will include:

   1) Scope of Work –Sections of the Scope of Work ONLY where consultant resources are identified.
   2) Project Cost Estimate – The Project Cost Estimate shall separately list CDOT and Consultant labor-hours and costs for each phase of the project.

After Region Management personnel including the Program Engineer and Specialty Unit managers concur with the Scope of Work and Project Cost Estimate, the Resident Engineer shall e-mail the authorization request to the respective FHWA Operations Engineer. The e-mail subject line should provide a brief description of the project (i.e., Preliminary Design, Final Design, etc.).

Any increases to previously authorized budgets require FHWA re-authorization. Only those increases greater than $100,000 require a revised Project Cost Estimate to be included in the re-authorization request to the FHWA Operations Engineer.

1.04.03 Obligation:

After a project has been authorized, FHWA obligates the federal funds, making them available for CDOT to spend for the approved project. Charges cannot be made against any phase of the project until the funds are obligated. It is further important to note that if federal aid has been requested, state authorization is not granted until the federal authorization is received. Work performed on unauthorized projects is not legitimate and could become the personal liability of the individual initiating such work.

1.04.03.01 Definitions:

NCAT: NCAT prevents time/labor charges from hitting the phase, at time sheet entry. The Region Business Office will need to unset NCAT to allow labor 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) 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.

Pre-Construction Phase encumbrances are generally for 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) encumber funds for all phases for the Local Agency on Local Agency projects.

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 (ROW, Utility, Design, Environmental, Construction, Miscellaneous, etc.) and provider (i.e. 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. 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, CDOT Regions and the Metropolitan Planning Organizations (MPOs) are allotted funds to spend on actual projects by sub-category. 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 and/or local highway funds, are applied in a suitable mix based on estimates from the Resident Engineer.

Funds to be budgeted must be in the current year's STIP. It should be noted that moving funds currently budgeted into a project that are from the same fiscal year is considerably easier than moving funds from a prior fiscal year. For example, if the project needs funds moved from Design to Construction, it will be much easier if the Design funds are in the current fiscal year STIP. If the funds are from a prior fiscal year, they will have to be de-budgeted, rolled forward in the TIP and in the STIP, and re-budgeted into the construction phase.

Determine whether or not the project's budget requires Transportation Commission action. Budget items requiring Commission approval are:

1. Initial Project Budget Actions from certain programs not already approved by Commission as a whole. (i.e., RPP, BRS, FBR)
2. Projects involving Earmarks or Discretionary Funding
3. Local Overmatch not already projected or 100% locally funded projects
4. Strategic Projects (7th Pot)
5. Additional Funding above 15% of prior TC approved Budget

All Budget Actions are processed daily and, if Commission action is required immediately scheduled for the next supplement. The cutoff for Budget Actions inclusion in a Supplement is the 25th of the month preceding the T.C. 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 ensures 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 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 fund authorizations and obligations requests are submitted daily for review and approval by FHWA Colorado Division via the outbound FHWA Fiscal Management Information System (FMIS). The approved federal authorization/obligation is received from FHWA via the inbound FMIS interface.

The process of requesting federal-aid fund authorization/obligation is differentiated by non-construction and construction phases of work.:

1. Pre-Construction

   For the pre-construction phases of a Federal-aid project OFMB's final approval of a budget action in 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 PS via the inbound FMIS interface.

   The Right of Way phase requires no further budgetary action by the Region. Actual acquisition, however, must be authorized by Staff ROW upon completion and approval of the ROW plans. Staff ROW notifies 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 (see definitions above) when created. Resident Engineer 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 Obligation of a Federal-aid construction project (See Section 2.30):
3. Budgeting Timing before obligation:

   Budgeting construction funds is usually in advance of the authorization/obligation process.

Budgeting construction funds can occur when the current STIP year begins for 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.

4. Obligation – See Section 2.30 Form 1180 section for construction funds obligation process.

1.04.04 After Award of Low Bidder

At the time of award, the construction phase budget will be adjusted so it matches Form 65 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 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 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 Transportation Commission 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 Transportation Commission approved budget, OFMB may approve the request as an “allotment advice.” Allotment advices include transfers to projects from pools or other projects. Allotment advices are usually processed within a few days.

Any surplus or deficit amounts will be corrected by the Regional Business Managers with a Budget Action submitted to OFMB for approval to de-budget or supplement the amount. If the Regional Business Office wishes to retain this surplus amount, the

business office must request an approval to retain the surplus funds from the Chief Engineer. The request must be submitted to the Bids and Awards section by Monday, NOON, following the Letting Day. See Section 2.36 for additional information on retaining surplus bids.

1.04.05 Supplementing the Budget

There are many reasons that project phase budgets need to be supplemented, including additional work or overruns. In those instances, the Resident Engineer will work with the Region Program Engineer and the Business Office to find sources.

Many requests to add funds to a project do not require Transportation Commission approval. However, in those cases that do require Transportation Commission approval, the Resident Engineer needs to be aware that supplementing a project can take months. See Section 1.01 requirements on STIP/TIP, and Transportation Commission Action (PD 707.1).

The Region should make as few presentations to the Transportation Commission as possible on any given project If there is any likelihood that several phases such as utilities and right of way are going to run over budget, both requests should be calculated and communicated to the Region Program Engineer as soon as the Resident Engineer has solid figures.

1.04.06 Day-to-Day Financial Management

The Resident Engineer should check their projects in either ZJ40 or ZF70 in SAP to determine the current status of the project funding, expenditures, and encumbrances. It is recommended to use the timesheet report available through the Portal and run the report as needed to see which CDOT employee charges to their project(s) and the indirects that hit the project(s) budget.

If any phase of a project goes into deficit, payment for any phase of the project to a third party will not be processed. For example, if the design phase goes into deficit after the project is awarded in construction, the contractor cannot be paid. The Resident Engineer needs to be aware of CDOT purchasing requirements, rules, and directives. State Procurement, CDOT Procurement, and the Center for Accounting offer training applicable to the financial aspects of running a project. There is an On-line budgeting class available through the Transportation Engineering Training Program (TETP). Additional References:

1. OFMB Policy and Procedures Manual - http://intranet.dot.state.co.us/business/ofmb/other/current/ofmb-policy-manual-4-11/view
2. PD 707.1 – Annual Budget Process
3. FHWA A Guide to Federal-Aid Programs and Projects http://www.fhwa.dot.gov/federalaid/projects.pdf
4. Title 23, United States Code (23 U.S.C.) Title 23, Highways, of the Code of Federal Regulations (23 CFR) – 630.106 (Project Authorizations (FMIS) Preconstruction)
5. The FHWA/CDOT Stewardship Agreement) http://www.coloradodot.info/business/permits/accesspermits/references/stewardship-agreement.pdf
6. TETP On-line budget training
7. SAP Training website

1.05 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 is obtained according to an approved selection process through the Engineering Contracts Unit Program in the Contracts & Market Analysis Branch.

This process is also followed when Construction Manager/General Contractor or CMGC services contractor is required for CMGC delivery. If CMGC services that require a Contractor produce any stamped design plans or lead a formal Value Engineering Study, Brooks Act compliance per the Consultant Selection process will be required. If no Brooks Act compliance is required for the CMGC process, please follow the alternate process for CMGC projects.

The method for obtaining a professional consultant to do a specific scope of work or non-project-specific consultant services shall comply with applicable federal and state laws governing the services of consultants, as outlined in CDOT Procedural Directive 400.1, Obtaining Professional Consultant Services, and 23 CFR Section 172, Administration of Engineering and Design Related Services.

The Program Manager in the Contracts & Market Analysis Branch 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 Contracts Unit facilitates the selection process. The Resident Engineer shall evaluate the consultant's performance on projects.

1.05.01 Obtaining a Consultant Contract

The following steps are necessary to obtain an executed consultant 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 consultant service is consistent with CDOT's Long-Range Plan, Statewide Transportation Improvement Program, the CDOT budget, and the Obligation Plan (Program Engineer, Resident Engineer and Business Office).

2. Develop scope of work. For non-fund encumbering (generally, Non-Project Specific or NPS contracts), the Scope of Work should provide a general description of the anticipated services. For fund encumbering contracts and Task Orders, the Scope of Work will be project specific and detailed to include all requirements and deliverables. If the Consultant is known, the Scope of Work 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 consultant selection request, including the Underutilized Disadvantaged Business Enterprise (UDBE) goals, for the Chief Engineer's approval for advertisement (Resident Engineer and Region EEO/Civil Rights Specialist).
5. Establish a selection panel (Resident Engineer).
6. Create selection schedule (Resident Engineer and the Engineering Contracts Unit Staff).
7. Advertise Invitation for Consultant Services on the Internet and, as needed, in special journals (contract writer).
8. Create and distribute the selection information and instruction package to the consultant community (contract writer).
9. Coordinate and facilitate selection panels to achieve consensus and make a recommendation to the Chief Engineer (contract writer).
10. Obtain RTD's approval of the selection results. (Resident Engineer)
11. Obtain the Chief Engineer's approval of the selection results (contract writer).
12. Notify consultants of selection results (contract writer).
13. Finalize the ICE. For non-fund encumbering Contracts, use the ICE Summary Template, Type A, in Section 1.05.02.03. For fund encumbering Contracts/Task Orders, work-hours and costs will be negotiated with the Consultant and the results documented in the ICE Summary Type B (Section 1.05.02.03) for "Fund Encumbering Contracts/Task Orders." Include all documents in the solicitation request to the Engineering Contracts Unit. (Resident Engineer)
    Note: For task order contracts, this step is done for each task order request.
14. Obtain and review the consultant's financial information, insurance information, and initial cost proposal (Consultant Audit).
15. Initiate audit evaluation (Consultant Audit Program).
16. Analyze audit evaluation report and negotiate consultant fee and final contract cost exhibit (contract writer).
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 consultant (Engineering Contracts Staff).
19. Debrief consultants, as requested, on selection results (contract writer).

20. Compile selection documentation and transmit the selection file to the CDOT Records Center (contract writer).

The Resident Engineer is responsible for the submittal of the Contract Certification and Contractor Evaluation forms that are part of the Colorado State Controllers Contract Management System (CMS). See Section 1.06 Contract Certification and Evaluation Requirements for Colorado Contract Management System (CMS).

1.05.02 Preparing an Independent Cost Estimate for Consultant Services

1.05.02.01 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 Independent Cost Estimate (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.

1.05.02.02 Definitions

Assumptions – An important component of an ICE is documenting assumptions relative to the tasks, i.e. definitions, resource needs, durations, etc.

Independent Cost Estimate (ICE) – A cost estimate to accomplish the scope of work, completed by the CDOT Project Manager. 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.

Scope of Work – A detailed listing of requirements, criteria, and objectives for services that a Consultant is expected to provide.

Work-Hour Estimate – Used to develop the ICE, the estimated Consultant labor hours required to complete the established scope of work.

1.05.02.03 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 Independent Cost Estimate (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 below:

Type A - Non Fund Encumbering ICE

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) Independent Cost Estimate (ICE) (**Required (>$100K)**) – Upon completion of the Scope of Work, the CDOT Project Manager 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 Project Manager 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 (>$100K)**) – Upon completion of the ICEs, the CDOT and Consultant Project Managers 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 ICE Summary (see below Section (3)). Copies of the CDOT and Consultant ICEs should be retained in the project records.

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

(3) Independent Cost Estimate (ICE) Summary (**Required (>$100K)**) – 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 below:

Type B-Fund
Encumbering ICE Sum

NOTE: If a Task Order Amendment is of a value greater than $100k OR a Task Order Amendment revises the collective Task Order value greater than $100k for the first time, steps 1 thru 4 above are required.

1.05.03 Obtaining a 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 Program, the CDOT budget, and the Obligation Plan (Program Engineer, Resident Engineer and Business Office).
2. Develop scope of work (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 EEO/Civil Rights Specialist).
5. Establish a CMGC selection panel per CMGC guidance from the Innovative Contracting Advisory Committee (Resident Engineer).
6. Create selection schedule (Resident Engineer and the Engineering Contracts Unit Staff).
7. Advertise Invitation for 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 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 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 scope of work, 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 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 CDOT Records Center (contract writer).

The Resident Engineer is responsible for the submittal of the Contract Certification and Contractor Evaluation forms that are part of the Colorado State Controllers Contract Management System (CMS). See Section 1.06 Contract Certification and Evaluation Requirements for Colorado Contract Management System (CMS).

1.07.12 PROJECT ESTIMATE – (See Section 1.02)

The Project Estimate is the summary of total costs for a project. This estimate is often broken out into ROW, Utilities, Design, Environmental and Miscellaneous (RUDEM) phases. Additionally, the Project Estimate will include projected costs for Construction of the project. Reasonably accurate Project Estimates are important, as budgets and project limits are often established from them.

A project schedule is prepared to monitor the progress of preconstruction activities and to determine a reasonable date for the advertisement of the project.

The project schedule is developed by the Resident Engineer 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 Resident Engineer will monitor the schedule to ensure important dates are met to successfully advertise the project.

The Resident Engineer should give priority attention to critical path 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.

Microsoft Project is used to establish the project schedule, critical path and milestones. Using Microsoft Project, the Resident Engineer and the Specialty Units can coordinate production milestones for completion of assigned tasks.

The Resident Engineer needs to consider the availability of funds when determining schedules. For example, preliminary engineering should not be started until funds have been budgeted and obligated for the design phase, and a project may not be advertised until funds are available for construction, particularly if federal aid is involved. In addition, local agencies may provide funds and their processes and time constraints for providing these funds have to be considered.

The Resident Engineer will develop the 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 Resident Engineer will inform affected parties of any changes to the schedule and adjustment to the advertisement date.

Developing and managing a project schedule includes the following activities:

1. Conduct the project design scoping prior to preliminary design by initiating a Design Scoping Review – See Sections 1.02 and 2.01.
2. Develop a proposed project schedule, preferably within 30 days after the Design Scoping Review.
3. Coordinate, monitor and update the project schedule with other appropriate milestones such as request and receipt of the survey, Field Inspection Review, Final Office Review, and advertisement date.
4. Update any changes to these dates in Microsoft Project.

The project schedule should be saved on a server within the Region or as a shared file on a personal computer so that specialty units and other members of the design project team may review the schedule. Any changes to the schedule or notes to be added should be coordinated through the Resident Engineer.

For Programming and Budgeting of funds refer to Sections 1.02, 1.03 and 1.04:

1.07.13 Milestone Dates in SAP Project Builder (CJ20N)

CDOT uses Critical Path Method (CPM) scheduling to help manage our design and construction projects. For CPM to be effective, the schedule must be maintained. Entering and reporting Milestone dates for a CDOT project is an important task for managing the schedule. However, it has historically been time-intensive. The SAP Project Systems team has eliminated several layers of networks and activities that were not being used in the CDOT Engineering template in Project Builder (CJ20N) and we have streamlined the configuration of the templates to include only the major Work Breakdown Structure (WBS) and Milestones. This new template will not have the extraneous ROW WBS, Design Networks and Design Activities. This has resulted in a simple layout that is easier for Project Managers to use and report project status. The new template became available on July 31, 2013.

The new templates have the same names (Std. Project – Eng. Cap. (with ROW) – 00010 and Std. Project – Eng. Cap (without ROW) – 00011). (See screenshot in Figure 1-2A.) The Milestones in the templates are the Standard Milestones outlined in the “Controlling Our Critical Path” document. With this change you can add additional Milestones to any WBS in the project. There is no limit to the number of additional milestones you can add. However, only the first five additional milestones will display on the Project Status Report (ZJ40).

There are two reports you can use to report Milestone dates. The first report, Project Status Report (ZJ40), will display most of the Project information including the Standard Milestones and up to five additional Milestones. (See Project Status Report sample in Figure 1-2B.) The second report is Milestones (CN53N). With this report you can call-up the Milestone dates by

Project or WBS Elements.

To add a template to a new project, refer to the help document "CJ20N - Add Template to Project" or "CJ20N - Add Standard Template to Bridge Enterprise Project" in SAPTraining.

If you created a project, added a template and released the project BEFORE August 1, 2013 you can change the template. To do this and include the new Milestones refer to "CJ20N – Update Old Template to Include New Milestones":

Update Old Template
to Include New Milest

To add dates to Milestones refer to "CJ20N – Add Milestone Dates to WBS Template":

Add Milestone Dates
to WBS Template.doc

Project Structure: Description	Identification
NEW TEMPLATE DEMO	19602
Std. Project - Eng. Cap. (with ROW)	19602
Pre-Construction	19602.10
Right of Way	19602.10.10
Ownership XXXX	19602.10.10.01
Utilities	19602.10.20
Design	19602.10.30
Completed Survey	80563
Prelim. Hydraulic Information	80565
Structure Selection Report	80566
Field Inspection Review (FIR)	80567
Utility Clearance	80568
Final PS&E	80569
Form 128 Signature (Top)	80570
Final ROW Plans	80571
Final Office Review (FOR)	80572
Environmental Clearance	80573
Right of Way Clearance	80574
Shelf Date	80575
Advertisement Date	80576
Prelim. Horiz. and Vert. Alignm	80564
Environmental	19602.10.40
Miscellaneous	19602.10.50
Construction (DO NOT CHARGE)	19602.20
Construction	19602.20.10
CE (Statistical)	19602.20.20
Indirects (Statistical)	19602.20.30

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ne

Figure 1-2A
Screenshot of Std. Project – Eng. Cap. (with ROW) Template

Project Status Report.

Report Date: Jul 29, 2013

Project Information

Project Def.: 19602	Project Number 0061-097	Region: 01	RE Org Code:
Description: NEW TEMPLATE DEMO			
Program Engineer/Branch Manager: --		Resident Engineer/ Section Head: --	
Project Manager/Pre-Const: --		Project Engineer/Const.Eng: --	
Initial Ad Date:	Current AD:	Scheduled AD:	Actual AD:
Award Date:	Re-AD Date:	Shelf Date:	Proj Acceptance Date:
Advertised by: -			
STIP Numbers:			

Budget Information

WBS	Description	Budget	Expenditure	Encumbrance	Balance
00000.00.00	Allocated Budget	.00	0.00	0.00	0.00
	Total	0.00	0.00	0.00	0.00

Milestones:

Description	Planned	Actual
Completed Survey	Mar 29, 2013	Mar 1, 2013
Prelim. Horiz. and Vert. Alignm	Mar 14, 2013	Mar 1, 2013
Prelim. Hydraulic Information	Mar 14, 2013	Mar 1, 2013
Structure Selection Report	Feb 21, 2013	Mar 1, 2013
Field Inspection Review (FIR)	Mar 14, 2013	Mar 1, 2013
Utility Clearance	Mar 15, 2013	Mar 1, 2013
Final PS&E	Mar 12, 2013	Mar 5, 2013
Form 128 Signature (Top)	Mar 20, 2013	Mar 5, 2013
Final ROW Plans	Mar 29, 2013	Mar 5, 2013
Final Office Review (FOR)	Mar 29, 2013	Mar 28, 2013
Environmental Clearance	Mar 14, 2013	Mar 1, 2013
Right of Way Clearance	Mar 14, 2013	Mar 28, 2013
Shelf Date	Mar 15, 2013	Mar 28, 2013
Advertisement Date	Mar 29, 2013	Mar 29, 2013

Comments

NEW TEMPLATE ZJ40 DEMO

Figure 1-2B
Screenshot of Project Status Report

We are continuing to work on additional help documents and will let you know as they become available. The help documents we are working on are: “CN53N – Milestone Reporting” and “CJ20N – Add Additional Milestones”.

If you need assistance on Milestones in SAP or SAP Project Systems, please contact the BPXs:

Tawnya Nicholson
tawnya.nicholson@state.co.us
(303)512-5207 [7-5207]

Valerie Metaiguer
valerie.metaiguer@state.co.us
(303)757-9837 [7-9837]

1.07.14 Additional References:

1. CDOT Procedural Directive 512.1, Project Scoping and the Design Scoping Review (DSR) at the following link: http://intranet/resources/policy-procedure/documents/0512-1/view
2. SAP Workflows at the following site: http://vupweb.dot.state.co.us/gm/folder-1.11.33901?mode=EU
3. OFMB Policy and Procedures Manual - http://intranet.dot.state.co.us/business/ofmb/other/current/ofmb-policy-manual-4-11/view
4. Controlling our Critical Path guide found at the following link: http://www.coloradodot.info/business/designsupport/design-docs/Controlling_Our_Critical_Path.pdf/view

1.15 ESTIMATING DRAWDOWN SCHEDULES

1.15.01 Background

CDOT is moving from a budget-based project funding system to an expenditure-based project funding system. What this means is that CDOT will now only encumber funds as they are needed on a fiscal year basis. Moving to an expenditure-based system will allow CDOT to more effectively use our cash reserves and deliver more projects.

In order to move to an expenditure-based funding system, CDOT needs to have a better understanding on when projects anticipate spending funds. Recognizing construction projects comprise the largest portion of our cash obligations, it was decided to focus on obtaining anticipated drawdown information for the construction phase dollars without including CE and indirect costs, before addressing the pre-construction phases.

1.15.02 Project Manager Guidance

Pre-advertisement (*Applies to all CDOT Managed Projects*):

1. Send the scoping level estimate and type of work to the Project Management Office (PMO). They will develop a scoping level construction drawdown and coordinate with the Project Manager and RE for feedback. Once there is agreement that the drawdown is reasonable, the Project Manager will enter the anticipated expenditures by fiscal year in SAP.
2. In coordination with PMO, update the anticipated construction phase drawdown at FIR using the latest construction estimate and update the drawdown in SAP.
3. In coordination with PMO, update the anticipated construction phase drawdown at FOR using the latest construction estimate, and update the drawdown in SAP.
4. In coordination with PMO, update the anticipated construction phase drawdown at least one week before processing the Form 1180 using the Engineer's Estimate (Line 7 from Form 65 Project Commitment Amount), and update the drawdown in SAP.
5. Include the appropriate construction drawdown standard special provision in your specification package (single or multiple fiscal years).

   https://www.codot.gov/business/designsupport/construction-specifications/2011-Specs/standard-special-provisions/section-100-revisions/108psscy.docx/view

   https://www.codot.gov/business/designsupport/construction-specifications/2011-Specs/standard-special-provisions/section-100-revisions/108psmcy.docx/view

1.15.03 Resources

For questions related to the phase level funding contact Eric Ehrbar. Contact Sam Pappas for questions related to indirect and construction engineering rates, encumbrances, and the Form 65 – Project Financial Statement.

Name	Phone Number	Email
Eric Ehrbar Budget and Cash Management Reporting Manager	(303) 757-9581 [7-9581]	eric.ehrbar@state.co.us
Scott Howard Cash Management Manager	(303) 757-9328 [7-9328]	scott.howard@state.co.us
Sam Pappas Projects Accounting and Reporting Manager	(303) 757-9628 [7-9628]	sam.pappas@state.co.us
Joe Duhon Budget Manager	(303) 757-9638 [7-9638]	joseph.duhon@state.co.us

For technical assistance entering the drawdown schedule into SAP, contact your Region SAP Power/Super User or the SAP Project System BPXs. Please contact your Resident Engineer for the name of you region's current representative.

SAP Project System BPX Tawnya Nicholson	(303) 512-5207 [7-5207]	tawnya.nicholson@state.co.us
SAP Project System BPX Valerie Metaiguer	(303) 757-9837 [7-9837]	valerie.metaiguer@state.co.us

For general guidance or support regarding Program and Cash Management implementation and specific requirements for Program and Cash Management found in Design and Construction Bulletins, contact the respective Region Program Management Representative listed below:

Name		Phone Number	Email
Region 1	Hilary Hawthorn	(720)497-6910 [1-6910]	hilary.hawthorne@state.co.us
Region 2	Michael Nusen	(719)546-5779 [2-5779]	michael.nusen@state.co.us
Region 3	Sherry Dunn	(970)683-6207 [3-6207]	sherry.a.dunn@state.co.us
Region 4	Bryan Schafer	(970)350-2219 [4-2219]	bryan.schafer@state.co.us
Region 5	Tom Bovee	(970)385-1412 [5-1412]	thomas.bovee@state.co.us

Additional References:

1. Design Bulletin DB 2014-1
2. CDOT Construction Manual

2.01 DESIGN SCOPING REVIEW

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

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

2.01.01 Form 1048, Project Scoping/Clearance Record

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

2.01.02 Design Scoping Review (DSR) Meeting

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

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

2.01.03 DSR Invitees

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

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

2.01.04 Conduct of the DSR Meeting

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

2.07.03.02 Safety Evaluation for 3R Projects

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

The TSM&O (Transportation Systems Management and Operations) Evaluation, which is required on all projects, consists of three parts: a Safety Analysis, an Operations Analysis, and an ITS Analysis.

Refer to the new section 4.12 for details on the TSM&O Evaluation.

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

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

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

2.07.03.04 Safety Issues Related to Geometric Design Criteria

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

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

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

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

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

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

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

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

2.15 CDOT DESIGN PHASE VALUE ENGINEERING (VE) PROGRAM

2.15.01 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 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 travelling 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 CDOT management in the spirit of continuous improvement.

2.15.02 Requirements

The CDOT/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 or more, and
- Any other project that the U.S. 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, then a 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.

2.15.03 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 and/or difficult technical issues,
- 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.

2.15.04 Roles and Responsibilities

2.15.04.01 State 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 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.

2.15.04.02 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.

2.15.04.03 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 the 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 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.

2.15.04.04 VE Team Members

The VE team is typically comprised of five to 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.

2.15.05 Planning and Reporting

2.15.05.01 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 30th.

2.15.05.02 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 FHWA as required. The Annual VE Tracking Report will be completed by November 30th.

2.15.05.03 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, FIR, and FOR meetings, and the decision to conduct a study or not, shall be documented in the meeting minutes. The 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 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 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, and estimates (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 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 Figure 1) 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.

Figure 1 - VE Study Team Information and Logistics Planning	
Study Package for VE Team Members: Accident 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 1 week prior to meeting.
Facilities and Equipment: Conference room with a large table and adequate space for the team, AASHTO Green Book, Field Log of Structures, calculators and/or computers, telephone, projector, CDOT Design Guide, design file, large scale aerial photos (if available), easel(s)/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 3 to 5 days for the team to meet.

It is recommended that the VE Job Plan (see Figure 2) 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 (www.value-eng.org).

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

2.15.05.04 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 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 and/or cost savings 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 FHWA.

2.15.06 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.

2.15.07 Attachments:

VE Study Summary and Implementation Report

VE Study Summary and Iplementation Re

2.15.08 References

1. CDOT/FHWA Stewardship Agreement
2. 23 United States Code (USC) 106 (e, g, and h);
3. 23 CFR Part 627, Value Engineering;
4. P.L. 112-141, MAP-21;
5. Value Engineering, Circular A-131, Office of Management and Budget
6. Guidelines for Value Engineering, 3rd Edition, American Association of State Highway and Transportation Officials (AASHTO);
7. *Value Methodology Standard and Body of Knowledge*, SAVE International, The Value Society: www.value-eng.org; and
8. CDOT VE Website (Under Development)

2.16 DESIGN PROJECT MANAGEMENT AND REGION PLAN STATUS REVIEW

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

2.16.01 Design Phase Responsibilities

2.16.01.01 Target the Current Planned Ad Date

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

2.16.01.02 Maintain Good Communications

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

2.16.01.03 Review Project Cost Estimates

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

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

Staff Bridge Branch may conduct a separate Field Inspection Review.

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

2.17.06 Conduct of the review

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

2.17.06.01 Scoping, Budgeting and Planning

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

2.17.06.02 Environmental

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

4. Permit requirements.

2.17.06.03 Traffic

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

2.17.06.04 Structures

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

2.17.06.05 Materials

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

2.17.06.06 Right of way

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

2.17.06.07 Utilities

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

2.23 SPECIAL PROVISIONS

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

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

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

2.23.01 Standard Specifications

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

2.23.02 Standard Special Provisions

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

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

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

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

2.23.03 Project Special Provisions

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

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

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

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

1. Submit every new project special provision to the Standards and Specifications Unit (SSU) for review at least two weeks before it is needed.

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

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

1. Index Pages – List the applicable Project Special Provisions and Standard Special Provisions.
2. Notice to Bidders - Establishes the required amount of the proposal guaranty and lists CDOT construction representatives assigned to the project.
3. Commencement and Completion of Work - Establishes beginning work requirements and Contract time. On small simple projects it lists salient features to be shown when a bar chart schedule is allowed. Most projects require a CPM schedule.
4. Contract Goals - Establishes Disadvantaged Business Enterprises goals.

5. Force Account Items - Identifies CDOT's estimate for force account work included in the Contract.
6. Traffic Control Plan, General Contains key elements of the traffic control plan and the proposed method of handling traffic.
7. Utilities - Lists utility companies and types of utility relocations within the project limits.
8. Right of Way Restrictions – Lists restrictions that will affect the project.
9. Project Specific Special Provisions - Contain specification changes appropriate to the project.

The following outlines the procedures for preparation of special provisions:

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

2.23.04 Additional References:

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

2.24 PROPRIETARY ITEMS

2.24.01 Construction Contracts

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

If only patented or proprietary products are acceptable, they shall be bid as alternatives with all, or at least a reasonable number of acceptable materials or products listed. A reasonable number would be to specify in the contract two or three equally suitable products and include the term "or approved equal". Note that additional wording shall be added to the specifications to more clearly define the phrase "or approved equal." An example of this is the following:

> For an alternative material to be considered an approved equal, the product shall have been lab tested and field trialed by the National Transportation Product Evaluation Program (NTPEP) and approved by the Department's Materials and Geotechnical Program. Information for the NTPEP evaluation program can be found at http://www.ntpep.org/Pages/RSCPReports.aspx

If a product is on the approved Finding in the Public Interest (FIPI) list it will be noted in the specification and the term "or approved equal" is not to be used. Also, if four or more products are specified the term "or approved equal" should not be used and neither a FIPI or Certification is necessary. Therefore, when the use of a patented or proprietary (trade name) item is essential and only one item is to be specified in the contract for synchronization reasons ort htat no equally suitable alternative exists then a Certification is necessary; however, if only one, when there are equally suitable products; ir uf two or three items without the phrase "or approved equal" are to be specified in the contract then a FIPI is necessary.

CERTIFICATION

The Certification Process will require that the Residency Engineer (for project specific), Program Engineer (for regionwide use), or Branch Manager (for

statewide use) prepare documentation that shows (1) that no equally suitable alternative exists; or (2) that the item is essential for synchronization with existing transportation facilities. Once the documentation is complete, it shall be submitted to the Standards and Specifications Engineer for certification approval.

FIPI

Finding in the Public Interest will require that the Residency Engineer (for project specific), Program Engineer (for regionwide use), or Branch Manager (for statewide use) prepare and submit documentation (1) that no other products exist that meet CDOT requirements as an "approved equal" by being tested and proved in the field; or (2) that such patented or proprietary item is used for research or will be used for a distinctive type of construction on relatively short sections of road for experimental purposes. Once submitted, the FIPI documentation requires written approval by CDOT (for a specific project), or by the FHWA (if the FHWA determines that the project is a "Project of Division Interest [PODI]", and for region-wide and statewide products). Additionally, 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).

See the attached flowchart, PROCESS FOR PREPARING "CERTIFICATIONS" OR "FINDING IN THE PUBLIC INTEREST" (FIPI) DOCUMENTS FOR PROPRIETARY ITEMS, for the process to follow for project specific, Region-wide, and State-wide approvals. (See Figure 2-2.)

A Certification or Finding in the Public Interest may be written for use of a proprietary item on a specific project or corridor, for use on a region-wide basis, or for use on state-wide basis. A project-specific Certification or 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.

Copies of approved Region-wide and State-wide Certifications or 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. Note that Certifications or Findings in the Public Interest shall be generally valid for three years unless otherwise specified.

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

1. Three years (or the specified time that was specified) has elapsed from date of approval.
2. New products are found or created that are equal to the products in the original Certification or 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 Certification or 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.

See Figure 2-2 for a diagram of the approval process for use of proprietary items on a project.

2.24.02 Procurement Contracts

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

A Sole Source Certification Form

http://cdot/business/procurement/Documents/PurchManual_MOD_2007.pdf (page 45) shall be completed only for sole sources of goods or services. This certification does not apply to situations classified as "Emergency Procurement" covered by CRS 24-103-206.

2.24.03 Additional References:

1. 23 CFR Part 635.411, Material or Product Selection
2. FHWA Contract Administration Core Curriculum Participant's Manual and Reference Guide 2006
   http://www.fhwa.dot.gov/programadmin/contracts/coretoc.cfm

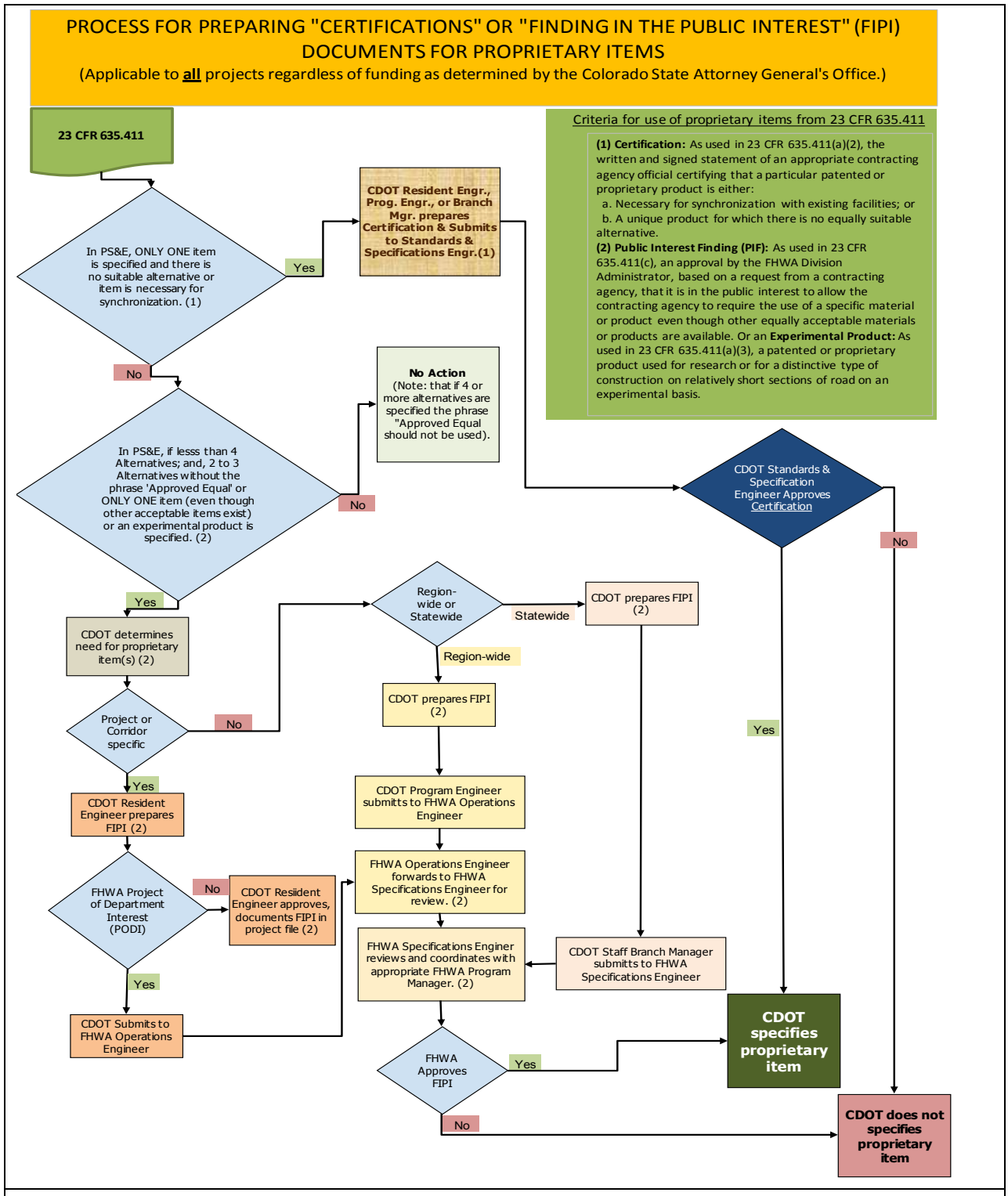

Figure 2-2
Certification or FIPI Flowchart

The procedures for preparing the Form 859 are:

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

Additional References:

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

2.27 ESTIMATE REVIEW BY ENGINEERING ESTIMATES AND MARKET ANALYSIS UNIT

2.27.01 Engineer's Estimate

On the fundamental level, the Engineering Estimates and 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 EEMA are called Engineer's Estimates (EE). 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, CDOT only commits real funds to a project 90 days before Ad.

The various estimates produced prior to FOR are parametric in nature. They are based on information available during a timeframe of 0 to 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 info 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. 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 August 27, 2014) to acquire additional funding.

Of note, CDOT has been granted a three-year relief from the automatic rejection Statute starting April 7, 2015. For cases where there are fewer than three bidders and the low bid is higher than the EE by previous statutory thresholds, award can still occur with Executive Director review and approval.

2.27.02 Estimate Security

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

2.27.03 Additional References:

1. 23 CFR Part 630B, Plans, Specifications and Estimates
2. HB15-1046, Highway Project Contract Amount Limit Waivers, Effective April 2015
3. *CDOT Manual on Bidding and Award Procedures (Effective July 2014, CDOT Procedural Directive 303.01, Award of Contract – Justification* of Bid was repealed)
4. *CDOT Procedural* Directive *511.1, Security and Confidentiality of the Engineer's Detailed Estimate*
5. Estimated Total Project Cost (see Section 1.02 of this manual)

2.28 FINAL OFFICE REVIEW

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

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

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

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

2.30 PLANS, SPECIFICATIONS AND ESTIMATE APPROVAL (FORM 1180)

If the project is a FHWA Project of Division Interest (PoDI), send the PS&E package to your FHWA Area Engineer for review at least two weeks prior to starting the Form 1180 approval process. The PS&E package must be sent to FHWA in paper format.

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

Obligation:

SAP Steps:

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

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

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

Authorization is requested from FHWA once OFMB receives:

1. Final Form 463 (Design Data)
2. Form 1180 workflow (Standards Certification and Project Plans, Specifications and Estimate Approval)

3. An approved Form 128 (*Environmental Categorical Exclusion Determination)* from the region.

These forms should be submitted to OFMB at least 7-10 days prior to the scheduled advertisement date to allow adequate time for OFMB/FHWA to process the authorization request. Therefore the start of the Form 1180 workflow should be timed adequately before the planned advertisement date.

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

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

The Form 1180 will then be forwarded in SAP to OFMB (Office of Financial Management and Budget). The Resident Engineer is responsible for forwarding the 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 CFR Part 630.106 specifies that federal funds shall not be used (participating) for costs incurred prior to the dates of obligation and authorization.

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

Additional References:

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

2.31 PURCHASE REQUISITION FOR CONSTRUCTION CONTRACT

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

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

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

Link to ME51N – Create a Construction Project PR Resource guide

ME51N - Federally Funded Construction

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

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

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

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

2.34 PS&E REVISIONS UNDER ADVERTISEMENT

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

2.34.01 Instructions to Complete PS&E Revisions Under Advertisement

2.34.01.01 Revision to Bid Documents

The process to revise the Bid Proposal is defined in the Web Trns•port PreConstruction User Handout, located on the Trns•port website at:

http://internal/trnsapps

2.34.01.02 Revision to Project Special Provisions

If there are any changes to the Project Special Provisions or Standard Special Provisions, prepare a revised index to reflect the changes.

Add a side bar to identify changes. (This can be completed either with Track Changes or using the Paragraph Tool Bar – Table Left Border).

NOTE: It is easiest to revise a spec with track changes by creating a new document, copying in the text of the spec 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 lower case letter indicates the revision number

- 1a Revision No. 1 under advertisement (Index page)
- 13b Revision No. 2 under advertisement
- 28c Revision No. 3 under advertisement

An upper case letter indicates that the page is being added.

- 13Ba

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

Example: Page 32 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 No. 1 is 32a, 32Aa, 32Ba, 32Ca, 32Da.

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

Example: The original spec package ends with Page 50. A ten page SWMP spec is added by Revision Under Ad. The page numbering would be as follows if the original Page 50 is not to be revised during this revision: 50Aa-50Ja. If another three page spec is added, the numbering is as follows: 50Ka-50Ma.

Deleted specifications by Revision Under Ad shall remain in the spec package with a "DELETED" dark diagonal watermark over the original text. Deleted specifications shall remain in the Project Special Provisions Index with a strikethrough the title of the text and (Deleted) following the title with the revised page number identified.

Example: The original spec package contains page 19. That page is being deleted by the first Revision Under Ad. The new page would be numbered 19a with the revision date and have a large text watermark imposed under the existing specification text. The watermark text would be the word "DELETED". Select the diagonal layout and make sure to uncheck the "Semitransparent" box. Select color as automatic (black). In Microsoft Word, the Printed Watermark option is found at Page Layout/Page Background Toolbar. In the Project Special Provisions Index, the title of original specification would remain with a strikethrough and (Deleted) following the title with the revised page number identified, in this case 19a.

2.34.01.03 Revision to Standard Special Provisions

Should a Standard Special provision need 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 will be identified by the date in the upper right hand corner of the each page. If a Standard Special Provision is deleted, the Index should include the title of the original specification with a strikethrough the title with Deleted in parentheses following the title with the revised page number identified, in this case 19a.

2.34.01.04 Revision to Plan Sheets

The Title Page (also identified as plan sheet 1) 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.

Sheets Revisions		
Date	Comments	Initials

The Index of Sheets on the Title Page (also identified as plan sheet 1) 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.

If text is to be deleted, the text shall remain with a strikethrough.

Use Revision Under Advertisement Revision No. to identify when the revision is made. Example: R-1 noted next to a change indicates this change was made with Revision Under Advertisement No. 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.

2.34.02 Documentation for PS&E Revisions Under Advertisement

All revision packages are to be submitted to the Printing and Visual Communications Center (VCC) at least 10 days prior to the scheduled bid opening date. Revisions submitted later will result in a deferred bid opening. The package to the Printing Center will include the revision letter and all revised sheets. Additionally, an e-mail distribution of

the revision letter must be made concurrently with or prior to the submittal to the VCC. These steps must be followed to ensure that key processes are initiated.

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

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

Project Manager
Resident Engineer

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

Alvaro Duran
Bid Plans
Jack Stiller
Kyle Dilbert
Tracie Benton
Marci Gray
} = *HQ-CU/Construction

Region Transp. Dir.
Program Engineer

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

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

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

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

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

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

EXAMPLE OF REVISION REQUEST E-MAIL:

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

TO: See Below

Subject: Revision No. 1 HB 9999-999

Please find attached the following revision letter for Project _____.

Distribution:

*HQ-CU/Construction contracts
|
Which may include the following individuals but the distribution list is kept up to date and should be used over the list below.
TO: Bid Plans @DHQ
TO: Duran, Alvaro @DHQ
TO: Stiller, Jack @DHQ
TO: Gray, Marci @DHQ
TO: Dilbert, Kyle @DHQ
TO: Benton, Tracie @DHQ

CC: RTD
CC: Program Engineer

EXAMPLE OF REVISION REQUEST LETTER:

[Project Name, i.e. HB 9999-999]
[SAP #, i.e. 10000]
SH 99, North of the Big Hole

DATE: [Current Date]

TO: All Holders of Plans for Project No. {HB 9999-999}

SUBJECT: Revision No. [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 not using EBS must submit their bids on the revised schedule dated (Revision Date) or the bid will be rejected. For EBS use the Amendment posted on the CDOT web site.
OR
No revisions to Schedule

Project Special Provisions:

Pages 1a and 2a: Revised Index
Page 16a: Added Cross Sections
Pages 50-56: Deleted Section 253-Asbestos Containing Material Management
...etc

OR
N/A

Standard Special Provisions:

Page 3a: Revised Date on Standard Special Provision R.O.S.
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 EBS file has been posted on the web to correspond to the revised bid opening date. Bidders using EBS must use the new file.

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

This revision is authorized by (PE II authorizing Revision).

cc: FHWA, Colo F/A Division Operations Engr.(If FHWA Oversight)
Stiller/Duran, Printing Center
J. Justiniano, Bid Plans
R. Liljenberg, Business Programs
M. Gray, Constr. Contracts
S. Yu, Cost Estimating
Central Files

Project Manager
Resident Engineer

2.37 GO SHEET (ZJ44)

The Go Sheet is published weekly to inform contractors about upcoming bid openings for CDOT construction projects. The Go Sheet consists of the following four reports:

1. Projects Advertised Revised this Week
2. Advertised Project Lettings
3. Projects to be Advertised within the next 90 days
4. Local Agency Projects

2.37.01 Accurate Adveertisement Dates

Information populating the Go Sheet now comes from SAP instead of Trns*port. It is very important for Project Managers to update project information in SAP, including the Current Planned Ad Date, Scheduled Ad Date, the Project personnel, Budget, and Contract Type. Currently only the Region Business Office can update the Scheduled Ad Date, but in the near future Project Managers also will be able to maintain this date.

2.37.02 Ad Certainty

A required field called “Ad Certainty” is included on the Project Manager’s tab. The system will prompt you to choose one of three options (Green, Yellow, or Red) to indicate the likelihood of meeting the Scheduled Ad Date. Green indicates a 90 to 100 percent likelihood of meeting the Scheduled Ad Date, Yellow indicates 50 to 90%, and Red indicates less than 50%.

The Pre-bid Meeting Date and DBE Goal will also appear on the Go Sheet. The Project Manager will need to coordinate entering in the Pre-bid Meeting Date and DBE Goal. These fields are on the Award Tab in SAP, so the Project Manager will need to notify the Awards Officer to enter this information.

Finally, a system-generated email will be sent to Project Managers and Resident Engineers one week before the Project is added to the “Projects to be Advertised within the next 90 days” report to remind them to check Project Ad dates before projects appear on the report. If the project is not going to ad in the next 90 days it is important that you update the Scheduled Ad Date.

Users can generate the Go Sheet reports in SAP by using the transaction, ZJ44. In addition, the Go Sheet will continue to be available on CDOT’s external web page. Instructions will soon be available in SAP with tips for updating Ad Dates and Ad

Certainty fields, as well as for generating reports. The document below has instructions for generating the reports:

End User GoSheet Instructions.docx

2.38 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 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. 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.

2.39 CUT BACK AND MULTIPLE SCHEDULE PROJECTS

2.39.01 Over Budget Less Than Ten Percent

If the project has a final total cost estimate from the Cost Estimating Unit less than ten percent 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 2.36.

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 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 2.36. 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 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.

2.39.02 Over Budget Ten Percent or Greater

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

The RTD may approve the option to reduce the Project Scope to fit within budget.

OR

The RTD may seek approval (Commission, 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 fifteen percent for two schedules, or thirty percent for three schedules. Greater deviations must be approved by the Chief Engineer before advertisement. The minimum estimate spread between schedules should be five percent. Do not use more than three schedules.

6. The Region CRO must be specifically advised that there will be multiple schedules advertised when a 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 contact the Engineering Estimates Manager (303-757-9293) and the Award Officer (303-757-9297) 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, MCR, CE, PE, 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 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 percent 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 percent 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 1.04.03 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.

> **Transport 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 work sheet found at the *Innovative Contract Provisions* web page listed below.

2. *Commencement and Completion of Work* based on the appropriate one of the three work sheets found at the *Innovative Contract Provisions* web page listed below.

The *Innovative Contract Provisions* web page is found at:

https://www.codot.gov/business/designsupport/construction-specifications/2011-Specs/innovative-contract-provisions

4.11 ENGINEERING JUDGMENT AND MUTCD REQUEST OPTIONS

The controlling federal document for designing roadway signage is the *Manual on Uniform Traffic Control Devices* (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 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 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 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 CDOT requests should be developed with the assistance of the appropriate Region Traffic Engineer or the Staff Safety and Traffic Engineering Branch's Traffic Engineering Support / Specs & Standards Unit.

Requests submitted by local entities in Colorado do not require CDOT approval or involvement. However, FHWA does provide the CDOT Traffic Specifications & Standards Engineer 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 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 References:

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

4.12 TSM&O EVALUATION

Beginning January 1, 2016 all projects with a Design Scoping Review on or after February 1, 2016 will require a Transportation Systems Management and Operations (TSM&O) Evaluation.

The TSM&O Evaluation is an evaluation that consists of three parts, a Safety Analysis, an Operations Analysis, and an ITS Analysis. The purpose of the TSM&O Evaluation will be to evaluate the project area and make recommendations to the project team for improvements related to safety and mobility to the project.

To initiate the TSM&O Evaluation, the Project Manager will take the following steps.

- Create the TSM&O Evaluation milestone in SAP when project is initiated. See SAP Workflow 1 in the guidance document on the CDOT website (https://www.codot.gov/business/designsupport/bulletins_manuals/adg). See Design Bulletin 2014-3 Milestone Dates in SAP Project Builder (CJ20N) (https://www.codot.gov/business/designsupport/bulletins_manuals/design-bulletins/db-2014-3/view) February 10, 2014 for more information on entering milestones in SAP CJ20N.

- Prepare the TSM&O Evaluation Request form at the beginning of the Pre-Scoping phase of the project by entering the project information in the request form at the following link:

  http://cdot.dot.state.co.us/business/tsm-o/evaluation/request

- Email the request form to Region Traffic contacts and ITS as indicated on the webpage.

- Fill out the Form 1048 section 4.12 ”Transportation Systems Management and Operations Evaluation”.

The evaluation will be coordinated and conducted by a Region Traffic Representative (RTR) assigned to the project, and provided to the Project Manager before the Field Inspection Review (FIR). In the case of a project incorporating new ITS devices or more complex projects, HQ TSM&O will provide additional support to the Regions.

4.12.01 Background

The TSM&O Reorganization Report of May 2013 recommended that all CDOT projects conduct an operational analysis to ensure improved systematic and integrated delivery of statewide operations. Per federal regulations, the FHWA-CDOT Stewardship Agreement, and CDOT policy, CDOT is required to conduct safety analyses and ITS systems engineering analyses as applicable on CDOT Projects. The TSM&O Evaluation combines all these analyses – safety, operational, and ITS systems engineering – into one coordinated process to ensure that every CDOT project is considering improvements for the safety and efficiency of the travelling public.

Another purpose of the TSM&O Evaluation is to enhance regional partnerships that support collaborative investment and implementation of TSM&O strategies that benefit the Region and its stakeholders. This requires collaborative investment by Maintenance, Access, Regions, Operations, Safety, ITS, 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 TSM&O Evaluation creates enhanced opportunities to provide safety improvements, accountability to stakeholders, increased ability to document and reference lessons learned, and streamline business processes while providing increased system reliability.

4.12.02 Operations Definition

Operations at CDOT refers to a number of 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 TSM&O Evaluation, to build 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 a completed TSM&O evaluation from the Regional Traffic Representative and considers recommendations that can be integrated into the scope of the project. The Project Manager will be responsible for assuring that an associated milestone is created in SAP CJ20N, coordinating with the RTR for status of the TSM&O Evaluation process, and discussing recommendations for implementation with his/her Resident Engineer.

4.12.03.02 Region Traffic Representative

The Region Traffic Representative (RTR) referred to in the process is the traffic engineer assigned to the project being evaluated. The RTR is the single point of coordination for the TSM&O Evaluation for the project. In this role, the RTR completes the Level 1 Safety and Operations Analyses and requests that the TSM&O Support Groups complete the Level 2 Analysis when required. The RTR also provides support to the Project Manager and coordinates and consolidates the key recommendations of the Evaluation from the TSM&O support groups, Safety, Operations and ITS. The RTR will be the lead for documenting recommendations from the Safety, Operations and ITS reports implemented into the project design. See Exhibit 1 and Table 1 in the guidance document on the CDOT website (https://www.codot.gov/business/designsupport/bulletins_manuals/adg).

4.12.03.03 TSM&O Support Groups

The TSM&O support group consists of HQ Traffic, Safety, Operations and ITS. Each specialty is responsible for providing detailed analysis and recommendations for each of their respective disciplines. The TSM&O Support Group will coordinate directly with the RTR's. The TSM&O Support Groups will also be responsible for reviewing and following up with the regions on the overall effectiveness of the process.

4.12.04 Additional References:

1. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*
2. Design Bulletin DB 2014-3 *Milestone Dates in SAP Project Builder (CJ20N)*
3. Design Bulletin DB 2016-1 *TSM&O Evaluations*

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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

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 3D ENGINEERED CONSTRUCTION SURVEYING (3DECS)

The Resident Engineer or Project Manager needs to determine early in the design of a project whether the project is a good candidate for CDOT to provide 3D modeling information to Contractors. With this information Contractors can gain efficiencies in bidding the work. They can also gain efficiencies during construction by not needing as much staking and by providing the data directly to an automated machine or to a machine operator.

The Project Special Provision *Revision of Section 102 Project Plans and Other Data* is where the design team will modify the contract to let the Contractors know that CDOT will be providing 3D modeling electronic data for use during construction.

Criteria for consideration of whether a project would be a good candidate include the following:

1. Project needs to have a large amount of earthwork or paving,
2. A new alignment,
3. A CDOT approved existing topographic survey, or
4. A CDOT approved Project Control Diagram.

Conditions that limit or would exclude the use of providing 3D modeling data are:

1. Widening with narrow strip additions,
2. Designs, such as overlays, which are not based on an existing Digital Terrain Model (DTM),
3. Designs that do not exist in a 3D digital environment. (Overlay, write-up job or projects without survey data needed.),
4. Structures,
5. Intersections,
6. Projects that are under a tree canopy, in narrow canyons, or next to tall buildings that interfere with GNSS signals. (This limitation only applies when GNSS is used to position equipment.), or
7. Design difficulties that would prevent the creation of an accurate and complete DTM.

CDOT's Standard Specifications Section 625 and 629, along with CDOT's Survey Manual, provides specifications for control, preliminary, and construction surveys that shall be followed for any 3DECS performed for CDOT by CDOT surveyors, consultant, surveyors, or contractor surveyors.

8.14.1 DESIGN CONSIDERATIONS

1. 3D Modeling Quality Assurance:

   CDOT has developed a Quality Assurance document which serves as a guide to be used by the project team to carefully examine and perform quality checking on project data as the data is produced during each stage of the design phase of the project. This guide is available to CDOT staff to be implemented on all design projects using InRoads and specifically for 3D engineered modeling for construction projects. Please use the link below to access the document:

   https://www.codot.gov/business/designsupport/cadd/cadd-workflows/v8i-ss2/wf-ir-18/view.

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 Constraint, template transition, superelevation transition stations, and End Condition Override Stations).
   d. When generating cross sections, use the same interval, event points, and external control points that were used in Roadway Designer to model the design surface.

3. Electronic Deliverables:
   a. LandXML files generated from the InRoads alg files (Proposed H&V), Existing dtm file, and the proposed dtm files.

      Note: The creation of LandXML files is covered in *Workflow IR 17 – Exporting A LandXML File*

   b. MicroStation dgn files containing proposed horizontal alignments, existing triangulated surface features, and proposed triangulated surface features.

c. AutoCAD dwg files converted from the above MicroStation files will also be provided.
d. Control diagram and file projection.

4. File Naming Convention:
   CADD Drawing Files (dgn/dwg)

   a. Proposed Horizontal Alignment – JPC#DES_Alignment##.dgn
   b. Proposed Vertical Alignment - JPC#DES_Profile##.dgn
   c. Existing Surface Features - JPC#SURV_Topo##Scale##.dgn
   d. Proposed Surface Features - JPC#DES_Model##.dgn

   Note: *AutoCAD files use the same naming conventions with the dwg file extension replacing dgn.*

5. Proposed Geometry:
   a. InRoads alg file – JPC#DES_*Descrption*.alg - The description should be a brief version of the project description.
      i. Horizontal Alignment – Route number_Usage. (i.e. SH75_Mainline, SH75_Rt Point Ctrl, Drive Stn 10+74 Lt, …)
      ii. Vertical Alignment – Use the same as its parent horizontal alignment with a usage descriptor if more than one vertical is there.
6. Surfaces:
   a. InRoads Design Surface - JPC#DES_*Route Number-Usage*.dtm (12345DES_SH75_Mainline, 12345DES_SH75_SW On Ramp,…)
      i. In the event that there are multiple surfaces along a single route, Station extents should be included in the name (i.e. SH75_Mainline1+25-5+73).
   b. InRoads Existing Surface – JPC#SURV_Existing##.dtm or the current ROW/Survey naming convention.