

SECTION 328400

IRRIGATION

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The requirements of the "General Conditions of the Contract" and of Division 1, "General Requirements", shall apply to all work of this Section with the same force and effect as though repeated in full herein.

1.2 DESCRIPTION

- A. Scope of Work: Provide all labor, materials, transportation, and services necessary to furnish and install the Irrigation System as shown on the Drawings and described herein.

1.3 QUALITY ASSURANCE & REQUIREMENTS

- A. Qualifications: The Contractor and its on-site job superintendent shall have regularly engaged and specialized, for the preceding five years, in the installation of Reclaimed water irrigation systems of similar scope, size and complexity as the system being installed under this contract.
- B. Permits and Fees: The Contractor shall secure the required licenses and permits, make payments of charges and fees required, give required notices to public authorities and verify permits secured or arrangements made by others affecting the work of this section.
- C. 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.
- D. Ordinances and Regulations:
 - 1. Comply with all local, municipal and state laws, rules and regulations.
 - 2. Conform to applicable provisions of the latest editions of the Uniform Plumbing Code, the National Electric Code and all codes properly governing the materials and work at the project site.
 - 3. All City of Beverly Hills Standard Plans, Standards for use of Reclaimed Water, and Specifications, 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 shall apply to all work of this Section with the same force and effect as though repeated in full herein. The Contractor shall carry out their provisions. Anything contained in these Specifications shall not be construed to conflict with any of the above rules, regulations, or requirements. 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.
- E. Explanation of Drawings:
 - 1. Due to the scale of the 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 of 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 the irrigation system, planting, underground utilities, above ground utilities and architectural features.

2. All work called for on the Drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the Specifications.
3. 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 CLIENT's Authorized Representative. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.

F. Reference specification and standards:

1. ASTM: D1784 Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds.
2. ASTM: D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and CL200.
3. ASTM: F441 Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40, 80 and CL200.
4. ASTM: D2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
5. ASTM: F437 Threaded Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
6. ASTM: D2466 Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
7. ASTM: F438 Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
8. ASTM: F2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.
9. ASTM: F493 Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.
10. The latest edition of the City of Beverly Hills Standard Plans, Specifications and Reclaimed Water Standards.
11. The latest edition of the regulations for the construction of irrigation water systems within the Village of Beverly Hills Water Department.

1.4 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 CLIENT's Authorized Representative.
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. Although manufacturer and other information may be different, the following is a guide to proper submittal format:

<u>Item</u>	<u>Manufacturer</u>	<u>Model Number</u>	<u>Description</u>
1.	Pacific Plastics	Mainline piping per Specification	PVC Class 315 purple pipe (R.W.) with solvent welded joints for sizes 2" and larger and PVC Schedule 40 Purple pipe (R.W.) with solvent welded for sizes 1-1/2" and smaller.
2.	Paige Electric	Irrigation Control wire	# 14 UF UL approved for control wire and # 12 UF UL approved for common wire.
3.	Nibco	T-113	T-113 with bronze cross handle - 3" and smaller.
4.	Rainbird	1806-SAM-PRS	6" pop-up spray head with Rain Bird "MPR" nozzles.
5.	Etc.	Etc.	Etc.

4. Irrigation submittal must be specific and complete with a full description of product use. All items must be listed and should include solvent/primer, wire, wire connectors, valve boxes, etc. No copies of manufacturer's literature (catalog cuts) are required as submittal information.
5. The Contractor may submit substitutions for equipment and materials listed on the Irrigation Drawings by following procedures as outlined in Section 1.06 of the Irrigation Specifications.
6. Equipment or materials installed or furnished without prior approval of CLIENT's Authorized Representative may be rejected and the Contractor may be required to remove such materials from the site at his own expense.
7. Approval of any item, alternative 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.
8. Manufacturer's warranties shall not relieve the Contractor of his liability under the guarantee. Such warranties shall only supplement the guarantee.

B. Record Drawings:

1. The Contractor shall update irrigation record drawings to include all irrigation changes and additions. Electronic files of previous irrigation record drawings will be provided by CLIENT.
2. The Contractor shall provide and keep up-to-date a complete record set of plain paper copy prints which shall be corrected daily, showing every change from the original Drawings and Specifications and the exact installed locations, sizes, and kinds of equipment. Prints for this purpose may be obtained from CLIENT's Authorized Representative at cost. This set of drawings shall be kept on the site and shall be used only as a record set.
3. These drawings shall also serve as work progress sheets and shall be the basis for measurement and payment for work completed. These drawings shall be available at all

times for observation and shall be kept in a location designated by CLIENT's Authorized Representative. Should the record drawing progress sheets not be available for review or not be up-to-date at the time of any observation (refer to Section 3.10 - Site Observation Schedule), it will be assumed no work has been completed and the Contractor may be assessed by CLIENT the cost of that site visit at the current billing rate of CLIENT's Authorized Representative. No other observations shall take place prior to payment of that assessment.

4. The Contractor shall make neat and legible notations on the record drawing progress sheets daily as the work proceeds, showing the work as actually installed. For example, should a piece of equipment be installed in a location that does not match the plan, the Contractor must indicate that equipment has been relocated in a graphic manner so as to match the original symbols as indicated in the irrigation legend. The relocated equipment and dimensions will then be transferred to the original record drawing plan at the proper time.
5. Before start of plant establishment, the Contractor shall provide the completed irrigation red lined set of "as-built" record drawings to CLIENT's Authorized Representative for review and approval. After review and approval of the red lined set of "as-built" record drawings by CLIENT, "as-built" information shall be transferred to AutoCad electronic drawing files. Electronic files of irrigation system will be provided by CLIENT. Dimensions shall be made so as to be legible even on the final controller chart. Provide AutoCAD submittal plot for CLIENT's review and approval prior to fabricating the controller charts. Update AutoCAD electronic files of "as-built" drawings in accord with CLIENT's requirements.
6. The Contractor shall be responsible for preparation of irrigation "as-built" record drawings in AutoCAD format. As an option, the Contractor may request to have the irrigation "as-built" record drawings prepared by the irrigation designer. If the Contractor elects to have the irrigation "as-built" record drawings prepared by the irrigation designer, the Contractor shall provide the irrigation designer with a copy of the redlined the irrigation "as-built" record drawings approved by CLIENT's Authorized Representative at start of plant establishment. The irrigation designer will transfer Contractor's redlined irrigation "as-built" record drawing information in AutoCAD format to the Contractor within 30 days of the request. Failure of the Contractor to provide red lined "as-built" information to the irrigation designer at the required time could result in an extension of the plant establishment period. Extension of the plant establishment period caused by the Contractor non-performance to provide the irrigation designer with a copy of the redlined the irrigation "as-built" record drawings approved by CLIENT's Authorized Representative shall be at no additional cost to CLIENT. The Contractor shall pay all costs involved for preparation of the irrigation "as-built" record drawings in AutoCAD format to the irrigation designer. This cost shall be included as a part of the Contractor's bid and no additional compensation shall be paid to the Contractor by CLIENT.
7. The Contractor shall dimension from two (2) permanent points of reference, such as building corners, sidewalk edges, 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 sprinkler pressure lines (dimension max. 100' along routing and at each change of direction).
 - e. Electric control valves.

- f. Routing of control wiring and flow sensor cable.
 - g. Quick coupling valves.
 - h. Other related equipment as directed by CLIENT's Authorized Representative.
8. Prior to the start of maintenance, the Contractor shall deliver the corrected and completed mylars, prints and electronic files of the of irrigation "as-built" record drawings to CLIENT's Authorized Representative. Submittal shall include one set of bond plots and one set of mylar plots along with one digital file on CD-ROM of the irrigation "as-built" record drawings in AutoCAD format and PDF format. Delivery of the mylars, prints and electronic files will not relieve the Contractor of the responsibility of furnishing required information that may be omitted from the redlined prints.

C. Controller Charts:

1. The Contractor shall include the irrigation controller charts. Electronic files of the Phase 1 irrigation controller charts will be provided by CLIENT.
2. Redlined As-built drawings shall be reviewed by CLIENT's Authorized Representative before controller charts are prepared.
3. Provide two controller charts for each controller supplied.
4. The chart shall show the area controlled by the automatic controller and shall be 11" X 17" in size and shall be prepared in AutoCAD format in the same manner as "as-built" record drawings.
5. The chart is to be a reduced drawing of the actual installed 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.
6. The chart shall be a plain paper copy print and a different color shall be used to indicate the area of coverage for each station.
7. When completed and approved, the chart shall be hermetically sealed between two pieces of plastic, each piece being a minimum 20 mils.
8. These charts shall be completed approved and shall be turned over to CLIENT prior to start of landscape maintenance. Also, include one digital file on CD-ROM of the irrigation controller charts in PDF format shall be included on the record drawing CD-ROM.

D. Operation and Maintenance Manuals:

1. Prepare and deliver to CLIENT's Authorized Representative within ten calendar days prior to completion of construction, two hard-cover, three-ring binders containing the following information:
 - a. Index sheet which states Contractor's name, address, and telephone number, and which lists each installed equipment and material item, including names and addresses of manufacturers' local representatives.
 - b. Guarantee statement.
2. In addition to the above-mentioned maintenance manuals, provide CLIENT's maintenance personnel with instructions for major equipment and show evidence in writing to CLIENT's Authorized Representative prior to start of landscape maintenance that this service has

been rendered.

E. Equipment to be Furnished:

1. Supply as a part of this contract the following:

- a. Operation and maintenance manuals.
- b. Color-coded controller charts laminated between 2 pieces of 20 mil plastic – Provide two charts for each controller.
- c. “As-built” record drawing mylars of irrigation plans.
- d. Completed Irrigation Guarantee Statement.
- e. Acceptance document to be signed by CLIENT’s authorized representative.

2. The above-mentioned equipment shall be turned over to CLIENT prior to start of landscape maintenance. Before landscape maintenance and final observation to start can occur, evidence that CLIENT has received these items must be shown to CLIENT’s Authorized Representative. Refer to “TURNOVER, AND ACCEPTANCE FORM” portion of these specifications for additional information.

F. Checklist:

1. Provide CLIENT with the following checklist information at the end of each segment of the project. This checklist shall be completed prior to start of maintenance.

- a. Plumbing permits obtained: If none required, so state.
- b. Material approvals. By whom approved and date.
- c. Pressure line tests: By whom approved and date.
- d. Manufacturer’s warranties, if required: Recipient and date.
- e. Written guarantee: Recipient and date.
- f. Lowering of heads in lawn areas: If not complete, so state and include anticipated completion date.
- g. Install anti-drain valve protection as required to prevent low head drainage.

1.5 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 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 a 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.

1.6 QUALIFICATION OF IRRIGATION PERSONNEL

A. Contractor and on site field superintendent shall have the following minimum qualifications:

1. Not less than five years continuous experience in installation of commercial irrigation systems.
2. Demonstrate completion of the manufacturer’s installation certification program for the weather based control system.
3. Upon CLIENT’s request, supply a list of references listing successfully completed

commercial irrigation systems.

1.7 SUBSTITUTIONS

- A. If the Contractor wishes to substitute any equipment or materials for the equipment or materials listed on the Drawings and Specifications, he may do so by providing the following information to CLIENT's Authorized Representative for review:
 - 1. Provide a statement indicating the reason for making the substitution. Use a separate sheet of paper for each item to be substituted.
 - 2. Provide descriptive catalog literature, performance charts and flow charts for each item to be substituted.
 - 3. Provide the amount of cost savings if the substituted item is approved.
- B. CLIENT's Authorized Representative shall have the sole responsibility in accepting or rejecting any substituted item as an approved equal to the equipment and materials listed on the Drawings and Specifications.

1.8 GUARANTEE

- A. The guarantee 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 CLIENT prior to acceptance of the irrigation system.
- B. A copy of the guarantee form shall be included in the operations and maintenance manual.
- C. The guarantee form shall be re-typed onto the Contractor's letterhead and shall contain the following information:

GUARANTEE FOR IRRIGATION SYSTEM

We hereby guarantee 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, unusual abuse, or neglect accepted. 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 costs to CLIENT. We shall make such repairs or replacements within a reasonable time, as determined by CLIENT, 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 CLIENT, we authorize CLIENT to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT NAME: _____

PROJECT LOCATION: _____

SIGNED BY: _____

CONTRACTORS ADDRESS: _____

CONTRACTOR'S PHONE NO.: _____

DATE OF ACCEPTANCE: _____

1.9 Turnover to CLIENT

The following checklist, turnover and acceptance forms shall be re-typed onto the Contractor's letterhead. The form shall be completed by the contractor and shall contain the all of the information shown on this sample checklist form and turned over to CLIENT prior to start of maintenance:

TURNOVER, AND ACCEPTANCE FORM

PROJECT NAME: _____

PROJECT LOCATION: _____

TURNOVER ITEMS:

- Operation and maintenance manuals.
- Color-coded controller charts laminated between 2 pieces of 20 mil plastic – Provide two charts for each controller.
- “As-built” record drawing mylars of irrigation plans.
- Completed Irrigation Guarantee Statement.

DELIVERED BY:

ACCEPTED BY:

Name of Contractor

Name of contractor's authorized representative

Signature contractor's authorized representative

Date of deliverance

Name authorized representative

Signature authorized representative

Date of acceptance

PART 2 - PRODUCTS

2.1 MATERIALS

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

- B. PVC Pressure Main Line Pipe and Fittings: (Use Purple Pipe for reclaimed water systems)
 - 1. Pressure main line piping for sizes 2" and larger shall be PVC Class 315 (Use purple pipe for Reclaimed Water).
 - 2. Class 315 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).
 - 3. Pressure main line piping for sizes 1-1/2" and smaller shall be PVC Schedule 40 with solvent welded joints (Use purple pipe for Reclaimed Water system).
 - 4. Schedule 40 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.
 - 5. PVC solvent-weld fittings for pressure main line piping shall be Schedule 80, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.
 - 6. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
 - 7. All PVC pipe must bear the following markings:
 - a. Manufacturer's name
 - b. Nominal pipe size
 - c. Schedule or class
 - d. Pressure rating in P.S.I.
 - e. NSF (National Sanitation Foundation) approval
 - f. Date of extrusion
 - 8. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.

- C. PVC Non-Pressure Lateral Line Pipe and Fittings: (Use Purple Pipe for irrigation system carrying recycled water system)
 - 1. Non-pressure buried lateral line piping shall be PVC Schedule 40 with solvent-weld joints
 - 2. PVC solvent-weld fittings for pressure main line piping shall be Schedule 40, 1-2, II-I NSF approved conforming to ASTM test procedure D2466.
 - 3. Schedule 40 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.

4. Solvent cement and primer for PVC solvent-weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
 5. All PVC pipe must bear the following markings:
 - a. Manufacturer's name
 - b. Nominal pipe size
 - c. Schedule or class
 - d. Pressure rating in P.S.I.
 - e. NSF (National Sanitation Foundation) approval
 - f. Date of extrusion
 6. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule and NSF seal of approval.
- D. Brass Pipe and Fittings:
1. Where indicated on the Drawings, use red brass screwed pipe conforming to Federal Specification #WW-P-351.
 2. Fittings shall be red brass conforming to Federal Specification #WW-P-460.
- E. Gate Valve:
1. Valves 3 inches and smaller shall be ASTM B 62 brass body, 150 pound saturated steam rated with screwed joints, non-rising stem, screwed bonnet, and solid disc, unless otherwise noted on drawings. Provide with hand wheel.
- F. Quick Coupling Valve:
1. Where indicated on the drawings, valves shall have brass body, 150 pound class, with 3/4 inch female threads opening at base permitting operation with a special connecting device (coupler) designed for this purpose.
 2. Coupler threads shall be lug type.
 3. Provide with rubber-like vinyl hinge cover (Purple vinyl cover).
- G. Backflow Prevention Unit: (For systems using potable domestic water for irrigation)
1. New backflow prevention unit and enclosure.
- H. Master Valve
1. Valve shall be spring-loaded, packless diaphragm activated, normally open type with brass body, equipped with flow control and pressure regulation capabilities when noted on drawing.
 2. Valve solenoid shall be 24 volt a.c. 4.5 watt maximum, 500 mili-amp maximum surge, corrosion-proof, stainless steel construction, epoxy encapsulated to form a single integral unit.
 3. Provide bleeder valve to permit operation in the field without power at the controller.

- I. Check Valve:
 1. Swing check valves 2" and smaller shall be 200 pound 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.
 2. 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 4 to 32 feet of head. Anti-drain valve shall be similar to the Hunter HCV or approved equal.

- J. Control Wiring:
 1. Wire requirements are as follows:
 - a. Unless otherwise noted, connections between an automatic controller and its corresponding electric control valves shall be made with direct burial copper wire AWG-U.F. 600 volt.
 - b. When more than one controller is installed at the same location, 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.
 - c. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14.
 2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
 3. Where more than one (1) wire is placed in a trench, the wiring shall be taped together at intervals of ten (10) feet.
 4. 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 valve, so that in case of repair, the valve bonnet may be brought to the surface without disconnecting the control wires. Control wires shall be laid loosely in trench without stress or stretching wire conductors.
 5. All control wire connection splices shall be made with 3M "DBY-6" direct bury splice kits or approved equal. Make only one splice with each splice kit.
 6. Field splices between the automatic controller and electric control valves will not be allowed without prior approval of CLIENT's Authorized Representative.

- K. Weather Based Irrigation Controller Assembly:
 1. Controller shall be fully automatic and capable of operating the required number of stations. Controller shall be pedestal mount type, in a housing with locking hinged cover. Fuse and chassis ground all controller components. Automatic controller shall include the following:
 - a. Surge protection.
 - b. Copper clad lightning protection device (specific type to be coordinated with General Contractor).
 - c. Permanent connection outside controller housing for quick connection of remote hand-held radio controls.

- d. Remote rain switch assembly mounted on the right hand side of enclosure, with interconnect wire harness pre-wired through a bypass switch into the controller and to the terminal strip.
 - e. Provide the controller assembly with a terminal strip clearly marking the position for one rain check device. Wire the terminal strip through clearly marked on/off switch mounted on the face of the controller to provide sensing bypass capability
- L. Stainless Steel Vandal-Resistant Controller Enclosure Assembly:
- 1. The stainless steel vandal-resistant controller enclosure assembly shall be as specified on the drawings.
- M. Electric Control Valve:
- 1. All electric control valves shall be the same size and type shown on the Drawings.
 - 2. All electric control valves shall have a manual flow adjustment.
 - 3. Provide and install one control valve box for each electric control valve.
- N. Valve Box:
- 1. All valve boxes shall be purple in color.
 - 2. Use 10" x 10-1/4" round box for all gate valves, Carson Industries #910-12B with purple bolt-down cover or approved equal. Extension sleeve shall be PVC with minimum size of six (6) inches.
 - 3. Use 15" x 21" rectangular box for all electric control valves, Carson Industries #1220 with purple bolt-down cover or approved equal.
 - 4. Use 10" diameter x 10-1/4" deep round plastic valve box for all quick coupling valves, Carson Industries #910-12B with purple bolt-down cover or approved equal.
- O. Sprinkler Head:
- 1. All sprinkler 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 Drawings and/or as specified herein.
 - 2. Spray heads shall have a screw adjustment.
 - 3. Riser units shall be fabricated in accordance with the installation details.
 - 4. Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.
 - 5. All sprinkler heads of the same type shall be by the same manufacturer.
- P. Identification Tag:
- 1. I.D. tags for electric control valves shall be manufactured from Polyurethane Behr Desopan. Use Christy's standard tag hot-stamped with black letters on yellow background. Tags shall be numbered to match programming shown on the Drawings. Provide one tag for each electric control valve.
 - 2. I.D. tags for quick coupling valves shall be manufactured from Polyurethane Behr

Desopan. Use Christy's maxi tag, hot-stamped with black letters on purple background. Tags shall read "Warning - Unsafe Water - Do Not Drink." Tag shall be printed in English on one side and Spanish on the other. Provide one tag for each quick coupling valve.

3. Special order tags from T. Christy Enterprises, 655 East Ball Road, Anaheim, CA 92805. Phone (714) 507-3300 and Fax (714) 507-3310.

Q. Flow sensor and flow transmitter.

1. Rainbird-FS-150 or equal.

R. Flow Sensor Cable and Conduit:

1. Cabling required for connections from controller to flow sensor shall be installed in conduit: Rain Master E.V Cable, or equal.

S. Miscellaneous Irrigation Equipment:

1. Refer to the Drawings for sizes and types of miscellaneous irrigation equipment.
2. All miscellaneous irrigation equipment shall be as specified or approved equal.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Before work is commenced, hold a conference with CLIENT, General Contractor, and Owner to discuss general details of the work.
- B. Verify dimensions and grades at job site before work is commenced.
- C. During the progress of the work, a competent superintendent and any assistants necessary shall be on site, all satisfactory to CLIENT. The superintendent shall not be changed, except with consent of CLIENT, unless that person proves unsatisfactory and ceases to be employed. The superintendent shall represent Contractor in its absence and all directions given to the superintendent shall be as binding as if given to Contractor.
- D. All work indicated or noted on Drawings shall be provided whether or not specifically mentioned in the Specifications.
- E. If there are ambiguities between Drawings and Specifications, and specific interpretation or clarification is not issued prior to bidding, the interpretation or clarification will be made only by CLIENT, and Contractor shall comply with the decisions. In the event the installation contradicts the directions given, the installation shall be corrected by Contractor at no additional cost to CLIENT.
- F. Layout of sprinkler lines shown on Drawings is diagrammatic only. Location of sprinkler equipment is contingent upon and subject to integration with all other underground utilities. Contractor shall employ all data contained in the Contract Documents and shall verify this information at the construction site to confirm the manner by which it relates to the installation.
- G. Coordinate the installation of all sprinkler materials, including pipe, with the landscape drawings to avoid conflict with the trees, shrubs, or other planting.
- H. Do not proceed with the installation of the sprinkler system when it is apparent that obstructions

or grade differences exist or if conflicts in construction details, legend, or specific notes are discovered. All such obstructions, conflicts, or discrepancies shall be brought to the attention of CLIENT.

- I. Replace, or repair to the satisfaction of CLIENT, all existing paving disturbed during the course of this work. New paving shall be the same type, strength, texture, finish, and be equal in every way to the material removed.
- J. CLIENT reserves the right to make temporary repairs as necessary to keep equipment in operating condition without voiding Contractor's guarantee or relieving Contractor of its responsibilities during the guarantee shall not be allowed.
- K. Coordinate the installation of all sprinkler materials, including pipe, with the landscape Drawings to avoid conflict with the trees, or other planting.

3.2 OBSERVATION OF SITE CONDITIONS

- A. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive approval from CLIENT's Authorized Representative prior to proceeding with work under this Section.
- B. Exercise extreme care in excavating and working near existing utilities. The 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 sprinkler irrigation materials including pipe, so there shall be NO interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers.
- D. The Contractor shall carefully check all grades to satisfy itself that he may safely proceed before starting work on the irrigation system.

3.3 PREPARATION

A. Physical Layout:

- 1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.
- 2. All layouts shall be reviewed by CLIENT's Authorized Representative prior to installation.

B. Water Supply:

- 1. The irrigation system shall be connected to water supply point(s) of connection as indicated on the drawings.
- 2. Connections shall be made at the approximate location(s) shown on the drawings. The Contractor is responsible for minor changes caused by actual site conditions.

C. Electrical Supply:

- 1. Electrical supply to be irrigation controller is existing P.I.P.
- 2. Connections shall be made at the approximate location(s) shown on the drawings. The Contractor is responsible for minor changes caused by actual site conditions.

3.4 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 the Drawings and as noted.
2. Provide for a minimum of twenty-four (24) inches cover for all pressure supply lines of 2 1/2-inch nominal diameter or smaller.
3. Provide for a minimum of twenty-four (24) inches cover for all pressure supply lines of 3-inch nominal diameter or larger.
4. Provide for a minimum of twelve (12) inches for all non-pressure lines.
5. Provide for a minimum cover of eighteen (18) inches for all control wiring.
6. Provide for a minimum cover of eighteen (18) inches for all communication cable conduits.

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 one-half (1/2) inch in size will be permitted in the initial backfill.
3. Flooding of trenches will be permitted only with approval of CLIENT's Authorized Representative.
4. If settlement occurs and necessitates adjustments in pipe, valves, sprinkler heads, lawn, plantings, or other installed work, the Contractor shall make all required adjustments without cost to CLIENT.

C. Trenching and Backfill Under Paving:

1. Trenches located under areas where paving, asphaltic concrete, or concrete will be installed, shall be backfilled with sand (a layer two (2) inches below the pipe and two (2) inches 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 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 a part of the Contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from CLIENT's Authorized Representative. 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. Plastic Pipe:

1. Install plastic pipe in accord with manufacturer's recommendations.
2. Install sprinkler head on plastic pipe as indicated on drawings.
3. Prepare all welded joints with manufacturer's primer prior to applying solvent.
 - a. Allow welded joints at least 15 minutes set-up/curing time before moving or handling.
 - b. Partially center load pipe in trenches to prevent arching and shifting when water pressure is on.
 - c. Do not permit water in pipe until a period of at least four hours has elapsed for solvent weld setting and curing, unless recommended otherwise by solvent manufacturer.
4. Attach pipe identification tape directly to pipe as specified in Section 02601, where color-impregnated and stenciled pipe is not utilized.
5. Do backfilling when pipe is cool.
 - a. Pipe can be cooled by operating the system for a short time before backfill, or by backfilling in the early part of the morning before the heat of the day.
6. Curing:
 - a. When the temperature is above 80°F., allow soluble weld joints at least 24 hours during the time before water is introduced under pressure.
 - b. When temperature is below 80°F., follow manufacturer's recommendations.

E. 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 in 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 CLIENT's Authorized Representative.
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.

F. Conduit and Sleeves:

1. Coordination: Sleeving shall be considered existing only when installed under another contract. For all other installations, provide materials and coordinate conduit and sleeve installation with other trades as required to facilitate smooth construction sequence.
 2. Conduit: Furnish and install conduit where control wires pass under or through walls, walks and paving. Conduits to be of adequate size to accommodate retrieval for repair of wiring and shall extend 12 inches beyond edges of walls and pavement.
 3. Sleeving: Install sleeves for all pipes passing through or under walks and paving as shown on the Drawings. Sleeving to be of adequate size to accommodate retrieval of wiring or piping for repair and shall extend 12 inches beyond edges of paving or other construction.
- G. Line Clearance:
1. All lines shall have a minimum clearance of six (6) inches from each other and from lines of other trades. Parallel lines shall not be installed directly over one another.
- H. Automatic Controller Assembly:
1. Electric control valves shall be connected to controller in numerical sequence as shown on the Drawings.
- I. Weather Based Irrigation Controller Setup, Schedule and Program:
1. Program the controller for all its functions and record settings on the sheet provided by the manufacturer.
 2. To install pedestal mount clock including the enclosure follow the guidelines listed below:
 - a. Assemblies shall be installed with the best of workmanship, neat appearance, and be easily accessible.
 - b. The complete assembly shall not cause a safety hazard of any kind.
 - c. Follow the manufacturer's recommendations regarding the electrical connections and mounting procedures.
 - d. The assemblies shall be set level, secure, and in alignment with adjacent surfaces.
 - e. Ground the assembly according to the manufacturer's recommendations.
 - f. All outside controllers shall be equipped with a G.F.C.I. 110-volt power source.
 3. The controller enclosure shall be mounted to a concrete pad with four 3/8 "J bolts" with a minimum of 6 inches penetration into the pad. The concrete pad shall be a minimum of 9 inches deep in ground, 3 inches above ground level and with a 6-inch overhang around complete enclosure base. Install a recognized electrical elbow for passing control wire through the concrete pad into the enclosure.
 4. After the plant establishment period and acceptance of the landscape and irrigation by the Owner's Authorized representative, the contractor shall change the irrigation controller from the plant establishment schedule and program to the full automated irrigation set-up, schedule and program shown on the irrigation drawings and entered into the irrigation controller.
- J. Electric Control Valves:
1. Install each electric control valve in a separate valve box.

2. Install where shown on the drawings. Where grouped together, allow at least twelve (12) inches between adjacent valve boxes.
3. Each valve number shall be heat branded on valve box lid with 1½" tall letters. Branding unit available from valve number shall be heat branded on purple valve box lid with 1½" tall letters. Branding unit is available from Hydroscape Products, Inc., phone number (714) 639-1850.

K. Flushing of System:

1. After all new sprinkler pipelines and risers are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and full head of water used to flush out the system.
2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of CLIENT's Authorized Representative.

L. Sprinkler Heads:

1. Install the sprinkler heads as designated on the drawings. Sprinkler 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. All sprinkler heads shall be set perpendicular to finish grade of the area to be irrigated unless otherwise designated on the drawings.

3.5 TEMPORARY REPAIRS

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

3.6 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 (1) inch and larger in diameter shall be painted with two coats of Tree Seal, or equal. Trenches adjacent to tree 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.

3.7 FIELD QUALITY CONTROL

A. Adjustment of the System:

1. The Contractor shall flush and adjust all sprinkler heads for optimum performance 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 sprinkler heads by the Contractor shall be accomplished within ten (10) days after notification by CLIENT.
4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the drawings.

B. Testing of the Irrigation System:

1. The Contractor shall request the presence of CLIENT's Authorized Representative in writing at least 48 hours in advance of testing.
2. Test all new pressure lines under hydrostatic pressure of 150 pounds per square inch and prove watertight. Pipe shall be center loaded with all pipe joints exposed during the pressure test.

Note: Testing of pressure main lines shall occur prior to installation of the electric control valves.

3. All piping under paved areas shall be tested under hydrostatic pressure of 150 pounds per square inch and proven 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 CLIENT's Authorized Representative. 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 CLIENT's Authorized Representative to determine if the water coverage for planting areas is complete and adequate. The coverage test shall be accomplished using a contractor furnished radio remote receiver and transmitter to turn each control valve on to observe sprinkler coverage and then to turn the control valve off when coverage test of that system is complete. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from the drawings, 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 CLIENT's Authorized Representative. This test shall be accomplished before any ground cover is planted.
8. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements. The contractor shall provide an irrigation water schedule for plant establishment as well as any subsequent schedule changes for review and approval by owner. Approval of irrigation schedule indicates only that the schedule submitted apparently meets the scheduling requirements of plant materials on the basis of the information submitted. Any adjustments to the schedule based on plants actual water needs or changes in weather conditions shall be the responsibility of the contractor.

3.8 MAINTENANCE

- A. The entire irrigation system shall be under full automatic operation for a period of seven (7) days prior to any planting.

- B. City Representative reserves the right to waive or shorten the operation period.

3.09 CLEAN-UP

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 occurring to the work of others shall be repaired to original conditions.

3.10 FINAL SITE OBSERVATION PRIOR TO ACCEPTANCE

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

3.11 SITE OBSERVATION SCHEDULE

- A. The Contractor shall be responsible for notifying CLIENT's Authorized Representative in advance for the following observation meetings, according to the time indicated:
 - 1. Pre-Job Conference - 7 days
 - 2. Pressure supply line installation and testing - 48 hours
 - 3. Automatic controller installation - 48 hours
 - 4. Automatic controller activation and scheduling - 48 hours
 - 5. Control wire installation - 48 hours
 - 6. Lateral line and sprinkler installation - 48 hours
 - 7. Point of connection installation – 48 hours
 - 8. Master Valve, strainer and flow sensor installation.- 48 hours
 - 9. Flow sensor conduit installation.-48 hours
 - 7. Coverage test - 48 hours
 - 8. Final site observation - 7 days
- B. When site observations have been conducted by a party other than CLIENT's Authorized Representative, show evidence in writing of when and by whom these observations were made.
- C. Prior to walking irrigation system with Owner's Authorized Representative, the Contractor shall pre-walk irrigation system with its own crew to ensure compliance with plans and specifications. The Contractor shall observe those items shown on the construction observation check list below and initial and date that the all items observed are in accordance with plans and specifications. This list shall be presented to CLIENT's Authorized Representative prior to the final irrigation walkthrough with CLIENT's Authorized Representative.
- D. No site observations will commence without record drawings or "Construction Observation Check List". In the event the Contractor calls for a site visit without record drawings or "Construction Observation Check List", without completing previously noted corrections, or without preparing the system for said visit, it shall be responsible for reimbursing CLIENT's Authorized Representative at his current hourly billing rate, portal to portal (plus transportation costs), for the inconvenience. No further site observations will be scheduled until this charge

has been paid and received.

- E. The following checklist and acceptance form shall be re-typed onto the Contractor's letterhead. The form shall be completed by the contractor and shall contain the all of the information shown on the sample checklist form shown on the next page.

CONSTRUCTION OBSERVATION CHECK LIST

PROJECT NAME: _____

PROJECT LOCATION: _____

DESCRIPTION:	Completed by		Approved by	
Sprinkler Heads	Contractor	Date	CLIENT	Date
Heads plumb and straight				
Spacing per design intent				
Correct nozzles used				
Pressure set appropriately				
PCS Screens installed				
N.P. Caps (when required)				
Heads at correct height				
Back-up heads properly located				
Turn down screws used only for minor adjustments only				
Nozzles are clean and unobstructed				
Pop-up heads retracting properly				
Heads adjacent to building/paving located correctly				
Head to head coverage ok				
Minimal overspray				
Swing joints installed				
No leaks observed				
Systems on slopes separated correctly				
Direction of spray appropriate				
No low head drainage				
Rotor are rotating				
Install van nozzles where necessary				
Proper arc patterns installed				

DESCRIPTION:	Completed by		Approved by	

Valves – All sizes and types	Contractor	Date	CLIENT	Date
Correct size of boxes				
Correct color of boxes				
Heat branding complete				
Reclaimed designation on valves and boxes				
Height of valves in boxes				
Gravel in boxes (2cu. ft.) installed				
Brick supports in boxes installed				
Valve I.D. tags installed				
Pressure setting on valve set properly				
Bolt downs on boxes provided				
PVC sleeve in box at gate valve				
Proper wire connectors installed				
No leaks observed				
Correct clearance from valve to gravel provided				
Brass handwheel installed				
2" operating nuts installed				

Irrigation Controllers				
Proper gauge and color of control and common wires.				
HydroPoint WeatherTRAK controller set-up, schedule and program complete per irrigation drawings				

Additional Items				
Coverage test complete				

END OF SECTION 328400