

## **APPENDIX K ROAD CUT, TRENCHING AND RESTORATION**

### **K.1 ROAD CUTS**

#### **K.1.1 General**

Placement or repair of subsurface facilities (utilities, culverts, or foundations) within the County roadways shall follow the requirements outlined in the Chapters 3 and 4 and this Appendix. Modifications to these Standards require written approval from the ECM Administrator before beginning work. Emergency repairs for broken pipes, cables etc. is allowed on a case-by-case basis and requires immediate notification of the ECM Administrator. Applicable Trench Notes are provided in Section K.2.

#### **K.1.2 Pavement Cutting**

##### **A. No Cuts Permitted**

No pavement cuts will be permitted in pavements less than three years old. In the event that a pavement cut is allowed through an approved deviation, restoration requirements may be more extensive than for older pavements. If the a permit holder makes a cut into a pavement less than three years old, which is not an emergency cut, the permit holder shall be liable for restoring the roadway to the satisfaction of ECM Administrator at the permit holder's expense.

##### **B. Boring May be Required**

Boring may be required for pipelines to cross roads, instead of trenching, as directed by the ECM Administrator. If sufficient right-of-way exists, the length of the bore shall extend a minimum of 4 feet from edge of pavement. Unused holes or abandoned casings shall be backfilled. Water boring under roadways shall not be permitted. Existing carriers and conduit installed under a roadway shall be physically located prior to boring.

##### **C. Pavement Cut Standards**

Pavement shall be cut so the joint line between existing and replacement pavement is straight and neat (i.e., within 5° of vertical and free from horizontal irregularities). All cuts shall be by saw or blade. The cut shall be full depth to allow the pavement to be removed without damage to the remaining pavement. The minimum allowable remaining pavement sections shall not be less than four feet (4') (not including the curb and gutter or concrete pavement) unless it is part of monolithic concrete pavement section that shall be full panel (per existing control joint).

##### **D. Removal and Disposal of Pavement**

Removed pavement shall be hauled away and disposed of in a proper manner (recycle or waste facility).

**E. Base Course Storage and Reuse**

Base course material may be removed and stockpiled off of the road surface area for reuse during backfilling if it meets specifications. If not, it is to be hauled away from the right-of-way and disposed of in a proper manner.

**F. Subbase Material Storage and Reuse**

Sub-base material may be stockpiled parallel to the trench alignment; in such a manner that encroachment upon the non-disturbed portion of the roadway and pedestrian walkways is kept to a minimum. The storage of materials on the non-disturbed portion of the roadway shall not be allowed unless identified in the traffic control plan with appropriate protective measures. Unsuitable material is to be hauled away from the right-of-way, disposed of in a proper manner and replaced with select backfill.

**G. Storage of Construction Materials in Right-of-Way**

The temporary storage of construction material in the public right-of-way in connection with utility projects is permitted. Material storage shall meet the requirements outlined by the ECM Administrator. Parking of construction or personal vehicles on roadways shall be kept to a minimum.

**H. Safety Standards**

Safety standards relating to the shoring and stabilization of trench sidewalls should be maintained as prescribed by appropriate safety regulatory agencies (OSHA, State of Colorado). All barricades shall comply with Manual of Uniform Traffic Control Devices (MUTCD).

**I. Length of Open Trench Limited**

Trenches shall not be opened for a distance of more than one hundred (100) feet at any one time, unless specifically authorized by the ECM Administrator.

**J. Trench Width and Pavement Cut**

The trench width shall be confined to those minimum dimensions, which will permit proper installation and acceptable pipe loading, as established by current acceptable engineering practices and all OSHA requirements. In no case shall the trench width be less than equal to the diameter of the pipe plus a minimum of 12 inches on each side to ensure adequate compaction by mechanical means.

All asphalt pavement cuts shall be a minimum of 12 inches in each lateral dimension beyond edge of trench and full panel replacement on all concrete or curb and gutter cuts.

**K. Open Condition and Traffic Warnings**

No road cuts should be left in an open condition overnight, except for the portion necessary to commence work the following morning. Warning signs, barricades and lights, all in conformance with the MUTCD, shall be used in areas where trenching operations are in public roadways. All work shall have flashing lights

used with warning signs and barricades. All barricades, signs and warning devices shall be installed in accordance with the MUTCD.

**L. Trenching Across the Road and Traffic**

When trenching across the road, no more than one-half (1/2) of the roadway is to be closed to traffic at one time. A traffic signal or flaggers as required by MUTCD shall be provided. The trenched roadway shall be completely backfilled and paved before trenching the other half of the road.

**M. Road Closure**

Closure of any road, approach, or other access points shall be approved by the ECM Administrator. Upon trenching across facilities, steel running plates, planks or other safe methods shall be used to provide for traffic to enter or leave the road or adjacent property.

**N. Driveways Closures**

The use of driveways to adjacent properties shall be respected by the permit holder. Every effort shall be made minimize closures and to open and make serviceable those driveways that are closed in the shortest time possible. If closure of driveways is anticipated, the permit holder performing the work shall notify the owners in advance of closure and shall notify the owners of the anticipated time and period of closure. When open, safe access to private driveways shall be provided.

**O. Notice Before Beginning Work**

The ECM Administrator, applicable policing authority and emergency companies shall be informed by the permit holder at least 48 hours in advance of beginning work in the public right-of-way.

**P. Accidents**

If traffic accidents or pedestrian incidents occur due to installations or obstructions placed in the right-of-way, the occurrence must immediately be reported to the ECM Administrator and the applicable policing authority by the permit holder.

**Q. Access to Fire Hydrants**

Safe access must be maintained at all times to fire hydrants.

**R. Restoration of Property**

The permit holder shall take precautions to limit the removal of or damage to existing pavements, sidewalks, curbs, lawns, shrubbery, trees, hedges, walls, fences, buildings, other existing improvements, existing survey monumentation, pavement markings, and signage in the County right-of-way or easement areas to the least practicable amounts and shall replace or restore improvements to their original location and condition after the excavation has been backfilled and compacted.

**S. Private Easement Conditions**

The permit holder is responsible for understanding and complying with all specific conditions contained in private easements.

**T. Inspection Costs**

All inspection costs shall be borne by the permit holder.

**U. Notice of Completed Work**

The permit holder shall notify the ECM Administrator in writing upon completion of work accomplished under the provisions of the permit.

**K.1.3 Backfilling**

**A. General**

Once the subsurface facility has been installed or repaired, backfill material shall be placed in accordance with these Standards.

**B. Backfilling Requirements**

**1. Preparation of Trench**

The bottom of the trench shall be prepared to provide a firm foundation for the facility in accordance with the bedding conditions specified by the Geotechnical Engineer for the type of facility to be installed. The subgrade of the trench shall be kept free of standing water. Where the trench subgrade material is found to be unsuitable and does not afford a solid foundation, the permit holder shall excavate to depth as necessary to construct a stable foundation. A stable foundation shall be constructed by placing crushed rock or other approved granular material to support the installed facility.

**2. No Deformation or Damage to Facility**

The facility, including backfill, shall be installed in a manner that ensures no deformation, displacement or damage to the facility likely to cause leakage or degradation to the structural integrity of the roadway.

**3. Trench Backfill**

The facility being placed will be properly bedded to at least one foot above the pipe with furnished sand or selected sandy soil free of humus, vegetable or other organic matter, frozen material, clods, sticks and debris. In addition, rock particles and hard earth clods larger than 3 inches will be removed. After the improvements are bedded, the previously removed and stockpiled material shall be replaced and properly compacted to an elevation which facilitates placing pavement. No fill material with a liquid limit greater than 40 and plasticity index greater than 20 percent shall be used within the top two feet of the trench without implementing proper mitigation techniques.

#### **4. Compaction Tests**

Compaction tests must be performed daily by a Geotechnical Engineer and shall be performed at a minimum of every 250 feet (250') or portion thereof along the trench and every 12 inches in elevation. Testing intervals may be increased at the discretion of the ECM Administrator.

#### **5. Compaction**

The subgrade shall conform to the lines, grades and cross-sections as shown on the approved plans. The backfill material shall be compacted in successive layers not to exceed eight inches (8") thick and shall be finished and maintained in a smooth compacted condition. The completed surface shall be free from rutting or other objectionable irregularities.

Within the roadway area, trench compaction shall be in accordance with the following, depending on the site conditions:

- Depths up to 15 feet and clay soils - 95 percent of maximum Standard Proctor dry density at moisture contents within 2 percent of optimum (ASTM D698 or AASHTO T99)
- Depths up to 15 feet and granular (sand) soils - 92 percent of maximum Modified Proctor dry density at moisture contents within 2 percent of optimum (ASTM D1557 or AASHTO T180)
- Depths over 15 feet and clay soils - 98 percent of maximum Standard Proctor dry density at moisture contents within 2 percent of optimum (ASTM D698 or AASHTO T99)
- Depths over 15 feet and granular (sand) soils - 95 percent of maximum Modified Proctor dry density at moisture contents within 2 percent of optimum (ASTM D1557 or AASHTO T180)

### **K.1.4 Subbase Preparation**

#### **A. General**

The term "subbase", for the purpose of trench backfill discussion shall refer to the CDOT Class 1 or Class 2 material that is part of a structural pavement design. There may or may not be a subbase in the pavement section. If there is none, the base course shall all CDOT Class 6.

#### **B. Subbase Placement Procedures**

##### **1. Subbase Grade and Cross Sections**

Subbase material shall conform to the lines, grades, cross sections and thickness shown on the approved plans and shall be finished and maintained in an acceptable condition at least one day's progress in advance of base construction.

**2. Subbase Material**

Subbase material shall be well mixed, free of organic matter and lumps or balls of clay, and shall consist of sound aggregate particles and suitable filler or binding materials which when placed and compacted will result in a firm, dense, unyielding foundation. Subbase material need not be crushed but may be of the pit run variety providing it is graded within the following limits.

**Table K-1. Gradation of Subbase Material**

Standard Size of Sieve	Percentage of Weight Passing Sieve
2 ½ inch	100
2 inch	95 – 100
#4	30 – 60
#200	5 - 15
Liquid Limit	35 maximum
Plastic Limit	6 maximum

**3. Subbase Placement**

Subbase shall be deposited and spread, without particle segregation in loose layers not to exceed 6 inches (6”) in depth. Each layer shall be thoroughly and individually compacted to 96% proctor (AASHTO T99) density. Wetting or aerating and rolling the material shall be required when ordered by the ECM Administrator. Subbase shall not be placed on soft, spongy, or frozen subgrade or other subgrade, the stability of which, in the opinion of the ECM Administrator, is unsuitable.

**K.1.5 Foundation for Base Course**

**A. General**

Foundation preparation shall be completed to ensure proper slopes, grades, shown of project plans are developed.

**B. Base Course Preparation Requirements**

**1. Base Course Grades and Cross Sections**

Base material shall conform to the lines, grades, cross-sections, and thickness shown on the approved plans and shall be finished and maintained in an acceptable condition at least one day’s progress in advance of placing prime coat.

**2. Base Course Material**

Base material shall consist of hard, durable particles or fragments of stone or gravel crushed to the required size and an AP-filler of sand or other finely divided mineral matter. When produced from gravel, not less

than 60% by weight of the aggregate retained on a No. 4 sieve shall consist of particles having at least one fractured face. Base material shall be free from vegetable matter and lumps or balls of clay and which when placed and compacted will result in a firm, dense, unyielding foundation. Base material shall meet the following grading requirements:

**Table K-2. Gradation Limits for Base Material**

Standard Size of Sieve	Percentage of Weight Passing Sieve
¾ inch	100
#4	0 – 65
#10	25 – 55
#200	3 – 12
Liquid Limit	25 maximum
Plastic Limit	6 maximum

**3. Base Course Placement**

Base material shall be deposited and spread without particle segregation in loose layers not to exceed 6 inches in depth. Each layer shall be thoroughly and individually compacted to 95% proctor (AASHTO T180) density. Wetting or aerating and rolling of the material shall be required as ordered by the ECM Administrator following review of all field test results. No base course shall be placed upon a soft, spongy or frozen subgrade or subbase or other subgrade, the stability of which, in the opinion of the ECM Administrator, is unsuitable.

**4. Material Deviations**

Deviation from the gradation limits may be permitted by the ECM Administrator on unpaved roads provided it can be unequivocally demonstrated that the subbase material is not conducive to rutting, raveling or forming a soft yielding surface in the presence of moisture.

**5. Compaction Equipment**

Compaction equipment must be on the job site before excavation is started. Compaction equipment must be capable of compacting within the trench width limits to avoid bridging the ditch.

**6. Existing Untreated Base Course**

If the existing base course is untreated, it shall normally be replaced with CDOT Class 6 aggregate base material and compacted in layers not to exceed 6 inches. The resulting total compacted base thickness shall be 8 inches or to the thickness of the removed base plus 2 inches. A replacement 2 inch thick asphalt surface wearing course, or matching

existing, whichever is greater, shall also be used when replacing asphalt treated aggregate.

#### **K.1.6 Trench Cover – Subgrade**

##### **A. General**

Trench cover placement shall follow the requirements of these Standards. The objectives are to place the material to lines and grades shown on project plans and ensure the compaction requirements are met.

##### **B. Trench Cover Placement Requirements**

###### **1. Trench Cover Subgrade**

After the backfill has been placed and compacted as specified, it shall be cut and trimmed to the required depth and cross section. Trench cover subgrade shall be free of all rock over 2 ½ inches in size. It shall have a compaction of 95 percent or more, by standard tests at the time of constructing curb, gutter, sidewalk, pavement and/or other permanent trench cover structure.

###### **2. Disposal and Restoration**

All excess excavated material shall be removed and disposed of outside the legal limits of the right-of-way as the work progresses, unless the approval of the ECM Administrator is obtained for disposal of the material within the legal limits of the right-of-way. All parts of the roadway and various structures disturbed shall be restored to a condition equal to or better than that which existed before starting the work.

#### **K.1.7 Trench Cover – Paved Roads**

##### **A. General**

Trench cover placement shall follow the requirements of these Standards. The objectives are to place the material to lines and grades shown on project plans for paved surfaces and ensure the compaction requirements are met.

##### **B. Temporary Trench Cover Requirements**

###### **1. Temporary Cover Required**

All trenches across traffic lanes, where it becomes necessary to remove any existing surfacing or pavement, shall be provided with temporary trench cover.

###### **2. Temporary Patch Materials**

A temporary patch of cold-mix asphalt shall be placed on all pavement surface cuts immediately after backfilling has been completed and shall be removed at the time a permanent patch is made.

Minimum requirements for temporary trench cover shall be well compacted surfacing material conforming to "Road Mixed Asphalt

Surfacing Material” of the CDOT Standard Specifications and shall match the existing asphalt or concrete thickness, or not less than 4 inches thick, whichever is greater. The mineral aggregate shall, with a tolerance of t percent, conform to the grading specified for 3/8-inch maximum aggregate. Bituminous binder to be mixed with the mineral aggregate shall be liquid asphalt, Grade MC-3000 and shall be between 5 ½% and 6% by weight of the dry mineral aggregate.

**3. Material Onsite**

Temporary trench cover surfacing material, other than cold-mix patch, shall be stockpiled on the job site and shall be placed within six hours after completion of trench backfill and compaction.

**4. Temporary Patch Maintenance**

Temporary trench cover shall be properly maintained until permanent trench cover is placed. The surface of the temporary repaving shall be smooth and at the same level as the adjacent undisturbed paved area.

**C. Permanent Trench Cover Requirements**

**1. Asphalt Replacement Depth**

In the areas where the wearing surface is asphalt concrete, replace the pavement with a full depth asphalt paving of a minimum thickness of 4 inches but in all cases to a thickness of the old surface plus base course plus 1 inch.

**2. PCC Replacement Depth**

In areas where the wearing surface is Portland cement concrete, replace the pavement with concrete pavement shall conform to these Standards. Concrete pavement replacement shall be of the same depth as the original pavement, but not less than 6 inches thick on alleys or residential roads, nor less than 8 inches on roads classified as collectives and above.

**3. Other Material Replacement Depth**

In areas where the wearing surface is other than asphalt concrete or Portland cement concrete, replace the pavement and base in kind, or minimum ECM Administrator standards, whichever is greater.

**4. Asphalt Placement**

Where original surface was asphalt concrete, bituminous treatment or mix, or oil mat; Asphalt concrete shall be compacted in layers not to exceed 3 inches to a total compacted thickness of 4 inches or the thickness of the removed pavement plus 1 inch, whichever is greater. On oil mat surfaces or substandard asphalt surfaces, an overlay of Class “EX” asphalt pavement 1 ½ inches thick shall be placed across the entire

traffic lane disturbed by the trench and shall be finished as set forth below.

- Immediately prior to placing the wearing surface, the abutting pavement edges shall be neatly cut.
- The existing pavement shall be cleaned, removing all loose material and coated with hot liquid asphalt (Grade AC-10) or asphalt emulsion applied cold (Grade CSS-1h) to ensure a bond with the new asphalt surfacing.
- The restored pavement shall be finished to a smooth riding surface and to the grade of the surrounding undisturbed pavement.
- Pavement replacement shall commence not more than 7 working days after backfilling, unless approved by the ECM Administrator.

**5. Trench Edges in the Wheel Travel Portion of Roadway**

In the event the trench edges fall in the wheel traveling portion of a traffic lane, existing or proposed, the applicant shall extend the finish surface paving to a point deemed satisfactory by the ECM Administrator. Finish surface paving shall be performed to provide a crown slope equal to that existing prior to excavation, with no ponding of run-off surface water either over the trench or at the joints between the new and original surfaces.

**6. Cuts Impacting More than One Traffic Lane**

When road surface damage involves more than one traffic lane, a full width paving lift may be required. Individual jobs may require negotiations with the ECM Administrator for partial participation in the cost of a full width overlay.

**K.1.8 Repair to Gravel Roads and Shoulder**

**A. General**

The repair of disturbed gravel surfaces shall be completed in accordance with these Standards. Placement of the gravel shall be done to ensure a smooth surface is developed and proper compaction is achieved.

**B. Restoration of Unpaved Areas**

**1. Material and Placement**

Where the original surface was crushed rock or gravel for the wearing surface and foundation material, Class 6 aggregate base course shall be used as replacement material. It shall be placed to a compacted thickness minimum of 8 inches or the thickness of the removed material plus 2 inches, whichever is greater.

**2. Backfill**

In the area from the right-of-way line (fence line/property line) to a point 5 feet outside of the roadside ditch flowline, all trenches shall be backfilled with excavated material and compacted to 90% standard compaction, or to the density of the existing ground, whichever is greater.

In all other areas, including the gravel road, the shoulders and the roadside ditch to a point 5 feet outside of the flowline; all trench compaction shall be completed to a minimum of 90% standard compaction.

**3. Erosion Protection**

During construction and after the trench is backfilled and compacted, erosion protection shall be provided to minimize sediment transport.

**K.1.9 General Restoration Requirements**

**A. Preservation, Restoration and Cleanup**

**1. Conform to Permit**

Where construction has impacted streams, wetlands, fish and wildlife habitat areas or their buffers, full restoration and mitigation shall be performed as required by permit. Restoration methods shall be in accordance with County codes, provisions of the applicable permit, and these Standards.

**2. Unsatisfactory Restoration**

Unsatisfactory restoration of the right-of-way, as determined by the ECM Administrator, shall be promptly corrected by the permit holder. If necessary, unsatisfactory restoration may be corrected by the County and billed to the permit holder.

**3. Protection of Existing Utilities and Facilities**

Reinforcement, protection and security of existing utilities and facilities under construction are the responsibility of the permit holder. In roadway restoration, the design shall consider the protection of existing utilities without sacrificing the geometrics of roadway design.

**B. Emergency Repairs**

If emergency repairs disturb the right-of-way, the right-of-way shall be restored immediately. Approval of the final restoration of the right-of-way shall be obtained from the ECM Administrator.

**C. Striping Replacement**

All traffic striping and walkway delineation removed during construction shall be replaced. Temporary striping shall be used on a limited basis and only as approved by the ECM Administrator. All permanent striping and channelization shall be installed by County forces at the expense of the permit holder. If County

forces are unavailable to perform the striping installation within an appropriate timeframe, the permit holder shall contract for the striping installation.

#### **D. Final Cleanup**

##### **1. Roadways Swept**

Roadways shall be cleaned and swept both during and after utility work. Disturbed soils shall be final graded, seeded, and mulched after installation of the utility facilities or equipment. In limited areas, seeding and mulching by hand, or sod placement using approved methods, will be acceptable. Ditches lined with erodible soil and subject to rapid flows may require seeding, jute matting, netting, placement of sod, or rock lining to control erosion. Revegetated areas shall be weed free.

##### **2. Siltation**

Any silting of downstream drainage facilities, whether ditches, pipes or catchbasins, which results from the utility installation shall be cleaned out and restored to proper operation as part of the site cleanup.

##### **3. Storm Drainage Facilities**

Any existing storm drainage facilities or roadside features damaged during repair or restoration activities shall be replaced with new materials by the permit holder.

#### **K.1.10 Maintenance Period**

For a period of two years following the backfilling of any trench in the County's right-of-way or the permanent patching of paved surfaces, the permit holder shall be responsible for the condition of the trench backfill, pavement patches, and adjacent revegetation areas. During that time the permit holder shall, at their own cost, upon request from the ECM Administrator, repair to the County's satisfaction any of the patches that become settled, cracked, broken, or otherwise faulty. Settlement of the replaced road surface of 1/2 inch or more within a 6-foot straight edge shall constitute evidence of improperly compacted backfill material. If test results do not meet the standards for compaction as set forth in this specification, the permit holder shall be responsible for repairs or replacement to meet these standards. Settlement of 3/16 inch or greater with a 10-foot straight edge will be cause for repair in the case of settlement or replacement in the case of unsatisfactory workmanship.

#### **K.2 TRENCHING DETAIL NOTES**

- This trench patching detail specifies requirements in addition to those specified in the latest edition of the CDOT's Standard Specifications for Road and Bridge Construction.
- A construction traffic control plan shall be submitted to and approved by ECM Administrator prior to issuance of construction permits in the County right-of-way.
- Trench shall be braced or sheeted as necessary for the safety of the workers and protection of other utilities or structures in accordance with applicable local, state and federal safety regulations.

- The trench width shall be confined to those minimum dimensions, which will permit proper installation and acceptable pipe loading, as established by current local, state and federal safety regulations.
- At the discretion of the ECM Administrator, the pavement may be required to be saw-cut back to maintain a straight edge.
- Backfill compaction requirements: Minimum density will be determined in accordance with AASHTO T99 or T180 as defined by CDOT Standard Specifications Section 203.11 and CDOT 703.03. Except for CLSM.
- Fill depth asphalt can be used as an alternative to base course. A ratio of 3 inches (3") base course to 1 inch (1") of asphalt shall be used in the substitution.
- A temporary cold-mix asphalt patch, 4 inches (4") minimum depth will be required for all road cuts if a permanent hot-mix asphalt patch cannot be applied for any reason, after construction is completed.
- Pavement edges shall be saw-cut straight to within 5 degrees of vertical. Edges shall be tack coated prior to patching.
- If existing road is paved with fabric, a "TEE" trench shall be required. The Contractor shall carefully saw-cut and remove the layer of asphalt above the fabric a minimum of 12" back from the edge of the trench.
- Minimum cover for prefabricated pipe shall be 2 feet (2').
- Changes in design criteria will require compensating change in pipe design.
- When pipe sewer is to be extended or replaced with pipe of different material, the connections shall conform to the detail shown on plans or be approved.
- Spacing for multiple pipe sewer installations shall be ½" inside diameter or span, or 3" maximum.
- Trenches over 5 feet (5') in depth shall be either shared or the trench walls shall be sloped to the angle of repose. If sloped, the bottom of the slope shall be a minimum of 1 foot (1') above the bottom of the slope.
- Shoring will be required when the bottom of the slope is more than 3 feet (3') above the bottom of the trench. Shoring shall extend a minimum of 1 foot (1') above the bottom of the slope.
- Timber Sheeting or shoring may be cut off 1 foot above the top of the pipe after backfilling is complete.
- Refer to the City/County DCM and CDOT "M" Standards.

Appendix K Road Cut, Trenching and Restoration  
Adopted: 1/9/2006  
Revised: 1/1/2008  
REVISION 2  
Section K.1.10-K.1.10