

## **CONSTRUCTION STANDARDS**

Note: The buildings on the UCCS campus are divided into two categories: General Fund and Auxiliaries. General Fund Buildings include academic and administrative functions. Auxiliary buildings include residence halls, athletic, and dining facilities. In some cases, construction standards differ depending on the building category. Confirm building category with Facilities Services Project Manager.

- Utilities
- Trenching, Backfilling and Compacting
- Water Utilities
- Sanitary Sewerage Utilities
- Storm Drainage Utilities
- Gas Utilities
- Electrical Utilities
- Communications Utilities
- Development Fees

### **DIVISION THIRTY-THREE: UTILITIES**

#### **A. TRENCHING, BACKFILLING, COMPACTING**

This section relates to trenching, backfilling and compacting in connection with the construction of underground utilities and appurtenances for work outside of building lines including the following:

- **Water Lines**
  - **Sanitary Sewer Lines**
  - **Storm Sewer Lines**
  - **Natural Gas Systems**
  - **Direct-bury Chilled Water Systems**
  - **Direct-bury Compressed Air Systems**
  - **Direct-bury Electric Lines**
  - **Direct-bury Telephone and Data Lines**
  - **Other Utilities as shown in the Contract Documents**
  - **Utility Tunnels**
1. Requirements of Regulatory Agencies
    - a. Supply, install, and remove all shoring as may be required to comply with all OSHA and EPA safety regulations and to maintain earth banks until backfill is placed.
    - b. Backfilling and construction of fills and embankments during freezing weather shall not be done except by permission of the Project Manager. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials, snow or ice be placed in any backfill, fill, or embankment.
  2. Testing and Inspection
    - a. Conform testing and inspection of backfill to the requirements per Division 31-Earthwork. Make in place density tests at intervals and locations as directed by the Project Manager.
    - b. All tests required for preliminary review of materials shall be made by an acceptable independent testing laboratory at the expense of the Contractor. Two (2) initial gradation

- tests shall be made for each type of pipe bedding, fill or backfill material, and one (1) additional gradation test shall be made for each additional 500 tons of each material. Retests of samples failing initial tests shall be at the expense of the contractor. Initial moisture density (Proctor) tests and relative density tests on the materials, and all in-place field density tests shall be made at the expense of the University.
- c. When excavating during non-operating hours Contractor shall have an established standard procedure in the event of an emergency.
3. Submittals
    - a. Submit a report from a testing laboratory verifying that materials conform to the specified gradations or characteristics.
    - b. Submit method of compaction in pipe zone including removal sequence of shoring where used.
  4. Project Site Conditions
    - a. Protect existing utilities, adjacent property and utility excavations, including hand excavation.
    - b. All projects that involve landscaping and/or utilities will perform a site assessment that will investigate the existing trees and the existing utilities. The site assessment should include size and species of existing trees as well as depth of the existing utilities. The site assessment should be provided to the Project Manager.
    - c. Existing Trees – No construction or maintenance project may perform excavation within the canopy of any existing tree without written consent from the Project Manager.
    - d. New Utilities-Utilities shall be installed in such a way that the utility will not encroach within 5 feet of the future mature tree canopy of any new or existing tree unless mitigation efforts are made. For deep utilities (greater than 15 feet deep), utilities shall be installed in such a way that the utility will not encroach within 10 ft of the mature drip line of any tree.
    - e. In areas where a conflict occurs, mitigation efforts shall be implemented, which may include the use of root barriers or installing a sleeve around the utility in the area where the utility pipe is under the mature tree's canopy.
  5. Sleeving
    - a. Verify all required utility sleeving is installed and properly located and supported prior to backfilling.
  6. Products
    - a. All bedding and backfill material shall have the approval of the Project Manager, and shall be free of frozen material, organic material and debris.
    - b. Bedding materials shall contain no cinders or other material which may cause pipe corrosion.
    - c. Squeegee sand conforming to the gradation for RCP Sewer Pipe may be used as bedding material for other types of pipes, subject to approval by the Project Manager.
    - d. Reuse of on-site material is subject to the Project Managers written approval.
    - e. Earth, loam, sandy clay, sand and gravel, soft shale, or other acceptable materials which are free from organic matter and large clods of earth or stone, may be used for fill. Material shall be moistened as required to facilitate backfilling.
  7. Dewatering
    - a. Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding areas.
    - b. Do not allow water to accumulate in excavations. Remove water to prevent softening of trench bottoms, and soil changes detrimental to stability of subgrades and foundations.

- c. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
  - d. Convey water removed from excavations and rainwater directly to storm sewer lines only.
  - e. Do not use pipe or pipe trench excavations as temporary drainage ditches.
8. Installation of Pipe Bedding
- a. Pipe bedding material shall consist of material as specified above. Bedding material shall be placed to the required elevation of the pipe invert. Tamping equipment shall be used to thoroughly tamp the bedding material. The moisture content of the material shall be within two (2) percent of optimum.
  - b. After bedding material has been placed and has been approved and after the pipe has been installed and approved the granular bedding material shall be installed to an elevation 12 inches above the top of the pipe. The granular bedding material shall be placed and compacted in distinct, separate lifts not to exceed six inches of loose depth; except that the first loose lift shall not be higher than the pipe centerline (springline). Compaction shall meet the above requirements utilizing T-bars or mechanical tamping equipment.
  - c. Set all pipe on compacted granular material supporting the lower half of the pipe barrel. Place compacted granular material around and on top of pipe to not less than 12" deep from top of pipe.
9. Installation of Trench Backfill
- a. When using crushed rock as bedding material the Contractor shall install nonwoven geotextile filter fabric between the bedding and backfill material in such a manner to prevent the migration of backfill material into the bedding material.
  - b. All backfill above the bedding installation shall be carefully placed and compacted. Compaction shall be by mechanical tamping in eight-inch maximum loose lifts using mechanical or hand tampers, suitable for material being compacted, or vibratory rollers. All backfill shall be compacted to 95% of maximum laboratory dry density or 70 % relative density. The material shall be within two (2) percent of optimum moisture content.
  - c. The Contractor may request approval of alternate means of compaction. Such request must be submitted to the Project Manager in writing and the approval will be made by the Project Manager in writing. Use of specified or approved compaction methods does not relieve the Contractor from providing a complete project meeting the intent of the Design and Construction Standard.
  - d. When directed by the Project Manager, the Contractor shall excavate backfilled trenches for purposes to perform compaction tests at locations and depths determined by the Project Manager. The Contractor shall be responsible for the reinstalling and compacting the test excavations at no additional cost to the University.
10. Placement of Flow Fill
- a. Sufficient mixing capacity shall be provided to permit the flow fill to be placed continuously, without interruption.
  - b. Flow fill shall be thoroughly mixed prior to discharging to ensure a uniform product. Agitation is required during transportation and waiting time to ensure that the material is in suspension when placed.
  - c. Flow fill shall be discharged from the mixer truck into the trench to be filled, or by other methods approved by the Project Manager.
  - d. The flow fill shall be placed continuously and brought up uniformly to a point a minimum of 1-inch above adjacent surfaces (trench walls) to ensure proper drainage of bleed water away from the trench.

- e. Flow fill shall be vibrated during and after placement to accelerate the bleeding and evaporation of water and to improve consolidation of the material.
- f. Flow fill shall not be placed on frozen ground.
- g. Flow fill shall be protected from freezing until it has hardened.
- h. When bleed water subsides, the fill material shall be struck off level with the adjacent pavement and the surface finished with a wood float. After the fill material has sufficiently cured to support anticipated traffic loads, the roadway may be temporarily reopened to normal traffic. It shall be the Contractor's responsibility to maintain the finished surface of the cured fill material in a safe and drivable condition, until such time that the roadway pavement section is permanently replaced. Alternatively, the Contractor may opt to remove the cured fill material to a depth equal to the bottom of the existing pavement, and install a temporary asphalt concrete patch. The foregoing does not preclude permanent pavement restoration immediately after the fill material has sufficiently cured to support anticipated traffic loads, should construction scheduling so permit. Permanent pavement restoration shall be in accordance with these standards.
- i. Flow fill mixing and placement may be started if weather conditions are favorable, when the air temperature in the shade and away from artificial heat is at least 34 degrees Fahrenheit and rising. Mixing and placing shall stop when the air temperature in the shade and away from artificial heat is 39 degrees Fahrenheit or less and falling, and in no case shall flow fill be placed when the air temperature is lower than 34 degrees Fahrenheit.
- j. It shall be the Contractor's responsibility to ensure that the backfilled trench is not exposed to vehicular traffic loads until such time that the fill material has sufficiently cured to support the anticipated vehicle loads. Prior to reopening the roadway to normal traffic, the Contractor shall subject the fill material to a vehicular test load that is reasonably representative of the ultimate loading anticipated. When the fill material supports such vehicular test load without apparent deformation, said fill material shall be deemed sufficiently cured to permit reopening of the roadway to normal traffic.
- k. Should it be necessary to reopen the roadway to normal vehicular traffic, before the fill material has sufficiently cured to support the anticipated traffic loads, it shall be the Contractor's responsibility to provide and install steel plates to bridge over the trench.

11. Pavement Removal and Replacement

- a. Asphalt Pavement
  - Score existing surface with a cutting wheel to create clean break line.

B. Utilities

- 1. For private locates, contact Berwick Electric. Private locates to be included in contractor scope, unless determined otherwise by UCCS Project Manager.
- 2. For public locates, contact Colorado Springs Utilities.
- 3. Contractors are required to identify location of all underground utilities prior to any excavation.
- 4. **Notify UCCS / Marcus Davis at 719-255-3599 and Colorado Springs Utilities at 719-448-4800 at least 72 hours prior to touching any water, fire or gas main shut-off valves.**
- 5. UCCS Project Manager must be notified of any interruptions of service to occupied buildings or areas. Provide minimum of 72 hours' notice so that UCCS Project Manager can coordinate with affected users.
- 6. IF camera of existing service lines required, cost to be incurred by contractor.
- 7. Coordinate all utility installations with UCCS Project Manager.
- 8. IF boring service lines is required, coordinate with UCCS Project Manager prior to activity.

9. Site Trench Backfill – Backfill per soils report requirements. Backfill should not commence until all work has been inspected, tested and accepted.

10. Engineer to provide load data forms to Colorado Springs Utilities.

C.

D. Water Utilities

1. Install per Colorado Springs Utilities standards.

E. Sanitary Sewerage Utilities

1. Install per Colorado Springs Utilities standards.

F. Gas Utilities

1. Install per Colorado Springs Utilities standards.

G. Electrical Utilities

1. Install per Colorado Springs Utilities standards.

H. Communications Utilities

1. Refer to Division 27 – Communications.
2. Provide traffic rated junction boxes at all vehicular areas.

I. Development Fees

1. Tap fees for water, sanitary sewer, gas and electric shall be arranged and paid for by UCCS.
2. Costs incurred due to Colorado Springs Utilities for installing their own taps, service, meters, etc., will be paid by the University.
3. Extensions from termination points to connection with building services and systems will be the responsibility of the Division 22 Contractor.