SECTION 300
SOILS AND EARTHWORK

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301.00 GENERAL CONDITIONS

Refer to Section 100 Title, Scope, and General Conditions of these CONSTRUCTION STANDARDS & SPECIFICATIONS for additional requirements that apply to all projects within Elbert County.

310.00 SCOPE

All site work and earthwork shall comply with the requirements of these CONSTRUCTION STANDARDS & SPECIFICATIONS and any special criteria established by Elbert County. Site work shall be completed as shown on the approved engineering plans. Site work shall consist of demolition, removal, and abandonment; clearing and grubbing; overlot grading; removal of topsoil; site preparation; embankment subgrade preparation; embankment fill; excavation, trenching, bedding and backfill of pipelines and service lines; excess excavation; structure backfill; roadway excavation, backfill and compaction; borrow; and restoration and cleanup. All workmanship and materials shall be in accordance with the requirements of these CONSTRUCTION STANDARDS & SPECIFICATIONS and shall conform to the lines, grades, quantities, and the typical cross-sections shown on the approved plans, or as directed by the DPW Director or designee.

311.00 Inspections

Refer to Section 154.00 Inspections of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

Adequate inspections assure compliance to Elbert County requirements and are the basis for Elbert County's recommendation that said improvements be accepted for maintenance and for release of performance guarantees. It is the responsibility of the Contractor to contact the DPW Director or designee / a minimum of one (1) full working day (twenty-four [24] hours) in advance of the required inspections. Required inspections shall include:

A. Erosion Control – Ensure that the Erosion Control Plan is adhered to and Best Management Practices (BMP's) are properly installed and maintained.
B. Testing – Verify that a Colorado Registered Professional Engineer (or designated representative), who practices the field of Geotechnical Engineering, is onsite and that adequate testing is performed. **FULL-TIME OBSERVATION AND TESTING IS REQUIRED FOR OVER-EXCAVATION WORK.**
C. Certification – Verify that the extent and depths of proposed work is certified. Verify the final grade.

The Contractor shall provide access to all Elbert County Inspectors/Representatives, and all other project quality control (QC) and/or quality assurance (QA) personnel throughout the earthwork process for observation and testing purposes. The Contractor shall not proceed with work until the project Soils Engineer has performed adequate observations and testing, unless approved by the DPW Director or designee.

All testing and retesting to meet requirements and specifications shall be at the Contractor's expense.

320.00 DEMOLITION, REMOVAL AND ABANDONMENT

The Contractor shall remove—wholly or in part—and satisfactorily dispose of all foundations, signs, structures, fences, old pavements, abandoned pipelines, traffic control device materials and any other obstructions which are not designated on the approved plans or allowed to remain. Utilities and other items for which other provisions have been made for removal shall follow demolition; removal and abandonment procedures shown on the approved plans or as otherwise approved by Elbert County Removal of sign panels shall include all work necessary to remove the panel and its attachment hardware from the existing installation. Concrete sign post bases shall be removed. Pedestals and bases shall be removed to one (1) foot below the surrounding ground or subgrade and backfilled with suitable material.

Where portions of structures shall be removed, the remaining parts shall be prepared to accommodate the new construction. The work shall be performed in such a manner that materials left in place shall be protected from damage. All damage to portions of structures to remain shall be repaired at the Contractor's expense. Reinforcing steel that projects from a structure to remain shall be cleaned and aligned to provide an adequate bond with new construction. Dowels shall be securely grouted with an approved grout. Depressions which result from removal of structures, footings, and other obstructions, shall be filled and compacted with clean fill materials or an approved CLSM ("Flowable fill") mixture so as to eliminate hazards such as cave-in or accumulation and ponding of water.

Materials used for traffic detour structures supplied by the Contractor shall be the property of the Contractor. After the detour is abandoned, the Contractor shall completely remove the traffic detour structure materials and disposal of materials shall comply with Section 320.01 Disposal of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

After all demolition, removal and abandonment work is complete, the Contractor shall grade the entire contract area by properly filling, compacting, and leveling the site to existing adjacent grades or to lines and grades shown on the approved plans.

The contractor shall follow all applicable Elbert County building code requirements in addition to these CONSTRUCTION STANDARDS & SPECIFICATIONS related to the demolition of any structure within Elbert County.

320.01 Disposal

The Contractor shall make all necessary arrangements for obtaining suitable disposal locations. If disposal shall be at other than established dumpsites, the DPW Director or designee may require the Contractor to furnish written permission from the property owner on whose property the materials and debris is proposed to be placed. Materials and debris shall be disposed of in a manner approved by the DPW Director or designee / and Elbert County Environmental Health. Burning shall not be allowed without prior written approval of the DPW Director or designee, the Elbert County Environmental Department and the governing fire district.

320.02 Salvage

All salvageable material shown on the approved plans and any additional salvageable material marked by Elbert County shall be removed without unnecessary damage in sections or pieces which may be readily transported and shall be stored by the Contractor in locations approved by the DPW Director or designee. The Contractor shall be required to replace any materials lost from improper storage methods or damaged by negligence. These materials include, but shall not be limited to, manhole frames and covers; inlet grates; valves and fire hydrants; landscape plant materials; fence materials; handrails; culverts; guardrail; walkway; roadway and traffic appurtenances (traffic signals and attached hardware, including mast arms and span wire) and irrigation systems and appurtenances.

321.00 Bridges, Culverts and Other Drainage Structures

Bridges, culverts, and other drainage structures in use by traffic shall not be removed until a Traffic Control Plan has been approved by the DPW Director or designee. Refer to Section 141.12 Traffic Control, Barricades and Warning Signs of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

Unless otherwise directed, the foundations or substructures of existing structures shall be removed down to one (1) foot below natural ground surface or bottom of drainageway. Where such portions of existing structures lie wholly or in part within the limits of a new structure, they shall be removed as necessary to accommodate construction of the proposed structure. Steel, concrete, and wood bridges shall be dismantled. Steel members to be salvaged shall be match-marked by Elbert County or the Contractor with waterproof paint.

322.00 Pipe and Appurtenances

All pipe and appurtenances to be taken out of service shall be completely removed or abandoned in place, as required by the DPW Director or designee.

Pipe designated to be reused shall be removed and stored, when necessary, to prevent loss or damage before relaying.

Excavation required to remove pipe or appurtenances shall be backfilled and compacted in accordance with Section 350.00 TRENCHING, BACKFILLING AND COMPACTING of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

When pipe is to be abandoned in place, it shall be completely filled with fly ash slurry composed of approximately sixty-five (65) percent Class C fly ash and thirty-five (35) percent water, unless otherwise approved by the DPW Director or designee. Each end of the pipe shall be capped with concrete.
When removing appurtenances such as manholes, catch basins, inlets etc., any live lines connected to these appurtenances shall be properly bypassed and shall remain in operation until abandonment is complete.
When appurtenances are to be abandoned in place, the remaining structure shall be lowered to a minimum of three (3) feet below finished grade, and shall be filled with concrete with a minimum compressive strength of 3000 psi (at 28 days) to the top of the remaining structure and then backfilled and compacted to the required grades.

323.00 Pavement and Concrete Flatwork

All concrete or asphalt to remain shall have a straight, true break line and a vertical face. Concrete or asphalt may be cut with a cutting wheel, jackhammer, or saw. The DPW Director or designee may require that saw-cutting be performed. Any damage to adjacent concrete or asphalt to remain in place shall be repaired at the Contractor's expense. The minimum depth of saw cuts in concrete shall be two (2) inches.

If areas cut for future placement of concrete or asphalt adjacent to existing asphalt or concrete are left exposed for longer than thirty (30) days or are subjected to inclement weather, the areas shall be evaluated by a Geotechnical Engineer and a recommendation shall be provided to Elbert County. An additional cut of at least six (6) inches behind and/or below the existing structure—or until competent subgrade is encountered—may be required by the DPW Director or designee.

The Contractor shall be responsible for the cost of removal and replacement of all overbreak as determined by the DPW Director or designee.

330.00 SITE PREPARATION

The Contractor shall complete all work necessary to properly prepare the site as shown on the approved plans and as specified herein. The site shall be prepared in such a manner that facilitates subsequent soils or earthwork operations. Site preparation includes clearing, grubbing, grading, tree and shrub removal, native grass stripping and removing and disposing of all debris within the limits of the project and other such areas as may be indicated on the plans or required by the work. Site preparation procedures shall be performed to comply with the approved plans or as designated by Elbert County. Adjacent vegetation and other items to remain shall be adequately preserved from injury.

331.00 Clearing

All sites to receive fill shall be cleared of organic materials, including root structures, at the Contractor's expense. Vegetation shall be pulled or grubbed in such a manner as to assure complete and permanent removal. Branches of trees extending over the roadbed shall be trimmed to give a clear height of twenty (20) feet above the road bed surface. All surface objects and trees, stumps, roots and other protruding obstructions not designated to remain shall be cleared and/or grubbed as required. Non-biodegradable, solid objects located at least two (2) feet below the final subgrade surface may remain at the discretion of the DPW Director or designee.

Elbert County may establish clearing lines and designate items and materials to remain. The Contractor shall preserve all materials and items to remain. Paint used for cut or scarred surfaces of trees or shrubs to remain shall be an approved asphalt base paint formulated especially for tree surgery.
Except in areas to be excavated, stump holes and other holes from which obstructions are removed shall be backfilled with suitable material and compacted in accordance with these CONSTRUCTION STANDARDS & SPECIFICATIONS.

The Contractor shall scalp areas where excavation or embankment shall be made. Scalping shall include the removal of organic material such as brush, roots, sod, grass, residue of agricultural crops, sawdust, and vegetable matter from the surface of the ground.

Fill shall be placed on competent subgrade as determined by the project Soils Engineer. The Contractor shall excavate soft, yielding, over-saturated, or otherwise unsuitable soils prior to the placement of fill.

Clearing shall be performed with due consideration and protection of the general public and public and private property. Any damage to streets, parking lots, utilities, plants, trees, buildings or structures on public or private property, or to benchmarks and construction staking due to the negligence of the Contractor, shall be repaired and restored to its original condition at the Contractor's expense. Areas proposed to be preserved shall be clearly staked or fenced off by the Contractor. It shall be the Contractor's responsibility to ensure that these areas are not damaged during the construction process. Any damaged areas shall be repaired or replaced at the Contractor's expense.

332.00 Staking and Grade Control

Control and construction stakes shall be set by field parties under the supervision of a Colorado Registered Professional Engineer or a Colorado Registered Land Surveyor who shall be paid by the Contractor. These field parties shall be available to check field control and to provide assistance to the Contractor. A set of approved plans shall be kept on the job site at all times by the Contractor.

It shall be the responsibility of the Contractor to maintain the alignment and grade shown on the approved plans. The alignment and grade elevation of forms shall be checked, and any necessary corrections shall be made before placing the concrete. When any form has been

disturbed or any subgrade thereunder has become unstable, the subgrade shall be reconditioned or replaced in accordance with these CONSTRUCTION STANDARDS & SPECIFICATIONS.

333.00 Grading Requirements

333.01 Grading Permit and/or Over-Excavation Permit

A Grading Permit and/or Over-Excavation Permit shall be required when a property's improvement includes 300 or more cubic yards of cut or fill and as specified in Section 151.00 Public/Private Improvement Permit (PPIP), Grading Permit, and Over-Excavation Permit of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

IF DISTURBING MORE THAN ONE ACRE A CDPHE PERMIT IS REQUIRED AND MUST BE ATTACHED TO THE GRADING/OVER-EXCAVATION PERMIT.

333.02 Grading Methods

All areas disturbed during grading operations shall have the final graded area hydro seeded or revegetated with native grasses in accordance with the requirements of Section 1000 LANDSCAPE STANDARDS FOR DEVELOPMENT PROJECTS of these CONSTRUCTION STANDARDS & SPECIFICATIONS. **SEEDING SHALL BE COMPLETED WITHIN SIXTY (60) DAYS OF THE GRADING COMPLETION AND NO LONGER THAN ONE HUNDRED EIGHTY (180) DAYS OF THE COMMENCEMENT OF GRADING OPERATIONS AT THE SITE.**

The Contractor shall comply with all dustproofing requirements of Section 141.11 Dustproofing of these CONSTRUCTION STANDARDS & SPECIFICATIONS for the duration of the project.

Grading shall be performed by an approved means. Areas adjacent to structures and other areas inaccessible to heavy grading equipment shall be graded by approved manual methods. Grading of filled and unfilled areas shall be to the lines and grades indicated on the approved plans. Grading shall be performed in conjunction with all necessary clearing, grubbing, stripping, filling, and compacting operations.

Final grading shall be performed to provide proper drainage for the overall site and away from site improvements that may be sensitive to moisture infiltration. In no case shall drainage from the project site be altered or controlled in a manner that may result in damage, or the potential for damage, to adjacent property or to any portion of the work from erosion or flooding.

333.03 Cut and Fill Requirements

All areas with slopes greater than fifteen (15) percent shall be benched or modified by an approved method prior to receiving fill. Benching dimensions shall be determined by the project Soils Engineer.

All fill shall be placed in a controlled state—tested for moisture and density—in locations designated in the approved plans and reports and in accordance with these CONSTRUCTION STANDARDS & SPECIFICATIONS, unless otherwise approved by the DPW Director or designee. **FILL MATERIALS SHALL NOT BE PLACED, STOCKPILED OR STORED IN AN AREA THAT IS NOT DESIGNATED ON THE PLANS OR APPROVED BY THE DPW DIRECTOR OR DESIGNEE.**

The Contractor shall comply with all federal and state environmental laws, such as the Endangered Species Act, Federal Emergency Management Act, Army Corps of Engineers Wetlands Regulations, and Division of Wildlife Regulations. Contractor shall make every effort to relocate wildlife prior to grading. Relocation plans shall be approved by Elbert County. All wetlands shall be protected by silt fencing and other required Best Management Practices (BMP's) during grading operations and until disturbed areas are fully revegetated.

Upon completion of work in which a Grading Permit or Over-Excavation Permit is required, the Contractor shall provide the following information, certified and sealed by a Colorado Registered Professional Engineer:

A. An "as-built" area grading plan which shows original ground surface elevations, as-constructed ground surface elevations, limits and depths of over-excavation, lot drainage patterns and locations and elevations of all surface and subsurface drainage facilities.
B. An overlot grading summary report prepared by the project Soils Engineer which states that fill placement is in conformance to approved plans and reports and includes locations and elevations of field density tests (referenced from a permanent landmark or permanent control point), summaries of field and laboratory tests and any other substantiating data and comments regarding deviations from the approved plans and reports and how they relate to or affect recommendations in the approved Geotechnical Engineering Report and grading plan.
C. A geological report prepared by an engineering geologist that includes a final description of the geology of the site, including any new information disclosed during the grading and how it relates to or affects recommendations in the approved Geotechnical Engineering Report and grading plan.

333.04 Topsoil

The Contractor shall salvage within the project limits, or acquire when needed, loose friable loam ("topsoil") reasonably free of admixtures of subsoil, refuse, stumps, roots,

rocks, brush, weeds, heavy clay, toxic substances or other material which would be detrimental to the proper development of vegetative growth.

Topsoil shall not be placed until the areas to be covered have been properly prepared and grading operations in the area have been completed. Topsoil shall be placed, spread and keyed to the underlying material at locations and to the thickness shown on the approved plans.

Topsoil shall not be incorporated into any embankment fill or backfill material without prior approval of the project Soils Engineer and the DPW Director or designee.

340.00 EARTHWORK

Earthwork shall consist of excavation, disposal, shaping and compaction of all material encountered within the limits of the project, including but not limited to excavation of ditches and channels, surface boulders, muck, rock, concrete foundations, slabs, stripping, etc. Excavation shall be performed to the line and grade and typical cross-sections shown on the approved plans or as required by the DPW Director or designee.

Excavation, dewatering, sheeting, and bracing shall be performed so as to eliminate any possibility of undermining or disturbing the foundation of any existing structures, utilities, pavement and concrete flatwork.

Free-running water shall be drained from all earthwork materials prior to construction of structures, utilities, or concrete flatwork construction.
The DPW Director or designee may require the Contractor to submit a proposed earth-moving diagram and map of proposed haul routes for approval.

340.01 Definitions

A. Suitable Material - Any earthen material that consists of onsite or similar non-organic sands, gravels, clays, silts and mixtures thereof with a maximum size of six (6) inches. Claystone fragments exceeding three (3) inches in particle size are not to be incorporated in embankment material unless specifically approved by the project Soils Engineer and the DPW Director or designee.

B. Bedrock that breaks down to specified soil types and sizes during excavation, hauling and placement may be considered as suitable material.

C. Unsuitable Material - Any earthen material that contains vegetable or organic silt, topsoil, frozen materials, trees, stumps, certain man-made deposits, or industrial waste, sludge or landfill, lignite, or other undesirable materials.

D. Unclassified Excavation - Any and all earthen materials encountered, including rocks and boulders, during construction. Rock formations that can be removed by ripping with a D-9 tractor in good repair with a single hydraulic ripper are considered as unclassified excavation.

E. Embankment Construction - Earthwork including preparation of the subgrade upon which embankment material shall be placed; dikes within or outside right-of-way; placement and compaction of approved material within areas where unsuitable materials have been removed; and placement and compaction of embankment materials in holes, pits and other depressions to lines and grades shown on the approved plans. Only suitable materials approved by the project Soils Engineer shall be used in construction of embankments and backfills. Claystone fragments exceeding three (3) inches in particle size are not to be incorporated in embankment material unless specifically approved by the project Soils Engineer and the DPW Director or designee.

F. Structure Excavation - Excavation of any and all materials over an area extending three (3) feet out from the outer most bottom edge of a proposed structure, up to existing grade or top of proposed grade (whichever comes first) at a one to one (1:1) slope. Rock formations within this area that can be removed by ripping with a D-9 tractor in good repair with a single hydraulic ripper shall be considered structure excavation.

G. Structure Backfill - Earthen material that is installed around and over any structure shown on the approved plans. Imported structure backfill (Class I) shall meet the general gradation of "Class 1 Structure Backfill Material" as specified in Section 703.08 of the CDOT *Standard Specifications for Road and Bridge Construction*. Onsite Class 2 structure backfill shall also meet the requirements of Section 703.08 of the CDOT *Standard Specifications for Road and Bridge Construction*. Materials which do not comply with these requirements may be used at the discretion of the project Soils Engineer and the DPW Director or designee.

H. Rock Excavation - Igneous, metamorphic or sedimentary rock formations that cannot be excavated with a D-9 tractor in good repair with a single hydraulic ripper.

I. Borrow - Backfill or embankment material which shall be acquired from designated borrow areas to make up the deficient areas which cannot be completed from excavation within work limits. All sources of borrow material shall be approved prior to use by the project Soils Engineer and the DPW Director or designee.

J. Proof-Rolling - The application of test loads over a subgrade surface by means of a heavy pneumatic-tired vehicle to locate weak areas in subgrade. Refer to Section 361.04 Proof-Roll Observation and Testing of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

K. Bedding Material - Material that is installed under and around pipelines, rip-rap, low flow channels, and any other locations required by the DPW Director or designee. The thickness and gradation of bedding materials shall comply with Section 352.00 Bedding for Pipelines and Service Lines of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

L. Stabilization Material - Material which shall be placed in over-excavation areas, areas with unsuitable in situ material, or areas with a high-water table in order to stabilize the existing material. Thickness of stabilization

material shall be determined and installed in the field, on a case by case basis. Gradation of stabilization material shall comply—at a minimum—with the "No. 4 Coarse Aggregate" specified in Section 703.02 of the CDOT *Standard Specifications for Road and Bridge Construction*, or other materials such as lime or flyash specified on the approved plans and approved by the project Soils Engineer.

340.02 Grading Tolerances

All earthwork shall perform in such a manner that final grades after excavation, compaction of backfill, placement of rip-rap, construction of channel lining, etc. shall conform to the cross-sections shown on the approved plans. The final earthwork shall comply with the design elevations, with the following allowable tolerances:

A. 0.03 feet within main drainage channel bottom limits
B. 0.3 feet at the top of any embankment where a cut side slope intersects the existing grade
C. 0.5 feet in all portions of the site not included in items a. or b. above.
D. In addition to the above tolerances, positive surface drainage shall be provided on the entire site so that no depressions or ponds are formed, regardless of depth.

It shall be the Contractor's responsibility to ensure that all portions of the site drain as shown on the approved plans.

340.03 Borrow

It shall be the Contractor's responsibility to stockpile suitable materials for use in the project. Only after the Contractor estimates that sufficient suitable backfill material is stockpiled to complete all earthwork operations of the project, shall excavated material be removed from the project site.
If the Contractor fails to preserve onsite, sufficient suitable material, and removes or disposes of suitable material, suitable material shall be recovered at the Contractor's expense.

If there is an insufficient quantity of suitable material available onsite, the Contractor shall provide additional suitable material, as defined in Section 340.01 Definitions of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

341.00 Embankment Construction

Embankment construction shall include placement, processing and compaction of all embankment material, and all related work required to ensure proper bond of materials with previously placed embankment material.

341.01 Preparation of Embankment Subgrade

No excavation shall be performed in any area until the proposed work has been staked by the Contractor, cross-sections of existing ground are determined and plotted, and all survey elevations and cross-sections shown on the approved plans are reviewed and approved by the DPW Director or designee. Excavation shall be performed to the lines and grades shown on the approved plans.

The grade shall be maintained so that the surface is well drained at all times. When necessary, temporary drain systems shall be installed to intercept or divert surface water that may affect the work.

Where an embankment shall be constructed, unsuitable material shall be removed from the surface. The cleared surface shall be plowed or scarified to a minimum depth of six (6) inches. The embankment area shall adhere to the density and moisture content requirements shown in the following table, unless otherwise approved by the project Soils Engineer and the DPW Director or designee:

Soil Classification AASHTO M145	**Relative Compaction By Standard Proctor ASTM D698 or AASHTO T99 (percent compaction)**	**Relative Compaction By Modified Proctor ASTM D1557 or AASHTO T180 (percent compaction)**	**Moisture Content Range (with respect to Optimum Moisture Content)**
A-1, A-2, A-3	-	95	-2 to +2 (based on AASHTO T180)
A-4, A-6, A-7	95	-	-1 to +3 (based on AASHTO T99)

Where embankments shall be placed on slopes steeper than 4:1 (horizontal to vertical), benches shall be excavated into the slope by a method approved by the project Soils Engineer and the DPW Director or designee. Such slopes include natural and previously constructed embankments. The benches shall be cut ten (10) feet horizontally into the existing slope to create a stepped bench condition, and the vertical step shall not exceed four (4) feet, unless otherwise approved by the project Soils Engineer and the DPW Director or designee. All surfaces to receive embankment material shall be inspected and approved by the project Soils Engineer immediately prior to embankment material placement.

341.02 Embankment Material

No embankment material shall be placed until approved in writing by the Owner.

Earthmoving equipment, watering equipment, processing equipment and compaction equipment are the responsibility of the Contractor. Equipment shall be suitable for performing excavation and embankment work in accordance with these CONSTRUCTION STANDARDS & SPECIFICATIONS and the Contract schedule. If

at any time the moisture-conditioning or processing equipment cannot apply moisture or process at a rate equal to or greater than the rate required to achieve an embankment material within the required size tolerances, uniformity, and moisture contents, embankment material placement shall be suspended at that area until it is demonstrated to the project Soils Engineer and the DPW Director or designee / that all questionable areas comply with these CONSTRUCTION STANDARDS & SPECIFICATIONS.

Equipment shall be operated in accordance with manufacturer's recommendations and instructions and shall be maintained so that it delivers the rated energies and compactive efforts.

IF EQUIPMENT IS DEEMED INADEQUATE, THE PROJECT SOILS ENGINEER AND/OR THE DPW DIRECTOR OR DESIGNEE MAY RECOMMEND THE USE OF LARGER OR DIFFERENT TYPES OF EQUIPMENT.

After subgrade is properly prepared, the embankment filling operation shall begin in the deepest part of the area to be filled. Embankment material shall be placed and compacted in parallel layers until the finished rough grade is reached. Temporary gaps through the embankment shall not be allowed without approval of the DPW Director or designee. All temporary slopes shall not be steeper than 4:l (horizontal:vertical).

THE THICKNESS OF EACH LAYER SHALL NOT EXCEED SIX (6) INCHES BEFORE COMPACTING.

Embankment material shall be a homogenous mixture of suitable material. No particle size shall exceed six (6) inches, and no claystone fragment shall exceed (3) three inches. The characteristics of the material shall be in accordance with that of 'suitable material' as defined in Section 340.01 Definitions of these CONSTRUCTION STANDARDS & SPECIFICATIONS. The full depth of each layer shall be processed to ensure a satisfactory bonding surface for the next layer of embankment material.

In order to achieve uniform moisture content throughout the materials in the layer, wetting or drying of the material and manipulation shall be performed. Placement of material shall not proceed until excessively wet material has been dried and overly dry material has been wetted with methods approved by the project Soils Engineer. Each layer of embankment shall be properly processed by disking or by other approved methods so that the water is distributed uniformly throughout the layer prior to rolling and after compaction. In no case shall additional embankment material be placed until the underlying layer has been properly processed in accordance with these CONSTRUCTION STANDARDS & SPECIFICATIONS. Materials placed that do not comply with moisture and/or density specifications are subject to removal and replacement and/or reprocessing at the Contractor's expense.

The surfaces of previously placed embankment material and foundation areas that have not had material placed on them for a period of time sufficient to allow those surfaces to

comply with the specified moisture content and/or density requirements, the surface material shall be re-processed until it complies with the requirements, prior to placement of additional material.

If hauling equipment is used to obtain compaction, the Contractor shall route its equipment at all times, both when loaded and when empty, over the layers as they are placed and shall distribute the travel evenly over the entire width of the embankment. The equipment shall be operated in such a manner that hardpan, cemented soils, clay, or other chunky soil material shall be broken up into smaller particles and become incorporated with the other material in the layer.

Rock Material In Common Embankment: Excavated material that contains solid rock consisting of cobbles, boulders or rock fragments ("rock material") less than one cubic yard in volume; a maximum thickness of one and one-half (1½) feet; and a maximum dimension of six (6) feet that cannot be processed by crushing, breaking or pulverizing, may be placed in embankments below ten (10) feet from the rough subgrade elevation with approval from the project Soils Engineer and the DPW Director or designee / . In no case shall claystone fragments larger than five (5) inches in any dimension be incorporated into the embankment layers. Rock material does not include the claystone bedrock formations common throughout Elbert County. If placed, rock material shall be incorporated in layers no thicker than the thickness of the largest pieces. The rock material shall be carefully dispersed throughout the layers and throughout the embankment to avoid nesting. Rock fragments shall be spaced far enough apart to allow the Contractor's equipment to operate between the rock pieces. All voids shall be filled with fines material to obtain the required uniform density around the rock fragments.

Embankment areas that contain rock material shall be compacted with adequate equipment and sufficient passes to ensure that the embankments meet all specified moisture and density requirements for common embankment before the next lift is placed. The Contractor shall perform a test fill to demonstrate satisfactory compliance with these specifications prior to placing rock material.

The Contractor shall maintain the embankment during the warranty period.

341.02.01 Embankments Twelve (12) Feet or Less in Depth

Compaction operations shall continue until each layer of embankment material for embankments less than twelve (12) feet in height is compacted to moisture and density requirements shown in the following table, unless otherwise required by the project Soils Engineer and the DPW Director or designee:

Soil Classification AASHTO M145	Relative Compaction By Standard Proctor ASTM D698 or AASHTO T99 (percent compaction)	Relative Compaction By Modified Proctor ASTM D1557 or AASHTO T180 (percent compaction)	Moisture Content Range (with respect to Optimum Moisture Content)
A-1, A-2, A-3	-	95	2 to +2 (based on AASHTO T180)
A-4, A-6, A-7	95	-	-1 to +3 (based on AASHTO T99)

341.02.02 Embankments Greater Than Twelve (12) Feet in Height

Compaction operations shall continue until each layer of embankment material for embankments greater than twelve (12) feet in height is compacted to the moisture and density requirements shown in the following table, unless otherwise required by the project Soils Engineer and the DPW Director or designee.

Soil Classification AASHTO M145	Relative Compaction By Standard Proctor ASTM D698 or AASHTO T99 (percent compaction)	Relative Compaction By Modified Proctor ASTM D1557 or AASHTO T180 (percent compaction)	Moisture Content Range (with respect to Optimum Moisture Content)
A-1, A-2, A-3	-	96	-2 to +2 (based on AASHTO T180)
A-4, A-6, A-7	100	-	-1 to +2 (based on AASHTO T99)

342.00 Excavation

All excavated areas shall be graded in a manner that allows adequate drainage and does not disturb material outside the limits of slopes. Excavated areas shall be within the tolerances noted in Section 340.02 Grading Tolerances of these CONSTRUCTION STANDARDS & SPECIFICATIONS. When practical, all suitable material removed from the excavation shall be used in the formation of embankments, for backfilling, and for other purposes. Materials that are considered unsuitable material (including rock) or surplus by the DPW Director or designee shall be disposed of at the Contractor's expense, in accordance with Section 320.01 Disposal of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

All water pumped or drained from the work shall be disposed of according to provisions of the Stormwater Discharge Permit (NPDES) in a manner satisfactory to the DPW Director or

designee Elbert County Health, without undue interference with other work or damage to pavements, other surfaces, or property.

342.01 Excavated Material

Excavated material shall be placed so as to minimize the inconvenience to occupants traveling on streets and driveways or adjoining properties. Excavated material shall not be deposited on private property unless written consent of the property owner(s) has been filed with the DPW Director or designee.

Suitable excavated material shall be used as backfill, fill for embankments, or other parts of the work in accordance with the appropriate sections of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

Disposal of surplus material shall be in accordance with Section 320.01 Disposal of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

342.02 Excess Excavation

If in the opinion of the project Soils Engineer or the DPW Director or designee / , the material at or below the depth to which excavation for structures would normally be carried is unsuitable for the required installation, it shall be removed to such widths and depths as directed by the project Soils Engineer or the DPW Director or designee / and shall be replaced to provide a stable, non-yielding surface that is approved by the project Soils Engineer and the DPW Director or designee / .

It is the sole responsibility of the Contractor to become familiar with the existing conditions and potential excess excavation at each project site. Geotechnical reports or other data provided by Elbert County may be used to assist in determining general site and soil characteristics.

If, through failure or neglect of the Contractor to conduct the excavation work in a proper manner, the surface of the subgrade is in an unsuitable condition for proceeding with construction, the unstable material shall be removed and replaced with recycled concrete, structure backfill, or other approved material at the Contractor's expense. The condition of the subgrade shall be approved by the project Soils Engineer and the DPW Director or designee before any additional materials are placed.

343.00 Structure Backfill

Structure backfill shall comply with Section 340.01 Definitions of these CONSTRUCTION STANDARDS & SPECIFICATIONS. Structure backfill material shall have a liquid limit not exceeding thirty-five (35) and a plasticity index less than fifteen (15), as determined by AASHTO T 89 and T 90, unless otherwise approved by the project Soils Engineer and the DPW Director or designee / .

Areas adjacent to structures and other areas inaccessible to mobile compaction equipment shall be compacted with suitable power-driven hand tampers or other approved devices. Backfilling shall consist of placing materials in horizontal, uniform layers brought up uniformly on all sides of the structure. **THE THICKNESS OF EACH LAYER OF BACKFILL SHALL NOT EXCEED SIX (6) INCHES BEFORE COMPACTING TO THE REQUIRED DENSITY.**

Backfill material shall not be deposited against the back of concrete abutments, concrete retaining walls, or the outside of cast-in-place concrete structures until the concrete has developed a strength of not less than eighty (80) percent of the required design strength. Backfill placed within two (2) feet of any structure shall be placed evenly on all sides to avoid unequal lateral pressures.

Compaction equipment or methods that produce horizontal or vertical earth pressures which may cause excessive displacement or may damage structures, shall not be used.

Unless otherwise shown on the approved plans or directed by the DPW Director or designee, all sheeting and bracing used for structure excavation shall be removed by the Contractor prior to backfilling.

The moisture content of the backfill material shall be carefully controlled. Excessive use of moisture that results in pumping, deflecting, or otherwise unstable material shall not be allowed, and all such material shall be removed and reprocessed or replaced. Dry, rocky, or otherwise poorly processed material shall also be rejected and replaced/reprocessed at the Contractor's expense. Compaction shall not be performed or subsequent lifts placed until the backfill material has been properly processed and moisture-conditioned in accordance with these CONSTRUCTION STANDARDS & SPECIFICATIONS.

In the event that suitable backfill material is not available on the site, the Contractor shall import Class 1 structure backfill materials as defined in Section 340.01 Definitions of these CONSTRUCTION STANDARDS & SPECIFICATIONS, or other material approved by the project Soils Engineer and the DPW Director or designee. The Contractor shall not be required to excavate below the depths of excavation indicated on the approved plans to provide structure backfill material.

Where pipe is connected to a structure to be backfilled, bedding and backfilling procedures shall comply with Section 353.00 Bedding for Pipelines and Service Lines and Section 354.00 Backfill for Pipelines and Service Lines of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

The Contractor shall uniformly process, maintain proper moisture in, and properly compact each lift throughout the backfilling process. All testing shall comply with Section 355.00 Compaction Testing of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

Structure backfill shall be compacted in conformance with the Moisture and Density Requirements for Embankment Materials table in Section 341.02 Embankment Material of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

Areas deficient in degree of moisture or compaction shall be reprocessed and recompacted at the Contractor's expense

350.00 TRENCHING, BACKFILLING AND COMPACTING

This work shall consist of furnishing all labor, materials, tools and equipment for trenching, bedding, backfill and compaction for all underground utilities (inclusive of "dry" utility trenches located under roadways or within roadway R.O.W. or dedicated easement) as specified herein and shown on the approved plans. The excavation shall be made to lines and grades shown on the approved plans and as established by the DPW Director or designee. Except where shown otherwise on the approved plans and except where the DPW Director or designee gives written permission to do otherwise, all trench excavation shall be made by open cut to the depth required to construct the pipelines as shown on the approved plans. All excavation shall be 'unclassified', as defined in Section 340.01 Definitions of these CONSTRUCTION STANDARDS & SPECIFICATIONS. All trenching shall be performed in accordance with all Occupational Safety and Health Administration (OSHA) requirements. These regulations are described in Subpart P, Part 1926 of the Code of Federal Regulations.

All excavated material which meets the requirements for backfill materials shall be stockpiled in a manner which shall not contaminate the excavated material, and shall be located a sufficient distance from the trench to avoid overloading, to avoid obstructing sidewalks, driveways, or streets, and to provide the least possible interference with traffic.

350.01 Special Conditions

A. Subsurface Investigation - Prior to the connection of any planned utility line to an existing line, the Contractor shall expose the existing utility at the points of connection in order to verify the elevations and materials of construction. The DPW Director or designee shall be notified a minimum of two (2) working days before such an investigation is performed. The Contractor shall also expose utilities as they cross each other to allow for verification of elevation and materials of construction. The DPW Director or designee shall evaluate this information and provide revisions, if required, within three (3) working days of the completion of the investigation.

B. Underground Wire, Cable, Fiber Optic, or Similar Lines - Where underground wire, cable, fiber optic or similar lines are encountered, they shall be relocated as directed by the telephone service provider and in accordance with their specifications. The Contractor shall coordinate this work with all other phases of construction to avoid further conflicts.

C. Gas and Electric Lines - Where underground gas and electric lines are encountered, they shall be relocated as directed by the gas and electric

service provider and in accordance with their specifications. The Contractor shall coordinate this work with all other phases of construction to avoid further conflicts.

350.02 Removal of Water

The Contractor shall provide and maintain adequate equipment to properly remove and dispose of all surface or ground water that enters the trench. Water shall be disposed of without damage to adjacent property and without being a nuisance to public health and convenience. The use of any sanitary sewer to dispose of trench water shall not be allowed. The trench shall be dry at all times during pipe installation. Dewatering shall be accomplished by well points, sumping or any other method approved by the DPW Director or designee.

351.00 Trench Excavation for Roadways

When excavating in concrete or asphalt areas, the limits of the trench shall be string lined and the surface cut in a vertical plane by sawing, cutting wheel or jack-hammering. If the vertical edges of a trench in a roadway ravel during construction, they shall be trued to a vertical plane to a point twelve (12) inches outside the limits of excavation prior to milling and placing the resurfacing material, in accordance with the Detail Drawings.

Surface materials such as concrete and asphalt shall be disposed of independently of the underlying soil. Suitable, non-contaminated base course and gravels shall be salvaged to be stockpiled, protected from contamination, and reused as suitable material for backfill.

Unsuitable materials shall be disposed of by the Contractor in accordance with Section 320.01 Disposal of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

352.00 Trench Excavation for Pipelines and Service Lines

The width of the trench shall comply with the requirements set forth in these CONSTRUCTION STANDARDS & SPECIFICATIONS and shall be sufficient to allow pipe to be installed and backfill placed and compacted. The allowable trench width, regardless of the type of soil encountered, the depth of excavation or method of bedding densification, shall not exceed the outside diameter of the pipe barrel plus twenty-four (24) inches, or be less than the outside diameter of the pipe barrel plus twelve (12) inches when measured at any point below the top of the pipe bell, flange or collar.

Where the width of the lower portion of the trench exceeds the maximum width herein stated, the Contractor shall furnish and install special pipe embedment or concrete encasement to protect the pipe from the additional loading. The type and quantities of special pipe embedment shall be determined by the pipe supplier, using trench loading criteria based upon saturated backfill weighing one-hundred twenty (120) pounds per cubic foot and allowance for other superimposed live loads.

352.01 Preparation of Foundation for Pipe Laying

When the excavation is in firm earth, care shall be taken to avoid excavation below the established grade plus the required specified overdepth to accommodate the pipe bedding material.

In case soft or otherwise unsuitable foundation material is encountered in the bottom of the trench, the project Soils Engineer and/or the DPW Director or designee may require removal and replacement with stabilization material to provide a suitable foundation for the pipe. If the trench bottom is wet, the project Soils Engineer shall determine whether it is stable. The bottom of sumps utilized for dewatering shall be two (2) inches minimum below the bottom of the trench excavation to prevent the upward flow of water into the excavation, which may result in unstable bottom conditions.

353.00 Bedding for Pipelines and Service Lines

All pipe shall be installed with sufficient bedding material to provide a minimum of six (6) inches of separation between the subsoil and the barrel of the pipe and shall extend to spring line. The bedding material shall be tamped under the haunches for the full length of the pipe barrel to ensure support for entire length of pipe. The pipe barrel shall be uniformly supported along the entire length of the pipe.

Bedding material for all PVC, HDPE, CPP and DIP ("flexible pipe") shall be material that complies with the gradation of "Fine Aggregate" as specified in Section 703.02 of the CDOT *Standard Specifications for Road and Bridge Construction*, well-graded sand or squeegee sand which complies with the following:

WELL GRADED SAND

Sieve size	Total Percent Passing by Weight
3/8 INCH	100
No. 4	70 - 100
No. 8	36 - 93
No. 16	20 - 80
No. 30	8 – 65
No. 50	2 – 30
No. 100	1 – 10
No. 200	0 – 3

SQUEEGEE SAND

Sieve size	Total Percent Passing by Weight

3/8 inch	100
No. 200	0-5

Bedding material for all RCP ("rigid pipe") shall consist of materials that meet the gradation of "No. 67 Coarse Aggregate" as specified in Section 703.02 of the CDOT *Standard Specifications for Road and Bridge Construction*

Bedding material shall be placed to a depth of twelve (12) inches above the barrel section of all "flexible pipe" and shall be carefully tamped into place. All other pipe, unless otherwise noted, shall be bedded to spring line. Pipe shall be installed in accordance with these CONSTRUCTION STANDARDS & SPECIFICATIONS.

Bedding for underdrain pipe or gravel for underdrain without pipe shall be well-graded washed rock ranging in size from one-half (½) inch minimum to one (1) inch maximum.

353.01 Bedding Compaction

All bedding material and suitable material placed to twelve (12) inches above the top of the pipe shall be carefully compacted to at least seventy (70) percent of maximum relative density in accordance with ASTM D4253 and 4254.

354.00 Backfill for Pipelines and Service Lines

Suitable backfill shall be as defined in Section 340.01 Definitions of these CONSTRUCTION STANDARDS & SPECIFICATIONS. Clay and similar material with a liquid index in excess of thirty-five (35) and a plasticity index in excess of six (6), as determined in accordance with AASHTO T89 and T90, shall not be considered suitable for backfilling in trenches located in improved streets, roads, highways and thoroughfares, unless approved by the DPW Director or designee / .

When the excavated material is unsuitable for compaction, import material shall be approved by the project Soils Engineer and the DPW Director or designee prior to placement.

Refer to Section 822.02 Controlled Low Strength Materials (CLSM) of these CONSTRUCTION STANDARDS & SPECIFICATIONS for requirements of structure backfill ("Flowable Fill") used to backfill pipeline and service line trenches.

Materials used above the subgrade level shall comply with the requirements for sub-base and base course materials as defined in Section 600 Hot Bituminous Pavement (Asphalt) Mix Design and Construction of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

Bracing installed to prevent cave-ins shall be withdrawn in a manner that shall maintain the desired support during the backfill operations. Driven sheet pilings shall be cut off at or above the top of pipe, and the portion below the cut-off line shall be left in the ground.

354.01 Backfill Compaction

Trench backfill shall be placed in loose six (6) inch lifts, processed and moisture-conditioned, and each lift thoroughly consolidated by tamping, vibrating, or a combination thereof, until the moisture content and the relative compaction complies with the values shown in the Moisture and Density Requirements for Embankment Materials table in Section 341.02 Embankment Material of these CONSTRUCTION STANDARDS & SPECIFICATIONS for the various soil classifications and relative compaction.

For new landscape areas with trees, compaction shall be between eighty-five (85) and ninety (90) percent of the maximum Standard Proctor dry density in the top two (2) feet of soils below finished grade. Where sidewalk or concrete trail will be constructed, soils shall be scarified, moisture treated and recompacted two (2) feet wider than the footprint of the sidewalk or trail until the moisture content and the relative compaction complies with the values shown in the

Moisture and Density Requirements for Embankment Materials table in Section 341.02.01 Embankments Twelve (12) Feet or Less in Depth of these CONSTRUCTION STANDARDS & SPECIFICATIONS.
Backfill of utilities, pipes, culverts, or other miscellaneous structures located in areas that will not have a hard surface shall be placed in six (6) inch lifts at ninety (90) percent of the maximum Standard Proctor dry density and within two (2) percent of the optimum moisture content. All other requirements for particle size and processing shall be met.

Processing, moisture-conditioning, and compaction shall be performed with equipment that is suitable for the specific field conditions. The equipment used shall be sufficient to obtain uniform processing, uniform moisture-conditioning, and uniform compaction throughout each lift of material placed. Vertical structures or other small, tight areas shall be compacted by hand or by equipment small enough to provide compaction within three (3) inches of the structure (or in between dual utility lines). Use of CLSM may be approved by the DPW Director or designee for such areas. It is the responsibility of the contractor to protect the installed pipe from damage resulting from compactive efforts. In no case shall soil compaction operations be performed within eighteen (18) inches (vertically) of rigid pipe or within twenty-four (24) inches (vertically) of flexible pipe; however, the material placed within this zone shall comply with the requirements of these CONSTRUCTION STANDARDS & SPECIFICATIONS. Flooding or jetting of trenches shall not be allowed without written approval from the DPW Director or designee.

355.00 Compaction Testing

Compaction testing shall be performed at a minimum frequency of one (1) test for every one thousand (1,000) yds and no less than two (2) tests per day for embankment fill materials.

Compaction testing shall be performed at a minimum frequency of (1) test per two hundred (200) yds3 of backfill material or at least one (1) test per two-hundred and fifty (250) lineal feet per lift, whichever controls. Sand cone testing or other means of verifying nuclear moisture and density test results shall also be performed.

Testing shall be performed at various depths and locations, and at all vertical structures. The project Soils Engineer and/or the DPW Director or designee may require additional testing around structures, manholes, valve boxes, etc.

Field test results shall be submitted to the DPW Director or designee within twenty-four (24) hours of the test or on the next working day. In no case shall fill or backfill be placed on materials that did not pass moisture and density testing.

Moisture and density testing shall be performed by a qualified technician who works under the direct supervision of a Colorado Registered Professional Engineer. Final soil compaction reports shall be prepared and signed by a Colorado Registered Professional Engineer, and who is qualified to prepare such reports. Reports shall be submitted to the DPW Director or designee within one (1) week of the test.

360.00 ROADWAY EXCAVATION, BACKFILL AND COMPACTION

Prior to placement of street subgrade, base, paving and concrete materials, utilities shall be installed, utility service lines shall be stubbed to the edge of the R.O.W., and all trenches shall be backfilled and properly compacted.

Roadway excavation shall be in accordance with ‘unclassified excavation’ as defined in Section 340.01 Definitions of these CONSTRUCTION STANDARDS & SPECIFICATIONS, except for areas of ‘rock excavation’, as defined in the same Section. Material and excavation for the roadway backfill shall comply with Section 341.02 Embankment Material of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

All roadway backfill shall be compacted to densities and moisture contents shown in the following table, unless otherwise required by the project Soils Engineer and the DPW Director or designee:

Soil Classification AASHTO M145	Relative Compaction By Standard Proctor ASTM D698 or AASHTO T99 (percent compaction)	Relative Compaction By Modified Proctor ASTM D1557 or AASHTO T180 (percent compaction)	Moisture Content Range (with respect to Optimum)
A-1, A-2, A-3	-	95	-2 to +2 (based on AASHTO T180)
A-4, A-6, A-7	95	-	-1 to +3 (based on AASHTO T99)

Prior to placement and compaction of roadway fill, all existing rubble and organic material shall be removed down to existing 'suitable material', as defined in Section 340.01 Definitions of these CONSTRUCTION STANDARDS & SPECIFICATIONS. The existing suitable material shall then be scarified, and roadway fill placed in accordance with Section 341.01 Preparation of Embankment Subgrade of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

361.00 Subgrade

Refer to Section 350.00 TRENCHING, BACKFILLING AND COMPACTING and Section 360.00 ROADWAY EXCAVATION, BACKFILL AND COMPACTION of these CONSTRUCTION STANDARDS & SPECIFICATIONS for backfill of concrete flatwork and structures.

Refer to Section 934.00 Construction of Pavement Sections of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

Subgrade and subgrade treatments described herein shall consist of soils directly under pavements and concrete curb or sidewalk and shall conform to the lines, grades, and cross-sections shown on the approved plans. All work shall be observed and tested by the project Soils Engineer or representative.

The construction of subgrade shall consist of preparing the approved subgrade material to form a firm, stable foundation.

Each layer of material shall be placed and spread so that after compaction it shall conform to the width and crown of the typical cross-sections.

Soft and yielding material and portions of the subgrade which show deflection shall be scarified and recompacted or removed and replaced with base course or other material approved by the project Soils Engineer and the DPW Director or designee and compacted as specified herein.

The wetting of subgrade layers shall be done with sprinkling equipment of a type that ensures uniform and controlled distribution of the water. All wetting shall be done by uniformly sprinkling each layer of material being placed with only the amount of water needed to obtain maximum density of the material.

Concurrently with the wetting operations, the material shall be uniformly compacted by rolling. Rolling equipment shall consist of one or more of the following: rubber-tired roller, sheepsfoot roller and flat wheel steel roller.

After excavation and embankment construction are complete and the subgrade brought to final grade, it shall be rolled with a rubber-tired roller which is a minimum size of eight (8) to twelve (12) tons and other compaction equipment as required to bring the subgrade to the density and moisture content shown in the following table, unless otherwise required by the project Soils Engineer and the DPW Director or designee / :

Soil Classification AASHTO M145	**Relative Compaction By Standard Proctor ASTM D698 or AASHTO T99 (percent compaction)**	**Relative Compaction By Modified Proctor ASTM D1557 or AASHTO T180 (percent compaction)**	**Moisture Content Range (with respect to Optimum)**
A-1, A-2, A-3	100	-	-2 to +2 (based on AASHTO T180)
A-4, A-6, A-7	95	-	-1 to +3 (based on AASHTO T99)

No concrete or asphalt pavement, subgrade or base course shall be placed on unsuitable material.

361.01 Over-Excavation for Expansive Soils

An Over-Excavation Permit shall be required in accordance with Section 151.00 Public/Private Improvement Permit (PPIP), Grading Permit and Over-Excavation Permit of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

Soils with a Plasticity Index (P.I.) over ten (10) and less than thirty (30) shall be over-excavated and recompacted to ninety-five (95) percent of maximum Standard Proctor dry density as determined by ASTM D698 or AASHTO T99. The moisture content shall be maintained between the optimum moisture content and three (3) percent over the optimum moisture content (+3%). There shall be a minimum of twelve (12) inches of soil stabilization below the pavement section included as part of the depth of treatment, and the total depth of treatment shall be in accordance with the approved pavement design.

Soils with a P.I. of thirty (30) or greater may require moisture treatment followed by pozzolan treatment (lime, cement, fly ash, kiln dust) or other subgrade stabilization method approved by the DPW Director or designee. Refer to the Minimum Over-Excavation Requirements table below. Stabilized subgrade shall extend to the back of the sidewalk for streets with attached sidewalks, and to one foot (1') behind the back of the curb for streets with detached sidewalks.

The DPW Director or designee may waive the pozzolan treatment requirement for onsite soils that have P.I.'s of thirty (30) or greater when the following conditions exist:

- The soils have a moisture content between the optimum moisture content and three (3) percent over the optimum moisture content (+3%);
- The soils have a maximum Standard Proctor dry density of at least ninety-five (95) percent, and
- The soils exhibit a swell potential of less than two (2) percent as determined under a two hundred (200) psf surcharge.

In lieu of subgrade stabilization, a composite section designed by a Colorado Registered Professional Engineer and consisting of at least twelve (12) inches of base course may be approved by the DPW Director or designee.

Unless otherwise recommended by the project Soils Engineer and approved by the DPW Director or designee, the following minimum over-excavation requirements shall apply for expansive soils:

Minimum Over-Excavation Requirements

PLASTICITY INDEX	DEPTH OF TREATMENT	
	Local and Collector Streets	Arterials
10-29	1 foot	2 feet
30-40	2 feet	3 feet
> 40	4 feet	4 feet

361.02 Base Course (For Composite Sections)

361.02.01 Materials

Base course subgrade shall consist of a foundation course composed of crushed gravel, recycled concrete or crushed stone and filler, constructed on the prepared subgrade. Material composed of uniform size particles, or which contains pockets of excessively fine or excessively coarse material, shall not be approved for use. Materials and construction shall be in accordance with the requirements of Section 304 of the CDOT *Standard Specifications for Road and Bridge Construction.* Gradation shall be Class 5 (1½" maximum) or Class 6 (¾" maximum), in accordance with Table 703-2 of CDOT *Standard Specifications for Road and Bridge Construction.*

361.02.02 Construction

All work shall be observed and tested by the project Soils Engineer or representative. The base course material, aggregate base or recycled concrete, shall be placed on the previously prepared subgrade at the locations and in the proper quantities to conform to the cross-sections shown on the approved plans and as directed by the DPW Director or designee. Geotextile fabric shall be installed if required on the approved plans. Placing and spreading shall be done by means of a spreader machine, moving vehicle, motor grader, or by other approved equipment methods. The material shall be placed without segregation. Any segregated areas shall be removed and replaced with uniformly graded material at the Contractor's expense.

The thickness of each base course layer shall not exceed six (6) inches before compaction. If the required depth exceeds six (6) inches, and is less than twelve (12) inches, material shall be placed in two (2) or more lifts of approximate equal thickness. If uniform density cannot be obtained by six (6) inch lifts, the maximum lift thickness shall not exceed four (4) inches.

Base course material shall not be placed on a dry or dusty soil foundation which could cause rapid dissipation of moisture from the base course material and hinder or preclude proper compaction.

Excessively dry soil foundations shall have water applied to them and shall be reprocessed and recompacted. If, at any time, the subgrade construction is subjected to rain, snow or other significant events, the project Soils Engineer shall evaluate the affected areas prior to continuing with subgrade preparation and shall make a recommendation to the Contractor and to Elbert County.

Rolling shall be continuous until the base course material has been compacted thoroughly in accordance with Section 304 of the CDOT *Standard Specifications for Road and Bridge Construction*. Water shall be uniformly applied during compaction to obtain the specified moisture content and to aid in consolidation. The surface of each layer shall be uniformly maintained during compaction operations.

The prepared base course surface shall be smooth and free of ruts and irregularities and shall be true to line and grade shown on the approved plans and as directed by the DPW Director or designee. The base course shall be maintained in this condition by watering, drying, rolling, and/or blading until the asphalt or concrete flatwork is placed. The surface tolerance of the base course shall be in accordance with Section 301.04 of the CDOT *Standard Specifications for Road and Bridge Construction.*

361.03 Lime-Treated Subgrade

When required, lime treated subgrade shall comply with Section 307 of the CDOT *Standard Specifications for Road and Bridge Construction*. Lime-treated subgrade shall extend to the back of the sidewalk for streets with attached sidewalks, and one (1) foot behind the back of the curb for streets with detached sidewalks, as shown in the Detail Drawings.

Alternative methods of soil stabilization may be allowed with approval of the DPW Director or designee. Soil mix design procedures shall comply with the CDOT *Standard Specifications for Road and Bridge Construction*.

Sulfate testing shall be performed on streets to have lime-treated subgrade. The initial sampling and testing frequency shall be every five hundred (500) feet per lane. Each sample shall consist of soils evenly distributed in the top twenty-four (24) inches of the subgrade to be lime-treated. Where sulfates greater than 0.03 ppm or 0.003% by volume are discovered, additional sampling and testing within a one hundred (100) foot radius of the "hot" soils shall be performed. Testing shall occur until the areas with sulfates greater than 0.03 ppm are isolated and removed.

361.04 Proof-Roll Observation and Testing

Proof-roll observation and testing (proof-rolling) may be required to determine whether certain areas of subgrade meet compaction requirements. Where required by the DPW Director or designee, proof-rolling shall be performed as designated with a water truck loaded to a minimum of 36,000 lb. Tires shall be inflated to a minimum of seventy (70) pounds per square inch and a maximum pressure of ninety (90) pounds per square inch. Air pressure in the tires shall be maintained within a tolerance of five (5) pounds per square inch.

Within the twenty-four (24) hour time period prior to paving, subgrade compaction testing and proof -rolling with a water truck shall be required.

After passing compaction tests, the Contractor and/or Owner's representative shall proof-roll the areas. No proof-roll inspections shall be performed until all underground utility testing is complete. Subgrade areas failing compaction testing or proof-rolling shall be delineated and reprocessed and/or removed and replaced in a manner approved by the project Soils Engineer and the DPW Director or designee. Such procedures may include over-excavation, scarification, moisture-conditioning, recompaction, and/or replacement with suitable materials that comply with the moisture and density requirements. In addition to complying with moisture and density requirements, all subgrade materials shall exhibit stability during proof-rolling. Additional compaction testing and proof-rolling may be required at the discretion of the DPW Director or designee or his designee. All proof-rolling operations shall be at the Contractor's expense.

370.00 RESTORATION AND CLEAN UP

At all times during construction, the Contractor shall maintain the site, including partially finished structures, material stockpiles and other like areas, in a reasonable state of order and cleanliness.

The grade and condition of all unsurfaced areas shall be restored to a condition equal to or better than the grade and condition immediately prior to construction, unless otherwise shown in the approved plans and approved by Elbert County. The Contractor shall restore or replace all seeded areas, sod, trees, landscaping materials, landscape irrigation systems, fences, and any other items, to a condition equal to or better than before the work began and to the satisfaction of the DPW Director or designee. All grassed areas shall be reseeded or resodded in accordance with Section 1000 LANDSCAPING STANDARDS FOR DEVELOPMENT PROJECTS of these CONSTRUCTION STANDARDS & SPECIFICATIONS, and the Contractor shall be responsible for maintaining these areas until substantial growth occurs and Construction Acceptance. Refer to Section 200 ACCEPTANCE PROCEDURES of these CONSTRUCTION STANDARDS & SPECIFICATIONS.

All pavement and concrete flatwork shall be restored or replaced to a condition equal to or better than before the work began and to the satisfaction of the DPW Director or designee.

In the event of failure of the Developer or Contractor to complete work, correct deficiencies, or clean up a project site in a reasonable time period, Elbert County has the right to draw upon the performance guarantee, as specified in the Subdivision Improvement Agreement.