

Project: US 6 over Garrison Street

Project Sub Acct. No: 19478

July 31, 2014

Technical Requirements

Section 12 - Hydraulics

General

The Project shall include all Work for the modification of existing drainage facilities, construction of new drainage facilities, construction of permanent Best Management Practices (BMPs), comply with CDOT Municipal Separate Storm Sewer System (MS4) permit, the City of Lakewood MS4 Permit, the requirements of this section 12 and all other applicable permits and standards as included in the Contract Documents to provide adequate highway drainage for this Project. The project shall be designed to accommodate the design flows and to meet project design criteria.

This project is not located within a FEMA floodplain.

The drainage design requirements for all proposed and existing structures shall be in accordance with the CDOT Drainage Design Manual and City of Lakewood Storm Drainage Design Manual, where applicable.

The Contractor shall design drainage facilities to be compatible with existing or proposed drainage systems on adjacent properties, and shall maintain existing drainage patterns. If the Contractor proposes that existing drainage patterns must be changed, the Contractor shall design a solution that does not adversely impact property owners outside the ROW; shall obtain approval from CDOT prior to construction; and shall secure all other necessary approvals, permits, and easements.

Stormwater Permits

The Contractor shall be cognizant of and adhere to the requirements of the various environmental and stormwater permits that will be necessary for construction and operation of this Project. Fines may be incurred upon the project for permit non-compliance by CDOT or other regulatory agencies. Any non-compliance fines shall be passed onto the Contractor. See Section 5 – Environmental for more information.

Coordination with Other Agencies and Disciplines

The Contractor shall coordinate all water resource issues with affected regulatory agencies, where appropriate. The Contractor shall include CDOT in all meetings with the water resource regulatory agencies.

The Contractor shall acquire approvals through the permit processes as required by the City of Lakewood and pay any associated fees. The Contractor shall submit the required design documents to the City of Lakewood for approval and obtain acceptance of the design from the City of Lakewood including construction stormwater permits.

Hydrology

Hydrology calculations shall be in accordance with CDOT Drainage Design Manual and the City of Lakewood Drainage Design Manual. Hydrologic analysis is provided in the Reference Documents.

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Hydraulic Design Requirements

Drainage Design Software

The following software (most recent versions) may be used in performing drainage design calculations.

1. USACE, HEC-RAS
2. FHWA, HY-8
3. Haestad Methods, StormCAD
4. Haestad Methods, Flow Master
5. Haestad Methods, Culvert Master
6. EMS-I, WMS
7. Inroads Storm and Sanitary
8. UDFCD Spreadsheets

Data Collection

The Contractor shall be responsible for all additional mapping and surveys necessary to meet the Contract Requirements. The contractor shall be responsible for verifying utility locations and avoiding or relocating utilities due to design of drainage facilities.

The Contractor shall design drainage facilities compatible with existing or proposed drainage systems on adjacent properties, and shall preserve existing drainage patterns wherever possible. If existing drainage patterns must be changed due to design of the Project, the Contractor shall design and construct a solution that does not adversely impact property owners outside the ROW. The contractor's hydraulics design approach shall meet CDOT and FHWA requirements.

Roadways

Roadway component geometric configurations shall be designed to provide adequate drainage and minimize hydroplaning and icing problems.

Roadway Ditches

The roadway ditch design shall minimize erosion risk with the appropriate design and erosion control measures. The design shall be in accordance with the CDOT Drainage Design Manual and City of Lakewood requirements where applicable.

Bridge Deck Drainage

Bridge deck drainage requirements shall be determined according to criteria in the CDOT Drainage Manual.

Pipe Material Selection

Drainage pipes shall have water tight joints and comply with the current CDOT Pipe Material Selection

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Policy. If the pipe is part of a storm sewer system with concrete manholes and inlets then concrete pipe shall be used for uniformity of material.

Municipal Separate Storm sewer System (MS4)

CDOT has obtained an MS4 Permit for the storm sewer systems that it owns and maintains (Permit Number COS-000005). CDOT submitted a modification request for the permit on April 17, 2014. The Water Quality Control Division conditionally approved CDOT's request on April 22, 2014, and further clarified the Interim Program Modification on May 22, 2014. The Contractor shall be responsible for complying with the terms and conditions of the CDOT MS4 Permit and the Interim New Development and Redevelopment Program Modification that pertains to the Project.

The 6th and Garrison Project falls under the Interim Program Modification. This project does not have an EA/EIS associated with it, it does not discharge to an impaired water as defined in the Requirements for CDOT's Interim New Development and Redevelopment Program Description, and as designed in the reference documents, does not increase the imperviousness within the project limits by 20%. Therefore this is a Nonpriority Project and no permanent water quality BMP's at the project site are required to meet CDOT's MS4 permit. The Construction Program of CDOT's MS4 Permit remains unchanged, the Contractor shall follow all requirements for temporary erosion control BMPs, and will complete the NDRD Evaluation and Tracking Form, as part of the cost of the Work and as discussed in Sections 5 and 17.

Any impacts to the City of Lakewood ROW will need to comply with the City of Lakewood's MS4 permit, and be approved by the City of Lakewood.

Preliminary Hydraulic Report

A Preliminary Hydraulics Report is provided in the Reference Documents. The report illustrates a summary of pertinent hydraulic information in accordance with the CDOT Drainage Design Manual.

Deliverables:

Final Hydraulic Report

The Final Hydraulic Report (or addenda to previously Accepted reports), shall be prepared by the Contractor and submitted for acceptance prior to Final Project Acceptance. The Final Hydraulic Report shall follow the report outline in the CDOT Drainage Design Manual, and shall include references to relevant design criteria, circumstances influencing design, discussion of all drainage issues and drainage facilities, permanent water quality features, detailed design calculations, computer printouts, and appropriate maps and plans. The final drainage reports shall be sealed by a Colorado Licensed Professional Engineer, and one copy shall be submitted to the CDOT Project Engineer for Acceptance.

At a minimum, the Contractor shall submit the following to the CDOT Project Engineer for review, approval and/or acceptance:

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NDRD Evaluation and Tracking Form

The NDRD Evaluation and Tracking Form is to be completed and submitted for all projects that disturb an acre or more within CDOT's MS4 area. The Form is included in the Reference Document Section of the RFP.

Drainage Design Deliverables

The Contractor shall prepare plans for all drainage related facilities for the Project in a format that follows the documentation procedure in chapter 4 of the *CDOT Drainage Design Manual*, and the *CDOT CADD Manual* and *CDOT Drafting Manual*. The Contractor shall submit all applicable plans with each Drainage Report. All deliverables shall follow the Quality Management Plan for the Project as described in Book 2, Section 3, Quality Management. The Contractor shall include the following for all drainage plan deliverables:

PLAN VIEW

1. Provide the location of all existing and proposed Storm Drains. Provide a label for each proposed Storm Drain location. The Contractor shall establish a labeling system that is specific to each proposed Storm Drain system and provide a table to summarize all pertinent information. The table shall include at a minimum the Drain Line and Sheet Number where the profile can be found.
2. Provide the location of all existing and proposed inlets, manholes, end sections, and outlet protection. Provide a label for each proposed inlet, manhole, end section, outlet Structure and outlet protection. Include a table that summarizes all pertinent information. The table shall include, at a minimum, the Label ID, Station & Offset, Item, Length, Pay Depth, and Notes.
3. Provide all existing and proposed grading.
4. Provide all Utility locations.
5. Provide location of ROW lines.

PROFILES

1. Provide profiles for all proposed Storm Drains. Include the Label ID from plan view sheets, station and offset, invert elevations, rim elevations, Structure depth, slopes, sizes, material, Utility crossings, existing and proposed finished grade lines, the design flow for the 10-year and 100-year event, and the calculated HGL for the 10-year and 100-year event.
2. Provide profiles for all proposed Cross Drains. Include the Label ID from plan view sheets, station and offset, invert elevations, slopes, sizes, material, Utility crossings, and existing and proposed finished grade lines. Provide the drainage area of contributing basin, 100-year discharge, and headwater elevation on all applicable profile sheets for Cross Drains.

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DRAINAGE DETAILS

1. Include details for all non-standard CDOT items.

Deliverable	Acceptance or Approval	Schedule
Final Hydraulic Report	Acceptance	Prior to Construction
Pipe Selection Report	Acceptance	Prior to Construction
NDRD Evaluation and Tracking Form	Acceptance	Prior to Construction
Drainage Plans, Profiles and Details	Acceptance	Prior to RFC