SECTION 22 52 00
FOUNTAIN PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 INTRODUCTION

A. This specification provides guidelines for the design of the supporting systems for ornamental fountains. It provide guidelines for materials, components equipment and services necessary for complete systems. Ornamental water features are designed for their artistic and aesthetic benefits and this guide does not address these elements. Stanford University encourages energy efficiency and water conservation when designing ornamental water features. This guide will list requirements and make recommendations for energy efficiency and water conservation.

1.2 REFERENCES AND STANDARDS

A. The following references and standards shall be consulted and appropriate provisions incorporated into the design.

1. Codes and standards:
   d. Applicable rules and regulations of local city and county codes.

2. Additional Standards:
   a. ANSI American National Standard Institute
   b. ASME American Society of Mechanical Engineers
   c. ASTM American Standards for Testing and Materials
   d. ASSE American Society of Sanitary Engineers
   e. AWWA American Water Works Association
   f. CS&PS Commercial Standards and Product Standards
   g. IAPMO International Association of Plumbing and Mechanical Officials
   h. NBS National Bureau of Standards
   i. NFPA National Fire Protection Association
   j. PDI Plumbing and Drainage Institute
   k. UL Underwriter’s Laboratory

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Firms regularly engaged in the manufacture of plumbing and fountain systems products, of types, materials, and sizes required, whose products have been successfully installed on similar projects for a minimum of 5 years.

B. Installer’s Qualifications: Firm with at least 5 years of successful installation experience on similar projects.
C. Manufacturer’s Instructions: Manufacturer’s instructions shall be followed where the manufacturers of the components used in the water feature have been provided.

1.4 WORK RESPONSIBILITIES

A. Coordinate the work with other trades.

B. Verify the location of all existing utilities prior to construction and protect from damage.

C. Install pipe with necessary offsets and fittings to maintain required accessibility, and satisfy the University’s Representative.

D. Provide complete functioning systems and include all necessary components required for the water feature to operate safely and satisfactorily.

E. Provide work indicated on the Drawings whether or not specifically mentioned in the Specifications.

1.5 SUBMITTALS

A. During Schematic Design:

1. Submit a detailed description of the intended appearance of the water feature. Include drawings or sketches that show the aesthetic aspects of the water feature. Include display heights, spray patterns and spray sequences.

B. During the final design phase provide a detailed design submittal. Include the following:

1. Complete plan drawings at a scale of 1/2 inch equals 1 foot of the water feature with all piping, pumps, and other components indicated.
2. Complete design calculations for pump and pipe sizing. Calculations shall include water flow rates at each display and pump pressure required to meet elevation and friction requirements.
3. An estimate of the evaporation rate and annual make-up water flow rate.
4. An estimate of annual energy consumption including energy for pumps and lighting.
5. A complete system diagram with all valves, pumps and filters to show the association of components to one another. Each component shall be labeled and tagged and listed in an equipment schedule.

C. The contractor shall submit product data and catalog cut sheets for:

1. All specified components including pumps, piping, filters, and any component integral to the operation of the water feature.
2. All materials proposed for substitution.
   a. Clearly indicate in submittal package those items that are proposed substitutions.
   b. Submittals for items proposed for substitution shall specifically include performance characteristics, material, finish, and Certification of Performance with specified codes and standards.

D. Detailed Drawings: Submit detailed drawings for review per Section 01 33 00 Submittal Procedures for all assemblies.
E. Record Drawings:

1. Keep an accurate record set of Drawings per requirements of Section 01 77 00.
2. Provide final as-built, reproducible drawings that include the following:
   a. All valves clearly marked and identified.
   b. Position of all concealed piping accurately dimensioned both vertically and horizontally.
   c. Locations of all concealed pipe bends, dimensioned from 2 reference points.
   d. All modifications from original fountain mechanical drawings clearly indicated.

F. Operation and Maintenance Manual: Prepare and deliver to the University’s Representative prior to acceptance of the Work, in ring binders containing the following information:

1. Catalog and parts sheets on every material and equipment installed under this Contract.
2. Index sheet stating Contractor’s address and telephone number, and a list of equipment with the name, address, and telephone number of the local manufacturer’s representatives.
3. Complete operating and maintenance instructions for all major equipment.
4. Recommended inspection and maintenance schedule.
5. Complete and dated warranties for all materials used.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All pipe and appurtenances shall be loaded for delivery in such a manner as to avoid scratches or damage to the pipe or appurtenances.

B. Delivery of pipe and other equipment to the site of the work shall not take place until immediately prior to installation.

C. All pipe and other equipment and materials shall be handled with care to avoid scratches and damage. Piping shall be protected from damage during installation.

D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the University’s Representative.

1.7 DAMAGE BY LEAKS

A. Contractor shall be responsible for damage to the premises caused by leaks in the water feature system installed as a part of the Work as indicated on the drawings and specified herein for the period of 12 months from the date of acceptance. Refer to warrantees and guarantees in division 1.
PART 2 - PRODUCTS

2.1 GENERAL

A. The use of an equipment room adjacent to the water feature is preferred over the use of equipment vaults.

B. Water features should be designed such that lower level basins do not overflow when pumps are turned off.

C. Use only new materials of brands, types, quality and performance indicated on the Drawings and specified herein, or approved equals.

D. Where practicable, the products of a single manufacturer for each type of material or equipment shall be used throughout all work specified under this Section.

E. Provide all special tools for proper operation and maintenance of the equipment under this Section and deliver to the University’s Representative.

F. Provide all materials required for a fully functional water feature plumbing system.

G. All water features shall incorporate the following minimum components which are specified in greater elsewhere:

1. Display pump
2. Water meter and back flow preventer on make up water feed
3. Control system
4. Strainer and filter
5. Basin level control
6. A means to mix chemicals required to maintain water quality
7. Drain
8. Overflow drain

H. Elaborate or large water features shall include the following in addition to the items listed above:

1. Wind speed monitoring to prevent water spray drift
2. Lighting controls
3. Automatic chemical dosing system
4. Programmable control system

I. Many companies manufacture water feature components. The following companies provide many of the components specified below:

1. The Fountain People
2. Long Island Fountain Company
3. Roman Fountains
4. Filtrific

2.2 PIPING AND FITTINGS

A. Buried Drain Lines:
1. Pipe: Schedule 40 PVC, conforming to ASTM 1785.
2. Fittings: Schedule 40 PVC, solvent-weld, conforming to ASTM 2466.

B. Buried Fountain Plumbing, Including Suction Lines, Jet Discharge Lines, Filter System Lines, and Overflow Line:
   1. Pipe: Schedule 40 PVC (sizes 6” or less)
   2. Fittings: Schedule 40 PVC solvent-weld (pipe sizes 6” or less)

C. Nuts, Bolts, and Related Hardware for Flanges:
   1. Stainless steel.

2.3 PUMPS
A. General: Water feature pumps should be selected to optimize pumping efficiency. The design point should be near the maximum efficiency region on the pump curve. Pumps must achieve a minimum efficiency of 65%. Pumps over 5 horsepower shall have a minimum efficiency of 70%. Submersible pumps shall be design for submersible service. All pumps and pump motors shall be design and rated for continuous operation.

B. Manufacturers: Nautilus or equal

2.4 FILTERS
A. General: Filtration requirements vary depending on the location of the water feature. Outdoor water features require greater filtration including strainers and screens. All water features require filtration for aesthetically pleasing clear water. Water features with large basins shall include skimmers to control floating debris. The following are example filters that may be used:

B. System Filter/Pump Tank: Filter tanks by Filtrific, Nautilus, Roman Fountains or equal.

C. Basket Strainers: Top access type for easy removal of collected debris.

D. Pre-engineered filter and pump vaults by The Fountain People, or Filtrific

E. Skimmers: Filtrific, Nautilus, The Fountain People, Roman Fountains.

2.5 OTHER COMPONENTS
A. Water level sensors and over flow drain should be concealed as appropriate to maintain the artistic elements of the water feature. Tile, stainless steel, or other matching cover should be used to conceal these elements. Sensors and over flow drains should be accessible for service and cleaning.

B. An anti-vortex plate should be used on the main return line from the basin to the pump: See examples by Roman Fountains

C. Pool Floor Inlet: REF-150-SW by Roman Fountains, or approved equal.

D. Mechanical Pump Switch: Filtrific, Nautilus, Roman Fountains or equal.
2.6 CONTROL SYSTEM

A. General: The control system is used to configure and control the operation of the water feature. It shall be programmable and users shall be able to modify the operational schedule of the water feature on a daily and hourly basis. The control system shall monitor the flow rate of the make-up water system and shall have an alarm to notify maintenance personnel if the flow rate exceeds an adjustable maximum rate. The control panel shall operate the make-up water valve to maintain the water level in the basin. The control panel shall control the operation of the water feature pump or pumps.

B. Packaged pre-programmed control panels are available from the manufacturers listed above.

C. Small, simple water features do not require programmable control panels. These systems may include float type water level sensors and pump switches set to time clock operation.

2.7 LIGHTING

A. General: Lighting designs for water features should consider energy efficiency. When used lighting systems should be integrated into the control panel system permitting automatic shut-off options. The manufacturers listed above can provide lighting options including low voltage and LED systems. Time clocks or daylight sensors shall be incorporated to prevent water feature lighting from operating during daylight hours.

2.8 WATER METERS

A. All make up water to ornamental water features shall be recorded with a water meter. Horizontal turbine water meters shall be used for water features

B. Construction: Bronze maincase, stainless steel and thermoplastic measuring element, stainless steel integral strainer and flanged connections. Meter shall have straight reading local display and remote reading connections

C. Manufacturers: Hersey or equal.

2.9 PIPE MARKERS

A. Self-sticking pipe markers consisting of pipe content wording and arrow indicating direction of flow on ANSI color background shall be provided for all piping.

PART 3 - EXECUTION

3.1 GENERAL

A. Prior to all work in this Section, carefully inspect the installed work of other trades and verify that all such work is complete to the point where this installation may properly commence.

B. Provide materials in sufficient quantities on the job site to complete work and to accommodate minor unforeseen changes and additions in the scope of work.
3.2 PIPING

A. Thoroughly clean all pipe and maintain in such condition throughout construction.
B. Temporarily cap open ends of incomplete pipe work at the end of each work day.
C. Install exposed piping parallel to, or at right angles with building walls, and install close to walls or ceilings when possible.
D. Arrange piping and hangers, supports, and bracing to allow for expansion and contraction.
E. No valve or water feature component shall support the weight of any pipe.
F. Install piping free from traps and air pockets, and true to line and grade. Piping between equipment rooms and water features shall slope towards the equipment rooms.
G. Buried piping shall be installed on a 4” layer of sand to provide uniform support of the pipe. Trench backfill within six inches of the water feature shall be similar to the bedding material.
H. Perform pipe backfilling in conformance backfilling and bedding specifications.

3.3 PIPE TESTING

A. Perform tests in accordance with the Uniform Plumbing Code and AWWA standards.
B. Test water feature display system and filtration system piping hydrostatically at a pressure 1 and ½ times the normal operation pressure or 85 PSIG, whichever is greater, for a 4 hour duration.
C. Test make-up water piping hydrostatically at a pressure of 150 PSIG for a 4 hour duration.
D. Test water feature drain and overflow piping hydrostatically at a pressure of 15 feet for a 2 hour duration.
E. Should any piece of equipment, apparatus, materials, or work fail in any of these tests, remove and replace with perfect material, and retest the portion of the work replaced.

3.4 WATER FEATURE EQUIPMENT

A. Position equipment to result in good appearance with easy access to all components for maintenance. Install the piping and pipe line accessories so that they do not interfere with equipment access.
B. Install equipment level and secure.
C. Start-up: Secure the services of the manufacturer’s representatives for the start-up of all equipment, as applicable.
3.5 EQUIPMENT IDENTIFICATION

A. Identify; pump and similar equipment with equipment identification tags in accordance with the submitted equipment schedule. Secure Tags to equipment by means of screws or bolts.

B. Install piping markers in accordance with specification for Identification of Plumbing Systems and equipment.

3.6 CAST-IN-PLACE FOUNTAIN COMPONENTS

A. The location of all cast-in-place fountain components shall be approved in field by the University’s Representative prior to pouring any concrete.

B. Install all cast-in-place fountain components plumb, level, in alignment with architectural features, and at the elevations indicated on the Drawings, as applicable. Special attention is required in setting the cast-in-place displays perfectly plumb.

C. Obtain acceptance from the University’s Representative for any deviation in the location of cast-in-place components from those indicated on the Drawings prior to installation.

3.7 FLUSHING

A. Flush all filter and fountain display system components with water to remove dirt and debris.

B. Completely drain and wash all piping, equipment, and basin.

C. Fill system and basin.

3.8 ADJUSTMENTS TO SYSTEMS

A. Check performance of the water feature display and systems to verify water feature performs in accordance with the display concept. Review performance with the University’s Representative and make adjustments to the system as necessary.

B. Adjust all equipment and system components as required, to result in the intended system operation and appearance. Compare performance with the University’s Representative against the design concept. Make readjustments as necessary to refine performance.

3.9 CLEAN-UP

A. Prior to Final Acceptance, thoroughly clean all exposed portions of the fountain mechanical installation, removing all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the system component, and being careful to avoid all damage to finished surfaces.