

## 11.0 EARTHWORK

This section includes the requirements for earthwork for the Project and shall be in accordance with the Contract Documents.

### 11.1 Administrative Requirements

CDOT may issue a Notice to Proceed (NTP) in advance of the NTP2 for the Project.

#### 11.1.1 Standards

The Contractor shall design and construct the Project in accordance with the Contract, including the Project Special Provisions in Book 2, Section 20, Modification of Standard Special Provisions in Book 2, Section 19, requirements of the standards in the documents listed in Table 11-1 and those referenced in Book 3. The Contractor shall use the latest adopted edition at the time of the Proposal Due Date.

**Table 11-1 Standards**

Author or Agency	Title
Colorado Department of Transportation (CDOT)	<i>Standard Specifications for Road and Bridge Construction (Standard Specifications)</i>
American Association of State Highway and Transportation Officials (AASHTO)	<i>Standard Specifications for Transportation Materials and Methods of Sampling and Testing</i>
CDOT	<i>Field Materials Manual (FMM)</i>
CDOT	<i>Geotechnical Design Manual (GDM)</i>
CDOT	<i>Mechanistic-Empirical (M-E) Pavement Design Manual</i>
Federal Highway Administration (FHWA)	<i>Design of Mechanically Stabilized Earth Walls and Reinforced Slopes, Geotechnical Engineering Circular No. 11, Report No. FHWA-NHI-10-024, 2009 (GEC 11)</i>

### 11.2 Design Requirements

#### 11.2.1 Submittals

All submittals shall be prepared, Reviewed, and submitted in accordance with the requirements set forth in Book 2, Section 3-Quality.

#### 11.2.2 Cut and Fill Slope Design

Cut and fill slopes shall be designed with the minimum factors of safety for global stability shown in the *GDM*. Designs that include permanent reinforcing to improve stability shall follow the guidelines in *GEC 11*.

Evaluation of global stability for slopes shall be performed using limit-equilibrium analysis

methods. Slope grades shall be designed to mitigate potential surface erosion, sloughing and rockfall; and to promote revegetation in accordance with Book 2, Section 17-Landscaping.

The Contractor is responsible for stability of temporary cut and fill slopes, and excavations.

### **11.3 Construction Requirements**

#### **11.3.1 Clearing and Grubbing**

Trees, logs, limbs, stumps, brush, trash, unsuitable materials, and any other items identified under clearing and grubbing shall become the property of the Contractor and shall be disposed of off Site. Clearing and grubbing shall conform to Section 201 of the CDOT *Standard Specifications*.

The Contractor shall conduct a landscape walkthrough, in accordance with requirements of Book 2, Section 17-Landscaping prior to the start of any construction Activities.

#### **11.3.2 Removal of Structures and Obstructions**

The Contractor shall raze, remove, and dispose of all structures and obstructions which are identified in the Basic Configuration for removal, except utilities, structures and obstructions removed under other contractual agreements, and salvable material designated to remain the property of the Department. Removal of structures and obstructions shall conform to Section 202 of the CDOT *Standard Specifications*.

Substructures of existing structures, regardless of location, shall be removed a minimum of two (2) feet below the existing natural ground surface or the proposed ground surface, whichever is at the lower elevation, and a minimum of 5 feet horizontally from proposed underground structures. The limits of removal shall be approved by CDOT prior to completing the work.

Existing pavements shall be removed for the Work. Removals, at a minimum, shall include Surface course, Base and Subbase courses, and unsuitable embankment Materials. Millings produced from removal of asphalt by planing shall become the property of the Contractor. Removal of asphalt mat shall conform to Project Special Provisions Revision of Section 202 - Removal of Asphalt Mat and Revision of Section 202 - Removal of Asphalt Mat (Planing).

#### **11.3.3 Excavations and Embankments**

Where the top of a cut slope meets existing grade, the slope shall be rounded and shaped to blend with the adjacent existing contours to create a pleasing appearance and to reduce erosion.

New embankment shall be benched into the existing slopes, where required.

Where Roadway embankment is retained by structurally designed walls (retaining walls), the retained embankment and reinforced fill Material properties shall be compatible with the soil parameters used in design of the walls. This shall apply to both externally stabilized and internally stabilized wall systems.

#### **11.3.4 Temporary Roads and Detours**

Detour submittals shall be as stated in Book 2, Section 10–Geotechnical and Pavements.

Temporary roads shall be designed and constructed to minimize disturbance to existing vegetation and shall be restored to the original contours or to new contours as shown on the restoration plans. Detours shall be obliterated and the alignments restored when they will no longer be used. Restoration of temporary roads and detour sites shall include stabilization, seeding and planting as required by Book 2, Section 5-Environmental, and Book 2, Section 17-Landscaping.

### **11.3.5 Material Requirements**

Except as required below, embankment material utilized for construction shall consist of materials meeting AASHTO classification A-1-a, A-1-b, or A-2-4 when classified in accordance with AASHTO M 145, and shall not contain Reclaimed Asphalt Pavement (RAP) materials in any percentage.

Materials generated on-site that do not meet AASHTO classification A-1-a, A-1-b, or A-2-4 when classified in accordance with AASHTO M 145 may be used on fill slopes and embankment areas outside of the roadway prism (See Section 101.65 of the Standard Specifications) as designated in the plans or as approved by the Engineer.

### **11.3.6 US 350, US 24, CO 9, and CO 239 Roadways**

The top two feet of subgrade immediately under the proposed Pavement Structure on all newly constructed composite pavements shall have a minimum resistance value (R-value) of 40 when tested by the Hveem Stabilometer and shall consist of A-1-a, A-1-b or A-2 material when classified in accordance with AASHTO M 145. The minimum horizontal limits for this material shall be the outer limits of the Pavement Structure, including shoulders and curb and gutter, plus two feet on each side.

The Contractor shall utilize the soils information included in the Reference Documents and conduct a supplemental soil survey to confirm/ascertain whether the existing roadway soil satisfies the above conditions if it is desired to re-use the on-site materials in the “roadway prism”. If the on-site materials are re-used, the material will be tested as stated in the CDOT Field Materials Manual during construction. This supplemental soil survey shall conform to the requirements as stated in the CDOT Field Materials Manual. Test holes are required at least every 1,000 feet. The Contractor shall provide any additional mitigation required as a result of the supplemental soil survey.

The results of the supplemental soil survey, along with any additional mitigation measures required, shall be submitted to CDOT for Approval before any embankment, aggregate base course, pavement and pavement related Work commences. The above information shall be submitted in a report format that clearly and concisely describes the existing soil conditions, delineates areas needing additional mitigation, and defines the required mitigation measures. The report shall include a soil profile, boring log, and the test results and shall be signed and sealed by a Professional Engineer.

All Work shall be conducted per the CDOT M-E Pavement Design Manual and the CDOT Field Materials Manual.

Alternative subgrade treatment shall be submitted to CDOT for Approval before any embankment, aggregate base course, pavement, and pavement related Work commences.

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### 11.3.7 Compaction Requirements

Depth of moisture-density control for this Project shall be as follows:

1. Full depth of all embankments
2. Six (6) inches for bases of cuts and fills unless otherwise specified
3. Twelve (12) inches underneath the proposed pavement section (pavement/base course/soil)
4. Compaction shall comply with (AASHTO) T-180 or T-99 testing procedures per Sections 203, 206, 304, and 603.

### 11.3.8 Reuse of Materials

The Contractor is allowed to use broken concrete that is less than 6 inches in maximum dimension or broken asphalt that is less than 6 inches in maximum dimension for embankment material provided it is placed in accordance with Section 203.06 of the Standard Specifications. Broken concrete or asphalt less than 6 inches in maximum dimension will not be allowed to be used within the top 5 feet of embankment material immediately below the proposed Pavement Structure or as ABC within the Pavement Structure

Inclusion of recycled asphalt will not be allowed in the embankment fill.

The Contractor shall not dispose of broken concrete greater than 6 inches in maximum dimension or asphalt greater than 6 inches in maximum dimension within the Project limits.

With Approval of CDOT, the existing subgrade may remain in place if it meets all other requirements herein, before any embankment, aggregate base course, pavement and pavement related Work commences.

### 11.3.9 Available Potential Source of Material

Potential sources of material have not been identified for this Project.

### 11.3.10 Geotextiles

Geotextiles shall meet the requirements for Geotextile Class I (Per AASHTO M 288) and be approved for stabilization and separation applications. The geotextile shall be selected from the New York State Department of Transportation list of approved products available at: <https://www.nysdot.gov/divisions/engineering/technical-services/technical-services-repository/alme/pages/470-1a.html>.

Locations requiring geotextile installation shall be as Approved by CDOT before any embankment, aggregate base course, pavement and pavement related Work commences. Where geotextile installation is required, in-situ soil shall be scarified to a depth of at least 12 inches and then compacted, following requirements of the Standard Specifications.

The geotextile shall be installed per manufacturer's recommendations.

#### 11.4 Deliverables

The Contractor shall submit the following to CDOT for Review, Approval or Acceptance:

Deliverable	Review, Acceptance or Approval	Schedule
Supplemental Soil Survey Report and Subgrade Improvement Plan	Approval	Before any embankment, aggregate base course (ABC), pavement and pavement related Work commences.
Alternative subgrade treatment	Approval	Before any embankment, aggregate base course, pavement and pavement related Work commences
The existing subgrade will be allowed to remain in-place	Approval	Before any embankment, aggregate base course, pavement and pavement related Work commences
Locations requiring geotextile installation	Approval	Before any embankment, aggregate base course, pavement and pavement related Work commences

All deliverables shall also conform to the requirements of Section 3 – Quality Management