

**INTERPRETATION IC 90.1-1989-7 OF
ASHRAE/IES 90.1-1989
ENERGY EFFICIENT DESIGN OF NEW BUILDINGS
EXCEPT LOW-RISE RESIDENTIAL BUILDINGS**

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References: This request refers to ASHRAE/IES Standard 90.1-1989, Subsection 9.4.8.3 Air Handling System Insulation, and Table 9-2.

Background: Subsection 9.4.8.3 requires ductwork to be insulated in accordance with Table 9-2. Table 9-2 generally requires ducts within the building envelope to be insulated if the temperature difference between the air in the duct and the surroundings is greater than 15°F. Exception (b) allows the insulation to be omitted "where it can be shown that the heat gain to or heat loss from ducts without insulation will not increase building energy costs."

Question 1: Does section 9.4.8.3 require duct insulation for a cooling supply air duct conveying air at a design temperature of 56°F where the duct is located within a ceiling return air plenum with a temperature of 77°F?

Answer: Yes. In the example given, insulation with a minimum R-value of 3.3 would be required since the supply air to ambient air temperature difference is between 15°F and 40°F.

Comment: Exception (b) does not apply to this case since uninsulated ducts in ceiling plenums will increase energy costs, regardless of whether the plenums are used for return air or not. For cooling systems, uninsulated ducts in return plenums will increase duct heat gain which will either increase supply air quantities and fan energy or, if supply air temperatures are lowered at the coil to compensate for duct heat gains, will increase cooling energy because of higher latent loads and possibly lower suction or chilled water temperatures. Similar arguments apply to heating systems. Cooling or heating energy costs may also increase if plenum return air is subsequently exhausted from the building or if heat gains or losses affect local conditions, e.g. heat gains to cooling ducts may decrease plenum temperatures near fan-powered mixing boxes operating in the heating mode.

Question 2: If the answer to Question 1 is yes, what situations other than exposed ducts located in the conditioned space is exception (b) intended to cover?

Answer: Exception (b) may or may not apply to ducts within the conditioned space. It would only apply if heat gains or losses have no negative energy impact. Examples of ducts covered by exception (b) include:

- *exposed supply ducts in the conditioned space they serve,
 - *exposed supply ducts in conditioned spaces other than the space served but which are in the same cooling or heating "mode,"
- (For example, ducts from a VAV cooling system exposed to interior zones need not be insulated since these zones essentially always require cooling and the supply ducts always carry cold air.)
- *exposed return ducts in conditioned spaces.