# Supplement F

# Common Duct Insulation Materials

We have received questions through the WSEC Hotline about different types and thicknesses of duct insulation and there appears to be some confusion about Table 5-11 of the Washington State Energy Code which lists the minimum densities, out-of-packages thickness and R-values for different types of duct insulation. The above table shows what the R-values are for varying thicknesses and types of duct insulation in a better layout than Table 5-11. The table also lists the ASTM and UL.

*Table F-1*

## R-Values for Common Duct Insulation Materials

| **Installed R-Value**[1] (h.oF ft²)/Btu | **Typical Material meeting or exceeding the given R-value**[2] |
|---|---|
| 1.9 | 1/2 in. Mineral fiber duct liner per ASTM C 1071, Type I |
| | 1 in. Mineral fiber duct wrap per ASTM C 1290 |
| 3.5 | 1 in. Mineral fiber duct liner per ASTM C 1071, Types I & II |
| | 1 in. Mineral fiber board per ASTM C 612, Types I & IB |
| | 1 in. Mineral fiber duct board per UL 181 |
| | 1 1/2 in. Mineral fiber duct wrap per ASTM C 1290 |
| | 1 in. Insulated flex duct per UL 181 |
| 6.0 | 1 1/2 in. Mineral fiber duct liner per ASTM C 1071 |
| | 1 1/2 in. Mineral fiber duct board per UL 181 |
| | 1 1/2 in. Mineral fiber board per ASTM C 612, Types IA & IB |
| | 2 in., 2 lb/ft3 Mineral fiber duct wrap per ASTM C 1290 |
| | 2 1/2 in., .6 to 1 lb/ft3 Mineral fiver duct wrap per ASTM C 1290 |
| | 2 1/2 in. Insulated flex duct per UL 181 |
| 8.0 | 2 in Mineral fiber duct liner per ASTM C 1071, Types I & II |
| | 2 in. Mineral fiber Duct board per UL 181 |
| | 2 in. Mineral fiber board per ASTM C 612, Types 612, Types I! & IB |
| | 3 in. 3/4 lb/ft3 Mineral fiber duct wrap insulation per ASTM C 1290 |
| | 3 in. Insulated flex duct per UL 181 |
| 10.0 | 2 1/2 in. Mineral fiber board per ASTM C 612, Types IA & IB |

[1] Listed R-values are for the insulation only as determined in accordance with ASTM C 518 at a mean temperature of 75oF at the installed thickness and do not include air film resistance.

[2] Consult with manufacturers for other materials or combinations of insulation thickness or density meeting the required R-value1.

• This table is from the User's Manual for ANSI/ASHRAE/IESNA Standard 90.1-2004, p 6-29.2

# Duct Insulation Requirements

The Washington State Energy Code requires residential ducts be insulated per Table 5-11 Chapter 5, page 26.

*Table F-2*

## Duct Insulation

(Table 5-11 WSEC Chapter 5)

| Duct Location | Climate Zone | Group R Occupancy Heating or Cooling Ducts |
|---|---|---|
| | | |
| On roof or on exterior of building | 1 | E and W |
| | 2 | D and W |
| Attic, garage, crawl space, in walls[1], in floor/ceiling[1] | 1 | E |
| | 2 | E |
| Within the conditioned space or in heated basements | | None Required |
| In cement slab or in ground | | B |

**Note:** Where ducts are used for both heating and cooling, the minimum insulation shall be as required for the most restrictive condition.

[1] Insulation may be omitted on that portion of a duct which is located within a wall or floor/ceiling space where both sides of this space are exposed to conditioned air and where this space is not ventilated or otherwise exposed to unconditioned air.

[2] Vapor barriers shall be installed on conditioned air supply ducts in geographic areas where the average of the July, August and September mean dewpoint temperature exceeds 60°F.

**INSULATION TYPES:** Minimum densities and out-of-package thickness.

A. 0.5-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket or equivalent to provide an installed total thermal resistance of at least R-2.
B. 2-inch 0.60 lb/cu. ft. mineral or glass fiber blanket, 1.5-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket. 1.5-inch 3 to 7 lb/cu. ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-5.
C. 3-inch 0.60 lb/cu. ft. mineral or glass fiber blanket, 2-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket. 2-inch 3 to 7 lb/cu. ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-7.
D. 4-inch 0.60 lb/cu. ft. mineral or glass fiber blanket, 3-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket. 3-inch 3 to 7 lb/cu. ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-10.
E. 3.5-inch 0.60 lb/cu. ft. mineral or glass fiber blanket, 2.5-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-8.
V. Vapor barrier, with perm rating not greater than 0.5 perm, all joints sealed.
W. Approved weatherproof barrier.