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SPRINKLER PROTECTION BASICS: SPRINKLERS

TYPES OF SPRINKLERS:

- **SPRAY SPRINKLERS**
  - standard response
  - quick response
  - extended coverage
  - quick response extended coverage

- **RESIDENTIAL SPRINKLERS**

- **OLD-STYLE SPRINKLERS**

- **FAST RESPONSE SPRINKLERS**
  - quick response (QR)
  - quick response extended coverage (QREC)
  - early suppression fast response (ESFR)
  - quick response early suppression (QRES)
  - residential

- **LARGE-DROP SPRINKLERS**

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SPRINKLER ORIFICE SIZES:

ORIFICE TYPE	NOMINAL ORIFICE SIZE	"K" FACTOR
Small	1/4 Inch	1.3-1.5
Small	5/16 Inch	1.8-2.0
Small	3/8 Inch	2.6-2.9
Small	7/16 Inch	4.0-4.4
Standard	1/2 Inch	5.3-5.8
Large	17/32 Inch	7.4-8.2
Extra Large	5/8 Inch	11.0-11.5
Very Extra Large	3/4 Inch	13.5-14.5

- Small orifice sprinklers permitted to be used under the following conditions:
  - Light hazard occupancy only and
  - Hydraulically calculated systems only and
  - Wet systems only and
  - Less water flow required than 1/2 inch sprinkler flowing at 7 psi and
  - Listed strainer provided for sprinklers with orifice size less than 3/8 inch.

SPRINKLER PROTECTION BASICS: SPRINKLERS

SPRINKLER TEMPERATURE CLASSIFICATION:

TEMPERATURE CLASSIFICATION	TEMPERATURE RATING	MAXIMUM CEILING TEMPERATURE
Ordinary	135-170°F	100°F
Intermediate	175-225°F	150°F
High	250-300°F	225°F
Extra-high	325-375°F	300°F
Very Extra-high	400-475°F	375°F
Ultra-high	500-575°F	475°F
Ultra-high	650°F	625°F

SPRINKLER PROTECTION BASICS: SPRINKLERS

SPRINKLER TEMPERATURE RATING IDENTIFICATION:

TEMPERATURE CLASSIFICATION	FRAME COLOR	GLASS BULB COLOR
Ordinary	Brass or Black	Orange or Red
Intermediate	White	Yellow or Green
High	Blue	Blue
Extra-High	Red	Purple
Very Extra-High	Green	Black
Ultra-High	Orange	Black
Ultra-High	Orange	Black

SPRINKLER PROTECTION BASICS: SPRINKLERS

STANDARD RESPONSE vs. FAST RESPONSE SPRINKLERS:

- Response Time Index (RTI) determined using the "plunge test".
- The "plunge test" involves placing a sprinkler in a test oven with a heated laminar airflow and determining the operating time of the sprinkler.
- Fast response sprinkler definition: RTI $\leq$ 50 meters$^{1/2}$-seconds$^{1/2}$
- Standard response sprinkler definition: RTI $\geq$ 80 meters$^{1/2}$-seconds$^{1/2}$

SPRINKLER PROTECTION BASICS: SPRINKLERS

GENERAL REQUIREMENTS:

- Only listed sprinklers permitted.
- Sprinklers required to be listed for a minimum working pressure of 175 psi.
- Coatings for corrosion-resistant sprinklers only permitted to be applied by the manufacturer.
- Sprinklers not permitted to be painted (except by the manufacturer).
- Upright sprinklers required to be installed with frame parallel to the branch line.
- Special (extended coverage) sprinklers permitted to be used based on testing.
  - Maximum area of protection per sprinkler protecting light or ordinary hazard occupancies limited to a maximum of 400 SF.
  - Maximum area of protection per sprinkler protecting extra hazard or high piled storage occupancies limited to a maximum of 196 SF.
- Special sprinklers designed for the protection of specific hazards or construction features permitted to be used based upon testing.
- Old-style sprinklers not permitted to be used in new installations.
  - Exception permits use of old style sprinklers in fur vaults and in special situations (such as the protection of piers and wharves).
- Upright and pendent spray sprinklers permitted to be used to protection all occupancy hazards in all building construction types.
  - Quick response sprinklers not permitted to be used to protect extra hazard occupancies (when the area/density (hydraulic) design method is used).

SPRINKLER PROTECTION BASICS: SPRINKLERS (CONTINUED)

GENERAL REQUIREMENTS:

- Sidewall spray sprinkler application limited to light hazard occupancies with smooth flat ceilings.
  - Exception permits sidewall sprinklers to protect ordinary hazard occupancies with smooth flat ceilings when specifically listed for ordinary hazard.
- Extended coverage sprinklers are only permitted to be used with unobstructed construction with smooth flat ceilings with a slope $\leq$ 2 inches per foot.
  - Exception for specially listed sprinklers.
  - Exception for upright and pendent extended coverage sprinklers used with truss or bar joist structural system where the web members have dimensions $\leq$ 1 inch.
  - Exception for specially listed sprinklers to be used with smooth flat ceilings with a slope $\leq$ 4 inches per foot.
- Residential sprinklers permitted to be used in dwelling units and corridors adjoining the dwelling units.
- Residential sprinklers are only permitted to be used with wet systems.
  - Exception indicates that residential sprinklers are permitted to be used with dry system when the sprinklers are specifically listed for this application.
- When residential sprinklers are used within a compartment, all sprinklers within the compartment are required to be fast response type sprinklers.

SPRINKLER PROTECTION BASICS: SPRINKLERS

GENERAL REQUIREMENTS:

- Ordinary temperature sprinklers required to be used, except as follows:
  - Ceiling temperatures exceed 100°F or
  - In ordinary or extra hazard occupancies, intermediate or high temperature sprinklers are permitted or
  - Sprinklers are located near heat-producing devices such as suspended heaters, ducts etc.

SPRINKLER PROTECTION BASICS: SPRINKLERS

STANDARD SPRINKLER LISTING REQUIREMENTS-UL 199:

FIRE TEST:

- Sprinklers ability to control ceiling temperatures and limit fire damage (weight loss) is measured in the fire test.
- Test for standard sprinklers:
  - 4 open sprinklers arranged on a 10 ft x 10 ft spacing used.
  - Sprinkler discharge:
    a. Standard orifice (1/2 inch) sprinklers: between 15 and 25 gpm.
    b. Large orifice (17/32 inch) sprinklers: between 21 and 35 gpm.
  - Test fire consist of a 350 pound wood crib constructed of lumber which is ignited by n-heptane flowing continuously at a rate of 1 gpm.
  - Test room size:
    a. 60 FT X 60 FT
    b. Ceiling height: 15 feet, 9 inches
  - Water discharge from the sprinklers is not started until the crib is allowed to burn for a minimum of 1 minute after ignition; the ceiling temperature prior to water discharge must reach 1,400°F.
  - Test criteria:
    a. Limit the ceiling temperature to less than 530°F above ambient within 6 minutes after crib ignition and
    b. Limit the weight loss to the crib to not more than 20% after a 30 minute burn.

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