

**INTERPRETATION IC 90.1-2004-6 OF
ANSI/ASHRAE/IESNA STANDARD 90.1-2004
Energy Standard for Buildings Except Low-Rise Residential Buildings**

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Reference: This request for interpretation refers to the requirements presented in ANSI/ASHRAE/IESNA Standard 90.1-2004, Sections 6.2 and 6.4.1.1 and Table 6.8.1C relating to mandatory equipment efficiency requirements for water cooled chillers.

Background: There seems to be some confusion in our industry regarding the mandatory full load energy requirements for water cooled chillers within ASHRAE Standard 90.1 if certain criteria are met. I desire to clarify this through the three separate interpretations below.

ASHRAE 90.1-2004, Section 6.2 states

"6.2 Compliance Path(s)

6.2.1 Compliance with Section 6 shall be achieved by meeting all the requirements for 6.1, General; 6.7, Submittals, 6.8, Minimum Equipment Efficiency; and either

(a) 6.3,implified Approach Option for HVAC Systems; or

(b) 6.4, Mandatory Provisions, and 6.5 Prescriptive Path

6.2.2 Projects using the Energy Cost Budget Method (Section 11 of this standard), must comply with 6.4, the mandatory provisions of this section, as a portion of that compliance path."

Also (in part): **"Section 6.4.1.1 Minimum Equipment Efficiencies -- Listed Equipment -- Standard Rating and Operating Conditions.**

Equipment shown in Tables 6.8.1A through 6.8.1G shall have a minimum performance at the specified rating conditions when tested in accordance with the specified test procedure. Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements, unless otherwise exempted by footnotes in the table."

As an example Table 6.8.1C shows the following minimum efficiency requirements for Water Cooled, Electrically operated, Centrifugal Chillers:

<150 tons	5.00 COP	5.25 IPLV
≥150 tons and <300 tons	5.55 COP	5.90 IPLV
≥300 tons	6.10 COP	6.40 IPLV

The specified test procedure for all these chillers is ARI 550/590, and Section 12 of Standard 90.1-2004, Normative References, shows ARI 550/590-98 with Addenda through July 2002.

In turn, ARI 550/590-98 (available for download from <http://www.ari.org/std/forms/550-590.html>) states

"C7.1.4 Power consumption shall be determined as follows:

C7.1.4.1 For motor driven centrifugal and rotary screw compressors where the motor is supplied by the manufacturer, the compressor power input shall be measured as close as practical to the compressor motor terminals.

If a frequency conversion device or motor starter is furnished as part of the compressor circuit, the compressor power input shall be measured at the input terminals of the frequency converter or motor starter. For remote starters or frequency converters, line losses shall be subtracted. If the Water-Chilling Package being tested is not equipped with the starter or frequency converter furnished for it, then a starter or frequency converter of similar type shall be used for the test."

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Background Interpretation No. 1:

I have a chiller selection:

- Its full load COP is less than the required COP
- The IPLV exceeds the required IPLV

The chiller is selected at 40°F or above, so footnote "a" of Table 6.8.1C does not apply.

Section 6.4.1.1 states: "Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements, unless otherwise exempted by footnotes in the table."

Interpretation No. 1: This chiller does NOT meet the mandatory requirements of ASHRAE 90.1-2004.

Question No. 1: Is this interpretation correct?

Answer No. 1: Yes

Comments No. 1: The requirement is to meet both full load COP and IPLV.

Background Interpretation No. 2:

I have a chiller selection and the chiller has a variable speed drive.

- Its full load COP is less than the required COP
- The IPLV exceeds the requirement in Table 6.8.1 C.

The chiller is selected at 40°F or above, so footnote "a" of Table 6.8.1C does not apply.

Section 6.4.1.1 states: "Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all stated requirements, unless otherwise exempted by footnotes in the table."

ARI 550/590 states that the "...power is measured at the input terminals of the frequency converter..."

Interpretation No. 2: This chiller does NOT meet the mandatory requirements of ASHRAE 90.1-2004.

Question No. 2: Is this interpretation correct?

Answer No. 2: Yes

Comments No. 2: The requirement is to meet both full load COP and IPLV and 90.1 references ARI 550/590. For existing equipment that is being modified or repaired refer to Exception 6.1.1.3 (a).

Background Interpretation No. 3:

I have a chiller selection:

- Its full load COP is less than the required COP
- The IPLV exceeds the requirement in Table 6.8.1C.

The chiller is selected at 40°F or above, so footnote "a" of Table 6.8.1C does not apply.

I am using the Energy Cost Budget (ECB) Compliance path and Section 6.2.2 states that the mandatory requirements of Section 6.4 be met when using the ECB method.

Interpretation No. 3: Even if the Proposed Building Design Energy Cost is lower than the Budget Building Design Energy Cost Budget, the project does not comply with 90.1-2004 because the mandatory equipment efficiency requirement is not met.

Question No. 3: Is this interpretation correct?

Answer No. 3: Yes

Comments No. 3: Section 11.1.4 states that "Compliance with Section 11 will be achieved if all requirements of... 6.4 ...are met...." Section 6.4 states that meeting both full load COP and IPLV is required for compliance.