

## ASPHALT ROOFING KETTLES

### DESCRIPTION

This category covers the installation and repair of asphalt roofs on commercial and industrial buildings. It does not include the manufacture of roofing materials. Asphalt roofing is applied with both cold and hot-applied methods. This category covers only hot-applied asphalt roofing, for which the only significant emissions source is the kettle used to heat the asphalt. Emissions from fuel combustion are not included; such emissions are accounted for in separate area source fuel consumption categories.

### POLLUTANTS

Volatile organic compounds (VOC)

### AVAILABLE METHODS

Activity levels and emission factors may be estimated as follows:

**Activity:** Total asphalt melted in roofing kettles (Tons) = [FSS + CSS + FS] x B

where: FSS = Number of felt sheet squares purchased. A felt sheet is defined as a non-woven fiberglass or organic mat sheet impregnated with asphalt. During installation, the felt sheet is set into and saturated with hot asphalt. Felt sheet squares do not include base sheets that are not set into and saturated with hot asphalt, such as those base sheets that are nailed to wood or plywood roof decks.

CSS = Number of cap sheet squares purchased. A cap sheet is defined as a mineral surfaced, asphalt coated sheet for use in hot applied built-up roofing systems. It is composed of a fiber glass or organic mat impregnated with asphalt and with ceramic or mineral granule surfacing on the side to be exposed to the weather. Cap sheets are used as the uppermost finish ply in some built-up roofing systems that do not have some other type of final surface.

FS = Number of flashing squares purchased. A flashing square is defined as a flexible material that is installed at roof edges or transitions, such as walls, skylights, roof penetrations, drains, and vents.

B = Amount of asphalt applied per square of felt sheets, cap sheets, and flashing squares, assuming 0.01 tons/square (20 lb/square) of felt sheet, cap sheet, and flashing, as a default.

Purchases of asphalt roofing squares by type may be obtained from the Asphalt Roofing Manufacturers Association. If only state level data are available, apportion state totals to the inventory region based on ratios of employment for SIC 1761 or NAICS 23561 (Roofing, siding, and sheet metalwork contractors) (U.S. Bureau of Census). Alternatives to the default value for B (amount of asphalt applied per square), or local data for quantities of asphalt roofing materials purchased may be obtained from surveys of local roofing contractors.

If a roof is finished with a smooth hot-applied asphalt surface in place of cap sheets, assume 0.0075 tons (15 lb) asphalt is applied per 100 square feet of roof. This factor should not be used for roofs that are finished with a cold-applied asphalt emulsion. If a roof is finished with a gravel or slag layer set in asphalt, in place of cap sheets, assume 0.03 tons (60 lb) asphalt is applied per 100 square feet of roof.

**Emission factor:** 6.2 pounds VOC/ton of asphalt melted (Puzinauskas, 1979)

### **POINT SOURCE ADJUSTMENTS**

No subtraction of emissions from point sources should be necessary.

### **ADJUSTMENTS FOR CONTROLS**

No controls are normally used for this category. State or local regulations may be checked to determine if any controls are applicable for this category.

### **SPATIAL & TEMPORAL ALLOCATION**

Local roofing companies may be contacted to determine if there is any significant seasonal variation in asphalt roofing activity. Unless specific local information is available, it may be assumed that this activity occurs 8 hours per day, 5 days per week, uniformly throughout the year. Activity may be allocated spatially by assuming uniform distribution across areas zoned as commercial and industrial land use types. More specific information on locations of asphalt roofing applications may be obtained from a review of local building permit files or surveys of building contractors.

### **NOTES ON THE DETERMINATION OF THE VOC EMISSION FACTOR**

Table II, *Properties of Roofing Asphalts for Study of Kettle Emissions*, in the Puzinauskas report presents data on samples of four asphalts that were used in a roofing kettle during the study. For each asphalt, the percent weight loss of the sample in a thin film oven test is reported. The average weight loss per sample is 0.310 percent, which is equal to 6.20 pounds per ton of asphalt. This is assumed to be equal to the emission rate that would occur during application. No information is given in the report on the conditions (e.g., temperature and duration) of this test.

Another parameter measured and reported in Table II of the Puzinauskas report is heating test residue weight loss, measured by ASTM D6. In this test, a sample is heated at 325°F for 5 hours and the weight loss (less water) is determined. The average weight loss for the four samples under ASTM D6 was 0.22 percent, or 4.4 lb/ton.

## **REFERENCES**

Asphalt Roofing Manufacturers Association  
6000 Executive Blvd.  
Rockville, MD 20852-3803  
(301) 231-9050

U.S. Bureau of the Census, Washington, DC. [www.census.gov/epcd/www/naics.html](http://www.census.gov/epcd/www/naics.html)

Puzinauskas, V.P. 1979. Emissions from Asphalt Roofing Kettles. Research Report No. 79-2, The Asphalt Institute, College Park, MD, November, 1979.