

## CHAPTER 24

# TENTS AND MEMBRANE STRUCTURES

### SECTION 2401 GENERAL

- 2401.1 **Scope.** Tents and membrane structures shall comply with this chapter. The provisions of Section 2403 are applicable only to temporary membrane structures. The provisions of Section 2404 are applicable to temporary and permanent membrane structures.

### SECTION 2402 DEFINITIONS

**2402.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**AIR-SUPPORTED STRUCTURE.** A structure wherein the shape of the structure is attained by air pressure, and occupants of the structure are within the elevated pressure area.

**MEMBRANE STRUCTURE.** An air-inflated, air-supported, cable or frame-covered structure as defined by the *International Building Code* and not otherwise defined as a tent or canopy. See Chapter 31 of the *International Building Code*.

**TENT.** Any structure, enclosure or shelter, other than a canopy, with or without sidewalls or drops constructed of fabric or pliable material supported by any manner except by air or the contents it protects.

### SECTION 2403 TEMPORARY TENTS AND MEMBRANE STRUCTURES

**2403.1 General.** All temporary tents and membrane structures shall comply with this section.

**2403.2 Approval required.** Tents and membrane structures having an area in excess of 200 square feet (19 m<sup>2</sup>) shall not be erected, operated or maintained for any purpose without first obtaining a permit and approval from the fire code official.

**Exception:** Tents used exclusively for recreational camping purposes.

**2403.3 Place of assembly.** For the purposes of this chapter, a place of assembly shall include a circus, carnival, tent show, theater, skating rink, dance hall or other place of assembly in or under which persons gather for any purpose.

**2403.4 Permits.** Permits shall be required as set forth in Sections 105.6 and 105.7.

**2403.5 Use period.** Temporary tents and air-supported, air-inflated or tensioned membrane structures shall not be erected for a period of more than 180 days within a 12-month period on a single premises.

**2403.6 Construction documents.** A detailed site and floor plan for tents or membrane structures with an occupant load of

50 or more shall be provided with each application for approval. The tent or membrane structure floor plan shall indicate details of the means of egress facilities, seating capacity, arrangement of the seating and location and type of heating and electrical equipment.

**2403.7 Inspections.** The entire tent, air-supported, air-inflated or tensioned membrane structure system shall be inspected at regular intervals, but not less than two times per permit use period, by the permittee, owner or agent to determine that the installation is maintained in accordance with this chapter.

**Exception:** Permit use periods of less than 30 days.

**2403.7.1 Inspection report.** When required by the fire code official, an inspection report shall be provided and shall consist of maintenance, anchors and fabric inspections.

**2403.8 Access, location and parking.** Access location and parking for temporary tents and membrane structures shall be in accordance with this section.

**2403.8.1 Access.** Fire apparatus access roads shall be provided in accordance with Section 503.

**2403.8.2 Location.** Tents or membrane structures shall not be located within 20 feet (6096 mm) of lot lines, buildings, other tents or membrane structures, parked vehicles or internal combustion engines. For the purpose of determining required distances, support ropes and guy wires shall be considered as part of the temporary membrane structure or tent.

#### Exceptions:

1. Separation distance between membrane structures and tents not used for cooking, is not required when the aggregate floor area does not exceed 15,000 square feet (1394 m<sup>2</sup>).
2. Membrane structures or tents need not be separated from buildings when all of the following conditions are met:
  - 2.1. The aggregate floor area of the membrane structure or tent shall not exceed 10,000 square feet (929 m<sup>2</sup>).
  - 2.2. The aggregate floor area of the building and membrane structure or tent shall not exceed the allowable floor area including increases as indicated in the *International Building Code*.
  - 2.3. Required means of egress provisions are provided for both the building and the membrane structure or tent, including travel distances.
  - 2.4. Fire apparatus access roads are provided in accordance with Section 503.

**2403.8.3 Location of structures in excess of 15,000 square feet in area.** Membrane structures having an area of 15,000 square feet (1394 m<sup>2</sup>) or more shall be located not less than 50 feet (15 240 mm) from any other tent or structure as measured from the sidewall of the tent or membrane structure unless joined together by a corridor.

**2403.8.4 Connecting corridors.** Tents or membrane structures are allowed to be joined together by means of corridors. Exit doors shall be provided at each end of such corridor. On each side of such corridor and approximately opposite each other, there shall be provided openings not less than 12 feet (3658 mm) wide.

**2403.8.5 Fire break.** An unobstructed fire break passageway or fire road not less than 12 feet (3658 mm) wide and free from guy ropes or other obstructions shall be maintained on all sides of all tents and membrane structures unless otherwise approved by the fire code official.

**2403.9 Anchorage required.** Tents or membrane structures and their appurtenances shall be adequately roped, braced and anchored to withstand the elements of weather and prevent against collapsing. Documentation of structural stability shall be furnished to the fire code official on request.

**2403.10 Temporary air-supported and air-inflated membrane structures.** Temporary air-supported and air-inflated membrane structures shall be in accordance with Sections 2403.10.1 through 2403.10.4.

**2403.10.1 Door operation.** During high winds exceeding 50 miles per hour (22 m/s) or in snow conditions, the use of doors in air-supported structures shall be controlled to avoid excessive air loss. Doors shall not be left open.

**2403.10.2 Fabric envelope design and construction.** Air-supported and air-inflated structures shall have the design and construction of the fabric envelope and the method of anchoring in accordance with Architectural Fabric Structures Institute ASI 77.

**2403.10.3 Blowers.** An air-supported structure used as a place of assembly shall be furnished with not less than two blowers, each of which has adequate capacity to maintain full inflation pressure with normal leakage. The design of the blower shall be so as to provide integral limiting pressure at the design pressure specified by the manufacturer.

**2403.10.4 Auxiliary power.** Places of public assembly for more than 200 persons shall be furnished with either a fully automatic auxiliary engine-generator set capable of powering one blower continuously for 4 hours, or a supplementary blower powered by an internal combustion engine which shall be automatic in operation.

**2403.11 Seating arrangements.** Seating in tents or membrane structures shall be in accordance with Chapter 10.

**2403.12 Means of egress.** Means of egress for temporary tents and membrane structures shall be in accordance with Sections 2403.12.1 through 2403.12.8.

**2403.12.1 Distribution.** Exits shall be spaced at approximately equal intervals around the perimeter of the tent or membrane structure, and shall be located such that all points are 100 feet (30 480 mm) or less from an exit.

**2403.12.2 Number.** Tents or membrane structures or a usable portion thereof shall have at least one exit and not less than the number of exits required by Table 2403.12.2. The total width of means of egress in inches (mm) shall not be less than the total occupant load served by a means of egress multiplied by 0.2 inches (5 mm) per person.

**TABLE 2403.12.2  
MINIMUM NUMBER OF MEANS OF EGRESS AND MEANS OF EGRESS WIDTHS FROM TEMPORARY MEMBRANE STRUCTURES AND TENTS**

OCCUPANT LOAD	MINIMUM NUMBER OF MEANS OF EGRESS	MINIMUM WIDTH OF EACH MEANS OF EGRESS (inches)	MINIMUM WIDTH OF EACH MEANS OF EGRESS (inches)
		Tent	Membrane Structure
10 to 199	2	72	36
200 to 499	3	72	72
500 to 999	4	96	72
1,000 to 1,999	5	120	96
2,000 to 2,999	6	120	96
Over 3,000 <sup>a</sup>	7	120	96

For SI: 1 inch = 25.4 mm.

a. When the occupant load exceeds 3,000, the total width of means of egress (in inches) shall not be less than the total occupant load multiplied by 0.2 inches per person.

**2403.12.3 Exit openings from tents.** Exit openings from tents shall remain open unless covered by a flame-resistant curtain. The curtain shall comply with the following requirements:

1. Curtains shall be free sliding on a metal support. The support shall be a minimum of 80 inches (2032 mm) above the floor level at the exit. The curtains shall be so arranged that, when open, no part of the curtain obstructs the exit.
2. Curtains shall be of a color, or colors, that contrasts with the color of the tent.

**2403.12.4 Doors.** Exit doors shall swing in the direction of exit travel. To avoid hazardous air and pressure loss in air-supported membrane structures, such doors shall be automatic closing against operating pressures. Opening force at the door edge shall not exceed 15 pounds (66 N).

**2403.12.5 Aisle.** The width of aisles without fixed seating shall be in accordance with the following:

1. In areas serving employees only, the minimum aisle width shall be 24 inches (610 mm) but not less than the width required by the number of employees served.
2. In public areas, smooth-surfaced, unobstructed aisles having a minimum width of not less than 44 inches (1118 mm) shall be provided from seating areas, and aisles shall be progressively increased in width to provide, at all points, not less than 1 foot (305 mm) of aisle width for each 50 persons served by such aisle at that point.

**2403.12.5.1 Arrangement and maintenance.** The arrangement of aisles shall be subject to approval by the fire code official and shall be maintained clear at all times during occupancy.

**2403.12.6 Exit signs.** Exits shall be clearly marked. Exit signs shall be installed at required exit doorways and where otherwise necessary to indicate clearly the direction of egress when the exit serves an occupant load of 50 or more.

**2403.12.6.1 Exit sign illumination.** Exit signs shall be of an approved self-luminous type or shall be internally or externally illuminated by luminaires supplied in the following manner:

1. Two separate circuits, one of which shall be separate from all other circuits, for occupant loads of 300 or less; or
2. Two separate sources of power, one of which shall be an approved emergency system, shall be provided when the occupant load exceeds 300. Emergency systems shall be supplied from storage batteries or from the on-site generator set, and the system shall be installed in accordance with the *International Code Council Electrical Code—Administrative Provisions*.

**2403.12.7 Means of egress illumination.** Means of egress shall be illuminated with light having an intensity of not less than 1 foot-candle (11 lux) at floor level while the structure is occupied. Fixtures required for means of egress illumination shall be supplied from a separate circuit or source of power.

**2403.12.8 Maintenance of means of egress.** The required width of exits, aisles and passageways shall be maintained at all times to a public way. Guy wires, guy ropes and other support members shall not cross a means of egress at a height of less than 8 feet (2438 mm). The surface of means of egress shall be maintained in an approved manner.

## SECTION 2404 TEMPORARY AND PERMANENT TENTS AND MEMBRANE STRUCTURES

**2404.1 General.** All tents and membrane structures, both temporary and permanent, shall be in accordance with this section. Permanent tents and membrane structures shall also comply with the *International Building Code*.

**2404.2 Flame propagation performance treatment.** Before a permit is granted, the owner or agent shall file with the fire code official a certificate executed by an approved testing laboratory certifying that the tents and membrane structures and their appurtenances; sidewalls, drops and tarpaulins; floor coverings, bunting and combustible decorative materials and effects, including sawdust when used on floors or passageways, shall be composed of material meeting the flame propagation performance criteria of NFPA 701 or shall be treated with a flame retardant in an approved manner and meet the flame propagation performance criteria of NFPA 701, and that such flame propagation performance criteria are effective for the period specified by the permit.

**2404.3 Label.** Membrane structures or tents shall have a permanently affixed label bearing the identification of size and fabric or material type.

**2404.4 Certification.** An affidavit or affirmation shall be submitted to the fire code official and a copy retained on the premises on which the tent or air-supported structure is located. The affidavit shall attest to the following information relative to the flame propagation performance criteria of the fabric:

1. Names and address of the owners of the tent or air-supported structure.
2. Date the fabric was last treated with flame-retardant solution.
3. Trade name or kind of chemical used in treatment.
4. Name of person or firm treating the material.
5. Name of testing agency and test standard by which the fabric was tested.

**2404.5 Combustible materials.** Hay, straw, shavings or similar combustible materials shall not be located within any tent or membrane structure containing an assembly occupancy, except the materials necessary for the daily feeding and care of animals. Sawdust and shavings utilized for a public performance or exhibit shall not be prohibited provided the sawdust and shavings are kept damp. Combustible materials shall not be permitted under stands or seats at any time. The areas within and adjacent to the tent or air-supported structure shall be maintained clear of all combustible materials or vegetation that could create a fire hazard within 20 feet (6096 mm) of the structure. Combustible trash shall be removed at least once a day from the structure during the period the structure is occupied by the public.

**2404.6 Smoking.** Smoking shall not be permitted in tents or membrane structures. Approved "No Smoking" signs shall be conspicuously posted in accordance with Section 310.

**2404.7 Open or exposed flame.** Open flame or other devices emitting flame, fire or heat or any flammable or combustible liquids, gas, charcoal or other cooking device or any other unapproved devices shall not be permitted inside or located within 20 feet (6096 mm) of the tent or membrane structures while open to the public unless approved by the fire code official.

**2404.8 Fireworks.** Fireworks shall not be used within 100 feet (30 480 mm) of tents or membrane structures.

**2404.9 Spot lighting.** Spot or effect lighting shall only be by electricity, and all combustible construction located within 6 feet (1829 mm) of such equipment shall be protected with approved noncombustible insulation not less than 9.25 inches (235 mm) thick.

**2404.10 Safety film.** Motion pictures shall not be displayed in tents or membrane structures unless the motion picture film is safety film.

**2404.11 Clearance.** There shall be a minimum clearance of at least 3 feet (914 mm) between the fabric envelope and all contents located inside the tent or membrane structure.

**2404.12 Portable fire extinguishers.** Portable fire extinguishers shall be provided as required by Section 906.

**2404.13 Fire protection equipment.** Fire hose lines, water supplies and other auxiliary fire equipment shall be maintained at the site in such numbers and sizes as required by the fire code official.

**2404.14 Occupant load factors.** The occupant load allowed in an assembly structure, or portion thereof, shall be determined in accordance with Chapter 10.

**2404.15 Heating and cooking equipment.** Heating and cooking equipment shall be in accordance with Sections 2404.15.1 through 2404.15.7.

**2404.15.1 Installation.** Heating or cooking equipment, tanks, piping, hoses, fittings, valves, tubing and other related components shall be installed as specified in the *International Mechanical Code* and the *International Fuel Gas Code*, and shall be approved by the fire code official.

**2404.15.2 Venting.** Gas, liquid and solid fuel-burning equipment designed to be vented shall be vented to the outside air as specified in the *International Fuel Gas Code* and the *International Mechanical Code*. Such vents shall be equipped with approved spark arresters when required. Where vents or flues are used, all portions of the tent or membrane structure shall be not less than 12 inches (305 mm) from the flue or vent.

**2404.15.3 Location.** Cooking and heating equipment shall not be located within 10 feet (3048 mm) of exits or combustible materials.

**2404.15.4 Operations.** Operations such as warming of foods, cooking demonstrations and similar operations that use solid flammables, butane or other similar devices which do not pose an ignition hazard, shall be approved.

**2404.15.5 Cooking tents.** Tents where cooking is performed shall be separated from other tents or membrane structures by a minimum of 20 feet (6096 mm).

**2404.15.6 Outdoor cooking.** Outdoor cooking that produces sparks or grease-laden vapors shall not be performed within 20 feet (6096 mm) of a tent or membrane structure.

**2404.15.7 Electrical heating and cooking equipment.** Electrical cooking and heating equipment shall comply with the *International Code Council Electrical Code—Administrative Provisions*.

**2404.16 LP-gas.** The storage, handling and use of LP-gas and LP-gas equipment shall be in accordance with Sections 2406.16.1 through 2404.16.3.

**2404.16.1 General.** LP-gas equipment such as tanks, piping, hoses, fittings, valves, tubing and other related components shall be approved and in accordance with Chapter 38 and with the *International Fuel Gas Code*.

**2404.16.2 Location of containers.** LP-gas containers shall be located outside. Safety release valves shall be pointed away from the tent or membrane structure.

**2404.16.2.1 Containers 500 gallons or less.** Portable LP-gas containers with a capacity of 500 gallons (1893 L) or less shall have a minimum separation between the container and structure not less than 10 feet (3048 mm).

**2404.16.2.2 Containers more than 500 gallons.** Portable LP-gas containers with a capacity of more than 500 gallons (1893 L) shall have a minimum separation between the container and structures not less than 25 feet (7620 mm).

**2404.16.3 Protection and security.** Portable LP-gas containers, piping, valves and fittings which are located outside and are being used to fuel equipment inside a tent or membrane structure shall be adequately protected to prevent tampering, damage by vehicles or other hazards and shall be located in an approved location. Portable LP-gas containers shall be securely fastened in place to prevent unauthorized movement.

**2404.17 Flammable and combustible liquids.** The storage of flammable and combustible liquids and the use of flammable-liquid-fueled equipment shall be in accordance with Sections 2404.17.1 through 2404.17.3.

**2404.17.1 Use.** Flammable-liquid-fueled equipment shall not be used in tents or membrane structures.

**2404.17.2 Flammable and combustible liquid storage.** Flammable and combustible liquids shall be stored outside in an approved manner not less than 50 feet (15 240 mm) from tents or membrane structures. Storage shall be in accordance with Chapter 34.

**2404.17.3 Refueling.** Refueling shall be performed in an approved location not less than 20 feet (6096 mm) from tents or membrane structures.

**2404.18 Display of motor vehicles.** Liquid- and gas-fueled vehicles and equipment used for display within tents or membrane structures shall be in accordance with Sections 2404.18.1 through 2404.18.5.3.

**2404.18.1 Batteries.** Batteries shall be disconnected in an appropriate manner.

**2404.18.2 Fuel systems.** Vehicles or equipment shall not be fueled or defueled within the tent or membrane structure.

**2404.18.2.1 Quantity limit.** Fuel in the fuel tank shall not exceed one-quarter of the tank capacity or 5 gallons (19 L), whichever is less.

**2404.18.2.2 Inspection.** Fuel systems shall be inspected for leaks.

**2404.18.2.3 Closure.** Fuel tank openings shall be locked and sealed to prevent the escape of vapors.

**2404.18.3 Location.** The location of vehicles or equipment shall not obstruct means of egress.

**2404.18.4 Places of assembly.** When a compressed natural gas (CNG) or liquefied petroleum gas (LP-gas) powered vehicle is parked inside a place of assembly, all the following conditions shall be met:

1. The quarter-turn shutoff valve or other shutoff valve on the outlet of the CNG or LP-gas container shall be closed and the engine shall be operated until it stops. Valves shall remain closed while the vehicle is indoors.
2. The hot lead of the battery shall be disconnected.

3. Dual-fuel vehicles equipped to operate on gasoline and CNG or LP-gas shall comply with this section and Sections 2404.18.1 through 2404.18.5.3 for gasoline-powered vehicles.

**2404.18.5 Competitions and demonstrations.** Liquid- and gas-fueled vehicles and equipment used for competition or demonstration within a tent or membrane structure shall comply with Sections 2404.18.5.1 through 2404.18.5.3.

**2404.18.5.1 Fuel storage.** Fuel for vehicles or equipment shall be stored in approved containers in an approved location outside of the structure in accordance with Section 2404.17.2.

**2404.18.5.2 Fueling.** Refueling shall be performed outside of the structure in accordance with Section 2404.17.3.

**2404.18.5.3 Spills.** Fuel spills shall be cleaned up immediately.

**2404.19 Separation of generators.** Generators and other internal combustion power sources shall be separated from tents or membrane structures by a minimum of 20 feet (6096 mm) and shall be isolated from contact with the public by fencing, enclosure or other approved means.

**2404.20 Standby personnel.** When, in the opinion of the fire code official, it is essential for public safety in a tent or membrane structure used as a place of assembly or any other use where people congregate, because of the number of persons, or the nature of the performance, exhibition, display, contest or activity, the owner, agent or lessee shall employ one or more qualified persons, as required and approved, to remain on duty during the times such places are open to the public, or when such activity is being conducted.

Before each performance or the start of such activity, standby personnel shall keep diligent watch for fires during the time such place is open to the public or such activity is being conducted and take prompt measures for extinguishment of fires that occur and assist in the evacuation of the public from the structure.

There shall be trained crowd managers or crowd manager supervisors at a ratio of one crowd manager/supervisor for every 250 occupants, as approved.

**2404.21 Vegetation removal.** Combustible vegetation shall be removed from the area occupied by a tent or membrane structure, and from areas within 30 feet (9144 mm) of such structures.

**2404.22 Waste material.** The floor surface inside tents or membrane structures and the grounds outside and within a 30-foot (9144 mm) perimeter shall be kept clear of combustible waste. Such waste shall be stored in approved containers until removed from the premises.

