

Ontario Fire Code

SECTION 5.18 *INDUSTRIAL OVENS FOR BAKING AND DRYING PROCESSES*

Illustrated Commentary



*Office of the
Ontario
Fire Marshal*

5.18.1. Application

- 5.18.1.1. This Section applies to industrial baking and drying ovens which during operation contain flammable vapours given off by the products being baked or dried.

This Article states the application of Section 5.18.

The process hazards within the baking and drying ovens may involve combustible materials, flammable liquids or flammable gases. Such hazards would occur in the curing of solvent based coating materials, roasting or drying of combustible agricultural products and other materials.



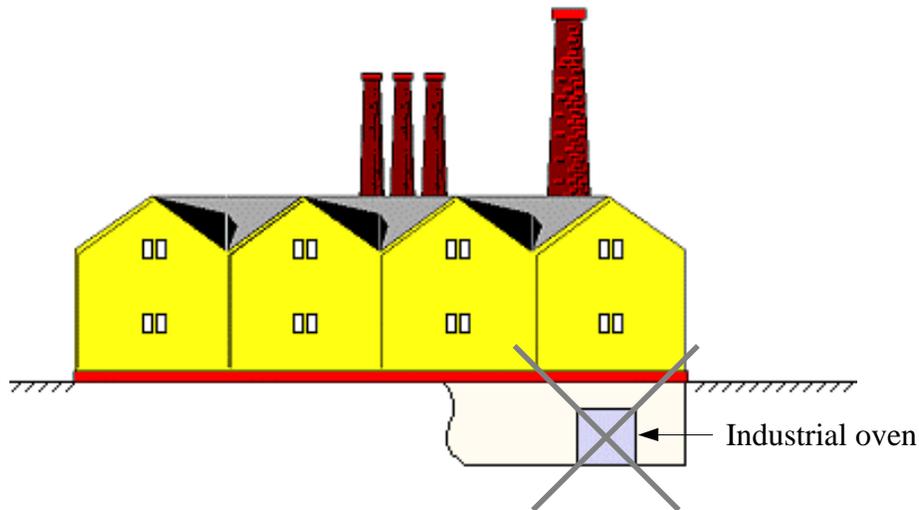
Example of an industrial oven.

5.18.2. Location

5.18.2.1. Ovens shall not be located in any **storey** below **grade**.

Prohibiting baking and drying ovens in basements or other storeys below grade is intended to reduce the risk of accumulating flammable or combustible vapours to ignitable concentrations in low areas of a building that would create a fire or explosion hazard.

Basements or other storeys located below grade can be difficult to adequately ventilate and can be difficult for firefighters to access thereby slowing down fire fighting operations.



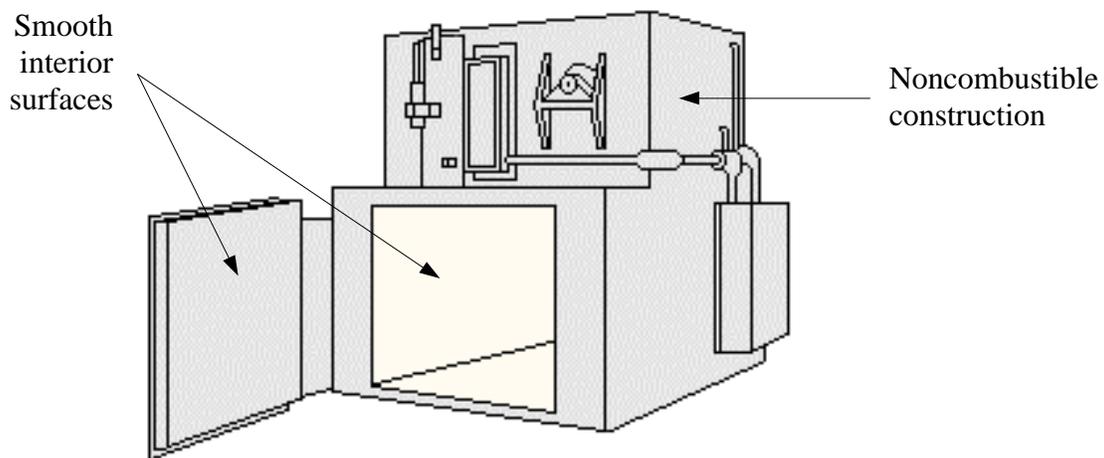
Grade means the average level of finished ground adjoining a building at all exterior walls.

Storey means that portion of a building that is situated between the top of any floor and the top of the floor next above it, and where there is no floor above it, that portion between the top of the floor and the ceiling above it.

5.18.3. Construction
Oven materials

- 5.18.3.1. Industrial ovens shall be constructed of noncombustible materials with smooth interior surfaces to permit cleaning.

The specifications for the interior surfaces used in industrial oven construction are intended to avoid accumulation of combustible deposits within the oven and facilitate cleaning. Using noncombustible materials limits the combustible content of the oven and reduces the risk of a fire involving the oven spreading to other parts of the building.



5.18.3. Construction

Limiting temperature on combustible construction

- 5.18.3.2. The roof and floor of ovens and heaters and associated ductwork shall have sufficient clearance or be insulated where necessary to prevent the temperature from exceeding 90°C at any combustible part of the **building** assembly.

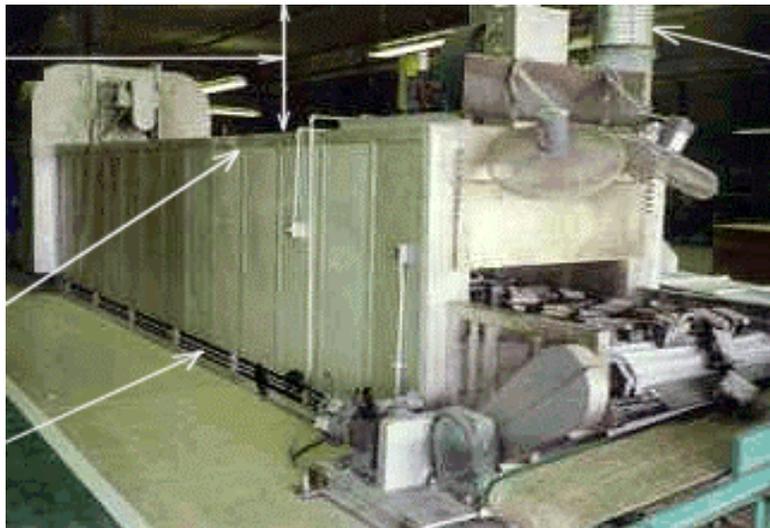
This Article indicates measures to be taken to prevent heat from the components of an oven or heater from causing ignition of adjacent combustible construction.

Limiting the potential surface temperature of adjacent combustible construction to less than 90°C reduces the risk of ignition through heat generated by the process during operation.

Sufficient clearance

Insulated roof

Insulated floor



Insulated
ductwork

Building means any structure used or intended for supporting or sheltering any use or occupancy.

5.18.3. Construction
Explosion vents

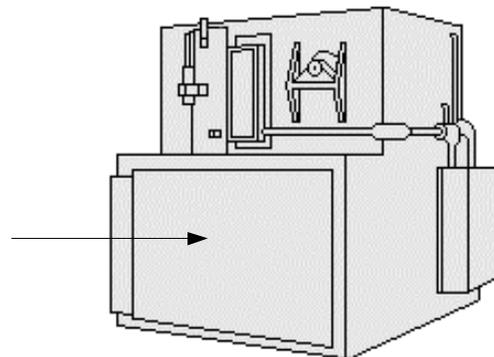
- 5.18.3.3.(1) Explosion vents shall be provided for ovens where fuel or vapour hazards are present.
- (2) Explosion vents shall be designed in conformance with NFPA 91, "Exhaust Systems for Air-Conveying of Materials", and shall have a venting ratio
- (a) of 0.2 m² of vent area for each cubic metre of oven volume, or
- (b) computed in accordance with NFPA 68, "Guide for Venting of Deflagrations", except in no case less than 650 cm² of vent area for each cubic metre of oven volume.
- (3) Openings or access doors equipped with explosion release hardware shall be acceptable as explosion vents.

The intent of Sentence (1) is to ensure that in the event that an explosion is generated inside an oven, relief vents are in place to diffuse the force of the explosion and:

- reduce the risk of endangering occupants of other parts of the building, and
- limit damage to a building or part thereof.

The intent of Sentence (2) is to ensure that explosion vents conform to NFPA requirements and that the ratio of venting area to oven volume is adequate to provide safe venting in the event of an explosion. The intent of Sentence (3) is to allow openings or access doors as explosion vents providing they are equipped with hardware approved for explosion release applications.

Access door acceptable as explosion vent when equipped with explosion release hardware (3)



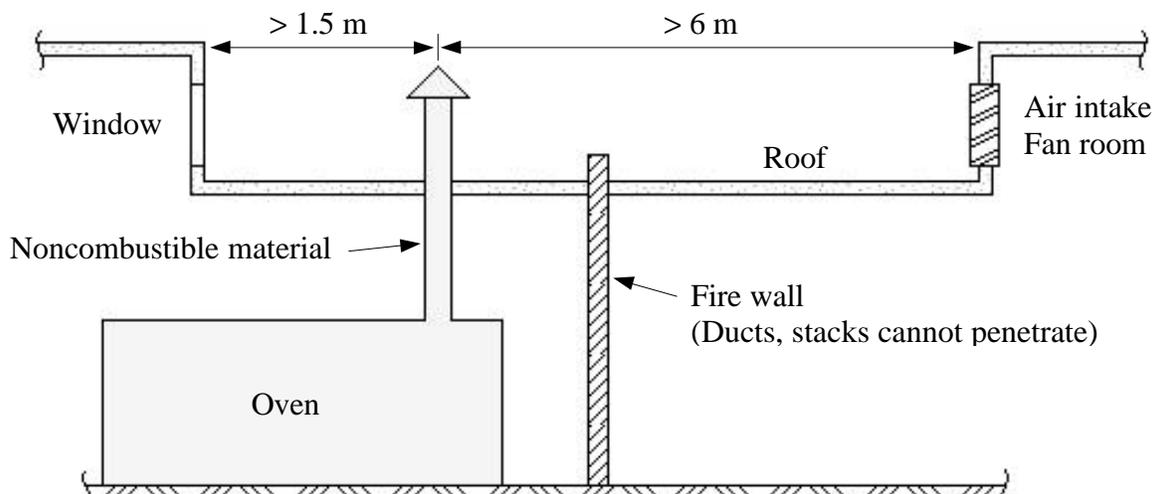
5.18.3. Construction

Duct and stack restrictions

- 5.18.3.4.(1) Ducts, stacks and associated insulation in systems for the removal of flammable vapours shall
- be constructed of noncombustible materials,
 - not pass through **firewalls**, and
 - not discharge within 1.5 m of windows or within 6 m of other air intake openings.

The intent of duct and stack restrictions specified in Sentence (1) is to:

- limit the combustible content of the duct, stacks and associated insulation in order to reduce the risk of a fire in the exhaust ventilation ductwork spreading to other parts of the building (Clause a),
- reduce the risk of a fire in the oven or its exhaust ventilation ductwork spreading to other parts of the building on the other side of the firewall (Clause b),
- reduce the risk of a fire in the exhaust ventilation ductwork or burning exhaust vapours spreading to other parts of the building or to other buildings through building openings near or facing exhaust discharge points (Clause c) and
- reduce the risk of returning flammable vapours into the building where they can accumulate to ignitable concentrations and cause a fire or explosion in the presence of a source of ignition (Clause c).



Firewall means a fire separation of noncombustible construction that subdivides a building or separates adjoining buildings to resist the spread of fire that has a fire-resistance rating as prescribed in the Building Code and that has structural stability to remain intact under fire conditions for the required fire-rated time.

5.18.4. Ventilation

Oven ventilation

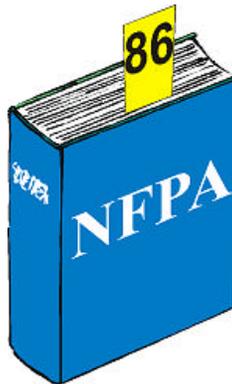
- 5.18.4.1. Ovens in which flammable vapours may be present or through which products of combustion are circulated shall be ventilated in accordance with NFPA 86, "Ovens and Furnaces".

The objective of this requirement is to minimize the risks associated with the presence of flammable vapours.

Providing ventilation of the oven in accordance with NFPA 86 will ensure that the concentration of flammable vapours and products of combustion in the oven are controlled within safe limits.

Proper ventilation includes a sufficient supply of fresh air, proper exhaust to outdoors, and properly distributed air circulation sufficient to ensure that the flammable vapour concentration throughout the oven is safely below the lower flammable limit at all times.

Due to the variety of different baking and drying processes, the ventilation system design and features provided will vary from one oven to another.



5.18.4. Ventilation

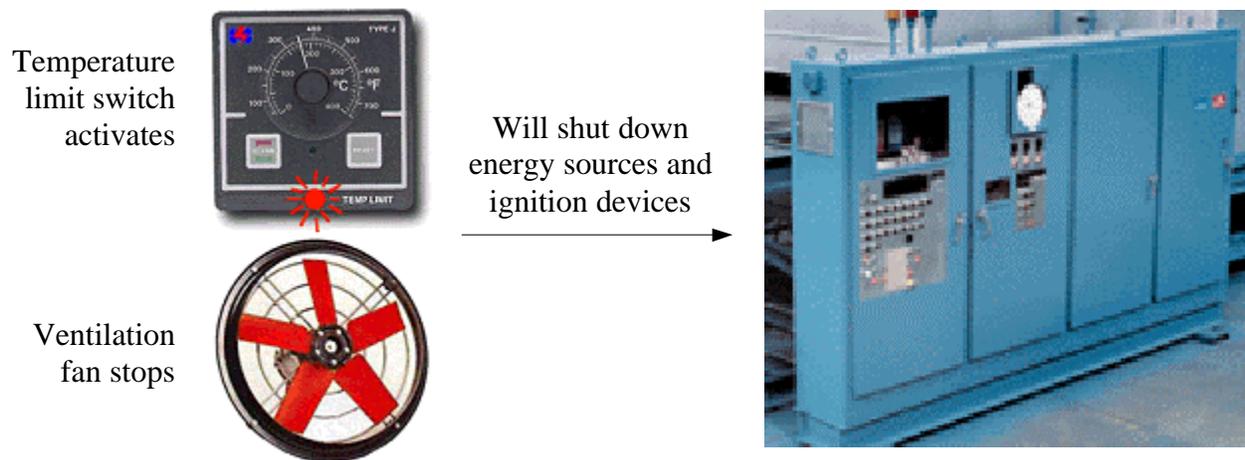
Fan interlocks

- 5.18.4.2. Where flammable vapours may be present in ovens, interlocks shall be provided to ensure that energy sources and ignition devices are de-activated when the ventilating fans stop or the excess temperature controls are activated.

The intent of this Article is to ensure that sufficient ventilation is provided during operation and that operating temperatures do not exceed safe limits.

This is accomplished by interlocks shutting down the heating elements and ignition sources in the oven whenever the ventilating fans stop or the excess temperature controls activate.

These two safeguards reduce the risk of igniting flammable vapours that may accumulate to ignitable concentrations inside an oven due to insufficient exhaust ventilation.



5.18.4. Ventilation

Fan interlocks

- 5.18.4.3. Where flammable vapours may be present in continuous process ovens, interlocks shall be provided to ensure that ventilating fans are operating before conveyors can be started and that the stopping of ventilating fans or activation of the excess temperature controls will stop the conveyors.

Conveyor interlocks ensure that:

- the conveyor will not start unless the ventilation fans are operative first,
- the conveyor will stop when the ventilating fans stop, and
- the conveyor will stop when the excess temperature controls activate.

These features ensure that any product transported by the conveyor will not increase the hazard under high temperature conditions (fire in oven) or if the ventilation fans shut down.

Temperature
limit switch
activates



Ventilation
fan stops



Will stop the
conveyor

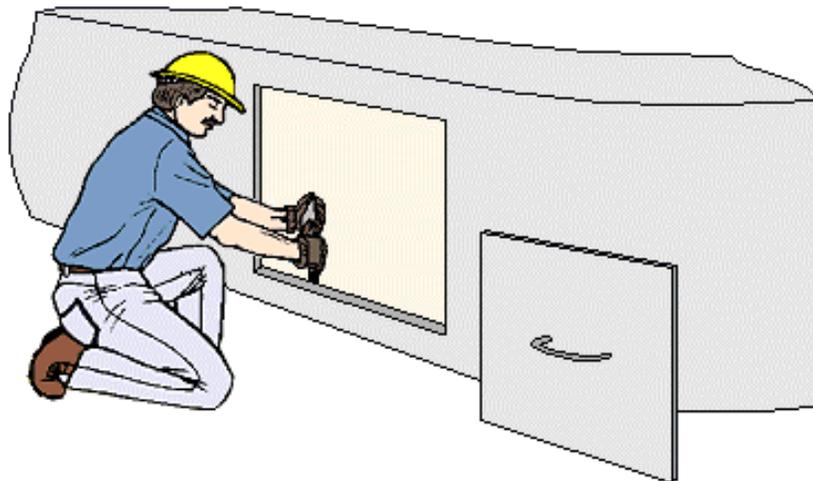


5.18.5. Maintenance*Cleaning of ovens and ductwork*

- 5.18.5.1.(1) Ovens and associated ductwork shall be **inspected**, cleaned and maintained internally and externally at intervals sufficient to prevent the accumulation of combustible deposits.
- (2) Access doors or panels shall be provided to permit **inspection**, cleaning and maintenance of ovens and associated ductwork.
- (3) Fixed noncombustible ladders, steps or grab rails shall be provided to permit access to the doors or panels required in Sentence (2).

Facilitating the inspection, cleaning and maintenance of ovens and ductwork as described in Sentence (1), (2) and (3) is intended to control accumulations of combustible deposits:

- in order to limit the combustible content and fire severity and reduce the risk of a fire in the oven or its exhaust ductwork spreading to other parts of the building, and
- to minimise the risk of obstructing the ventilation system and reduce its exhaust capacity that could create an explosive atmosphere inside or outside of the oven.

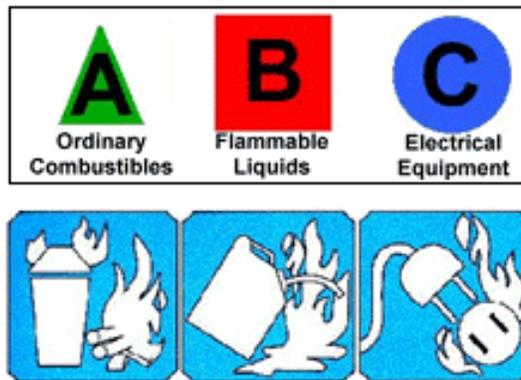


Inspect means physical examination to determine that the device or system will apparently perform in accordance with its intended function.

5.18.6. Fire Protection
Portable extinguishers

- 5.18.6.1. Portable extinguishers shall be provided in conformance with Section 6.2.

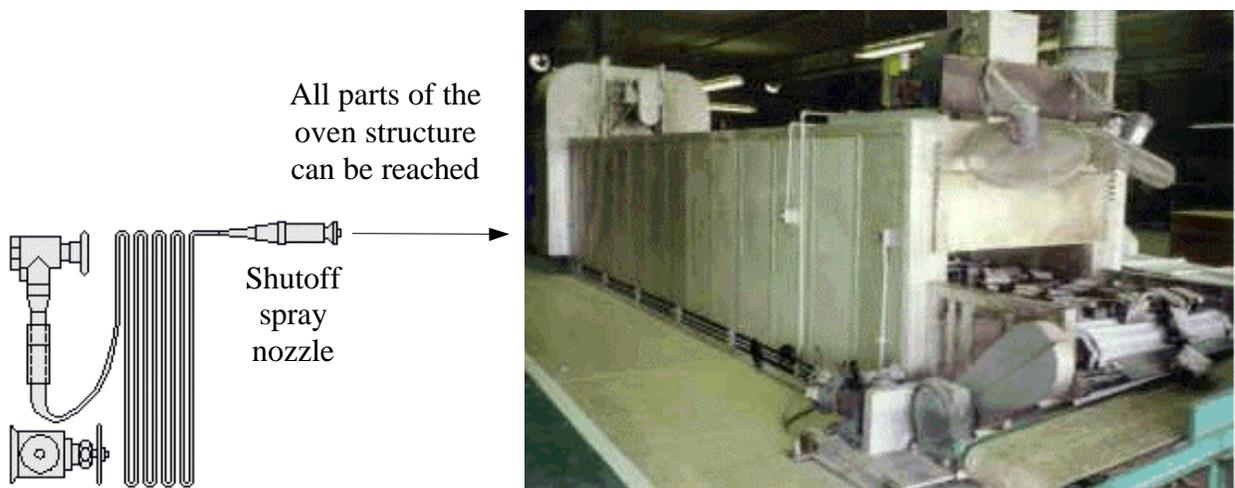
This Article is a reminder that portable fire extinguishers must be provided to facilitate quick response to extinguish a fire in its incipient stage before it evolves into a larger fire.



5.18.6. Fire Protection
Standpipe and hose systems

- 5.18.6.2. A standpipe and hose system shall be installed in conformance with the **Building Code** and equipped with shutoff spray nozzles so that all parts of an oven structure can be reached by a hose stream.

The provision of a standpipe and hose system is intended to avoid delays or ineffectiveness in conducting manual fire fighting operations that could result in the spread of fire beyond the area of origin.

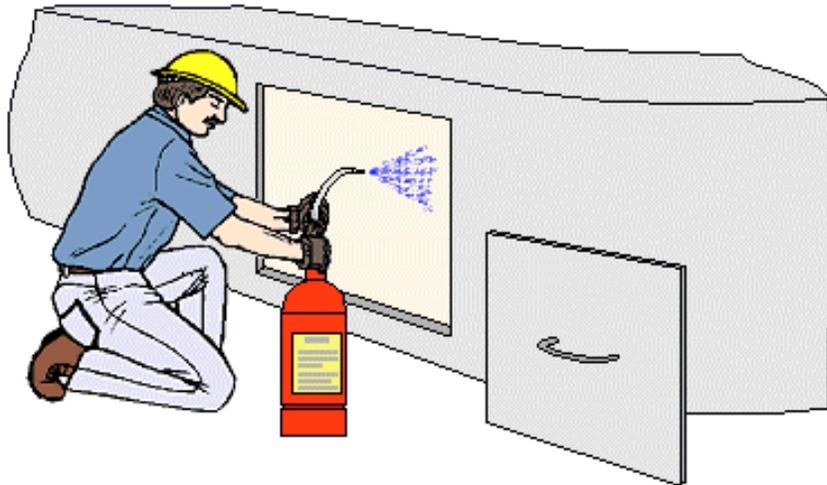


Building Code means the Ontario Building Code made under the Building Code Act or a predecessor to that Act.

5.18.6. Fire Protection
Fire access doors

- 5.18.6.3. Doors or other means of access shall be provided in ovens and associated ductwork so that portable extinguishers or hose streams may be used in all parts of the equipment.

Providing doors or other means of access for ovens and exhaust ventilation systems is intended to avoid delays or ineffectiveness in conducting manual fire fighting operations that could result in the spread of fire beyond the area of origin.

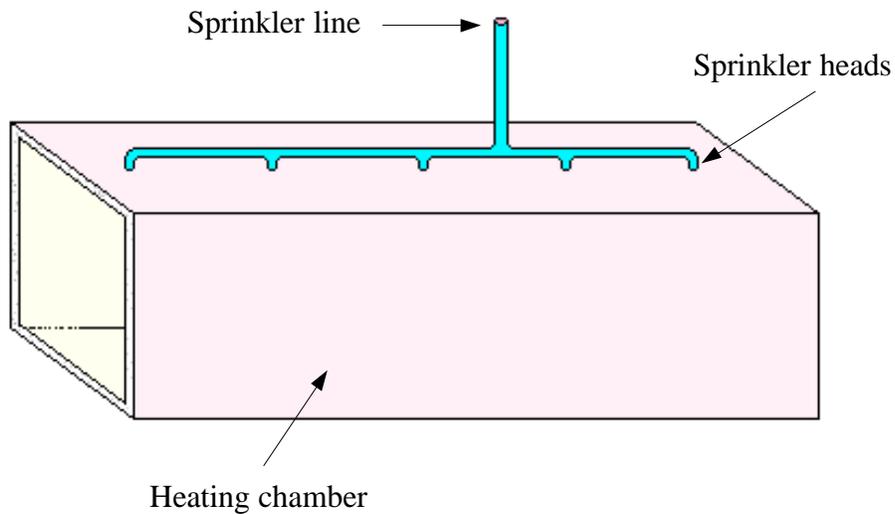


5.18.6. Fire Protection

Fire access doors

- 5.18.6.4. Ovens containing or processing sufficient combustible materials to sustain a fire shall be protected by an automatic sprinkler system or other fixed extinguishing systems.

Automatic sprinklers or other fixed extinguishing systems are necessary to extinguish a fire in ovens that contain or process sufficient combustible materials capable of sustaining a fire. The type of protection provided depends upon the construction, size and arrangement of the oven and the materials handled in it.



- Q1. Are basements acceptable locations for industrial ovens?
A1. Refer to Subsection 5.18.2.
- Q2. What materials should be used for the construction of industrial ovens?
A2. Refer to Subsection 5.18.3.
- Q3. When are explosion vents necessary and how should they be designed?
A3. Refer to Article 5.18.3.3.
- Q4. When is ventilation necessary and what are the requirements?
A4. Refer to Subsection 5.18.4.
- Q5. How often is maintenance required?
A5. Refer to Subsection 5.18.5.
- Q6. Is a standpipe and fire hose required if portable extinguishers are provided?
A6. Refer to Article 5.18.6.2.
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