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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 US 6, I-25, Federal Blvd., Bryant St., 5th Avenue, Interchange Ramps, Collector-Distributor Roads, Weir Gulch Trail and Platte River Bikeway

1. CDOT Roadway Design Guide
2. AASHTO, A Policy on Geometric Design on Highways and Streets
3. AASHTO, Roadside Design Guide
4. CDOT, Standard Plans List, M & S Standards
5. CDOT, Standard Specifications for Road and Bridge Construction
6. AASHTO, Guide for the Development of Bicycle Facilities
7. United States Access Board, ADA Accessibility Guidelines for Buildings and Facilities
8. United States Access Board, *Revised Draft Guidelines* for Accessible Public Rights-of-Way
9. State of Colorado, State Highway Access Code
10. City and County of Denver, Transportation Standards and Details for the Engineering Division

13.1.2 Local Roadways

Local roadways include Federal Blvd., 5th Avenue~~,~~, Bryant Street, Canosa Court and other non-CDOT roadways impacted by the Work.

Roadways controlled or maintained by local agencies other than CDOT shall be designed and constructed according to the ~~Local~~ local agency's standards and requirements. The additional manuals and standards are as follows:

1. City and County of Denver, Transportation Standards and Details For The Engineering Division
2. CCD, Traffic Signal Standards
3. CCD, Sign & Marking Standards……
4. Other manuals and standards as required to complete the Work

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 Approval and Acceptance, as required in Book 2, Section 3 - Quality Management.

13.2.2 General Design Requirements by Project Element

13.2.2.1 Basic Configuration Accommodation

The infrastructure constructed with the Project shall consider and accommodate the Basic Configuration, including but not limited to horizontal/vertical geometry and clearances to Structures.

The Contractor shall prepare and submit the preliminary design plan elements in consideration of the Basic Configuration for the Project and prior to issuance of Released for Construction plans, according to procedures of its Approved Quality Management Plan.

13.2.3 Cross Slope and Superelevation

13.2.3.1 Normal Cross Slope

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

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

For overlay sections where the existing cross slope is equal or greater than 2 percent, the Contractor shall maintain the existing pavement cross slope. For overlay sections where the existing cross slope is less than 2 percent, the cross slope shall be built-up through the use of a variable thickness overlay to a minimum of 2 percent, unless documented otherwise for review by CDOT in advance of construction activities.

13.2.3.2 Superelevation Rates

~~1.~~ Superelevation runout and runoff lengths for US 6, I-25, collector distributor roads, and interchange ramps shall be designed based on design criteria and methodology of AASHTO, A Policy on Geometric Design on Highways and Streets, the CDOT Roadway Design Guide, CDOT Standard Plans List of M & S Standards, and other requirements as determined appropriate by the Contractor

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13.2.4 Stopping Sight Distance

~~1.~~ Stopping sight distances and decision sight distances shall meet or exceed the requirements of Exhibits 13-1 and 13-2 ~~–~~Roadway Design Criteria ~~Table~~ in this Section. Stopping sight distances shall be determined in accordance with the AASHTO, A Policy on Geometric Design on Highways and Streets and the CDOT Roadway Design Guide.

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13.2.5 Fill and Cut Slopes and Clear Zones

The Contractor shall design cut and fill slopes to obtain clear zones and avoid the need for guardrail wherever possible. Where clear zones cannot be obtained within CDOT ROW, guardrail shall be required.

Clear zones shall be designed in accordance with the recommendations of the AASHTO Roadside Design Guide.

13.2.5.1 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 (or sidewalk) and the POSS shall be as follows:

1. Mainline US 6 and I 25: 12 feet minimum at a 6:1 slope
2. Collector-distributor roads: 12 feet at a 6:1 slope
3. Ramps: 12 feet at a 6:1 slope
4. Curb and sidewalk areas: 2 feet at a 50:1 slope

13.2.5.2 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. Where the above conditions cannot be obtained, and as accepted as a variance by the Engineer, the Contractor may use any of the following design approaches:

    A. Use 3:1 slopes with guardrail protection. Slopes steeper than 4:1 shall incorporate the use of soil retention blankets and shall be in compliance with the requirements of Section 17 - Landscaping.

    B. Use retaining walls as necessary, with guardrail protection. Where retaining walls are used, provide a traversable surface with a maximum 6:1 cross slope and a minimum 10 feet width between face of wall and ROW or permanent easement line, fence line, or other obstruction.

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

13.2.5.3 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. Where the above conditions cannot be obtained, and as accepted as a variance by the Engineer, the Contractor may use any of the following design approaches:

   A. Use 3:1 slopes with guardrail protection. Slopes steeper than 4:1 shall incorporate the use of soil retention blankets and shall be in compliance with the requirements of Section 17 - Landscaping.

   B. Use retaining walls as necessary, with guardrail protection to match 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.

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13.2.7 Guardrail

Guardrail shall be required wherever clear zone requirements cannot be achieved.

Median barrier is required along the entire length of US 6 and I-25. Median barrier shall be concrete barrier with a concrete glare screen in accordance with CDOT Standard M-606-13.

Guardrail along outside shoulders of US 6, I-25, collector-distributor roads, and interchange ramps shall be concrete barrier where inlets are required for pavement drainage. Type 3 guardrail with asphalt curb will not be allowed for drainage accommodation.

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

13.2.8 Access Design

The Contractor shall construct connecting roads, driveways, or curb cuts to provide access to property parcels where existing accesses have been disturbed or modified. Access design and location shall conform to the following requirements, in the order of precedence listed:

1. Access locations and restrictions delineated on the ROW Plans in Book 4
2. Access locations as required for maintenance operations
3. State of Colorado, State Highway Access Code
4. CCD permit requirements

Connecting roads and driveways shall be paved to the ROW limits using similar pavement as the adjacent roadway, and shall be replaced in conformance to the above requirements to the limits required to match existing grade.

13.2.9 Bikeway

13.2.9.1 Bikeway Values

The Platte River Bikeway is an existing commuter facility. The Bikeway design shall:

1. Conform to CCD safety requirements.
2. Not increase out-of-direction travel from the existing configuration.
3. Provide horizontal and vertical separation from mainline US 6 and I 25 that minimizes the need for barrier separation from the Roadway.
4. Meets all other CCD requirements.

13.2.10 Design Exceptions

13.2.10.1 Identified Design Exceptions

Design ~~exceptions~~ Exceptions (DEs) and Design Decision (DDs) that have been identified by CDOT and may be required for this Project are included in the ~~Section 13 – Roadways~~Reference Documents as related to specific elements of the reference drawings. ~~Additional~~ Design ~~exceptions~~ Exceptions required for the Contractor's design shall be obtained by the Contractor in accordance with the following requirements:

13.2.10.2 Design Exception Process

The Contractor shall comply with the following requirements when requesting a ~~design~~ Design ~~exception~~ Exception to the requirements herein:

1. The Contractor shall submit ~~design~~ Design ~~exception~~ Exception requests in the form of a letter addressed to the CDOT Project Director for Approval prior to issuance of applicable Released for Construction Documents.
2. The D~~d~~esign ~~exception~~ 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 ~~e~~Exception. Justification shall address the following items:

      (1) Site conditions of the exception.
      (2) Compelling reason for the exception, including which standard is not being met~~,~~ . I~~i~~f the exception affects any other standards ~~and~~, state what will be done to mitigate the effects of the exception.
      (3) Effects of the exception on safety and operation of the facility.
      (4) Previous crash history near the location of the exception.
      (5) Calculations estimating the cost of attaining the design standard and costs of exception as proposed.
      (6) Effect on scenic, historical, or other environmental features.

   D. Plan and profile drawings depicting the exception.

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~~Table 13.2-2~~
~~US 6 BRIDGES DESIGN BUILD DESIGN EXCEPTIONS~~

~~No.~~	~~Element~~	~~Item~~	~~Design Criteria~~	~~Design Exception~~	~~Comments~~
~~DE-1~~	~~US 6~~	~~Horizontal Alignment~~	~~65 MPH Horizontal Design Speed~~	~~40 MPH Horizontal Design Speed~~	~~Reduced horizontal design speed to tie into existing condition at west end of project.~~
~~DE-2~~	~~Ramp - Federal Blvd to WB US 6~~	~~Horizontal Alignment~~	~~55 MPH Horizontal Design Speed~~	~~45 MPH Horizontal Design Speed~~	~~Reduced horizontal design speed to limit impact of ramp on Barnum North Park.~~
~~DE-3~~	~~Ramp - Federal Blvd to EB US 6 (Braided Ramp)~~	~~Horizontal Alignment~~	~~30 MPH horizontal design speed~~	~~25 MPH horizontal design speed~~	~~Reduction in horizontal design speed to reduce length of braided ramp structure.~~
~~DE-4~~	~~Ramp - Bryant St to Federal Blvd~~	~~Vertical Alignment~~	~~45 MPH Vertical Design Speed~~	~~35 MPH Vertical Design Speed~~	~~Reduced vertical curve speeds to match elevations with US 6 and minimize ramp grades.~~
~~DE-5~~	~~EB US 6 CD Road~~	~~Horizontal Alignment, Vertical Alignment, Stopping Sight Distance~~	~~55 MPH horizontal and vertical design speed, stopping sight distance of 425'~~	~~30 MPH horizontal, 30 MPH Vertical, 35 MPH Stopping Sight Distance of 230'~~	~~Reduced horizontal, vertical, and stopping sight distance due to tie in with existing flyover ramps/structure~~
~~DE-6~~	~~WB US 6 CD Road~~	~~Shoulder Width~~	~~12' Outside Shoulder~~	~~8' Outside Shoulder~~	~~Reduced shoulder width to minimize impact to Robinson Dairy~~
~~DE-7~~	~~Ramp - SB I-25 to WB US 6 CD Road~~	~~Horizontal Alignment~~	~~45 MPH horizontal design speed~~	~~30 MPH horizontal design speed~~	~~Reduced horizontal speed due to matching normal cross slope of US 6 as well as reduced area to lengthen curve of ramp~~
~~DE-8~~	~~Ramp - SB I-25 to EB US 6~~	~~Horizontal Alignment, Vertical Alignment, Stopping Sight Distance~~	~~50 MPH Horizontal and Vertical Design Speed, Stopping Sight Distance of 425'~~	~~18 MPH Horizontal Design Speed, 30 MPH Vertical Design Speed, Stopping Sight Distance of 168'~~	~~Existing flyover piers and vertical elevation change reduce design speeds for this ramp~~
~~DE-9~~	~~US 6 crossing over I-25~~	~~Inside Shoulder, Outside Shoulder~~	~~12' Inside Shoulder, 12' Outside Shoulder~~	~~8' Inside Shoulder, 4' Outside Shoulder~~	~~Flyover piers limit roadway width~~
~~DE-10~~	~~I-25 underpass of US 6~~	~~Inside Shoulder~~	~~12' Inside Shoulder~~	~~7' Inside Shoulder~~	~~Tie into existing I-25 alignment limits shoulder width.~~

~~DE-11~~	~~US 6 east of I-25~~	~~Horizontal Alignment~~	~~55 MPH horizontal design speed~~	~~50 MPH horizontal design speed~~	~~Flyover structures limit ability create a superelevated curve along US 6 without further lowering I-25~~
~~DE-12~~	~~Ramp - NB I-25 to EB US 6 (entrance to US 6)~~	~~Horizontal Alignment~~	~~50 MPH horizontal design speed,50 MPH Vertical Design Speed~~	~~30 MPH Horizontal Design Speed, 36 MPH Vertical Design Speed~~	~~Existing geometric and vertical constraints~~
~~DE-13~~	~~SB I-25 south of US 6~~	~~Grade~~	~~4% Maximum Grade~~	~~4.5% Maximum Grade~~	~~To obtain vertical clearances with proposed US 6 over I-25 structure~~
~~DE-14~~	~~Ramp - NB I-25 to EB US 6 (exit from I-25)~~	~~Vertical Alignment~~	~~55 MPH Vertical Design Speed~~	~~36 MPH Vertical Design Speed~~	~~Must match grade at I-25 and tie into US 6 which minimized the allowable distance to lengthen vertical curves.~~
~~DE-15~~	~~Ramp - NB I-25 to WB US 6~~	~~Horizontal Alignment, Vertical Alignment~~	~~50 MPH Horizontal Design Speed, 50 MPH Vertical Design Speed~~	~~20 MPH Horizontal Design Speed, 43 MPH Vertical Design Speed~~	~~Geometric constraints due to existing flyover piers.~~

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13.3 Construction Requirements

13.3.~~2~~1 Guardrail

In areas that allow use of Type 3 guardrail, the Contractor shall use galvanized guardrail (Standard Plan No. M606-1) with steel posts. The Contractor shall pave asphalt a minimum of 1 foot behind the new guardrail posts.

13.3.~~3~~2 Median Cover Material

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Median cover material for raised medians constructed by the Project shall match color and texture of median cover material constructed on adjacent roadways.

13.3.~~4~~3 Fencing

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13.3.~~4~~3.1 Temporary Fencing

Installation of temporary fencing will be required ~~according to ROW acquisition 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 may be required in ~~Section 5 - Environmental Requirements, Section 17 - Landscaping, and~~ any other section of the Contract.

13.3.~~4~~3.2 Permanent Fencing

Provide permanent fencing of types and at locations in Table 13.3-1.

Table 13.3-1
PERMANENT FENCING TYPES

Location	Type	Remarks

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Right-of-Way line	-	Per CDOT Standard M-607-2
Access control between bikeway and US 6/I-25	-	Per CDOT Standard M-607-2
Water quality/detention ponds	-	Per CDOT Standard M-607-2

13.3.43.3 Gates

Provide gates in fences at locations, width and type as specified by requirements of the Contract or other maintaining entities for maintenance access, including CDOT.

13.4 Deliverables

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At a minimum, the Contractor shall submit the following to CDOT for review, Approval, and/or Acceptance:

Deliverable	Review, Acceptance, or Approval	Schedule
Overlay sections where the existing cross slope is less than 2 percent and cannot be built-up through the use of a variable thickness overlay to a minimum of 2 percent, and documented otherwise by the Contractor	review	In advance of construction activities.
Design ~~exceptions~~ Exceptions	Approval	Prior to issuance of applicable Released for Construction Documents

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Exhibit 13-~~1~~ 1 – Roadway Design Criteria

~~DESIGN ELEMENT (CONTINUED)~~	~~I-25~~	~~6TH AVE (WEST OF PLATTE RIVER)~~	~~6TH AVE (EAST OF PLATTE RIVER)~~
~~*Roadway Classification*~~	-	-	-
~~Roadway Classification~~	~~Interstate - Urban~~	~~Principle Arterial - Urban~~	~~Principle Arterial - Urban~~

Access Control Classification		Interstate (Full)	-	-
Design Speed		-	-	-
-	Minimum (MPH)	60	65	55
-	Loop Ramp (MPH)	-	-	-
Posted Speed Limit Minimum (MPH)		55	55	45
Design Vehicle		WB-67	WB-67	WB-67
Horizontal Alignment Criteria		-	-	-
Curve Radius For Design Speed Minimum (Ft.)		1330'	1660'	1060'
Superelevation (e_{max})		6%	6%	6%
Max. Degree of Curve - Design Speed (Calculated)		4.31	3.45	5.41
Cross Slope - Normal	-	2%	2%	2%
Maximum Algebraic Difference at Crossover Line (%)		4 to 5%	4 to 5%	4 to 5%
Clear Zone (On Tangent)		-	-	-
-	Minimum	30'	30'	22'
Clear Zone (On Curve)		-	-	-
-	Minimum	42'	42'	33'
Lane Width (Ft.)		12'	12'	12'
Shoulder Widths		-	-	-
-	Left Inside (Ft.)	12'	12'	12'
-	Right Outside (Ft.)	12'	12'	12'
Curb and Gutter Type		N/A	N/A	N/A
Sidewalk Widths		N/A	N/A	N/A
Side Ditches		-	-	-
-	Z slope (6:1)	12'	12'	12'
-	Fill Slope	2:1 to 6:1	2:1 to 6:1	2:1 to 6:1
-	Cut Slope	3:1	3:1	3:1
Redirect Taper (Ft.)		65:1 min.	65:1 min.	65:1 min.
Transition Taper for Accel/Decel Lanes		25:1 min.	25:1 min.	25:1 min.
Taper Length Roadway Lane Drop		70:1 Desirable 50:1 min.	70:1 Desirable 50:1 min.	70:1 Desirable 50:1 min.
Vertical Alignment Criteria		-	-	-

Maximum Grade		4%	6%	6%
Minimum Grade		0.30%	0.30%	0.30%
Min. Vertical Grade Break without a Curve		0.20%	0.20%	0.20%
Min. Vertical Curve Length (Ft.)		180'	195'	180'
K Value Ranges		-	-	-
-	Crest VC (Minimum)	151	193	114
-	Sag VC (Minimum)	136	157	115
Sight Distances		-	-	-
-	Level (Minimum)	570'	645'	495'
-	3% Downgrade (Minimum)	598'	682'	520'
-	3% Upgrade (Minimum)	538'	612'	469'
Interchanges Parallel Type Ent./Ex. Terminals		-	-	-
Taper Length Taper Entrance Terminal (L>1300 Ft.)		between 50:1 & 70:1	between 50:1 & 70:1	between 50:1 & 70:1
Taper Length Parallel Entrance Terminal (L<1300 Ft.)		300' Minimum	300' Minimum	300' Minimum
Taper Length Parallel Exit Terminal		between 15:1 & 25:1	between 15:1 & 25:1	between 15:1 & 25:1
Structure Clearance Criteria		-	-	-
Highway Underpass Vertical (Ft.)		16.5'	16.5'	16.5'
Local Road Underpass Vertical (Ft.)		16.5'	16.5'	16.5'
Rail Road Structure (Ft.)		23.5'	23.5'	23.5'
Sign Structures and Pedestrian Overpass (Ft.)		17.5'	17.5'	17.5'
Overhead Power Lines Vertical (Ft.)		20.5' to 21.5'	20.5' to 21.5'	20.5' to 21.5'

DESIGN ELEMENT (CONTINUED)	**6TH AVE CD ROAD**	**INTERCHANGE RAMPS**	**FEDERAL BLVD**
Roadway Classification	-	-	-

Roadway Classification		Collector-Distributor Road	Interchange Ramps	Principle Arterial - Urban
Access Control Classification		-	-	–
Design Speed		-	-	-
-	Minimum (MPH)	55	50/45/30	40
-	Loop Ramp (MPH)	-	30	-
Posted Speed Limit Minimum (MPH)		45	N/A	35
Design Vehicle		WB-67	WB-67	WB-67
Horizontal Alignment Criteria		-	-	-
Curve Radius For Design Speed Minimum (Ft.)		1060'	833'/643'/231'	485'
Superelevation (e_{max})		6%	6%	N/A
Max. Degree of Curve - Design Speed (Calculated)		5.41	6.88	11.8
Cross Slope - Normal	-	2%	2%	2%
Maximum Algebraic Difference at Crossover Line (%)		4 to 5%	4 to 5%	4 to 5%
Clear Zone (On Tangent)		-	-	-
-	Minimum	20'	20'	14'
Clear Zone (On Curve)		-	-	-
-	Minimum	33'	28'	20'
Lane Width (Ft.)		12'	12' (2 lanes) 15' (1 lane)	11'
Shoulder Widths		-	-	-
-	Left Inside (Ft.)	4'	4'	–
-	Right Outside (Ft.)	12'	6'-8'	-
Curb and Gutter Type		Type 2 (Section I-B, II-B)	Type 2 (Section I-B, II-B)	Type 2 (Section I-B, II-B)
Sidewalk Widths		N/A	N/A	8'
Side Ditches		-	-	-
-	Z slope (6:1)	12'	12'	-
-	Fill Slope	2:1 to 6:1	2:1 to 6:1	2:1 to 6:1
-	Cut Slope	3:1	3:1	3:1
Redirect Taper (Ft.)		65:1 min.	65:1 min.	65:1 min.
Transition Taper for Accel/Decel Lanes		25:1 min.	25:1 min.	25:1 min.
Taper Length Roadway Lane Drop		70:1 Desirable 50:1 min.	70:1 Desirable 50:1 min.	70:1 Desirable 50:1 min.
Vertical Alignment Criteria		-	-	-

Maximum Grade		7%	3% 5% (45 50 mph) 4% 6% (40 mph) 7% (25 30 mph)	7 %
Minimum Grade		0.30%	0.30%	0.3%
Min. Vertical Grade Break without a Curve		0.20%	0.20%	0.20%
Min. Vertical Curve Length (Ft.)		165'	150'	120'
K Value Ranges		-	-	-
-	Crest VC (Minimum)	114	84/61/19	44
-	Sag VC (Minimum)	115	96/79/37	64
Sight Distances		-	-	-
-	Level (Minimum)	495'	425'/360'/200'	305'
-	3% Downgrade (Minimum)	520'	446'/378'/205'	315'
-	3% Upgrade (Minimum)	469'	405'/344'/200'	289'
Interchanges Parallel Type Ent./Ex. Terminals		-	-	-
Taper Length Taper Entrance Terminal (L>1300 Ft.)		between 50:1 & 70:1	N/A	N/A
Taper Length Parallel Entrance Terminal (L<1300 Ft.)		300' Minimum	N/A	N/A
Taper Length Parallel Exit Terminal		between 15:1 & 25:1	N/A	N/A
Structure Clearance Criteria		-	-	-
Highway Underpass Vertical (Ft.)		16.5'	16.5'	16.5'
Local Road Underpass Vertical (Ft.)		16.5'	16.5'	16.5'
Rail Road Structure (Ft.)		23.5'	23.5'	23.5'
Sign Structures and Pedestrian Overpass (Ft.)		17.5'	17.5'	17.5'
Overhead Power Lines Vertical (Ft.)		20.5' to 21.5'	20.5' to 21.5'	20.5' to 21.5'

DESIGN ELEMENT	I-25	6TH AVE (WEST OF PLATTE RIVER)	6TH AVE (EAST OF PLATTE RIVER)
Roadway Classification			
Roadway Classification	Interstate - Urban	Principle Arterial - Urban	Principle Arterial - Urban
Access Control Classification	Interstate (Full)	-	-
Design Speed			
Minimum (MPH)	60	65	55
Posted Speed Limit Minimum (MPH)	55	55	45
Design Vehicle	WB-67	WB-67	WB-67
Horizontal Alignment Criteria			
Curve Radius For Design Speed Minimum (Ft.)	1330'	1660'	1060'
Superelevation (e_{max})	6%	6%	6%
Max. Degree of Curve - Design Speed (Calculated)	4.31	3.45	5.41
Cross Slope - Normal	2%	2%	2%
Maximum Algebraic Difference at Crossover Line (%)	4 to 5%	4 to 5%	4 to 5%
Clear Zone (On Tangent)			
Minimum	30'	30'	22'
Clear Zone (On Curve)			
Minimum	42'	42'	33'
Lane Width (Ft.)	12'	12'	12'
Shoulder Widths			
Left Inside (Ft.)	12'	12'	12'
Right Outside (Ft.)	12'	12'	12'
Curb and Gutter Type	N/A	N/A	N/A
Sidewalk Widths	N/A	N/A	N/A
Side Ditches			
Z slope (6:1)	12'	12'	12'
Fill Slope	2:1 to 6:1	2:1 to 6:1	2:1 to 6:1
Cut Slope	3:1	3:1	3:1
Redirect Taper (Ft.)	65:1 min.	65:1 min.	65:1 min.
Transition Taper for Accel/Decel Lanes	25:1 min.	25:1 min.	25:1 min.
Taper Length Roadway Lane Drop	70:1 Desirable 50:1 min.	70:1 Desirable 50:1 min.	70:1 Desirable 50:1 min.

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Exhibit 13-1 – Roadway Design Criteria (Cont.)

DESIGN ELEMENT (CONTINUED)		I-25	6TH AVE (WEST OF PLATTE RIVER)	6TH AVE (EAST OF PLATTE RIVER)
Vertical Alignment Criteria				
Maximum Grade		4%	6%	6%
Minimum Grade		0.30%	0.30%	0.30%
Min. Vertical Grade Break without a Curve		0.20%	0.20%	0.20%
Min. Vertical Curve Length (Ft.)		180'	195'	180'
K-Value Ranges				
	Crest VC (Minimum)	151	193	114
	Sag VC (Minimum)	136	157	115
Sight Distances				
	Level (Minimum)	570'	645'	495'
	3% Downgrade (Minimum)	598'	682'	520'
	3% Upgrade (Minimum)	538'	612'	469'
Interchanges Parallel Type Ent./Ex. Terminals				
Taper Length Taper Entrance Terminal (L>1300 Ft.)		between 50:1 & 70:1	between 50:1 & 70:1	between 50:1 & 70:1
Taper Length Parallel Entrance Terminal (L<1300 Ft.)		300' Minimum	300' Minimum	300' Minimum
Taper Length Parallel Exit Terminal		between 15:1 & 25:1	between 15:1 & 25:1	between 15:1 & 25:1
Structure Clearance Criteria				
Highway Underpass Vertical (Ft.)		16.5'	16.5'	16.5'
Local Road Underpass Vertical (Ft.)		16.5'	16.5'	16.5'
Railroad Structure (Ft.)		23.5'	23.5'	23.5'
Sign Structures and Pedestrian Overpass (Ft.)		17.5'	17.5'	17.5'
Overhead Power Lines Vertical (Ft.)		20.5' to 21.5'	20.5' to 21.5'	20.5' to 21.5'

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Exhibit 13-2 – Roadway Design Criteria

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DESIGN ELEMENT	6TH AVE CD ROAD	LOOP RAMPS	INTERCHANGE RAMPS	FEDERAL BLVD
Roadway Classification				
Roadway Classification	Collector-Distributor Road	Interchange Ramps	Interchange Ramps	Principle Arterial - Urban
Access Control Classification	-	-	-	-
Design Speed				
Minimum (MPH)	55	25	50/45/30	40
Posted Speed Limit Minimum (MPH)	45	N/A	N/A	35
Design Vehicle	WB-67	WB-67	WB-67	WB-67
Horizontal Alignment Criteria				
Curve Radius For Design Speed Minimum (Ft.)	1060'	144'	833'/643'/231'	485'
Superelevation (e_{max})	6%	6%	6%	N/A
Max. Degree of Curve - Design Speed (Calculated)	5.41	24.8	6.88	11.8
Cross Slope - Normal	2%	2%	2%	2%
Maximum Algebraic Difference at Crossover Line (%)	4 to 5%	4 to 5%	4 to 5%	4 to 5%
Clear Zone (On Tangent)				
Minimum	20'	14'	20'	14'
Clear Zone (On Curve)				
Minimum	33'	21'	28'	20'
Lane Width (Ft.)	12'	15'	12' (2 lanes) 15' (1 lane)	11'
Shoulder Widths				
Left Inside (Ft.)	4'	4'	4'	-
Right Outside (Ft.)	12'	6' (1 lane) 8' (2 lane)	6' (1 lane) 8' (2 lane)	-
Curb and Gutter Type	Type 2 (Section I-B, II-B)	N/A	Type 2 (Section I-B, II-B)	Type 2 (Section I-B, II-B)
Sidewalk Widths	N/A	N/A	N/A	8'
Side Ditches				
Z slope (6:1)	12'	12'	12'	
Fill Slope	2:1 to 6:1	2:1 to 6:1	2:1 to 6:1	2:1 to 6:1
Cut Slope	3:1	3:1	3:1	3:1
Redirect Taper (Ft.)	65:1 min.	25:1	65:1 min.	65:1 min.
Transition Taper for Accel/Decel Lanes	25:1 min.	25:1 min.	25:1 min.	25:1 min.
Taper Length Roadway Lane Drop	70:1 Desirable 50:1 min.	70:1 Desirable 50:1 min.	70:1 Desirable 50:1 min.	70:1 Desirable 50:1 min.

Exhibit 13-2 – Roadway Design Criteria (Cont.)

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DESIGN ELEMENT (CONTINUED)	6TH AVE CD ROAD	LOOP RAMPS	INTERCHANGE RAMPS	FEDERAL BLVD
Vertical Alignment Criteria				
Maximum Grade	7%	7%	3%-5% (45-50 mph) 4%-6% (40 mph) 7% (25-30 mph)	7 %
Minimum Grade	0.30%	0.30%	0.30%	0.3%
Min. Vertical Grade Break without a Curve	0.20%	0.20%	0.20%	0.20%
Min. Vertical Curve Length (Ft.)	165'	75'	150'	120'
K-Value Ranges				
Crest VC (Minimum)	114	12	84/61/19	44
Sag VC (Minimum)	115	26	96/79/37	64
Sight Distances				
Level (Minimum)	495'	155'	425'/360'/200'	305'
3% Downgrade (Minimum)	520'	N/A	446'/378'/205'	315'
3% Upgrade (Minimum)	469'	155'	405'/344'/200'	289'
Interchanges Parallel Type Ent./Ex. Terminals				
Taper Length Taper Entrance Terminal (L>1300 Ft.)	between 50:1 & 70:1	N/A	N/A	N/A
Taper Length Parallel Entrance Terminal (L<1300 Ft.)	300' Minimum	N/A	N/A	N/A
Taper Length Parallel Exit Terminal	between 15:1 & 25:1	N/A	N/A	N/A
Structure Clearance Criteria				
Highway Underpass Vertical (Ft.)	16.5'	16.5'	16.5'	16.5'
Local Road Underpass Vertical (Ft.)	16.5'	16.5'	16.5'	16.5'
Railroad Structure (Ft.)	23.5'	23.5'	23.5'	23.5'
Sign Structures and Pedestrian Overpass (Ft.)	17.5'	17.5'	17.5'	17.5'
Overhead Power Lines Vertical (Ft.)	20.5' to 21.5'	20.5' to 21.5'	20.5' to 21.5'	20.5' to 21.5'

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