UL Solutions

Fire Extinguishers

Testing, Inspection, and Certification

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1 Jun 2023

Safety. Science. Transformation.™

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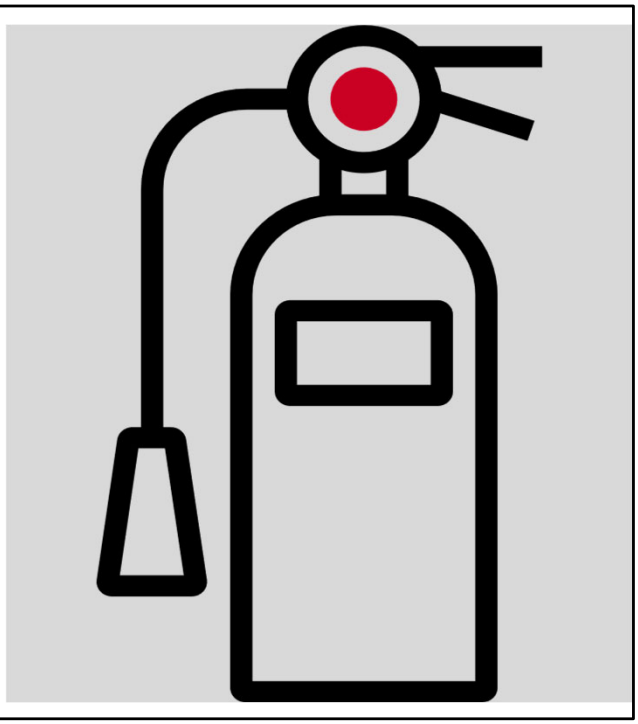
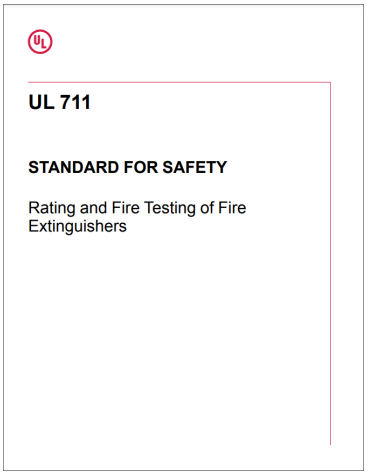


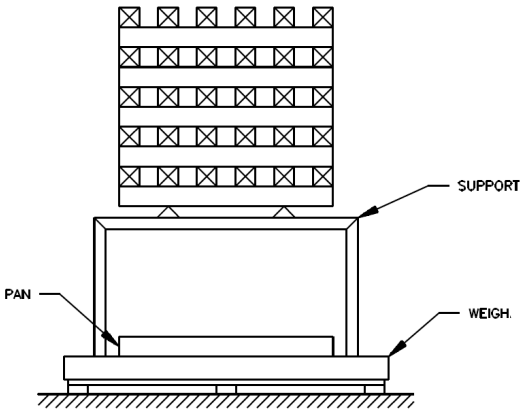
Rating and fire testing of fire extinguisher standard

- **Apr 1965 | 1st edition**
  - **Class A**: Fires that involve ordinary combustible materials such as wood, cloth, paper, rubber, and many plastics.
  - **Class B**: Fires that involve flammable liquids, oils, petroleum greases, tars, oil-base paints, solvents, lacquers, alcohols, and flammable gases.
  - **Class C**: Fires that involve energized electrical equipment where the electrical nonconductivity of the fire extinguishing agent as discharged is of importance. (When electrical equipment is de-energized, extinguishers rated for Class A or B fires are used.)
  - **Class D**: Fires that involve combustible metals, such as magnesium, titanium, zirconium, sodium, lithium, and potassium.
  - **Class K**: Fires that involve cooking appliances with flammable cooking vegetable oils or animal fats.

Extinguishers are classified for one or more of these types of fires.



Representative Class A wood crib fire



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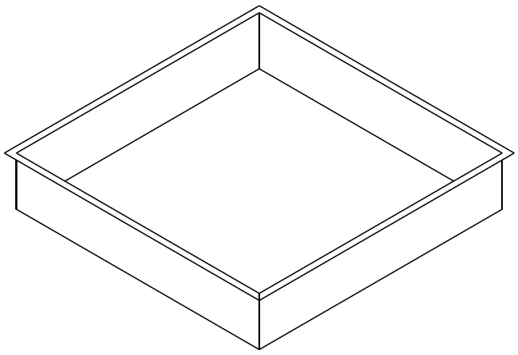
- This is a representative Class A wood crib.
- In the video, it is initially seen that the pan below the wood crib is burning. This is the ignition source for the crib.
- The wood crib is made from nominal 2-inch by 2-inch lumber of specified length installed with “X” number of pieces per layer. Each layer is fastened to the other at 90 degrees of the previous.
- When the weight of the crib is decreased to the percentage specified in the standard, the extinguisher nozzle is aimed at the base of the fire, and the lever squeezed, and the nozzle swept from side to side.

Representative Class B pan fire



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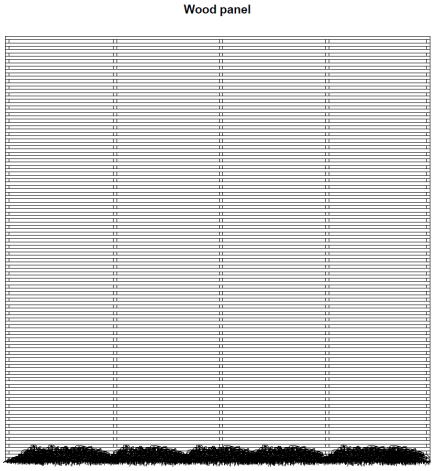
- This is a representative Class B pan fire.
- In the video, the steel pan is filled with a base of water and a 2-inch layer of heptane to provide a distance to the top of the pan as specified in the standard.
- The heptane is ignited and allowed to burn for 1 minute.
- When the 1 minute has passed, the extinguisher nozzle is aimed at the base of the fire, and the lever squeezed, and the nozzle swept from side to side.

Representative Class A wood panel fire



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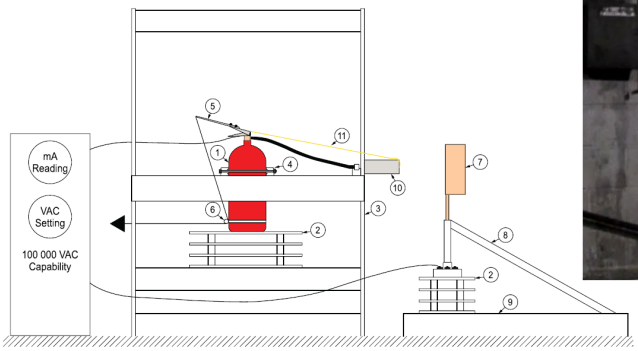
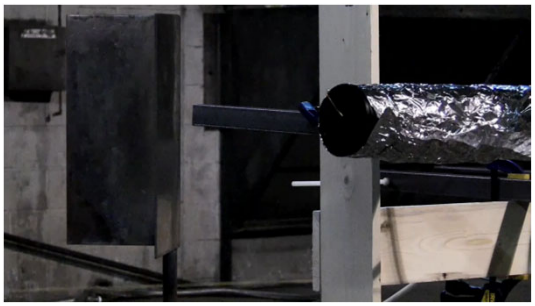
- This is a representative Class A wood panel vertical surface fire.
- In the video, it is initially seen that the panel is sprayed with kerosene.
- Then the floor is cleaned of excess kerosene.
- The first windrow of excelsior (shaved wood) is placed at the base of the panel, a wick of heptane sprayed on the floor, the wick ignited, the excelsior ignited, the kerosene ignited, and the panel ignited.
- We will watch the video for about 20 to 25 seconds [watch video until 1:00]
- Now, skip ahead toward the end of the test, the excess excelsior is cleared, the fire contained to the vertical surface.
- Upon examination, it is noted that one of the wood sticks has begun cracking and is removed just prior to application of the extinguishing agent.
- The extinguishing agent is applied, and the fire is out.

Representative Class C test





1– extinguisher
2 – insulating platform
3 – scaffold and working platform
4 – cross bars
5 – extension rod
6 – pulley clamped to extinguisher
7 – target
8 – pedestal support bar
9 – target stand
10 – extinguisher horn or discharge nozzle
11 – copper wire

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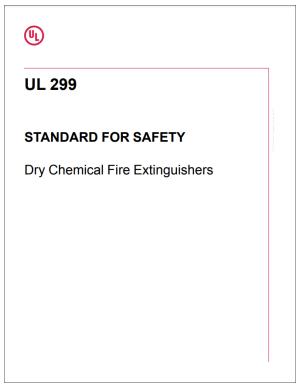
- This is a representative Class C test.

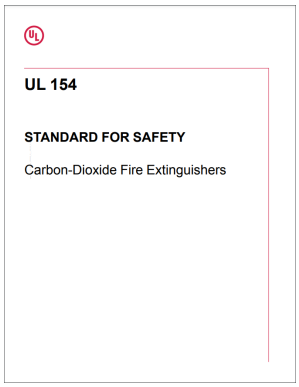
- In the video, the copper target (item 7) is to the left and the extinguisher horn (item 10) is to the right.
- With 100,000 Volts (AC) between the target and extinguisher, there is no arcing – therefore, acceptable results.

Fire extinguisher product standards

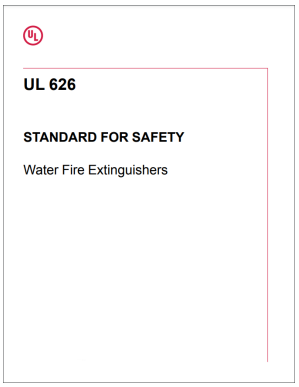
Jun 1952 | 1st edition
Class A, B, C; A, B; D



Mar 1956 | 1st edition
Class B, C

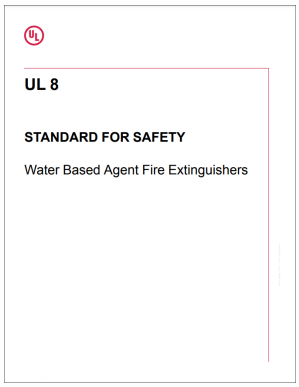


Mar 1963 | 1st edition
Class A

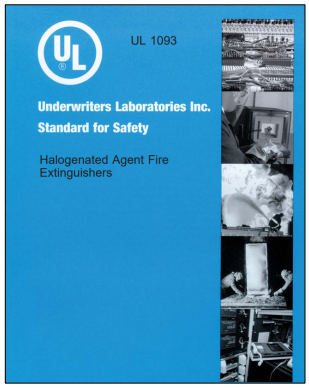


Fire extinguisher product standards

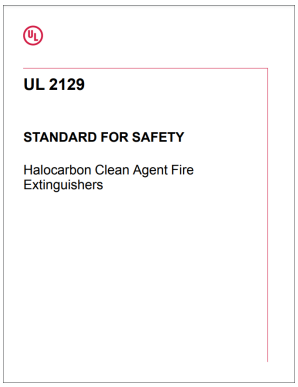
Jun 1976 | 1st edition
Class A, C; B; A, K



Sep 1980 | 1st edition
Class A, B, C



Mar 1999 | 1st edition
Class A, B, C; B, C



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Fire extinguisher product standards

Construction	Performance	Markings	Instructions
-Normative features -Specific function -Load calculations -Stress calculations -Interoperability	-Corrosion -Discharge property -Functional limitations -Leakage -Metal materials -Plastic materials -Rubber materials -Fire & ratings	-Manufacturer -Model -Ratings -Date -Readiness -Ease of use -Caution -Warning -Owner's manual -Availability of instruction manual	-Limitations -Installation -Inspection -Maintenance -Qualifications -Examples -Flow & pressure loss -Discharge characteristic -Per accepted codes

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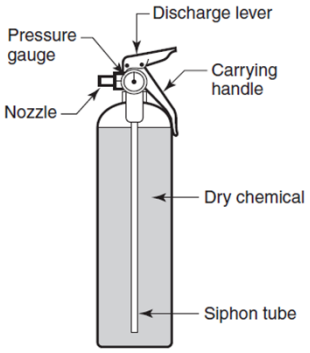
Fire extinguisher product standards

Construction

Stored pressure dry chemical extinguisher

- Cylinder for storage of the extinguishing agent and expellant gas.
- Attached to the cylinder joint, and sealed with gaskets or O-rings, is a discharge valve fitted with a siphon tube, handle, lever, nozzle pressure gauge, and potentially a pressure relief.
- Also on the discharge valve is a tamper indicator and locking device.



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- This is the basic construction of all stored pressure extinguishers.

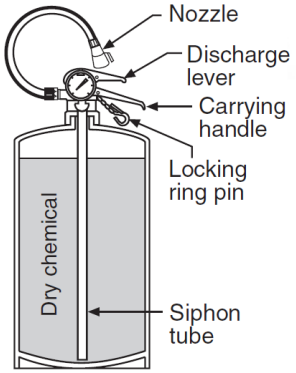
- Cylinder for storage of the extinguishing agent and expellant gas.
- Attached to the cylinder joint, and sealed with gaskets or O-rings, is a discharge valve fitted with a siphon tube, handle, lever, nozzle, pressure gauge, potentially a pressure relief.
- Also on the discharge valve is a tamper indicator and locking device.

Fire extinguisher product standards

Construction

Stored pressure dry chemical extinguisher with hose and nozzle

- Cylinder for storage of the extinguishing agent and expellant gas.
- Attached to the cylinder joint, and sealed with gaskets or O-rings, is a discharge valve fitted with a siphon tube, handle, lever, hose with nozzle, pressure gauge, potentially a pressure relief.
- Also on the discharge valve is a tamper indicator and locking device.



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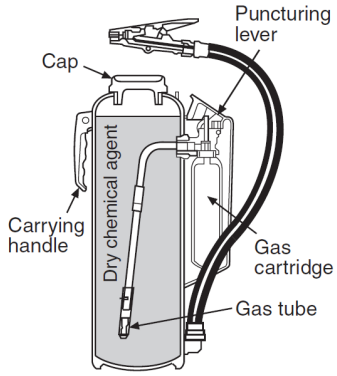
- This is very similar to the last, except it is larger and therefore includes a hose with nozzle.

Fire extinguisher product standards

Construction

Cartridge operated dry chemical extinguisher

- Cylinder for storage of the extinguishing agent and attachment of discharge tube and expellant gas cartridge with a pressure relief.
- Attached to the cylinder joint, and sealed with gaskets or O-rings, is a cap. Also attached to the cylinder is a handle, and a hose with valve and nozzle.
- Also on the puncturing mechanism is a tamper indicator and locking device.



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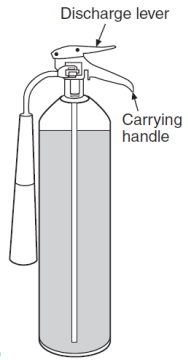
- This type of design, cartridge operated extinguisher, is similar, but different – without any ‘stored pressure’ – instead, relying on the attached gas cartridge to provide the pressure at the time of use.

Fire extinguisher product standards

Construction

Carbon dioxide extinguisher with affixed plastic discharge horn

- Cylinder for storage of the extinguishing agent at its maximum fill density.
- Attached to the cylinder joint, and sealed with gaskets or O-rings, is a discharge valve fitted with a siphon tube, a pressure relief, handle, lever, discharge tube and nozzle with discharge horn.
- Also on the discharge valve is a tamper indicator and locking device.



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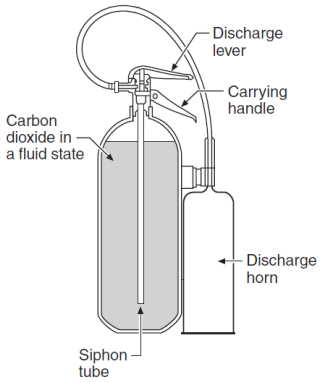
- The carbon dioxide extinguisher is stored under very high pressures when at the maximum fill density. A discharge tube and nozzle with discharge horn is used to assist in expanding and directing the stored liquid carbon dioxide.

Fire extinguisher product standards

Construction

Carbon dioxide extinguisher with hose and plastic discharge horn

- Cylinder for storage of the extinguishing agent at its maximum fill density.
- Attached to the cylinder joint, and sealed with gaskets or O-rings, is a discharge valve fitted with a siphon tube, a pressure relief, handle, lever, and discharge hose and nozzle with discharge horn.
- Also on the discharge valve is a tamper indicator and locking device.



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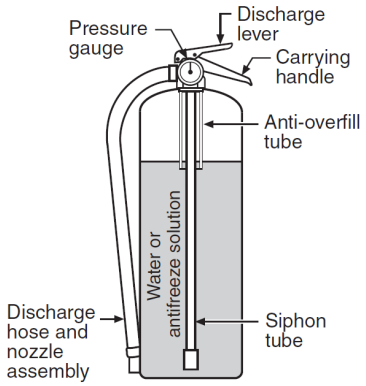
- Nearly identical to the previous carbon dioxide extinguisher with exception to being larger and provided with a discharge hose and nozzle with discharge horn.

Fire extinguisher product standards

Construction

Water or antifreeze extinguisher with hose and nozzle

- Cylinder with anti-overfill tube for storage of the extinguishing agent and expellant gas.
- Attached to the cylinder joint, and sealed with gaskets or O-rings, is a discharge valve fitted with a siphon tube, handle, lever, hose with nozzle, pressure gauge, and potentially a pressure relief.
- Also on the discharge valve is a tamper indicator and locking device.



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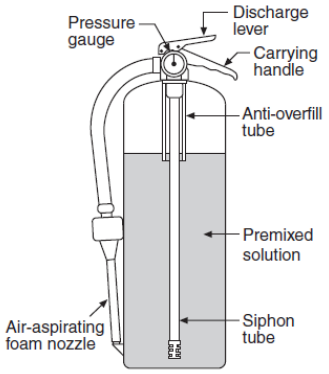
- Switching over to water or antifreeze extinguishers, these also include an anti-overfill tube.

Fire extinguisher product standards

Construction

Foam extinguisher with hose and air-aspirating nozzle

- Cylinder with anti-overfill tube for storage of the extinguishing agent and expellant gas.
- Attached to the cylinder joint, and sealed with gaskets or O-rings, is a discharge valve fitted with a siphon tube and strainer, handle, lever, hose with air aspirating nozzle, pressure gauge, and potentially a pressure relief.
- Also on the discharge valve is a tamper indicator and locking device.



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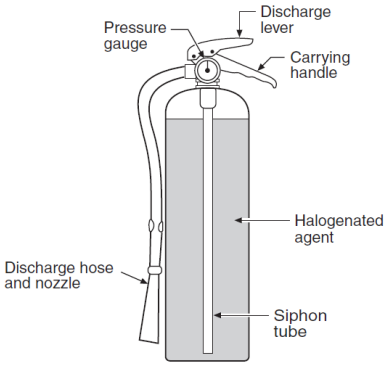
- Compared to water extinguishers, foam extinguishers typically include an air-aspirating nozzle.

Fire extinguisher product standards

Construction

Halogenated agent extinguisher with hose and nozzle

- Cylinder for storage of the extinguishing agent at its maximum fill density and expellant gas.
- Attached to the cylinder joint, and sealed with gaskets or O-rings, is a discharge valve fitted with a siphon tube, handle, lever, hose with nozzle, pressure gauge, potentially a pressure relief.
- Also on the discharge valve is a tamper indicator and locking device.



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- Lastly, it is seen that the halogenated agent extinguisher is very similar to many of the basic constructions shown.

Fire extinguisher product standards

Performance

Corrosion
- salt spray corrosion

Discharge property
- abnormal operation
- discharge capacity
- discharge duration & range
- intermittent discharge
- operation
- rate of flow

Leakage
- elevated temperature
- one-year time leakage
- pressure retention
- temperature cycling

Rubbers
- rubber parts & aging

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Fire extinguisher product standards

Performance

Functional limitation
- discharge horn resistance
- extinguishing agent
- handle & mounting device
- horn impact
- nameplate
- operating temperatures
- packed chamber & hose

Metals
- hydrostatic strength
- moist ammonia

Functional limitation
- pressure gauge
- pressure relief
- roadability & rough usage
- servicing & valve cycling
- siphon tube pull
- tamper indicator & locking device
- vibration

Plastics
- hydrostatic strength
- plastic parts & aging

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Fire extinguisher product standards

Markings

- Manufacturer
- Model
- Year of manufacture
- Use limitations
- Gross weight
- Reference to NFPA 10
- Reference to NFCC
- Operating instructions
- Use code symbols
- Recharging instructions
- Identification of contents
- Inspection instructions

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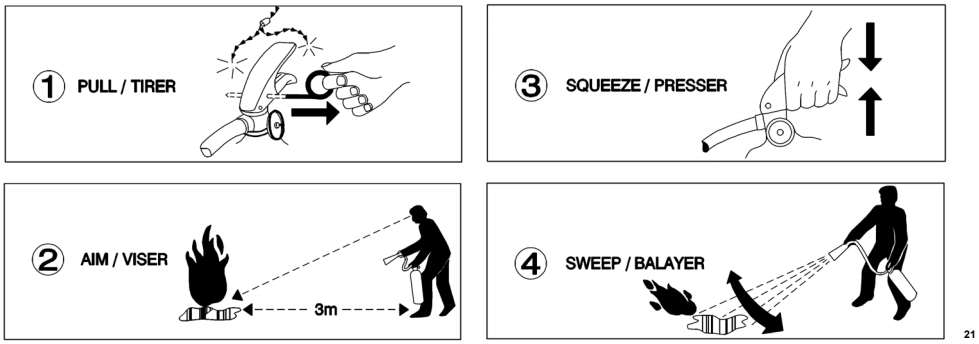
Fire extinguisher product standards

Markings

Operating instruction pictographs



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Fire extinguisher product standards

Markings

Use code symbols

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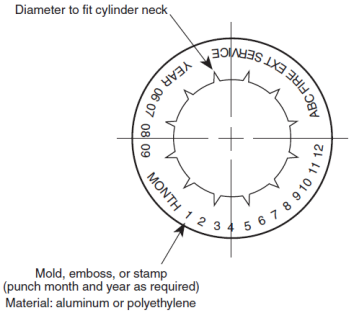
Fire extinguisher product standards

Instructions

Record Tag

- Except for an extinguisher having a capacity not exceeding 2.3 kg (5 lb) of dry chemical and marked to indicate that it is intended for use in a home, an extinguisher shall be provided with a record tag for recording the date on which the extinguisher was last inspected and the name or initials of the person making the inspection in accordance with the Standard for Portable Fire Extinguishers, NFPA 10, and the National Fire Code of Canada.



Fire extinguisher product standards

Instructions

Instruction manual

- An instruction manual shall be provided with each extinguisher.
- This manual shall contain the necessary instructions, warnings, and cautions for the intended installation, operation, inspection, and maintenance of the extinguisher.
- For marine type extinguishers, a statement shall also be included that Marine approval is valid only when the extinguisher is equipped with an approved marine type bracket.

Fire extinguisher product standards

Instructions

Service manual available upon request for each manufacturer's extinguisher model.

- Contain required instructions, warnings, and cautions.
- Contain a description of servicing equipment.
- Contain a description of procedures for intended servicing.
- Provide a list of part numbers of all replaceable parts.
- Indicate the pressure gauge (as applicable) attached to the extinguisher is not to be used to determine when the intended charging pressure has been reached.
- Indicate a pressure regulator is to be used when the pressure source is a tank of high-pressure gas, as applicable.

Surveillance standard

- **Jul 1986 | 1st edition**
  - **Current Scope**: This standard covers the basic elements of a Third-party Certification and Inspection Program for various types of portable fire extinguishers, hand and wheeled, including the following: carbon dioxide, dry chemical, water based, clean agent, and stored pressure water.

Installation and inspection standard

- **1921 | 1st edition**
  - **Current Scope**: The provisions of this standard apply to the selection, installation, inspection, maintenance, recharging, and testing of portable fire extinguishers and Class D extinguishing agents.

Questions

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Fire Suppression including

- Fire Extinguishers
- Fire Extinguishing Systems
- Fire Fighting Foam & Equipment

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