

SOLDERING OPERATIONS

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Dates Modified / Updated:

PROCESS DESCRIPTION:

Most electronic manufacturing facilities use some type of soldering operation to form a conductive connection between electronic components and a circuit board. These operations often involve equipment described as wave soldering, hydrosqueegees, solder levelers, solder reflow, solder coating, drag soldering, solder plating, and/or hand soldering. Soldering materials usually consist of a conductive metal (solder) and an organic liquid (flux). Emissions of metal fumes are assumed to be negligible since typical soldering temperatures are well below the boiling point of the metal. The solder process does, however, result in the evaporation of some volatile organics in the flux. The standard District technique for estimating emissions from soldering operations is based upon material usage and composition information as described in the following equations:

$$Ea = (Ua - Wa) \times D \times Ci \times (1 - e)$$

$$Eh = Ea / H$$

Where:

Ea = Annual emissions of each listed substance, (lbs/year)

Eh = Maximum hourly emissions of each listed substance, (lbs/hour)

Ua = Total annual amount of flux material used, (gallons/year)

H = Annual hours of operation, (hours/year)

Wa = Total annual amount of flux waste disposed, (gallons/ year)

D = Density of flux material, (lbs/gallon)

C_i = Weight percent of each listed substance, (lbs/lb flux)

e = Control equipment VOC collection and removal efficiency, (%)

EMISSIONS INFORMATION:

The above emission estimation technique is based on material balance of the flux materials used. Waste generated from these processes must often be adjusted to reflect the volume of flux material being disposed.

ASSUMPTIONS / LIMITATIONS:

- Metal fume emissions are assumed to be negligible based on the anticipated difference between the boiling point of the solder material and the actual operating temperature.
- Site specific test data approved by the District may be used in place of the above emission estimation equation if appropriate. In practice, test results are usually limited to the control device removal efficiency which may or may not include the capture efficiency. A general mass balance of the flux material should be performed to QA any proposed test results. Emission factors based on material usage are usually less accurate than mass balance procedures and do not reflect changes in operating procedures.
- Overall control device efficiencies must account for the expected collection efficiency of the device as well as the removal efficiency. Capture efficiency is often overlooked during testing.
- Visible wisps of "smoke" may sometimes be observed at the exhaust of soldering equipment as a result of overheating the flux material. Extreme overheating could result in solder metal emissions and damage to the products.
- Most flux materials contain significant quantities of various alcohols. Some flux materials may contain CFC's or glycol ethers. Few operations, if any, discharge waste to the sewer.

FORMS:

Data for each flux material used in each device must be provided. Emissions are assumed to occur from only one material at a time per device (i.e.; it is assumed that simultaneous emissions from several materials used concurrently in the same device does not occur).