# Technical Tidbit

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Sometimes a responder needs to be able to convert between one unit of measurement for concentration to another unit of measure. The two most common units found in reference sources are parts per million (ppm) and milligrams per cubic meter (mg/m^3). Most toxic chemicals that have a significant vapor pressure and therefore have the potential of producing a toxic vapor cloud usually have the toxic concentration expressed as ppm. The toxic concentration is also referred to as the Level of Concern (**LOC)**, i.e., IDLH, ERPG-1, ERPG-2 or ERPG-3. Many hazardous materials have their **LOC** expressed as both ppm and mg/m^3.

There are legitimate reasons for reporting **LOCs** in mg/m^3, such as when dealing with particulates, fumes or chemicals whose molecular weight is uncertain. For those instances where the **LOC** is reported as mg/m^3, a conversion of the mg/m^3 **LOC** to ppm can be made using the following formula:[1]
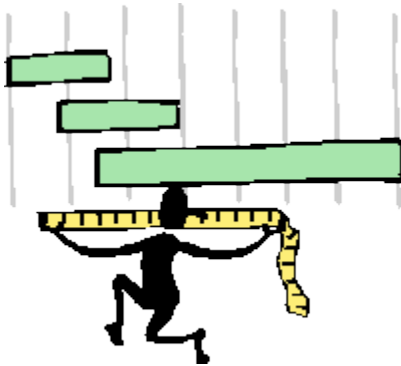
$$LOC_{concentration\ in\ ppm} = (LOC_{concentration\ in\ mg/m}3 * 24.45)/(molecular\ weight)$$

For those instances where the **LOC** is reported as ppm, a conversion of the ppm **LOC** to mg/m^3 can be made using the following formula:

$$LOC_{concentration\ in\ mg/m}3 = (LOC_{concentration\ in\ ppm} * molecular\ weight)/24.45$$

AN EXAMPLE
Isopropoxymethylphosphonyl fluoride, which is commonly known as Sarin, also referred to as GB has the following properties:

- Molecular Weight: 140
- Boiling Point: 316°F
- Vapor Pressure @77°F: < 0.01 atm

Its IDLH is expressed as 0.2 mg/m^3

Using the formula above:

$$LOC_{concentration\ in\ ppm} = (0.2 * 24.45)/(140)$$
$$LOC_{concentration\ in\ ppm} = 0.035\ ppm$$

Obviously an extremely toxic material when compared to Chlorine with an IDLH of 10 ppm.

This conversion of mg/m^3 to ppm or ppm to mg/m^3 can only be applied in situations where the concentration is small.