13.0 ROADWAYS

13.1 Administrative Requirements

The Contractor shall comply with the requirements of the following manuals and standards (latest versions at Proposal Due Date) for the design and construction of the Work for the Project.

13.1.1. Interstate 25 (I-25), Ramps, Trails, and Parking Lots

1. Roadway Design Criteria Table (see Exhibit 13-A)
2. Poudre River Trail Design Criteria Table (see Exhibit 13-B)
3. Colorado Department of Transportation (CDOT) *Roadway Design Guide*
4. American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design on Highways and Streets* (PGDHS)
5. AASHTO, *Roadside Design Guide*
6. CDOT*, Standard Plans List, M&S Standards*
7. CDOT*, Standard Specifications for Road and Bridge Construction*
8. Federal Highway Administration (FHWA) Interstate Access Request (IAR) and Minor Interchange Modification Request (MIMR)
9. CDOT *Cable Barrier Guide*
10. AASHTO, *Guide for the Development of Bicycle Facilities*
11. AASHTO, *Guide for High-Occupancy Vehicle Facilities*
12. Regional Transportation District (RTD) *Bus Transit Facilities Design Criteria* and *Light Rail Design Criteria*

13.1.2. Local Roadways

Roadways controlled or maintained by Local Agencies other than CDOT shall be designed and constructed according to the following list:

1. Larimer County Urban Area Street Standards with local supplements
2. Millennium General Development Plan (GDP) Criteria

Other requirements provided in Book 3 shall govern the design and construction, as applicable.

13.2 Design Requirements

13.2.1. Design and Plan Submittals

In addition to the submittal requirements specified in this Section, the Contractor shall submit design and plan documents for CDOT review and Acceptance, as required in Book 2, Section 3.

13.2.2. Traffic Analysis and Design

The IAR, MIMR, and Traffic Technical Report will provide design year traffic volumes, Measures of Effectiveness (MOE), and other operational parameters for the Project. The Project design shall meet or

exceed the MOEs and other operational parameters identified in the IAR, MIMR, and Traffic Technical Report.

The design of the Basic Configuration shall provide equivalent or better operations for I-25 mainline, ramps, and ramp intersections for 2040, as described in the IAR, MIMR, and Traffic Technical Report.

13.2.3. General Design Requirements by Project Element

13.2.3.1 Basic Configuration Accommodation of Ultimate Configuration

The infrastructure constructed with the Project shall consider and accommodate the Ultimate Configuration, including but not limited to horizontal/vertical geometry in the Final Environmental Impact Statement (FEIS) alignment areas and clearances to fully reconstructed structures.

The Contractor shall prepare and submit the Preliminary Design Plans (30%) for Review, Preliminary Design Documents (100%), and Final RFC Documents for Acceptance according to procedures of its Approved Design Quality Management Plan (DQMP).

13.2.4. Cross Slope and Superelevation

13.2.4.1 Normal Cross Slope

All new and reconstructed pavement sections shall have a normal cross slope of 2 percent.

For pavement widening sections, the widened and overlaid section shall have a normal cross slope of 2 percent.

13.2.4.2 Superelevation Rates

Superelevation transitions for I-25 and interchange ramps shall be designed based on the typical sections (number of lanes) and geometry required for the Ultimate Configuration in the FEIS alignment areas. Superelevation transitions in all areas shall comply with the design criteria and methodology of the current AASHTO*, A Policy on Geometric Design on Highways and Streets* and CDOT *Roadway Design Guide*.

Superelevation diagrams shall be provided in the roadway plans to verify that edge profiles will meet design criteria. Superelevation transitions shall be modified if necessary to meet this criteria.

Superelevation transitions shall be designed to minimize the occurrence of 0 percent cross slopes on bridge decks or on profile grades flatter than 0.5 percent.

13.2.5. Stopping Sight Distance

Stopping sight distances (SSD) and decision sight distances shall meet or exceed the requirements of Exhibit 13-A in this Section. SSDs shall be determined in accordance with the CDOT *Roadway Design Guide* and AASHTO, *A Policy on Geometric Design on Highways and Streets*.

13.2.6. Decision Sight Distances

Alignment design on the mainline shall provide for obtaining decision sight distances on the mainline of I-25 to all exit ramp gores, and at ramp approaches to ramp intersections. Decision sight distances are provided in the Roadway Design Criteria Table in Exhibit 13-A.

13.2.7. Fill and Cut Slopes and Clear Zones

The Contractor shall design cut and fill slopes to obtain clear zones and avoid the need for barriers wherever possible. Where clear zones cannot be obtained within CDOT Right-of-Way (ROW), barrier shall be required.

Clear zones on I-25 shall be 34 feet. The clear zones shall be measured from the outer edge of travel way of the I-25 auxiliary lanes or through lanes. Ramps shall be designed in accordance with the recommendations of the AASHTO *Roadside Design Guide*, Table 3-1 and Table 3-2.

13.2.7.1 Roadside Slopes Adjacent to Pavement

(Note: All slopes stated herein are in terms of horizontal:vertical.)

The Point of Slope Selection (POSS) is defined as the location at which the roadside slope adjacent to the pavement ends and the cut or fill slope begins. Width and slope of the area between the edge of pavement (EOP) (or sidewalk) and the POSS shall be as follows:

1. Mainline I-25: 18 feet minimum at a 6:1 slope
2. Ramps: 12 feet at a 6:1 slope
3. Frontage and Local Roads: 8 feet at 6:1 slope

13.2.7.2 Fill Slopes

Fill slopes beyond the POSS shall be designed and constructed in accordance with the following priority.

1. Use 6:1 slopes where fill heights are less than 4 feet and matches with existing conditions that can be obtained within the Project limits.
2. Use 4:1 slopes where fill heights are greater than 4 feet but less than 10 feet and matches with existing conditions that can be obtained within the Project limits.
3. Use 3:1 slopes where fill heights are less than 10 feet and slopes steeper than 4:1 are required to match existing conditions within the Project limits.
4. Use 3:1 slopes where fill heights exceed 10 feet, match with existing conditions can be obtained within the Project limits and clear zone can be obtained within the Project limits.
5. Where the above conditions cannot be obtained, the Contractor may use any of the following design approaches.
   A. Use 3:1 slopes with barrier protection.
   B. Use retaining walls, as necessary, with barrier protection. Where retaining walls are used, provide a traversable surface with a maximum 6:1 cross slope and a minimum 10-foot width between face of wall and ROW or Permanent Easement (PE) line, fence line, or other obstruction.

Fill slope areas shall be designed to prevent Roadway and slope drainage from flowing onto adjacent properties.

13.2.7.3 Cut Slopes

Cut slopes beyond the POSS shall be designed and constructed in accordance with the following priorities.

1. Cut slopes must be transitioned at the match with the 6:1 slopes adjacent to Roadway pavement in such a manner to comply with the recommendations of the AASHTO *Roadside Design Guide*.
2. Use 4:1 or flatter slopes for cut slopes where matches with existing conditions can be obtained within the Project limits.
3. Use 3:1 slopes for cut slopes where such slopes steeper than 4:1 are necessary to obtain matches with existing conditions within the Project limits.
4. Where the above conditions cannot be obtained, the Contractor may use any of the following design approaches.
   A. Use 3:1 slopes with barrier protection.
   B. Use retaining walls, as necessary, with barrier protection to obtain matches with existing conditions within the Project limits. Where retaining walls are used, locate to avoid landscaping and maintenance areas of less than 10 feet in width.

All cut slopes shall be rounded at their matches to provide a pleasing appearance.

13.2.7.4 Retaining Walls

Retaining walls shall be used as necessary. Retaining walls in the FEIS alignment areas shall be designed to accommodate the Ultimate Configuration.

Refer to Book 2, Section 15 for a list of identified walls.

13.2.8. Barrier

Barrier shall be required wherever clear zone requirements cannot be achieved. Where the width between the opposing inside EOPs are less than 24 feet, the median shall have concrete barrier with a concrete glare screen in accordance with CDOT Standard M-606-13 for medians. Where the width between opposing inside EOPs are 24 feet or greater, tensioned Cable Barrier shall be used according to the CDOT *Cable Barrier Guide*. Median barrier through the Kechter inundation area shall comply with all drainage requirements listed in Book 2, Section 12.

All concrete barriers shall be cast-in-place. Precast barriers are not allowed for permanent installations.

13.2.9. Interstate Access

13.2.9.1 Access Studies and Approvals

CDOT is in the process of obtaining IAR and MIMR Approval from FHWA for the Basic Configuration to be provided with the Final Request for Proposal. The Contractor shall fully comply with the design included in the IAR and MIMR, unless otherwise Approved by CDOT. The Contractor shall be responsible for obtaining FHWA approval for any modifications to the IAR and MIMR.

13.2.9.2 Ramp Metering Accommodation

Ramp metering is anticipated to be implemented as an operational management strategy in the corridor and will be installed as part of this Project and as needed in the future. The Contractor shall design ramp geometry for all reconstructed and reconfigured ramps in the Project to ensure a 2-lane ramp meter system will operate when implemented. At a minimum, the design shall provide for proper width of lanes and grading for meter equipment, maintenance access, acceleration lengths, and geometry and operations at the ramp terminal intersections.

A list of ramp meter locations anticipated to be operational by summer 2017 and the construction requirements are provided in Book 2, Section 19.

13.2.10. Cache La Poudre Regional River Trail

There has been one trail identified for construction within the Project area. The trail shall be constructed according to the Poudre River Trail Design Criteria listed in Exhibit 13-B. Safety lighting under bridges and in trail underpasses shall be provided.

13.2.11. Toll Points

Toll Points with enforcement zones will be required as defined in Book 2, Chapter 19 and as shown in the Reference Documents plans.

13.2.12. Parking Lot and Bus Rapid Transit Platforms

The Contractor shall design parking lots at State Highway (SH) 402 and Kendall Parkway as shown in Exhibit 1-A. The SH 402 parking lot shall be located in the southwest quadrant of the I-25 and SH 402 interchange and include 290 spaces. The Kendall Parkway parking lot shall be located in the southwest quadrant of the I-25 and Union Pacific Railroad (UPRR) crossing and include 200 parking spaces, a bus ring roadway, and three sawtooth bus bays. Parking lots shall include curb and gutter, curb ramps and sidewalk as needed for access to adjacent roadways. All requirements of the Americans with Disabilities Act (ADA) shall be met for the design and construction of parking lots, bus bays and shelters, and pedestrian access on-and-to platforms.

The Contractor shall design the Kendall Parkway parking lot according to the Millennium GDP criteria, City of Loveland standards, and RTD design criteria for parking lots.

The Contractor shall design Bus Rapid Transit (BRT) Platforms parallel to I-25 with pedestrian connections to the Kendall Parkway parking lot. BRT platforms shall be designed according to Regional Transportation District (RTD) criteria, and provide space for two motor coach style buses to be stopped and loading at one time. Pedestrian access sidewalk from the Kendall Parkway parking lot to the BRT platforms shall be provided with a minimum width of 8 feet, and a minimum width of 12 feet when parallel to Kendall Parkway. In locations where the pedestrian access sidewalks require switchbacks stairs shall be used to provide a direct connection. Pedestrian access shall meet ADA requirements.

The Contractor shall procure, assemble, and install Bustang bus stop shelters at the BRT platforms. Bustang bus shelters shall be manufactured by Tolar Manufacturing Company as shown in the plans in the Reference Documents. The shelters shall include perforated benches. The final details of the shelters are to be coordinated with CDOT prior to ordering to ensure conformance with statewide Bustang shelters. The existing Bustang Shelter at the US 34 parking lot can be relocated to one of the BRT platforms.

13.2.13. Design Exceptions

13.2.13.1 Identified Design Exceptions

The design variances listed in Table 13-1 have been approved by FHWA for this Project:

Table 13-1 I-25 – Geometric Exceptions

No.	Item	Design Criteria	Design Exception	Comments
DE-01	Vertical Clearance	Required vertical clearance is 16.5 ft.	Vertical clearance at southbound EOP is15.9 ft., northbound EOP is 16.2 ft.	EOP is substandard – edge of travelled way meets criteria (> 17 ft.)
DE-02	Outside Shoulder Width	Outside shoulder width for freeway is 10 ft. For managed lane facilities, the desirable outside shoulder width is 10 ft.	Reduced outside shoulder width to match existing EOP location on northbound and southbound I-25 between approximate stations (Sta.) 3424+60 to 3426+60, near Larimer County Road (LCR) 20 and Great Western Railway (GWRR)	Reduced shoulder width varying from 8.27 ft. to 10 ft. for approximately 200 ft.
DE-03	Inside Shoulder Width	Inside shoulder width for freeway is 10 ft. For managed lane facilities, the desirable inside shoulder width is 10 ft.	Reduced inside shoulder width on northbound and southbound I-25 between approximate Sta. 3451+32 to 3453+75, near U.S. Highway (US) 34	Reduced shoulder width varying from 9.39 ft. to 12 ft. for approximately 126 ft.
DE-04	Outside Shoulder Width	Outside shoulder width for freeway is 10 ft. For managed lane facilities, the desirable outside shoulder width is 10 ft.	Reduced inside shoulder width on northbound and southbound I-25 between approximate Sta. 3450+42 to 3454+38, near US 34 along existing Clover Leaf on-ramps	The current shoulder through this area is 4 ft. Reduced shoulder width is required varying from 1.5 ft. to 4 ft. for approximately 396 ft.
DE-05	Inside Shoulder Width	Inside shoulder width for freeway is 10 ft. For managed lane facilities, the desirable inside shoulder width is 10 ft.	Reduced inside shoulder width on northbound and southbound I-25 between approximate Sta. 3814+82 to 3829+69, near Kechter Boulevard	Reduced shoulder width of 6 ft. for approximately 1487 ft.
DE-06	SSD	SSD for 80 miles per hour (mph) crest vertical curve is 910 ft.; K=384	SSD at northbound PGL VPI Sta. 3772+02.52 = 730 ft.; K=247	Vertical curve meets 70 mph (SSD=730 ft.; K=247)
DE-07	SSD	SSD for 80 mph crest vertical curve is 910 ft.; K=384	SSD at southbound PGL VPI Sta. 3777+64.29 = 821 ft.; K=312	Vertical curve meets 75 mph (SSD=821 ft.; K=312)
DE-08	SSD	Stopping Sight Distance for 80 mph crest vertical curve is 910 ft.; K=384	SSD at northbound PGL VPI Sta. 3779+46.02=730 ft.; K=247	Vertical curve meets 70 mph (SSD=730 ft.; K=247)
DE-09	SSD	Stopping Sight Distance for 80 mph crest vertical curve is 910 ft.; K=384	SSD at northbound PGL VPI Sta. 3935+35.00=839 ft.; K=326	Vertical curve meets 75 mph (SSD=839 ft.; K=326)
DE-10	SSD	SSD for 80 mph crest vertical curve is 910 ft.; K=384	SSD at southbound PGL VPI Sta. 3936+10.00=830 ft.; K=319	Vertical curve meets 75 mph (SSD=830 ft.; K=319)
DE- 11	Outside Shoulder Width	Outside Shoulder width for ramps is 6 ft. min.	Reduced outside shoulder width to match the existing shoulder width at the Colorado State Patrol (CSP) access off-ramp and on-ramp	Reduced shoulder width of 4 ft. on the CSP access off-ramp and on-ramp

13.2.13.2 Design Exception Process

Design Exceptions in addition to those identified herein shall be subject to the Approval of CDOT. If determined to be necessary by CDOT, Design Exceptions may be subject to the Approval of FHWA.

The Contractor shall comply with the following requirements when requesting a Design Exception:

1. The Contractor shall submit Design Exception requests in the form of a letter addressed to the CDOT Project Director for Approval prior to issuance of Preliminary Design Documents (100%).
2. The Design Exception request shall consist of the following items:
   A. A letter identifying the exception(s) by number, Project number, location, and status (new submittal, resubmittal, etc.)
   B. A completed CDOT Form 464a
   C. Supporting documentation indicating the justification for the Design Exception. Justification shall address the following items:
      i. Site conditions of the exception.
      ii. Compelling reason for the exception, including which standard is not being met. If the exception affects any other standards, state what will be done to mitigate the effects of the exception.
      iii. Effects of the exception on safety and operation of the facility.
      iv. Previous crash history near the location of the exception.
      v. Calculations estimating the cost of attaining the design standard and costs of exception as proposed.
      vi. Effect on scenic, historical, or other environmental features.
   D. Plan and profile drawings depicting the exception.

13.3 Construction Requirements

13.3.1. Median Cover Material

Medians measuring less than 12 feet in width, EOP to EOP, shall be paved with a consistent material and pavement structure section with respect to the shoulders upon which they abut. No grass median shall be allowed less than 12 feet in width.

13.3.2. Safety Edge

The Contractor shall include Safety Edges, as defined in Book 2, Section 20 and as shown in the plans in the Reference Documents. Safety Edges shall be required on all mainline I-25, ramp, local road, and frontage road pavements. Safety Edges shall not be required in front of guardrail, adjacent to median barrier, mainline I-25 abutting ramp pavement, or on roadways that require curb and gutter.

13.3.3. Rumble Strips

The Contractor shall include Rumble Strips, as defined in CDOT Standard Plans List, M&S Standards, and as shown in the plans in the Reference Documents. Rumble Strips shall be required on mainline I-25 pavement on the inside shoulder in the FEIS alignment areas, and on both shoulders in all other areas.

13.3.4. Fencing

13.3.4.1 Temporary Fencing

Installation of temporary fencing will be required according to ROW agreements to protect adjacent private property. In remaining areas, temporary fencing should be considered to control construction operations and avoid impacts beyond ROW limits. Temporary fence shall be placed as required in any other Section of the Contract.

13.3.4.2 Permanent Fencing

Provide permanent ROW fencing of types and at locations in Table 13-2. In remaining areas, if a permanent fence is impacted due to Construction, it shall be replaced per CDOT Standard M-607-1 or M-607-2, whichever is applicable.

Table 13-2 Right-of-Way Fencing Locations

Location* * Station locations are approximate	Type	Remarks
ROW Fence impacted by Project	Barbed-wire with metal posts	Per CDOT Standard M-607-1
BRT Ramp Platform Fencing	Fence Chain Link (Special) (36 Inch Splash Guard)	Per CDOT Standard B-607-3

13.3.4.3 Gates

Replace all gates, in kind, which are removed during the prosecution of the Work.

13.4 Deliverables

In addition to submittal requirements specified in Book 2, Section 3, the Contractor shall submit the following to CDOT for review, Approval, and/or Acceptance.

Table 13-3 Deliverables

Deliverable	Review, Acceptance, or Approval	Schedule
Design Exceptions (if applicable)	Approval	Prior to issuance of Preliminary Design Documents (100%)
Field Locations of fencing gates	Approval	Prior to issuance of Preliminary Design Documents (100%)

13.5 Project Special Provisions

The following specifications modify and take precedence over the Standard Specifications.

REVISION OF SECTION 606
TENSIONED CABLE BARRIER (TL-4)

Section 606 of the Standard Specifications is hereby revised for this project to include the following:

DESCRIPTION

This work consists of the installation of Tensioned Cable Barrier at locations shown on the plans.

MATERIALS

The tensioned cable barrier system shall meet NCHRP Report 350 (only applicable for those systems developed prior to 2011) or MASH (acceptable for all systems), Test Level 4 (TL-4), and shall be one of the following:

(1) Brifen Wire Rope Safety Fence (Brifen WRSF) supplied by Brifen USA Inc., 12501 N. Santa Fe Ave., Oklahoma City, OK 73114, Phone: (405) 751-8062, Fax: (405) 751-8338.

(2) Trinity Cable Safety System (Trinity CASS) supplied by Trinity Industries, Inc., 2525 Stemmons Freeway, Dallas, TX 75207, Phone: (800) 772-7976, Fax: (801) 292-9138.

(3) Safence Cable Barrier System (Safence) supplied by Gregory Industries, 4100 13th St., SW, Canton, Ohio, 44710, Phone 330-477-4800, Fax: 330-477-0626.

(4) Gibraltar Cable Barrier Systems (Gibraltar) supplied by Gibraltar Cable Barrier Systems, L.P. 4303 Innovation Loop, Marble Falls, TX, 78654, Phone 800-495-8957, Fax: 830-798-5445

The system shall have four cables. The cable shall be pre-stretched during manufacture in accordance with the manufacturer's specifications.

All posts shall be socketed posts. Concrete for posts and anchorages shall be Class B. End Anchorages (Tensioned Cable Barrier) shall meet NCHRP 350 (only applicable for end anchorages developed prior to 2011) or MASH (acceptable for all end anchorages), TL-3.

CONSTRUCTION REQUIREMENTS

Tensioned Cable Barrier shall be installed in accordance with the details shown on the plans and in accordance with manufacturer's recommendations. The post spacing for the system used shall be no greater than that tested in accordance with NCHRP 350 or MASH (per test utilized) for an impact deflection not to exceed nine feet and must be approved by the FHWA. The maximum post spacing shall be 20 feet.

The Contractor shall arrange for a qualified representative from the cable barrier manufacturer to be on site for the following:

(1) The Contractor shall be adequately trained by the manufacturer's representative to ensure proper installation of the Cable Barrier.

(2) The Manufacturer's representative shall check installation and tensioning after completion.

The Contractor shall obtain documentation from the manufacturer confirming the most recent detailed drawings are provided for the materials to be installed, and that these materials conform to the

requirements of the NCHRP 350 or MASH (per test utilized). Three weeks prior to start of work, the Contractor shall submit three copies of the submittal drawings and specifications to the Engineer. Work shall not begin until approval of these drawings has been received from the Engineer.

Installation of the cable barrier shall be performed in the presence of the Engineer and a qualified representative of the manufacturer.

The Contractor shall obtain a signed statement from the manufacturer's representative confirming that the cable barrier has been installed correctly and is operational.

Sections of wire cable shall be connected using turnbuckles, with thread connector swaged on the cable. Concrete foundations for end anchorages and line posts shall be constructed with appropriate rebar based on the size of the foundations. The Contractor shall conduct a soil survey based on at least one test boring every mile and at anchor sites to identify the soil type, classification, and load bearing capacity. The Contractor shall submit the results of the soil survey to the manufacturer so that adjustments can be made to the size or type of footing used. A copy of this survey shall also be submitted to the Engineer for the project records.

The minimum concrete post footing size shall be 14 inches in diameter and 3 feet in depth.

The minimum concrete anchor footing shape may vary according to the manufacturer's recommendations but shall contain at least two cubic yards of concrete per anchor for systems with a single anchor for all cables. For systems having a separate anchor for each cable the footing shall contain at least one half cubic yard of concrete.

The Contractor shall install larger post and anchor footings than the minimum when soil conditions warrant. All size footings shall be constructed using Concrete Class B.

The Contractor shall maintain the cable barrier until CDOT Final Acceptance upon project completion. Cable barrier tensioning shall be checked within six weeks prior to project Final Acceptance.

Tensioned Cable Barrier and End Anchorage (Tensioned Cable Barrier) spare parts shall be provided and become the property of CDOT Maintenance. Spare parts shall include one complete end anchorage and all supplies needed for repairs for 1500 linear feet of Tensioned Cable Barrier, including, but not limited to: tension meter, standard socketed line posts, transition posts, post caps, excluders, locating pegs, cable clamp and prismatic reflectors. Spare parts shall include a cable spreader for weaved type cable installations. Spare parts shall be delivered to the CDOT maintenance yard at 12755 WCR 40, Platteville, CO 80651. The Contractor shall coordinate delivery of the spare parts with CDOT.

METHOD OF MEASUREMENT

Tensioned Cable Barrier will be measured by the linear foot of barrier that is installed and accepted, excluding end anchorage.

End Anchorage (Tensioned Cable Barrier) will be measured by the actual number of anchorages that are installed and accepted. End Anchorage (Tensioned Cable Barrier) shall include concrete

13.6 Exhibits

Exhibits are as follows:

Exhibit 13-A Roadway Design Criteria Table

Exhibit 13-B Poudre River Trail Design Criteria Table

Exhibit 13-C CDOT Design Exception Variance Request Form

Exhibit 13-A – Roadway Design Criteria

Criteria	I-25 Mainline	I-25 Normal Ramps	Prospect Road	SH 402	Frontage Roads	Remarks
Design Criteria & Controls						
Design Speed (mph)	80	50	50	50	60 / 40	Frontage Road (Desirable/Minimum)
Posted Speed (mph)	75		45	45	55 / 35	Frontage Road (Desirable/Minimum)
Terrain	Rolling	Rolling	Rolling	Rolling	Rolling	
Horizontal Alignment						
eMAX	6%	6%*	4%	4%	4%	CDOT *Roadway Design Guide* 8.1.6 *CDOT Preference on ramps.
Axis of Rotation	PGL	HCL	HCL	HCL	HCL	
Minimum Radius (ft.)	3050	833	926		1500 / 533	PGDHS Table 3-8, 3-9 Note: Based on maximum super elevation and design speed. Radius will be measured from the inside of the Ultimate inner lane.
Use of Spirals	Permitted	N/A	N/A	N/A	Permitted	Use spirals is permitted when recommended in PGDHS Table 3-20.
Superelevation Runoff Location on Tangent	0.85	0.80	N/A	N/A	0.80	PGDHS Table 3-18
Vertical Alignment						
Minimum Grade	0.50%	0.50%	0.50%	0.5%	0.5%	CDOT *Roadway Design Guide* Table 3-4
Maximum Grade	4.00%	-5.00% / 5.00%	-5.00% / 5.00%	-5.00% / 5.00%	-5.00% / 5.00%	CDOT *Roadway Design Guide* 3.3.3 Note: Based on rolling terrain
Minimum K Value, Crest	384	84	84	84	151 / 44	PGDHS Table 3-34
Minimum K Value, Sag	231	96	96	96	136 / 64	PGDHS Table 3-36
Sight Distance (SD)						
Stopping SD (ft.)	910	425	425	425	570 / 305	PGDHS Table 3-1, use PGDHS Table 3-2 for SSD on Grades Note: Not adjusted for grade. Allow horizontal sight distance across barriers. Use 3d graphical solutions for areas with vertical curvature. Glare screen not allowed.

Criteria	I-25 Mainline	I-25 Normal Ramps	Prospect Road	SH 402	Frontage Roads	Remarks
Decision SD	1455 ft.	890 ft.	890 ft.	890 ft.	N/A	PGDHS Table 3-3 Note: Applies to express lane entrances and critical gores (Maneuver D)
Vertical Clearance						
Underpass	16 ft. 6 in.	16 ft. 6 in.	16 ft. 6 in.	16 ft. 6 in.	16 ft. 6 in.	CDOT *Roadway Design Guide* Table 3-3
Overhead Sign Structures	17 ft. 6 in.	17 ft. 6 in.	17 ft. 6 in.	17 ft. 6 in.	17 ft. 6 in.	CDOT *Roadway Design Guide* Table 3-3
Underpass at Rail Roads	23 ft. 6 in.	23 ft. 6 in.	23 ft. 6 in.	23 ft. 6 in.	23 ft. 6 in.	CDOT *Roadway Design Guide* Table 3-3
I-25 Overpass Local Streets and Collectors	14 ft. 6 in.	14 ft. 6 in.	14 ft. 6 in.	14 ft. 6 in.	14 ft. 6 in.	CDOT *Roadway Design Guide* Table 3-3
I-25 Overpass Arterials and Freeways	16 ft. 6 in.	16 ft. 6 in.	16 ft. 6 in.	16 ft. 6 in.	16 ft. 6 in.	CDOT *Roadway Design Guide* Table 3-3
Cross Section						
Lane Width	12 ft.	15 ft. for single lane 12 ft. for two or more lanes	12 ft.	12 ft.	12 ft.	CDOT *Roadway Design Guide* 8.1.4, Figure 4-3
Inside Shoulder	12 ft.*	4 ft. for single lane 6 ft. for two or more lanes	0 ft.	0 ft.	0 ft.	CDOT *Roadway Design Guide* 8.1.4, Figure 4-3 *4 ft. Through Ingress/Egress zones (see design exception)
Outside Shoulder	10 ft.	6 ft. for single lane 8 ft. for two or more lanes	8 ft.	8 ft.	10 ft.	CDOT *Roadway Design Guide* 8.1.4, Figure 4-3
HOV Buffer	4	N/A	N/A	N/A	N/A	NCHRP 414
Normal Cross-Slope	2%	2%	2%	2%	2%	CDOT *Roadway Design Guide* 8.1.4
Clear Zone	34 ft.	22 ft.	22 ft.	22 ft.	22 ft.	AASHTO *Roadside Design Guide,* Table 3-1
Design Vehicle	WB-67	WB-67	WB-67	WB-67	WB-67	
Ramp Terminals / Intersections						
Acceleration Length (ft.)	Varies	Varies	Varies	Varies	N/A	PGDHS Table 10-3, 10-4
Deceleration Length (ft.)	Varies	Varies	Varies	Varies	N/A	PDGHS Table 10-5, 10-4

Criteria	I-25 Mainline	I-25 Normal Ramps	Prospect Road	SH 402	Frontage Roads	Remarks
Transition Taper Rate (ft.)	80:1	50:1	50:1	50:1	50:1	CDOT *Roadway Design Guide* 10.5.8 Note: For through lane drops
Redirect Taper Rate	80:1	50:1	50:1	50:1	50:1	Note: For lane shifts
Entrance Ramp Type	N/A	Parallel	N/A	N/A	N/A	Figure 10-13 of CDOT *Roadway Design Guide*
Exit Ramp Type	N/A	Parallel	N/A	N/A	N/A	Figure 10-18 of CDOT *Roadway Design Guide*
CDOT *Roadway Design Guide* = Colorado Department of Transportation *Roadway Design Guide* PGDHS = AASHTO, *A Policy on Geometric Design of Highways and Streets* NCHRP 414 = National Cooperative Highway Research Program, Report 414 (1998)						

Exhibit 13-B – Poudre River Trail Design Criteria

Criteria Category	Proposed Criteria	Comments
Highway Functions		
Functional Classification	Shared Use Path	
Design Criteria and Controls		
Design Speed	14 mph	CDOT *Roadway Design Guide* Section 14.2.2
Terrain	Rolling	Obtained from CDOT website
Horizontal Alignment		
Minimum Centerline Curve Radius	41	CDOT *Roadway Design Guide* Section 14.2.7 Table 14-4
Maximum Superelevation, emax / Cross slope	2%	CDOT *Roadway Design Guide* Section 14.2.5
Axis of Rotation Location	Edge of Trail	
Bridge and underpass approaches	20 ft. min tangent section approaching bridge or underpass	Fort Collins Trail Standard
Vertical Alignment		
Maximum Grade	5%	CDOT *Roadway Design Guide* Section 14.2.8
Minimum Grade	0.5%	AASHTO *Guide for the Development of Bicycle Facilities* Section 5.2.7
Minimum Length of Curve, ft.	Varies	CDOT *Roadway Design Guide* Section 14.2.3.3 Table 14-3
Vertical Clearance		
Minimum Vertical Clearance	10 ft. minimum, 12 ft. desirable	CDOT *Roadway Design Guide* Section 14.2.10.1 Fort Collins Trail Standard
Cross Section		
Trail Width	10 ft.	CDOT *Roadway Design Guide* Section 14.2.4 Fort Collins Trail Standard
Trail Thickness	5 in.	Fort Collins Trail Standard
Trail Material	Colored Concrete with fiber mesh reinforcement	Fort Collins Trail Standard
Trail Color	Davis color Yosemite Brown integral color	Fort Collins Trail Standard
Trail Finish	Heavy broom finish	Fort Collins Trail Standard
Z-Slope	2 ft. min, 3 ft. desirable	CDOT *Roadway Design Guide* Section 14.2.6 Fort Collins Trail Standard
Z-Slope, %	6:1 Max	CDOT *Roadway Design Guide* Section 14.2.6

Criteria Category	Proposed Criteria	Comments
Trail Cross Slope	1%	CDOT *Roadway Design Guide* Section 14.2.5
Centerline Grade (Ramps)	5% to 8.3%, rise 2.5 ft. max, landing length 5 ft. min	CDOT *Roadway Design Guide* Section 14.2.10.2
Design Vehicle	Typical Upright Adult Bicyclist	
Sight Distance		
SSD	93 ft.	CDOT *Roadway Design Guide* Section 14.2.3.1 Table 14-2
Roadside Design		
Max Foreslopes	1V:3H	CDOT *Roadway Design Guide* Section 14.2.6

Exhibit 13-C – CDOT Design Exception Variance Request Form

COLORADO DEPARTMENT OF TRANSPORTATION **DESIGN EXCEPTION VARIANCE REQUEST**	TEA-21 program ☐ NHS ☐ STP	Project Code
Project name	Date	Project Number
Type (check all that are applicable) ☐ New construction ☐ Restoration ☐ Resurfacing ☐ Rehabilitation ☐ ____ ☐ Reconstruction ☐ Safety ☐ Enhancement ☐ ____ ☐ ____	Revised	Region

Part 1 – Complete A through G for all projects (if 3R type or Safety type project, show comfort speed: ____ mph or ☐ if shown on CDOT Form 463a).

A. Short project description (☐ see CDOT Form 463 for more detailed description)	☐ NHS standards apply ☐ 3R standards apply ☐ State standards apply ☐ ____
B. Description of standard(s) reduced	PS&E approved by ☐ CDOT ☐ FHWA
C. Rational need for exception(s) Does this exception affect any existing potential hazards? ☐ (If so, describe hazard and rationale for retaining above.)	
D. Mitigation measures proposed (include safety discussion)	
E. Description of adjoining sections: (☐ see CDOT Form 463a) Other: ____	☐ same as existing project ☐ same as proposed project

F. Accident data Source: Most recent statewide accident rate (calendar year) for this functional class / facility: a) ____ b) ____ Latest accident rate for this highway (usually 3 years): ____ a) ____ b) ____	G. Cost Estimated item cost if built to full standard $ ____ Estimated cost of exception item, as proposed $ ____ ± difference in cost: ____ $ ____
H. Other (as needed) Optional: See ____ for traffic counts and/or additional speed data.	

Part 2 – Appropriate signatures required.

A. Submitted by (Project Manager)	Date	Approved by (Program Engineer)	Date

Required for Federal-oversight projects only

B. ☐ Not approved or ☐ approved with conditions		**Condition(s) / comment(s)**
Approved by (FHWA Division Administrator)	Date	

Distribution:
Region ____ Project file
Region ____ Project Manager
Region ____ Program Engineer
HQ ____ Records Center, Project file
FHWA, if applicable

Instructions: Refer to *The Roadside Design Manual*, Sections 1103.7& 1103.8 for 3R projects
Refer to P.D. 548.1 if project is resurfacing or safety type

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