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PRACTICAL ELEMENTARY FOUNTAIN DESIGN

With growing interest in the use of fountains for commercial and decorative purposes, it has become increasingly important that any person who has a responsibility for the selection, design and/or development of a fountain installation be familiar with the technical fundamentals that govern the basic design of this equipment. This knowledge is essential if proper assistance is to be given to architects, engineers and other clients. In addition, it will enable the fountain designer to transmit necessary information to the factory and expedite the handling of proposals and bids. It will also help materially in making an intelligent appraisal of competitive situations.

Fountains usually develop from one of the following reasons:

A governmental activity, City, County, or State, where a program of beautification is undertaken in parks, reservoirs, lakes, civic centers or other construction such as traffic circles, malls, etc.

Interactive playgrounds for public spaces, city parks, theme parks, retail and water parks to cool off, entertain and amuse children of all ages.

Private grounds of commercial institutions such as manufacturing plants, distribution centers, etc., where the fountain serves a twofold purpose of landscaping and company identifications.

Hospitals and rest homes where restful fountains and pools have a definite therapeutic effect. Cemeteries where subdued fountain patterns lend a quiet dignity. Motels, highway hotels and other roadside business establishments where the fountain serves as an advertising billboard. Private home gardens or courtyards - apartment houses.

Many other specialized functions such as water treatment and cooling towers as a means of aesthetically using visual impact from the nozzles to achieve the effects from the use of the application.

DEVELOPMENT OF PRELIMINARY INFORMATION

A fountain transaction can be an experience for all parties involved or it can be one that generates a professional respect for the agent and manufacturer and satisfaction with the end product. It all depends upon how the details are handled and the time to build a sound relationship. Correct and complete initial information will avoid costly and aggravating problems.

DETERMINE FOUNTAIN BUDGET

Many times a designer considering a fountain has a mistaken idea of cost. Excluded and generally overlooked are the operating and the capital expenditure costs. It is therefore

important to ascertain the general type of fountain the client has in mind and the amount of money that has been planned for this expenditure and whether this budget is absolute or is subject to revision. This enables design and engineering to intelligently develop the best possible fountain to fit the requirements of application and budget. To have an accurate understanding of this avoids needless "dry runs" and delays.

Many factors control the type of fountain best suited for a particular situation. If the area is large and the pool not limited in size, such as park, race track infield, reservoir or other locations of similar dimensions, and where the viewing points are somewhat remote, then a fountain using heavier spray effects and moving larger masses of water is to be preferred. You will be amazed how distance shrinks the size of a fountain. A fountain of inadequate size and substance is just as undesirable as one that is over sized.

If the pool size is restricted or is in a location where splash out would be objectionable, spray rings, for example, with an inside fall pattern would be desirable. A combination of two rings, one of smaller diameter and inside the other, and rising to a greater height, with or without a center jet, makes a very attractive fountain. Fountains must be designed to conform with their intended importance in the total landscape effect. Proper balance and proportion with surrounding backgrounds is important. Unless a fountain is intended to be the complete center of interest, it should compliment its environment, not overwhelm it. If the client has envisioned a lighted fountain with changing water patterns but there simply are not sufficient funds to provide all of these functions, it would be unwise to reduce the size of the fountain. Rather, it would be sensible procedure to build the basic fountain as planned and make provisions for the addition of the changing water patterns and lights (and light changing sequencing timer) at later dates when additional funds are available. All necessary future services can be stubbed in and capped at the time of initial construction.

In extreme cases of austerity, if adequate pump capacity is provided, parts of pre-planned fountain water effects can be added in stages. Georgia Fountain Company, Inc.™ provides two basic types of fountain services. The first fountain type is the custom fountain. In this area there is no limit to size and versatility. However, it should be borne in mind that a fountain is a mechanical and electrical device and rugged simplicity of the construction is commercially more desirable than some unorthodox creation where enthusiasm has out run sound judgment. This does not mean that the unusual is unsound, but it does mean that in all cases sound engineering practices should be followed. The custom type fountains use the latest technology and are built with more high-tech devices that will have an initial up front cost.

Secondly, is the pre-engineered and pre-priced standard fountain kits. There is a wide selection available from these fountain kits. They have been designed as a result of an analysis of the records that reflect the type and size of fountains most commonly preferred. The fountain kits offers more fountain per dollar of investment than any other type because of the saving in engineering and drafting costs as well as assembly. These fountain kits range in price from approximately $1,000.00 to $40,000.00. More time is required to maintain water features that contain the fountain kits because no filtration is included.

It is helpful for the designer to have a working knowledge and understanding of the fundamentals of the fountain operation. Take the time to study this discussion of fountain components and how they perform. The general rule of thumb in designing the overall pool size is for every vertical foot of spray there is, there will need to be the same foot distance required horizontally from the jet to the nearest wall in order to contain splash.

JET AND SPRAY NOZZLE CHARACTERISTICS

Fountains are like any other piece of precision equipment. If professional results are to be expected, professional equipment of specific characteristics built by an experienced manufacturer should be insisted upon.

All of the materials and components that go into the construction of a fountain are designed to do one thing, deliver the proper amount of water at the necessary head pressure to the jets. If the jets are not of correct design, then all that has gone into the supporting equipment is wasted and the quality of the effect is ruined.

The term jet is often used in place of "nozzle" but the meaning is the same. The mouth or opening through which the water is emitted is known as an "orifice". The characteristics of jets vary with their design.

The charts in the fountain catalog provide data on each size jet and from this information it can be determined the proper jet best suited for a particular requirement. It will be noted that the chart not only shows the required GPM (gallons per minute) but also the amount of head pressure in feet to raise the stream of water a given distance. The head pressure is shown to be higher than the stream height. A rule of thumb equation for smooth bore jets (nozzles) is; up to 140-150 feet of stream height, the head pressure required to lift the stream is 1.22 times the stream height desired. Above that height, other factors enter into the equation and such problems should be referred to the factory.

There are two different types of jets, water level dependent and water level independent. The water level dependent jet requires that the water level be constant at all time with relationship to the jet. Changing water level, even less than 1/2", will create a different water effect from the originated jet. More water over the nozzle will reduce the overall spray height creating a mound effect of water while less water over the jet will create a higher, thinner stream of water. The water level independent jet can be mounted anywhere with respect to the water level so as the top of the jet is not covered with water. The water level can drop well below the jet without changing the spray effect.

IMPORTANT

Be certain that your customers and clients are cautioned against using home made jets or nozzles not specifically designed for fountain work. If there is any savings (which we doubt) it is false economy and will result in an inferior fountain.

WAVE BREAKERS AND SURGE BAFFLES

Careful design is needed when a single water level dependent jet, cascade or foam jet, is placed in the middle of a circular or small square pools. The result will be that of harmonic wave action created by the jet and intensifying over time. This wave action will cause the jet to "dance" uncontrollably. Another effect from the wave is that of water splashing up and out of the pool causing other potential problems. The wave breaker is a manufactured device that is placed in the water over the spray head. The sides of the wave breaker are usually fabricated to

be 2" higher than the operating water level. The turbulence from the jet is kept inside the wave breaker causing the water to flow atmospherically out from underneath the openings in the side. The rough turbulent water is able to calm down as it enters the main pool.

FOUNTAIN PUMPS

Pumps, such as are generally used in fountains, fall into two classifications: Dry and submersible (either single or multiple stage turbines). The general purpose of a dry centrifugal pump is located in a cool dry pit or vault as near to the fountain pool as possible. The suction entrance to the pump must be below the minimum water level of the pool unless some other means of priming the pump is provided. The pumping system is usually isolated from the pool by means of isolation valves (normally a gate valve in the suction line and a ball valve in the discharge line). These serve as barriers to prevent the back flow of water should it be necessary to remove the pumps. When in operation, the suction valve should be fully open. Flow regulation is accomplished through adjustment of the ball or butterfly valve in the discharge line. The submersible pump is built with a waterproof motor housing and is mounted underwater and connected directly to the fountain through a ball or other regulating valve. The power cord is fed into an underwater junction box through a brass cord seal. While the submersible pump system is initially less expensive then a dry system, a great share of the added cost is offset by lower pool construction and installation costs. The long range costs may exceed the dry system due to the fact that additional periodic maintenance will be required on the fountain kit systems since no filter units are designed. If the submersible pump every needs to be serviced, then the pool or pond must then be drained.

Certain classes of motors require motor starters and they are not normally furnished by motor manufacturers nor are they included in pricing of motors. Starters are available in several types and characteristics and care should be taken to be certain that the proper starter is specified.

ACCESSORIES

The more sophisticated fountains employ supplemental pieces of equipment designed to facilitate the control and maintenance of the fountain environment. Chiefly among these items are water make-up systems, filter systems and wind control units, to name a few.

WATER FILL MAKE-UP SYSTEMS

The water make-up system is either an electrically controlled sensing unit that activates an automatic solenoid valve when the water level drops to a predetermined point or a mechanical float valve, housed in either a niche or exposed in the pool wall. GEFCO's™ electrically controlled water level unit is the #EE115-Series model and is used in conjunction with an appropriately sized automatic valve.

FILTRATION SYSTEMS

Filters are usually of the diatomaceous earth or sand type. The "Hi-Rate Sand Filter" has been quite popular in the past. More recently, the Cartridge Filter is becoming more popular and provides an excellent filter medium. Many designers incorporate provisions for vacuuming the

pool as a part of the filter system. Vacuum cleaner outlet fittings with connecting lines can be installed at the time the fountain pool is built. Other accessories, such as "Eyeball Inlet Fitting", to direct the flow of re-circulated filtered water, and "Skimmers", to skim off surface floating debris, are all a part of the filtering system.

It is normally good practice to use the filter pump to operate the fountain effects. Very seldom does the required pumping characteristics of the fountain match that of the filter. Further, if there is an attempt to run the filter and fountain simultaneously from the same pump, the fountain effects will not be constant for the reason that as debris accumulates in the filter, the head pressure and flow characteristics change. In a few cases where the pump requirements are approximately the same, a by-pass valve can be used to divert the flow to the fountain instead of through the filter. However, the saving in the cost of the additional pump is hardly worth it and it is not recommended.

WIND CONTROL UNITS

These units are either single stage, two or three state and are employed to control the modification of the fountain effects under adverse wind conditions. They consist of an anemometer, or wind cups, which is responsive to wind velocity. The rotating cups provide a digital signal to a remote electronic measuring control unit – the wind monitor. The single-stage wind monitor is a sophisticated device the reads the wind speed and when a pre-set velocity is reached, the wind monitor will activate an intermediate relay and either turn off the pump motor or to reduce its speed electronically if the system is designed and equipped with one. Once the wind subsides below the pre-set point, the pump motor will be re-activated or returned to its set point electronically. The wind monitor may also work directly with an automatic solenoid valve or motorized ball or butterfly valves that will reduce the fountain spray effect to a low height during the period of inclement weather conditions. The two-stage wind control unit, functions in the same manner except that stage one reduces the fountain effect through automatic valves during periods of intermediate wind conditions and during excessive wind turns the pump off completely. In reverse, as the wind subsides, the fountain returns to normal operation.

FOUNTAIN LIGHTING

There are very few unlighted fountains being installed today. As attractive as a fountains may be during daylight hours, it is immeasurably more beautiful at night with multi-hued lights playing upon it. A few things to remember. You can rarely over light a fountain and under lighting one can completely ruin its potential beauty. Lights with clear lenses when operating in conjunction with colored lenses tend to "wash" out the color. Colored lenses have different light transmission values and for balanced brilliancy this must be taken into consideration. Relative light transmission values are approximately as follows: White (Clear - 100%; Amber - 50%; Green - 25%; Red - 15%; Blue - 15%. Different shades of these basic colors will, or course, affect these percentages.

Using today’s technology it is now standard to use low voltage (LV) (12 VAC or 12/24 VDC) LED lights. With the latest changes in the NEC the use of either white or colored LED lights is prevalent as the huge power hogs of the past are now history. So many options utilizing digital color lighting control and RGB or RGBW LED lighting make for the most power efficient use of digital lighting technology and power consumption.

SAFETY WARNING

Electrical equipment installed in the proximity of people and water can cause fatal electrical shock when not installed properly. All electrical equipment supplied by Georgia Fountain Company, Inc.™ must be installed in accordance with the National Electric Code (NEC) standards by qualified electrical contractors. This equipment must be maintained regularly after installation to prevent accidents.

IN CONCLUSION

It is obviously impossible to treat this subject in great depth and detail in such a limited space, but it is hoped that this brief outline will give you the basic working knowledge that will make you feel comfortable when discussing the subject.

Final engineering and design should be referred to the engineers at the factory for their evaluation and advise.