



HOUSTON FIRE DEPARTMENT LIFE SAFETY BUREAU (LSB)



LSB STANDARD 22 REV 03 TENTS AND OTHER MEMBRANE STRUCTURES

SUPERSEDES: LSB Standard 22 Rev. 02, dated 12/31/2010

Note: A vertical bar in the left-hand column indicates changes since the previous version.

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LSB Standards are established in accordance with provisions of the City of Houston Fire Code. They are subject to the administrative sections covering alternative materials and methods, modifications, and the Board of Appeals.

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LSB STANDARD 22 Rev 03

TENTS AND OTHER MEMBRANE STRUCTURES

SECTION 22.1 --- GENERAL

22.1.1 Scope.

Use of tents, canopies, and air-supported, air-inflated or tensioned membrane structures within the City of Houston shall be in accordance with the “*City of Houston Fire Code*” (*Fire Code*) and this standard.

22.1.2 Purpose.

This standard shall provide guidelines on the use of and permitting requirements for temporary tents or other membrane structures.

SECTION 22.2 --- DEFINITIONS

22.2.1 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.

22.2.2 Canopy.

A structure, enclosure or shelter constructed of fabric or pliable materials supported by any manner, except by air or the contents it protects, and is open without sidewalls or drops on 75 percent or more of the perimeter.

22.2.3 Fire Marshal.

The Fire Marshal or duly authorized representative.

22.2.4 Place of assembly.

For the purposes of this standard, a place of assembly shall include a circus, carnival, tent show, theater, skating rink, dance hall, religious observance, benefit functions or other such assembly purposes in or under which 50 or more persons gather for any purpose.

22.2.5 Tent.

A structure, enclosure or shelter constructed of fabric or pliable material supported by any manner except by air or the contents that it protects.

SECTION 22.3 --- APPROVAL REQUIREMENTS

22.3.1 Approval required.

Tents, canopies, and membrane structures having an area of 1200 square feet or more, shall not be erected, operated or maintained for any purpose without first obtaining a permit and approval from the Fire Marshal.

Exception:

1. Tents used exclusively for recreational camping purposes

22.3.2 Building code approval.

Tents and other membrane structures having an area in excess of 1200 square feet intended to be erected for other than temporary public assembly use shall have approval by the City of Houston Building Official. Where the tent or other membrane structure occupies the same property with other buildings or structures, those buildings or structures shall have posted on site an approved ***Certificate of Occupancy*** issued in accordance with the *Building Code*.

22.3.3 Permit required.

A Fire Marshal Approval is required to erect a tent and other membrane structures having an area of 1,200 square feet or more, for any purpose. Permit applications submitted less than 5 business days prior to the event will incur special handling fees.

Permit Office contact information for Tents or Membrane Structures is as follows:

The Houston Permitting Center

1002 Washington Avenue

Houston, Texas 77007

Hours of operation: 8:00 a.m. to 3:30 p.m. Central Time

Monday through Friday

Office phone (832)394-8811

To Email Customer Service Questions: hfd.permitoffice@houstontx.gov

Link to City Wide Fee Schedule: www.houstoncityfees.org

22.3.4 Permit approval.

22.3.5 Plans provided.

Where tents, canopies, air-supported, air-inflated or tensioned membrane structures are used for assembly with an occupant load of 50 or more, or used for temporary display or storage of goods and merchandise, detailed site and floor plans shall be provided with each permit application. The site and floor plan shall indicate details of the fire and emergency vehicle access, means of egress facilities, seating capacity, arrangement of the seating, location of stages, and location and type of heating, cooking and electrical equipment.

22.3.6 Period of permitted use.

Temporary tents, air-supported, air-inflated or tensioned membrane structures and canopies shall be not used for any purpose for a period of ***more than 180 days*** within a 12-month period on a single premise.

SECTION 22.4 --- LOCATION

22.4.1 Location.

Temporary membrane structures, tents, canopies, air-supported, or air-inflated structures shall not be located within 20 feet of lot lines, buildings, other temporary membrane structures, other tents and canopies, 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, tent or canopy. For exceptions see the *Fire Code*

22.4.2 Location of structures in excess of 15,000 square feet in area.

Tents, air-supported, air-inflated or tensioned membrane structures having an area of 15,000 square feet or more shall be located not less than 50 feet from any other tent or structure as measured from the side wall of the tent unless joined together by a corridor.

22.4.3 Connecting corridors.

Tents, air-supported, air-inflated or tensioned 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 wide.

22.4.4 Fire break.

An unobstructed fire break passageway or fire road not less than 12 feet wide and free from guy ropes or other obstructions shall be maintained on all sides of all tents, air supported, air-inflated or tensioned membrane structures unless otherwise approved by the Fire Marshal.

22.4.5 Anchorage and stability required.

Tents, air-supported, air-inflated or tensioned 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 Marshal on request.

SECTION 22.5 --- FIRE SAFETY REQUIREMENTS

22.5.1 Flame-resistant treatment.

Before a permit is granted, the owner or owner's agent shall provide the Fire Marshal a certificate issued by an approved testing laboratory, certifying that the tents, air-supported, air-inflated or tensioned membrane structures and their appurtenances, sidewalls, drops and tops of temporary membrane structures, canopies, tarpaulins, floor coverings, bunting, combustible decorative materials and effects, including sawdust when used on floors or passageways, shall be composed of flame-resistant material or shall be treated with a flame retardant in an approved manner and meet the requirements for flame resistance as determined in accordance with NFPA 701, and that such flame resistance is effective for the period specified by the permit.

22.5.2 Label.

Temporary membrane structures, tents or canopies shall have a permanently affixed label bearing the identification of size and fabric or material type. Label shall be located so as to be readily accessible and legible.

22.5.3 Certification.

An affidavit or affirmation shall be provided to the Fire Marshal, and a copy shall be retained on the premises on which the tent or air-supported structure is located and be

readily available for inspection by the Fire Marshal. The affidavit shall attest to the following information relative to the flame resistance 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-resistant 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.

22.5.4 Combustible materials.

Hay, straw, shavings or similar combustible materials shall not be located within any tent or air-supported structure containing an assembly occupancy. Sawdust and shavings utilized for a public performance or exhibit may be permitted, provided the sawdust and shavings are dampened with water so that dust is not produced from the sawdust or shavings. 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 from the structure. Combustible trash shall be removed at least once a day from the structure and stored in approved containers located at least 20 feet from the structure.

Exception: the materials necessary for the daily feeding and care of animals.

22.5.5 Interior contents clearance.

There shall be a minimum clearance of at least 3 feet between the fabric envelope and all contents located inside the air-supported structure.

22.5.6 Smoking prohibition.

Smoking shall not be permitted in tents or air supported structures. Approved "No Smoking" signs shall be conspicuously posted at all entrances into and exits from the tent or air supported structure, at any location where alcoholic beverages may be dispensed, and in accordance with the *Fire Code*.

22.5.7 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 of the tent, air-supported, air-inflated or tensioned membrane structures while open to the public unless approved by the Fire Marshal.

22.5.8 Pyrotechnic displays.

Pyrotechnic displays shall not be used within 100 feet of tents, canopies, air-supported, air-inflated or tensioned membrane structures.

22.5.9 Spot lighting.

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

22.5.10 Safety film.

Motion pictures shall not be displayed in tents, air-supported, air-inflated or tensioned membrane structures unless the motion picture film is safety film.

22.5.11 Electrical lighting, wiring and equipment.

All electrical lighting, wiring and equipment shall comply with the *Electrical Code*. Temporary wiring shall be in accordance with the *Electrical Code*, and shall not be affixed to metal supports of a tent, canopy, air-supported, air-inflated or tensioned membrane structure except in a manner approved by the Fire Marshal. Extension cord and multi-adaptor use shall be in accordance with the *Fire Code*. All decorative and/or seasonal lighting wiring and devices shall be UL (or similarly approved) Listed.

SECTION 22.6 --- FIRE PROTECTION

22.6.1 Fire extinguishers.

Listed portable fire extinguishers shall be provided in every tent, canopy, air-supported, air-inflated or tensioned membrane structure as follows:

1. 200-500 square feet of floor area: One 2-A:10-B:C rated portable fire extinguisher. 501-1000 square feet of floor area: Two 2-A:10-B:C rated portable fire extinguisher. Each additional 2000 square feet of floor area or fraction thereof: One 2-A:10-B:C rated portable fire extinguisher.
2. At least one 40-B:C rated portable fire extinguisher shall be provided for each kitchen, mess hall, power generator or transformer and at locations where flammable and combustible liquids are used, stored or dispensed, and as required by the Fire Marshal.
3. All fire extinguishers shall have a current annual inspection tag by an approved licensed fire protection equipment company.
4. Portable fire extinguishers shall be maintained in a fully charged and operable condition.
5. Portable fire extinguishers shall be conspicuously located where they will be readily accessible and immediately available in the event of fire. Preferably they shall be located along normal unobstructed paths of travel, including exits from areas.

22.6.2 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 Marshal.

SECTION 22.7 --- OCCUPANT LOAD AND SEATING

22.7.1 Occupant loads.

The occupant load allowed in an assembly structure, or portion thereof, shall be determined in accordance with the *Fire Code*.

Maximum Floor Area Allowance Per Occupant:

Assembly without fixed seats;

Concentrated (chairs only—not fixed) = 7 sq ft per person

Standing space = 5 sq ft per person

Un-concentrated (tables and chairs) = 15 sq ft per person

22.7.2 Seating arrangements.

Seating in tents, canopies, air-supported, air-inflated or tensioned membrane structures, temporary membrane structures shall be in accordance with the *Fire Code*.

22.7.3 Posting of occupant load.

Where a tent, canopy, air-supported, air-inflated or tensioned membrane structure is used for assembly with an occupant load of 50 or more, the occupant load of the tent, canopy, air-supported, air-inflated or tensioned membrane structure shall be posted in a conspicuous place, near the main access doorway. Posted signs shall be of an approved legible design, constructed of weather resistant materials and indicating the number of occupants permitted within the tent, canopy, air-supported, air-inflated or tensioned membrane structure. Posted signs shall be maintained by the owner or authorized agent.

SECTION 22.8 --- EXITS

22.8.1 Number required.

Tents, canopies, air-supported, air-inflated or tensioned membrane structures, temporary membrane structures or usable portion thereof shall have at least one exit and not less than the number of exits required by the *Fire Code*. The widths of means of egress required shall be divided approximately equally among the separate means of egress. The total width of means of egress in inches shall not be less than the total occupant load served by a means of egress multiplied by 0.2 inches per person. (See Table 22.8 of Appendix A)

22.8.2 Distribution of exits.

Exits shall be spaced at approximately equal intervals around the perimeter of the tent, canopy, air-supported, air-inflated or tensioned membrane structure, temporary membrane structure, and shall be located such that all points are 100 feet or less from an exit.

22.8.3 Exit openings.

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 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 contrast with the color of the tent.

22.8.4 Doors.

Exit doors shall swing in the direction of exit travel. To avoid hazardous air and pressure loss, such doors shall be automatic-closing against operating pressures. Opening force at the door edge shall not exceed 15 pounds.

22.8.5 Aisles.

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.
2. In public areas, smooth-surfaced, unobstructed aisles having a minimum width of not less than 44 inches shall be provided from seating areas, and aisles shall be progressively increased in width to provide, at all points, not less than 1 foot of aisle width for each 50 persons served by such aisle at that point.

22.8.6 Aisle arrangement and maintenance.

The arrangement of aisles shall be subject to approval by the Fire Marshal and shall be maintained clear at all times during occupancy.

22.8.7 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.

22.8.8 Exit sign illumination.

Exit signs shall be of an approved self-luminous type or shall be internally or externally illuminated by fixtures 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 the on-site generator set, and the system shall be installed in accordance with the *Electrical Code*.

22.8.9 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.

22.8.10 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. The surface of means of egress shall be maintained in an approved manner.

SECTION 22.9 --- HEATING AND COOKING EQUIPMENT

22.9.1 Cooking.

Cooking is prohibited within Tents, canopies, and air-supported, air-inflated or tensioned membrane structures, temporary membrane structures.

Exception: Tents approved and designated for cooking operations.

22.9.2 Food preparation 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 used to fuel equipment inside a tent, air-supported, air-inflated or tensioned membrane structure, temporary membrane structure or canopy shall be adequately protected to prevent tampering, damage by vehicles or other hazards and shall be located in an approved location.

22.9.3 Cooking tents.

Tents where cooking is performed shall be separated from other tents, air-supported, air-inflated or tensioned membrane structures, temporary membrane structures or canopies by a minimum of 20 feet.

22.9.4 Cooking location.

Within cooking tents the cooking and heating equipment shall not be located within 10 feet of exits or combustible materials.

22.9.5 Outdoors cooking.

Outdoor cooking that produces sparks or grease-laden vapors shall not be performed within 20 feet from a tent, air-supported, air-inflated or tensioned membrane structure, temporary membrane structure or canopy.

22.9.6 Electrical heating and cooking equipment.

Electrical cooking and heating equipment shall comply with the *Electrical Code*.

22.9.7 LP-gas use.

22.9.7.1 General.

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

22.9.7.2 Location of containers.

LP-gas containers shall be located outside. Safety release valves shall be pointed away from the tent, air-supported, air-inflated or tensioned membrane structure, or canopy.

22.9.7.2.1 Containers 500 gallons or less.

Portable LP-gas containers of 500 gallons or less capacity shall have a minimum separation between the containers and structure not less than 10 feet.

22.9.7.2.2 Containers more than 500 gallons.

Portable LP-gas containers of more than 500 gallons capacity and shall have a minimum separation between the container and structures not less than 25 feet.

22.9.7.3 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, air-supported, air-inflated or tensioned membrane structure, temporary membrane structure or canopy 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.

SECTION 22.10 --- FLAMMABLE AND COMBUSTIBLE LIQUIDS

22.10.1 Use.

Flammable-liquid-fueled equipment shall not be used in tents, air-supported, air-inflated or tensioned membrane structures, temporary membrane structures or canopies.

22.10.2 Flammable and combustible liquid storage.

Flammable and combustible liquids shall be stored outside in an approved manner not less than 50 feet from tents, air-supported, air-inflated or tensioned membrane structures, temporary membrane structures or canopies. Storage shall be in accordance with *The Fire Code*.

22.10.3 Refueling.

Refueling shall be performed in an approved location not less than 20 feet from tents, air-supported, air-inflated or tensioned membrane structures, temporary membrane structures or canopies.

22.10.4 Spills.

Flammable and combustible liquid spills shall be cleaned up immediately and disposed of in an approved manner.

SECTION 22.11 --- LIQUID- AND GAS-FUELED VEHICLES

22.11.1 Display of motor vehicles.

Liquid and gas-fueled vehicles and equipment used for display within tents, air-supported, air-inflated or tensioned membrane structures, temporary membrane

structures or canopies shall be in accordance with the *Fire Code and LSB Standard 25, Safety Inspections for Vehicles on Indoor Display*.

22.11.2 Competitions and demonstrations.

Liquid- and gas-fueled vehicles and equipment used for competition or demonstration within a tent, air-supported, air-inflated or tensioned membrane structure, temporary membrane structure or canopy shall comply with the *Fire Code*.

22.11.3 Generators.

Generators and other internal combustion power sources shall be separated from tents, air-supported, air-inflated or tensioned membrane structures, temporary membrane structures or canopies by a minimum of 20 feet and shall be isolated from contact with the public by fencing, enclosure or other approved means.

22.11.4 Fuel storage.

Fuel for vehicles or equipment shall be stored in approved containers at an approved location outside of the structure and not less than 50 feet from tents, air-supported, air-inflated or tensioned membrane structures, temporary membrane structures or canopies. Storage shall be in accordance with the *Fire Code*.

22.11.5 Fueling.

Refueling shall be performed outside of the structure in an approved location not less than 20 feet from tents, air-supported, air-inflated or tensioned membrane structures, temporary membrane structures or canopies.

22.11.6 Spills.

Fuel spills shall be cleaned up immediately and disposed of in an approved manner.

SECTION 22.12 --- HOUSEKEEPING

22.12.1 Vegetation removal.

Combustible vegetation shall be removed from the area occupied by a tent, air-supported, air-inflated or tensioned membrane structure, temporary membrane structure or canopy and from areas within 30 feet of such structures.

22.12.2 Waste material.

The floor surface inside tents, air-supported, air-inflated or tensioned membrane structures, temporary membrane structures or canopies and the grounds outside and within a 30-foot perimeter shall be kept clear of trash and combustible waste accumulation. Such waste shall be stored in approved containers until removed from the premises.

SECTION 22.13 --- STANDBY PERSONNEL

22.13.1 General.

In accordance with the *Fire Code*, the Fire Marshal is authorized to require one or more standby inspectors be provided, when it is essential for public safety in a place of assembly or any other place where people congregate, because of the number of

persons, or the nature of the performance, exhibition, display, contest or activity. When required, the owner, agent or lessee shall employ one or more approved standby personnel on duty. The jurisdiction shall provide the standby personnel upon payment of fees specified in the *Fire Code*. The standby personnel assigned shall be in uniform and shall remain on duty during the times such places are open to the public, or when such activity is being conducted.

22.13.2 Crowd managers.

When it is essential for public safety in a place of assembly or any other place where people congregate, because of the number of persons, or the nature of the performance, contest or activity, the owner, agent or lessee shall provide trained crowd managers or crowd manager supervisors at a ratio of one crowd manager/supervisor for every 250 occupants.

SECTION 22.14 --- OCCUPANCY CAPACITY SIGNS

22.14.1. Where required.

Rooms having an occupancy load of 50 or more where fixed seating is not installed, and which are used for classroom, assembly or similar purpose, shall have the maximum occupancy capacity of the room posted on an approved sign adjacent to the main exit from the room. Additional signs may be required as deemed necessary by the Fire Marshal for rooms without a distinct main exit or multiple main exits. (The maximum occupancy load in a building or portion of a building shall not exceed the amount specified in the *Building Code*.)

22.14.2. Sub-dividable rooms.

Rooms with areas that are sub-dividable into smaller separated rooms, with occupancy loads of 50 or more persons, shall have room capacity signs posted by the main exit for each separate room in addition the main room sign.

22.14.3. Sign construction.

Signs shall be constructed of durable materials, with minimum of 1-inch block letters and numbers, on a contrasting background so as to be readily visible. The number of occupants permitted for each room use and the room identification for each separate room area (where provided) shall be included on the sign. (See Figure 22.14.3, Page 12, Sign Example)

22.14.4. Sign placement.

The sign shall be located in a conspicuous location not obstructed by doors, curtains, poster board stands, furniture, room dividers, or similar items. The sign shall be posted not more than 60-inches or less than 48-inches above the floor.

22.14.5. Sign maintenance.

The owner or the owner's authorized agent shall maintain all occupancy capacity signs legible.

Figure 22.14.3

SIGN EXAMPLE: (Reference: Current edition of the Fire Code)

Large lettering shall be a minimum 1" in height.

Small lettering shall be a minimum of 3/8" in height.



(NOTE: Occupancy sign is not to scale. Background shall contrast lettering.)

APPENDIX A

Table 22.8 - EGRESS REQUIREMENTS FOR TENTS AND CANOPIES

MINIMUM NUMBER OF MEANS OF EGRESS AND MEANS OF EGRESS WIDTHS FROM TEMPORARY MEMBRANE STRUCTURES, TENTS AND CANOPIES

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 or Canopy	Membrane Structure
10 to 100	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 ^a	7	120	96

- 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.

REFERENCES

1. City of Houston *Fire Code*, International Fire Code, 2006 edition, as amended
2. City of Houston *Building Code*, International Building Code, current edition, as amended
3. City of Houston Electrical Code, International Electrical Code, current edition, as amended
4. National Fire Protection Association (NFPA) Standard 10, "Portable Fire Extinguishers"
5. National Fire Protection Association (NFPA) Standard 701, "Methods of Fire Tests for Flame-Resistant Textiles and Films"
6. Life Safety Bureau (LSB) Standard 01, "Installation and Maintenance of Fire Extinguishers"
7. Life Safety Bureau (LSB) Standard 10, "LP-Gas Storage and Use"