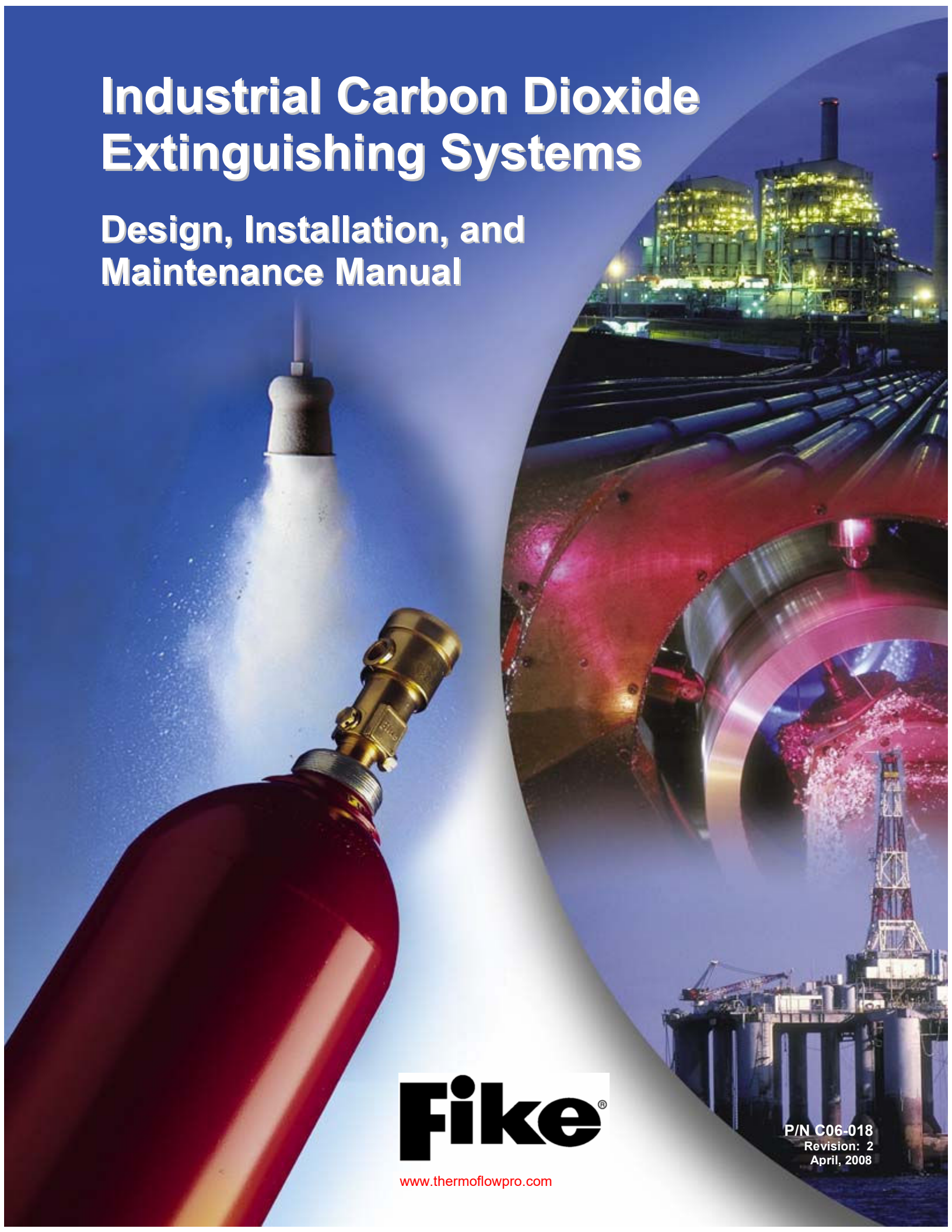
Industrial Carbon Dioxide Extinguishing Systems

Design, Installation, and Maintenance Manual



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2.2.1.1 HAZARD VOLUME

Determine the volume of the hazard by multiplying (length) x (width) x (height). For total-flood applications, the volume can be reduced to exclude any permanent, non-removable, or impermeable structures from the overall volume of the protected space.

2.2.1.2 FLOODING FACTORS FOR SURFACE FIRES

The minimum extinguishing concentration required for Surface fires is **34%** by volume. To determine the base CO_2 agent requirement, multiply the hazard volume by the flooding factors in the following tables.

FLOODING FACTORS FOR SURFACE FIRES			
English Values			
Vol. of Space ft^3.	Vol. Factor ft^3 / lb. CO_2	Vol. Factor lb. CO_2 / ft^3.	Min. Qty. CO_2 lbs.
Up to 140	14	0.072	***
141 – 500	15	0.067	10
501 – 1,600	16	0.063	35
1,601 – 4,500	18	0.056	100
4,501 – 50,000	20	0.050	250
Over 50,000	22	0.046	2500

[*NFPA 12, Table 2-3.3(a)]*

FLOODING FACTORS FOR SURFACE FIRES			
Metric Values			
Vol. of Space m^3.	Vol. Factor m^3 / kg. CO_2	Vol. Factor kg. CO_2 / m^3.	Min. Qty. CO_2 kg.
Up to 3.96	0.86	1.15	***
3.97 – 14.15	0.93	1.07	4.5
14.16 – 45.28	0.99	1.01	15.1
45.29 – 127.35	1.11	0.90	45.4
127.36 – 1,415.0	1.25	0.80	113.5
Over 1,415.0	1.38	0.77	1135.0

[*NFPA 12, Table 2-3.3(b)]*

2.2.1.3 AGENT ADJUSTMENTS FOR SPECIAL CONDITIONS

Additional CO_2 must be supplied to compensate for specific material types, ventilation, hazard temperature, and enclosure leakage. The determination of these adjustments is explained in the following paragraphs.

- See Section 3 for Sample Problems.

2.2.1.3.1 VENTILATION

Where forced-air-ventilating systems are involved, they preferably shall be shutdown and/or closed before or simultaneously with the start of the CO_2 system discharge. When a ventilation system cannot be shutdown prior to the CO_2 system discharge, additional agent must be added to compensate for the volume expressed as cubic feet per minute (cfm) leaving the enclosure. This information is variable and will depend upon the type and capacity of the air handling system(s) present.

The additional agent required is determined by multiplying the volume moved (cfm) during the required holding period by the flooding factor used to determine the base quantity required. This amount must also be multiplied by the material conversion factor (See Section 2.2.3.3) when the design concentration for the protected space is greater than 34%. The additional agent is supplied through the regular piping distribution system.