Section 8

Additional Project Development Considerations

February, 2025

COLORADO
Department of Transportation
Office of the Chief Engineer

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COLORADO
Department of Transportation

8.01 Americans with Disabilities Act Standards

Through the implementation of the provisions of the document, Americans with Disabilities Act "(ADA) Accessibility Requirements in Colorado Department of Transportation (CDOT) Transportation Projects", CDOT has established uniform standards to ensure projects on new and existing transportation facilities conform with the ADA and are made accessible to persons with disabilities, including wheelchair users and persons who are blind or visually impaired [One] [Two].

Facility design shall be in compliance with the Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way (PROWAG) Final Rule effective Sep. 7, 2023 and as amended by the United States Department of Transportation. PROWAG applies to safety rest areas, designated interest points, curb cuts with truncated domes, pedestrian overpasses, underpass structures, shared use paths, pedestrian ramps, and designated points of pedestrian concentration for controlled roadway crossing. In addition implementing PROWAG requirements, 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.

According to the Final Rule:

- New facilities are defined as construction on undeveloped land (i.e., greenfield) and design and construction of these facilities shall be in full compliance the technical standards as defined in PROWAG and CDOT Standards.
- Alterations are a change to or an addition of a pedestrian facility in an existing developed public right of way that affects or could affect pedestrian access, circulation, or usability. In the design and construction of alterations, CDOT shall comply with the technical requirements of PROWAG and CDOT Standards to the maximum extent feasible where existing physical constraints make compliance technically infeasible.
- When a pedestrian circulation path is temporarily not accessible due to construction, maintenance operations, closure, or other similar conditions, an alternate pedestrian access route must be provided that complies with PROWAG and CDOT standards.
- 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's Office of Environmental Justice & Equity (EJE). All decisions regarding compliance with ADA Accessibility Requirements will be documented in the project file.

In consultation with the Office of Environmental Justice & Equity, the Resident Engineer will be responsible for incorporating the design and implementation of all facilities in compliance with PROWAG and CDOT Standards. 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 alterations.

The Resident Engineer will provide proper plans, checklists, standards, and details as required by Colorado Department of Transportation (CDOT) and federal guidelines related to accommodations for persons with disabilities.

Additional Resources:

42 United States Code (USC), Subchapter 2—Public Services (Title 2), Americans with Disabilities Act of 1990

28 Code of Federal Regulations (CFR) Part 35, Nondiscrimination on the Basis of Disability in State and Local Government Services

CDOT Miscellaneous & Safety (M&S) Standard Plans

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

CDOT Policy Directive 605.0 Comprehensive Accessibility for Persons with Disabilities

Americans with Disabilities Act (ADA) Accessibility Requirements in CDOT & Local Agency Transportation Projects, October, 2003

United States (US) Architectural and Transportation Barriers Compliance Board (Access Board), Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities

Designing Sidewalks and Trails for Access – Federal Highway Administration “(FHWA)-HEP-99-006 HEHE/8-99/(5M)E”

Americans with Disabilities Act Access Board, US Access Board

Accessibility Guidelines for Pedestrian Facilities in the Public Right of Way, Final Rule, published Aug. 8, 2023, effective Sep. 7, 2023

8.02 Airport & Heliport Clearances

Airport protected airspace-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 protected airspace 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 airport protected airspace-highway clearances and conflicts when developing the Plans, Specifications & Estimate (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. Particular attention needs to be paid to roadways or other infrastructure that may be located or planned to be located in a designated existing or future airport Runway Protection Zone (RPZ), which exists to enhance the protection of persons and property on the ground.

The Resident Engineer will notify Colorado Department of Transportation's (CDOT's) Division of Aeronautics and the airport or heliport of any conflict that might apply and coordinate with Aeronautics and 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) 14 Code of Federal Regulations (CFR) Part 77 (77.17) for those locations off the airport where construction may impact airport airspace, runway protection zones, 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 United States Department of Transportation – Federal Aviation Administration.

Documentation shall be provided by the CDOT and the coordinating airport official to the FAA; all information submitted will be reviewed by the airport and FAA to determine if the proposed project is consistent with required airspace protections. The FAA will notify the airport of its findings.

The FAA issues a Finding in the Public Interest based on compliance with airspace and RPZ clearances that conform to FAA standards. FAA standards and guidelines also typically apply to military and private airports with the same rules and regulations as apply to public airports/heliports.

Additional Resources:

23 CFR Part 620 A, Highway Improvements in the Vicinity of Airports

14 Code of Federal Regulations (CFR) Part 77, Objects Affecting Navigable Air Space

Federal Aviation Administration Advisory Circular (AC) 70/7460-2K "Proposed Construction of Alteration of Objects That May Affect the Navigable Airspace" Federal Aviation Administration – Advisory Circulars (AC's)

8.03 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 Project 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 and 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 Best Management Practices (BMP's). 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. Permanent water quality treatment features may be required as part of the parcel's development or improvement.

The Project Engineer shall coordinate the buildings for rest areas with the State Buildings Program delegate at the Colorado Department of Transportation (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 Project 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.

Federal Highway Administration (FHWA) oversight may apply to safety rest area development.

Additional Resources:

23 CFR Part 752.5, 752.7 and 752.8 Safety Rest Areas

Americans with Disabilities Act Guidelines

American Association of State Highway and Transportation Officials (AASHTO) Guide for Development of Rest Areas on Major Arterials and Freeways

Colorado Department of Transportation (CDOT) Lighting Design Manual

CDOT New Development and Redevelopment Stormwater Management Program Manual, 2004

CDOT webpage for information on existing CDOT Rest Area locations, Colorado Rest Areas

Safety Rest Areas: Planning, Location and Design, United States Department of Transportation (USDOT), FHWA, 1981

CDOT Policy Directive 605.0 Comprehensive Accessibility for Persons with Disabilities

8.04 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 US Code (USC) 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. If applicable, these designs should integrate multimodal solutions, ensuring seamless connections between rail services, buses, bicycles, and pedestrian pathways. Prioritize accessibility features such as ramps, elevators, and tactile guidance for individuals with disabilities.
2. Prepare documents and specifications to assure compliance with railroad agreement requirements but also promotes social equity. Engagement with underserved communities to identify and address their specific transportation needs.
3. Obtain approvals and appropriate signatures from the railroad company, the Department, and other agencies (such as the Attorney General or State Controller).
4. Prepare railroad flagging, coordination, and railroad insurance specifications. This should ideally prioritize safety and inclusivity.

The Railroad Program manager, in the Traffic Safety & Engineering Branch, is responsible for preparing the railroad contract for review by the railroad and other agencies. Coordination among the Colorado Department of Transportation (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 the 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 amount method of construction, the procedures for this type of construction will apply (see Section 1.08 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 the 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.

Key items to consider with Passenger Railroad Design:

1. Speed and reliability of service for passenger rail: It is essential to prioritize the speed and reliability of railroad-highway services. Efficient and timely services can significantly enhance user satisfaction and increase ridership.
2. Convenience of passenger rail: Enhancing the convenience of railroad-highway services can attract more users. This includes ensuring easy access to stations, providing ample parking facilities, and integrating services with other modes of transportation for seamless connectivity. This can be done through park-and-ride facilities and mobility hubs.
3. Investment into new technologies: Embracing new technologies is essential for the future of railroad-highway projects. Investments should be made in innovative solutions that enhance efficiency, safety, and user experience. This includes adopting advanced signaling systems, energy-efficient trains, and smart infrastructure.

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 to ensure a collaborative approach. Recognize that railroads have specific rights that often take precedence over the Colorado Department of Transportation’s (CDOT’s) rights. Additionally, actively involve stakeholders throughout the process to gather input and address concerns, ensuring that the project meets the diverse needs of the community.

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 Resources:

23 Code of Federal Regulations (CFR) Parts 140 I, Reimbursement for Railroad Work; 646 A, Railroad-Highway Insurance Protection; 646 B, Railroad-Highway Projects

23 United States Code (USC) 109, Standards; 130, Railway-Highway Crossings

Federal Highway Administration (FHWA) Railroad-Highway Grade Crossing Handbook, United States Department of Transportation (USDOT) FHWA – Revised Second Edition, August, 2007 (available from the Federal Railroad Administration [FRA] website) United States Department of Transportation – Federal Railroad Administration

Colorado Department of Transportation (CDOT) Roadway Design Guide

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

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

[Joint] Burlington Northern Santa Fe (BNSF) Railway/Union Pacific Railroad Guidelines for Railroad Grade Separation Projects (available from either railroad website in Portable Document Format (PDF) Union Pacific Engineering Project Specifications

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

8.05 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 multimodal 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.

Operations and Maintenance agreement discussions need to begin as soon as transit elements are included in the project's scope. Wayfinding signage may be required to meet local transit provider requirements, and location for this signage may impact the environmental clearance and right of way processes.

Project planning and design need to consider detours and mitigation plans which allow for existing transit services to remain uninterrupted throughout construction. Allow for time to complete agreements with the transit providers and communication to transit riders prior to construction and preferably prior to advertisement of construction contracts.

Transportation Demand Management

Transportation Demand Management (TDM) evaluation efforts attempt to determine how, when, and where individuals' behavior is modified in response to strategies employed as part of the TDM Effort. To mitigate congestion and promote safety before, during, and after a construction project, a Programs – Transportation Demand Management (TDM) plan needs to be developed. The Resident Engineer should aim to create various ways for travelers to access the corridor using all modes of transportation. A key role of the Colorado Department of Transportation (CDOT) in the TDM space is providing a built environment that prioritizes the movement of people, not cars. Therefore, scoping, design and project delivery should prioritize the amenities required to support modeshift while also ensuring there is mode choice for Colorado's traveling public, especially those who face transportation barriers. Engagement with stakeholders and internal CDOT TDM experts would be a critical component of these projects. Please reference TDM training videos, resources, contacts, and additional information regarding building a TDM Plan at CDOT Colleagues' YouTube channel. Also, please reach out to CDOT's Office of Innovative Mobility (OIM) for individualized Programs – Transportation Demand Management (TDM) training and grant opportunities.

Baseline measures of TDM effectiveness can include a wide range of quantitative and qualitative information such as:

- Average vehicle occupancy (peak-period, all-day average)
- Awareness of transportation or route alternatives
- Awareness of TDM grant incentives or transit pass programs through CDOT and OIM
- Number of vanpools operating in the corridor
- Vehicle emissions (based on vehicle miles traveled)

More breakdowns of these measures can be found on the Mobility Services' Programs – Transportation Demand Management (TDM).

Transit and other appropriate TDM measures should be a key consideration in a project's planning, design, and construction 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 and scope smaller items that would help accommodate and facilitate transit service delivery, such as multimodal infrastructure and access to the transit service. This can include protected and separated multiuse pathways, park-and-ride lots, bus stops, pads, signage, and shelters. For additional support contact the Office of Innovative Mobility (OIM) who have developed a First Last Mile (FLM) Index and prioritization tool for transit and passenger rail planning. Apart from the application of tools OIM can provide recommendations and expertise in multimodal planning. During planning and design efforts, the following multimodal project goals shall guide the ongoing design of the roadway improvements, Bus Rapid Transit (BRT) system, and commuter bikeways:

1. Improve safety in the whole design scope with a prioritization on Vulnerable Road Users (VRU's).
2. Ensure infrastructure is in place to support multimodal travel including separation of uses, i.e., vehicles, VRU's with physical barriers, and ensuring existing infrastructure such as sidewalks are preserved.
3. Maximize the number of people able to move through the corridor versus just Single Occupancy Vehicle (SOV) vehicle throughput.
4. Improve transit travel times.
5. Improve connectivity to the bicycle and pedestrian network. Improve access for alternative modes (i.e., bicyclists and pedestrians) to transit services to ensure safe access for all modes.
6. Outreach efforts to support the use of the project through education and coordination with Community-Based Organizations (CBO's).
7. Identify dedicated funding to ensure all elements, specifically multimodal amenities, i.e., protected bike plus lanes and sidewalks, can be included in the design.

As the Colorado Department of Transportation (CDOT) continues to grow its role within providing and supporting public transportation services such as the Bustang Family of Services and leading BRT efforts it is crucial that design standards adapt to meet the changing transportation needs. Part of this effort is to entail updates to design manuals to ensure that multimodal corridors prioritize the safety of VRU's versus SOV throughput. This requires different approaches than what is typically applied. Safety for an Interstate such as an I-70 that doesn't have competing uses is different from a BRT corridor where the focus is on increasing the use of transit. For this reason, OIM has developed the FLM recommendations to ensure

that the traveling public can safely and equitably access transit corridors in non-Single Occupancy Vehicle (SOV) modes. However, the design of the roadway itself needs to prioritize transit throughput, Vulnerable Road User (VRU) safety through protected and separated infrastructure, and overall slower vehicular travel to reduce Killed or Seriously Injured (KSI) crashes. For detailed recommendations on project delivery for Bus Rapid Transit (BRT), please refer to the Institute of Transportation & Development Policy – Publications – BRT Standard This manual provides comprehensive guidance on various aspects of project management and execution and has a scoring card that can be referenced.

At the scoping stage, the Resident Engineer should be thinking about future mass-transit needs and incorporating future transit elements into the project scope and 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, Office of Innovative Mobility, 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, VRU's etc.

For consultants, they shall develop a multiphased Transportation Demand Management (TDM) Plan to identify the strategies required during the various phases of the project. Cross-agency engagement is necessary to effectively build off existing TDM Plans and other TDM efforts in the corridor.

It is important to implement reasonable modifications to policies, practices, procedures, and infrastructure to ensure that projects are accessible to individuals with disabilities or mobility restrictions, thereby ensuring that all individuals, regardless of socioeconomic status or location, have fair and equitable access to transportation services and infrastructure. This approach promotes inclusivity and reduces disparities in transit accommodations. The decision to implement transit accommodations is usually a joint effort between the Federal Highway Administration (FHWA), the Federal Transit Administation (FTA), the metropolitan planning organizations, the local transit agency, responsible local officials, and the Colorado Department of Transportation (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 Resources:

Colorado Department of Transportation: Transportation Demand Management Website

Colorado Department of Transportation: Transportation Demand Management & Corridor Projects

Statewide Transportation Demand Management (TDM) Plan 2019

How to Create a TDM Plan

Association for Commuter Transportation Website & Forum

8.06 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 or easement. Simply because a highway crosses an irrigation ditch does not give the Colorado Department of Transportation (CDOT) the right to alter or modify the ditch as the highway Right of Way (ROW) is typically subservient to the rights of the irrigation ditch. The agreement authorizes CDOT to enter upon the property to modify and construct 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 modified or otherwise affected by the proposed construction. It is also recommended that CDOT obtain similar agreements from private ditch owners whenever possible, however this can be difficult in situations where numerous downstream users exist, and there is no clear or known primary ownership of the facility.

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.

CDOT and the irrigation owners are responsible for the design of the irrigation improvements, and shall coordinate their efforts on these improvements. The region Utilities Engineering Program Manager (RUEPM) pursues and coordinates the signing of the agreement between the ditch company and CDOT. The Region Utility Engineer (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. Often, the

decreed volumetric flow rate of the ditch is required to properly construct the conveyance—both the ditch owner and the State Engineer's Office are good sources of information when researching decreed flows for design.

Documentation necessary for the Preliminary Services Agreement:

1. Irrigation 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 the Colorado Department of Transportation (CDOT) Headquarters (HQ) Records Management. CDOT Contracts archives all agreements of this nature.

Additional Resources:

Colorado Constitution Article XVI Section 7; Colorado Revised Statute (CRS) 37-86-101 ff, Rights of Way and Ditches

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. In some cases, irrigation owners will request reimbursement of costs associated with design and legal review and a Preliminary Services Agreement will be required in addition to the Irrigation Agreement for Construction.
    b. Determine the decreed flows of these irrigation structures and their characteristics including any combination of capacity, freeboard and other operating requirements..
    c. Meet with the ditch owner(s)**,** discuss the proposed CDOT construction and the possible impact on or conflict with their existing structures and customer obligations. This should include discussions relating to construction timing, access to facilities, maintenance history and ongoing responsibilities, and historical stormwater flows from the highway facility that enter the irrigation facility.
    d. Record and retain pertinent data (see "Ditch Company Coordination Information").

2. Develop a preliminary structure design, which may include one or more design alternatives, 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 or authorized irrigation representative and obtain their 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.
    b. Safety considerations such as guardrail, “narrowing of roadway” illusion or ditch cleaning activity near roadway.
    c. Maintenance considerations, snow removal considerations with guardrail, deck rehabilitation, abutment backfill stabilization, etc.
    d. Operating requirements such as debris removal and trash racks, freeboard, scour, and project schedule versus 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 Headquarters [HQ] Utilities Unit, Traffic Safety & Engineering Branch).

3. When the structure plan is finalized, prepare and submit for owner’s approval the following:

    a. Irrigation 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 should be attached to and referenced as part of the agreement.

4. After the owner has signed the agreement, obtain signature of the Chief Engineer and the Colorado Department of Transportation (CDOT) Controller’s office. The agreement will be electronically signed (Docusign) and filed in OnBase. Copies of the executed agreement can be obtained through OnBase or from the Region Utility Engineering Program Manager (RUEPM).

5. If the owner will not sign the Irrigation Agreement for Construction (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.

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 _____

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) _____

Anticipated 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 _____

8.07 Stockpasses, Landowners' Access, Wildlife Crossings & 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 feet 10 inch x 7 feet 8 inch 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 machinery or vehicles used in support of the intended purpose.

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 Resources:

Colorado Department of Transportation (CDOT) Roadway Design Guide

CDOT Drainage Design Manual

CDOT M&S Standard Plans

Report Number “CDOT-DTD-UCD-2003-9” Identifying the Best Locations Along Highways to Provide Safe Crossing Opportunities for Wildlife

8.08 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 Resources:

23 Code of Federal Regulations (CFR) Part 635D, General Material Requirements

Proprietary Items (see Section 2.22 of this manual)

8.09 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 and considering the 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 United States (US) Government, when disposing of material from public lands. When the Contractor procures a disposal site, it will be their 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 Resources:

23 Code of Federal Regulations (CFR) Part 635.407, Use of Materials Made Available by a Public Agency

8.10 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, the Colorado Department of Transportation (CDOT) can require the Contractor to use material furnished by CDOT, another 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. Refer to 23 CFR Part 635.407 for more information on 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 the Federal Highway Administration (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.

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 Cost Estimating Services Unit.

Federal Highway Administration (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 State Transportation Agency (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 Federal Highway Administration (FHWA) policy for the mandatory use of borrow or disposal sites:

Mandatory use of either requires a public interest finding and the Division Administrator's concurrence, mandatory use of either may be based on environmental consideration where the environment will be substantially enhanced without excessive additional cost, and 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 1.08. 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 Cost Estimating Services 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.

The region will notify the agency with clearance to proceed with "advance purchase of materials", when appropriate.

Additional Resources:

23 Code of Federal Regulations (CFR) Part 635D, General Material Requirements

Federal Highway Administration (FHWA) Contract Administration Core Curriculum Participant's Manual and Reference Guide 2006. Federal Highway Administration – Contract Administration Core Curriculum Manual 2014

23 CFR Part 635B, Force Account Construction

23 US Code (USC) 112, Letting of Contracts

Traffic Data (See Section 4.01 of this manual.)

8.11 Context Sensitive Solutions

Context Sensitive Solutions (CSS) should be incorporated into your design processes whenever appropriate. 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 National Cooperative Highway Research Program [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. This can be addressed by creating surveys, meeting with local leaders and stakeholders, and holding public involvement meetings.
2. The project is a safe facility both for the use and the community by creating appropriate equitable design choices.
3. The project is in harmony with the community and preserves the environmental, scenic, aesthetic, historic, and natural resources 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 the 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.

Incorporate Multimodal Solutions

Some of the best project solutions can be both context sensitive and multimodal. Various transportation modes should be considered when appropriate, including walking, cycling, public transit, and vehicular traffic, to ensure accessibility and convenience for all users.

Optimal design promotes seamless connectivity between different modes of transportation, enhancing overall efficiency and user experience.

Promote Equity

The project must ensure that all community members, regardless of socio-economic status, age, or ability, have equitable access to transportation options and project benefits. The design process should actively involve all stakeholders to address their specific needs and concerns.

Any specific guidance and information can be addressed with the Business – Office of Environmental Justice & Equity.

Enhance Sustainability

The project prioritizes environmentally sustainable practices, such as goals reflected in the Colorado Greenhouse Gas Pollution Reduction Roadmap Final Report.pdf. This will lead to a reduction of greenhouse gas emissions, minimizing resource consumption, and protecting natural habitats.

Colorado Department of Transportation's (CDOT's) design professionals determine which design solutions best fit, given the site's condition and context.

Additional Resources:

National Cooperative Highway Research Program (NCHRP) Report 480

Colorado Greenhouse Gas Pollution Reduction Roadmap

8.12 Providing Supplemental Data to Contractors

On Three-Dimensional (3D) designed projects, the Colorado Department of Transportation (CDOT) provides supplemental 3D data to Contractors for information only at project advertisement. Referencing Transportation Research Board (TRB) "Report SPR 1680" prepared for the Michigan Department of Transportation, CDOT has determined that the overall benefit of the statewide policy of providing 3D data at project advertisement for information only and not part of the contract outweigh the risks to the Department. The central benefit of this practice as documented in "SPR 1680" is the reduction of bid prices stemming from all bidders being supplied with better bidding information.

When Contractors are not supplied with available 3D data, they often allocate significant resources towards recreating a 3D project model based off cross-sections either before Award for bidding or after to facilitate construction. After using designer data to more efficiently create their own 3D model, Contractors gain efficiencies during construction through reduced staking by loading the data directly to an automated machine or into a machine operator.

CDOT has deep experience with 3D modeling and determining which projects are good candidates for 3D modeling. As a result, the Resident Engineer or project manager will continue to determine which projects are good candidates for 3D design. Electronic information beyond the contract package is not expected to be provided to Contractors on projects that are

not deemed as good candidates for 3D modeling by Colorado Department of Transportation (CDOT) staff.

To provide additional information about the Three-Dimensional (3D) data being provided when it is available and make clear that the supplemental 3D data is not part of the contract, CDOT staff is to include project special provision Work Sheet 102ppod or Revision of Section 102 – Project Plans and Other Data.

For file distribution, it is recommended that project staff place the supplemental files in a central location like Google Drive in lieu of attempting to distribute flash or hard drives to all bidders. To streamline file distribution, project staff may create a Portable Document Format (PDF) for posting to the Business to Government Shared Online Platform (B2G) with the drive link or download instructions if staff decide to use a File Transfer Protocol (FTP) site rather than Google Drive.

8.12.01 Design Considerations

1. 3D Modeling Quality Assurance:

   The Quality Assurance (QA) of 3D models is critical just as QA is with all other elements of design. CDOT is developing the suggested QA procedure specific to OpenRoads Designer (ORD) projects. Once complete, this procedure will be posted at Business – Computer Aided Design & Drafting (CADD) Highway Engineering Design Processes.

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.) – 1-foot intervals,
   c. Additional template drops should occur at:
      i. Event Points defined in the horizontal alignment.
      ii. External Control Points - (Point Control, location where multiple corridors interact, locations where the proposed alignment tie with the existing alignment, Parametric Constraints, template transition, superelevation transition stations, and End Condition Exception).

3. Electronic Deliverables:

   a. Project Alignments:

i. LandXML file generated of all Proposed Geometry, including proposed Horizontal & Vertical geometry.

b. Surfaces – LandXML files of the following:
   i. Existing Terrain Model – Triangles Only.
   ii. Finished Grade Terrain Model – Both Triangles and Features.
   iii. Subgrade Terrain Models – Both Triangles and Features.

c. Design Extension (DGN) files:
   i. 3D Components of the Project Design Model.
   ii. Right of Way (ROW).
   iii. Topography
   iv. Additional files include – Discipline Design files.
   v. Other files – as needed per project.

4. File Naming Convention:

LandXML Files:

a. Alignments – “JPC#_Alignments.xml”
b. Surfaces:
   i. “JPC#_Existing Ground.xml”
   ii. “JPC#_Finished Grade.xml”
   iii. “JPC#_Subgrade_Alignment Name.xml”

Computer Aided Design and Drafting (CADD) Drawing Files:

c. Design Extension (DGN) files:
   i. Three-Dimensional (3D) Components – “JPC#RDWY_3DModel_Components.dgn”
   ii. Topo – “JPC#SURV_Topo.dgn”
   iii. Right of Way (ROW) – “JPC#ROW_Design.dgn”
d. Additional files include – Discipline Design files:
   i. Roadway:
      - Roadway Design – “JPC#RDWY_Design.dgn”
      - Alignments – “JPC#RDWY_Alignments_GEO.dgn”
      - Stationing – “JPC#RDWY_Stationing.dgn”
      - Cross-Sections – “JPC#RDWY_Design_XSEC.dgn”
   ii. Drainage – “JPC#HYDR_Design.dgn”
   iii. Bridge – “JPC#BRDG_Design.dgn”
   iv. Utilities – “JPC#UTIL_Design.dgn”
   v. Striping – “JPC#TRAF_Striping.dgn”
   vi. Other files – As needed per project.

8.13 Utility Account Matrix (UAM)

The UAM is required on any project that is installing a utility service or impacting an asset that is associated with a utility service. The UAM is intended to collect the necessary utility account information for both the asset owner and the business office to ensure the utility is accurately billed to and owned by the proper Colorado Department of Transportation (CDOT) Department.

The Utility Account Matrix has two phases, design and construction. Each phase has required deliverables:

- Design: The design project manager is to complete the design phase designated columns within the UAM. The UAM is to be submitted two weeks prior to Ad. Once the UAM is approved by the Region Utility Account Coordinator (RUAC), the design Project Manager (PM) will share it with the construction project team. For submission directions, please reference the “Resources” section.
- Construction: The construction project manager is to complete the construction phase designated columns of the UAM with as-built data. The completed Utility Account Matrix (UAM) will be submitted prior to any utility services being transferred to CDOT. Should utility services be transferred prior to submitting the Utility Account Matrix, the Colorado Department of Transportation (CDOT) will not pay the invoice. This could result in the service being turned off by the provider. Once the UAM is received and approved, the data will be added to the utility database and the business offices will be able to process payments for invoices received.

8.13.01 Background

The UAM is required by Procedural Directive (PD) 90.1 Utility Account Management.pdf. PD 90.1 is the result of a 2019 audit which found poor management of utility accounts. To ensure more accurate tracking and responsible account management, the use of the UAM was implemented and the regional Utility account coordinator was created. The UAM will ensure the necessary account and asset information is tracked, invoiced and documented. The regional Utility account coordinators will help bridge the gap between project teams and the Business Offices. They will validate data produced in the UAM, help guide the transfer of the utility service to CDOT, confirm the utility was set up correctly from a billing perspective, confirm CDOT is no longer being billed for disconnected services, investigate unknown bills, and validate all assets yearly.

8.13.02 Roles and Responsibilities

“Design Project Manager (DPM)” is the Colorado Department of Transportation (CDOT) employee responsible for developing and assembling such documents as Scopes of Work and Plans, Specifications, Utility Account Matrix (UAM), and Estimates (PS&E) for CDOT projects. DPM’s may include Resident Engineers, Project Engineers, maintenance supervisors, program managers, facility managers, etc.

“Construction Project Manager (CPM)” is the CDOT employee responsible for overseeing and managing services and efforts that install or modify assets for CDOT. They are also responsible for the completion and submission of the final UAM. For the purposes of this Procedural Directive, CPM’s may include Resident Engineers, Project Engineers, maintenance supervisors, facility managers, etc.

“Region utility account coordinator” is the CDOT employee responsible managing the inventory of utility accounts in a region. They are the liaison between the Business Offices and the project teams. A Region Utility Account Coordinator (RUAC) will also work with the utility vendors to resolve account issues. They will validate data produced in the UAM, assist with the transfer of the utility services to CDOT, confirm the utility was set up correctly from a billing perspective, confirm CDOT receives a final invoice for disconnected services, investigate unknown bills, and validate all assets yearly.

“Utility Engineer” is the CDOT employee who helps set up new utility services and helps relocate existing utility services. Utility Engineers initiate utility agreements and issue utility clearances. They will provide new service information upon request for the project manager to complete the UAM.

8.13.03 Resources

The UAM will ultimately be housed in PMWeb. To accommodate this pending change, current submission directions, resources, and the UAM will be updated on the below websites. Once the UAM is included in PMWeb, these websites will be updated to reflect this move.–

- Internal website: Intelligent Transportation Systems (ITS)
- External website: Programs – Utility Accounts Office Overview