



CARBON DIOXIDE CO2

Marine & Industrial Fire Suppression Systems

Fire Technology

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INTRODUCTION

- The effectiveness of carbon dioxide for fire extinguishing has long been known.
- Operation without reliance on any outside source of energy.
- All operating parts are completely tested.
- No falling weights.
- No sealing disks to replace after operation.
- All vital operating parts can be easily tested without dismantling containers.
- Contents checking can be done without dismantling (via continuous weight monitoring).

Typical Applications

- Engine rooms
- Cargo Holds
- Flammable liquid storage areas
- Printing presses, flow solder M/C's
- Quench tanks/exhaust fume ducts
- Paint spray booths
- EDP/computer floor voids
- Electrical switchgear & substations
- Fryers/ovens

CO2 Characteristics

CO2 is Versatile

- The 3 dimensional action of carbon dioxide means it can extinguish fires that burn both vertically and horizontally.
- Fast moving, fast expanding gas penetrates past obstructions and through tiny openings to reach the most inaccessible and hidden hazard areas.

CO2 is Clean

- CO2 is a colourless, odourless, dry, inert gas and is one of the most familiar of all chemicals.
- After extinguishing a fire, it vaporizes fully leaving no residue.
- There is no mess, nothing to clear up, no water damage.
- It is harmless to most materials and will not contaminate foodstuffs.
- It is non-corrosive and a non-conductor of electricity so it can safely be used on delicate electronic equipment, valuable art treasures, paintings, or manuscripts.

CO2 is Low Cost

- Carbon dioxide is a standard commercial product with many other uses, and it is readily available throughout the world.
- Because of its universal use, it can be obtained cheaply, and this is an important consideration when frequent recharging of storage containers is necessary as in local application systems, where fires are common.

TOTAL FLOODING SYSTEMS

- Total flooding systems extinguish fires by supplying an enclosed volume with enough carbon dioxide to create an atmosphere that is incapable of supporting combustion.
- The system is completely effective even in spaces with a limited amount of open area.
- By filling the entire space, fire cannot exist on the floor, on the ceiling, or at any level in between.

LOCAL APPLICATION SYSTEMS

- This method of system design is used to protect unenclosed hazards confined to a small area where it would be uneconomical to flood the entire room.
- Discharge horns are placed where fires are expected to start and at points to which the fire will travel so as to build up a dense cloud that penetrates into every crack and crevice, blanketing the burning area completely.
- These installations, operated either automatically or manually, snuff out unbelievably severe fires.
- Two methods of CO2 quantity calculation are available, the choice depending upon site configuration.

FLEXIBLE DESIGN

- The wide range of components manufactured by Brassbell enables systems to be engineered to suit individual customer requirements.
- Systems can be either automatically or manually operated or arranged to protect single or multi-zone hazards and with any number of reserve discharges.
- Automatic control can be achieved mechanically, pneumatically, or electronically, or by any combination of these to suit site conditions.
- Facilities are available for providing a pre-alarm and delayed discharge, as well as various methods of preventing automatic release, while personnel occupy protected rooms.
- Audible and visual indications of system control can be provided and facilities to automatically shut fuel valves, fire doors, dampers, and shutters by either mechanical or electrical devices.
- CO2 is stored at atmospheric temperatures, in steel cylinders manufactured to International standards & specification. The pressure varies with temperature and at 21C would be approximately 59 bars.
- Any number of cylinders can be manifolded together and simultaneously released to provide the total design requirement.

SYSTEM INFORMATION

Total Flooding Systems Surface Fires

- Fires involving flammable liquids, gases, or solid materials not subject to smouldering are known as surface type fires.
- Deep Seated Fires
- A fire involving a solid material that is subject to smouldering is called a deep-seated fire.
- Rooms containing these materials should have no openings that cannot be automatically closed, other than small openings or pressure vents near the top of the enclosure.
- Additional quantities of CO2 are needed and held within the space for not less than 20 minutes.

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SYSTEM INFORMATION

Local Application Systems

Volume Method

- The volume method of system design is used where the fire hazard consists of three-dimensional irregular objects that cannot easily be reduced to equivalent surface area.
- The total discharge rate of the system is based on the volume of an assumed enclosure surrounding the hazard.
- The basic design rate is 16 kg/min/m³, but this can be adjusted to actual site conditions, subject to the degree of existing enclosure.

Area Method

- The quantity of carbon dioxide required is based upon the total discharge rate from a carefully sited nozzle arrangement, a sufficient number of nozzles being used to adequately cover the entire area on the basis of the unit area protected by each nozzle.
- For this method of design, nozzle characteristics* must be known in order to determine gas quantities in relation to pattern coverage, at varying distances.

Table 1 - To Determine Basic CO2 Quantity (Industrial Systems)

Volume - m ³	Factor - kg/m ³
Up to 4	1.15
More than 4 Up to 14	1.07
More than 14 Up to 45	1.01
More than 45 Up to 126	0.90
More than 126 Up to 1400	0.80
More than 1400	0.74

Table 2 - To Determine Higher Concentrations for Specific Hazards

	Material Conversion Factor
Acetylene	2.5
Benzol	1.1
Butadiene	1.3
Ethyl Ether	1.5
Ethylene	1.6
Hexane	1.1
Hydrogen	3.2
Kerosene	1.0
Petrol	1.0

Table 3 - Concentrations for Deep Seated Hazards

Hazard	Flooding Factor
Dry electrical wiring & insulation	1.35 kg/m ³
Computer equipment	1.5 kg/m ³
Data processing & tape storage	2.25 kg/m ³
Record Stores/archives	2.00 kg/m ³
Dust collectors	2.7 kg/m ³