

## **PART II**

### **SECTION 11, IRRIGATION SYSTEM**

This section specifies the furnishing and installation of an automatically controlled, underground, irrigation system and associated equipment.

#### **1.0 GENERAL**

##### **1.01 THE REQUIREMENT**

A. Provide all labor, materials, and equipment necessary to perform the complete scope of irrigation work as specified to ensure that the system is fully and properly operational.

B. If irrigation plans are not provided; provide complete irrigation plans and schedule, as part of scope of work, to a degree, detail, and inclusion that such plans will be accepted for all necessary permitting required installing the job complete per plans and as set forth in these specifications. This may or may not include providing details of equipment and/or their connections.

C. Provide the complete and proper construction of the landscape irrigation system including, but not limited to:

1. All piping including mains, laterals, fittings, sleeves, connections, tee, risers, and clamps.
2. All control, ball, globe, pressure reducing, quick coupling and other valves, including valve boxes, markers, connections, operators and other accessories.
3. Complete automatic control system, including controllers, programming, and control wiring connections.
4. Complete electrical connection of the controller to service panel location.
5. Connections of piping to the supply source utilizing a meter provided by the City and installing a new vacuum breaker and flow meter at the meter location.
6. All excavation, site work, relocation or replacement of utilities, backfill and restoration of all disturbed areas and circumstances.
7. Provide a complete and operable system for the irrigation of all proposed landscape areas on the project site. These specifications are intended to include all items obviously necessary and requisite for the proper irrigation of the project. This in no way relieves the CONTRACTOR of his responsibility to furnish any additional labor, materials and equipment required for a proper system as part of this scope of work.
8. Adjust any system components to work with existing and proposed landscaping.
9. Supply, deliver, store, and protect all equipment and materials, including pipe and fittings, valves, controllers, wire, and all other component parts necessary for the installation of a fully automatic irrigation system as indicated in these specifications.

D. Complete sod and planting restoration in all areas that are trenched or damaged during the installation of the irrigation system upon completion of the project.

##### **1.02 RELATED WORK SPECIFIED ELSEWHERE**

- A. Earthwork
- B. Excavation and Backfill for Utilities
- C. Piping, General
- D. Valves, General
- E. Water Distribution system

#### 1.03 EXISTING UTILITIES

A. Before starting site operations, the CONTRACTOR shall arrange for the disconnection of all utility services designated to be removed in accordance with the Section entitled "Demolition".

B. The CONTRACTOR shall locate all existing active utility lines traversing the site and determine and develop implementation plan for their protection throughout project duration. Note that all active utilities adjacent to or traversing the site and/or designated to remain shall remain in continuous, uninterrupted service throughout the duration of the Work, unless specifically scheduled for a shutdown, in accordance with requirements specified in Section 5.

C. The CONTRACTOR shall furnish all temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered during the progress of the work, whether shown or not on the drawings. Such Work shall be considered incidental to the scope of the project and no separate compensation will be provided for such.

D. Where the grade or alignment of proposed piping is obstructed by existing utility structures, such as conduits, ducts, pipe branch connections to main sewers and the like, whether or not shown on the drawings, the obstruction shall be permanently supported, relocated, removed, and/or reconstructed by the utility owner, pending proper coordination by the CONTRACTOR, at no additional cost to the CITY. Such Work shall be considered incidental to the scope of the project and no additional compensation will be provided for such work. In addition, all such work shall be full compliance with utility owner requirements.

E. It shall be the responsibility of the CONTRACTOR to notify the owners of existing utilities in the area of construction a minimum of 48 hours prior to any excavation adjacent of such utilities, so that field locations of said utilities may be established.

F. The CONTRACTOR shall remove, plug and/or cap inactive or abandoned utilities encountered in excavation.

G. The CONTRACTOR shall record location of all utilities, whether shown on the drawings or not, in accordance with the Section entitled "Project Record Documents".

H. No deviation shall be made from the required line or grade except as directed by the ENGINEER.

#### 1.04 DESCRIPTION OF SYSTEM

A. This system has been designed as a typical block valve type using Rain Bird (or approved equal) components including, but not limited to sprinklers, rain sensor, valves, vacuum breaker, etc. The individual irrigation system shall be controlled by a new, most-recent model, Motorola Irrinet Scorpio unit.

B. The water source for this system shall be from an existing City potable water system. The City will provide the tap and water meter location as per irrigation plans or as determined in the field. CONTRACTOR to coordinate with City of Miami Beach Public Works Department for location and size of meter to be installed

## 1.05 QUALITY ASSURANCE

A. All applicable ANSI, AWWA, and ASTM Standards and Specifications, and all applicable building codes and other public agencies having jurisdiction upon the work.

B. The CONTRACTOR shall be responsible for constructing the system in complete accordance with all local codes, ordinances and laws. The CONTRACTOR shall install all sprinkler heads according to the manufacturer's specifications with regard to installation, depth and distance between heads. Any modification made to conform to said codes, laws, ordinances and specifications shall be completed at the Contractor's expenses with no additional compensation allowed.

C. Protection of Existing Site Conditions and Materials: The CONTRACTOR shall take all necessary precautions to protect site conditions and materials to remain. Should damages occur, CONTRACTOR shall repair the damage to its original condition or better at his own expense.

1. The CONTRACTOR shall avoid where possible trenching through the roots of any existing trees, and shall alert the engineer before conducting any such activity that may damage large or primary root systems.

D. Permits and Fees: CONTRACTOR shall be responsible for obtaining all permits and pay required fees to any governmental agency having jurisdiction over the work. Inspection required by local ordinances during the course of construction shall be arranged as required. On completion of the work, satisfactory evidence shall be furnished to the City of Miami Beach to show that all work has been installed in accordance with the ordinances and code requirements. It shall be noted that as a general policy of the City of Miami Beach, irrigation/plumbing / other permit fees for City-Owned projects are waived.

E. CONTRACTOR shall insure full, 100% coverage (*minimum* head to head) in all areas to receive irrigation, and shall be responsible for adding additional heads, zones, and components as required to achieve such coverage. "Head to head" means that the farthest edge of the water throw trajectory of a single head extends or overlaps the surrounding irrigation heads.

F. Workmanship: All work shall be installed by skilled personnel, proficient in the trades required, in a neat, orderly, and responsible manner with recognized standards of workmanship. The CONTRACTOR should have installed at least five projects of similar magnitude and demonstrated ability in the installation of sprinkler irrigation systems of this type.

## 1.06 SUBMITTALS

A. Before starting fabrication, the Contractor shall submit detailed working drawings for review and acceptance by the Engineer. Such drawings shall show all irrigation system equipment, indicating all details required for the proper construction including, but not limited to: controllers, valves, flow meters, gate valves, piping, fittings, materials, vacuum breaker, connectors, etc. Where appropriate, and when approved by the City, manufacturer's product data for the proposed components may be substituted for shop drawings.

## 1.07 SUBSTITUTIONS

A. A written request for approval to substitute a material's type, grade, quality, etc. due to the non-availability of the material specified may be submitted to the Engineer. Approval of the substitution must be given by the Engineer AND the City of Miami Beach Parks and Recreation Department before the material is ordered, delivered, or installed on the project.

## 1.08 CHANGES AND ADDITIONAL WORK

A. The CONTRACTOR shall not start on any changes or additional work in the project until the City and the CONTRACTOR have executed a written agreement setting forth the adjusted contract amount. Any work performed on any changes or additional work prior to the execution of a written agreement may not be compensated by the City.

B. The City reserves the right to adjust the number and location of sprinkler heads and other equipment in order to provide for any modifications which might become necessary.

#### 1.09 GUARANTEE

A. CONTRACTOR shall warranty the entire irrigation system against defects, poor workmanship, discrepancies, deficiencies, and malfunction for a minimum of one calendar year from the time of final acceptance. Warranty all include, but not be limited to, all parts and components included in the system and its installation, and all labor-related items regarding the procurement, assembly, installation, and operation of the system including any and all of its components. An inspection, to be arranged and coordinated by the CONTRACTOR, and Engineer, shall be made at the beginning and end of the guarantee period.

#### 1.10 QUALITY AND GRADE OF REPLACEMENT

A. All replacement material shall be equal to or better in regards to size, quality, quantity, and grade, as that of the material to be replaced, unless directed otherwise by the Engineer.

B. Replacement components and labor shall be guaranteed for a period equal to the originally specified guarantee of one year. This guarantee period shall begin at time of acceptance of the replacement material and/or workmanship.

C. Final payment to the CONTRACTOR shall not relieve guarantee obligations.

#### 1.11 AS-BUILT DRAWINGS

A. After final acceptance of project, CONTRACTOR shall furnish complete as-built reproducible drawings that show the following: scaled drawings that show the locations of all valves and piping (with dimensions where required or necessary), horizontal or vertical dimensions measured from permanent/fixed objects (buildings, sidewalks, etc.) including but not limited to the mainline pipe, controller location, remote control/ball/quick coupler valves, wiring/conduit, and sprinkler heads. The drawings shall also indicate and show any and all approved substitutions including size, material, and manufacturer's name and catalog number. All piping shall be labeled to show diameter sizes. Remote control valves and isolation valves shall have two (2) measurements from separate fixed objects so that triangulation of an exact coordinate for the valves may be calculated. Provide a minimum of two (2) hard copies and one digital copy (in Autodesk AutoCAD version) of the as-built drawings to the City.

## 2.0 MATERIALS

### 2.01 PIPE

A. PVC: All pipes shall be Polyvinyl Chloride (PVC) schedule 40 conforming to ASTM D, 1785 or better unless noted otherwise on the Plans or in these Specifications. All pipes shall be new and free from defects and shall be continuously marked indicating size schedule type and Department of Commerce Standard Reference. Pipe shall be furnished in standard length of twenty (20) feet.

B. PVC SLEEVES: Pipes routed under pavement and sidewalks shall be sleeved in Polyvinyl Chloride (PVC) Schedule 40, conforming to ASTM D, 1785, pipe unless noted otherwise on the Plans or in these Specifications. All pipes shall be new and free from defects and shall be continuously marked indicating size, schedule type and Department of Commerce Standard

Reference. Pipe shall be furnished in standard length of twenty (20) feet.

C. GALVANIZED PIPE: Pipe installed above grade for the backflow preventers shall be galvanized painted steel conforming to ASTM A.120, SCH 40.

D. Thrust blocks shall be installed on all main lines 2" and greater in diameter at all 90 degree turns. Thrust blocks shall be made out of concrete and shall be installed as per pipe manufacturer's recommendations. Size thrust block to ensure adequate support.

## 2.02 PIPE FITTINGS

A. All PVC fittings shall be white PVC solvent weld Schedule 40 fittings, which are new and free from defects. The primer and solvent glue shall be compatible with the pipe and fittings. Where adapters are used between threaded and slipped pipes or valves, they shall be only female PVC threaded to socket coupling adapters. No male threaded PVC fittings are to be used, with the exception of street ells and riser adapter.

B. Galvanized steel pipe shall have threaded standard 150 pound galvanized malleable fittings.

C. All sprinkler heads shall be connected to the supply line as shown on the enclosed detail.

D. All sprinkler heads shall be connected to the supply line with PVC swing joints, unless indicated otherwise in the Plans and Specifications.

## 2.03 PRIMER

A. Shall be a PVC High Etch Primer. This primer shall have a color tint to aid in visual inspection.

## 2.04 SOLVENT/GLUE

A. Shall be slow drying, heavy-duty gray PVC solvent/glue.

## 2.05 SPRINKLER HEADS

Pop-up Spray Heads (6"): The sprinkler shall be Rainbird 1800 Series or approved equal meeting the following criteria:

1. The sprinkler shall be of the fixed spray type designed for in-ground installation. The sprinkler shall be capable of covering up to 15 feet radius at 30 psi and deliver 3.70 GPM.
2. The sprinkler body, stem, and screen shall be constructed of heavy duty, ultra violet resistant plastic. It shall have a heavy-duty stainless steel retract spring for positive pop-down and a ratcheting system for easy alignment of the pattern.
3. The sprinkler shall have a soft elastomeric pressure activated co-molded wiper seal for cleaning debris from the pop-up stem as it retracts into the case to prevent the sprinkler from sticking up and minimize "flow-by "
4. The sprinkler shall have a matched precipitation rate (MPR) plastic or brass nozzle with an adjusting screw capable of regulating the radius and flow. The sprinkler shall be capable of housing under the nozzle; protective non-clogging filter screens or pressure compensating (PSC) screens. The screen shall be used in conjunction with the adjusting screw for regulating. The 6" and 12" models shall have both a side and a bottom 1/2" (FNPT) inlet for ease of installation.
5. The sprinkler shall have a Pop-Top Flush Plug pre-installed. The plug shall prevent debris from clogging the sprinkler during installation and allow for system to be flushed before nozzling. The

plug shall be bright orange in color and constructed of polypropylene material.

6. Coverage shall be either full or part circle. The part circle coverage shall be available in arcs of 90, 120, 180, 240, and 270 degrees or adjustable part circle. Also included shall be special patterns including an end strip and center strip nozzle configuration. Nozzle delivery shall be such as to allow circle patterns to match full circle patterns in precipitation rates

## 2.06 IRRIGATION CONTROL WIRE

A. All irrigation control wire from the controller to the electric valve shall be UL approved PE irrigation control wire; single conductor insulated utilizing low density high molecular weight polyethylene insulation suitable for operating at 600 volts and conductor temperatures up to 60 degrees C. The conductor shall be soft drawn bare copper meeting the requirements or ASTM Specification B\_3 or B\_8. Temperature rating shall be from -55 degrees to +60 degrees C. Thickness of insulation for conductor size 14 AWG through 8 AWG solid shall be 3/64 inches. AWG size for wire shall be in accordance with the manufacturer's specifications based upon a relationship between the number of valves and their distance from the controller

## 2.07 WIRE CONNECTORS

A. All splices in irrigation control wire shall be accomplished using Rainbird ST\_03 UL Snap Tite connectors and PT\_S5 sealer or 3M DBY Direct Bury Splice Kit.

## 2.08 CONDUIT

A. Gray conduit shall be PVC, U.L. approved. Conduit size as required by code or as shown on the plan, which ever is larger in size.

## 2.09 RISERS

A. Pipe to be utilized as risers shall be 1/2 inch PVC Schedule 40 or schedule 80.

B. Risers are to be utilized in shrub masses (shrub heights of 18 inches or greater) and they are to be secured to #4 steel rebar with stainless steel hose clamps.

## 2.10 AUTOMATIC CONTROL VALVES

A. Automatic Control Valves (Rainbird PEB Series or approved equal)

1. The remote control valve shall be a normally closed 24 VAC 50/60 cycle solenoid actuated globe pattern design capable of having a flow rate of 70 gallons per minute (GPM) with a pressure loss not to exceed 14 pounds per square inch (PSI). The valve pressure rating shall not be less than 200 PSI.

2. The valve body and bonnet shall be constructed of heavy-duty glass-filled UV-resistant nylon and have stainless steel studs and flange nuts; diaphragm shall be of nylon reinforced nitrile rubber.

3. The valve shall have both internal and external manual open/close control (internal and external bleed) for manually opening and closing the valve without electrically energizing the solenoid. The valve's internal bleed shall prevent flooding of the valve box.

4. The valve shall house a fully encapsulated, one-piece solenoid. The solenoid shall have a captured plunger with a removable retainer for easy servicing, and a leverage handle for easy turning. This 24 VAC 50/60 Hz solenoid shall open with

19.6 volt minimum at 200 PSI. At 24 VAC average inrush current shall not exceed .41 amps.

5. The valve shall have a brass flow control stem for accurate manual regulation and/or shut-off of outlet flow. The valve must open or close in less than 1 minute at 200 PSI, and less than 30 seconds at 20 PSI.

6. The valve construction shall be such as to provide for all internal parts to be removable from the top of the valve without disturbing the valve installation.

#### 2.11 GATE VALVES

A. Gate valves 4 inches and smaller shall be Crane No. 438 (screwed end) with all bronze body, wedge disc and non-rising stem, or approved equal. They shall be hand wheel operated and installed in a valve box with cover.

#### 2.12 QUICK COUPLING VALVES

A. Quick Coupling Valves (Rainbird 5RC Series or approved equal)

1. The quick coupling valve shall be a one piece type capable of having a discharge rate of up to 70 gallons per minute (GPM) with a pressure loss not to exceed 14.0 pounds per square inch (PSI).

2. The valve body shall be constructed of heavy cast brass. The cover shall be durable and self-closing. When so specified, the 5RC cover shall be a locking rubber cover (LRC).

3. The valve shall be opened and closed by a brass key of the same manufacturer

#### 2.13 VALVE BOXES

A. Valve boxes for electric and manual valves shall be Ametek plastic boxes or approved equal with green covers and designed for installation with irrigation systems. The valve box shall be large enough to provide at least 2" of clearance around all valve parts. The word "irrigation" shall be imprinted in the valve box cover. Each valve box shall have a cover with an anti-theft mechanism.

B. Valve boxes shall be installed flush with the finished grade as detailed on the drawings.

C. Bottom of all valve boxes will be on a 6" bed of pea gravel for drainage.

#### 2.14 PAINT

A. All paint for risers, rebar and visible pipe shall be dark green, waterproof and rated for outdoor use.

B. A color sample shall be submitted to the City of Miami Beach Parks and Recreation Department for approval and that all parts to be painted shall received the number of coats necessary to completely mask underlying, original colors/materials.

#### 2.15 BACKFLOW PREVENTER

A. Backflow preventer or any valves which may be required by code are the responsibility of the Contractor and shall be installed at no additional cost as part of this contract.

B. Backflow preventer shall be "Febco" Model 825Y (2") or approved equal.

C. Backflow preventer shall be a reduced pressure type consisting of two independently operating, center guided spring loaded, "Y" pattern check valves and one hydraulically independent differential relief valve. All internal parts shall be of corrosion resistant material.

## 2.16 CONTROL SYSTEM

Irrigation system controller shall be fully compatible with the City's Remote Motorola Irrinet Irrigation Control System.

A. CONTRACTOR shall provide the controller with a 110-volt A.C. electrical supply. The controller unit shall have input and output surge protection consisting of a GFI circuit breaker built into the controller enclosure on the input side, and a separate transformer with one relay output module for each zone on the output side.

B. The controller shall be encased in a securable, wall mounted, waterproof stainless steel enclosure unless specified otherwise. The controller case shall include a cooling fan that will automatically turn on whenever the interior temperature rises above 105 °F, and shall automatically turn off when the interior temperature reaches 96 °F. CONTRACTOR shall supply the appropriate control keyboard, which shall be mounted securely, but for easy removal, inside the enclosure door. A complete, easily legible, laminated wiring diagram of equipment inside the enclosure shall be affixed to the inside of the enclosure door. Wiring diagram shall also list radio frequency(s) for the controller and a list of zones with types of heads and their numbers for each.

C. Irrigation field wires shall not be brought directly into the controller enclosure. A "tray cable" UL® listed for Direct Burial and Sunlight Resistant shall be connected to the controller output terminals and placed inside a valve box just outside the enclosure. These wires shall each be a #16 AWG, THWN, stranded. Each wire shall be printed on its full length with a number, and color-coded. Field wires shall be connected to these wires inside the splice box utilizing approved waterproof connectors.

D. Unit shall be grounded as per the manufacturer's specifications.

E. The entire controller assembly consisting of the controller, enclosure, and any other related equipment, shall be listed under UL 508A as an "Enclosed Industrial Control Panel". This listing shall be provided by the Irrinet supplier, and shall include the supplier's name and the product serial number on a decal affixed to a visible area inside of the control enclosure.

F. Accessories:

1. Flow Meters: All flow meters shall be interchangeable types as manufactured by Bermad, Inc. or approved equal. One flow meter with pulse indicator and a master valve feature shall be installed at each connection or tap (meter locations) into the existing water line source. Flow meters shall be installed in a valve box, with 6" of pea gravel aggregate underneath to promote drainage. Flow meters shall be wired to the controller.

The Bermad flow meters must be sized correctly to work accurately. Use the following flow rate / meter combinations:

Up to 65 gpm—1" size

Up to 100 gpm — 2" size



2. Rain Sensor Device: The rain sensor device shall be manufactured by Rainbird or approved equal.

3. Back-up Power Supplies: Each field unit shall each have a nickel-cadmium battery backup system in case of power loss or failure. The battery shall be nickel-cadmium 9-volt capacity and manufactured by Varta, Duracell or equal.

4. Training and Manuals: CONTRACTOR to coordinate a minimum 4-hour training session on the operation and programming of the new system for City of Miami Beach Parks and Recreation Department designated employees. Training session will take place within the City of Miami Beach, and shall be conducted by a factory authorized representative to perform such service. Time and exact location to be coordinated directly with CMB Parks and Recreation Department. In addition, CONTRACTOR shall supply the original factory copy of controller operation/owner's manual. CONTRACTOR shall register product with manufacturer and provide a copy of completed warranty card/sheet information to Parks and Recreation Dept.

#### 2.17 BACKFILL SOIL

A. Backfill material shall be clean fill, and completely free from any rock or other material which, if it came into contact with, could damage the pipe. If material from excavation is not acceptable, then clean sand must be used. No rock will be permitted in contact with the PVC pipe.

#### 2.18 RAIN SENSOR

A. An external rain sensor device shall be provided with the system, as manufactured by Rainbird Corp. or approved equal. The rain sensor shall be properly connected to the system controller to provide its intended purpose. Rain sensor shall be securely mounted to a tangible structure, out of human reach, and clear of any overhead obstructions that may negatively impact performance.

#### 2.19 BOOSTER PUMP STATION (ONLY IF APPLICABLE)

A. GENERAL: This document describes a complete skid mounted pumping system with electrical controls, pipe manifolds, valves, and all accessories described herein. The pump station shall be assembled in a workman like manner with consideration given to convenience of use, maintenance, and future repairs. All intended features shall work properly and reliably. All materials exposed to the weather shall be corrosion resistant and shall not be harmed by spraying water. All components mountings shall be sturdy and solid, with sufficient clearance to safely access, operate, and repair without significant disassembly of other components. The station shall be manufactured, tested, and then shipped to the site. All sizes, output values, etc., to be determined by project Landscape Architect or City of Miami Beach Parks and Recreation Dept., or their designee.

#### B. ELECTRICAL CONTROL PANEL

1. ELECTRICAL ENCLOSURE — MOUNTING — The control panel enclosure shall be fiberglass, NEMA 4X, with stainless steel hardware. All panel penetrations shall maintain the NEMA 4X rating. This enclosure shall be mounted on an angled aluminum pedestal to facilitate ease of use.

2. ELECTRICAL REQUIREMENTS - The control panel shall be designed to operate on 3 phase 208 volts. Total electrical load presented by the entire pump station and control system to the electrical service shall be: 25 amps @ 208 volts three phase.

3. FUSELESS — There shall be no fuses used anywhere in the pump station. All circuit protection shall consist of properly sized circuit breakers. Exceptions will be made for irrigation

controllers requested by purchasers.

4. LISTING - The electrical panel assembly will be listed in its entirety by Underwriters Laboratories UL® section 508A as an ENCLOSED INDUSTRIAL CONTROL PANEL by the station manufacturer. This panel shall be built by the station manufacturer at their own UL® certified shop, it shall not be subcontracted.

5. DOOR INTERLOCK DISCONNECT and SHORT CIRCUIT / GROUND FAULT PROTECTION - If a large short circuit or ground fault occurs in the pump station the main circuit breaker shall trip and shall indicate the fault by means of the door handle moving to the TRIP position. After the fault is cleared, the circuit breaker will be reset by first moving the door handle to the OFF position, then back to the ON position. This main disconnect shall be a door interlocking handle preventing the panel door from opening unless the handle is moved to the OFF position. Fuses shall not be used for this disconnect, for short circuit protection, or ground fault protection.

6. ELECTRICAL SAFETIES — The short circuit protection shall utilize a circuit breaker moving to the TRIPPED position. The motor overload protection shall utilize an adjustable overload trip module. This overload protection shall be reset by the door panel RESET button, it shall not be necessary to open the control panel to reset an overload condition. Phase loss protection shall be provided by the overload module by means of an unbalanced trip bar shortening the trip curve for overload when a phase is lost.

7. PRESSURE DEMAND — The pump shall start on a drop in pressure, and shall retire when flow ceases. This pressure drop shall be detected by a dedicated pressure switch separate from the LOW PRESSURE sensor.

8. FLOW SAFETIES — The control panel shall turn the pump off in response to harmful conditions as follows: LOW PRESSURE (by means of a dedicated low pressure sensing switch, VOLUTE (via a volute mounted heat sensor), LOSS OF PRIME, and RAPID CYCLE. All of the flow safeties shall be properly time delayed and all sensors and switches de-bounced inside the control PLC.

9. OVERLOAD — If the pump motor draws an overload current, the motor starter overload shall trip, and then automatically reset. The pump shall not come on until the control door RESET button is depressed, it shall not be necessary to open the control panel door to reset an OVERLOAD alarm condition. A labeled pilot light shall indicate an overload condition.

10. VOLUTE - When the pump volute reaches a temperature of 100 °F continuously for 3 minutes, the pump shall be turned off. The pump shall not come back on until the RESET button is depressed. A labeled pilot light mounted on the outside of the control panel door shall indicate that a VOLUTE high temperature condition has occurred.

11. LOW PRESSURE — An adjustable dedicated pressure switch monitoring mainline pressure will be used to determine a low-pressure alarm. When mainline pressure drops below the adjustable set pressure continuously for 3 minutes, the pump shall be turned off. The pump shall not come back on until the RESET button is depressed. A labeled pilot light mounted on the outside of the control panel door shall indicate that a LOW PRESSURE alarm has been declared.

12. HIGH PRESSURE — A dedicated pressure switch shall be used to detect abnormal high-pressure conditions. If the adjustable high-pressure detection pressure switch goes active continuously for 3 minutes the pump shall be retired and the HIGH PRESSURE alarm light shall indicate the failure. This alarm condition will be reset by the RESET pushbutton.

13. RAPID CYCLE — If the pump station starts more than once every 5 minutes the station shall be shut down and shall not re-start until the RESET button is depressed. A labeled pilot light shall

indicate that the station is off because of a RAPID CYCLE fault. This feature shall monitor pump starts over two hour periods allowing no more than 24 starts in any two-hour period, and shall reset the counter if the pump is off continuously for 1/2 hour.

14. FAULT EXCLUSIVITY — The first fault to occur precludes all other faults from occurring or indicating. If the station shuts down because of an OVERLOAD condition, the station shall not indicate NO FLOW. If the station shuts down because of a VOLUTE high pressure condition, the station shall not indicate NO FLOW.

15. FAULT MEMORY RECALL — The station shall be capable of reporting the last three failures experienced by the station by depressing the RESET pushbutton for 21 seconds continuously. The first pilot light to turn on after 21 seconds is the last fault that occurred, the second pilot light to turn on is the second most recent fault, and the third light to turn on is the third most recent fault that occurred.

16. LAMP TEST — The control panel shall include a lamp test feature to prove pilot lights are working. Depressing the RESET button 5 times within 5 seconds activates the feature by turning all the pilot lamps on except the RUN light. The RUN light will be tested separately by turning the HOA switch to the HAND position.

17. HAND — OFF — AUTO (HOA) SWITCH PER PUMP - This switch shall provide HAND, OFF, and AUTO functions as follows:

HAND Turning the switch to the HAND position turns the pump on, all flow safeties are by-passed except the VOLUTE heat sensor.

OFF Turning the switch to the OFF position prevents the pump from operating.

AUTO Turning the switch to the AUTO position puts the station in automatic start mode; the pump starts automatically as required.

18. RESET BUTTON - Shall restart the station for all station alarms except SHORT CIRCUIT. It shall not be necessary to open the control panel door to reset an OVERLOAD condition.

19. LOW VOLTAGE CONTROLS, LED LAMPS — All flow and pressure sensors inside and outside the control panel, all pilot lights, and all door mounted hardware shall be powered with less than 30 volts. All pilot lamps shall be mounted on the control panel door exterior and shall utilize LED lamps rated for 100,000 hours of continuous on operation. Incandescent lamps shall not be used.

20. CONTROL CIRCUIT PROTECTION - All controls shall receive power from an isolation transformer mounted in the control panel. This transformer shall be protected on both primary and secondary sides against short circuit, ground fault, and overload by means of properly sized DIN rail mounted circuit breakers. Both primary and secondary sides of the transformer shall include properly sized Metal Oxide Varistors installed "line to line".

21. PLC & POWER SUPPLY — All station functions shall be controlled by a programmed PLC. This PLC shall be field replaceable with quick connect wire connectors; screw terminals shall not be used. The PLC power supply shall be separately replaceable and shall also utilize electrical quick connection plugs.

#### C. EQUIPMENT SKID AND ENCLOSURE

1. All pump station equipment and the Motorola controller will be securely mounted on a welded aluminum skid. All equipment on this skid will be covered by an enclosure manufactured with black Starboard XL HDPE plastic shell, 1/2" thick. Full-length stainless steel piano hinges shall be

used on the hinged doors providing convenient access to all equipment. All doors will be securely locked with built in lock mechanisms featuring stainless steel handles. The shell shall remain smooth and wrinkle free at all times regardless of temperature. The station shall be vented with a squirrel cage fan when the pump is operating. This fan shall have a minimum per minute volume ten times the total enclosed air space. All controls including pressure gauges, flow meters, irrigation controllers, and the electrical control panel shall be mounted in such a manner that they are easy and convenient to use.

#### D. PUMP/MOTOR

1. The pump used shall be a G&L model 4SV, a vertical stainless steel 2 stage pump with flanged connections and driven by a TEFC enclosed 3 phase motor whose horsepower shall be sufficient to produce the desired pressure and effect for the proper irrigation of the project. The pump and motor combination shall be totally non-overloading with no utilization of the motor service factor.

#### E. PUMP MANIFOLD

1. The pump manifold will be constructed of schedule 40 galvanized steel, utilizing Victaulic galvanized roll grooved fittings and/or welded schedule 40 steel fittings hot dip galvanized after welding. This manifold shall be rigid with no movement of the pipe manifold during pump starting and stopping or during pressure changes in the system. All Victaulic couplings shall utilize Victaulic "Flush-Seal" gaskets. The station shall include two isolation valves, one intake and one discharge; these isolation valves shall be Victaulic model 700 butterfly valves.

#### F. PRESSURE CONTROL VALVE

1. A pressure control valve shall be installed on the pump station as follows. The main body shall be a Bermad 400 series, size as required. The pilot operating system shall be rack mounted and include the following features: Netafim disc filter, fixed non-adjustable orifice, Clay-Val model CRD pressure reduction pilot valve, twin isolation ball valves, and twin stainless steel glycerin filled pressure gauges.

#### G. FLOW METER

1. A SeaMetrics model TX101 series brass insertion turbine flow meter with jewel bearings shall be properly installed according to the flow meter manufacturer's installation recommendations. This flow sensor shall be connected to a SeaMetrics digital flow meter model number FT420 indicating both real time flow rate and flow totalization. This flow meter shall provide a programmable pulse output to the Irrinet controller indicating flow rate.

#### H. CONCRETE PAD

1. The pump station shall be rested on a mm 4" thick, poured-in-place concrete pad. The station manufacturer shall deliver and set the station onto this pad, then fasten the station to the pad utilizing two 3/8" machine bolt anchors, entirely made of stainless steel, both anchor and bolt.

#### INSTALLATION

1. The irrigation CONTRACTOR shall connect the water supply and the irrigation mainline to the pump station. The irrigation CONTRACTOR shall also make all field wire connections to the splice box provided by the station manufacturer.

#### J. SURGE PROTECTION - GROUNDING

1. The "tray cable" shall be terminated on surge protection boards with manual ON/OFF switches for each of the output zones. These surge protection boards shall include for each zone MOVs,

choke coils, gas discharge tubes, and resistors both for outputs and inputs.

#### K. PRECIPITATION SENSING

1. A Texas Instruments tipping rain sensor shall be installed on the top of a 2" galvanized pole 10 feet high. This sensor shall provide a pulse output to the controller input 2.

#### L. POWER SUPPLY

1. The pump station control panel shall provide power to the irrigation controller through an isolation transformer. The controller shall receive this power through an ON/OFF toggle switch feeding a GFI circuit breaker feeding into a Leviton model 51020-wm surge protector.

#### M. OPERATING MANUAL - ON SITE TRAINING

1. The pump station manufacturer shall provide a bound operating manual specifically written for the pump station to the Parks and Recreation Dept, and will provide on site training for the designated maintenance personnel. This manual shall contain at minimum the following: explanation of station operation, control wire schematic, trouble-shooting guide, manufacturer's name, address, and telephone numbers, wire tightening torque values for supply connections, and all fuse sizes. The pump station manufacturer shall provide 4 hours of on site programming and training for the Motorola controller.

### **3.0 EXECUTION**

#### 3.01 GRADES

A. It shall be the responsibility of the CONTRACTOR to provide the final grading so the final level conforms to surrounding grades and is at the proper elevation with relation to walks, paving, drainage structures and other site conditions, and as identified in the general notes and specifications section of the planting plan or as directed by the City's Project Manager. Depth of irrigation system components shall be measured from the FINAL grade.

#### 3.02 PREPARATION

A. Layout of Mains and Laterals: Layout sprinkler main lines and perform line adjustments and site modification to lateral lines prior to excavation. Any conflicts shall be brought to the immediate attention of the project Landscape Architect or the City of Miami Beach for coordination of solution.

B. Valve Location: Locate valves to assure ease of access for maintenance and that no physical interference with other elements of the project exists. Align valves parallel to each other in manifold systems.

C. Furnish temporary support/adequate protection and maintenance from all underground and surface utilities, structures, drains, sewers, and other obstructions encountered in the progress of the utilities work.

D. Where the grade or alignment of proposed pipe is obstructed by existing utility structures such as conduit, ducts, pipe branch connections to sewer mains, main drains, water services, electrical lines, or other utilities, the CONTRACTOR shall notify the project Landscape Architect or the City of Miami Beach immediately to coordinate a solution.

#### 3.03 PIPE INSTALLATION

- A. The CONTRACTOR shall stake out the location of each run of pipe/valves prior to trenching.
- B. Excavation shall include all materials encountered in the excavation of trenches for pipe installation. The trench shall be of sufficient width and depth for installation of the pipe as indicated herein. The CONTRACTOR shall cause minimum disturbance to all existing conditions.
- C. Any pavement cut must have the prior consent of the Public Works Department of the City of Miami Beach. All irrigation lines and wire routed under pavement and sidewalks shall be sleeved inside polyvinyl chloride (PVC) Schedule 80 pipe unless noted otherwise on the plans or in these specifications. Size of all sleeves shall be able to accommodate proposed irrigation line AND any necessary electrical conduit with at least 1/2" excess free space.
- D. CONTRACTOR shall abandon any old irrigation components found below grade during the installation of the new irrigation system except those that are to remain in operation or as directed by the project Landscape Architect or City. The CONTRACTOR shall remove and dispose of old irrigation components. CONTRACTOR shall properly cap any old irrigation system mains and branch mains as encountered, except those scheduled for use with the new system.
- E. Trenches shall be made wide enough to allow a minimum of 6 inches between parallel pipelines. No lines shall be installed directly over another. Trenches for pipelines shall be made of sufficient depths to provide the minimum cover from finish grade. All main line pipes shall have a minimum cover of 18 inches from finish grade.
- F. The pipe and fittings shall be carefully inspected before installation of the trench. All rocks over 1 inch diameter and unsuitable bearing materials shall be removed from trench in strict accordance with the manufacturer's recommendations.
1. Solvent welded joints shall be made only on clean, dry, square cut, smooth pipe sections. Fittings shall be "dry" tested for proper size before solvent is applied. The assembly shall proceed in strict accordance with recommended procedures furnished by the manufacturer.
  2. Solvent welded pipe sections shall be "snaked" from side to side in the trench to prevent joint rupture due to thermal expansion and contraction.
  3. Pipe openings shall be temporarily plugged during construction to prevent entrance of foreign materials.
- C. Backfill shall be carefully placed to avoid pipe dislocation. Backfill material shall be free of rocks, stumps, roots and other unsuitable material. Backfill shall be placed in 6" lifts and shall be thoroughly compacted. Any backfill under pavement or sidewalks shall be compacted to 98% of maximum AASHTO T 180 density. The soil surface of backfilled trenches shall be manually settled so it is even with the surrounding soil surface grade.

### 3.04 SPRINKLER HEADS

- A. irrigation heads shall be installed per manufacturer's specifications and as provided in these technical specifications.
- B. Provide minimum 2" ring of clean sand around irrigation heads.
- C. All at-grade heads are to be connected to the supply line using 1/2" funny pipe, or approved equal flexible pipe, and adapters, unless otherwise specified or installation is to occur in a high traffic area, in which case PVC swing joints are to be used. Allow enough slack in the funny pipe to allow for proper horizontal adjustment of the heads after installation.

D. Risers extensions are to be utilized in shrub massings when conventional pop-up spray heads would provide inadequate coverage (shrub heights of 18" or greater). Risers shall be secured to Rebar (#4) with stainless steel hose clamps. Rebar to be secured into the ground to a depth that will not allow for willing movement. Risers in shrub massings shall be a minimum of 12" from the edge of the planter bed. All risers and rebar shall be painted with a dark green color, weatherproof outdoor paint (see this Section 2.14- Paint). Apply number of coats necessary to completely mask any original colors underneath.

### 3.05 CONTROL SYSTEM

NOTE - ALL WIRE SHALL BE INSTALLED IN UL APPROVED GRAY PVC CONDUIT, except under the following conditions:

1. When the conduit is directly exposed to ultra violet light, such as from the sun, then that exposed portion shall be rigid, threaded, heavy walled galvanized pipe (see Section 2.14-Paint).

2. When the use of PVC conduit is restricted by local, state or federal code, then the wire shall be installed in the type of conduit required by code. NO DIRECT BURIAL WIRE INSTALLATIONS SHALL BE ALLOWED. ALL SPLICES SHALL BE TWISTED AND INSULATED FROM MOISTURE, SHALL ONLY OCCUR IN VALVE BOXES, AND ARE TO ULTIMATELY BE RECORDED IN THE AS-BUILT DRAWINGS.

A. CONTRACTOR to install Control System including Pump System (if applicable), and all associated components, in strict accordance with the Manufacturer's Specifications and Instructions, and the Specifications contained herein.

B. Accessories:

1. Rain Sensor Device: The Rain Sensor shall be installed in a location that is free from overhead obstructions that may cause improper performance of the unit. It shall be installed in a location that is out of range of the sprinklers and away from trees or overhanging objects, which might affect accumulation of rain in the rain cup. Install as recommended by the manufacturers' specifications. Furthermore, where possible, Rain Sensor shall be installed in an inconspicuous location, away from the direct visibility of passersby, and out of reach of the general public. Coordinate exact location and installation of rain switch with project Landscape Architect or CMB Parks and Recreation Dept. for approval.

2. Backup Power Supplies: The back-up power supply for the Controller shall be installed at the same location as the Controller itself. Install as per manufacturer's specifications and specifications.

C. Training and Manuals: The CONTRACTOR, through the manufacturer, shall:

1. Provide proper training to the City of Miami Beach Parks and Recreation Dept. maintenance staff on the use, operation, and maintenance of the Control System.

2. Provide technical and general information sheets and Operating Manuals for all equipment.

3. All manuals, technical information sheets and general information sheets shall be in duplicate and separately bound.

D. The CONTRACTOR shall pay any start-up fees for factory technicians.

### 3.06 CONTROL WIRE INSTALLATION

A. Install control wires in UL approved PVC conduit at least 18" below finish grade and lay to the side of the main line. Provide a minimum 24 in. of looped wire slack at valves.

B. All underground splices shall be made at electric valves in valve boxes. Splices shall utilize Rainbird ST-03 UL Snap-Tite connectors and PT-S5 Sealer or 3M DBY direct burial splice kit. Splices should be designed into the system and minimize additional splices in the field. Show all splices locations on the as-built drawings.

### 3.07 AUTOMATIC VALVES

A. All automatic valves shall be installed in a rectangular valve box and shall be arranged for easy adjustment and removal. A union shall be installed on the downstream side. The flow adjustment feature of each valve shall be utilized to balance operating pressures throughout the system.

B. Master Control Valves shall be located downstream from the vacuum breaker in a valve box. The exact location is to be approved by the CMB Parks and Recreation Department.

C. A valve actuator shall be installed on each valve. Follow manufacturer recommendations for installation instructions.

### 3.08 BALL VALVES

A. Ball valves shall be installed at all paved crossings and before all automatic valves, in accordance with local codes, and arranged in valve box for easy adjustment and operation.

### 3.09 VACUUM BREAKER/BACKFLOW PREVENTER

A. CONTRACTOR to install as per plans and field-adjust as necessary, per project Landscape Architect's or CMB Parks and Recreation Department's approval. All vacuum breaker locations are to be approved by CMB Parks and Recreation before installation or any part thereof. All pipes installed above grade to be Schedule 40 galvanized steel and painted dark green (see this Section 2.14-Paint).

### 3.10 VALVE BOXES

A. Valve boxes shall be installed so that top is flush with surrounding final grade and shall be set on a minimum of six inches of pea gravel. CONTRACTOR shall insure proper percolation of water to subsurface.

### 3.11 TESTING AND INSPECTION

A. The CONTRACTOR shall notify the project Landscape Architect and the City of Miami Beach Parks and Recreation Department a minimum 72 hours in advance of testing, and shall coordinate as required.

B. Cleaning and pressure testing: Flush irrigation system with water to clear lines of foreign materials after system assembly is complete and prior to installation of the control valves. Cap and/or plug outlets and fill lines with water. Upon completion of the irrigation main and prior to the installation of any control valves, test the entire main or portion(s) of the main for proper operation. After completion of the flushing operation, test the main lines with 125 psi hydrostatic pressure for a minimum of 3 hours. No pressure loss shall be allowed over the duration of the test. Remove and/or replace any item or component of the system, which does not comply with the test and test the entire system again until satisfactory test results are obtained. All testing shall be done in the presence of the project Landscape Architect and the City of Miami Beach Irrigation Systems Supervisor. All joints, tees, elbows, caps and connections shall be left exposed during this test. Main line sections of solid unbroken pipe should be buried at intervals adequate to secure stabilization of pipe runs when pressurized, if necessary, repair any leaks and retest



entire assembly until achieving satisfactory result. Install sprinkler heads only after approval of test results by the project Landscape Architect and the City of Miami Beach Irrigation Systems Supervisor.

C. Final inspection shall be made when the complete system is in place, operable, and all repairs, additions, adjustments, and other work is complete. At such time, the CONTRACTOR shall adequately demonstrate the proper operation of the system, shall show the system's complete conformance with the specifications, and demonstrate that the irrigation system gives proper and adequate coverage of all landscaped areas. Final test should include two-minute timed intervals of water flow per zone, allowing a one- minute down time between each zone test. Acceptance by the project Landscape Architect and/or the City of Miami Beach in no way removes the CONTRACTOR of his responsibility to make further repairs, corrections and adjustments to eliminate any deficiencies which may later be discovered. Moreover, the CONTRACTOR shall fully honor the one-year warranty outlined herein.

### 3.12 RESTORATION OF EXISTING CONDITIONS

A. CONTRACTOR shall coordinate irrigation system installation, and any components thereof, with other project work to avoid disturbance of new work such as turf, planting beds, paved areas, etc. CONTRACTOR shall be responsible for and shall bear all costs of any replacement, repair, or restoration to existing conditions, new or otherwise, as a result of irrigation system installation before Final Acceptance. This shall include any and all irrigation work, initial or as a result of re-installation of unacceptable components, done prior to Final Acceptance of the system. Repairs shall include like materials and conditions, equal to those being replaced or repaired, and to the satisfaction of the City of Miami Beach.

### 3.13 ACCEPTANCE AND OPERATION BY OWNER

A. Upon completion of the work and acceptance by the Owner, the Contractor shall be responsible for the training of the Owner's Representative(s) in the operation of the system (provide minimum 48 hours written notice in advance of test). The Contractor shall furnish, in addition to the record drawings, GPS as-built and operational manuals, copies of all available specification sheets and catalog sheets to the Owner's personnel responsible for the operation of the irrigation system. The Contractor shall guarantee all parts and labor for a minimum period of one (1) year from date of acceptance.

B. Conditions for acceptability of work for start of maintenance by Owner issued by Owner or Owner's Representatives shall include but not be limited to:

1. Punch list items complete and approved by Owner or Owner's Representative.
2. Landscape irrigation system complete and in place.
3. Record drawings and GPS as-built complete.
4. Maintain installation and watering schedules until all conditions noted above have been completed.

### 3.14 CLEAN UP

A. Upon completion of all installation work. Contractor shall remove all leftover materials and equipment from the site in a safe and legal manner.

B. Contractor shall remove all debris resulting from work of this Section.

C. Contractor shall regrade, lightly compact, and replant around sprinkler heads where necessary to maintain proper vertical positioning in relation to established grade.

D. Contractor shall fill all depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas in accord with Drawings requirements.