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PART 1 – GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Furnish all labor, materials, equipment, appliances and necessary incidentals for the complete installation of all landscape irrigation system as shown on the drawings and as specified herein.

1.3 RELATED WORK IN OTHER SECTIONS

- A. 32930 Plants

1.4 QUALITY ASSURANCE AND REQUIREMENTS

- A. Permits and fees: The Contractor shall obtain and pay for any and all permits and all observations as required.
- B. Manufacturer's directions: Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used in this contract furnish directions covering points not shown in the drawings and specifications.
- C. Ordinances and regulations: All local, municipal and state laws, and rules and regulations governing or relating to any portion of this work are hereby incorporated into and made a part of these specifications, and their provisions shall be carried out by the Contractor. Anything contained in these specifications shall not be construed to conflict with any of the above rules and regulations or requirements of the same. However, when these specifications and drawings call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these specifications and drawings shall take precedence.
- D. Explanation of drawings:
 - 1. Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc. which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all his work and plan his work accordingly, furnishing such fittings, etc. as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and Landscape Architectural features.
 - 2. The word Landscape Architect as used herein shall refer to the Owner's authorized representative.
 - 3. All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.

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4. The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in area dimensions exist that might not have been considered in engineering. Such obstructions or differences should be brought to the attention of the Owner's authorized representative. In the event this notification is not performed, the irrigation Contractor shall assume full responsibility for any revision necessary.

1.5 SUBMITTALS

A. Material List:

1. The Contractor shall furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior written approval by the Landscape Architect.
2. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.
3. Equipment or materials installed or furnished without prior approval of the Landscape Architect may be rejected and the Contractor required to remove such materials from the site at his own expense.
4. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.
5. Manufacturer's warranties shall not relieve the Contractor of his liability under the warranty. Such warranties shall only supplement the warranty.

B. Record And As-Built Drawings:

1. The Contractor shall provide and keep up to date a complete 'as-built' record set of prints which shall be corrected daily and show every change from the original drawings and specifications and the exact 'as-built' locations, sizes, and kinds of equipment. Prints for this purpose may be obtained from the Landscape Architect with the Owner's approval at cost. This set of drawings shall be kept on the site and shall be used only as a record set.
2. These drawings shall also serve as work progress sheets and shall be the basis for measurement and payment for work completed. The Contractor shall make neat and legible annotations thereon daily as the work proceeds, showing the work as actually installed. These drawings shall be available at all times for observation and shall be kept in a location designated by the Landscape Architect.
3. Before the date of the final observation, the Contractor shall provide all 'as-built' information to the Landscape Architect in the form of redlined prints , All work shall

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be neat, in ink and subject to the approval of the Landscape Architect.

4. The Contractor shall dimension from two (2) permanent points of reference, building corners, sidewalk, or road intersections, etc., the location of the following items:
 - a. Connection to existing water lines.
 - b. Connection to existing electrical power.
 - c. Gate valves.
 - d. Routing of irrigation pressure lines (dimension max. 100 ft. along routing).
 - e. Irrigation control valves.
 - f. Routing of control wiring.
 - g. Quick coupling valves.
 - h. Other related equipment as directed by the Landscape Architect.
 5. On or before the date of the final observation, the Contractor shall deliver the corrected and completed sepias to the Landscape Architect. Delivery of the sepias will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the prints.
- C. Controller Charts:
1. As-built drawings shall be approved by the Landscape Architect before controller charts are prepared.
 2. Provide one controller chart for each controller supplied.
 3. The chart shall show the area controlled by the automatic controller.
 4. The chart is to be a 50% reduced drawing of the actual as-built system. However, in the event the controller sequence is not legible when the drawing is reduced, it shall be enlarged to a size that will be readable when reduced.
 5. The chart shall be a blackline print and a different color shall be used to indicate the area of coverage for each station.
 6. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum of 10 mils.
 7. These charts shall be completed and approved prior to final observation of the irrigation system.

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- D. Operation and Maintenance Manuals: Prepare and deliver to the Landscape Architect within ten calendar days prior to completion of construction, two hard cover binders with three rings containing the following information:
 - 1. Index sheet stating Contractor's address and telephone number, list of equipment with name and addresses of local manufacturer's representative.
 - 2. Catalog and parts sheets on every material and equipment installed under this contract.
 - 3. Warranty statement.
 - 4. Complete operating and maintenance instruction on all major equipment.
 - 5. In addition to the above mentioned maintenance manuals, provide the Owner's maintenance personnel with instructions for major equipment and show evidence in writing to the Landscape Architect at the conclusion of the project that this service has been rendered.
- E. Equipment to be furnished
 - 1. Supply as a part of this contract the following tools:
 - a. Two (2) sets of special tools required for removing, disassembling and adjusting each type of irrigation and valve supplied on this project.
 - b. Two (2) five ft. long valve keys for operation of gate valves.
 - c. Two (2) keys for each automatic controller.
 - d. Six (6) quick coupler keys and matching hose swivels for each type of quick coupling valve installed.
 - 2. The above mentioned equipment shall be turned over to the Owner at the conclusion of the project. Before final observation can occur, evidence that the Owner has received material must be shown to the Landscape Architect.

1.6 JOB CONDITIONS

- A. Verification of Existing Conditions
 - 1. Visit the site to determine existing conditions, including access to the site and the nature and extent of existing improvements upon adjacent public and private property. Nature of materials to be encountered and other factors that may affect the work of this section.
 - 2. Additional compensation resulting from the alleged ignorance of local conditions, and their effect upon the cost of the work will not subsequently be approved.
- B. Protection

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1. Protect the Owner's property from injury or loss. All damage to existing property (buildings, utilities, etc.) or planting (trees, shrubs, lawn or ground cover) caused by the Contractor during his operation or as a result of malfunction of installed work during the warranty period shall be repaired at Contractor's expense.
 2. Cause minimum interference with workmen, materials, or other equipment of other trades on the project.
- C. Irrigation work shall not begin until all construction adjacent to the areas has been completed unless otherwise directed.
- D. Contractor shall apply for and secure all required permits.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Handling of PVC Pipe and Fittings: The Contractor is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with new piping.

1.8 WARRANTY

- A. The warranty for the irrigation system shall be made in accordance with the attached form. The general conditions and supplementary conditions of these specifications shall be filed with the Owner or his representative prior to acceptance of the irrigation system.
- B. A copy of the warranty form shall be included in the operations and maintenance manual.
- C. The warranty form shall be re-typed onto the Contractor's letterhead and contain the following information:

WARRANTY FOR IRRIGATION SYSTEM

We hereby warranty that the irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse, or neglect excepted. We agree to repair or replace any defects in material or workmanship which may develop during the period of one year from date of acceptance and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within a reasonable time, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within a reasonable time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

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Project	_____
Location	_____
Signed	_____
Address	_____
Phone	_____
Date of Acceptance	_____

PART 2 - PRODUCTS

2.1 GENERAL

- A. Use only new materials or brands and types noted on drawings, specified herein, or approved equals.

2.2 PRESSURE MAIN LINE PIPE AND FITTINGS

- A. Pressure main line piping for sizes 2 in. and larger, shall be PVC Class 315.
- B. Pipe shall be made from an NSF approved type I, grade I, PVC compound conforming to ASTM resin specification D1784. All pipe must meet requirements as set forth in Federal Specification PS-22-70, with an appropriate standard dimension (S.D.R.). (Solvent weld pipe)
- C. Pressure main line piping for sizes 1 2 in. and smaller shall be PVC schedule 40 with solvent-weld joints.
- D. Pipe shall be made from NSF approved type I, grade I, PVC compound conforming to ASTM resin specification D1785. All pipe must meet requirements as set forth in Federal Specification PS-21-70. (solvent-weld pipe).
- E. PVC solvent-weld fittings shall be schedule 40, 1-2, II-1 NSF approved conforming to ASTM test procedure D2466 unless owner specifies it to be schedule 80.
- F. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
- G. All PVC pipe must bear the following markings:
 - 1. Manufacturer's name.
 - 2. Nominal pipe size.
 - 3. Schedule or class.
 - 4. Pressure rating in P.S.I.
 - 5. NSF (National Sanitation Foundation) approval.
 - 6. Date of extrusion.

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- H. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.

2.3 PVC NON-PRESSURE LATERAL LINE PIPING

- A. Non-pressure buried lateral line piping shall be PVC schedule 40 with solvent-weld joints.
- B. Pipe shall be made from NSF approved, type I, grade I PVC compound conforming to ASTM resin specification D1784. All pipe must meet requirements set forth in Federal Specification PS-21-70 with an appropriate standard dimension ratio.
- C. Except as noted in paragraph A and B of Section 2.3, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure mainline pipe and fittings as set forth in section 2.2 of these specifications.

2.4 PVC SCHEDULE 80 RISERS AND NIPPLES

- A. Polyvinyl Chloride Schedule 80 Risers and Nipples. Type 1, Grade 1, Schedule 80, high impact molded, manufactured from virgin compounds as specified for piping. Threaded ends shall be molded threads only. Machined threads are not acceptable. PVC Schedule 80 nipples and risers shall conform to ASTM D-2464.

2.5 BRASS PIPE AND FITTINGS

- A. Where indicated on the drawings, use red brass screwed pipe conforming to Federal Specification #WW-P-351.
- B. Fittings shall be red brass conforming to Federal Specifications #WW-P-460.

2.6 GALVANIZED PIPE FITTINGS

- A. Where indicated on the drawings, use galvanized steel pipe ASA schedule 40 mild steel screwed pipe.
- B. Fittings shall be medium galvanized screwed beaded malleable iron. Galvanized couplings may be merchant coupling.
- C. All galvanized pipe and fittings installed below grade shall be painted with two (2) coats of Koppers #50 Bitumastic.

2.7 QUICK COUPLING VALVES

- A. Quick coupling valves shall have a brass one or two piece body designed for working pressure of 150 P.S.I. operable with quick coupler. Key size and type shall be as shown on plans.
- B. Quick coupling valves shall be installed from 6 in. to 12 in. from nearest adjacent paved area.

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2.8 BALL VALVES

- A. Ball valves 2 inches and smaller shall be full port bronze with treaded ends. Use Watts B-6080 or equivalent.
- B. Ball valves larger than 2 inches shall be either cast iron or bronze, full port and flanged. Use Watts G-4000 series or equivalent.
- C. It is not acceptable to substitute a gate valve for a ball valve..
- D. All ball valves shall be installed per installation detail.

2.9 CONTROL WIRING

- A. Connections between the automatic controllers and the electric control valves shall be made with direct burial copper wire AWG-UF 600 volt. Pilot wires shall be a different color wire for each automatic controller. Common wires shall be white with a different color stripe for each automatic controller. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14.
- B. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
- C. Where more than one (1) wire is placed in a trench, the wiring shall be taped together at intervals of ten (10) feet.
- D. An expansion curl shall be provided within three (3) feet of each wire connection. Expansion curl shall be of sufficient length at each splice connection at each electric control, so that in case of repair, the valve bonnet may be brought to the surface without disconnection of the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.
- E. All splices shall be made with dry splice connectors.
- F. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the Landscape Architect.

2.10 CHECK VALVES

- A. Swing check valves 2 in. and smaller shall be 200 lb. W.O.G. bronze construction with replaceable composition, neoprene or rubber disc and shall meet or exceed Federal Specification WW-V-51D, Class A, Type IV. Install when required to prevent any low head drainage.
- B. Anti-drain valves shall be of heavy duty virgin PVC construction with F.I.P thread inlet and outlet. Internal parts shall be stainless steel and neoprene. Anti-drain valve shall be field adjustable against drawout from 5 to 40 feet of head. Anti-drain valve shall be similar to the Valcon 'ADV' or approved equal. Install when required to prevent any low head drainage.

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2.11 DRIP IRRIGATION:

- A. Valves: Rain Bird PESB-R series
- B. Filter: NETAFIM Tech filter
- C. Drip tube: NETAFIM Techline CV 17mm dripline
- D. Fitting: All NETAFIM Fittings

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2.12 AUTOMATIC CONTROLLERS

- A. Automatic controllers shall be of size and type shown on the plans.
- B. Final location of automatic controllers shall be approved by the Landscape Architect.
- C. Unless otherwise stated on the plans, the 120 volt electrical power to the automatic controller location shall be furnished by others. The final electrical hook-up shall be the responsibility of the irrigation Contractor.

2.13 ELECTRIC CONTROL VALVES

- A. All electric control valves shall have a manual flow adjustment.
- B. Provide and install one control valve box for each electric control valve.

2.14 BACKFLOW PREVENTION UNITS

- A. Backflow prevention units shall be of size and type indicated on the irrigation drawings. Install backflow prevention units in accordance with irrigation construction details.
- B. Wye strainers at backflow prevention units shall have a 125 lb flanged cast iron with 30 mesh monel screen and shall be similar to Bailey #100A or approved equal.

2.15 CONTROL VALVE BOXES

- A. Use 10 in. x 10 ¼ in. round valve box with extension and green bolt down cover for all ball valves, NDS #212 BC or approved equal. Extension sleeves shall be PVC – 6" minimum size.
- B. Use 12 in. x 17 in. x 12 in. rectangular box for all electrical control valves, NDS #214 BC or approved equal. Use 10 inch x 10 ¼ inch round box for all irrigation wire splices with green bolt down cover or approved equal.
- C. All electric control valve boxes shall have controller and valve station numbers embossed on top of cover.
- D. Use NDS #214 BC rectangular box for all filters and automatic line flush valves. Provide box extensions for all filters 1 size or larger. Provide gravel filled box extensions as drain sumps for all automatic line flush assemblies.
- E. Use 10 in. x 10 ¼ in. round box for all irrigation wire splices with green bolt down cover or approved equal.

2.16 IRRIGATION HEADS

- A. All irrigation heads shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the plans

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and/or specified in these special provisions.

- B. Spray heads shall have a screw adjustment.
- C. Riser units shall be fabricated in accordance with the details shown on the plans.
- D. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.
- E. All irrigation heads of the same type shall be of the same manufacturer.

PART 3 - EXECUTION

3.1 OBSERVATION

- A. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive Landscape Architect's approval prior to proceeding with work under this section.
- B. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by his operations or neglect. Check existing utilities drawings for existing utility locations.
- C. Coordinate installation of irrigation materials, including pipe, so there shall be no interference with utilities or other construction or difficulty in planting trees, shrubs, vines, and ground cover.
- D. The Contractor shall carefully check all grades to satisfy himself that he may safely proceed before starting work in the irrigation system.

3.2 PREPARATION

- A. Physical Layout:
 - 1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of irrigation heads.
 - 2. All layout shall be approved by Landscape Architect prior to installation.
- B. Water Supply:
 - 1. Irrigation system shall be connected to water supply points of connection as indicated on the drawings.
 - 2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.
- C. Electrical Supply:
 - 1. Electrical connections for automatic controller shall be made to electrical points of

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connection as indicated on the drawings.

2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

3.3 INSTALLATION

A. Trenching:

1. Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted.
2. Provide for a minimum cover of twenty four (24) inches for all pressure main line piping 4 in. and larger and for a minimum cover of eighteen (18) inches for all pressure main line piping 3 in. and smaller
3. Provide for a minimum cover of twelve (12) inches for all non-pressure lines.
4. Provide for a minimum cover of eighteen (18) inches for all control wiring.

B. Backfilling:

1. The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.
2. A fine granular material backfill will be initially placed on all lines. No foreign matter larger than 2 in. in size will be permitted in the initial backfill.
3. Flooding of trenches will be permitted only with approval of Landscape Architect.
4. If settlement occurs and subsequent adjustments in pipe, valves, irrigation heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

C. Trenching and Backfill Under Paving:

1. Trenches located under areas where paving, turfblock, asphaltic concrete or concrete, will be installed shall be backfilled with sand - a layer 6 in. below the pipe and 3 in. above the pipe - and compacted in layers to 95% compaction, using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The Contractor shall set in place, cap and pressure test all piping under paving prior

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to the paving work.

2. Generally, piping under existing walks is done by jacking, boring or hydraulic driving, but where any cutting or breaking of sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as part of the contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the Landscape Architect. No hydraulic driving will be permitted under concrete paving.
3. Provide for a minimum cover of eighteen (18) inches between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving.

D. Assemblies:

1. Routing of irrigation lines as indicated on the drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform with the details per plans.
2. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice with prior approval of Landscape Architect.
4. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent welding methods shall be as recommended by the pipe and fitting manufacturer.
5. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon tape or approved equal, shall be used on all threaded PVC to PVC, and on all threaded PVC to metal joints. light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded PVC adapters into which the pipe may be welded.

E. Line Clearance: All lines shall have a minimum clearance of 6 in. from each other and from lines of other trades. Parallel lines shall not be installed directly over one another.

F. Automatic Controller: Install in accordance with manufacturer's instructions. Remote control valves shall be connected to controller in numerical sequence as shown on the drawings.

G. High Voltage Wiring For Automatic Controller:

1. 120 volt power connection to the automatic controller shall be provided by the Contractor.
2. All electrical work shall conform to local codes, ordinances, and union authorities having jurisdiction.

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- H. Remote Control Valves: Install where shown on drawings and details. When grouped together, allow at least 12 in. between valves. Install each remote control valve in a separate valve box.
- I. Flushing Of System
 - 1. After all new irrigation pipe lines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of irrigation heads, the control valves shall be opened and a full head of water used to flush out the system.
 - 2. Irrigation heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Landscape Architect.
- J. Irrigation Heads:
 - 1. Install the irrigation heads as designated on the drawings. Irrigation heads to be installed in this work shall be equivalent in all respects to those itemized.
 - 2. Spacing of heads shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.

3.4 TEMPORARY REPAIRS

- A. The Owner reserves the right to make temporary repairs as necessary to keep the irrigation system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the warranty as herein specified.

3.5 EXISTING TREES

- A. Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and tree roots. Excavation in areas where two (2) inch and larger roots occur shall be done by hand. All roots two (2) inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap, to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than two (2) inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts through. Roots one-half (2) inch and larger in diameter shall be painted with two coats of tree seal, or equal. Trenches adjacent to trees should be closed within twenty four (24) hours; and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas.

3.6 FIELD QUALITY CONTROL

- A. Adjustment Of The System:
 - 1. The Contractor shall flush and adjust all sprinkler heads for optimum performance

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and to prevent overspray onto walks, roadways, and buildings as much as possible.

2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.
3. Lowering raised irrigation heads by the Contractor shall be accomplished within ten (10) days after notification by Owner or Landscape Architect.
4. All irrigation heads shall be set perpendicular to finished grades unless otherwise designated on the plans.

B. Testing Of Irrigation System:

1. The Contractor shall request the presence of the Landscape Architect and University Landscape Supervisor in writing at least 48 hours in advance of testing.
2. Test all pressure lines under hydrostatic pressure of 150 lbs. per sq. inch, and prove watertight.
NOTE: Testing of pressure main lines shall occur prior to installation of electric control valves.
3. All piping under paved areas shall be tested under hydrostatic pressure of 150 lbs. per sq. inch, and proved watertight, prior to paving.
4. Sustain pressure in lines for not less than two (2) hours. If leaks develop, replace joints and repeat test until entire system is proven watertight.
5. All hydrostatic tests shall be made only in the presence of the Landscape Architect. No pipe shall be backfilled until it has been observed, tested and approved in writing.
6. Furnish necessary force pump and all other test equipment.
7. When the irrigation system is completed, perform a coverage test in the presence of the Landscape Architect and University Landscape Supervisor, to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans, or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate, without bringing this to the attention of the Landscape Architect and University Landscape Supervisor. This test shall be accomplished before any ground cover is planted.
8. Upon completion of each phase of work, entire system shall be tested and adjusted to meet site requirements.

3.7 MAINTENANCE

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- A. The entire irrigation system shall be under full automatic operation for a period of seven (7) days prior to any planting and for sixty (60) days after observation to begin maintenance period.
- B. The Landscape Architect reserves the right to waive or shorten the operation period.

3.8 CLEAN-UP

- A. Clean-up shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down, and any damage sustained on the work of others shall be repaired to original conditions.

3.9 FINAL OBSERVATION PRIOR TO ACCEPTANCE

- A. The Contractor shall operate each system in its entirety for the Landscape Architect and University Landscape Supervisor at time of final observation. Any items deemed not acceptable by the observer shall be reworked to the complete satisfaction of the Landscape Architect.
- B. The Contractor shall show evidence to the Landscape Architect that the Owner has received all accessories, charts, record drawings, and equipment as required before final observation can occur.

3.10 OBSERVATION SCHEDULE

- A. Contractor shall be responsible for notifying the Landscape Architect and University Landscape Supervisor in advance for the following observations, according to the time indicated:
 - 1. Pre-job conference - 7 calendar days.
 - 2. Pressure supply line installation and testing - 48 hours.
 - 3. Lateral line and sprinkler installation - 48 hours.
 - 4. Coverage test - 48 hours.
 - 5. Observation to begin maintenance period - 7 calendar days.
 - 6. Final observation coverage test - 7 days.
- B. When observations have been conducted by other than the Landscape Architect, show evidence of when and by whom these observations were made.
- C. No observations will commence without as-built drawings. In the event the Contractor calls for an observation without as-built drawings, without completing previously noted corrections, or without preparing the system for observation, he shall be responsible for reimbursing the Landscape Architect at the rate of two and one-half times the normal office hourly rate per hour portal to portal (plus transportation costs) for the inconvenience. No

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further observations will be scheduled until this charge has been paid.

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