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7.01 SAFETY REST AREAS

Safety rest areas with parking facilities separated from the roadway 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 the safety rest area.

Safety rest areas are off-roadway areas that provide 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 the disabled. They should have controlled entrance and exit connections with proper signing, restroom facilities, parking areas, adequate lighting, adequate source of water, and properly disposal of sewage.

The objective is to give weight to the appropriateness of the site rather than exact adherence to constant distance or driving time between sites. Planners should consider distance to the nearest safety rest areas to provide a reasonable opportunity for the motorist to stop.

A team of design, construction, maintenance, landscaping, and right-of-way personnel should select the best feasible site to optimize factors such as safety, materials, utility, drainage, economy, and scenic value. These factors may be determined by examination of aerial photos and by ground reconnaissance.

FHWA oversight may apply to safety rest area development.

Additional References:

1. 23 CFR Part 752.5, *Safety Rest Areas*
2. *Americans With Disabilities Act Handbook*

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7.02 DETOUR DESIGN

A detour is designed to safely and efficiently move traffic while providing an adequate construction work area. 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.

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, temporary barrier with properly designed end terminals, surfacing requirements, approach ties, environmental mitigation and construction traffic control.

In particular, 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 construction of the object 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, offset required 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.

Important considerations when designing a detour are that the motorists pass safely through the construction when work is taking place next to the travel way, and that construction workers are provided with a safe work area. Construction work area should be adequate to not delay or impact traffic whenever conditions and economics permit. Priorities for providing a proper detour are:

1. Safety for motorists and workers
2. Adequate construction work area
3. Maintaining reasonable detour design speeds
4. Providing adequate roadway capacity
5. Economical detour design
6. Consideration of vehicles that exceed legal weight and height limitations

The detour alignment should be as smooth as possible in relation to and from the major roadway alignment; it is desirable to maintain the lane width and geometric design speed properties of the main roadway. A detour should be designed with a speed as close to the original speed as is reasonably possible. The designer should anticipate the level of motorist compliance with the reduced speed in a detour zone, when

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deciding on the detour design speed. Many motorists do not comply with the reduced speed zones, despite adequate signing. However, 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 Design Guide* and 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, included as an attachment to Section 3.10 and should be followed.

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. For consultant or entity projects, their responsible engineer shall complete the Form 518. On projects with federal oversight, the designer shall meet all federal standards and obtain FHWA concurrence with the design.

Signing and striping for the detour should be included in the Traffic Control Plan (see Section 3.10 of this manual). The Transportation Safety and Traffic Engineering Branch 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.

Additional References:
1. CDOT Standard Plan S-630-1
2. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*
3. See Appendix A for forms

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7.03 FRONTAGE ROAD DESIGN

Frontage roads, often referred to as "service roads," reduce the number of access points to the main adjacent highway by providing circulation to an appropriate access location. Frontage roads serve to control access to the main road, to function as a street facility serving adjoining property, and to maintain circulation traffic on each side on the main road.

Frontage roads are usually roads auxiliary to and located on one or both sides of a major collector or arterial highway for service to abutting and adjacent areas when direct access is limited. These facilities can be used with all types of highways. Access roads may also be provided behind or through affected properties to provide alternative access. Frontage roads have their best value when used with expressways and freeways. In urban areas, consideration should be given to alternatives to frontage roads, such as additional lanes on the main highway with center medians to control access and roads between adjoining properties to provide access. Ideally, frontage road access should be at least 500 feet from the interchange ramps and mainline roadway connections.

The decision to provide for frontage roads should be made prior to preliminary design based on policy, corridor review, existing access control plans, public involvement and mitigation of roadway access limitation. At the scoping of the project, the Resident Engineer in consultation with the Region Access Coordinator and Right-of-Way Manager, determines where frontage roads are necessary for access, based on a cost comparison of providing the frontage road versus other options that may be available to meet the need.

A justification based on businesses, infrequent access points, local agency access control policies and other land uses may be considered. The Resident Engineer will provide access design in accordance with the *State Highway Access Code* and the *CDOT Design Guide*. Access is a property right; consultation with the Region Access Coordinator and Right-of-Way Manager will ensure that the proper access to adjacent property is maintained.

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7.04 RAILROAD DESIGN

CDOT has prescribed provisions, policies, and procedures for advancing federal-aid and state projects that include railroad facilities.

Railroad/highway projects are for the installation of protection devices (gates lights, signs and markings) where railroad hazards cannot be eliminated, elimination of hazards to both vehicles and pedestrians at railroad/highway crossings, grade crossings, railroad relocation, and adjustments to railroad facilities required by highway construction; such as encroachment on railroad property, and utility involvement crossings.

The requirements necessary 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.
5. Prepare Finding-in-the-Public-Interest for work done by railroad when work is beyond the scope of normal railroad activities as defined in the 23 CFR Part 635B, Force Account Construction.

The Railroad Program Manager, Utilities unit, Safety and Traffic Engineering Branch, is responsible for preparing the draft and final 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. The Agreements Program in Project Development negotiates scope and cost of work and initiates final distribution of copies of executed agreements.

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. If work is done by the force account method of construction the procedures for this type of construction will apply (see Section 8.01 of this manual).

The documentation required for railroad/highway projects is:

1. Approved Form 463a, Design Data
2. Executed Contracts between state/local agency/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

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6. Approved Form 418a, Federal-Aid Program Data
7. Project Special Provisions
8. Estimate and general plan sheet from involved railroad company
9. Right-of-way and utility clearances, as appropriate
10. 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 as this process may take up to a year for clearance. Plans need to be nearly complete before any contract can be successfully executed.
2. Make early communication with the railroad company and recognize that railroads have specific rights.
3. Not presume an existing contract will cover new work.

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. *Railroad-Highway Grade Crossing Handbook, US DOT FHA-1978*
4. *CDOT 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. *CDOT Railroad Design Data Handbook* (available through the Safety and Traffic Engineering Branch, Utilities unit)
8. See Appendix A for forms

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7.05 AIRPORT / HELIPORT CLEARANCES

Airway/highway flight area clearances must be adequate for the safe movement of air and highway traffic. Related to that, 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.

The Resident Engineer will seek to eliminate substandard airway/highway clearances on existing and new highway projects considering such objects as overhead signs, lighting standards, moving vehicles on the highway, over-crossing structures and fencing adjacent to the airport/heliport. Construction operation activities such as crane placement should be considered.

The Resident Engineer is responsible for notifying the airport/heliport of any conflict that might apply and for coordinating with airport officials in notifying these concerns and findings to the Federal Aviation Administration (FAA). The Resident Engineer should file a FAA Form 7460-1 as per FAR Part 77 (77.17). If the Resident Engineer requires assistance or has questions regarding the FAR Part 77 or the process of filing a FAA Form 7460-1, he should contact the CDOT Division of Aeronautics.

Documentation shall be from the coordinating airport official to the FAA; all information submitted by them shall be reviewed by the Federal Highway Administration (FHWA) to determine if clearances provided are sufficient. The FHWA shall advise the FAA of its findings and give its concurrence. When conflicts cannot be resolved, the regional 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. The Form 418a, Federal-Aid Program Data, has a designation for the airport/heliport in the vicinity, and when FAA coordination is required.

Additional References:

1. 23 CFR Part 620 A, Highway Improvements in the Vicinity of Airports
2. *CDOT Design Guide*
3. 14 CFR Part 77, Objects Affecting Navigable Air Space
4. See Appendix A for forms

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7.06 AMERICANS WITH DISABILITIES ACT STANDARDS

CDOT has established and adheres to uniform guidelines 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 in compliance with the Americans with Disabilities Act applies to safety rest areas, designated interest points, curb cuts, pedestrian overpasses, underpass structures, pedestrian ramps and wherever there is 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 and signs. Signing and pavement marking for disabled and van accessible parking is to 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, the alterations must meet current ADA standards. When feasible and within budget, consideration should be given for updating construction projects to ADA standards. During construction, ADA temporary access and facilities should be addressed.

In consultation with the CDOT ADA Coordinator in the Center for Equal Opportunity (Headquarters) or Region EEO/Civil Rights Specialist, 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 and existing facilities.

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 Standards*
4. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*
5. *CDOT Procedural Directive 507.1, Standards for Rest Areas, Pedestrian Underpasses and Overpasses*

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6. *U.S. Architectural and Transportation Barriers Compliance Board (Access Board), Americans With Disabilities Act Accessibility Guidelines for Buildings and Facilities*
7. *Designing Sidewalks and Trails for Access – FHWA-HEP-99-006 HEHE/8-99/(5M)E*
8. Americans With Disabilities Act Access Board, http://www.access-board.gov

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7.07 BICYCLE AND PEDESTRIAN FACILITIES

Bicycle and pedestrian facilities are of a growing importance nationally for commuting and recreation 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 applicable projects.

Bicycle and pedestrian facilities are any portion of a road or pathway that in some manner are specifically designated as being open to bicycle and/or pedestrian travel, regardless of whether such facilities are designed for the exclusive use of bicycles and/or pedestrians. Shared bicycle use with other modes of transportation is an important consideration. On-road bicycle facilities, such as designated bike lanes and shoulders, are also viable options when separate facilities are not practical.

Colorado allows bicyclists to use roadways with the same rights and responsibilities of other drivers. Consideration for pedestrian and bicycle design is especially important in areas close to schools and parks.

The Resident Engineer should include the options for providing bicycle and pedestrian facilities on new construction and reconstruction projects. The evaluation should include review of *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 should be considered where warranted and cost effective.

Bicycle and pedestrian facilities should utilize the latest design standards and Americans With Disabilities Act requirements, including sidewalks, crosswalks, over/underpasses, traffic control features, curb cuts and access ramps for persons with disabilities. Curb cuts and other provisions for persons with disabilities are required on all federal-aid projects involving provisions for curbs or sidewalks. Exceptions to Americans With Disabilities Act Standards require variance approval. The need to provide traffic control for bicycles and pedestrians should be included in the Traffic Control Plan.

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

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

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Where rumble strips are proposed on projects, the effects to bicyclists should be evaluated according to the *CDOT Design Guide*, Safety Chapter.

Replaced and rehabilitated bridge decks should be reconstructed to accommodate bicyclists where they are permitted and when the cost is reasonable.

The Resident Engineer has the responsibility to evaluate bicycle and pedestrian facilities in the design of any new construction and reconstruction work. Pedestrian movements are less predictable than those of motorists; the designer should consider this to ensure general safety of the relationship of these different modes of transportation.

The scoping document should discuss applicability of providing bicycle and pedestrian facilities and the Form 463a, Design Data, should reflect these decisions. For new or reconstruction projects, the Resident Engineer should document design decisions and variances for bicycle and pedestrian facilities. The inability to provide for bicycle and pedestrian facilities should also be documented.

Guidelines are in the *AASHTO Guide for the Development of Bicycle Facilities* 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 municipalities use them for locally funded projects.

Additional References:

1. 23 CFR Part 652, Pedestrian and Bicycle Accommodations and Projects
2. Transportation Research Board, TRB 959 - Pedestrian and Bicycle Facilities
3. *CDOT Procedural Directive 507.1, Standards for Rest Areas, Pedestrian Underpasses and Overpasses*
4. Americans With Disabilities Act Handbook
5. FHWA Region 8 Commentary and Text, Section 14, ADA Accessibility Guidelines
6. *CDOT M Standards*
7. *CDOT Design Guide*
8. *Flexibility in Highway Design* – FHWA-PD-97-062
9. *The National Bicycling and Walking Study* – FHWA-PD-94-023
10. *Review of Planning Guidelines and Design Standards for Bicycle Facilities* – ITE – IR-089 – 1997
11. *Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)*
12. See Appendix A for forms

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7.08 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 move people into high-occupancy vehicles and reduce single-occupancy vehicle usage.

Parking facilities for transportation services are an important means to accommodate individuals utilizing these services.

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 projects 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-n-ride lots, and bus stops/pads/ 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 such 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.

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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)*

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7.09 SAFETY REVIEW (Including Clear Zone Decisions)

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

Highway safety 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 -- forgiving roadside concepts
3. Traffic engineering and operations -- improving traffic regulations, warnings and directions

AASHTO 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. Usage 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.

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 Safety and Traffic Engineering Branch can prepare safety reports detailing feasible alternatives and recommendations.

The Resident Engineer should document the safety issues and 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 for all projects on the National Highway System (including Interstate) are applicable to any proposed improvement regardless of funding (federal, state, local or private). Deviations from standards must have 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 1.10 for Design Exception Variances.

Additional References:

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

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5. *CDOT Procedural Directive 548.1, Safety Considerations on Resurfacing and 3R Type Projects*

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7.10 RESURFACING PROJECT SAFETY LETTER

On 3R type projects (Resurfacing, Restoration and Rehabilitation), a safety letter to the file shall be prepared by the Resident Engineer in accordance with *CDOT Procedural Directive 548.1, Safety Considerations on Resurfacing and 3R Type Projects.*

The Resident Engineer also will ensure that geometric design factors, especially those related to safety, are adequately considered on resurfacing and 3R type projects.

Resurfacing projects, normally referred to as "1R" (of the "3R" description) are defined as projects undertaken to extend the service life of an existing highway and enhance highway safety. Work includes upgrading of geometric features, such as minor widening, flattening curves, and improving sight distance. When deviations from the 3R Program minimum standards occur, a formal design exception is required for certain controlling criteria (see Section 1.10 for controlling criteria) and a safety letter written in accordance with *Procedural Directive 548.1* shall accompany any variance (3R design exception) whenever a safety enhancements would not be cost effective.

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

A request for a variance from approved standards in writing shall be submitted by the Resident Engineer. The request shall include a description of the problem and its solution, if applicable, and an accompanying safety letter. The Resident Engineer will submit the request to the Region Program Engineer for approval, with a copy sent to the FHWA. For state and maintenance resurfacing projects, a variance or safety letter is not required, but is recommended.

Accident history will be reviewed and high-accident locations and potential accident sites will be upgraded or enhanced if possible. Recommendations for improvements are to be agreed upon during the plan development stage.

The Resident Engineer will submit a listing of identified accident locations and potential hazard locations along with specific recommendations for each identified element (see *Procedural Directive 548.1*).

The Safety and Traffic Engineering Branch is available to prepare the safety assessment report for resurfacing projects, which may substitute for the resurfacing safety letter.

Additional References:

1. 23 CFR Part 625, Design Standards for Highways
2. *AASHTO Roadside Design Guide*

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3. *CDOT Design Guide*
4. http://www.fhwa.dot.gov//////legsregs/directives/techadvs.htm FHWA Technical Advisory 5040.28, *Developing Geometric Design Criteria and Processes for Nonfreeway RRR Projects*
5. Transportation Research Board, *TRB Special Report 214, Designing Safer Roads*
6. See Appendix A for forms

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7.11 GUARDRAIL / BARRIER DESIGN AND REVIEW

Guardrail or concrete barrier is installed to reduce the severity of run-off-the-road accidents at warranted locations. The primary purpose of guardrail/barrier is to prevent a vehicle from leaving the road and striking a fixed object or terrain feature that is more hazardous than guardrail.

A guardrail and/or 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. Guardrail is installed when an obstacle cannot be removed or relocated or when the steepness of the roadside terrain prevents adequate clear zone. CDOT desires to install guardrail only when it is not economically feasible to eliminate a hazard, make the feature transversable, or terrain conditions are such that an adequate roadside recovery area cannot be provided for the given design speed.

In many cases, slope flattening and extending hazardous features such as culverts can be viable option to guardrail. Guardrail (semi-rigid) and concrete (rigid) barriers can redirect errant vehicles when impacted. Semi-rigid barriers can deflect up to 3 feet upon impact. Rigid concrete barrier has no deflection upon impact.

Because guardrail is a hazard in itself, it should be installed only per the guidelines of the *AASHTO Roadside Design Guide.* Placement of guardrail and barrier is based on accident potential and severity. Since both guardrail and concrete barrier are hazards, installation of these devices must result in a reduction in the accident severity compared to impacting the hazard being shielded.

Substandard bridge rail should be examined for upgrading on projects, including resurfacing when feasible.

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 decision should be coordinated with 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 versus guardrail cost should be considered.

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

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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 steep terrain feature to a point were an errant vehicle is less likely to impact, 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 and/or crash cushion 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, scenic roadway, or historical feature.

When the Resident Engineer recommends guardrail, criteria in the *CDOT Design Guide*, *CDOT M Standards* and the *AASHTO Roadside Design Guide* should be followed. For resurfacing, Type 3 guardrail should be reset to the specified height of 27 inches, when it is less than 24 inches after the overlay. Substandard existing guardrail end sections are to be replaced with end treatments passing the National Cooperative Highway Research Program Report No. 350 criteria on all Interstate highways 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. It is also desirable to replace the end treatment on other roadway systems.

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7.12 HYDRAULIC DESIGN (EROSION CONTROL / STORMWATER)

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

The design of highway drainage 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 practices for erosion and sediment control and stormwater management on projects.

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

The Hydraulics Engineer is responsible for determining major structure type, location, and size, as determined by field inspections; working the Environmental Programs staff to identify environmental assessments; identifying floodplain assessments, including any significant encroachments; and making preliminary estimates, and finalizing structure design in elevation, scour, erosion protection, storm runoff, and any hydraulic drainage. 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, can be completed by a Resident Engineer familiar with minor structure hydraulics, and will be reviewed by the Hydraulics Engineer.

Hydraulic reports and documentation should be completed as evidence that a competent and responsible design has been made. If environmental factors are to be affected by hydrology, a complete written assessment should be documented and submitted to the Region Planning/Environmental Manager. Reports and documentation are essential in case of litigation, or if design modifications become necessary.

Procedures for the design of pipe culverts, concrete box culverts, 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 Hydraulics Engineer, will decide which structures the Resident Engineer is capable of designing. The Hydraulics Engineer will design the special structures, such

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as irrigation and storm drains, and all standard structures larger than 48 inches in diameter.

The Resident Engineer will provide structure cross-sections and other necessary data to the Hydraulics Engineer. Preliminary designs should be completed prior to the Field Inspection Review. 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

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7.13 CULVERTS OTHER THAN BID ITEMS 617 AND 624

When specifying culverts other than with Bid Items 617 and 624, the Resident Engineer will justify the decision in the project file.

Bid Items 617 and 624 are culvert pipes ranging in size from 12 to 84 inches where the culvert material is not specified. Bid Item 617 also includes 24-inch special culvert and detour culverts. Bid Items 624 are all designated with a Corrosion Resistance (CR). All other pipes shall be designated as to size and type (steel, concrete, etc.) The selection of Bid Items 617 and 624 is to encourage the most economical installation; the Contractor will then be allowed to select the pipe material.

Additional References:

1. *CDOT Drainage Design Manual*
2. *CDOT Erosion Control and Stormwater Quality Guide*

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7.14 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 they usually have the capacity to handle the traffic volume.

The requirements for establishing climbing lanes are usually based on traffic volume, capacities, percent of trucks, grades, speeds and level of service. A climbing lane is required where critical length of grade is exceeded by a reduction of 10 miles per hour or more in the speed of loaded vehicles, provided the volume of traffic and percentage of vehicles with high weight/horsepower ratios justify the cost. 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.

When a climbing or a passing lane is required, a plan and profile will be developed, with a graph showing the relationship between rate and length of grade for several reductions in speed. 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 Design Guide*). Justification for climbing lanes where the critical length of grade is exceeded may be considered from the standpoint of highway capacity.

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 *Design Guide* and in the *AASHTO Policy Guide on Design of Highways and Streets*.

Where terrain conditions permit, a passing lane should be added when there is 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 per the *Design Guide*.

Additional References:

1. *Transportation Research Board (TRB) Highway Capacity Manual - Special Report 209*

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7.15 STOCKPASS AND MACHINE PASS

Stockpass and machine passes provide a safe passage of livestock and/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. A machine pass should be large enough for the expected farm machinery or vehicles that will use the underpass. In addition, wildlife movement may benefit from the placement of a stockpass.

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 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 or machine pass, excluding savings on eliminating or reducing the drainage structure.

Additional References:

1. *CDOT Design Guide*
2. *CDOT Drainage Design Manual*
3. *CDOT M& S Standards*

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7.16 ALTERNATE BIDS

The use of alternate bids allows the consideration of more than one option for the construction of a project. Alternative bids are usually associated with the construction of bridges, such as concrete versus steel options, but can also include drainage structure options and other designs where it is likely that more than one alternative can provide the function over the design period.

Alternative bids are generally used only on large projects where the potential for cost savings are substantial enough to justify the additional costs for alternate design and bids. The use of alternative bids is generally limited to projects where viable alternatives clearly exist and potential cost savings are high. The ability to construct an alternate in a safe and efficient manner should be considered in the selection process.

The major factors for considering alternative bids are initial costs, maintenance costs, and construction/material considerations.

The Contractor will usually bid one of the alternatives based on their ability to construct one option in a more efficient and cost-effective manner. CDOT may reserve the right to require the Contractor to bid on all options.

In most cases, CDOT will select the lowest bid option, however, the lowest bid may not be the sole determination.

When alternative bids are used, the Resident Engineer will prepare the design, the estimates, and bid tabulation for each alternative bid option.

Documentation supporting the decision to use alternative designs and bid packages should be finalized and saved in the project file prior to the Final Office Review. Alternative designs should not be produced if the analysis clearly shows only one option to be cost effective. The decision to use alternate bids should be documented with an initial economic analysis comparing the bid options, maintenance costs and any relevant secondary factors considered.

Additional References:

1. *CDOT Design Guide*
2. *CDOT Cost Data Book*

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7.17 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® and ProBE do not handle combination projects. (SiteManager is a registered trademark of the American Association of State Highway and Transportation Officials.)

Consolidated projects are utilized 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 which is beneficial to several entities with multiple, varied funding sources where project complexity would not allow for breakout of pay items to be funded by each entity. 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:

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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.

ProBE will then calculate the correct allotment required for each fund. ProMIS and FHWA adjustments would be based on these calculations.

The Resident Engineer will initiate the appropriate budget requests with funding distribution in ProMIS to consolidate funds. A Form 950, Project Closure, should be prepared for closing 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 ProMIS Manual*
3. CDOT Trns*Port Client-server
4. *CDOT Trns*Port PES/LAS manual*
5. http://www.dot.state.co.us/payestimates/pay.htm
6. See Appendix A for forms

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7.18 SPECIAL PROVISIONS

Special Provisions are text sheets including the Project Special Provisions and the Standard Special Provisions that are attached to the front of the construction plans. The Special Provisions provide additions and revisions to the *CDOT Standard Specifications for Road and Bridge Construction* for each project.

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 unique to each project. The special provision sheets provide the Contractor and Project Engineer specific information and instruction related to unique aspects of a particular project. Project Special Provisions include an index of the required Standard Special Provisions that apply to the project.

Standard Specifications
The *Standard Specifications for Road and Bridge Construction* (referred to as the *Standard Specification* book) is updated regularly by the Project Development Standards and Specifications unit, and contains the standard specifications used to control the work on CDOT transportation and maintenance projects. This is the primary reference for specifications related to road and bridge construction.

Standard Special Provisions
The Standard Special Provisions revise, clarify or supersede the *Standard Specification* book to reflect 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 usage. The Resident Engineer adds these provisions to the project, as applicable to each project. Each Region is provided an up-to-date list of Standard Special Provisions with instruction for the use of each provision.

Project Special Provisions
Project Special Provisions are used when specific requirements are not adequately addressed in the *Standard Specification* book 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

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Resident Engineer is responsible for the content and accuracy of each Project Special Provision.

The Resident Engineer is responsible for preparing referenced standard provisions and the project specific special provisions prior to the Final Office Review. All new or changed provisions are to be submitted to the Project Development Specification Engineer for review prior to advertisement. 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 the all 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.

Project Special Provisions that are usually included in the transportation construction plans are given by the following examples:

1. Index Pages -- Applicable Project Special Provisions and Standard Special Provisions.
2. Notice to Bidders -- Required amount of proposal guaranty and lists CDOT construction representatives assigned to the project.
3. Commencement and Completion of Work -- Beginning work requirements, Contract time, and salient features.
4. Contract Goals -- Disadvantaged Business Enterprises goals.
5. Force Account Items -- CDOT's estimate for force account work included in the Contract.
6. Special Notice to Contractors -- Required inspection sampling and testing of materials.
7. Traffic Control Plan, general -- Key elements of the traffic control plan and the Contractor's proposed method of handling traffic.
8. Utilities -- Utility companies and types of utility relocations within the project limits.
9. Right-of-Way Restrictions – Restrictions that will affect the project.
10. Project Specific Special Provisions -- As appropriate.

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 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.

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3. Upon request by the Resident Engineer, the Project Development Standards and Specifications unit will review the specifications portion of the Plans, Specifications and Estimate package.

Additional References:

1. *CDOT Design Guide*

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7.19 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 per an approved selection process.

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 Project Development is responsible for the prequalification and coordination of selection of the 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 work on projects.

The following steps are necessary to obtain an executed consultant contract. The Agreements Program shall perform the steps unless otherwise noted:

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 (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 Agreements Program).
7. Advertise Invitation for Consultant Services in appropriate newspapers and, as needed, in special journals.
8. Create and distribute the selection information and instruction package to the consultant community.
9. Coordinate and facilitate selection panels to achieve consensus and make a recommendation to the Chief Engineer.
10. Obtain the Chief Engineer's approval of the selection results.
11. Notify consultants of selection results.

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12. 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.
13. Obtain and review the consultant's financial information, insurance information, and initial cost proposal.
14. Initiate audit evaluation (Consultant Audit Program).
15. Analyze audit evaluation report and negotiate consultant fee and final contract cost exhibit.
16. Prepare final contract and route the contract for approval and signatures. Distribute executed contract (Procurement and Business Offices).
17. Issue the Notice-to-Proceed to the consultant (Resident Engineer).
18. Debrief consultants, as requested, on selection results.
19. Compile selection documentation and transmit the selection file to the CDOT Records Center.

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

An entity agreement is required when CDOT and an entity/public agency 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 an entity/public agency. The term "entity," as used here, refers to a public agency, local public agency, established public 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 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/county is entered into when a project is within a local public agencies jurisdiction and CDOT administers the federal-state funding.

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 regional agency such as the Denver Regional Council of Governments.

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 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.

When the entity is a local public agency, the CDOT Colorado Local Agency Program guidelines apply. The procedures for processing entity agreements are in *CDOT Procedural Directive 1700.5, Local Entity/State Contracts and Local Entity/Consultant Contracts and Local Entity/R.R. Contracts Under C.A.*, and *CDOT Procedural Directive 1700.6, Railroad/Highway Contracts (Under Certification Acceptance)*.

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

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

The Agreements Program in Project Development 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 Utility/Railroad Unit 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 Right-of-Way program in Project Development)

If there will be utility involvement (i.e., the relocation of existing facilities or the installation of new services) the 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 (occasionally) 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 CDOT Headquarters. All required utility agreements usually 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 the Record 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 unless otherwise noted:

1. Ensure that the proposed consultant service is consistent with CDOT's Long-Range Plan, State-wide Transportation Improvement Program (STIP), the CDOT budget, and the Obligation Plan. (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)

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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 (Resident Engineer)

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.

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7.21 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 and/or ditch shown on the CDOT plans.

An irrigation company agreement is a legal document signed by the irrigation company/ owner and CDOT, which describes the proposed work and sets forth any 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, and/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/ditch. The Region Utilities Engineer pursues and coordinates the signing of the agreement between the ditch company and CDOT. The Hydraulics Engineer performs or reviews the structure hydraulic design and may recommend structure alternates. The Staff Utilities Engineer may assist with any special terms and conditions of the agreement.

Documentation necessary (attached):

1. Form 1028a, Irrigation Company Agreement for Construction
2. Structure Selection Costs
3. Ditch Company Coordination Information

The Resident Engineer needs to adhere to the Procedure for Irrigation Co. Agreement.

Additional References:
1. CRS 37-86-101 ff, Rights-of-Way and Ditches
2. *CDOT Design Guide*

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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").

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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.

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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 Project Manager, 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.

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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.

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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 _____

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TYPE AND SIZE OF EXISTING STRUCTURE _____

IS EXISTING SIZE ADQUATE? _____

TYPE & APPROXIMATE SIZE OF PROPOSED STRUCTURE (CLEAR SPAN, PIER OF WEBB WALL) _____

CANAL CROSS-SECTION REQUIRED? _____ DITCH LINING REQUIRED? _____

DECREED FLOW _____

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