Please note all changes from revision 1 are replaced with this ballot document. No changes are being proposed to section 1.5, 6.6.1, 6.6.3, 6.9.1 and 6.9.2.

6.6 Pump performance curve

6.6.1 For each pump model or model series, the manufacturer shall provide a pump performance curve that plots the pump’s total dynamic head versus the discharge flow rate. The manufacturer shall also have a curve available that plots the net positive suction head (NPSH) or total dynamic suction lift (TDSL), brake horsepower, and pump efficiency in relation to the performance curve.

NOTE – Pumps with a rating of 5 HP (03.7 kW) or less are not required to have a NPSH curve.

6.6.2 The actual pump curve, as determined in accordance with Annex C, section C.1, shall be within a range of -3% to +5% of the total dynamic head or -5% to +5% of the flow, whichever is greater, indicated by the performance curve. Data taken above 90% full flow shall not be judged to the acceptance criteria. Pumps with more than one operating speed shall be tested as documented below:

- Fixed multispeed pump or motor assemblies, test at each speed; or
- Variable speed pump or motor assemblies, test at 100%, 50%, and the lowest speed.

Reason: Establishes requirements for multispeed or variable speed pumps.

C.4 Pump curve and energy efficiency performance

C.4.1 Purpose
This establishes the pump performance curve per NSF/ANSI 50, Annex C.1, and energy efficiency performance per California Energy Commission CEC-400-2009 Title 20.

C.4.2 Functions and variables
Three functions (curves) shall be calculated (plotted) on the same graph as the pump curve determined in accordance with C.1.

A: \( H = 0.0167 \times F^2 \)
B: \( H = 0.050 \times F^2 \)
C: \( H = 0.0082 \times F^2 \)

Where
- \( H \) = system head in feet of water (ft)
- \( F \) = flow rate in gallons per minute (gpm)

Function A corresponds to a system with a flow rate of 60 gpm at 60 ft (18.3 m) of head, typical of new pool construction using 2 in (51 mm) PVC pipe.
Function B corresponds to a system with a flow rate of 40 gpm at 80 ft (24.4 m) of head, typical of older pool construction using 1.5 in (38 mm) copper pipe.
Function C corresponds to a system with a flow rate of 110 gpm at 100 ft (30.5 m) of head.

C.4.3 Energy factor
For each function (A, B, or C) the system pump head shall be adjusted until the flow and head lie on the curve. The following shall be tested and reported for each curve for single speed pumps, or for each curve at both highest and lowest speeds for two-, multi-, or variable-speed pumps.

C.4.3.1 Function A
The system head shall be adjusted so that the function graph (A) intersects the pump curve developed in C.1

Record:
- system head (ft of water);
C.4.3.2 Function B

The system head shall be adjusted so that the function graph (B) intersects the pump curve developed in C.1

Record:

- system head (ft of water);
- flow (gpm);
- power (watts); and
- Energy Factor (EF) (gallons per watt hour);

Where the Energy Factor (EF) is calculated:

\[ EF = \frac{\text{flow (gpm) } \times 60 \text{ (min/hr)}}{\text{power (watts)}} \]

C.4.3.3 Function C

The system head shall be adjusted so that the function graph (C) intersects the pump curve developed in C.1

Record:

- system head (ft of water);
- flow (gpm);
- power (watts); and
- Energy Factor (EF) (gallons per watt hour);

Where the Energy Factor (EF) is calculated:

\[ EF = \frac{\text{flow (gpm) } \times 60 \text{ (min/hr)}}{\text{power (watts)}} \]

C.4.4 Examples

Table 1 and Graph A

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<th>Capacity (gpm)</th>
<th>Total Head (ft H₂O)</th>
<th>Kilowatts</th>
<th>Volts</th>
<th>Total Amps</th>
<th>Power Factor</th>
<th>A</th>
<th>B</th>
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Graphic to be removed as part of this ballot.

Graph A: Example