



**University of New Mexico  
Environmental Services  
Irrigation Specifications**

**SECTION 02810 IRRIGATION SYSTEMS**

**PART 1 GENERAL**

**1.01 SUMMARY:**

- A. The work consists of installing a complete underground sprinkler system as specified hereafter. The Contractor performing this work shall furnish all labor, equipment, materials and permits necessary for the completion of the system, except those specified to be furnished by others. The construction of the sprinkler system shall include furnishing, installing and testing of all pipe, fittings, valves, sprinkler devices, controllers, backflow preventers, inlet and discharge piping, manual drain valves, valve boxes, water meters, and all other components pertinent to the plans and specifications of this system. The Contractor shall perform all trenching, excavating, boring, backfilling, concrete installation, electrical work, and any other work necessary for the completion of the project.

**1.02 SUBMITTALS:**

- A. On projects greater than \$50,000.00, prepare and make five sets of submittals providing manufacturer's specifications and "cut sheets" on all controllers, water emitting devices, backflow preventers, valves, pumps and other equipment as required. For projects less than \$50,000.00, two sets of submittals will be adequate.

**1.03 DRAWINGS:**

- A. Bid Drawings. The University will provide drawings for the bidding of this project in an electronic form.
- B. The Contractor shall provide and keep up to date a complete set of "record" drawings which shall be corrected daily to show all changes in the location of sprinkler heads, controllers, backflow preventers, valves, drains, meters, points of connection, pull boxes and wire splice boxes, pipe and wire routing and other changes that may have been made from the original drawings and specifications as provided to them. All gate valves, manual drains, wire splice, automatic and manual valve locations shall be shown with actual measurements to multiple permanent reference points so they may be easily located in the field.
- C. At the time of final acceptance, the Contractor shall furnish a digital set of reproducible "record" drawings prepared by a qualified draftsman in AutoCAD, (most recent version preferred), showing the entire completed system as actually installed. This is the responsibility of the Contractor and shall not be construed to be the responsibility of any other party. This drawing shall be accurate and to scale. The symbols for valves, heads, and piping, etc. shall be the same as shown originally on the drawings. The legend shall also be modified to designate any "record" changes. The final drawings shall be dated and clearly labeled "RECORD DRAWING".

- D. The Contractor shall also provide and install in the controller enclosure at the Site, a legible reduction of the Record Drawing, laminated in plastic, indicating the zone layout.
- E. The Contractor shall also supply digitally recorded photographic documentation of the following installations: mainline locations, sleeves, valve locations, wire splice locations and all other critical connections.

## **PART 2 PRODUCTS**

### **2.01 MATERIAL:**

- A. All materials shall be new and without flaws or defects of any type and shall be the best of their class and kind. All materials shall have a minimum guarantee of one year against material defects or defective workmanship.
- B. All material shall be the brands and types noted on the Drawings or as specified herein, or approved equal.
- C. The irrigation system will be designed around equipment manufactured by specific companies as a standard. Approved equal equipment by other manufacturers may be used only with the approval of the UNM representative. Request for approval of non- specified materials must be submitted to the UNM Representative a minimum of seven (7) days prior to the opening of bids. Submission of irrigation sprinkler heads for approval as equal shall only be considered if submitted heads match the precipitation rate, gallons per minute and spacing of specified Sprinkler heads.

### **2.02 PLASTIC PIPE AND FITTINGS:**

- A. Plastic Pipe: All mainline pipe, from the point of connection to the zone valve, with a diameter of two inches (2") or less shall be Schedule 40 PVC and shall conform to ASTM D 1785; mainline pipe with a diameter of two and one-half inches (2 1/2") or greater shall be Class 200 "O" ring gasket pipe, SDR 21; lateral line piping downstream of the zone valves will be one (1) inch in diameter and greater and shall be Schedule 40 PVC and shall conform to ASTM D 1785. Solvent shall meet ASTM L 2774 and D 2855 requirements. All PVC pipe shall be continuously marked with identification of the manufacturer, type, class, and size, and shall be free of holes, foreign material, blisters, wrinkles, dents or sunburn. Minimum pipe size shall be one inch and will increase by ½ inch increments as required. The use of ¾ inch and 1 1/4 inch pipe is prohibited.
- B. All piping installed under paved surfaces, such as sidewalks, up to 8 feet in width shall be sleeved in a Class 200 PVC pipe two (2) sizes larger than the pipe to be sleeved. All piping installed under paved surfaces wider than 8 feet, such as roads or parking lots, shall be Schedule 80 PVC pipe sleeved in a Class 200 PVC pipe two (2) sizes larger than the pipe to be sleeved. Wiring shall be placed in a separate sleeve from that of the pipe crossing and shall be minimum 1 1/2" Class 200 PVC.
- C. Location Tape: Irrigation line location tape shall be approved by UNM representative prior to installation and shall be installed a minimum of six (6) inches above all main line piping.

- D. PVC Fittings: Fittings on PVC lateral lines shall be Schedule 40 PVC, Type 1, Cell Classification 13454-B, and shall comply with ASTM D 2466. All main line fittings shall be Schedule 80 PVC, Type 1, cell classification 12454-B and shall comply with ASTM D 2464 and ASTM D 2467.
- E. Threaded Nipples: All threaded PVC nipples shall be Schedule 80 Molded PVC pipe. All galvanized nipples shall be Schedule 40 galvanized steel pipe. The use of male adaptors is not allowed.

### **2.03 VALVES AND VALVE BOXES:**

- A. Valves: All electric valves shall be Weathermatic 2100 DW series valves. Minimum valve size shall be one (1) inch.
- B. All manual valves installed below grade shall be schedule 80, full port, true union ball valves.
- C. Valves for use in electrically controlled automatic control systems shall be diaphragm actuated and hydraulically operated solenoid valves.
- D. Valve Boxes: Valve boxes shall be Carson Industry brand unless prior approval is given for substitute. Model 1419 eighteen inch standard valve boxes shall be used for all single valve (or single electric valve with an isolation valve) installation. Model 1730 Super Jumbo XL boxes shall be used for multiple valve installations up to three electric valves and an isolation valve. Valve boxes shall be Tan in color when installed in gravel areas and green in color when installed in turf areas.

### **2.04 SPRINKLER HEADS, BUBBLERS AND DRIP SYSTEMS:**

- A. All sprinkler heads shall be Rainbird brand. Fixed spray sprinklers will be Rainbird pressure compensating heads. The use of stream type rotor heads is encouraged to optimize system performance.
- B. Bubblers are not a preferred method of applying water to plant materials. If bubblers are to be used they shall be fixed rate type bubbler install on a flexible riser no higher than one inch higher than the gravel.
- C. Drip Irrigation systems are preferred to bubbler systems to applying water to non turf plant material. All drip systems must have a filter and a pressure regulation device installed in a Model 1419 eighteen inch standard valve box. Drip systems will be designed and installed to meet current and future plant water requirements which may include installation of emitters outside the current root zone of the plant material. The use of point source emitters is preferred to line source emitters due to long term maintenance requirements. Additionally, DBK brand flag type emitters are preferred. Emitters shall never be placed with-in six (6) inches of the plants base and multiple emitters are required for each plant. The number of emitters and there placement is determined by the plant size and location.

### **2.05 CONTROLLER:**

- A. Controllers shall be Rainbird ESP or LX type controllers with a minimum of two extra stations for future expansion capabilities. ESP-MC type controllers will be required on all systems 12 stations and larger.

**2.06 BACKFLOW PREVENTER:**

- A. The backflow prevention device shall be a Febco, Model 825Y-BV and it shall comply with the City of Albuquerque Cross Connection Control Ordinance.
- B. Atmospheric and Pressure Vacuum Backflow prevention devices may be used in certain limited conditions only with prior approval by the University
- C. Automatic drains and unions shall be installed on both sides of the backflow prevention device.
- D. A State of New Mexico mechanical permit is required for all new backflow prevention devices installed on the University of New Mexico Campus.
- E. The backflow prevention device shall be tested, meet or exceed the testing requirements, and be approved by a licensed backflow technician prior to final acceptance. Test results will be provided to the University representative at the completion of the project.
- F. Reduced Pressure Backflow assemblies and Pressure Vacuum breakers must have insulated enclosures installed on a concrete slab per New Mexico Uniform Plumbing Code (NMUPC). Electrical supply for heat tape or equal is preferred if site conditions allow.

**2.07 CEMENTS, CLEANERS/PRIMERS AND JOINT COMPOUNDS:**

- A. Cement shall be Weld On brand plastic pipe cement for use on all sizes and schedules of PVC pipe and fittings. Cement must be NSSF approved and meet ASTM D 2564 requirements.
- B. Cleaner/primer shall be Weld On C-65 pipe cleaner.
- C. All threaded connections between metal to metal, PVC to metal and PVC to PVC shall be made using RECTORSEAL #5 slow dry, soft set, thread sealing compound. Thread sealing compound shall not be used on threaded connections between sprinkler nipple or bubbler and nipple or on any plastic valves.
- D. All "O" ring gasket and pipe spigot ends shall be lubricated using the lubricant recommended or supplied by the pipe manufacturer. If the pipe does not provide a lubricant for the pipe, use IPS Weld-on #787 gasket lube or approved equal.

**2.08 WIRE:**

- A. Wire for the 120 volt wiring shall be solid copper (or stranded copper in larger wire sizes), under grounded feeder for direct burial and PVC insulated. Size of wire shall be # 12 AWG.
- B. Wire for the 24 volt wiring shall be solid copper wire, PVC insulated, UL approved under ground feeder wire for direct burial in ground. Common wires shall be a minimum of #12, white. The wire shall be supplied in either 500' or 2,500'rolls. The control wires shall be a minimum of #14 gauge (larger gauge as required) of any color other than white unless otherwise indicated on drawings.
- C. Wire Splicing Materials: All wire splices shall be made water-tight using 3M Scotchlok Connectors or King "One Step" direct bury waterproof connectors or previously approved equal.

- D. A minimum of two extra zone wires are to be installed from the controller to the furthest valve location for future use. If the controller is centrally located, one wire will be taken to each end location.

**2.09 OTHER MISCELLANEOUS FITTINGS AND MATERIALS:**

- A. Rainbird 44 RC Quick coupler valves shall be installed every 100 feet of main line run or at all electric valve locations, whichever distance is less.  
All Quick coupler valves shall be installed in a Carson Industry model 910, ten inch round valve box. The color of the valve box shall be as previously specified.  
All other miscellaneous fittings and materials shall be as specified on the Drawings.

**PART 3 EXECUTION**

**3.01 GENERAL:**

- A. This section includes installation specifications for all items installed as a part of the sprinkler irrigation system. Certain construction procedures or minor equipment installation procedures may have been omitted from these specifications that are necessary for the proper installation of the system. In any case, all materials and equipment shall be installed in a neat and workmanlike manner according to manufacturer's recommendations and specifications, local state codes, as shown on the Drawings and as specified herein.

**3.02 PRODUCT HANDLING:**

- A. The Contractor shall be responsible for correct procedures in loading, unloading, staking and transporting and handling all materials to be used in the system. The Contractor shall avoid rough handling which could affect the useful life of equipment. Pipe shall be handled in accordance with the manufacturer's recommendations on loading, unloading and storage.

**3.03 EXCAVATION AND TRENCHING:**

- A. The Contractor shall paint out the location of each run of pipe and all sprinkler heads and valves prior to trenching. The UNM representative shall approve each lay out of the system before actual installation is started.
- B. Excavation and trenching for pipelines shall be true and as nearly vertical as practical. The width of the trenches shall not be greater than necessary to permit proper joining, tamping, backfilling, bedding or any other installation procedures that may be necessary. Trench widths shall also be wide enough so that there will be a minimum horizontal and vertical separation of 4" between pipes in the same trench.
- C. In areas where trees are present, trench lines will be adjusted on the site to eliminate or minimize any damage to tree roots. Hand trenching and excavation under tree roots may be required at the discretion of the University Representative.
- D. Trench depths shall be sufficient to provide the specified pipe cover as described elsewhere in these specifications or as noted on the Drawings. In rocky areas the trenching depth shall be 6"

below normal trench depth to allow for pipe bedding as described in other portions of these specifications.

- E. Depth of Bury: Minimum cover over mainline and lateral piping shall be eighteen (18) inches.
- F. Low flow, poly type drip systems shall be buried 3-5 inches below grade to protect pipe.

#### **3.04 PIPE AND FITTINGS INSTALLATION:**

- A. Installation of plastic pipe and fittings shall be in accordance with the manufacturer's recommendations and procedures and as mentioned in the specifications. Manufacturer's recommended procedures for making solvent weld fittings shall be strictly adhered to. Only solvent cements, cleaners, and primers or lubricants recommended or supplied by the pipe manufacturer shall be used.
- B. The Contractor in handling, loading, unloading, and storing of PVC pipe and fittings shall exercise caution. All PVC pipe shall be stored and transported in a vehicle with a bed or rack long enough to allow the pipe to lie flat without subjecting it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged or in any other way found to be defective, either before or after installation shall be replaced with sound pipe without additional expense to the Owner.
- C. Before installation, the inside of the pipe shall be cleaned of all dirt and foreign matter and shall be kept in a clean condition during and after installation of pipe. When work is not in progress, open ends of pipe and fittings shall be secured closed so that no trench water, earth or other foreign substances will enter the pipe or fittings. Where pipe ends are left for future expansion or connections, they shall be valved off and capped as directed. These future expansion points will be noted on the as built drawings.
- D. All PVC pipe and fittings shall be assembled to permit the pipe or fittings to be jointed at the true parallel position of the fittings. Placement of pipe in curving trenches that cause excessive bending and stress on pipe and fittings will not be permitted. System shall be designed and installed so that no fittings are within two times the pipe diameter of each other. For example, on a two inch diameter pipe, no fittings are within four inches of each other.
- E. Before installing the pipe, all rubbish and large rocks shall be removed from the trenches. If the soil is extremely rocky, the trenches shall be bedded with dirt or sand as outlined in other portions of these specifications. The UNM representative shall approve material used for pipe bedding. The full length of each section of the pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, joints and couplings.
- F. Pipe shall not be laid in water or when trench or weather conditions are unsuitable for the work. Any water, which may be encountered or may accumulate in the trenches or excavation shall be pumped out or otherwise removed as necessary to keep the bottom of the trench or excavation free and clear of water during the progress of the work. Pipe shall not be laid when the temperature is 32° F or below.

- G. PVC pipe will expand or contract at the rate of 1" per 100' per 10F change of temperature. Therefore, the pipe shall be installed in a manner so as to provide for expansion and contraction as recommended by the manufacturer.
- H. The minimum horizontal and clearance between lines in the same trench shall be 4". Do not stack lines in the same trench.
- I. After all sprinkler piping, risers, valves, thrust blocks etc., have been installed and partially backfilled as specified in other parts these specifications, the control valve shall be opened and a full head a water used to flush out the system. After the system is thoroughly flushed, risers shall be capped off and the system pressure tested in accordance with the testing section of these specifications. At the conclusion of the pressure test, the heads shall be installed and the backfill operation completed.

### **3.05 SOLVENT WELDING PROCEDURE:**

- A. PVC plastic pipe shall be squarely cut utilizing a hacksaw with a blade of 18 or 24 teeth per inch or equal. Burrs left from cutting shall be wiped off with a clean dry cloth. Utilizing a cleaner/primer, thoroughly clean the mating pipe end and the fitting socket with a clean, dry cloth.
- B. Apply a uniform coat of solvent cement to the outside of the pipe end with a non-synthetic brush or dauber. In like manner, apply a thin coating of solvent cement to the inside of the fitting socket.
- C. Re-apply a light coat of solvent cement to the pipe end and quickly insert it into the fitting to the full depth of the fitting socket. Rotate the pipe or fitting approximately 1/4 turn to insure even distribution of the solvent cement. Hold in position for approximately 30 seconds.
- D. Wipe off any excess solvent cement that forms as a bead around the outer shoulder. Care should be taken so as not to use an excess amount of solvent cement that could cause burrs or obstructions to form on the inside of the pipe joint. Solvent weld joints shall be allowed to cure for at least 24 hours before pressure is applied to the system.

### **3.06 BACKFILLING:**

- A. Upon completion of a particular section of the irrigation system, and after sufficient time has elapsed for the curing of solvent weld joints, partial backfilling can begin, leaving all joints, risers and connections exposed for visual inspections during the hydrostatic testing. Only upon successful completion of the hydrostatic test can the backfill operation be completed for any one particular section.
- B. All backfill material shall be subject to approval by the UNM Representative. Backfill material shall be free from rocks or other debris over one (1) inch in diameter, brush, sod, frozen material or other unsuitable substances that may damage pipe during the backfilling operations.
- C. In the event that the material from the excavation or trenching is found to be unsuitable for use in backfill by the UNM Representative, the material shall be removed from the site and properly disposed of by the Contractor and at the contractor's expense. The contractor shall then, at no additional cost to the Owner, arrange for, purchase, and furnish suitable backfill material

consisting of earth, loam, sandy clay, sand or other approved materials free of large clods of earth or sharp stones and capable of attaining the same relative density of the surrounding ground.

- D. In rocky areas, the trench depth shall be 6" below the normal trench depth to allow for 6" of suitable backfill as padding for the pipe. In like manner, there shall be at least 6" of padding on all sides of the pipe as protection against the rock wall of the trench.
- E. All mainline piping shall have irrigation line location tape installed in the trench six (6") inches above and six (6) inches below the pipe.
- F. Backfill shall be placed in horizontal layers not exceeding 6" in depth and shall be thoroughly tamped, or water compacted to near original density or so that no settling will result. Backfill shall be placed to the original ground level. If settlement of trenches occurs within one (1) year from date completion, it shall be the contractor's responsibility to refill trenches and re-seed or sod the repaired areas.

**3.07 SADDLE TAPS:**

- A. No saddle taps shall be permitted unless approved by the UNM Representative.

**3.08 THRUST BLOCKS:**

- A. Concrete thrust block shall be provided where necessary to resist system pressure. Thrust block shall be constructed at all direction changes size changes, valves and terminations or at any other points of the system that will result in an unbalanced thrust line for equipment 2 1/2" and larger. Do not obstruct the outlets of fittings that are intended for future connections. Thrust blocks shall be poured against undisturbed earth and in accordance with the Drawings.

**3.09 PAVEMENT CROSSINGS:**

- A. Unless otherwise noted, all piping installed under paved surfaces, such as sidewalks, up to 8 feet in width shall be sleeved in a Class 200 PVC pipe two (2) sizes larger than the pipe to be sleeved. All irrigation piping installed under paved surfaces wider than 8 feet, such as roads or parking lots, shall be Schedule 80 PVC pipe sleeved in a Class 200 PVC pipe two (2) sizes larger than the pipe to be sleeved. Wiring shall be placed in a separate sleeve from that of the pipe crossing and shall be minimum 1 1/2" Class 200 PVC. Ends of sleeves shall be sealed following installation of wire or piping.

**3.10 SPRINKLER HEAD INSTALLATION:**

- A. Sprinkler heads shall be of the type and make specified and shall be installed as shown on the Drawings. Sprinkler heads shall be installed with a minimum 6" space between the edge of the sprinkler head and curbs, walls, driveways, building walls, etc. Heads shall be installed in the vertical position and backfilled and compacted to near original density. All sprinklers will be installed on a previously approved flex type or swing type riser.



- B. Sprinkler head spacing shall not exceed the manufacturers recommended spacing and shall be in the location and configuration as shown on the Drawings. Contractor shall verify turf area dimension while staking sprinkler head location. Sprinkler heads shall be spaced to achieve maximum uniform coverage.
- C. After all piping and risers are in place and connected and before installation of the sprinkler heads, all control valves for a given section shall be fully opened and a full head of water shall be used to flush out the system. If water pressure without the heads installed is not sufficient to provide adequate water flow from end risers, the Contractor shall cap off enough heads closest to the water source to provide adequate flushing of the end riser assemblies.

**3.11 CONTROLLER INSTALLATION:**

- A. The Controller location ~~is~~ shall be indicated on the Drawings. The Contractor shall familiarize themselves with the requirements of making the power connections at the locations noted (120 volt supply to the Controller) and shall include in his lump sum price for the sprinkler irrigation system, the cost to complete this portion of the contract.
- B. The Controller shall be mounted and wired according to the manufacturer's recommended procedures and as specified herein and on the Drawings.
- C. When Controllers are mounted outside of any building, vault or enclosure, the Contractor shall direct wire the 120-volt power supply to the Controller.
- D. Remote control valves shall be connected to Controller in the numerical sequences as shown on the Drawings or as directed by the UNM Representative.
- E. The extra control wires installed shall be identified in the controller but not wired into the controller. The end location of the wires will also be noted.

**3.12 AUTOMATIC CONTROL VALVE INSTALLATION:**

- A. All automatic control valves shall be of the type and size as indicated on the Drawings. Installation shall be according to these specifications, and the manufacturer's recommendations.
- B. All automatic valves will have a schedule 80, full port, true union ball valve installed just prior to each individual valve or group of valves as design conditions warrant. At no time will more than three electric valves be isolated by one manual valve.
- C. The valve boxes shall be of the size and type previously indicated.
- D. Valve wire splices shall be waterproofed using 3M Scotchlok Connectors or King "One Step" direct bury waterproof connectors or approved equal. The Contractor shall provide a 36" wire expansion coil to facilitate raising splices to ground level without cutting wires.
- E. All valves will be labeled with a stamped metallic label identifying the valve's corresponding controller zone number.

**3.13 24 VOLT CONTROL VALVE WIRING:**

- A. All wire installation procedures as described herein shall be checked to conform to local codes.

- B. The Contractor shall install the 24-volt control valve wiring in the same trench as the irrigation mainline. Only when it is not possible for the wires to be installed in the mainline trench, they shall be installed in the lateral pipe trench. All wires shall be laid below the pipe. In no case shall the wire be laid on top of the pipe. The wires shall be laid loose in the trench and taped together at 10'-0" intervals. When trenches used for piping are not appropriate for routing wire, Contractor shall install wire in a separate trench, 18" deep.

Wire splices, other than at valve box locations, shall be kept to a minimum and if needed shall be made only at common splice points and placed in a Carson Industry model 910, ten inch round valve box. The color of the valve box shall be as previously specified. The location of these wire splice boxes shall be noted on the record drawings. All connections shall be made waterproof using 3M Scotchlok connectors or approved equal.

- C. At control wire splices, the Contractor shall provide a 36" wire expansion coil to facilitate raising splices to ground level without cutting wires.
- D. All continual wire shall be one color and in no case shall wires of different colors be spliced together.
- E. All 24 volt wiring shall be installed in PVC conduit when inside a building. All 24 volt wiring installed on exterior building walls shall be installed in metal conduit.

#### **3.14 120 VOLT CONTROLLER POWER WIRING:**

- A. The Contractor shall familiarize himself with the work required to complete this portion of the installation. All 120 volt wiring shall be installed in accordance with local electrical codes. The 120-volt service shall consist of one (1) black and one (1) white wire. The neutral wire shall be bonded.
- B. A licensed electrician shall supply 120-volt power to the Controller location.

#### **3.15 MANUAL DRAIN VALVES:**

- A. Manual drain valves shall be of the size and type necessary to drain the main line system as necessary.
- B. Automatic drain valves, other than those installed on the backflow prevention device, are not allowed.

#### **3.16 TESTING:**

- A. Upon completion of the irrigation system's mainline, the entire mainline shall be tested for a one hour period at 100 psi, unless otherwise noted. Prior to testing, the mainline shall be partially backfilled, leaving all joints and connections exposed for visual inspection. All dirt shall be flushed from the system and the line filled with water to remove air. The mainline shall be brought to static pressure. A pressure gauge and temporary valve shall be installed at the end of the mainline to permit air pressure to be applied to the main. A pressure of 100 psi must be

retained for a one-hour period. Any leaks resulting in the one-hour pressure test shall be repaired and the system retested until the system passes the test.

- B. Upon completion of the lateral piping sections, each lateral system shall be pressure tested for one hour at 100 psi. On systems using flex nipples, or swing joints, the lateral system shall be tested prior to installation of the flex nipples or swing joints. Prior to testing, the lateral lines shall be partially backfilled leaving joints and connections exposed for visual inspection. All air and dirt shall be flushed from the system and all open fittings shall be capped. The testing procedure shall be the same as used for the main line. If after one hour no visual leakage has occurred and the 100-psi pressure has been retained, the sprinkler heads, flex nipples and/or swing joints shall be installed, and the backfill operation completed. Any leaks resulting from the hydrostatic test shall be repaired and the system retested until the system passes the test.

### **3.17 ADJUSTING OF SYSTEM:**

- A. After completion of testing and installation, the Contractor shall adjust all valves for the proper operating pressure and adjust all sprinklers and bubblers for uniform coverage and even flow. Contractor shall wire the Controller (valve/station) as directed by the UNM Representative. The valve number will be indicated on the Controller panel for each station. Contractor will program Controller to provide optimum sprinkler system performance.

### **3.18 TREE & PLANT PROTECTION STANDARDS**

- A. All existing plant material will be protected throughout the construction process. Failure to abide by the Universities Landscape Protection guidelines may result in financial damages being assessed to the Contractor. A copy of these specifications will be provided.

### **3.19 CLEAN UP:**

- A. The Contractor shall continuously keep a neat and orderly area in which they are installing the system. Disposal of rubbish and waste material resulting from the installation shall be continual. Upon completion of the system, the Contractor shall remove from the Owner's property at his own expense, all temporary structures, rubbish waste material, tools and equipment resulting from or used in the installation of the system. UNM restroom facilities are not available for contractors use. Existing landscaped and hardscaped areas that are damaged as a result of the installation of the irrigation system will be repaired by the contractor to original condition. Turf areas damaged as a result of construction activities will be replaced with sod.

### **3.20 PROTECTION OF EXISTING UTILITIES:**

- A. The Contractor shall be responsible for locating all cables, conduits, piping, and any other utilities or structures that may be encountered either above or below ground. All necessary precautions must be taken by the Contractor to prevent any damage to these existing utilities and improvements. In the event that such damage should occur from the Contractors operations, the

Contractor shall repair or replace damaged utilities to their original condition at no additional expense to the Owner.

**3.21 ROCK:**

- A. If the Contractor encounters rock or other unfavorable trenching conditions, no additional compensation will be paid. When material from the excavation or trenching is unsuitable for use as backfill, additional backfill material suitable for this purpose shall be brought in at the expenses of the Contractor. It shall also be the Contractor's responsibility to remove and dispose of all unsuitable materials removed from the trench that cannot be used in the backfill operation.

**3.22 FINAL ACCEPTANCE:**

- A. When the Contractor is satisfied that the system is operating properly, that it is balanced and adjusted, that all work and clean-up is completed he shall issue notice of completion to the UNM Representative requesting a final inspection. The UNM Representative will respond to the notice of completion by the contractor and shall appear at the agreed upon time. At that time the Contractor shall demonstrate the operation of each system in its entirety. In judging the work, no allowance for deviation from the original Drawings and Specifications will be made unless prior approval has been obtained.
- B. Any inconsistency to the Specifications or the Drawings shall be noted by the UNM Representative, and a written copy of required corrections shall be given to the Contractor. Any work deemed not acceptable shall be re-worked to the complete satisfaction of the UNM Representative.
- C. When the completed work and the "RECORD" drawings, certification of backflow inspection, keys and maintenance manual have been reviewed and approved by the Owner, a written acceptance of the project signed by the Owner will be given to the Contractor.

**3.23 OPERATIONAL INSTRUCTION:**

- A. After the system has been tested and accepted, the Contractor shall instruct the UNM Representative in the operation and maintenance of the system.
- B. The Contractor shall provide the Owner with two (2) keys for the following:
  - 1. Globe or ball valves.
  - 2. Valve boxes.
  - 3. Valve Markers.
  - 4. Controllers.
- C. Any locking assemblies in need of key access.
- D. The Contractor shall provide the Owner with two copies of a Maintenance Manual bound in a three ring binder. The maintenance manual shall include copies of the approval Submittals, Controller operations manuals and manufacturers warranties on all irrigation products.

**3.24 SYSTEM MAINTENANCE AND GUARANTEE:**

- A. For a period of one (1) year from final acceptance of the system, the Contractor will promptly furnish and install, without cost to Owner, any and all parts or materials, which prove defective in material or workmanship. Damage due to irrigation system line breaks shall be repaired and brought to original condition by the Contractor at no expense to the Owner.
- B. In the fall, at the Owner's request, the Contractor will drain the system, and otherwise prepare the system for winter. In the spring, at the Owner's request, the Contractor will reactivate the system, repair any defects or damage and adjust the system. As these services are performed, the contractor will instruct the Owner.
- C. For a period of one (1) year from final acceptance of the system, the Contractor shall repair any settlement of trenches by one of the following methods as directed by UNM Representative.
  - 1. Bring to grade by top-dressing (raking topsoil into the grass).
  - 2. Bring to grade with topsoil and seed.
  - 3. Remove existing sod, fill depression with topsoil, and replace with new sod to match existing sod.
  - 4. Repair by any of the above methods must result in a smooth, level area. Maintenance of repaired areas shall be the responsibility of the Owner.

**3.25 INSPECTION:**

- A. The following inspections shall be the minimum required inspections during the course of construction. Additional inspections shall be made at any time at the discretion of the Owner. It shall be the responsibility of the Contractor to notify the Inspector, in writing, 48 hours in advance of each required inspection. The sequence of required inspections shall not be changed from the sequence listed below. The Contractor shall not proceed with work of the next sequence without written approval of the work of previous sequence. The Contractor shall attach a copy of the written inspection approvals to all applications for payment.
  - 1. Inspect staked locations of mainline, valves, laterals sprinkler heads.
  - 2. Inspect and pressure test mainline installation and lateral lines.
  - 3. Inspect 24-volt control wire installation.
  - 4. Inspect and pressure test automatic valves and lateral irrigation installation.
  - 5. Inspect automatic controller installation and operation.
  - 6. Inspect sprinkler and bubbler head placement, coverage and operating pressure prior to planting.
  - 7. Inspect at end of maintenance period.

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