

## California Title 24 2005 Building Energy Efficiency Standards For Residential and Nonresidential Buildings

The above referenced standard, commonly referred to as “Title 24” went into effect on October 1, 2005. This standard addresses every aspect of building energy efficiency. There are several sections that are pertinent to users of K-Flex USA insulation products.

### SUBCHAPTER 3 – NONRESIDENTIAL, HIGH-RISE RESIDENTIAL, AND HOTEL / MOTEL OCCUPANCIES – MANDATORY REQUIREMENTS FOR SPACE-CONDITIONING AND SERVICE WATER-HEATING SYSTEMS AND EQUIPMENT

#### SECTION 123 – REQUIREMENTS FOR PIPE INSULATION

This section covers all “space conditioning” and “service water-heating” applications. Insulation thickness requirements are listed in TABLE 123-A, and are dependent upon insulation thermal conductivity (k-factor), system type, line temperature and line size (diameter). Insulation thickness requirements range from 0.5 to 3.5 inches for line sizes and temperatures where K-Flex USA products can be used. **It is important to note that when installed within the building envelope, the insulation is required to meet ASTM E84 25 / 50, which limits use of K-Flex USA products to 1-1/2 inches for (black) elastomeric insulation.** Section 123 also has requirements for protection of insulation materials installed outdoors as well as protection from possible maintenance related damage. It should also be noted that piping operating between 60 - 105°F does not require insulation.

TABLE 123-A PIPE INSULATION THICKNESS

| Fluid Temp. Range (°F)   | Conductivity Range<br>Btu-inch per hour<br>per ft <sup>2</sup> per °F | Insulation<br>Mean Rating<br>Temp., °F | Nominal Pipe Diameter (in inches) |     |        |       |     |     |
|--|---|--|-----------------------------------|-----|--------|-------|-----|-----|
|  |   |  | Runouts<br>up to 2                | ≤ 1 | 1.25-2 | 2.5-4 | 5-6 | ≥8  |
| Space heating system (steam, steam condensate and hot water)   |   |  |                                   |     |        |       |     |     |
| Above 350  | 0.32-0.34   | 250                                    | 1.5                               | 2.5 | 2.5    | 3.0   | 3.5 | 3.5 |
| 251-350  | 0.29-0.31   | 200                                    | 1.5                               | 2.0 | 2.5    | 2.5   | 3.5 | 3.5 |
| 201-250  | 0.27-0.30   | 150                                    | 1.0                               | 1.5 | 1.5    | 2.0   | 2.0 | 3.5 |
| 141-200  | 0.25-0.29   | 125                                    | 0.5                               | 1.5 | 1.5    | 1.5   | 1.5 | 1.5 |
| 105-140  | 0.24-0.28   | 100                                    | 0.5                               | 1.0 | 1.0    | 1.0   | 1.5 | 1.5 |
| Service water-heating systems (recirculating sections, all piping in electric trace tape systems, and the first 8 feet of piping from the storage tank for nonrecirculating systems) |   |  |                                   |     |        |       |     |     |
| Above 105  | 0.24-0.28   | 100                                    | 0.5                               | 1.0 | 1.0    | 1.5   | 1.5 | 1.5 |
| Space cooling systems (chilled water, refrigerant and brine)   |   |  |                                   |     |        |       |     |     |
| 40-60  | 0.23-0.27   | 75                                     | 0.5                               | 0.5 | 0.5    | 1.0   | 1.0 | 1.0 |
| Below 40   | 0.23-0.27   | 75                                     | 1.0                               | 1.0 | 1.5    | 1.5   | 1.5 | 1.5 |

Note: Refer to product literature for maximum operating temperatures for K-Flex USA insulation products.



## SECTION 124 – REQUIREMENTS FOR AIR DISTRIBUTION SYSTEM DUCTS AND PLENUMS

Ducts and plenums must also meet the requirements of the 2001 California Mechanical Code (CMC). Minimum supply- and return-air duct insulation R-value requirement is R-8 for outdoors, in a space between the roof and an insulated ceiling, in a space directly under a roof with fixed vents or openings to the outside or unconditioned spaces, in an unconditioned crawlspace, or in other unconditioned spaces. For all other locations, the minimum R-value for supply-air ducts is R-4.2 (or higher depending upon CMC section 605 requirements). These requirements can be attained with either duct liner or duct wrap. **ASTM E84 25 / 50 requirements are applicable to all duct liner applications and all duct wrap insulation installed within the building envelope. K-Flex Gray Duct Liner meets these requirements for R-4.2 (nominal 1” thickness). K-Flex USA manufactured black elastomeric sheet insulation products meet these requirements up to 1-1/2 inch thickness (R-6.0). Nominal 2” thick black elastomeric sheet meets R-8 requirements, but does not meet E84 25 / 50.**

Section 124 (c) requires that all R-values are based on insulation only, excluding air films, vapor barriers, or other duct components.

## SUBCHAPTER 7 – LOW-RISE RESIDENTIAL BUILDINGS – MANDATORY FEATURES AND DEVICES

### SECTION 150 – MANDATORY FEATURES AND DEVICES

#### SECTION 150 (J) – Water System Pipe and Tank Insulation and Cooling Systems Line Insulation

##### 2. Water piping and cooling system line insulation thickness and conductivity.

Piping, whether buried or unburied, for recirculating sections of domestic hot water systems; piping from the heating source to the storage tank for indirect-fired domestic water-heating systems; the first five feet of hot and cold water pipes from the storage tank for nonrecirculating systems; and cooling system lines shall be insulated as specified in Subsection A or B. Piping for steam and hydronic heating systems or hot water systems with pressure above 15 psig shall meet the requirements of **TABLE 123-A**.

- A. For insulation with conductivity in the range shown in TABLE 150-A for the applicable fluid temperature range, the insulation shall have the applicable thickness shown in Table 150-B.

Table 150-B

Insulation Thickness Requirements, inches

| <u>System Type</u>  | <u>Pipe Diameter</u> |               |
|---|----------------------|---------------|
|   | <u>≤ 2"</u>          | <u>&gt;2"</u> |
| Domestic Hot Water (above 105°F)                                  | 1.0                  | 1.5           |
| Hydronic Heating Supply Lines (above 200°F to 250°F)              | 1.0                  | 2.0           |
| Hydronic Heating Supply Lines (above 105°F to 200°F)              | 1.0                  | 1.5           |
| Cooling system refrigerant suction, chilled water and brine lines | 0.75                 | 1.0           |

Exceptions to Section 150 include cold domestic water piping, condensate drains, roof drains, vents or waste piping. Protection of insulation installed outdoors is also a requirement of Section 150.

Summary: Always review insulation thickness requirements in specific jurisdictions to assure that the correct insulation thickness is installed. Pipe insulation thicknesses greater than 1 inch can be attained by the use of 1-1/2" wall *elastomeric* insulation where available or by nesting two layers of insulation. Larger pipe sizes may require use of sheet insulation for the second layer. Polyolefin insulation is limited to maximum 1" wall / sheet thickness.