Chapter 3:
General Compliance

General Comments

There are a significant number of aspects concerning pool and spa design and installation that are common to all. For example, piping materials, suction entrapment avoidance, decks, dimensional tolerances, circulation systems, heater systems and barriers have general characteristics that are the same no matter with what pool or spa they are connected. Placing the regulations for these common items in one location, Chapter 3, makes them easier to find and results in fewer coordination problems as the code is changed in future editions.

Purpose

Chapter 3 contains regulations for electrical, plumbing, energy consumption, barriers, decks, suction entrapment avoidance, circulation systems, heaters and lighting for all types of pools and spas. First and foremost, these regulations provide for the protection of the users of pools and spas. The regulations also provide for a level of quality necessary to ensure that the pools and spas are installed correctly to provide for long-term performance.

SECTION 301
GENERAL

301.1 Scope. The provisions of this chapter shall govern the general design and construction of public and *residential* pools and spas and related piping, equipment, and materials. Provisions that are unique to a specific type of pool or spa are located in Chapters 4 through 10.

❖ Many requirements for different types of pools or spas are identical. For example, barriers (such as fences and walls) have the same requirements no matter what pool or spa the barriers protect. Rather than repeat these common requirements for each type of pool or spa, the requirements are stated once in this chapter. Requirements that are specific to each type of pool or spa are indicated in Chapters 4 through 10.

301.1.1 Application of Chapters 4 through 10. Where differences occur between the provisions of this chapter and the provisions of Chapters 4 through 10, the provisions of Chapters 4 through 10 shall apply.

❖ Chapters 4 through 10 have requirements that are specific to each type of pool or spa. Where Chapter 3 has a requirement that is also discussed in each of Chapters 4 through 10, and the requirements are different, the requirements in Chapters 4 through 10 take precedence over the requirement in Chapter 3. In other words, the specific overrides the general.

SECTION 302
ELECTRICAL, PLUMBING, MECHANICAL AND FUEL GAS REQUIREMENTS

302.1 Electrical. Electrical requirements for aquatic facilities shall be in accordance with NFPA 70 or the *International Residential Code*, as applicable in accordance with Section 102.7.1.

Exception: Internal wiring for portable *residential* spas and portable *residential* exercise spas.

❖ The *National Electrical Code* (NEC), NFPA 70, is to be applied to the electrical installations in connection with pools and spas except for those pools and spas that are associated with residential structures covered by the *International Residential Code*® (IRC®). The IRC contains chapters on electrical installation that are based on residential-appropriate portions of NFPA 70. Internal wiring requirements for portable residential spas and portable residential exercise spas are covered under UL 1563 or CSA C22.2 No. 218.1. Chapter 10 requires portable residential spas and portable residential exercise spas to be listed and labeled to one of those standards.

This code references specific editions of NFPA 70 and the IRC. Unless the jurisdiction makes an amendment to the code at the time of adoption to change the year of NFPA 70 or the IRC that is referenced, the editions that are referenced in Chapter 11 are to be enforced. Note that a jurisdiction has the authority to adopt local amendments to the code as well as to NFPA 70 and the IRC. Local amendments to the electrical codes might be the result of formal interpretations (FI) or temporary interim amendments (TIA) that were generated by NFPA for the NEC. Designers and installers should never assume that these FIs or TIAs are part of the electrical codes being enforced in any jurisdiction. Designers and installers should always consult with each jurisdiction to determine what local amendments might apply for that jurisdiction.

This code, the IRC and the NEC do not address who is responsible for performing the design and installation of electrical work covered by the regulations in these codes. Each jurisdiction decides who is qualified to perform such work and typically requires licensure of those individuals at either a state or local

level. The licensing laws of the jurisdiction dictate the extent of work that can be performed by licensed individuals.

Section 102.4 covers additions, alterations, renovations or repairs to existing pools and spas. The code official has the responsibility to decide how much of an existing electrical installation must be brought up to the current code. Designers and installers should always consult with each jurisdiction to determine the extent of electrical rework that is necessary for any remodeling project on a pool or spa.

The electrical requirements in NFPA 70 and the IRC are minimum requirements. These codes do not prohibit designs that exceed the minimum requirements.

302.2 Water service and drainage. Piping and fittings used for water service, makeup and drainage piping for pools and spas shall comply with the *International Plumbing Code*. Fittings shall be *approved* for installation with the piping installed.

❖ This section addresses piping for the supply of potable water to the pool or spa and drainage (wastewater) from the pool or spa. The *International Plumbing Code*® (IPC®) has provisions for the installation of such piping.

302.3 Pipe, fittings and components. Pipe, fittings and components shall be *listed* and *labeled* in accordance with NSF 50 or NSF 14. Plastic jets, fittings, and outlets used in public spas shall be *listed* and *labeled* in accordance with NSF 50.

Exceptions:

1. Portable *residential* spas and portable *residential* exercise spas *listed* and *labeled* in accordance with UL 1563 or CSA C22.2 No. 218.1.
2. *Onground storable pools* supplied by the pool manufacturer as a kit that includes all pipe, fittings and components.

❖ The requirement for the listing and labeling of items to NSF 50 or NSF 14 provides for a certain level of quality for those items so that they will not structurally fail under the intended service conditions, not impart harmful chemicals to the water in the pool or spa, and will properly fit with other listed and labeled components. Where pipe, fittings, components, plastic jets and outlets are part of portable residential spas and portable residential exercise spas listed and labeled to UL 1563 or CSA C22.2 No. 218.1, the quality of the items are controlled, as necessary, by those standards.

Because onground storable pools are made for disassembly and storage, replacement of pipe and fittings is more easily accomplished. More frequent replacement of these types of components is generally expected by the owner of this type of pool. The owner will most likely not purchase replacement components listed and labeled to NSF 50 or NSF 14 because similar components that will "do the job" will be less expensive and be readily available at local hardware stores. Thus, from a manufacturer's point of view, there is no need to initially build these systems with components meeting NSF 50 because replacement of components is relatively easy and inexpensive. See Section 704.5.

302.4 Concealed piping inspection. Piping, including process piping, that is installed in trenches, shall be inspected prior to backfilling.

❖ Piping installed in trenches must be inspected prior to backfilling the trench so that the installation can be checked for leaks, proper piping bedding and the use of appropriate fittings.

302.5 Backflow protection. Water supplies for pools and spas shall be protected against backflow in accordance with the *International Plumbing Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1.

❖ Potable water supplies to pools or spas must be kept safe from contamination. The IPC or the IRC, as applicable, provides the necessary requirements for protection against backflow.

302.6 Waste-water discharge. Where waste water from pools and spas, backwash from filters and water from deck drains discharge to the building drainage system, such installation shall be in accordance with the *International Plumbing Code* or the *International Residential Code*, as applicable in accordance with Section 102.7.1.

❖ Where wastewater from a pool or spa can be legally disposed of is a decision that must be made in each jurisdiction. Where the jurisdiction requires that such water be discharged to a building drainage system, then the requirements of the IPC or the IRC, as applicable, must be followed.

302.7 Tests. Tests on water piping systems constructed of plastic piping shall not use compressed air for the test.

❖ Air testing of plastic piping is dangerous because compressed air contains significant potential energy. Should the piping or fittings have imperfections or cracks created during manufacturing, such defects could explode during testing. Dirt, rocks and plastic pipe shrapnel propelled by a failure of the piping could injure nearby personnel. Testing piping systems, including the equipment such as filters and pumps connected to the piping, with water, is much safer.

302.8 Maintenance. Pools and spas shall be maintained in a clean and sanitary condition, and in good repair.

❖ Pools and spas that are not maintained become breeding grounds for mosquitoes. A pool or spa in need of repair can be dangerous to users and possibly to the environment where water leaks out of the pool or spa into the surrounding earth. This section provides the code official with the authority to make the owner of a pool or spa perform the necessary maintenance and repairs.

302.8.1 Manuals. An operating and maintenance manual in accordance with industry-accepted standards shall be provided for each piece of equipment requiring maintenance.

❖ In order to properly maintain equipment associated with pools and spas, instructions in written form must be provided for each piece of equipment. Equipment manuals typically are included within the product or component packaging. Such materials, if not placed in a secure location, can be inadvertently lost, discarded or damaged. The contractor should deliver all product and component manuals, instructions, accompanying signage and other literature to the owner/operator at or before the completion of the project. Because manuals contain important end user safety, proper operation and maintenance information, it is helpful to include this requirement on inspection checklists.

SECTION 303
ENERGY

303.1 Energy consumption of pools and permanent spas. The energy consumption of pools and permanent spas shall be controlled by the requirements in Sections 303.1.1 through 303.1.3.

❖ The energy consumption of pools and permanent spas can be significant because filter pumps operate continuously. This section covers methods and equipment to limit energy consumption. Note that Section 303.3 has additional requirements for residential pools and permanent residential spas.

303.1.1 Heaters. The electric power to heaters shall be controlled by a readily accessible on-off switch that is an integral part of the heater, mounted on the exterior of the heater or external to and within 3 feet (914 mm) of the heater. Operation of such switch shall not change the setting of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas-fired heaters shall not be equipped with continuously burning ignition pilots.

❖ The provision of an easily accessed on-off switch for a heater goes a long way towards offering the user of the pool or spa a method to limit energy use. Where adjustment of a thermostat is required for turning off a heater, most users will elect not to make the adjustment because they have it set to their preferred temperature. The switch for the heater needs to be within close proximity to the heater (or mounted externally on the heater) so that a person knows to what piece of equipment the switch belongs. This is especially useful (and safe) for servicing a heater where there are multiple heaters in one location. Although NFPA 70 (and the electrical chapters of the IRC) do not require a separate switch where the circuit breaker is within sight of the equipment, having such a switch further enables users to turn off the heater when not in use. Some users might have safety concerns (generally unwarranted) about "flipping" a circuit breaker in a circuit breaker panel (having multiple circuit breakers). Also, some circuit breaker panel doors are difficult to open, especially those suitable for outdoor service. Older circuit breakers in existing circuit breaker panels might not have circuit breakers that are rated for "switch duty." Frequent use of those older circuit breakers might result in damage to the circuit breaker. Gas heaters with "standing pilots" (continuously burning pilots) waste energy. There are other technologies available to provide ignition for gas-fired heaters.

303.1.2 Time switches. Time switches or other control methods that can automatically turn off and on heaters and pump motors according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built-in time switches shall be in compliance with this section.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Pumps that operate solar- or waste-heat recovery pool heating systems.

❖ The area where the pools or spas are located might not be open to users during certain hours of the day or on certain days. A time switch is a simple way to automatically shut off heaters and pumps during these times. The first exception allows for not providing the time switch where the public health standards require that the pool be heated or circulated (or both) 24 hours per day. The second exception is for pools that are provided with a heat recovery pool heating system or solar heating system. Pumps for these systems need to run when the heat source is available to maximize the energy savings that those systems offer.

303.1.3 Covers. Outdoor heated pools and outdoor permanent spas shall be provided with a vapor-retardant cover or other *approved* vapor-retardant means in accordance with Section 104.11.

Exception: Where more than 70 percent of the energy for heating, computed over an operating season, is from site-recovered energy such as from a heat pump or solar energy source, covers or other vapor-retardant means shall not be required.

❖ The majority of energy loss from a heated pool or spa is from the open surface of the water, primarily because of the cooling effect that evaporation of water from the surface causes. Covering pools and spas with a vapor-retardant cover when the pool or spa is not in use is highly beneficial. As an encouragement for pool and spa owners to actually install a cover on the pool or spa, this section requires that a cover be present (but not necessarily installed) at final inspection. Although the code official cannot make the owner install the cover, it is hoped that if the owner incurred the expense for having the cover present, he will use it to his benefit for saving money on energy use.

The exception recognizes that where the 70 percent of the energy (over an operating season) for

heating pool or spa water is "free" energy available at the site, such as capturing waste heat generated from equipment (site-recovered energy) or energy from the sun (site solar energy), then the overall objective for reducing consumption of utility energy is achieved. The 70-percent level is established because site waste energy (heat) might not be generated or the sun might not shine on the thermal collectors to the extent required to keep the pool or spa water heated to design temperatures.

There are many different types of equipment that can generate waste heat. A heat pump generates waste heat when in the mode of cooling conditioned spaces in a building. Fuel-fired boilers and water heaters waste heat. Refrigeration equipment generates heat waste heat. That heat can be captured and put to use to reduce consumption of utility energy.

Solar thermal energy is nearly always available. Site locations (geographic) and weather patterns (based on historic data) affect the amount of heat energy that is available from this source over the anticipated operating season for the pool or spa.

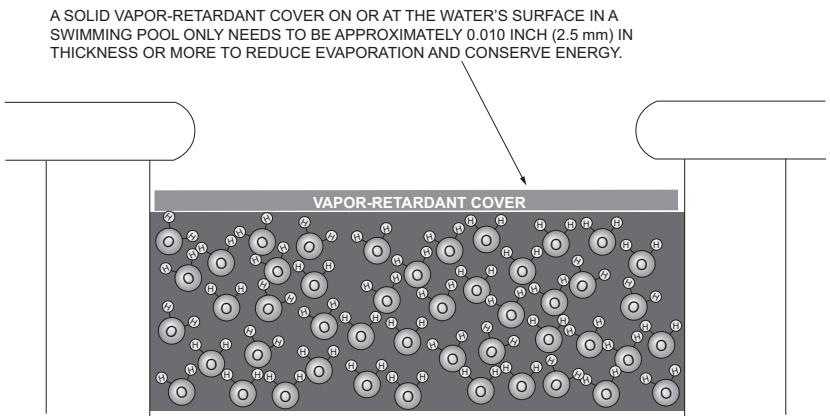
This exception is not concerned with the efficiency of pool or spa water heating equipment requiring utility power (electricity or gas) for directly heating pool and spa water. Although such equipment is becoming slightly more efficient as equipment designs improve over time, greater efficiencies are difficult to achieve without exorbitant equipment cost and increasing complexity. Installation of pool water heating equipment with higher efficiency (less use of utility power) is often a wise decision. However, choosing higher efficiency equipment at a greater cost to lower power costs where abundant "free" energy is available at the site might not be as wise of a decision in the long run. Equipment requires servicing, parts require replacement and eventually, equipment needs replacing. Complex, high-efficiency equipment can have a significant cost that needs to be carefully considered against the benefits gained. Thus, the purpose of this section and its exception becomes more clear. There is a cost associated with supplying a pool cover. Without question, pool and spa covers, especially for large or oddly-shaped pools and spas, can be difficult to install, resulting in the fact that many will never be installed. This defeats the intent for reducing consumption of utility-generated energy. Installing higher efficiency direct pool or spa water-heating equipment is senseless where that energy is just allowed to, literally, evaporate into the air. Where there is significant use of abundant free energy (heat) at the site, why not eliminate the requirement for the cover (that most times will rarely be used) and spend that money on equipment to capture that free energy? Once installed, the pool operator doesn't need to install a cover to gain the same benefit, if not a greater benefit, of reducing power costs.

A vapor-retardant cover is a solid layer of material (not mesh or netting) that rests on or at the water's surface to retard or curtail evaporation. In a swimming pool, the solid vapor retardant cover must touch most of the water's surface to impede the majority of water molecules from escaping [see Commentary Figures 303.1.3(1) and (2)].

On a spa, the vapor-retardant cover can be above the water's surface as long as all sides of the spa rim or coping are sealed by the cover to confine the water molecules that have escaped the water's surface to the airspace between the water and the cover, keeping them from escaping into the atmosphere [see Commentary Figure 303.1.3(3)].

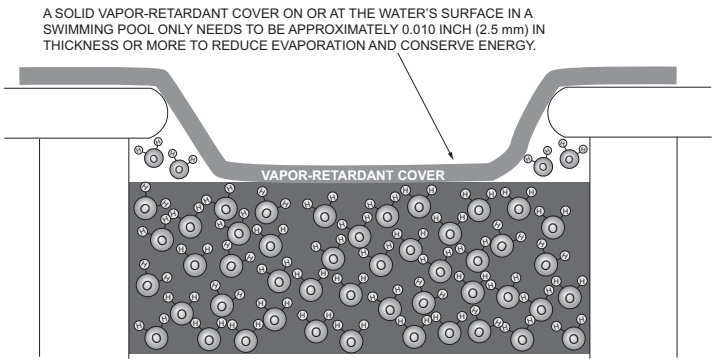
303.2 Portable spas. The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP 14.

❖ Electric-powered portable spas are products manufactured to numerous standards, one of which is APSP 14, which specifically addresses energy efficiency for these types of products.



For SI: 1 inch = 25.4 mm.

FIGURE 303.1.3(1)
FLOATING-TYPE SOLID VAPOR-RETARDANT COVER
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]



For SI: 1 inch = 25.4 mm.

FIGURE 303.1.3(2)
POWERED OR PIN-DOWN-TYPE SOLID VAPOR-RETARDANT COVER
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

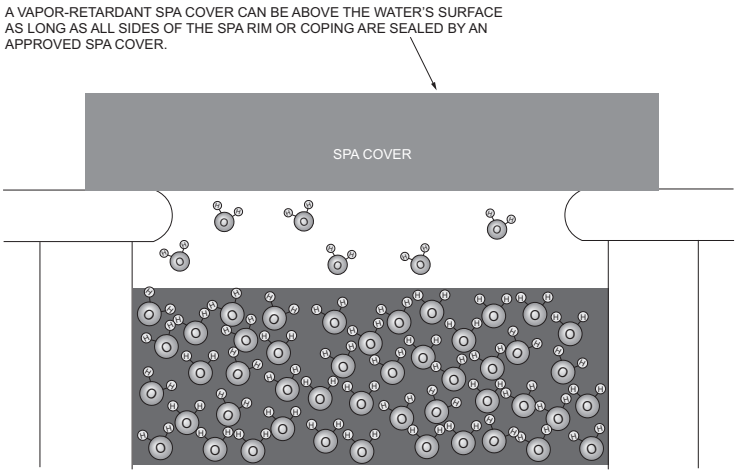


FIGURE 303.1.3(3)
SOLID VAPOR-RETARDANT SPA COVER
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]

303.3 Residential pools and permanent residential spas. The energy consumption of *residential* swimming pools and permanent *residential* spas shall be controlled in accordance with the requirements of APSP 15.

❖ By some estimates, there are over 7 million permanent inground residential swimming pools in the United States alone. Some of the "higher-end" residential pools also have permanent residential spas with separate circulation systems. There is also an increasing trend of installation of permanent residential spas without pools as space and finances might not be available for a pool installation. The number of permanent inground residential swimming pools and permanent residential spas far surpasses the number of public pools in the United States. As every pool and spa must have one or more pumps for circulation, the collective amount of energy used by all of these pumps is staggering. Controlling the energy consumption by these currently installed pumping systems is strongly encouraged by all electric utilities. Many owners of existing pools and spas have taken advantage of electric utility rebates to replace their old, inefficient pumps that consumed an amount of energy that was nearly 50% of their monthly household electric bill. For new pumping systems, APSP 15 provides the requirements to design and install low-energy-consuming circulation systems. APSP 15 also provides details on how to select energy-efficient pumps from a database that all pump manufacturers populate with certified energy usage data for the models that they sell.

APSP 15 covers residential swimming pool filtration systems, including the filtration pump, controller, filter, backwash valve, filtration piping and valves. Note that only systems used for filtration are regulated by the standard; other systems, such as for cleaning, spa boosting and various water features, are not regulated. However, where a system is used for multiple purposes, one of which is filtration, the system is regulated by APSP 15.

APSP 15 requires that residential swimming pool and spa filtration pumps be listed in either the APSP Appliance Efficiency Pool Pump Database (available from APSP) or the California Energy Commission's Appliance Efficiency Database for Residential Pool Pumps. In order to be listed in these databases, the manufacturer of the filtration pump/motor assembly must have the assembly tested by an independent testing laboratory to produce energy factor information about the pump operating at three different operating conditions that represent three different types of circulation systems. The energy factor in the database is listed in "gallons per watt-hour" ("liters per watt-hour") and is similar in concept to the "miles per gallon" ("km per liter") rating of an automobile. The energy factor information makes it easy for the purchaser of a pump/motor assembly to compare the energy consumption of various pump models. The purchaser can then make a decision about which assembly to use based on the expected savings in energy usage (energy cost). Commentary Figure 303.3 shows the three circulation system curves that are used in the pump testing required by APSP 15. Pools that are 17,000 gallons (64 352 L) or less in volume use the flow rate listed for Curve A; pools more than 17,000 gallons (64 352 L) use the flow rate listed for Curve C.

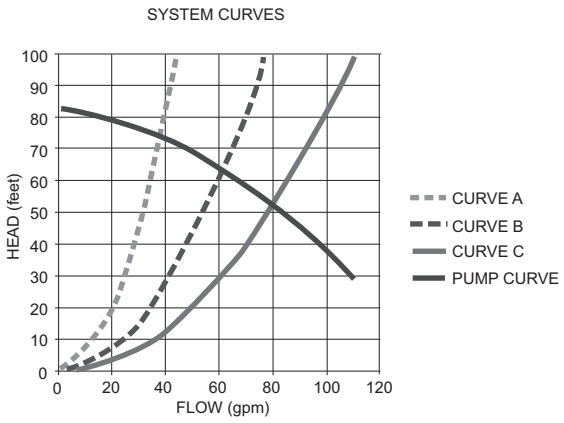
The size and capacity of pumps are limited based on pool volume, while ensuring adequate turnover. All residential pools must have a pump capable of achieving turnover in 12 hours or less (see Section 810). APSP 15 also requires that single-speed pumps in residential pools must not be capable of turning over the pool volume in less than 6 hours. Multispeed-pumps (which include dual and variable speed) must have at least one speed that will not turn over the pool volume in less than 6 hours.

According to APSP 15, pools with a capacity of less than 13,320 gallons (50 422 L) are not subject to the 6-hour turnover limit. Instead a single-speed pump that is not capable of exceeding 36 gallons per minute (gpm) (136 lpm) or a multiple-speed pump in which at least one setting will not exceed this flow rate can be used. This exception for smaller pools is necessary because skimmers or other sanitizing equipment might not operate properly at lower flow rates. Without the 36 gpm (136 lpm) allowance, a 4,000-gallon (15 141 L) patio home pool would be limited to a design flow rate of 11 gpm (42 lpm) (4000/360=11.1), a flow rate that few, if any, swimming pool filter pumps can achieve. This does not mean pool filter pumps cannot operate below 36 gpm (136 lpm): they can and often do. It is left to the contractor and property owner/operator to decide what is best to achieve the water quality requirements of Section 302.1. Using the 4,000-gallon (15 141 L) pool example, a two-speed pump on low speed, pumping 22 gpm (83 lpm), will turn over the pool in 3 hours, whereas 36 gpm (136 lpm) will turn over the pool in about 2 hours. Both flow rates exceed all turnover requirements for public pools (having more severe requirements), thereby ensuring that circulation is not compromised for smaller pools.

APSP 15 provides minimum sizes for pool filters, their backwash valves and the filtration piping to and from the swimming pool. These minimum sizes are calculated based on the pool volume; the larger the pool, the larger they must be. Control valves in the pool filtration loop must be at least as large as the pipe. This minimum pipe, fitting and valve size requirement does not apply to the pipe connections associated with the pump (which typically are smaller), heater, sanitizer and safety equipment, such as a safety vacuum release system and suction-limiting vents.

Note that APSP 15 does not currently specify a maximum limit for how much energy a pump can use. The information in the database should be enough to steer most buyers toward more energy-efficient pump models. Spending more for a high-efficiency pump that will be installed in a geographic location where electric energy costs are high should be an easy choice as the payback period for the higher cost of the pump (as compared to the lower cost of a lower-efficiency pump) will be relatively short. On the other hand, perhaps the decision on what pump to buy might not include the concern about having to pay for the energy consumption after the pump is installed. APSP 15 allows this flexibility in pump efficiency choice as the pump can be easily changed to a higher-efficiency model at a later date.

The APSP 15 requirements for permanently installed residential spas include those of Section 303.1 and minimum heater efficiency ratings that are set by federal regulations. Gas-fired heaters manufactured before April 16, 2013, must be at least 78-percent efficient; after this date they must be at least 82-percent efficient. Heat pumps must have a coefficient of performance of not less than 4.0.



For SI: 1 foot = 305 mm, 1 gallon per minute = 3.8 lpm.

FIGURE 303.3
CIRCULATION SYSTEM CURVES VERSUS PUMP CURVE
[Illustration courtesy of the Association of Pool and Spa Professionals (APSP)]