SPR DESIGN STANDARD 32 80 00

IRRIGATION SYSTEMS DESIGN

1.01 GENERAL

A. Intent of Standard: This Design Standard provides criteria for determining the requirements for irrigation systems and irrigation control systems, as well as guidelines for developing their design and construction specifications, all in accordance with industry-accepted operation and maintenance practices and standards observed by the Seattle Department of Parks and Recreation (SPR). It also delineates the responsibilities of the Designer in developing the design and overseeing its construction.

B. Design Mission: SPR's goal is to achieve sustainable, well-maintained park facilities with attractive and healthy landscapes. Important objectives include water conservation, reduced maintenance needs, reduced chemical use, erosion control, and the health, safety and welfare of the general public.

C. Designer Qualifications: Individuals participating in the design of irrigation systems shall either have or be under the direct supervision of an individual who has the following qualifications and credentials:

- Registered Landscape Architect, Professionally-Licensed Civil Engineer, or Certified Irrigation Designer (CID) with minimum 5 years of experience in design of commercial irrigation systems;
- If Maxicom is incorporated in the design, Certified Landscape Irrigation Auditor (CLIA).

D. Design Product: The design product shall include the following elements, as applicable in the Design contract:

1. **Irrigation Concept Plan:** A complete description of irrigation measures proposed by the designer based on the landscaping plan and the criteria provided herein, consistent with industry-accepted practices, and in accordance with the scope of work established by the Designer's contract or agreement with SPR.
2. **Maintenance & Utility Impact Report:** The Irrigation Concept Plan shall be accompanied by a Maintenance & Utility Impact Report that quantifies expectations in terms of water usage, and operations/maintenance costs for the proposed irrigation concept(s). This report shall be prepared using the format and applicable labor and utility rates provided by SPR at the request of the Designer, such request being made at the time the report is prepared.
3. **Maxicom™ Cost/Benefit Analysis:** This analysis shall be prepared in accordance with Section 1.03.C.1, except in those instances where:
   a. The irrigation system is for an athletic field;
   b. The irrigation system is for temporary plant establishment (see Section 1.03.B);

c. Maxicom™ is excluded in accordance with Section 1.03.C.2; or

d. This requirement is waived by the Park Engineer.

4. **Drawing Set:** A complete set of drawings showing all site preparation, demolition, installation, system components, and instructions necessary for successful construction of the approved Irrigation Plan. SPR Standard Details as listed in Section 1.02 shall be utilized to the extent possible.

5. **Final Technical Specifications:** The Designer shall complete the template technical specification 02810 Irrigation Systems to the extent required to properly coordinate with the approved Irrigation Plan and the design drawings, as needed for its inclusion as part of the final Construction Contract Documents.

   Text within the template specification that is intended to be edited by the Designer is identified by use of highlighted red bold font. Such items usually entail making choices about what type of equipment is needed for the conditions and requirements particular to the subject project. Other than appropriate finalization of these specially-identified areas in the template specification, the Designer shall not make any changes (add, delete, or alter) to Section 02810 unless specifically approved by the Park Engineer, through the project's technical review process.

6. **Maxicom™ Commissioning:** When Maxicom™ is incorporated in the irrigation system design, the Designer shall be responsible for working directly with the Parks Irrigation Coordinator as needed to coordinate all commissioning activities and ensure that they are successfully carried out prior to substantial completion of the irrigation system construction. The commissioning activities shall confirm that the system is operating at the optimum level anticipated by the design, and that the controlling software has been correctly and completely programmed.

7. **As-Built Drawings:** The Designer shall submit a complete as-built drawing set within 10 calendar days of substantial completion, developed in accordance with the process outlined below. The Designer shall verify that the Construction Contract Project Manual is completed in a manner that contractually obligates the Contractor to follow this process.

   a. The Contractor shall keep a current working set of drawings with all as-built changes or actual conditions as work proceeds, to be submitted to Designer at substantial completion of irrigation system installation.

   b. The Contractor shall arrange for surveying services to locate all piping and equipment with trenches open as system is constructed, with survey data properly recorded into field books.

   c. The Contractor shall perform all required tests, audits, etc. with adequate notice as detailed in the specifications.

   d. The Designer shall interpret and incorporate field information into a scaled AutoCAD drawing (utilizing same scale as contract documents) and provide to the Park Engineer prior to final acceptance of project.

   e. The Designer shall prepare Mylar record drawings ("as-builts") with contractor's and SPR surveyor's information included, and CD(s) containing electronic AutoCAD

drawings with that same information, to be submitted to the Owner along with all other required information, manuals, etc.

1.02 GOVERNING DESIGN STANDARDS

A. Accepted Standards: All materials, components, hardware, fixtures, and any other items associated with the design shall be in accordance with approved standards, details, and technical specifications provided in the SPR documents referenced below. The Designer shall demonstrate to the Engineer that all specifications relevant to the project have been included into the Construction Contract Documents.

1. **SPR's Technical Specification 02810 - Irrigation Systems**.

2. **SPR's Series 32 82 thru 85 Standard Details:** All Standard Details that are part of the project Scope of Work shall be used as provided by SPR (without alterations) and shall be included in the Contract Documents.

B. Exceptions: In general, all aspects of the design shall be in accordance with the accepted standards cited in Section 1.02.A. However, the Designer has the added responsibility to expand upon these documents as required, dictated and/or warranted by the approved Irrigation Plan and/or considerations that include, but are not limited to, the following:

- As directed by the Park Engineer as a result of SPR's Technical Review process;
- Special conditions pertaining to the project and/or site;
- Environmental considerations and constraints;
- The integrity of the proposed design;
- The health, safety, and welfare of the general public;
- Adherence to Uniform Plumbing Code (UPC) requirements;
- Adherence to Seattle Public Utilities requirements (e.g. backflow device testing);
- Adherence to other applicable codes or legal standards.

1.03 DEVELOPMENT OF IRRIGATION CONCEPT PLAN

In general, irrigation system layout and capacity shall be consistent with the nature and extent of plantings established as part of the landscape plan provided, in accordance with the design contract.

A. Permanent Automatic Irrigation: Developed sites that are landscaped with mostly mowed turf and maintained ornamental shrub beds shall be automatically irrigated, unless otherwise directed by SPR. These sites include turf athletic fields, community center grounds, neighborhood parks and playgrounds, display gardens, etc.

Small landscaped parks (**10,000** square feet or less) shall be provided with automatic irrigation systems unless specifically directed otherwise by the Park Engineer. Small landscaped parks that are not automatically irrigated shall be (at a minimum) provided with a manual watering system that includes quick couplers spaced so that no hose over 50' length needs to be used to water any landscaped area. This manual system shall be a metered connected to the water main and shall be installed according to code with backflow prevention.

At minimum, all automatic irrigation systems shall be controlled by hand-held remote control devices (TRC Commander) at the site. Remote control via Maxicom™ over hard wired land line of cellular phone connection will typically be required based on the criteria set forth in Section 1.03.C below.

B. Plant Establishment Irrigation: Unless directed otherwise by SPR, landscape planting plans consisting of "Natural Areas" (i.e., native plantings requiring minimal maintenance) and/or drought tolerant plantings shall be provided with appropriate plant establishment irrigation measures. Drip irrigation or sprinkler irrigation in accordance with SPR standards may be utilized as most cost-efficient. Manual watering shall only be acceptable in situations where the surface to be watered is less than **1,000** square feet, appropriate maintenance staff is assigned to perform manual watering or a contract is planned or in place to perform that function, and/or SPR specifically directs the Designer of this intent.

The design and construction of plant establishment irrigation systems shall be sufficiently durable to provide a design life of at least twice the anticipated plant establishment period, and in accordance with SPR standards. All such systems:

1. Unless specifically directed otherwise by Parks, shall not use Maxicom™ (except as described in 1.03.C.1. below).
2. Shall utilize components and irrigation strategies that are most cost-effective and appropriate for the site and landscape design, or as specifically directed by SPR.
   - **a. Quick Couplers:** Typically used where hand watering is the best/only option or is desired by the maintenance staff assigned to do that watering. An example of this would be to water annual flowers planted around a park rainbow sign or plant containers in a downtown plaza or community center entry.
   - **b. Drip Irrigation:** Typically used where plantings need to be watered only during the establishment period and then the irrigation system will be turned off and probably not used again.
3. Shall utilize durable components, materials and fittings as defined in Section 32 80 00 of the Technical Specifications.
4. Shall include a system manual shut-off valve.
5. System shall include backflow prevention.

C. Maxicom™ Remote Computer Control: Maxicom™ Computerized Central Control Program, manufactured by Rainbird Sprinkler Manufacturing Corporation, is the SPR approved standard method of centralized computer control for all remotely-controlled automatic irrigation systems. Efficient water management, optimum plant asset health, and water conservation are the primary goals of using a central control system. Efficiency and savings can be achieved by monitoring local weather conditions and using "Evapo-transporation (ET)" data to adjust irrigation scheduling on a daily basis.

1. **Determining Maxicom™ Requirement:** In general, any Athletic Field or other areas of similar or greater size with highly maintained (mowed) turf areas shall require Maxicom™. In addition, irrigated sites located along the top of critical (potentially unstable) slopes shall require Maxicom™.

All other sites requiring permanent irrigation, with the exception of the situations identified in Section 1.03.C.2 below, shall be evaluated by the Designer to determine the cost-efficiency of providing Maxicom™. This evaluation shall consist of a cost/benefit analysis and recommendation to either include or omit Maxicom™, which shall be submitted to the Park Engineer prior to proceeding with detailed design. Acceptance of the Designer's recommendation shall be at the discretion of the Park Engineer, and the Designer shall proceed with detailed design based on the Park Engineer's subsequent direction (which may be contrary to the Designer's recommendation).

The cost/benefit analysis shall compare the additional cost of incorporating Maxicom™ software programs in conjunction with on-site automatic control with the anticipated savings in water usage and associated surface drainage costs, and shall address the following considerations, at minimum:

- Value of reduced water usage and surface drainage over the design life of the Maxicom™ system, as compared to a standard time clock controller;
- The additional system cost for procurement and installation of the hardware, software, communications equipment, etc. required for Maxicom™;
- The cost or savings of the equipment, services, and labor required to maintain and operate the Maxicom™ software and controller over its design life.

2. **Separate Mainline:** Whenever Maxicom™ control is installed, a separate mainline dedicated to that system must be provided. Quick coupler connecters are not allowed on Maxicom™ mainlines.

3. **Wastewater Deduct Meters:** Maxicom™ mainlines shall be designed to allow installation of metering equipment to monitor irrigation flow, as recommended to reduce or eliminate wastewater charges.

4. **Maxicom™ Exclusions:** The following sites shall not be provided with Maxicom™ irrigation control:

   - **Golf Courses**: These already have automatic irrigation with their own on-site central control, and/or have permanently-stationed maintenance crews;
   - **Special Parks:** These may consist of specialty gardens or other sites with permanently assigned staff, and shall be specifically identified by the Park Engineer as excluded from Maxicom if such is the case.
   - **Small Sites**: SPR has deemed that any site that is **10,000** square feet or less in area is too small to warrant Maxicom™ controls, unless a specific exception is identified by SPR.

D. Non-Irrigated Areas: Meadow and similar areas that are largely managed at a low service level or managed with low frequency (as exist in some large parks) shall not be permanently irrigated. Additionally, mature landscapes that will not be significantly altered by the project scope and sites/areas that either have poor drainage patterns or are otherwise inappropriate for irrigation shall be specifically identified by the Designer in the Irrigation Concept Plan, and unless directed otherwise by the Park Engineer, shall be developed in a manner that eliminates

the need for permanent irrigation and reduces or eliminates need for plant establishment irrigation.

In general, small landscaped parks shall be automatically irrigated as stated in Section 1.03.A. However, in cases where the Park Engineer has directed otherwise, small landscaped parks shall be provided with a manual ("quick coupler") connection to the water main, installed according to code.

1.04 DESIGN GUIDELINES

A. Irrigation Main Shut-off (Gate) Valve: All irrigation systems shall be equipped with a main shut-off valve at the point of connection, just after the meter, in order to be able to manually shut down the system to perform maintenance activities or for winterization purposes.

B. Mainline Isolation (Gate) Valves: Shall also be provided, as directed through the design/technical review process or generally, at all mainline branches or at places where isolation of the mainlines enhances the ability of maintenance staff to work on parts of the system while keeping other parts operational and draining of lines to be worked on can be accomplished without draining the entire system.

C. Layout of Sprinkler Heads: Spacing and placement of irrigation sprinkler heads shall be optimized, and the Designer shall provide appropriate irrigation coverage sketches and design calculations to demonstrate adherence to the following requirements:

1. System utilizes fixtures that are among the approved selection of sprinkler heads, as defined in Section 02810 of the Technical Specifications.
2. System minimizes to the extent possible the total amount of equipment (valves and sprinkler heads) required, while delivering the appropriate amount of water for the plantings being irrigated. Provide 'head to head' coverage and space heads to achieve maximum efficiency of water delivery to the irrigated areas. Do not stretch head spacing of published sprinkler radii unless no wind conditions exist at the site (i.e. interior courtyard or other well protected areas). In general, design all sprinkler head layouts at 45% of published diameter (90% radius). In areas of persistent wind, design all rotary sprinkler head layouts at 40% of published diameter (80% radius).
3. Overspray to paved areas, bodies of water, and/or other areas where irrigation is not needed or desired shall not exceed 5% of the total irrigation system volumetric flow.
4. Strive to maintain consistency in the make/model of sprinkler heads utilized in a given irrigation system. Utilize different heads only when it can be demonstrated that there is ongoing cost benefit in doing so. Choose the right heads for the right situation depending on the shape and layout of the lawn or shrub bed areas to be irrigated.

D. Selection of Sprinkler Heads: Sprinkler irrigation heads shall be selected based on the following general criteria:

1. **Pop-Up Spray Heads (Smaller Applications):** Used in smaller shrub bed areas with lower growing shrubs and ground covers or in smaller turf areas (such as parking strips) where various radius coverage and pop-up heights are required for varying plant heights

and where bed or turf area shapes may vary widely. Also used where the water needs of the plants is important, uniform coverage is desired, and/or plants may block the spray patterns of some heads. These heads include Rainbird 1800 Series and Toro 570 Series.

1. **Pop-Up Rotor Heads (Medium to Large Applications):** Used in medium to large turf or ground cover areas and shrub beds with large shrubs, when various radius coverage and pop-up heights are required for turf or bed areas that vary in size and shape, and/or as needed to maximize flexibility of design and minimize number of zones. These heads include Toro 300 Stream Rotor Series (incl. 340 & 300XP), Toro Super 700 Series, and Hunter I-40 Series.

2. **Pop-Up Rotor Heads (Larger Applications):** Big throw turf area rotors are mainly used for turf athletic fields, all-weather athletic field dust control systems or other large commercial applications where turf areas are regularly shaped and the minimum radius coverage area is no less than 47' at the narrowest point. These heads include Toro 640 and Hunter I-20 Series.

3. **"Hunter" Heads:** Technical Specification Section 02810 allows use of Hunter Series I-10, I-20 and I-40 adjustable sprinkler heads on an "exception" basis. If specified in the design, the Designer must first demonstrate that use of such heads will create better efficiency in terms of coverage and/or reduction in number of heads required.

B. Battery-Powered and Photovoltaic-Battery Powered Controllers: Battery or photovoltaic controllers shall only be considered at sites where hard lined electrical power is not available or too expensive to provide, the system has very few control zones and the site is relatively small (i.e., less than 10,000 square feet). The designer must provide preliminary information to quantify the cost-efficiency of battery-powered controllers as part of the Irrigation Concept Plan, and verify the cost-efficiency with appropriate design calculations during the design phase.