

SECTION 32 84 00
PLANTING IRRIGATION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01, General Requirements, specification sections apply to this section.

1.02 SUMMARY

- A. Section Includes: Provide all labor, materials, equipment, and services necessary to furnish and install the irrigation system as shown on the Drawings and described herein.

1.03 LICENSED IRRIGATOR

- A. The design and installation of the irrigation system shall be under the “Direct” supervision of a superintendent or foreman currently licensed as an Irrigator by the State of Arizona.

1.04 SYSTEM DESCRIPTION

- A. Irrigation system shall be completed according to all applicable construction standards. Contractor shall provide all offsets, fittings, sleeves, etc., which may be required, but may not be indicated. Carefully investigate the structural and finished conditions affecting all of the work and plan the 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 system and planting, architectural features and other underground facilities.
- B. It is the intention of these specifications to install a sprinkler system within the Project limits providing proper coverage of the planted areas free from defects in materials and workmanship.
- C. Discrepancy on Drawings shall be brought to the attention of the Government. Contractor assumes full responsibility for work installed without clarification.

1.05 SUBMITTALS

A. Product Data:

1. Furnish the articles, equipment, materials, or processes specified by examples in the drawings and specifications per requirements of Division 01, General Requirements. Only approved equals for product shall be allowed and only with prior written approval by the Government.
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 to be used.
3. Equipment or materials installed or furnished without prior approval of the Government may be rejected and the Contractor required to remove such materials from the Site at their 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. All proposed substitutions shall be accompanied with the items it is intended to replace.

B. Record Drawings:

1. The Contractor shall dimension from two permanent points of reference, building corners, sidewalk, or road intersections, etc., the location of the following items:
 - a. Connection to existing water lines.
 - b. Gate valves.
 - c. Routing of irrigation main lines (dimensioned maximum 100 feet along routing).
 - d. Sprinkler control valves.
 - e. Routing of control wiring.
 - f. Quick-coupling valves.
 - g. Sleeves under paving.
 - h. Other related equipment as directed by the Government.
2. Before the date of the final inspection, the Contractor shall deliver the corrected and completed Record Drawings to the Government. Delivery of the Record Drawings will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the prints.

C. Controller Charts:

1. Record Drawings shall be approved by the Government before controller charts are prepared.
2. Provide one revise controller chart for the existing controller.

3. The chart shall show the area controlled by the automatic controller and shall be the maximum size which the controller door will allow.
4. The chart is to be a 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 or blueline print and a different color shall be used to indicate the area of coverage for each station. Each chart/map shall be specific to each controller. The controller coverage shall be graphically dominant in appearance with the adjacent control areas shaded back but still discernable.
6. When completed and approved, each chart shall be hermetically sealed between two pieces of clear plastic lamination material, each piece being a minimum of 10 mils thick.
7. These charts shall be completed and approved prior to final inspection of the irrigation system.

1.06 QUALITY ASSURANCE

A. Qualifications:

1. List statements of qualifications for contractor employed designers (for parts not designed by an A/E or consultant), manufacturers, fabricators, welders, installers, and applicators of products and completed work. The following subparagraphs represent the standard master specification qualification language:
 - a. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum 3 years documented experience.
 - b. Installation Qualifications: Company specializing in performing Work of this section with minimum 10 years documented experience.
 - c. Supervision: Provide the services of a qualified and experienced superintendent who shall constantly be in charge of the work of this section and who shall remain at the Site at all times that work is in progress.
 - d. Regulatory Requirements: All local, municipal and state laws, rules and regulations governing any portion of this work shall be made a part of these specifications and their provisions carried out. However, when the Specifications or the Drawings describe materials, workmanship of construction of better quality, or larger size, it shall take precedence over the rules and regulations.
 - e. Certifications: Include statements to certify compliance with certain requirements. This includes certification of controller adjustments and alterations.

1.07 PROJECT REQUIREMENTS

- A. The Contractor shall erect such fences or guards for the protection of the public and Contractor's materials, and shall maintain same in good condition until completion of Work.

1.08 EXISTING CONDITIONS

- A. Prior to submitting bid, thoroughly examine all Contract Documents. Discrepancies, omissions, or conflicts in the Contract Documents, or doubt as to the meaning thereof, shall be brought to the attention of the Government prior to the opening date. Addendum will be issued to clarify the discrepancies, omissions, conflicts, or meaning and it shall become a part of the Contract. Oral instructions are not valid under this section of the Specifications.
- B. Before submitting a bid, visit the premises and become familiar with all existing conditions pertaining to the execution of the work contemplated under this section. No request for additional payment due to failure to allow for working conditions will be valid.
- C. Paving and landscape headers shall be in place prior to installation of sprinkler heads.
- D. Scarifying and/or loosening of soil in planting areas specified under another Section shall be done prior to installation of any pipe.
- E. Obtain Government's approval of rough grades prior to the installation of any pipe.

1.09 WARRANTY

- A. The entire sprinkler system, done under this Contract, shall be guaranteed against all defects and faults of material and workmanship, and sustain in working order for 1 year from date of completion without expense to the Government.
- B. Materials used shall carry a minimum 1 year manufacturer's guarantee over and above Contractor's guarantee.
- C. If, during that period, settlement occurs and adjustments in pipes, valves and sprinkler heads, planting areas or paving are necessary to bring the system to the proper level of the permanent grades, the Contractor shall make all adjustments without extra cost to the Government.
- D. After the system has been completed, the Contractor shall instruct the Government in the operation and maintenance of the system.

- E. Contractor shall not be held responsible under the above guarantee for damage arising from acts of God, vandalism, negligence, or inadequate maintenance by Government during the maintenance period.

1.10 MAINTENANCE

A. Operation and Maintenance Manuals:

1. Prepare and deliver operation and maintenance manuals as follows:
 - a. Catalog and parts sheets on every material and equipment installed under this Contract.
 - b. Guarantee statement.
 - c. Complete operating and maintenance manuals.
2. In addition to the above-mentioned maintenance manuals, provide the Government's maintenance personnel with instructions for operation of major equipment and show evidence in writing to the Government at the conclusion of the Project that this service has been rendered.

B. Equipment to be Furnished:

1. Supply as a part of the Contract the following tools:
 - a. Two sets of special tools required for removing, disassembling and adjusting each type of sprinkler and valve supplied on this Project.
 - b. One quick-coupling key and matching hose swivel for every six, or fraction of, quick-coupling valves shown on the Drawings.

- C. The above-mentioned equipment shall be turned over to the Government at the conclusion of the Project. Before final inspection may occur, evidence that the Government has received material must be shown to the Government.

PART 2 PRODUCTS

2.01 PRODUCTS

- A. General: Use only new materials of types and descriptions noted on the Drawings and in currently use at the Project Site. Mix of manufacturers is not permissible.

2.02 MATERIALS

- A. Backfill Material: Existing site material, if approved by Government, shall be used for backfill material. Backfill material shall be free from organic materials, large clods of earth or rocks larger than 1 inch diameter, trash, debris, rubbish, broken cement, asphalt material, or other objectionable substances.

2.03 MANUFACTURED UNITS

A. Pressure Main Line and Non-Pressure Lateral Line:

1. Piping shall be PVC Schedule 80 with solvent-welded joints.
 - a. Pipe shall be made from NSF approved Type I, Grade I, PVC compound conforming to ASTM D1785. All pipe shall meet requirements set forth in Federal Specification PS-21-70. (Solvent-weld Pipe).
 - b. Use Schedule 80 PVC solvent weld couplings.
 - c. Pipe must be purple for non-potable use.
2. All PVC pipe shall bear the following markings:
 - a. Manufacturer's name.
 - b. Nominal pipe size.
 - c. Schedule or class.
 - d. Pressure rating in psi.
 - e. National Sanitation Foundation (NSF) approval.
 - f. Date of extrusion.
3. All fittings shall bear the manufacturer's name or trademark, material designation, size applicable, psi, schedule and NSF seal of approval.

B. PVC Sleeves and Conduit: Sleeve and conduit piping shall be PVC Schedule 40 with solvent-welded joints. Pipe shall be made from NSF approved Type I, Grade I, PVC compound conforming to ASTM D1785. All pipe shall meet requirements set forth in Federal Specification PS 21 70. (Solvent-weld Pipe). Use Schedule 40 PVC solvent weld couplings.

C. Gate Valves:

1. Gate valves 2-1/2 inches and smaller shall be stainless steel construction with operating wheel and screwed connections. Install in 10 inches diameter heavy duty plastic valve box. Use concrete valve box in paved or hardscape areas including gravel and decomposed granite areas.
2. Gate valves 3 inches through 10 inches shall be epoxy coated cast iron with operating nut (2-inch square) and "O" ring connections for HDPE plastic pipe and resilient seat. Install in appropriate valve box.
 - a. Roadway Locations: Cast iron valve box complete with PVC sleeves. Cast iron cover.
 - b. Landscaped Areas: Reinforced Concrete valve box with Composite Cap, example Christy F8 box, or equal with F8D reinforced concrete lid marked "GV". Perimeter Cap and Lid to have polypropylene or polyethylene cap.
 - c. Concrete or Sidewalk Areas: Reinforced Concrete with Steel Frame valve box, example Christy G5 traffic box or equal with

G5C traffic rated cast iron lid marked "GV". Box to have cast iron perimeter ring cap and lid seat.

- D. Quick Coupler Valves: All quick coupling valves and keys shall be made of 100 percent 304 Series stainless steel and EPDM rubber seals. Quick coupling valves shall be provided for reclaimed water (purple cover). All hose swivel elbows shall be made of 100 percent 304 Series stainless steel with 360 degree outlet to accommodate 3/4-inch male garden hose connection. Swivels elbows shall be tapped to accept pressure gauges. Example, LEEMCO Inc. L2QCV-FPT-P quick coupling valves, L2QCV-KEY quick coupler key and L2QCV-SWIVEL-007 quick coupler swivel or approved equal.
- E. Remote Control Valves: All remote control valves shall be the type and size shown on the Drawings.
- F. Valve Boxes:
 - 1. 2-1/2-Inch and Smaller Gate Valves and Quick Couplers in Lawn Areas: Use heavy duty 10-inch diameter round plastic valve box with bolt-down lid for all gate valves and quick couplers; Material: High density polyethylene structural foam material valve box, example Brooks #910, or equal. Color to be black.
 - 2. Remote Control Valves in Lawn Areas: Use heavy duty plastic valve box with bolt-down lid for remote control valves; No smaller than Carson #1419, or equal. One valve per box. Color to be black. Size box to accommodate remote control valve, ball valve, and unions to facilitate maintenance.
- G. Automatic Controllers:
 - 1. Multiple start time programming.
 - 2. Minimum three cycles preprogram capability.
 - 3. Operation information including recommended monthly and seasonal schedules, water budgets based on gallons used or landscape planting for year one and year three, with the irrigation plan and documentation.
 - 4. Independent rain and freeze shut-off device.
 - 5. Locking capability, pedestal mounted.
 - 6. System shall be grounded per manufacturer's recommendations
- H. Backflow Device: Backflow Device shall be the type and size shown on the Drawings.
- I. Pressure Regulating Device: Install at Point of Connection and at section valve as necessary so that the irrigation components operate within the manufacturers' recommended operating pressure.

- J. Valve Manifold and Riser Fittings: Connect between main lines and remote control valves shall be of Schedule 80 PVC (threaded both ends) nipples and fittings.
- K. Drip Emitters: Sprays as shown on the Drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Conditions:

1. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive Government's approval prior to proceeding with work under this section.
2. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by their operation or neglect. Check existing utility drawings, and contact the appropriate utility companies to determine existing utility locations.
3. Coordinate installation of sprinkler irrigation materials, including pipe, so there is no interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers.
4. The Contractor shall carefully check all grades to satisfy himself that he may safely proceed before starting work on the sprinkler irrigation system.

3.02 PREPARATION

A. Physical Layout:

1. Prior to installation, the Contractor shall stake out all pressure main supply lines, routing and location of sprinkler heads and lateral lines.
2. All layouts should be approved by Government prior to installation.
3. Run pipelines and automatic control wiring in common trenches wherever practical. Where mainlines are installed outside of common trench from control wiring, install copper tracer wire and attach to top of pipe with 10-mil polyethylene tape wrapped around pipe at 10-foot intervals. Stub tracer wire into valve box at each end.
4. Install pipelines and wire within Schedule 40 PVC Plastic Pipe Sleeving when passing beneath hardscape in excess of 6 feet across.

- ##### **B. Water Supply:** Sprinkler irrigation system shall be connected to water main supply points of connection as indicated on the Drawings.

3.03 INSTALLATION OF PIPE

- A. Trenches located under areas where paving, asphaltic concrete or concrete will be installed shall be backfilled with sand (a layer 6 inches below the pipe and 3 inches above the pipe) and compacted in layers to 95 percent 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.
- B. Provide for a minimum cover of thirty inches (30 inches) between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under roadway paving. Provide fittings and thrust blocks where required to route around gravity based utilities such as sanitary and storm sewers. Maintain required clearances between utilities.
- C. Excavation shall be in all cases ample in size to permit the pipes to be laid at the elevations intended and to permit ample space for joining.
- D. Make trenches for pipelines deep enough to provide minimum cover from finish grade as follows:
 - 1. 30-inch minimum cover from top of all pipes to pavement subgrade in roadway, driveway, and parking areas. This applies to gravel trafficable surfaces also.
 - 2. 18-inch minimum cover over all pressure main lines outside of paved areas.
 - 3. 18-inch minimum cover over low voltage control wires from controller to valves.
 - 4. 18-inch minimum cover over sensor cable.
 - 5. 18-inch minimum cover over lateral lines to rotor sprinkler heads and 12-inch pop-up heads.
 - 6. 12-inch minimum cover over lateral lines to other type sprinkler heads.

3.04 ASSEMBLING PIPE

- A. All pipe shall be assembled free from dirt and pipe scale. Field cut ends shall be reamed only to full pipe diameter with rough edges and burrs removed.
- B. Rubber Ring Seal Joint:
 - 1. Use factory-made male end or prepare field-cut male end to exact specifications of factory-made end.
 - 2. Carefully clean bell or coupling and insert rubber ring without lubricant. Position ring carefully according to manufacturer's instructions.
 - 3. Lubricate male end according to manufacturer's instructions and insert male end to specified depth. Use hands only when inserting PVC pipe.

4. Thrust blocks shall be provided where necessary to resist system pressure on ring-tite pipe and fittings. Blocks shall be of Class "B" concrete and the size shall be based on an average soil safe bearing load of 2,000-pound per square foot.
5. Form thrust blocks in such a manner that concrete comes in contact only with the fittings. Thrust blocks shall be between solid, undisturbed soil and the fittings.

C. Solvent Weld Joint:

1. Prepare joint by first making sure the pipe end is square, then deburring the pipe end and cleaning pipe and fitting of dirt, dust and moisture.
2. Dry-insert pipe into fitting to check for missing. Pipe should enter fitting 1/3 to 2/3 depth of socket.
3. Coat the inside socket surface of the fitting and the fitting and the male end of the pipe with industrial strength, ultra low VOC purple primer, example Weld-On P-70 primer or approved equal. Then without delay, apply industrial grade, gray, ultra low VOC emission, heavy bodied, medium setting, PVC solvent cement for all classes and schedules of pipe and fittings with interference fit through 12 inches (315 mm) diameter, including Schedule 80, example Weld-On 711 cement or approved equal, liberally to the male end of the pipe and also apply 711 cement lightly to the inside of the socket. At this time, apply a second coat of cement to the pipe end.
4. Insert pipe immediately into fitting and turn one-fourth turn to distribute cement and remove air bubbles. The pipe must seat to the bottom of the socket and fitting. Check alignment of the fitting. Pipe and fitting shall be aligned properly without strain to either.
5. Hold joint still for approximately 30 seconds and then wipe the excess cement from the pipe and fitting.
6. Cure joint a minimum of 30 minutes before handling and at least 6 hours before allowing water in the pipe.

D. Threaded Joint:

1. Field threading of plastic pipe or fittings is not permitted. Factory-formed threads only will be permitted.
2. Factory-made nipples shall be used wherever possible. Field-cut threads in metallic pipe will be permitted only where absolutely necessary. When field threading, cut threads accurately on axis with sharp dies.
3. All threaded joints shall be made up with compatible pipe joint compound. Apply compound to male threads only.
4. Where assembling metallic pipe to metallic fitting or valve, no more than three full threads shall show when joint is made up.
5. Where assembling to threaded plastic fitting, take up joint no more than one full turn beyond hand tight.

6. Where assembling soft metal (brass or copper) or plastic pipe, use strap type friction wrench only; do not use metal-jawed wrench.
- E. Cap or plug openings as pipeline is assembled to prevent entrance of dirt or obstructions. Remove caps or plugs only when necessary to continue assembly.
- F. Where pipes or control wires pass through sleeves, provide removable non-decaying plug at ends of sleeve to prevent entrance of earth.

3.05 INSTALLATION OF IRRIGATION LATERALS

A. Assemblies:

1. Routing of sprinkler irrigation lines as indicated on the Drawings is diagrammatic. Install lines (and various assemblies) in such a manner as to conform to the details per the Drawings.
2. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with the respective detail. In absence of detailed drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with the best standard practice with prior approval of Government.
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. PVC pipe shall be installed so that there will be a small amount of excess length in the pipe to compensate for contraction and expansion of the pipe. This shall be accomplished by “snaking” the pipe in the trench during installation.
5. On PVC to metal connections, the Contractor shall work the metal connections first, PTFECon tape or approved equal shall be used on all threaded PVC to PVC joints, 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 adaptors into which the pipe may be welded.
6. In changing pipe depth, 45-degree elbows shall be used.

- B. Line Clearance: All lines shall have a minimum clearance of 3 inches from each other and 6 inches from lines of other trades. Parallel lines shall not be installed directly above one another.

C. Remote Control Valves:

1. Install where shown on the Drawings and group together where practical. Limit one remote control valve per box - No Exceptions.

2. Locate valve boxes 12 inches from and perpendicular to walk edges, buildings and walls. Provide 12 inches between valve boxes where valves are grouped together.
3. Thoroughly flush main line before installing valve.
4. Install in shrub or ground cover areas where possible.
5. Label control line wire at each valve with a 2-1/4 inch by 3/4 inch polyurethane I.D. tag, indicating identification number of valve (controller and station number). Attach label to control wire.

D. Controller Wires:

1. Run lines along mains wherever practical. Tie wires in bundles with pipe wrapping tape at 10-foot intervals and allow slack for contraction between bundle points.
2. Loop a minimum of 3 feet of extra wire in each valve box; both control wire and ground wire.
3. Connections shall be made by twisting wires within wire nuts and sealing with specified seal packs.
4. Locate all splices at valve locations within valve boxes.
5. Where control lines pass under paving, they shall pass through PVC sleeves.

E. Sprinkler Heads and Quick Coupling Valves (QCV):

1. Thoroughly flush lines before installing heads or QCV's.
2. Locate heads and QCV's as shown on the Drawings and Details.
3. Adjust sprinkler heads for proper distribution and trim.
4. Install lawn heads 2 inches above grade in seeded lawn area at time of installation. Lower to finished grade after turf is well established and as directed by Government.

3.06 RESTORATION

- A. Restore surfaces, utilities, existing underground installations, etc., damaged or cut as a result of excavations, to original conditions in manner approved by Government.
- B. Where other utilities interfere with irrigation trenching and pipe work, adjust the trench depth as instructed by Government.
- C. Initial Backfilling:
 1. The trenches shall not be backfilled until all required tests are performed.
 2. 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 landscape areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, humps, sunken areas, or other surface irregularities.

3. A fine granular material backfill is to be initially placed on all lines. No foreign matter larger than 1/2 inch in size will be permitted in the initial backfill.
4. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Government.

3.07 TESTING

- A. Perform test as specified below. Remake any faulty joints with all new materials. Use of cement or caulking to seal leaks is prohibited.
- B. The Contractor shall:
 1. Notify Government at least 3 days in advance of testing.
 2. Perform testing at Contractors expense.
- C. Center load piping with small amount of backfill to prevent arching or slipping under pressure. No fitting shall be covered.
- D. Apply the following tests after welded plastic pipe joints have cured at least 24 hours.
 1. Hydrostatic pressure and leakage test shall be conducted as outlined in Section 22, AWWA Standard C600-54T. Testing shall be done in the presence of the Government.
 2. No trenches shall be backfilled until they have been inspected and accepted by the Government. Two calibrated gauges 0 psi to 200 psi shall be installed on the main line piping system. All pipe and valves, including quick-coupling valves, shall be installed.
 3. Apply continuous static water pressure of 125 psi to main line with no drop in gauge reading for 2 hours. Government shall witness test for entire two hour period. Leaks resulting from test shall be repaired and test repeated until system passes test.
- E. When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Government to determine if water coverage for lawn and planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage do to deviations from plans or where the system has been willfully installed as indicated on the Drawings when it is obviously inadequate due to site conditions, without

bringing this to the attention of the Government. This test shall be accomplished before any groundcover is planted.

- F. Upon completion of each phase of the work, entire system shall be tested and adjusted to meet site requirements.

3.08 FINAL BACKFILLING

- A. Final backfill only after piping has been tested, inspected and approved.
- B. Backfill material shall be the earth excavated from the trenches, free from rocks, concrete chunks, and other foreign or coarse materials. Carefully select backfill that is to be placed next to plastic pipe to avoid any sharp objects which may damage the pipe.
- C. All pipe under asphalt paving shall be backfilled with 4 inches of clean sand on all sides of pipe.
- D. Place backfill materials in 6 inches layers and compact by jetting or tamping to a minimum compaction of 90 percent of original soil density.
- E. Dress off areas to finish grades and remove excess soil, rocks or debris remaining after backfill is completed.
- F. If settlement occurs along trenches, and adjustments in pipes, valves and sprinkler heads, soil, sod or paving are necessary to bring the system, soil, sod or paving to the proper level or the permanent grade, the Contractor, as part of the Work under this Contract, shall make all adjustments without extra cost to the Government.

3.09 ADJUSTING THE SYSTEM

- A. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent over spray onto walks, roadways, buildings, and adjacent areas as much as possible.
- B. 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 patterns as well as location.
- C. Lowering raised sprinkler heads by the Contractor shall be accomplished within 10 days after notification by the Government.
- D. All sprinkler heads shall be set perpendicular to finish grades unless otherwise shown on the Drawings.

- E. Contractor shall be responsible for all adjustments until the system has performed without issue for 1 week and until final acceptance of the Project.

3.10 CLEAN-UP

- A. Clean-up shall be made as each portion of the 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 acceptable to Government.

3.11 GUARANTEE

- A. It shall be the responsibility of the Contractor to fill and repair all depressions and replace all necessary lawn and planting due to the settlement of irrigation trenches for 1 year following completion and acceptance of the job.
- B. Contractor shall also guarantee all materials, equipment and workmanship furnished by him to be free of all defects of workmanship and materials, and shall agree to replace at his expense, at any time within 1 year after installation is accepted, any and all defective parts that may be found.

3.12 DEMONSTRATION

- A. The Contractor shall operate each system in its entirety for the Government at time of final observation. Any items deemed not acceptable shall be reworked to the complete satisfaction of the Government.
- B. The Contractor shall show evidence to the Government that the Government has received all accessories, charts, Record Drawings, and equipment as required before final observation can occur.

3.13 OBSERVATION SCHEDULE

- A. Contractor shall be responsible for notifying the Government in advance for the following observations according to the time indicated:
 - 1. Pre-job Conference: 7 days.
 - 2. Pressure Supply Line Installation and Testing: 48 hours.
 - 3. Coverage Test: 48 hours.
 - 4. Final Observation: 48 hours.
- B. When inspections have been conducted by other than the Government, show evidence of when, and by whom these inspections were made.
- C. No observation shall 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, the Contractor shall be responsible for reimbursing the A/E at the hourly rate in effect at the time of the observation (portal to portal (plus transportation costs) for the inconvenience. No further observations will be scheduled until this charge has been paid.

END OF SECTION