TABLE 42–B THRESHOLD LIMIT VALUES FOR 1968 (Continued)

made when there is good reason to believe that the chief effects of the different harmful substances are not in fact additive, but independent as when purely local effects on different organs of the body are produced by the various components of the mixture In such cases the threshold limit ordinarily is exceeded only when at least one member of the series $\left(\frac{C_1}{T^1}+\text{or}+\frac{C}{T^i}\text{ etc}\right)$ itself has a value exceeding unity, (See Example 1A b)

Antagonistic action or potentiation may occur with some combinations of atmospheric contaminants Such cases at present must be determined individually Potentiating or antagonistic agents are not necessarily harmful by themselves Potentiating effects of exposure to such agents by routes other than that of inhalation is also possible, e g , imbibed alcohol and inhaled narcotic *(trichloroethylene)* Potentiation is characteristically exhibited at high concentrations, less probably at low

When a given operation or process characteristically emits a number of harmful dusts, fumes, vapors or gases, it will frequently be only feasible to attempt to evaluate the hazard by measurement of a single substance In such cases, the threshold limit used for this substance should be reduced by a suitable factor, the magnitude of which will depend on the number, toxicity and relative quantity of the other contaminants ordinarily present

Examples of processes which are typically associated with two or more harmful atmospheric contaminants are welding, automobile repair, blasting, painting, lacquering, certain foundry operations, diesel exhausts, etc (Example 2)

THRESHOLD LIMIT VALUES FOR MIXTURES

EXAMPLES

1A General case, where air is analyzed for each component

a ADDITIVE EFFECTS

$$\frac{C_1}{T_1}+\frac{C_2}{T_2}+\frac{C_3}{T_3}+\qquad\frac{C_N}{T_N}=1$$

Air contains 5 ppm of carbon tetrachloride (TLV, 10), 20 ppm of ethylene dichloride (TLV, 50) and 10 ppm of ethylene dibromide, (TLV, 25)

$$\frac{5}{10}+\frac{20}{50}+\frac{10}{25}=\frac{65}{50}=1\,3$$

Threshold limit is exceeded

b INDEPENDENT EFFECTS

Air contains 0 15 mg/cu m of lead (TLV, 0 2) and 0 7 mg/cu m of sulfuric acid (TLV, 1)

$$\frac{0\,15}{0\,20}=0\,75,\qquad\frac{0\,7}{1}=0\,7$$

Threshold limit is not exceeded

1B Special case when source of contaminant is a mixture and atmospheric composition is assumed similar to that of original material, i e vapor pressure of each component is the same at the observed temperature

a ADDITIVE EFFECTS, approximate solution

1 A mixture of equal parts (1) trichloroethylene (TLV, 100), and (2) methyl chloroform (TLV, 350)

$$\frac{C_1}{100}+\frac{C_2}{350}=\frac{C_m}{T_m}$$

Solution applicable to "spot" solvent mixture usage, where all or nearly all, solvent evaporates

$$C_1=C_2=\frac{1}{2}C_m$$

$$\frac{C_1}{100}+\frac{C_1}{350}=\frac{2C_1}{T_m}$$

$$\frac{7C_1}{700}+\frac{2C_1}{700}=\frac{2C_1}{T_m}$$

$$T_m=700\times\frac{2}{9}=155\text{ ppm}$$

1B b General Exact Solution for Mixtures of N Components With Additive Effects and Different Vapor Pressures

(1) $\frac{C_1}{T_1}+\frac{C_2}{T_2}+\qquad+\frac{C_n}{T_n}=1,$

(2) $C_1+C_2+\qquad+C_n=T,$