

Section 13 – Roadway Design

Administrative Requirements

The horizontal and vertical alignment may be adjusted to provide a more economical design that meets project constraints identified within this document.

The horizontal and vertical alignment shall tie into existing SH 92 at the same approximate limits as shown in the Reference Documents.

SH 92

The primary requirements for the design and construction of highways shall include, but are not limited to, the following documents (latest versions at project advertisement):

- CDOT, CDOT Design Guide, 2005.
- AASHTO, A Policy on Geometric Design of Highways and Streets, 2011 (PGDHS).
- AASHTO, Roadside Design Guide, Third Edition, 2006.
- CDOT, Standard Plans, M & S Standards, July 2012.
- CDOT, Standard Specifications for Road and Bridge Construction, 2011.
- BNSF/UPRR, Guidelines for Railroad Grade Separation Projects.

Other requirements provided on the plans shall govern the design and construction as applicable.

Design Requirements

Design of the Project shall be in accordance with the Technical Requirements Section 1 - General.

Design and Plan Submittals

In addition to the submittal requirements specified in this Section, the Contractor shall submit all design and plan documents to the CDOT Project Engineer for Acceptance as required in Section 3 – Quality Management.

Roadway Requirements

General

The Contractor shall provide a design alignment, to the CDOT Project Engineer during the design review, which demonstrates the ability to meet all design criteria and requirements.

The design speed for SH 92 shall be 55 mph.

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Typical Section

The SH 92 typical section shall consist of one 12-foot lane with 8-foot shoulders in each direction with the exception of acceleration/deceleration lane widening at Pleasure Park and eastbound climbing lane as shown in the Reference Documents. In sections where there are multiple lanes in one direction the shoulder width may be reduced to 4-foot in width. The Railroad crossing Structure (I-05-Z) shall have one 12-foot lane with 8-foot shoulder in each direction. The Structure typical section shall include bridge rail and chain link fence. See Reference Documents for roadway typical sections.

The SH 92 typical section shall provide for acceleration and deceleration lanes for turning movements in and out of the Pleasure Park access and eastbound climbing lane.

Cross Slope and Superelevation

Crown

The normal crown shall be -2% and shall be the center of the 2-lane section. The crown line shall not fall within a travel or turn lane in widened sections. The SH 92 roadway approach tie-ins shall have a cross slope and crown line that matches the proposed pavement cross slope and crown line.

Superelevation Rates

The maximum superelevation rate shall be 6%.

Stopping Sight Distance

For SH 92, the stopping sight distances and decision sight distances shall meet or exceed the requirements of [CDOT Roadway Design Guide Criteria](#) Table, Exhibit 43-1. Stopping sight distances shall be determined in accordance with the PGDHS.

Fill and Cut Slopes and Clear Zones

The Contractor shall design cut and fill slopes to obtain clear zones and shall exhaust all design efforts to eliminate the use of guardrail. Where clear zones cannot be obtained within CDOT right-of-way, the use of guardrail shall be allowed as an option, subject to CDOT's evaluation and acceptance.

Clear zones shall be designed in accordance with the recommendations of AASHTO, Roadside Design Guide. *(Note: All slopes stated herein are in terms of horizontal: vertical)*

Roadside Slopes Adjacent to Pavement

Roadside slopes directly adjacent to mainline pavements shall be 4H:1V except, at accepted guardrail locations and where otherwise noted. The Point of Slope Selection (POSS) is

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defined as the location at which the roadside slope adjacent to the pavement ends, and the cut, or fill slope begins. The POSS shall be 8 feet from the edge of shoulder as shown in the Typical Sections included in the Reference Documentation.

Typical sections shall include a hinge point and maintain 2% positive drainage in the base course material as described in the CDOT Roadway Design Guide, Section 4.4 Typical Sections.

Fill Slopes

Fill slopes (H:V) shall be designed and constructed in accordance with the following priority.

1. Use 4:1 slopes where fill heights are less than 10 feet, and matches with existing conditions that can be obtained within the Project limits.
2. Use 3:1 slopes where fill heights exceed 10 feet, and matches with existing conditions can be obtained within the Project limits and clear zone can be obtained within the Project limits.
3. Use 2:1 slopes where fill heights exceed 15 feet, and matches with existing conditions that can be obtained within the Project limits and clear zone can be obtained 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 to 2:1 slopes with guardrail protection. Slopes steeper than 2.5:1 shall incorporate the use of soil retention blankets.
 - B. Use retaining walls as necessary, with guardrail protection, to meet project constraints.

Fill slope areas shall be designed with ditches as necessary to control project drainage from flowing onto Railroad.

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

Cut Slopes

Cut slopes (H:V) shall be designed and constructed in accordance with the following priorities:

1. Cut slopes must be transitioned at the match with the 4:1 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.

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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 to 2:1 slopes with guardrail protection. Slopes steeper than 2:5:1 shall incorporate the use of spray on mulch blanket.
 - B. Use retaining walls as necessary, with guardrail protection, to meet project constraints.

Cut slope areas shall be designed with ditches as necessary to control project drainage from flowing onto Railroad.

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

Cut slopes shall include a brow ditch at the top to control offsite storm water from eroding cut slope.

Guardrail

Guardrail shall only be allowed, with CDOT's evaluation and acceptance, wherever clear zone requirements cannot be achieved with cut/fill slope configuration within the acquired ROW. The Contractor shall design the guardrail needed for the structure approaches and other areas that do not meet clear zone requirements.

All guardrail shall be galvanized steel. All Posts shall be steel with composite blocks. All work shall be as specified in CDOT Standard M-606-1.

The Contractor shall pave asphalt a minimum of 1-foot behind all Type 3 guardrail installed as part of the Work.

Approach Roads

Roadway and field approaches shall be designed to have sufficient sight distance as per reference Standards. These approaches shall be Class 6 material and paved to the limits as shown in the Reference Documents.

Roadway approach side catch slopes within the SH 92 mainline clear zone shall be 6:1.

Construction Requirements

Removals

The Contractor shall be responsible for the removal of all items on the project designated for removal or found to conflict with project design elements. Removal items shall become the

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property of the Contractor unless designated to remain property of CDOT. Removal items shall include, but not be limited to: structures/portions of structures and obstructions, signs designated for removal, asphalt mat, culverts, and fencing. All removals shall be performed in accordance with Standard Specification 202.

Fencing/Gates

Fencing shall include combination wire as well as barbed wire. See Reference Documents for fence details. Deer Fence/Gates shall be replaced in locations where design requires removal of existing Deer Fence/Gates. Removed Deer Fence/Gates shall become the property of the adjacent land owner. Driveway Gates shall be the type as specified in the Project Special Provisions.

Deliverables

The Contractor shall submit the following to the CDOT Project Engineer.

Deliverable	Acceptance or Approval	Schedule
Design Exceptions	Approval	30 days before submitting RFC plans

All Deliverables shall also conform to the requirements of Section 3 Quality Management.

Project: SH 92 Stengel's Hill
Project Sub Acct. No: 17772
January 16, 2014
Technical Requirements

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Project Special Provisions

REVISION OF SECTION 607 DRIVEWAY GATES

Section 607 of the Standard Specifications is hereby revised for this project as follows:

Subsection 607.02 shall include the following:

Driveway gates provided for this project shall be a "Powder River" style 5 rail tubular steel gate.

Minimum gate specifications are:

Height	48 inch
Frame and rails	1-5/8 inch O.D. 16 gauge tube
Latch	Chain with keeper
Vertical stays	As recommended by the Manufacturer

Subsection 607.04 shall include all hardware necessary to complete the gate unit. This shall include a threaded rod-style hinge assembly and a chain-style latch with keeper as provided by the Manufacturer.