Pool and Spa Energy Requirements
Effective January 1, 2010

Forms:

- A **CF-6R-MECH-03** form must be submitted with all applications, and be posted, or made available with the building permit(s) at final inspection, and a signed copy is required to be included with the documentation the installer provides to the building owner.

Minimum Requirements:

The mandatory requirements in the 2008 Energy Efficiency Standards for pool and spa heating equipment are essentially the same as in the 2005 Standards. However, the 2008 Standards do include many additional requirements for residential swimming pool filtration equipment which affect pump selection and flow rate, piping and fittings, and filter selection. These new Standards are designed to reduce the energy used to filter and maintain the clarity and sanitation of pool water.

- **Heating Equipment Requirements:**
  All pool or spa heating systems or equipment must certified by the Energy Commission that the system or equipment complies with §114 and §115. These requirements include:
  - Minimum heating efficiency according to Appliance Efficiency Regulations;
  - An on-off switch outside the heater;
  - Permanent and weatherproof operating instructions;
  - No electric resistance heating, except:
    - Listed package units with fully insulated enclosures (e.g., hot tubs), and with tight-fitting covers, insulated to at least R-6;
    - Pools or spas getting 60 percent or more of their annual heating from site solar energy or recovered energy;
  - Pool and spa heaters may not have continuously burning pilot lights;
  - Outdoor pools and spas with gas or electric heaters shall have a cover installed. The cover should be fitted and installed during the final inspection.

- **Pool Pump Controls:**
  Pool controls are a critical element of energy efficient pool design. Modern pool controls allow for auxiliary loads such as cleaning systems, solar heating, and temporary water features without compromising energy savings.
  - A time switch or similar control mechanism must be installed as part of the pool water circulation control system that will allow all pumps to be set or programmed to run only during the off-peak electric demand period and for the minimum time necessary to maintain the water in the condition required by applicable public health standards.
  - Multi-speed pumps must have controls that default to the filtration flow rate when no auxiliary pool loads are operating. The controls must also default to the filtration flow rate setting within 24 hours and must have a temporary override capability for servicing.

- **Pool Pipe, Filter, and Valve Requirements:**
  System design for residential pools is new for 2008. Correct sizing of piping, filters, and valves reduces overall system head, reduces noise and wear, and increases energy efficiency. Other mandatory requirements include leading straight pipe into the pump, directional inlets for mixing, and piping to allow for future solar installations.

  - Pool piping must be sized according to the maximum flow rate needed for all auxiliary loads. The maximum velocity allowed is 8 fps in the return line and 6 fps in the suction line. Table 5-3 shows the minimum pipe sizes required by pool volume based on a 6-hour turnover filtration flow rate. These pipe sizes would need to be increased if there are auxiliary loads that operate at greater than the filtration flow rate. Conversely, they could be reduced if the pump is sized for greater than a 6-hour turnover filtration flow rate.

Table 5-3 – 6-Hour Turnover Pipe Sizing

Pool Volume (gallons)		Minimum Pipe Diameter (in)	
Min	Max	Return	Suction
-	13,000	1.5	1.5
13,000	17,000	1.5	2
17,000	21,000	2	2
21,000	30,000	2	2.5
30,000	42,000	2.5	3
42,000	48,000	3	3
48,000	65,000	3	3.5

  - There must be a length of straight pipe that is greater than or equal to at least 4 inches pipe diameters installed before the pump. That is, for a 2 inch suction pump, there must be at least 8 inches of straight pipe before the pump's strainer basket.
  - Traditional hard 90° elbows are not allowed. All elbows must be sweep elbows or a type of elbow that has a pressure drop less than the pressure drop of straight pipe with a length of 30 pipe diameters. For example, a 2 inch elbow must have a pressure drop less than a 5-foot length of 2 inch straight pipe.
  - Filters shall be sized using NSF/ANSI 50 based on the maximum flow rate through the filter. The filter factors that must be used are (in ft^2/gpm):

Cartridge	0.375
Sand	15
Diatomaceous Earth	2

  - Backwash valves must be sized to the diameter of the return pipe or two inches, whichever is greater. Multiport backwash valves have a high pressure drop and are discouraged. Low-loss slide and multiple 3-way valves can provide significant savings.
  - The pool must have directional inlets to adequately mix the pool water.
  - If a pool does not currently use solar water heating, piping must be installed to accommodate any future installation. Contractors can choose three options to allow for the future addition of solar heating equipment:
    1. Provide at least 36 inches of pipe between the filter and the heater to allow for the future addition of solar heating equipment.
    2. Plumb separate suction and return lines to the pool dedicated to future solar heating.
    3. Install built-up or built-in connections for future piping to solar water heating. An example of this would be a capped off tee fitting.

- **Pool Pump Requirements:**
  For maximum energy efficiency, pool filtration should be operated at the lowest possible flow rate for a time period that provides sufficient water turnover for clarity and sanitation. Auxiliary pool loads that require high flow rates such as spas, pool cleaners, and water features, should be operated separately from the filtration to allow the filtration flow rate to be kept to a minimum.
  - The pool filtration flow rate may not be greater than the rate needed to turn over the pool water volume in 6 hours or 36 gpm, whichever is greater. This means that for pools of less than 13,000 gallons the pump must be sized to have a flow rate of less than 36 gpm and for pools of greater than 13,000 gallons, the pump must be sized using the following equation:

    Max Flow Rate (gpm) = Pool Volume (gallons) ÷ 360min.
  - Pools with auxiliary pool loads must use either a multi-speed pump or a separate pump for each auxiliary pool load. For example, if a spa shares the pool filtration system, either a multi-speed pump must be used or a separate pump must be provided to operate the spa. If the pool system can be served by one pump of less than 1 total-hp in capacity, the pump may be single speed. Filtration pump motors with a capacity of 1 total-hp or more must be multi-speed.
  - All pool pumps must be tested and listed with the Energy Commission according to the Appliance Efficiency Regulations. Pump manufacturers must list flow rate, power, and energy factor at each of three system curves (see Figure 5-3). For pools equal to or less than 17,000 gallons, a pump must be chosen such that the flow rate listed for Curve A is less than the 6-hour turnover rate. For pools greater than 17,000 gallons, a pump must be chosen such that the listed flow rate at Curve C is less than the 6-hour turnover rate.

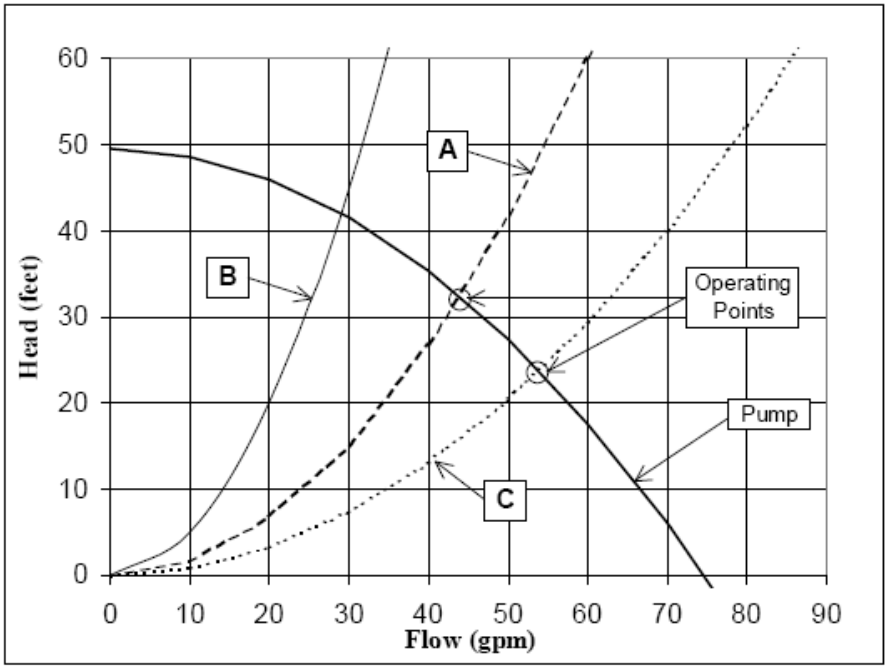

Figure 5-3 – System Test Curves

- **Pool Lighting:**
  Permanently installed luminaires in or around swimming pools, water features, or other locations subject to Article 680 of the California Electric Code need not be high efficacy luminaires. Refer to Article 680 of the California Electric Code to determine if lighting in the proximity of water features is subject to this article. Article 680 covers the following areas related to residential outdoor lighting:

  - Lighting installed directly above the water in an outdoor pool, spa, hot tub, or fountain.
  - Pool lighting in an area extending between 5 ft and 10 ft horizontally from the inside walls of a pool.
  - Spa, hot tub, or fountain lighting within 5 ft from the inside walls of the spa, hot tub, or fountain.
  - Underwater luminaires.

Pool and Spa Heating Systems requirements

§114(a): Systems and Equipment.

- ☐ 1. Heater has a thermal efficiency that complies with the Appliance Efficiency Regulations.
- ☐ 2. Has a readily accessible on-off switch mounted outside of the heater.
- ☐ 3. Weatherproof plate or card containing operating instructions for the pool or spa heater.
- ☐ 4. No electric resistance heating except for listed package units that has fully insulated enclosures and tight fitting covers that are insulated to at least R-6. Or if documentation is provided that at least 60 % of the annual heating energy is from site solar energy or recovered energy.
- ☐ 5. Heating system has no pilot light.

§114(b): Installation.

- ☐ 1. System is installed with at least 36" of pipe between the filter and heater, or dedicated suction and return lines, or built-in or built-up connections for future solar heating.
- ☐ 2. A cover for outdoor pools or spas that have a heat pump or gas heater.
- ☐ 3. Pool system has directional inlets to adequately mix the pool water
- ☐ 4. Time switch which will allow the pump to be set or programmed to run during off-peak periods only

§150(p) Pump Sizing and flow rate specification

- ☐ 1. The pump specified is listed in the CEC database of certified pool pumps.
- ☐ 2. The pump flow rate shall be calculated based on pool sizing table below.
- ☐ 3. The pump is capable of operating at 2 or more speeds (not applicable if pump is less than 1 horsepower).
- ☐ 4. Each auxiliary pool load is served by either a separate pump, or the system is served by a multi-speed pump.

Pool sizing (Values are based on a maximum allowable turnover rate of 6- hours)

Max Pool Volume (gallons)	Min Pipe D or Greater (inches)		Min Filter Area or more (square feet)			Max Pump Flow (gpm)
	Return	Suction	Cartridge	Sand	DE	
13,000	1.5	1.5	100	2.4	20	36
17,000	1.5	2	130	3.1	25	47
21,000	2	2	160	3.9	30	58
28,000	2	2.5	210	5.2	40	78
42,000	2.5	3	320	7.8	60	117
48,000	3	3	360	8.9	70	133

Note: *For pumps greater than 1 hp. The maximum Pump Flow is the lowest speed default filtration*

- ☐ 5. Calculated volume of pool_____ (gallons).
- ☐ 6. Return Pipe Diameter _____ (inches).
- ☐ 7. Suction Pipe Diameter_____ (inches).
- ☐ 8. Filter Type _____ (Cartridge, Sand, DE).
- ☐ 9. Filter Surface Area_____ (sf).
- ☐ 10. Max Pump Flow_____ (gpm).

System Piping

☐ 1. The suction side pipe is straight for at least 4 pipe diameters before entering the pump (See table below for the required straight run lengths for various pipe sizes).

☐ 2. The design uses low pressure drop fittings (sweep90's)

Pipe Diameter (inch)	Required Pipe Length leading into pump (inch)
1.5	6
2	8
2.5	10
3	12

Filtration Equipment

☐ 1. If a backwash valve is used: The diameter of the backwash multi-port valve is 2 inches or as large as the circulation pipe, whichever is greater

DECLARATION STATEMENT

- I certify under penalty of perjury, under the laws of the State of California, the information provided on this form is true and correct.
- I am eligible under Division 3 of the Business and Professions Code to accept responsibility for construction, or an authorized representative of the person responsible for construction (responsible person).
- I certify that the installed features, materials, components, or manufactured devices identified on this certificate (the installation) conforms to all applicable codes and regulations, and the installation is consistent with the plans and specifications approved by the enforcement agency.
- I reviewed a copy of the Certificate of Compliance (CF-1R) form approved by the enforcement agency that identifies the specific requirements for the installation. I certify that the requirements detailed on the CF-1R that apply to the installation have been met.
- **I will ensure that a completed, signed copy of this Installation Certificate shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a signed copy of this Installation Certificate is required to be included with the documentation the builder provides to the building owner at occupancy.**

Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)		
Responsible Person's Name:		Responsible Person's Signature:
CSLB License:	Date Signed:	Position With Company (Title):