SECTION 02085
ASBESTOS MATERIAL ABATEMENT

PART 1 – GENERAL

1.1 SUMMARY
A. This section provides standards for asbestos material abatement.

1.2 REFERENCES
A. Colorado Air Quality Control Commission Regulation #8, Part B, The Control of Asbestos.
B. Occupational Safety and Health Administration, 29 CFR 1926.1101, Asbestos.
C. Environmental Protection Agency, 40 CFR 763.120, Asbestos Worker Protection Rule.
E. Sections 01105 Administration, Procedure and Codes, August 12, 2009 or latest Asbestos Contaminated Soil Management Standard Operating Procedure Document University of Colorado Denver, Anschutz Medical Campus.

1.3 SYSTEM PERFORMANCE REQUIREMENTS
A. Presence on Campus:
   1. Asbestos is present in many building in and around the campus. Typical forms include pipe insulation, ceiling, wall and floor materials. UC Denver has identified many of the locations of asbestos in previous studies, but there may still be locations where asbestos containing materials (ACM) have not yet been identified.
   2. Every project shall investigate the area where work will occur to identify asbestos containing materials (ACM). The UC Denver Project Manager shall be responsible for coordinating and ensuring that an inspection or review of previous surveys and any required sampling be performed prior to finalizing the scope or work and associated budget.
   3. The cost of investigations and sampling shall be included in the cost of the project.
B. Asbestos Removal:
   1. Any asbestos removal (abatement), repair, encapsulation or spill clean-up shall be performed in accordance with the above referenced regulatory standards.
   2. The cost of abating ACM shall be budgeted for each project.
   3. Abatement design and removal shall be completed only by personnel fully qualified and trained in accordance with the above referenced regulatory standards.
C. Notice to Contractor:
   1. Every project shall inform contractors through the project documents to stop work immediately when asbestos is encountered or though to be encountered and notify the UC
Denver Project Manager. It is the responsibility of the UC Denver Project Manager to decide what type of action will follow, in consultation with the UC Denver's Environmental Health & Safety (EHS) Department.

D. Asbestos Containing Waste

1. Each external contractor who generates asbestos waste as part of any project must follow the UC Denver asbestos waste disposal guidelines and comply with applicable all regulations promulgated by the Environmental Protection Agency.

2. All cost associated with asbestos waste transportation and disposal be paid by the project.

1.4 DEFINITIONS

1.5 SUBMITTALS

A. Asbestos Project notifications and Permits:

UC Denver Project Managers and/or external contractors must follow all applicable notification and permit requirements specified in the above referenced standards.

B. Abatement Specifications:

1. A certified asbestos project manager shall be used on all asbestos abatement projects in which the amount of friable asbestos material to be abated exceeds 1000 linear feet on pipes or 3000 square feet on other surfaces. Written abatement specifications shall be prepared and approved by the applicable certified asbestos project manager.

2. Written abatement specification may be required at the discretion of the UC Denver EHS Department depending on the nature of the project. The UC Denver Project Manager shall coordinate with the EHS to determine any additional requirements.

C. Asbestos Waste Manifests:

Hazardous waste manifests must be prepared for all asbestos waste shipments associated with UC Denver asbestos related projects. Copies and originals of these manifests must be submitted in sequential (numerical) order to the UC Denver Project Manager and/or EHS for accountability and tracking of asbestos waste for the project.

1.6 QUALITY ASSURANCE

1.7 WARRANTY

A. Product and system warranties shall be provided in accordance with Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 MATERIALS, GENERAL

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL
3.3 TESTING, CLEANING, AND CERTIFICATION

3.4 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

END OF SECTION
SECTION 02100
SITE PREPARATION

PART 1 - GENERAL

1.1 SUMMARY
A. This section provides standards for site preparation.

1.2 REFERENCES
A. Manual Part 2 Section 2.6 Site Drainage Guidelines
B. Section 02950 Landscape

1.3 SYSTEM PERFORMANCE REQUIREMENTS
A. Top Soil:
   1. Top soil is a valuable commodity and must be stripped from the construction site and separately stockpiled (coordinated with the UC Denver Project Manager) for replacement around the building at the completion of the job or otherwise disposed as directed by the UC Denver Project Manager. Top soil to a depth of approximately 6 to 8 inches shall be stripped from all areas to be graded, excavated or filled.

1.4 DEFINITIONS

1.5 SUBMITTALS

1.6 QUALITY ASSURANCE
A. Installer Qualifications:
   1. Trash Removal:
      a. The contractor shall be responsible for removal of all trash, sand, gravel, road base, concrete and trench insulation material.

B. Testing Laboratory Qualifications:
   1. Hazardous Waste Removal:
      a. Plans and procedures for removal of hazardous waste shall conform to applicable codes and be submitted to the UC Denver Project Manager for approval by the UC Denver EHS.

C. Regulatory Requirements:
   1. Landscape and Irrigation System Damage:
      a. Refer to Section 02950 - Landscape and Irrigation System Damage.

   2. Follow current UC Denver Asbestos Soil Contamination related to asbestos in soil.

D. Quality Assurance shall be provided in accordance with Division 1.
E. Follow all Federal and State requirements for site water quality and obtain related permits prior to starting work and provide copy of plan and permit to UC Denver Project Manager.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Delivery, storage, and handling shall be provided in accordance with Division 1.

1.8 WARRANTY
   A. Product and system warranties shall be provided in accordance with Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 MATERIALS, GENERAL

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

3.3 TESTING, CLEANING, AND CERTIFICATION

3.4 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

END OF SECTION
SECTION 02200
EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY
A. This section provides standards for earthwork.

1.2 REFERENCES
A. Section 02100 Top Soil
B. Section 02950 Landscape
C. Anschutz Medical Campus Asbestos Contaminated Soil.

1.3 SYSTEM PERFORMANCE REQUIREMENTS
A. Irrigation System Damage:
   1. Refer to Section 02950 - Landscape.
B. Backfilling:
   1. Excavations should be backfilled as promptly as work permits, but not until completion of inspection, testing, approval, and location recording of underground utilities.
   2. Concrete tailings, sand, gravel and other debris will not be permitted in trenches.
   3. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the UC Denver Project Manager immediately for directions. Cooperate with the UC Denver Project Manager in keeping respective services and facilities in operation. Damaged utilities must be repaired to the satisfaction of the UC Denver Project Manager.
C. Excavations:
   1. All shoring should follow OSHA Standards. All excavations exceeding 6 ft in depth shall be surrounded with 6 feet high chain link fence system.

2. Excavator shall have a HSD trained spotter on site for identifying asbestos contaminated soil.

1.4 DEFINITIONS

1.5 SUBMITTALS

1.6 QUALITY ASSURANCE
A. Quality Assurance shall be provided in accordance with Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Delivery, storage, and handling shall be provided in accordance with Division 1.
1.8        WARRANTY

A. Product and system warranties shall be provided in accordance with Division 1.

PART 2 - PRODUCTS

2.1        MANUFACTURERS

2.2        MATERIALS, GENERAL

PART 3 - EXECUTION

3.1        EXAMINATION

3.2        INSTALLATION, GENERAL

3.3        TESTING, CLEANING, AND CERTIFICATION

3.4        COMMISSIONING (DEMONSTRATION)

3.5        SCHEDULES

END OF SECTION
SECTION 02500
PAVING AND SURFACING

PART 1 - GENERAL

1.1 SUMMARY
A. This section provides standards for paving and surfacing.

1.2 REFERENCES
A. Manual Part 2, Section 2.10 Vehicular Circulation Guidelines
B. Manual Part 2, Section 2.11 Parking Guidelines
C. Manual Part 2, Section 2.12 Pedestrian Circulation Guideline
D. Section 03000 Concrete General Information
E. Section 03300 Cast-In-Place concrete

1.3 SYSTEM PERFORMANCE REQUIREMENTS
A. Sidewalks:
1. Locations shall maintain a minimum of 5 foot clearance from all existing trees where possible.
2. Design layouts of sidewalks will have minimum radius turns of 6 feet to accommodate turning radius of tractors used for snow removal.
3. Sidewalks shall be designed with adequate jointing to prevent cracking. Expansion and contraction characteristics as well as jointing in adjacent surfaces shall be considered in development of a jointing pattern. Saw cut joints are accepted as an alternative method to tooled joints.
4. Finishing shall be a medium broom finish perpendicular to travel direction.
5. The contractor should note that stakes driven into the ground during concrete forming sometimes punctures holes in irrigation lines. Care should be taken to avoid this. Cost of repairs shall be the Contractors responsibility.

B. Dumpster Pads:
1. Location of pads for dumpsters shall be determined by UC Denver Fac. Ops, and the campus Architect through the UC Denver Project Manager. Pad size will vary with each site location, but will be a minimum of 8 feet x 8 feet to a maximum of 24 feet x 14 feet and a minimum of 6 inches thick.

C. Bicycle Pads:
1. Bicycle pads may be required depending upon several factors. Consult with the UC Denver Project Manager as necessary.
D. Wheelchair Ramps:
   1. Ramps shall be placed at appropriate places to allow access over curbs to sidewalks from streets according to ANSI Handicap Standard A 117.1 and Americans with Disability Act.
   2. Ramps up to building entrances may be necessary as all entrances shall be handicap accessible.

E. Asphalt Parking Lots and Driveways:
   1. New parking lots and asphalt driveways shall have a compacted road base undercourse of 6 to 8 inches and a minimum of 4 inches of new type "E" asphalt unless soils report indicates a more stringent requirement.

F. Transformer Pads:
   1. Building electrical transformers will be placed outside of the building with location determined by electrical engineer with approval of the UC Denver Project Manager.

1.4 DEFINITIONS
1.5 SUBMITTALS
1.6 QUALITY ASSURANCE
   A. Quality Assurance shall be provided in accordance with Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Delivery, storage, and handling shall be provided in accordance with Division 1.

1.8 WARRANTY
   A. Product and system warranties shall be provided in accordance with Division 1.

PART 2 - PRODUCTS
2.1 MANUFACTURERS
2.2 MATERIALS, GENERAL
   A. Sidewalks (6 feet wide and over):
      1. Concrete: 6” thick, 4000 psi
      2. Reinforcing: Fiber-mesh
   B. Sidewalks (less than 6 feet wide):
      1. Concrete: 4” thick, 4000 psi
      2. Reinforcing: Fiber-mesh
   C. Dumpster Pads:
      1. Concrete: 6” thick, 4000 psi
      2. Reinforcing: Fiber-mesh
PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

3.3 TESTING, CLEANING, AND CERTIFICATION

3.4 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

END OF SECTION
SECTION 02600

UTILITY PIPING MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. This section provides standards for utility piping materials.

1.2 REFERENCES

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Nonmetallic Utility Lines:

1. All new nonmetallic utility lines outside the building envelope must include an insulated 16 gauge tracer wire (or metallic tape) that will indicate the utility's location to tracing equipment. Such tape or wire must be located either affixed to the utility, or, if metallic tape, buried with a 12 inch separation directly above the utility. As a general rule, if tracer wire is used, it must be exposed at either end of the utility (above grade) and prominently marked with flagging after backfill is completed. The UC Denver Project Manager and utility locator/document will coordinate with the contractor to determine the appropriate point and method of termination, as field conditions may vary.

2. All materials, installation, and testing must conform to City of Aurora utility standards.

B. Isolation of Utilities:

1. All incoming utilities shall have proper means for isolation before entering the building.

C. Utility Sleeves:

1. Provide tubing or pipe (not sheet metal) sleeves for all utility services passing through structural walls and slabs. All sleeves passing through slab floors shall project a minimum of 2 inches above the slab and sealed water tight to the slab.

2. Sleeves shall be filled with a flexible gas tight caulking.

1.4 DEFINITIONS

1.5 SUBMITTALS

1.6 QUALITY ASSURANCE

A. Quality Assurance shall be provided in accordance with Division 1 and City of Aurora Standards.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be provided in accordance with Division 1.

1.8 WARRANTY
A. Product and system warranties shall be provided in accordance with Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 MATERIALS, GENERAL

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

3.3 TESTING, CLEANING, AND CERTIFICATION

3.4 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY

A. This section provides standards for water distribution.

1.2 REFERENCES

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Water Systems:

1. UC Denver buildings are served via the City of Aurora water distribution system, and UC Denver water meters. The system is operated at about 85 psig.

2. Design of building will include exterior fire hydrants, interior fire protection, main line tap and valve, main building shut-off valve inside and outside, and water meter located in the building near point of water entrance.

3. Provide tubing or pipe (not sheet metal) sleeves for all water services passing through structural walls.

4. Support exterior water mains at building entrances to avoid shear stress. Support will be designed to support the water main over its entire length between the building entrance point and unexcavated ground.

5. Provide backflow preventers per City of Aurora standards.

6. The Plumbing Contractor shall be required to clean and disinfect all domestic hot and cold water systems, including fire systems connected to the domestic water systems. For buildings already occupied, the procedure shall be modified as required to accommodate the occupants.

7. Water meters shall conform to City of Aurora standards.

1.4 DEFINITIONS

1.5 SUBMITTALS

1.6 QUALITY ASSURANCE

A. Quality Assurance shall be provided in accordance with Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling shall be provided in accordance with Division 1.

1.8 WARRANTY
A. Product and system warranties shall be provided in accordance with Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products following:

1. Fire Hydrants and Auxiliary Valves:
   a. Fire hydrants are owned and services by the City of Aurora. Coordinate installation of new hydrants with City of Aurora through the UC Denver Project Manager.
   b. Provide auxiliary valves per City of Aurora standards.

2.2 MATERIALS, GENERAL

A. Fire Hydrants:

1. Provide fire hydrants that conform to City of Aurora standard.

2. The above specifications are intended to meet City of Aurora Standard, except for open left requirement for valves. The exposed portion of the hydrant shall be painted with DeVoe Safety Yellow No. 58158-01.

3. Fire hydrants shall meet the requirements of the Aurora Fire Department. The A/E shall review the specific project requirements with the Aurora Fire Department to ensure the standards are met.

B. Gate Valves:

1. Provide gate values that conform to City of Aurora standards.

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

3.3 TESTING, CLEANING, AND CERTIFICATION

A. Test/Clean Certification:

1. All new fire hydrants shall have pressure and flow tests in accordance with City of Aurora standards. Test results shall be submitted in O & M manual.

3.4 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

END OF SECTION
SECTION 02680

FUEL AND STEAM DISTRIBUTION

PART 1 - GENERAL

1.1 SUMMARY

A. This section provides standards for fuel and steam distribution.

1.2 REFERENCES

A. Section 15000 General Provisions
B. Section 15110 Piping
C. Section 15520 Steam and Steam Condensate Piping

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Gas Distribution System:

1. Most academic buildings on the main campus are served via the Excel distribution system. Main gas pressure is about 6 psig. Design for 4 psig.

All new buildings tying into existing gas systems must be approved through the UC Denver Project Manager. All new building gas service will include a meter and a regulator to be provided and installed under the contract. Provide insulated union (dielectric) above ground upstream of the regulator. Keep all fuel runs from the meter to the building as short as possible to reduce the need for additional cathodic protection. If fuel piping from meter to building goes underground an insulated union shall be provided inside building.

Install shut-off-valves prior to all unions.

Underground piping and fittings must be wrapped or protected from moisture.

B. Steam and Condensate Distribution Systems:

1. Steam is distributed from the UC Denver Central Utility Plant direct buried lines. Nominal distribution pressure is 125 psig saturated. All building mains shall be dripped and branches back-graded to the main.

2. Steam service lines to each building shall be installed with a minimum of 20 pipe diameters straight run for metering.

3. Provide main building shut off valves outside the building typically in the mechanical vault.

4. All steam and condensate lines shall be insulated. Valves, strainers, and other equipment shall be insulated with removable preformed insulated casings or jackets.

5. Steam condensate is returned to the UC Denver Central Utility Plant via direct buried lines per the requirements of Section 15520.
6. Condensate receivers with mechanical pumps are not permitted without approval by UC Denver Fac. Ops. through the UC Denver Project Manager. If pumps are used, they shall be of the centrifugal duplex type with cast iron receiver. Switching for alternate service shall be accomplished by a float operated mechanical alternator. Receiver capacity shall be sized for 25% future capacity. Flash tanks shall be installed ahead of receivers.

7. Specific methods and locations of trapping shall be specified.

8. Steam supply and condensate return shall be metered in each building. Steam and condensate meters must be approved by UC Denver Fac. Ops. through the UC Denver Project Manager.

1.4 DEFINITIONS

1.5 SUBMITTALS

1.6 QUALITY ASSURANCE
   A. Quality Assurance shall be provided in accordance with Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Delivery, storage, and handling shall be provided in accordance with Division 1.

1.8 WARRANTY
   A. Product and system warranties shall be provided in accordance with Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 MATERIALS, GENERAL
   A. Exterior Gas Pipe:

   1. Exterior gas piping shall be black ASTM A53, Grade B seamless, plain end with Fusion Bonded Mill Coating. The coating material, application procedures, and marking shall meet and be as outlined below and in the NAPCA Bulletin 12-78.

   a. Material:

      1) Napko Pipe Coating Division, Nap-Guard Mark X Product No. 7-2501.

      2) Electro Products Division/3M, Scotchkote Brand 217, 205, or 206N pipe coatings.


      4) Coating Thickness: Nominal coating thickness of 10 or 12 mils.

   b. Application:

      1) The specifications for plant application shall be those recommended by the coating manufacturer. Application instructions should include pipe
surface preparation, coating application, inspection, holiday repair, storage, handling and shipping.

c) Marking:

1) Marking of coating shall comply with NAPCA Bulletin 4-68, Pipe Identification "Data Code" except type coating marking should be in accord with NAPCA Bulletin 7-69.

2) Engineer should also specify joint wrap and primer. Isolate piping at meter and equipment with dielectric union. Cathodic protection may be required. This will be coordinated with the UC Denver Project Manager.

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

3.3 TESTING, CLEANING, AND CERTIFICATION

A. Before placing a steam and condensate piping system in service the piping must be thoroughly blown out with steam to remove dirt, rust, scale or other contaminants.

B. Place the steam system in operation and waste the condensate for a period of at least three hours. Following approval by the UC Denver Project Manager return condensate to collection system.

3.4 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

END OF SECTION
PART 1 - GENERAL

1.1 SUMMARY
A. This section provides standards for storm and sanitary sewer systems.

1.2 REFERENCES
A. Section 15110 Piping

1.3 SYSTEM PERFORMANCE REQUIREMENTS
A. Sanitary and Storm Sewerage:
   1. Provide manholes at major junctions of exterior sewer lines and cleanouts on all other junctions.
   2. Manholes shall have holes drilled in lid for use of lifter for removal.
   3. Manhole covers located in driveways and parking lots shall not have raised or uneven surfaces or projections which could interfere with snow removal equipment.

1.4 DEFINITIONS

1.5 SUBMITTALS

1.6 QUALITY ASSURANCE
A. Quality Assurance shall be provided in accordance with Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Delivery, storage, and handling shall be provided in accordance with Division 1.

1.8 WARRANTY
A. Product and system warranties shall be provided in accordance with Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 MATERIALS, GENERAL

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL
3.3 TESTING, CLEANING, AND CERTIFICATION
3.4 COMMISSIONING (DEMONSTRATION)
3.5 SCHEDULES

END OF SECTION
SECTION 02780

POWER AND COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY
A. This section provides standards for power and communication.

1.2 REFERENCES
A. Section 16300 Transformers and Underground Power Distribution
B. Section 16740 Telecommunications Voice & Data Systems

1.3 SYSTEM PERFORMANCE REQUIREMENTS
A. Electric Power Transmission:
   1. Underground Electrical Primary: Refer to Section 16300 - Transformers and Underground Power Distribution for requirements.

B. Communication Transmission:
   1. The UC Denver owns and maintains its telephone and communications distribution system. UC Denver IS will provide design parameters for the distribution system and for individual buildings, and shall be consulted during the project design through the UC Denver Project Manager.
   2. Refer to Section 16740 - Telecommunications for communication requirements.

1.4 DEFINITIONS

1.5 SUBMITTALS

1.6 QUALITY ASSURANCE
A. Quality Assurance shall be provided in accordance with Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Delivery, storage, and handling shall be provided in accordance with Division 1.

1.8 WARRANTY
A. Product and system warranties shall be provided in accordance with Division 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 MATERIALS, GENERAL
PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

3.3 TESTING, CLEANING, AND CERTIFICATION

3.4 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

END OF SECTION
SECTION 02810
IRRIGATION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY
A. This section provides standards for irrigation systems.

1.2 REFERENCES
A. Manual Part 2, Section 2.15 Irrigation Guideline
B. Section 01720 Project Record Documents
C. Section 02950 Landscape

1.3 SYSTEM PERFORMANCE REQUIREMENTS
A. General Design Information:
   1. Irrigation systems shall be installed according to latest standards of the Association of Landscape Contractors of Colorado (ALCC).
   2. During the growing season turf is watered for 30 minutes, 2 times per day, depending on weekly schedule. In the future this utility may be tied to the energy management system computer. Until that time, system clocks must be installed in various locations around campus. Coordinate current requirements through the UC Denver.
   3. The sprinkler system design will be reviewed by the UC Denver Project Manager and the Grounds Department.
   4. All new irrigation systems shall be equipped with an automatic rain shutoff device.
   5. Remote Solenoid Control Valves:
      a. Boxes shall have a minimum of 4 inches between bottom of box lid and highest part of valve. Boxes shall also have minimum of 4 inches between bottom of box and piping. Valve boxes shall have a minimum of 4 to 6 bricks to support bottom side of box. Ground shall be hand tamped underneath valve boxes.
      b. All RCVs shall be of same brand.
      c. On City of Aurora water system, Hardie Ultra Flow plastic shall be used.
      d. Whenever possible, existing galvanized fittings shall be removed and replaced with PVC.
      e. Each RCV zone shall be flushed with sprinkler heads removed.
   6. All sprinkler irrigation systems must be separately metered from the building.
   7. Sprinkler Heads:
a. Shall include models with 12 different size nozzles per head, gear driven and sealed in oil, strip proof gears, vandalism resistant, dirty water screen, small surface area and fully interchangeable.

b. Shall be a minimum of 1 inch from walk and 3 inches from building or vertical surface. Top of heads shall be placed exactly at finished grade except where heads are next to walks or curbs shall be placed flush with top of sidewalk or curb.

c. Shall be firmly tamped under and around so as to be exactly straight up and down.

d. Shall have 8 to 12 inches of swing pipe, but not to exceed 24 inches.

8. See Diagram Below:
B. Review:

1. Irrigation control system layout will be reviewed by the UC Denver Grounds Department through the UC Denver Project Manager, after the layout is completed. Notify the UC Denver Project Manager three days in advance of review. Modifications may be identified at this review.

2. The contractor should be informed that bending or kinking of poly pipe weakens the pipe, eventually causing leaks. Therefore, all kinked pipe must be rejected and replaced.

3. Verify locations of underground utilities including the existing irrigation system components.

4. Backfilling of new trenches shall be puddled in landscaped areas. Backfilling under pavement shall be adequately compacted backfill.

C. Salvage:

1. Existing irrigation controllers, sprinklers and valves shall be turned over to the UC Denver unless otherwise instructed.

D. Electrical Control System:

1. Control system requires electrical power supply. Coordinate work with the electrical engineer. The electrical control wire design shall be in accordance with the NEC.

2. Provide location in the grounds closet (if provided), the mechanical room, or other services area space for the lawn sprinkler control cabinet. Provide electrical service (110V) at this location with conduit large enough to contain the valve control wires to the outside.

3. The UC Denver Project Manager will determine whether replacement of the control wire from a satellite controller and to a solenoid valve shall be replaced when an existing irrigation system is to be extended.

4. The locations of the control units on the drawings will be approximate. UC Denver Grounds will determine the exact site locations at the system layout review. The manufacturer's Project Manager will test for positive radio communication prior to the installation of the satellite controllers.

5. Lightning protection shall be provided with a copper-clad grounding rod driven into the soil 8 feet deep. A single rod may be used for grouped control units. Connect controller to grounding rod with AWG No. 10 solid conductor copper wire. Secure wire to grounding rod with brass or bronze clamp. If rod is buried adjacent to the controller enclosure, locate the connection in a separate valve box.

6. Attach wire markers to the ends of control wires inside the controller unit housing. Label wires with an identification number which consists of the name and station number of the existing controller to which the control wire had been previously connected.

7. Bundle control wires where two or more are in the same trench at a minimum of 10 foot intervals.

8. Control wiring may be pulled into the soil utilizing a vibratory plow device specifically manufactured for pipe pulling. Minimum burial depth equals 12 inches.
9. Provide a 24 inch excess length of wire in an 8 inch diameter loop at each 90 degree change of direction, at both ends of sleeves and at 100 foot intervals along continuous runs of wiring. Do not tie wiring loop. Coil 24 inch length of wire within each remote control valve box.

10. Install only one control valve on each control wire.

E. Sleeving:
   1. Install separate sleeves beneath paved areas to route each run of irrigation wiring bundle.
   2. All sleeves under pavement must be bedded in sand with a minimum of 6 inches above and below the sleeve.
   3. Only one irrigation pipe shall be installed per sleeve.
   4. Install sleeving at a depth which permits the encased wiring to remain at the specified burial depth.
   5. Extend sleeve ends six inches beyond the edge of the paved surface. During construction, cover sleeve ends and mark with stakes. Mark concrete with a chiseled "X" at sleeve end locations.
   6. Bore through obstructions which cannot be removed rather than alter the route. Employ equipment and methods designed for horizontal boring.
   7. Cut and patch roadways which must be crossed. Replacement asphalt and subgrade shall match existing conditions. All sleeves under pavement shall be embedded in sand with a 6 inch cover under and above sleeve.

F. Piping:
   1. All pressurized pipe shall be located between 14 inches and 18 inches deep.
   2. All non-pressurized poly pipe shall be located between 8 to 12 inches deep.
   3. Pressurized and non-pressurized pipe underneath roads shall be a minimum of 18 inches deep.
   4. Any changes to new or existing piping shall be mapped and documented indicating size, type and location of pipe.
   5. Concrete thrust blocks shall be provided on all pressurized pipe 2 inches and larger. Consult Uniform Plumbing Code for size and location of thrust blocks. Base selection on 60 psig static system pressure.

1.4 DEFINITIONS

1.5 SUBMITTALS
   A. Record Drawings: Record all alterations with accurate reference dimensions, measured from at least two permanent reference points, for each controller or control unit, each sleeve end, each stub-out for future wiring connections, and other irrigation components enclosed within a valve box.

1.6 QUALITY ASSURANCE
A. Quality Assurance shall be provided in accordance with Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Delivery, storage, and handling shall be provided in accordance with Division 1.

1.8 WARRANTY
A. Product and system warranties shall be provided in accordance with Division 1, including the following:
   1. The system shall have a one year warranty including blow out and turn on. The warranty shall include, but not be limited to, fill and repair depressions and restoration of landscape or structural damaged by the settlement of irrigation trenches or excavations. Repairs shall be made within seven days of notification from the UC Denver Project Manager.
   2. Sprinkler heads shall have 2 year minimum warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Electric Valves:
      a. Hardies Ultraflow 700 Series - .75 - 1 - 1.50 - 2 - in.
      b. Rain Bird 100-DV/100-DV-F - .75 - 1 - 1.50 - 2 - in.
      c. Greenlawn 61-1 71-1 72-1 all 1FC
   2. Brass Gate Valves (all with cross handles), Size .50 to 3 inches:
      a. Matco 515T (Treaded) 515C (Solder), or equal
   3. Forged Brass Ball Valves, Standard/Full or Full Port Drainable:
      a. Matco 752T - 752C
      b. Matco 754T - 754C
      c. Matco 8701 - 8711
   4. Automatic Drain Valves:
      a. King Drains
      b. Imperial
      c. Rain Bird
   5. Valves Cover Boxes:
      a. Carson Boxes: any model size as needed
      b. Ametex Boxes: any model size as needed
   6. Controllers:
      a. Irritrol - MC-4 Plus B to MC-42 Plus B
b. Irritrol - Dial-5B to Dial-36B
  c. Rain Bird

7. Pop-up Spray Sprinkler:
   a. Rain Bird 1800 Series Size 1802 to 1812 Regular, S.A.M. or Pressure Regulating
   b. Hunter S-type 2 and 4 inch
   c. Spray Nozzles, as needed (plastic/brass)

8. Rotor Pop-up Sprinkler Mini-Paw, Maxi-Paw:
   a. Rain Bird 15103 Mini-Paw
   b. Hunter
   c. Hardie

9. Flex Swing Pipe:
   a. Hardie (Super Blue)
   b. Rain Bird (20/SP-100)
   c. or equal

10. Clamps for Poly Pipe:
    a. Crimp Clamp (size .50 to 1 inch)
    b. Murray Worm Gear Clamp (size .50 to 3 inch) 100% stainless steel
    c. or equal

11. Wire Connectors:
    a. 3M DBY/DBR Direct Bury Connector
    b. Rain Bird ST-03 Gray/PT-S5 Snap-Tite
    c. Fixed Spring Wire Connectors

12. Quick Coupling Valves:
    a. 3 NP/33 DNP/5NP/44NP (non-portable)
    b. 3RD/33DRC/5RC/44RC Quick Coupling Valves
    c. or equal

13. Drip Irrigation:
    a. Rain Bird Underground Pressure Regulator HMB-20 and 25
    b. Rain Bird Y-filters RBY-075-RBY-100
    c. Hardies Y-filters

14. Drip Tubing:
    a. Blue Stripe
    b. Lasco
    c. Pepco

15. Drip Emitters:
    a. Rain Bird
    b. Salco
    c. Agrifim
2.2 MATERIALS, GENERAL

A. Electrical:

1. Electrical conduit shall be PVC Schedule 40 conforming to ASTM Standard D1785. Fittings shall be Schedule 40, Type 1, PVC solvent weld fittings, ASTM Standards D2466 and D1784.

2. Control wires shall be pre-numbered or labeled with indelible non-fading ink, made of permanent, non-fading material.

3. Wire from satellite controller unit to each remote control valve for new construction shall be AWG No. 14 solid copper, Type UF cable, UL approved for direct underground burial or multi-strand type UF irrigation cable no smaller than 18 gauge.

4. All wiring sizing must conform to the manufacturers recommendations on voltage losses of solenoid valves being used and must not exceed these specifications.

5. Wires shall have same color over its entire length. Use white for common ground wire.

6. Crimp solder splices and seal with waterproof sealant. Wire connectors shall be made of plastic construction consisting of two pieces: one piece which snap locks into the other. A copper crimp sleeve should also be provided with a connector. All wiring splices that are direct buried must be done with "3M" D by wire splice kits.

B. Sleeving:

1. Sleeving material beneath pedestrian pavements shall be PVC Class 200 pipe with solvent welded joints.

2. Sleeving beneath drives and streets shall be PVC Class 200 pipe with solvent welded joints.

3. Sleeving diameter shall be a minimum of twice that of the pipe and wiring bundle, which ever is greater. Sleeves for wiring shall have a minimum diameter of 2 inches.

C. Piping:

1. Lateral branch lines can be poly pipe rated at 100 psig NSF for 3/4 and 1 inch sizes. Larger branch lines and main trunk lines shall be poly pipe. All poly pipe of 1-1/4 inches and larger must be 80 psig NSF grade.

2. All poly pipe fittings must be plastic barbed, designed specifically for underground irrigation practices. PVC fittings shall be schedule 40, with solvent weld on all sizes 3 inches and smaller and tight fittings on all sizes 3 inches and larger. Ring tight fittings shall have appropriate thrust blocking.

3. All 1-1/4 inch and larger insert fittings must be double clamped; smaller poly pipe may be single clamped with screw or pinch clamps.

D. Copper Tube:

a. Type K
b. Type L
c. Type M
d. Copper fitting (all)
E. Ultra-Clear Flexible Pipe:
   a. .50 to 2 inch (125 psi) NSF
   b. .50 to 2 inch (100 psi) NSF
   c. .50 to 2 inch (80 psi) NSF

F. PVC Pipe:
   a. 1 to 6 inch (class 200)
   b. 1 to 6 inch (class 160)

G. Insert Fittings (PVC and Nylon):
   a. PVC (Schedule 80)
   b. PVC (Schedule 40)

H. Weld-on Plastic Pipe Cement (PVC only):
   a. #725 cement P70 primer
   b. #711 cement P70 primer
   c. #727 cement P70 primer

I. Teflon Seal Thread Tape and Paste:
   a. STT - 12 x 600  1/2 x 600’ Tape
   b. STT - 34 x 520  3/4 x 600’ Tape
   c. STT - 1 x 520  1 x 500’ Tape

J. Wire Solder:
   a. Silver and Safe Flow Silver
   b. Silver Bearing Solder: 96% tin, 4% silver
   c. 95/5; 95% tin, 5% antimony

K. Sprinkler Control Wire “UL” Listed:
   a. #18-4 to #18-12 PJ Thermo Multi-conductor Spool
   b. 14-UF Single Conductor Reels
   c. 12-UF Single Conductor Reels

L. Tools and Spare Parts:
   1. Contractor shall provide proprietary tools, test equipment and other parts necessary to service system. Spare parts should be provided for critical components.

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

   A. System Damage:
1. Refer to Section 02950 - Landscape.

2. In the event of main line damage, the Contractor must ensure immediate repair.

3. In the event of damage to poly lines or sprinklers, the UC Denver Project Manager should be contacted to repair damage promptly and in the proper sequence. If asbestos irrigation pipe is damaged, Contractor shall stop work and notify UC Denver Project Manager.
   a. Immediately upon cutting through the irrigation line, the contractor shall cut and tape both ends such that dirt and debris cannot get into the lines.
   b. Backfill and tamp, or puddle up to the level of irrigation line that is to be repaired and notify the UC Denver Project Manager. After repair has been completed, backfill to grade but do not tamp directly on top of irrigation line.

B. Warning Tape:

1. Warning tape shall be buried six inches deep on top of control wiring. The Tape shall be inert plastic film highly resistant to alkalis, acids, or other destructive chemical components likely to be encountered in soils. The tape shall be three inches wide, colored yellow and imprinted with "CAUTION: BURIED ELECTRIC LINE BELOW."

3.3 TESTING, CLEANING, AND CERTIFICATION

A. Electrical:

1. Test for leaks to ground per manufacturer's recommendations. Test results must meet or exceed manufacturer's guidelines for acceptance.

2. Defective wires, underground splices or appurtenance will be replaced. Tests will be repeated after replacement and approved by Grounds through the UC Denver Project Manager.

3.4 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

END OF SECTION
SECTION 02870

SITE FURNISHINGS

PART 1 - GENERAL

1.1 SUMMARY
A. This section provides standards for site furnishings.

1.2 REFERENCES
A. Manual Part 2, Section 2.16 Site Accessories Guideline

1.3 SYSTEM PERFORMANCE REQUIREMENTS

1.4 DEFINITIONS

1.5 SUBMITTALS
A. Quality assurance shall be provided in accordance with Division 1.

1.6 QUALITY ASSURANCE
A. Quality assurance shall be provided in accordance with Division 1.

1.7 DELIVERY, STORAGE AND HANDLING
A. Delivery, storage and handling shall be provided in accordance with Division 1, including the following:
   1. Delivery: Deliver all furnishings to job site in manufacturer’s original packing materials.
   2. Storage: Store furnishings in manner so as to protect them from all forms of damage including weather and construction activities. Protect stored furnishings from weather with waterproof, non-staining cover or enclosures, but allow air to circulate.
   3. Where shop fabrication is indicated, comply with industry standards for storage of materials. Architect shall be allowed access to work in progress during all stage of fabrication during normal working hours. Protect all completed work and coordinate delivered to the site for final installation and acceptance. Materials delivered for field fabrication shall be delivered and stored in a clean, protected location.
   4. Handling: Handle all furnishing to prevent chipping, breakage, soiling or other damage.
   5. Replace damaged furnished with new as directed.

1.8 WARRANTY AND REPLACEMENT
A. Warranties shall be provided in accordance with Division 1.

PART 2 – PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Benches, Tables, Chairs, Trash Receptables:
   a. Landscape Forms, Inc.

2. Bicycle Racks:
   a. BRP Manufacturing Enterprises, Inc.

2.2 MATERIALS GENERAL

A. Benches:
   1. SC3005-BS-72, woven seat with back or SC3005-FS-72, woven seat flat.

B. Tables:
   1. CT4002- 30” or 36” cantena steel top, embedded pedestal support.

C. Chairs:
   1. SC3005-BS-24, woven seat.

D. Trash Receptacles:
   1. SC5002-24-40, vertical strap, radial side loading; with ash pan, Napoleon.

E. Bicycle Racks:
   1. FU-2-02-EM. Paint 3 coats w/RAL 7022 smooth glossy finish. Install per manufacturer's direction. BRP Enterprises, Inc.
      a. Color: to match Stormcloud.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:
   1. Examine areas and conditions under which the Work of this Section will be performed. Report unsatisfactory or questionable conditions to the Contractor.
   2. Do not proceed with the Work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all area and conditions.
3.2 INSTALLATION, GENERAL

A. Placement and Mounting:

1. Place and mount all furnishings as per manufacturer’s recommendations and as indicated in the Drawings. All furnishing shall be mounted plumb.

2. Protect pavement from harm including scratching or cracking due to furnishings placement operations. Do not drop or drag furnishings on pavement.

3.3 TESTING CLEANING AND CERTIFICATION

A. Remove protective covering.

B. Clean exposed surfaces with clean water. Use cleaner and procedures recommended by manufacturer and fabricator. Do not use wire brushes, metal scrapers or acids. Protect adjacent surfaces from damage during cleaning operations.

C. Repair: After cleaning, examine work and repair unacceptable conditions. Replace defective, broken, permanently stained, or damaged units. Repair unfilled or defective joints.

3.4 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

END OF SECTION
SECTION 02930
SEED AND SODDING

PART 1 - GENERAL

1.1 SUMMARY
   A. This section provides standards specifications for selection and planting of sod and seed.

1.2 REFERENCES
   A. Associated Landscape Contractors of Colorado (ALCC) 1991 handbook "The Guide for Colorado Landscape Industry Contracts and Specification". Portions of the ALCC Handbook are reprinted with ALCC's permission. Supplements or modifications have been added.

1.3 SYSTEM PERFORMANCE REQUIREMENTS
   A. Type of Sod or Seed:
      1. Sod or seed used for the repair or replacement of existing turf shall match the surrounding turf.

1.4 DEFINITIONS

1.5 SUBMITTALS

1.6 QUALITY ASSURANCE
   A. Quality Assurance shall be provided in accordance with Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING
   A. Delivery, storage, and handling shall be provided in accordance with Division 1, including the following:
      1. Sod left out for more than 24 hours shall not be used without approval of the UC Denver Project Manager. Sod in rolls shall be kept moist and protected from exposure to sun, wind and heat. All sod transported in open vehicles for a distance of more than 25 miles must be properly protected. All sources of sod shall be made known to the UC Denver Project Manager 3 business days in advance of cutting.
      2. Deliver seed in original sealed, labeled, and undamaged containers.

1.8 WARRANTY
   A. Product and system warranties shall be provided in accordance with Division, including the following:
      1. Sod and seed shall be warrantied for a period of one year from the date of final completion. The warranty period begins anew for each required replacement of sod.
      2. Warranty Condition:
         a. Resod or reseed all areas when sod or seed is no longer in a satisfactory growing condition as determined by the A/E for the entire warranty period.
b. Replacement will not be allowed in any season determined unfavorable for sodding or seeding.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 MATERIALS, GENERAL

A. Sod:

1. New sod shall be of uniform density, color, and texture, and strongly rooted. All sod: equivalent of a 90% Turf-type Tall Fescue (2 varieties), 10% Improved Kentucky Bluegrass sod or as approved by UC Denver Fac. Ops. through the UC Denver Project Manager.

2. The sod shall have a vigorous and healthy root system that has been regularly watered, mowed, fertilized and sprayed for weeds in the sod nursery. Each piece of sod shall be free of objectionable weeds. The sod shall be such that it will not tear, break or crumble during the handling and placing of the sod. Unless short and smooth, the grass shall be clipped with a lawn mower to a height of two inches before it is lifted. The sod is to be cut evenly not more than one inch thick and cut in strips approximately eighteen inches in width.

B. Seed:

1. Grass seed to be fresh, clean, dry, new seed proportioned by weight as follows:

   a. All seed: equivalent of a 90% Turf-type Tall Fescue (2 varieties), 10% Improved Kentucky Bluegrass seed or as approved by UC Denver Fac. Ops. through the UC Denver Project Manager.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination of the conditions of the substrate to receive the work shall be done in accordance with Division 1.

3.2 INSTALLATION, GENERAL

A. Sodding and Seeding Season:

1. Sodding or seeding shall occur only after April 1 and before October 1 unless approved by the A/E.

2. Sodding or seeding shall occur only when weather and soil conditions permit in accordance with locally accepted practice.

B. Lawn Area Preparation:

1. Well rotted cow manure shall be spread over the surface of the ground of the areas to be covered at the minimum rate of three cubic yards per thousand square feet. The areas shall then be thoroughly tilled to a depth of from a minimum of 4 inches to a maximum of 6 inches until no manure appears on the surface.

2. All sticks, stones and other debris appearing on the surface or larger than 1 inch in any dimension shall be carefully removed. The entire surface shall then be carefully graded so
that no unevenness appears. The Landscape Contractor shall finish grade in accordance to grading plan and shall remove any high or low spots to obtain an even surface.

3. Provide erosion-control measures for seeded areas to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent areas.

C. Lawn Installation:

1. Areas to be sodded or seeded shall be smooth before any sodding or seeding is to be done. If slopes are steeper than 2:1, the bed shall be lightly and sufficiently watered.

2. Sod shall be laid by staggering joints. On any slopes, the sod shall run perpendicular to the slope. When in position, the sod shall be watered, then rolled and/or tamped into contact with the soil, so that no open joints are apparent. After laying the sod, it shall be fertilized with a commercial fertilizer 20-20-10 at the rate of ten pounds per thousand square feet.

3. Seeded areas to be drill seeded. Sow seed at a rate of 5-6 lbs/1000 sf.

4. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly to form a continuous blanket 1 ½ inches in loose depth over seeded areas. Crimp mulch.

D. Watering:

1. The Landscape Contractor shall initially water the sod and lightly and sufficiently to a depth of 4 inches with care so that no erosion takes place and so that no gullies are formed.

2. The sod and seed shall then be watered in early morning and afternoon for at least five successive days after laying to establish the lawn as determined by the UC Denver Project Manager. During hot weather, the sod should be kept moist and not allowed to dry out for a minimum of three weeks after installation.

E. Maintenance of Turf:

1. General: Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as aerating, rolling, regrading and resodding as necessary to establish a smooth, acceptable lawn, free of eroded or bare areas or as directed by the Architect.

   a. Overwatering of lawn, which causes stress to trees, is not allowed.

2. Maintenance Period: Begin maintenance immediately after sodding or seeding. Maintain lawn areas until the end of the Warranty period. If sodding occurs in autumn and maintenance has not been performed, or if work was not yet acceptable at the end of autumn growing season (October 1), continue maintenance the following spring beginning April 1 (or sooner, weather permitting) and continue to the end of the warranty period.

3. Mowing and Trimming: Mow and trim around tress (keeping mulch in saucers and beds), walls, fences, etc., maintaining turf at 2 – 2 3/4” height. Do not remove more than 33% of grass leaf in single mowing. Remove grass clippings from pavements areas.
END OF SECTION
SECTION 02950

LANDSCAPE - TREES, SHRUBS & GROUND COVER

PART 1 - GENERAL

1.1 SUMMARY

A. This section provides standards for landscape, trees, shrubs, and ground cover. Note: Architecture Engineer should review part 2 of the standard and incorporate the planting guidelines and low water use.

1.2 REFERENCES

A. Manual Part 2, Section 2.13 Landscape Guidelines
B. Manual Part 2, Section 2.14 Recommended Plant List

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. General Design Information:

1. All landscape designs shall be reviewed by the UC Denver Grounds Department through the UC Denver Project Manager, for conformance with the Landscape Master Plan.
   a. Protection of existing landscape features, especially trees and shrubs, will be paramount for each project. These must be specifically discussed in detail in the specifications.
   b. Isolated islands or berms etc. are labor intensive and should be avoided. The design should be kept in context with adjacent spaces.
   c. A preliminary landscape plan shall be prepared by the A/E with generic descriptions to be used in discussing design concepts prior to doing detailed planting plans.


B. Repair of Landscape or Irrigation System Damage:

1. Projects shall bear the cost of restoration to existing landscape for damage associated with construction. Repair shall include damage outside of construction zones if damage results from some effect of project such as rerouting of pedestrian traffic across a grass area in lieu of a previous sidewalk path.
2. Contractors shall include restoration costs in the bid proposals.

3. Contractor may choose to have restoration work done by the UC Denver through the UC Denver Project Manager or by a prequalified Landscape Contractor. However, competitive bidding between the UC Denver and Landscape Contractors is not permitted.

4. The extent of restoration work shall be established in the following manner.
   a. Prior to construction, the site shall be surveyed by the UC Denver Project Manager, A/E, and Contractor.
   b. The initial condition shall be documented through mutual agreement, written description, sketches and/or photographs.
   c. After construction the site shall be surveyed by same group and the final condition shall be documented through same procedure.

5. Restoration work shall be performed according to these Standards, which shall be included in the Construction Documents. Conformance to Standards shall include the intermediate or temporary repairs as outlined here. Temporary repairs may be necessary to keep irrigation systems active. Failure to do so may result in additional damage to turf areas which shall require restoration.

C. Layout of New Trees:

1. The use of street trees is encouraged in all designs and will be coordinated with the UC Denver Campus Architect through the UC Denver Project Manager.

2. All trees must have a minimum 3 feet diameter mulch area to be covered with shredded cedar mulch.

3. Trees must not be planted above underground utilities. The following table identifies the minimum and recommended distances from trees to utilities and other site items.

<table>
<thead>
<tr>
<th>Item</th>
<th>Minimum Distance (feet)</th>
<th>Preferred Distance (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curbs</td>
<td>2.5 CE</td>
<td>3-5 CE</td>
</tr>
<tr>
<td>Sidewalks</td>
<td>2.5 CE</td>
<td>3-5 CE</td>
</tr>
<tr>
<td>electric buried cable</td>
<td>4 CC</td>
<td>5-6 CC</td>
</tr>
<tr>
<td>water lines</td>
<td>6 CC</td>
<td>7-8 CC</td>
</tr>
<tr>
<td>sewer lines</td>
<td>10 CC</td>
<td>10+ CC</td>
</tr>
<tr>
<td>steam/condensate lines</td>
<td>10 CC</td>
<td>15+ CC</td>
</tr>
<tr>
<td>gas lines</td>
<td>4 CC</td>
<td>5-6 CC</td>
</tr>
<tr>
<td>street lights-shade trees</td>
<td>40 CC</td>
<td></td>
</tr>
<tr>
<td>street lights-ornamental trees</td>
<td>15 CC</td>
<td></td>
</tr>
<tr>
<td>street signs</td>
<td>7 CC</td>
<td></td>
</tr>
</tbody>
</table>
### Landscape - Trees, Shrubs & Ground Cover

#### Item | Minimum Distance (feet) | Preferred Distance (feet)
--- | --- | ---
Intersections | 30 CC | 
Vaults and pits | 5-10 CC | 10 CC |
Tree to tree – shade | 35 CC | 
Tree to tree – ornamental | 20 CC | 

CE = center of tree to center
CC = center of tree to edge
EE = edge of trees to edge

### D. Landscape Requirements:

1. Planting beds should have a weed control blanket underlay of polyester nylon mesh, not polypropylene. These will be determined by the UC Denver Grounds Department and the UC Denver Project Manager during review.

2. The shredded cedar mulch in the shrub beds should be three inches in depth minimum after setting.

### E. Protection and Preservation of Existing Trees:

1. All site or landscape plans should show all existing trees. Trees to be saved or removed should be indicated.

2. Trees to be saved should have a properly constructed barrier fence which protects the total area within the drip line. The drip line is defined as the area on ground covered by spread of branches.

3. No equipment or materials shall be parked or stored within the drip line of the tree.

4. Trenching should be done outside the drip line of trees. Trenching or boring will be permitted inside the drip line of a tree only with approval from the UC Denver Project Manager.

5. After trenching outside the drip line of a tree, any severed roots should be cut again smoothly and with flush cuts. Trenches should be backfilled immediately to prevent roots from drying out.

6. Where possible, curbs should not be located closer than 5 feet from the trunk of the tree. No paving or asphalt should be located closer than 5 feet from the tree trunk.

7. New sidewalks, paving or asphalt must allow breathing space for tree roots. The following should be used as a guideline. For trees up to 4 inches in trunk caliper, 25 square feet of porous area is needed. For each additional 2 inches of tree caliper, 10 additional square feet are needed.

### F. Selection of New Plants:
1. All plants shall conform to the following specifications adapted from the ALCC Handbook and to the American Standard for Nursery Stock, 1986 Edition. Plants shall be supplied from propagating houses, beds, frames or nurseries. "Collected" stock will not be accepted unless specified or approved by UC Denver Grounds and the UC Denver Project Manager as a substitute.

2. All plants shall have well formed buds with size normal for the species. Growth increments of shoots for the previous year shall be of a size normal for the season, i.e., not showing stunted growth. Plants shall not have been in storage for more than one growing season.

   a. All plants shall be sound, healthy, vigorous and free of harmful insects, diseases and major mechanical injuries. Major mechanical injuries include damages to trunk or branches to the extent it would affect normal growth and/or appearance, or would require pruning or wound treatment.

   b. Plants shall be symmetrical and typical for species and variety. Trees planted in rows shall be consistent in branching habit, size, form and height.

   c. Plant sizes shall be specified.

3. Plants shall be selected from specified growing areas as defined below.

   a. Colorado Grown: plants grown in Colorado nursery fields for the major portion of their life.

   b. Colorado Fielded: plants shipped in, which have grown in Colorado for one full growing season or more prior to delivery.

   c. Northern Grown: plants grown in nurseries one year or more located in Hardiness Zones 1 through 5, as shown in USDA Map.

4. Alternate plants may be proposed by the Contractor if specified types are not available. Approval of substitutes shall be made by the UC Denver Project Manager.

1.4 DEFINITIONS

1.5 SUBMITTALS

1.6 QUALITY ASSURANCE

   A. Quality Assurance shall be provided in accordance with Division 1.

1.7 DELIVERY, STORAGE, AND HANDLING

   A. Delivery, storage, and handling shall be provided in accordance with Division 1, including the following:

   1. Transportation of Plants:

      a. All plants shall be dug to conform to the minimum standards set forth in the most recent revision of the Rules and Regulations of the Colorado Nursery Act.
b. All plants specified in containers shall conform to the most recent revision of the Rules and Regulations of the Colorado Nursery Act.

c. All plants specified as balled and burlapped shall conform to the most recent revision of the Rules and Regulations of the Colorado Nursery Act.

d. All plants, bare root, container or balled and burlapped shall be protected from the time of digging to the time of planting from any conditions that would adversely affect the continued growth of the plant.

e. Delivery and planting shall be scheduled and coordinated with other landscape work.

1.8 WARRANTY

A. Product and system warranties shall be provided in accordance with Division 1, including the following:

1. Warranty shall be for a period of one (1) growing season after Final Acceptance of landscape work and at no additional cost to the Owner. The Contractor shall replace any trees, shrubs, groundcover or bulbs that are dead, or that are, in the opinion of the Owner, in unhealthy or unsightly condition, or that have lost their natural shape due to dead branches or excessive pruning of dead branches.

2. The warranty period begins anew for each replaced area or item and extends each time the area or item requires replacement. Replacement of planting shall be in accordance with the original specifications.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.2 MATERIALS, GENERAL

A. All trees, shrubs and groundcover shall be selected from the lists included in Manual Part 2, Section 2.14.

PART 3 - EXECUTION

3.1 EXAMINATION

3.2 INSTALLATION, GENERAL

A. Planting Seasons:

1. Planting shall occur only after April 15 and before October 1 or as specified on the Drawings without written approval from Architect.

2. Planting shall occur only when weather and soil condition permit in accordance with locally accepted practice. Do not plant during periods of prolonged cold or heat, or during excessively wet or dry periods.

B. Planting:

1. Locations for plants shall be staked and verified according to the landscape plan.
2. Prior to any excavation, all underground utilities shall be identified by Utility Services through the UC Denver Project Manager according to the Utility Locate procedure described in Section 01040 - Coordination.

3. Plants which have been container grown and balled and burlapped shall be planted as follows:
   a. In clay or clay loam soil, the planting pit shall be made 2 to 4 inches more shallow than the height of the soil ball, and a minimum of 1 foot larger in diameter.
   b. In sandy loam soil, which is well drained, the planting pit depth shall be no deeper than the height of the root ball and a minimum of 1 foot larger.
   c. Container plants shall be removed and the fibrous roots teased, manipulated or scarred with a knife to discourage circling roots. Care should be taken not to break the root ball.
   d. Balled and burlapped plants shall be set in the planting pit at the proper depth and all twine removed from the trunk, and excess burlap cut from the top of the root ball prior to backfilling.

4. Bare root plants shall have backfill soil amended according to recommendations of the Architect/Engineer. Backfill shall be added and watered thoroughly, settle soil with water to eliminate all air pockets. Do not compact backfill by tamping. If area is irrigated, do not provide a basin. If area is not irrigated, form a basin for water.

5. Percolation test shall be provided by the contractor to check for adequate air and water movement. If site soil fails the test, the contractor shall notify the UC Denver Project Manager. Improvement of soil drainage shall be performed prior to planting and may require recommendations through the design team from a soil testing laboratory and/or an agricultural drainage consultant.

6. Backfill amendments shall be of a consistency to allow for air and water movement without compacting.

7. Wire baskets shall be used. Remove the bottom of the basket up to the first tier of wire prior to placing the tree in pit. Place the balled tree in the hole at the proper depth, backfill and compact the soil up to the first tier of wire above the bottom of the ball to stabilize it. Remove the remainder of the wire and backfill and compact the soil up to approximately one-third of the bottom portion of the ball. Finish backfilling with loose soil and thoroughly puddle with water.

8. Staking, guying and tree wrap shall conform to Details L-6 through L-13 in Appendix A. Trees shall be wrapped with approved material, e.g. the standard 4 inch crepe wrap. Wrap from the ground line up to the second whorl of branches and secure. Apply wrap approximately November 15 and remove approximately April 15 of the following year. When guy wires are used, they shall be flagged with a conspicuous material and replaced as required by the UC Denver Project Manager until guy wires are removed.

9. Pruning shall be provided to any injured or broken roots or branches. These shall be trimmed to a clean, smooth cut without disturbing branch collar. Evergreens
shall have only damaged branches trimmed in a manner that the form of the tree is not affected.

10. No hole or pit shall remain open without safety devices to protect the
UC Denver from liability for personal accidental injury.

C. Plant Maintenance:

1. General: Maintain plants by watering, fertilizing, pruning, restoring planting
saucers, tightening and repairing stake supports, resetting trees and shrubs to
proper grades or vertical position, spraying as required to keep trees and shrubs
free of insects and disease, cultivating and weeding as required for healthy growth
or as directed by the Architect.

a. Monitor watering of plants and lawns to verify overwatering is not
causing stress to trees, especially when planted in turf.

b. Tree wrap:
   a. Apply a coating of insecticide and fungicide to the tree trunk
      area to be wrapped.
   b. Apply wrap to overlap 1 ½” from ground line up to lowest
      branch. Wrap trunks in late fall (approximately November 15).
   c. Tie securely in at least five places with jute twine, placed at
      least 12” apart.
   d. Remove tree wrap at the beginning of the growing season
      (approximately April 15).

plants until the end of the Warranty period. If planting occurs in autumn and
maintenance has not been performed, or if work was not yet acceptable at the end
of the autumn growing season (October 1), continue maintenance the following
spring beginning March 15 (or sooner, weather permitting) and continue to the end
of the warranty period.

3.3 TESTING, CLEANING, AND CERTIFICATION

3.4 COMMISSIONING (DEMONSTRATION)

3.5 SCHEDULES

END OF SECTION