

ADDENDUM A

32 84 23 SPRINKLER IRRIGATION SYSTEMS

Revised: September 23, 2013

~~32 84 23 – Sprinkler Irrigation Systems~~~~Revised May 2013~~***Description***

~~The DP shall provide a conceptual irrigation system layout as part of the schematic landscaping plan for budgetary inclusion and general coordination and approval by the ASU Grounds Department. The DP or their consultant should recognize and design irrigation systems based upon the premise of "xeriscape" landscaping design.~~

~~See Irrigation Master Plan for additional information.~~

Design Standard

~~A. — The contractor will be responsible for all blue staking before and during the project.~~

~~B. — A.N.S.I. Standards will be followed by contractors when applicable.~~

~~C. — Trenching~~

- ~~1. — Main lines shall be a minimum of 18 inches deep; auxiliary lines shall be 4 inches deeper than the bottom of the head being used.~~
- ~~2. — Lines bordering curbs, sidewalks or other hard surfaces shall be held 12 inches away to allow for maintenance and access to the lines.~~
- ~~3. — Sand shall be used in all trenches as bedding material for all PVC piping and also used as a covering for all piping. There shall be a minimum depth of 2 inches over the top of all piping.~~
- ~~4. — Pipe, drip tubing and control wire being routed under walks, roads or other hard surfaces shall be installed in schedule 40 sleeves.~~

~~D. — Pipe and Fittings~~

- ~~1. — All pipe for main and auxiliary (lateral) lines shall be schedule 40 (after valves). Ratings must be printed on the pipe.~~
- ~~2. — All fittings shall be schedule 40, pressure rated PVC fittings or better.~~
- ~~3. — Standard specifications for the piping materials shall include that the pipe shall be free from cracks, sunburn, discoloration, holes, foreign materials, blisters inside, bubbles, wrinkles and dents.~~
- ~~4. — If pipe is stored outside, it shall be protected from direct sunlight.~~

SECTION 3: TECHNICAL GUIDELINES

5. ~~NO galvanized or schedule 80 nipples, elbows or other fittings shall be used with any PVC pipe installations.~~
6. ~~ALL main lines shall be looped whenever possible so as to improve pressure and flow.~~
7. ~~PVC joints shall be primed and glued according to manufacturer's recommendations and wiped clean to avoid glue erosion.~~
8. ~~Glued joints shall cure for 24 hours before pressure is applied to the lines.~~
9. ~~ALL MAIN lines shall be first primed, then glued. All pipe 1 inch or larger shall be primed then glued. Glue used shall be Weld On 711 and primer shall be P-70.~~
10. ~~Warning Tape: Each line shall have warning tape provided directly above line, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs. **All main lines shall have tracer wires for efficient locating.**~~
 - a. ~~Provide Acid and alkali resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.~~
 - b. ~~Provide detectable warning tape with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep for non-metallic utility pipes, conduit or other underground services outside of building line.~~

E. ~~Control Wiring~~

1. ~~Wire size shall be UF-14 direct burial cable and shall be taped together in trench.~~
2. ~~Control wires must be buried a minimum of 12 inches below finish grade.~~
3. ~~Lawn, shrub, flower beds, desert and drip areas shall be valved separately and have separate stations on the time clock.~~
4. ~~Wiring between the sprinkler time clocks and the electric remote control valves shall be color coded and the neutrals shall always be white.~~
5. ~~All connections to remote control valves and all splices shall be made with "PIN TITE" connectors and RAINBIRD-PT-S5 sealer or pre-filled Pin Tite or approved equal.~~
6. ~~All wire runs shall have expansion loops at all corners.~~
7. ~~Electric lines shall be below pipe.~~

F. ~~Valves~~

1. ~~Electric remote control valves shall be Rainbird EFB-CP or Rainbird PES (PES should be of plastic design). All master valves shall be Rainbird EFB-CP and shall be of brass construction. Valves are to be labeled and valve boxes permanently marked.~~

SECTION 3: TECHNICAL GUIDELINES

- ~~2.— Valves should be located, when possible, in grass or gravel areas and five feet from sidewalks, curbs or other hardscapes. Avoid locating valves in areas where curbs and walks or other hardscapes come together.~~
- ~~3.— Where possible, valves shall be manifolded together, and each group of valves shall have a quick coupler or hose bib on the pressure side of the valve.~~
- ~~4.— Valves shall not be smaller than 1 inch.~~
- ~~5.— All valves shall be bedded on pea gravel and said pea gravel shall have a minimum depth of 6 inches.~~
- ~~6.— Isolation valves up to 3 inches shall be ball type and constructed of non-corrosive plastic.~~
- ~~7.— All valves shall be installed with unaltered manufacturer's Christy I.D. tags.~~
- ~~8.— Valve boxes shall be Christy (or equivalent) with locking bolts, tan color in gravel areas, and green in grass areas. Bow-Smiths shall be encased in a 6-inch, round irrigation 'box.'~~

~~G.— Clocks~~

- ~~1.— New Maxicom clocks shall be housed in Rainbird Rainsafe enclosures. Clocks shall be manufactured by RAINBIRD and shall be MAXI compatible. The only acceptable clock is an ESP-SAT-TW.~~
- ~~2.— Clocks shall be mounted OUTSIDE of buildings, tunnels, parking structures, equipment rooms, etc., for easy accessibility in emergencies.~~
- ~~3.— All grounding for electrical/lighting protection, surge protection, etc., shall be completed as per RAINBIRD specifications. All flow sensors, transmitters, and pulse decoders shall be installed using RAINBIRD specifications.~~
- ~~4.— The MAXI system has been installed on the ASU campus and the contractor shall make hard-wire hook up to the nearest cluster control unit, usually closest to the phone equipment room. ASU sprinkler crew will assist in this hook up.~~
- ~~5.— Flow sensors, transmitters and pulse decoders shall be required on all irrigation systems. (Minimum of one each per CCV).~~

~~H.— Sprinkler Heads~~

- ~~1.— All lawn heads shall be installed so that head-to-head coverage is accomplished regardless of wind and manufacturer's field tested specifications.~~
- ~~2.— Sprinkler heads for lawn areas less than 30 feet wide shall be RAINBIRD 1804 with VAN nozzles. Final placement of these heads shall be a minimum 4-6 inches from the edge of hard surfaces. The heads shall be on swing joints. The use of polypipe swing joints is acceptable BUT the same manufacturer shall make the polypipe and PVC fittings.~~
- ~~3.— Heads for narrow strips of lawn shall be RAINBIRD 1804 with appropriate nozzles. Heads for shrubs and flowers shall be RAINBIRD 1400/1500 or RICHDEL hand-adjustable bubblers.~~

4. ~~Heads for areas larger than 30 feet wide but having some trees shall be RAINBIRD 5000 or HUNTER PGM.~~
5. ~~Heads for very large open lawn areas shall be RAINBIRD FALCONS.~~
6. ~~Prevailing wind direction, location of mounds, and location of trees shall influence placement of all heads.~~
7. ~~All sprinkler heads shall be on swing joints.~~
8. ~~All lines shall be flushed before the sprinkler heads are installed.~~
9. ~~The sprinkler system shall be balanced and all heads plumbed to vertical before acceptance by ASU.~~

I. ~~Drip Irrigation~~

1. ~~The use of drip irrigation or 1/2 inch black poly tubing on any ASU project is discouraged, and should only be used where runoff of sprinkler water might be a problem due to extreme elevation/grades.~~
2. ~~Drip emitter type shall be limited to AGRIFIM SUPER FLO or BOW SMITH. Spaghetti lines shall be no longer than 8 feet long, and shall be 1/4 inch diameter only. Lines shall be buried until about 2 inches to plant and shall be staked. Bow Smiths shall be encased in a 6 inch, round irrigation 'box.'~~

J. ~~Backflow Prevention~~

1. ~~Reduced pressure backflow preventers shall be installed at all connections to water distribution mains.~~
2. ~~Reduced pressure backflow preventers shall be manufactured by FEBCO.~~
3. ~~By code, back flow preventers must be a minimum of 12 inches above grade.~~
4. ~~Immediately downstream of the back flow preventer shall be a water meter or MAXI compatible flow sensor of appropriate size. Flow sensors shall be 2 feet before and two feet after any joints to insure accurate readings.~~

K. ~~Drawings~~

1. ~~Prior to construction, preliminary design plans must be submitted to ASU Grounds for approval. At the completion of each project, accurate, reproducible, as built drawings will be provided to ASU Grounds Services. AutoCad compatible files (*.dwg, *.dxf) will be provided so the sprinkler system may be entered into the campus infrastructure data.~~

L. ~~Miscellaneous~~

- ~~1. When designing and installing new sprinkler systems at ASU, the following should be observed: 1) When placing sprinkler heads in lawn areas having sidewalks, driveways, etc., all the hard surfaced areas shall be lined with RAINBIRD 1804 sprinkler with van nozzles; rotary type sprinklers may be used to fill in the large open areas. 2) If the area being designed is an older part of campus with many mature, invaluable trees, care must be taken to ensure that no damage is done to the bark of trees due to water impact from sprinkler heads. 3) All designs must be submitted to the ASU Grounds Services (or the Landscape Architect Coordinator at the ASU at the Polytechnic campus) for approval before installation proceeds.~~

32 84 23 Sprinkler Irrigation Systems

Revised: September 2013

Description

This section applies to capital and renovation projects containing landscaped site areas with permanent irrigation. Work of this section covers conventional in-ground irrigation only and does not include irrigation by any other means. The determination of required irrigation work will be made during the project scope definition.

Section Standard

- A. In keeping with the University's sustainability goals, the irrigation system shall be designed for maximum efficiency and water-conservation.
- B. All projects containing turf, planting beds, raised planters or planter pots are required to be irrigated by an automatic irrigation system.
- C. Irrigation work may be based upon one or any combination of the following:
 - Restoration/repair of existing system.
 - Select component upgrade.
 - Construct/install new irrigation system.

The Owner shall review and approve the irrigation scope of work.
- D. Irrigation work includes, but is not limited to the following:
 1. Controller, either stand-alone or with data communication link to ASU FDM water management computer.
 2. Trenching, stockpiling, excavation and backfill.
 3. Water connections including meter, backflow prevention assemblies.
 4. Piping, valves, fittings, spray heads and drip assemblies, sensors, control wiring, communication cabling.
 5. Testing, inspection, and approval.
 6. Maintenance, warranting and replacement of any and all irrigation materials and/or products.
- E. Irrigation water supply shall be based on the following:
 1. New irrigation systems shall have a separately metered water supply and not be connected to a building water supply.
 2. Existing irrigation systems may be connected to a building water meter. In certain cases, the building connection may remain, but possibly will require the addition of a sub-meter and/or flow sensor.
 3. All water supply sources including non-potable water and metering requirements to be approved by the Owner.

SECTION 3: TECHNICAL GUIDELINES

- F. Work may also include keeping existing plant material watered and irrigation systems operational during construction. Manual watering and/or provision of a temporary water source may be required. Contractor will be responsible for all costs incurred with during temporary watering efforts. Any existing plant material damaged due to inadequate watering will be replaced and paid for by the Contractor.
- G. Irrigation design shall meet all applicable laws, codes, ordinances, rules and regulations. Conform to requirements of reference information listed below, except when more stringent requirements are specified.
1. American Society for Testing and Materials (ASTM) – Specifications and test methods.
 2. Underwriters Laboratories (UL) – UL wires and cables.
 3. National Fire Protection Agency (NFPA) – National Electrical Codes.
 4. American Society of Safety Engineers (ASSE) – Performance requirements for backflow preventers/assemblies.
- H. Irrigation design and installation shall follow the Arizona State University Irrigation Master Plan and Standard Irrigation Details in conjunction with these section standards.
- I. Refer to Construction Submittal Schedule and Checklist (Exhibit 1) for overall project sequencing, communications, submittals, requirements and procedures.
- J. Manufacturer cut sheets on all material components to be submitted for approval by Arizona State University prior to construction.
- K. Automatic Controller:
1. Central Control System
 - a. Tempe, Polytechnic, Lake Havasu Campus:
 - i. Controller: Calsense, model - ET2000e
 - ii. Cabinet: SSE-R (stainless steel pedestal w/radio antenna)
 - iii. Number of Stations: per design
 - iv. Data Communication: EN (wired Ethernet)
 - v. Flow Monitoring: FM-B series
 - vi. Radio Remote Board: RRe
 - vii. Weather Sensors: per design
 - viii. Multiple controllers and/or multiple points-of-connection may require additional hardware, communications or software specifications
 - b. West Campus:
 - i. Controller: Rainbird, model – Maxicom² ESP-SAT2
 - ii. Cluster Control Units: Rainbird, model – CCU6 or CCU28 (per design)
 - iii. Cabinet: Stainless steel wall or pedestal mount (per design)
 - iv. Number of Stations: per design
 - v. Data Communication:
 - a) Computer to CCU – per design
 - b) CCU to satellite – two wire path
 - vi. Flow Monitoring: FS series
 - vii. Radio Remote: Freedom for Maxicom² (if specified)
 - viii. Weather sensors: per design
 - ix. Multiple controllers and/or multiple points-of-connection may require additional hardware, communications or software specifications
 2. Stand-Alone System
 - a. Downtown Phoenix Campus and other specified locations
 - i. Controller: Hunter Industries, model – I-Core[®]
 - ii. Cabinet: Stainless steel wall or pedestal mount

SECTION 3: TECHNICAL GUIDELINES

- iii. Number of stations: per design
 - iv. Radio remote: ICR
 - v. Weather Sensor(s): Rain-Clik[®], Wind-Clik[®] (for turf applications)
- L. Backflow Preventer – Febco 825YA
- M. Master Control Valve – Rainbird PES
- N. Flow Meter – Calsense or Rainbird (match controller make)
- O. Electric Control Valves – Rainbird EFB-CP or PES. No valves smaller than 1 inch.
- P. General piping:
- 1. Pressure Supply Lines (downstream of backflow prevention units) – Schedule 40 PVC, Solvent Weld Belled End for 2-1/2” or smaller, and rubber-ring joint for 3” and larger with ductile iron fittings.
 - 2. All mainlines shall be looped whenever possible so as to improve pressure and flow.
 - 3. Non-pressure lines shall be Schedule 40 PVC, Solvent Weld Belled End.
 - 4. All piping for non-potable water systems shall be purple colored or wrapped with reclaimed “sock” or reclaimed marking tape, and main lines shall have detectable reclaimed marking tape in trench 12” above top of pipe continuously.
 - 5. Drip Piping – Schedule 40 PVC, Solvent Weld unless otherwise specified on plans.
 - 6. Emitter Tubing – ¼” I.D. vinyl Pepco or approved equal.
- Q. Low Pressure / Volume Systems:
- 1. Emitters shall be Agrifim Super-Flo or Bowsmith.
 - 2. Adjustable bubbler shall be Irritrol 533.
 - 3. Drip Piping – manufactured of polyvinyl chloride compound conforming to ASTM D2241 and ASTM D1784, Type 1, Grade 1.
 - 4. Fittings – Schedule 40 PVC, or as recommended by piping manufacturer.
 - 5. Drip Valve Assembly –
 - a. Wye Strainer – Plastic / Fiberglass construction with 150 mesh nylon screen and blow out assembly. Rainbird
 - b. Control Valve – 2-way, solenoid pilot operated type made of synthetic, non-corrosive material; diaphragm-activated and slow closing. Include freely pivoted seat seal; retained (mounted) without attachment to diaphragm. Rainbird EFB-CP or PES.
 - c. Pressure Regulator – Plastic / Fiberglass construction, preset type with pressure setting per drawings.
- R. Quick Coupling Valves:
- 1. Brass two-piece body designed for working pressure of 150 psi, operable with quick coupler. Equip quick coupler with locking rubber cover (purple for non-potable water if specified).
- S. Valve Boxes:
- 1. Valve box color to be tan if located in areas of decomposed granite and green if in turf. All box covers for non-potable water systems shall be purple colored, and marked for reclaimed water.
 - 2. Drip Line Blow-out Stubs, and Wire Stub Box – Carson #910-12.
 - 3. 1-inch through 2-inch Control Valves – Carson #1419-13B.
 - 4. Drip Valve Assemblies – Carson #1419-13B.
 - 5. Control Wiring Splices – Carson #910-12.
 - 6. Main Line Ball Valves – Carson #910-12.
 - 7. Air-Relief Valves – Carson #1419-13B.

SECTION 3: TECHNICAL GUIDELINES

8. Manual Drain Valves – Carson #1419-13B.
 9. Emitter Box – NDS 107BC.
- T. Low Voltage Electrical Control Wiring:
1. Electrical Control Wire – AWG UF UL approved No. 14 gauge direct-burial copper wire for all control wires, and No. 14 gauge direct-burial copper wire for all common wires.
 2. Wire Colors:
 3. Control Wires – Red.
 4. Common Wires – White.
 5. Master Valve Wires – Blue and White.
 6. Flow Sensor Wires – Black and Black.
 7. Future Wires – Green, labeled at termination.
 8. If multiple controllers are utilized, and wire paths of different controllers cross each other, both common and control wires from each controller shall be different colors.
 9. Wire connections for all valve and solenoid locations shall be UL 486D approved direct-bury wire connectors for wet/damp locations, as manufactured by Suresplice, Rainbird DB Connector, or approved equal.
- U. Sprinkler Heads:
1. Pop-Up – Rainbird 1804-SAM-PRS
 2. Rotors – Areas larger than 30' wide use Rainbird 5000 or Rainbird Falcon.
- V. The Contractor is responsible for all blue staking before and during the project. Request horizontal and vertical location staking from the proper utility companies (including Arizona State University Facilities Management where applicable) for all underground utilities. Take whatever precautions necessary to protect these underground lines from damage. In the event damage does occur, all damages shall be repaired by Contractor unless other arrangements have been made with the ASU Project Manager.
- W. Preserve and protect all existing trees, plants, monuments, structures, and paved areas from damage due to Work in this Section. Any damage shall be completely repaired or replaced to the satisfaction of the Owner. All costs for repair and/or replacement shall be paid for by the Contractor. Restore disturbed areas to original condition, or as approved by the ASU Project Manager.
- X. Irrigation Piping and Wiring Installation:
1. Install sleeving under all asphalt paving and concrete walks, prior to the installation of concrete or paving operations, to accommodate piping and wiring.
 2. Boring will be permitted only where pipe must pass under obstruction(s) which cannot be removed, and must be approved by ASU Project Manager if not specifically indicated on construction drawings.
 3. All trenching or other Work under limb spread of any and all low branching trees and plant material shall be done by hand or by other methods so as to prevent damage to limbs or branches. Prior to commencement of work, Contractor shall obtain approval for trenching methods from the Project Design Professional.
 4. Line clearance – Provide not less than 6 inches of clearance between each line, and not less than 12 inches of clearance between lines of other trades.
 5. Pipe and Wire Depth:
 - a. Pressure Supply Piping – 24 inches from top of pipe (30 inches where 6" and larger pipe is on project).
 - b. Non-pressure piping – 12 inches from top of pipe.
 - c. Control Wiring – Side and bottom of pressure supply line.
 - d. Drip Piping – 12 inches from top of pipe.
 - e. Emitter tubing – 12 inches from top of pipe (non-slope plantings). 4 inches from the top of

SECTION 3: TECHNICAL GUIDELINES

- pipe (slopes 2:1 of greater).
6. When communication cable is not located in the mainline trench it shall be installed one (1) inch DB120 PVC conduit.
 7. Provide detectable warning tape for all non-metallic irrigation mainline, utility pipes, conduit or other underground services outside of building line.
- Y. Contractor to provide field data controller information for each automatic controller installed. Refer to Exhibit 5, Field Data Controller Chart.
1. Field data controller chart shall be completed and approved by Project Design Professional prior to Substantial Completion walk-through.
 2. Approved controller chart to be attached inside of each controller cabinet. Provide second copy to ASU FDM Grounds Representative for central computer programming purposes.
- Z. Contractor to provide Owners Operations and Maintenance Manual to ASU Project Manager upon acceptance of Substantial Completion. Documentation to include the following:
1. Index sheet stating project name, and listing Contractor name, address, phone number, and contact person. Include same information for Primary Sub-Contractors.
 2. List of major suppliers indicating contact information, materials and/or equipment supplied.
 3. Certificate of inspections (as applicable).
 4. Manufacturer cut sheets for all material components of irrigation system. Highlight or circle specific models or items.
 5. Warranty documents for all materials, equipment and systems used.
 6. Letter of Warranty/Guarantee of workmanship.
 7. List of spare parts, extra materials and tools supplied to the Owner.
 8. Operations instructions including complete description of operations, control diagrams, instructions books for all irrigation components.
 9. Maintenance instructions including a written list of required and recommended maintenance for all irrigation components.
 10. Contractor to furnish the following maintenance tools to the ASU Project Manager upon acceptance of Substantial Completion:
 11. 2 sets of special tools required for moving, disassembling, and adjusting each type of sprinkler head and valve supplied on this project.
 12. 2 keys for each automatic controller.
 13. 3 quick coupler keys and matching hose swivels.
- AA. Contractor to provide digital irrigation As-Built drawings in AutoCAD format (*.dwg,*.dxf). The files will be entered into the campus infrastructure data base. Contractor shall submit the As-Built information to ASU Project Manager and Project Design Professional upon project Final Acceptance.
- BB. The maintenance period for all irrigation work shall be based on the following:
- Restoration/repair of an existing system – to date of Substantial Completion or as directed by Project Manager.
 - Select component upgrade – to date of Substantial Completion or as directed by Project Manager.
 - Construct/install new irrigation system – 90 days from date of Substantial Completion
- CC. For new installations, Contractor shall be responsible for the operation of the irrigation system during the 90 day maintenance period.
1. For central control systems, the system shall be operated in 'stand-alone' mode for 60 days. For the last 30 days of the maintenance period, the system shall be switched to 'central control' and operated entirely from the ASU FDM water management computer. The Contractor shall work with ASU FDM Grounds staff to jointly operate the system during this time.
 2. For stand-alone systems the Contractor shall be responsible for operation during the entire 90 day

SECTION 3: TECHNICAL GUIDELINES

maintenance period.

3. Within the last 30 days of the maintenance period, the Contractor shall familiarize ASU FDM Grounds staff with the setup and operation of the irrigation system components including, but not limited to the point-of-connection, automatic controller, valves, sprinklers, quick-couplers, sensors, hand-held remote controls, run-times, field adjustments and fine-tuning requirements.

DD. Contractor shall warrant materials against defects for a period of one year from the date of Substantial Completion. Contractor shall guarantee workmanship for similar period. Contractor shall be responsible for coordinating material warranty items with the supplier, manufacturer and/or distributor as required. Settling of backfilled trenches which may occur during guaranty period shall be repaired by Contractor at no expense to the Owner, including complete restoration of damaged property.

CONSTRUCTION SUBMITTAL SCHEDULE & CHECKLIST

Landscape Irrigation	ITEM / TASK	BY	TO	TIMEFRAME	QUANTITY / TYPE	
CONSTRUCTION STARTUP						
✓	✓	Agreement signed	Owner, Contractor			
✓	✓	Plans to Contractor for as-built recording	Project Design Professional	Contractor	Within 2 weeks of date of agreement	1 copy
✓	✓	Manufacturers literature and instructions (if non-standard equipment specified)	Contractor	ASU Project Manager, Project Design Professional	Within 2 weeks of date of agreement	1 binder, 3 copies each cut sheet and instructions
✓	✓	Proposed construction schedule	Contractor	ASU Project Manager, Project Design Professional	Within 2 weeks of date of agreement	3 copies
✓	✓	Completed construction and material delivery schedule	Contractor	ASU Project Manager, Project Design Professional	Within 2 weeks of date of agreement	3 copies
✓	✓	Material sample submittals (if applicable)	Contractor	ASU Project Manager, Project Design Professional	As required	As required
✓	✓	Notice of sample approval	Project Design Professional	Contractor	Within 1 week from date of specification	1 copy
✓	✓	Shop Drawings	Contractor	ASU Project Manager, Project Design Professional	As required by specifications	3 prints each drawing for review
✓		Approved shop drawings	Project Design Professional	Contractor	Within 1 week from date of submission	Copies to manufacturer, subcontractors, other as required
✓		Seed mixture list and procurement confirmation list	Contractor	Project Design Professional	Within 2 weeks of date of agreement	1 copy
DURING CONSTRUCTION						
✓	✓	Construction progress meetings:			Weekly/bi-monthly	
✓	✓	Task list (previous/current/next week)	Contractor	ASU Project Manager, Project Design Professional	Weekly/bi-monthly	Minimum 3 copies
✓		Inventory control sheets	Contractor	ASU Project Manager, Project Design Professional	Construction Submittal Schedule and Checklist	Minimum 3 copies
✓		On-site field mock-ups	Contractor	ASU Project Manager, Project Design Professional	1 week prior to installation	As specified
✓	✓	Updated as-built landscape, hardscape, irrigation drawings	Contractor	Contractors job trailer	Bi-monthly	Annotated print
✓		Seed Certificates	Contractor	ASU Project Manager, Project Design Professional	2 weeks prior to installation	1 copy
✓	✓	Structural inspection	Contractor	ASU Project Manager, Project Design Professional, ASU Inspector	As required	
✓	✓	Electrical system inspection	Contractor	ASU Project Manager, Project Design Professional, ASU Inspector	As required	
✓	✓	Mechanical system inspection	Contractor	ASU Project Manager, Project Design Professional, ASU Inspector	As required	
✓	✓	Certificate of inspections	Contractor	ASU Project Manager, Project Design Professional	Within 1 week of inspection	2 copies
POST CONSTRUCTION						
Substantial Completion¹						
✓	✓	Checklist for landscape, irrigation substantial completion	Contractor	ASU Project Manager	Prior to walk-throughs for landscape and irrigation substantial completions	2 copies
	✓	Field Data Controller Chart	Contractor	FDM Grounds Representative	Prior to walk-throughs for landscape and irrigation substantial completions	2 copies
✓	✓	Verification of substantial completion checklist items	Contractor, ASU Project Manager		Prior to walk-throughs for landscape and irrigation substantial completions	
✓	✓	Updated landscape, irrigation as-built drawings	Contractor	Project Design Professional	At walk-throughs for landscape, and irrigation substantial completion	1 copy full size print
✓	✓	Walk-through for landscape, irrigation substantial completion	Contractor, ASU Project Manager, Project Design Professional, OUA Representative, FDM Grounds Representative		As scheduled by ASU Project Manager. Start of Maintenance and Guarantee Periods	
✓	✓	Notice of substantial completion - landscape, irrigation	ASU Project Manager	Contractor, Project Design Professional	Within 1 week of walk-throughs for landscape, and irrigation substantial completion	3 copies
✓	✓	Punch list for landscape, irrigation substantial completion	Project Design Professional	Contractor, ASU Project Manager, OUA Representative, FDM Grounds Representative	Within 1 week of walk-through for landscape substantial completion	4 copies
Final Acceptance						
✓	✓	Verification of landscape, irrigation substantial completion punch lists	Contractor, ASU Project Manager, Project Design Professional, OUA Representative, FDM Grounds Representative		Within 30 days of walk-through for substantial completion	
✓	✓	Notice of final acceptance - landscape and irrigation	ASU Project Manager	Contractor, Project Design Professional	Within 1 week of substantial completion verification	2 copies
✓	✓	Owner's Operations and Maintenance manual	Contractor	ASU Project Manager	Within 1 week of substantial completion verification	2 binders
	✓	Spare parts and maintenance materials, tools	Contractor	ASU Project Manager	At walk-throughs for landscape, and irrigation substantial completion	1 set
✓	✓	Owner Training	Contractor	ASU Project Manager, FDM Grounds Representative	Within the last 30 days of the maintenance period	
✓	✓	Final as-built landscape, irrigation drawings	Contractor	ASU Project Manager, Project Design Professional	Within 1 week of substantial completion verification	1 copy digital file; 2 copies full-size prints
Guarantee Period						
✓	✓	Guarantee period walk-through - shrubs/groundcover	Contractor, ASU Project Manager, Project Design Professional, FDM Grounds Representative		90 days from the start of the guarantee period or as determined by ASU Project Manager	
✓	✓	Punch list from walk-through - shrubs/groundcover	Project Design Professional	Contractor, ASU Project Manager, FDM Grounds Representative	Within 1 week of guarantee period walk-through	3 copies
✓	✓	Verification of walk-through punch list - shrubs/groundcover	Contractor, Project Design Professional, OUA Representative, FDM Grounds Representative		Within 1 week of guarantee period walk-through	
✓	✓	Guarantee period walk-through - hardscape, trees, irrigation	Contractor, ASU Project Manager, Project Design Professional, FDM Grounds Representative		1 year from the start of the guarantee period or as determined by ASU Project Manager	
✓	✓	Punch list from walk-through - trees, irrigation	Project Design Professional	Contractor, ASU Project Manager, FDM Grounds Representative	Within 1 week of guarantee period walk-through	3 copies
✓	✓	Verification of walk-through punch list - hardscape, trees, irrigation	Contractor, Project Design Professional, FDM Grounds Representative		Within 1 week of guarantee period walk-through	
✓	✓	Notice of guarantee period completion	ASU Project Manager	Contractor, Project Design Professional, FDM Grounds Representative	Within 1 week of guarantee period walk-through. End of the guarantee period or as determined by the ASU Project Manager	
Notes						
Guarantee Period - Nursery Trees: 1 Year / Salvage Trees: 1 Year / Container Plants: 90 Days / Turf: 1 Year / Owner Supplied Salvage Plants: TBD / Hardscape: 1 Year / Irrigation: 1 Year						

CHECKLIST FOR LANDSCAPE SUBSTANTIAL COMPLETION

1. The following items will be reviewed by the Owner during the Substantial Completion Walk-Through.
2. The Contractor shall insure that each item has been addressed and is in satisfactory condition at the time of Substantial Completion Walk-Through.
3. The Contractor shall review each item and check the box or note as N/A if not applicable to the project.
4. Submit completed checklist to Project Design Professional for verification **PRIOR TO** arranging for the Substantial Completion Walk-Through.
5. This guideline is for the Contractor's use and does not relieve the Contractor from the contractual obligations or scope of work as defined by the specifications and drawings.

PROJECT/PHASE: _____

- Grades (transition to natural areas, proper level at back of curb, sidewalk or hardscape edges, trench settlement, wash definition, restoration at path or trail interface, restoration from work by others)
- Drainage problems eliminated (ponding, erosion), maintain existing drainage routes, sub-surface drainage systems installed and tested
- Hardscape and/or walkway construction complete: cross slopes, surface drainage, scoring/paving patterns, color, finishes and textures, cracking and/or settlement corrected
- Walls, fencing, columns installed per plan and manufacturer's directions, plumb and level
- Utility equipment installation and coordination, painted per specifications
- Boulder installation (scars treated with Eonite or approved alternate)
- Trees and specimen plants oriented correctly
- Plumb on Trees, Saguaros, Ocotillos
- Tree staking completed per detail, nursery stakes removed
- Tree tags on nursery material (remove upon verification)
- Turf subgrade preparation with correct fine grading, compaction and soil amendments
- Sod and/or stolon installation, condition, edging installed, patching (seed/sod)
- Plants located per plan and installed per details (plant wells, offsets, spacing/density and setbacks)
- Annual beds installed per plan (correct soil mixture, plant spacing)
- Palms matched height and appearance, installed plumb, tied one time, allowed to break tie upon rooting, fronds trimmed as required
- Pots installed and planted per plan, sealed interior, correct soil mixture, irrigation and drainage
- Plant material in vigorous, healthy condition
- Dead, stressed or missing plants replaced

Exhibit 2

- Prune out dead wood, broken branch stubs, correct clearances at walkways, site visibility zones and seating areas
- Soil rings installed for Trees, Palms in turf
- Filter fabric installed where specified, no exposed edges
- Decomposed granite areas installed (pre-emergent applications), raked smooth
- Desert cobble installed, blended at disturbance line, match existing patterns and densities
- Fixed site furnishings installed per manufacturer's directions
- Movable site furniture placed or provided to Owner
- Removable bollard keyed lock converted to A2-C lock system, keys provided to Owner
- Collapsible bollard key wrenches provided to Owner
- Excess granular, cobble, concrete spoils, irrigation materials, litter, and trash removal
- No tape, string, wire, etc. left on plant material
- As-Built landscape plans (accuracy, tag number, type – box, spade (for salvage material))
- Weed control (pre-emergent application) per specifications
- Seeding application (post substantial completion walk-through) Date: _____

CHECKLIST SUBMITTED BY:

General Contractor: _____ Date: _____

Landscape Contractor: _____ Date: _____

Project Design Professional: _____ Date: _____

CHECKLIST FOR IRRIGATION SUBSTANTIAL COMPLETION

1. The following items will be reviewed by the Owner during the Substantial Completion Walk-Through.
2. The Contractor shall insure that each item has been addressed and is in satisfactory condition at the time of Substantial Completion Walk-Through.
3. The Contractor shall review each item and check the box or note as N/A if not applicable to the project.
4. Submit completed checklist to Project Design Professional for verification **PRIOR TO** arranging for the Substantial Completion Walk-Through.
5. This guideline is for the Contractors use and does not relieve the Contractor from the contractual obligations or scope of work as defined by the specifications and drawings.

PROJECT/PHASE: _____

- Dedicated Point of Connection
 - Backflow Preventer installed
 - BFP testing complete
 - Backflow Preventer metal security enclosure installed with keyed lock
 - Master Valve installed and wired to Controller
 - Flow Sensor installed and wired to Controller
- Valve Box Assemblies
 - Wiring coiled
 - Pin-Tite Connectors installed
 - Correct wire colors, labeled
 - Valve Box installed with gravel and filter fabric per detail
 - All Components installed (Ball Valve, Wye Strainer, Pressure Regulator, Union)
 - Jumbo Valve Box w/embossed valve number on lid
 - Christy Tag installed inside valve box with valve number
 - Security Bolt installed on locking valve box lid
- Emitters / Bubblers
 - Installed per detail, quantity per plant and plant size
 - Emitter tubing buried 8" minimum below finish grade
 - Daylight emitter tubing vertical, 1" maximum above finish grade
 - Uphill of planting in sloping condition
 - Distribution tubing length 6'-0" maximum to plant served
 - Drip irrigation in Annual Beds, Planter Pots

Exhibit 3

- Adjustable bubblers and inspection tubes at palms installed per detail
- All emitters and/or bubblers operational
- Sprinklers
 - Correct nozzles installed
 - Full head-to-head coverage
 - Adjust sprinklers to eliminate over-spray of walls, structures and adjacent hardscape/walks
 - Flow control of valve throttled to eliminate fogging
 - Heads flush with grade
 - Heads set 6" away from edge of hardscape, walks
- Flush caps installed at end of each poly-line run
- Quick couplers installed
- Check valves installed when elevation differential exceeds 10'
- Automatic Controller
 - Power supplied with separate circuit and breaker, identified at panel
 - Grounding installed
 - Certification of satellite controller assembly by:

Name: _____ Company: _____ Date: _____
- Communication cable splice per details
- Controller Cabinet keys provided to Owner
- Satellite Controller on-line and communicating with FDM Grounds central computer
- Completed and approved Field Data Controller Chart
- Hand-held remote operational and provided to Owner

CHECKLIST SUBMITTED BY:

General Contractor: _____ Date: _____

Landscape Contractor: _____ Date: _____

Project Design Professional: _____ Date: _____

FINAL ACCEPTANCE SHEET

1. The ASU Project Manager will be responsible for coordinating walk-throughs, recording dates and securing approval signatures from all reviewers.
2. The Contractor shall insure that the date for seed application has been recorded.

PROJECT/PHASE: _____

- A. Landscape, Irrigation Walk-through for Substantial Completion** **Date:** _____
Start of 90 Day Maintenance and 1 Year Guarantee Period

- B. Seeding application, if applicable (by Contractor) **Date:** _____

- C. Verification of Landscape and Irrigation Punch Lists;
Notice of Landscape, Irrigation Final Acceptance** **Date:** _____
(Within 30 days of date of Substantial Completion)

- D. Final hardscape, landscape and irrigation as-built information accepted **Date:** _____

- E. Owner Training **Date:** _____
(Within 30 days of end of maintenance period)

- F. End of 90 Day Maintenance Period** **Date:** _____

- G. Guarantee Period Walk-through – Shrubs, Groundcover** **Date:** _____
(90 Days from Date of Substantial Completion)

- H. Verification of walkthrough punch list – Shrubs, Groundcover **Date:** _____

- I. Guarantee Period Walk-through – Trees, Irrigation** **Date:** _____
(1 Year from Date of Substantial Completion)

- J. Verification of walkthrough punch list – Trees, Irrigation **Date:** _____

- K. Notice of Guarantee Period Completion** **Date:** _____

PROJECT REVIEWED AND ACCEPTED BY:

ASU Project Manager: _____

Project Design Professional: _____

OUA Representative: _____

FDM Grounds Representative: _____

General Contractor: _____

Landscape Contractor: _____

FIELD DATA CONTROLLER CHART

Date _____ Controller No. _____ CCU No. _____ Sensor Type 1) _____
 Location _____ Flow Manager Flow Zone _____ 2) _____
 Page _____ of _____ Controller Size _____ Flow Watch Flow Zone _____ 3) _____
 CCU Channel(s) _____

Station No.	Valve Size	Head Type	Nozzle # w/GPM Flow	Precipitation (in./hr.)	Arc	Station Flow (GPM)	Station Description: Turf/Annual Sprinkler (head type); Drip (shrub, tree); Bubbler	Miscellaneous Notes
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FIELD DATA CONTROLLER CHART

Date _____ Controller No. _____ CCU No. _____ Sensor Type 1) _____
 Location _____ Flow Manager Flow Zone _____ 2) _____
 Page _____ of _____ Controller Size _____ Flow Watch Flow Zone _____ 3) _____
 CCU Channel(s) _____

Station No.	Valve Size	Head Type	Nozzle # w/GPM Flow	Precipitation (in./hr.)	Arc	Station Flow (GPM)	Station Description: Turf/Annual Sprinkler (head type); Drip (shrub, tree); Bubbler	Miscellaneous Notes
25								
26								
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41								
42								
43								
44								
45								
46								
47								
48								

**LANDSCAPE & IRRIGATION
OWNERS OPERATION AND MAINTENANCE MANUAL**

TABLE OF CONTENTS

1. List of Subcontractors
2. List of Materials, Major Suppliers
3. Affidavit on Asbestos Free Materials
4. Seed Certifications
5. Certificate of Inspections
 - 5.1. Back Flow Preventer
 - 5.2. Service Entrance Section
6. Warranty Information
 - 6.1. Irrigation Controller
 - 6.2. Cluster Control Unit
 - 6.3. Valves
 - 6.4. Pop-Up and Rotor Sprinklers
 - 6.5. Flow Sensors and Transmitters
 - 6.6. Back Flow Preventer
 - 6.7. Wye Strainer
 - 6.8. Pressure Regulators
 - 6.9. Quick-Couplers
 - 6.10. Emitters
 - 6.11. Service Entrance Section
 - 6.12. Low-Voltage Transformers
 - 6.13. Lighting Fixtures
 - 6.14. Plant Material
7. Letter of Warranty | Guarantee of Workmanship
8. Field Satellite Station Assignment Schedule
9. List of Spare Parts, Extra Materials and Tools
10. Maintenance Instructions
11. Operating Instructions