TECHNICAL BULLETIN

ESFR PENDENT SPRINKLER
UL: SPECIFIC APPLICATION ESFR SPRINKLER
FM: STORAGE SPRINKLER
NFPA: SPECIAL SPRINKLER
VK514 (K28.0)

The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
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1. DESCRIPTION

Viking Early Suppression Fast Response (ESFR) Pendent Sprinkler VK514 incorporates the capability to suppress specific high-challenge fires. The larger K-Factor allows protection of higher hazard commodities at greater ceiling heights with lower end-head pressures. K28.0 sprinklers can:

- Provide flexibility of fire protection designs.
- Eliminate the use of in-rack sprinklers when protecting high piled storage of certain specified materials up to:

UL (Refer to Table 4): 43 ft. (13,1 m) with ceilings up to 48 ft. (14,6 m)*

FM (Refer to Table 5): 50 ft. (15,2 m) with ceilings up to 55 ft. (16,76 m)*
OR
45 ft. (13,5 m) with ceilings up to 50 ft. (15,2 m)*

NFPA 13 (Refer to Table 6): The VK514 is a Special Sprinkler as defined by the National Fire Protection Association (NFPA 13, 2022 Ed.-Section 15.2).

Viking ESFR Pendent Sprinklers VK514 are primarily intended to protect the following types of storage, which tend to produce severe-challenge fires: palletized and solid pile storage and single, double, and portable open rack storage (no open-top containers or solid shelves). The VK514 is listed to utilize a minimum aisle width of 6'-0" (UL - 43' storage or FM - 45' storage) or 8'-0" (FM - 50' storage). Viking ESFR Pendent Sprinklers VK514 provide protection of most common storage materials, including:

- Encapsulated or unencapsulated Class I, II, III, and IV commodities*.
- UL Listed for protection of cartoned nonexpanded** Group A plastic commodities*.
- FM Approved for protection of cartoned unexpanded** plastic commodities.*

* Refer the Approval Chart and Commodity Selection and Design Criteria Overview for Listing and Approval requirements that must be followed.

**The terms nonexpanded and unexpanded are equivalent.

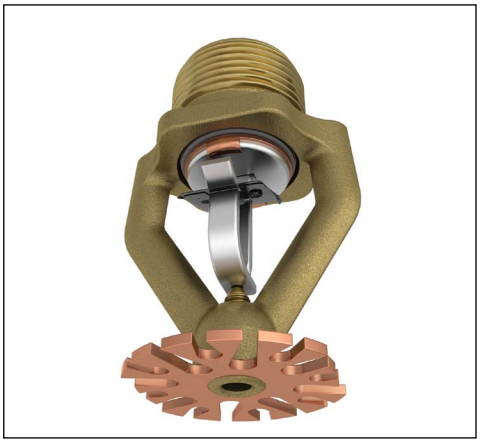

TABLE 1
SPRINKLER GENERAL INFORMATION

Item	Description
Sprinkler Identification Number (SIN)	VK514
K-factor, gpm/psi½ (lpm/bar½)	28.0 (404)
Thread Size	1" NPT (25 mm)
Sprinkler Orientation	Pendent
Maximum Working Pressure	175 psi (12 bar)

2. LISTINGS AND APPROVALS*

UL Listed: Category VNWH (Listed as an ESFR Sprinkler)

FM Approved: Class 2035

* Refer the Approval Chart and Commodity Selection and Design Criteria Overview for Listing and Approval requirements that must be followed.

Deviation from the standards or any alteration to the sprinkler after it leaves the factory including, but not limited to: painting, plating, coating, or modification, may render the sprinkler inoperative and will automatically nullify the approval and any guarantee made by The Viking Corporation.

3. PATENT INFORMATION

Please refer to PATVK.COM for all appropriate patents and patent information pertaining to the Model VK514 ESFR Sprinkler.

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4. TECHNICAL DATA

Specifications:
Maximum Working Pressure: 175 psi (12 bar). Factory tested hydrostatically to 500 psi (34.5 bar).
Thread size: 1” NPT or 25 mm BSPT (Refer to Table 2)
Nominal K-factor: 28.0 U.S. (404 metric*)
* Metric K-factor measurement shown is in bar. When pressure is measured in kPa, divide the metric K-factor shown by 10.0.
Overall Length: 3-3/16” (81 mm)
Deflector Diameter: 1-3/4” (45 mm)

Material Standards:
Frame Casting: Brass UNS-C84400 or CW602N
Deflector: Phosphor Bronze UNS-C51000
Seat: Copper UNS-C11000 and Stainless Steel UNS-S30400
Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape
Compression Screw: Stainless Steel UNS-S31603
Trigger and Support: Stainless Steel UNS-S31600
Fusible Element Assembly: Beryllium nickel coated with a black epoxy, polyurethane (FM only), or acrylic paint

NOTICE: DO NOT DISASSEMBLE SPRINKLER

Image is not to scale.

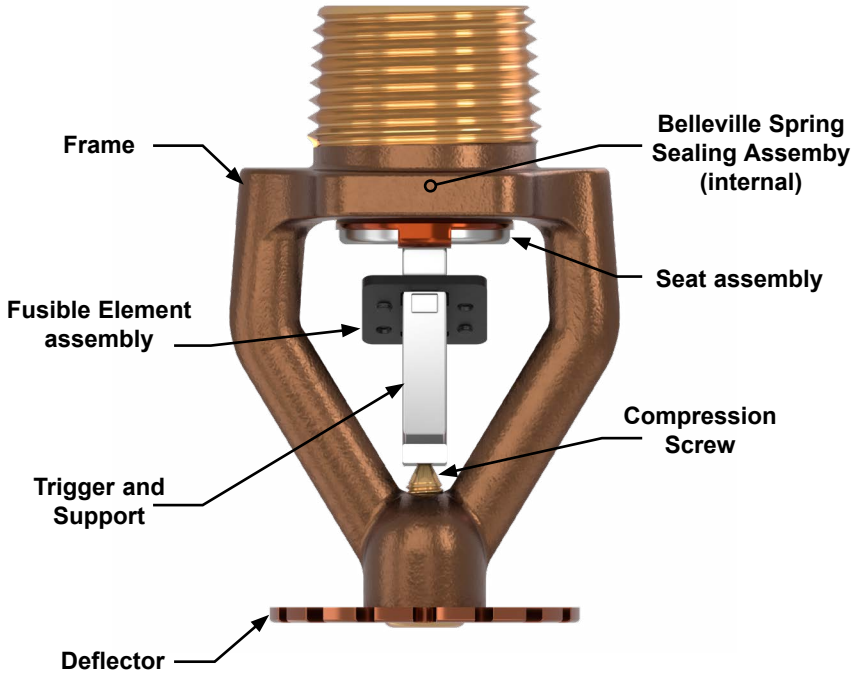

Figure 1:
Sprinkler Components

VIKING®	TECHNICAL BULLETIN	ESFR PENDENT SPRINKLER UL: SPECIFIC APPLICATION ESFR SPRINKLER FM: STORAGE SPRINKLER NFPA: SPECIAL SPRINKLER VK514 (K28.0)

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Ordering Instructions

1. Choose a sprinkler base part number with the required thread size and listing or approval (refer to the approval chart).
2. Add the suffix for the desired finish.
3. Add the suffix for the desired temperature rating.

EXAMPLE: 22894AC = VK514 with brass finish and 165 °F (74 °C) nominal temperature rating. This sprinkler is to be installed into an area with a maximum ambient temperature of 100 °F (38 °C).

NOTE: *The "TQ" suffix for the part numbers below indicates a special protective cap (Figure 2-B) intended for use with InstaSeal® fittings. When ordering sprinklers with TQ suffixes in combination with InstaSeal® fittings, refer to Form No. F_021223 for installation instructions.*

Sprinkler Base Part Number	
Part Number	**Thread Size**
22894	1" NPT
22894XX-TQ*	1" NPT
22958	25 mm BSPT
22958XX-TQ*	25 mm BSPT

Finish	
Description	**Suffix**
Brass	A

Temperature Ratings			
Temperature Rating	**Frame Color**	**Maximum Ambient Ceiling Temperature**	**Suffix**
165 °F (74 °C)	None	100 °F (38 °C)	C
205 °F (96 °C)	White	150 °F (66 °C)	E

*** Where "XX" is shown in the base part number, enter the desired suffixes for Finish and Temperature Rating (EXAMPLE: 22894AE-TQ)**

Accessories
Sprinkler wrench: 13635W/B (Use side B)
Sprinkler wrench: 26519M/B (Use Side B)

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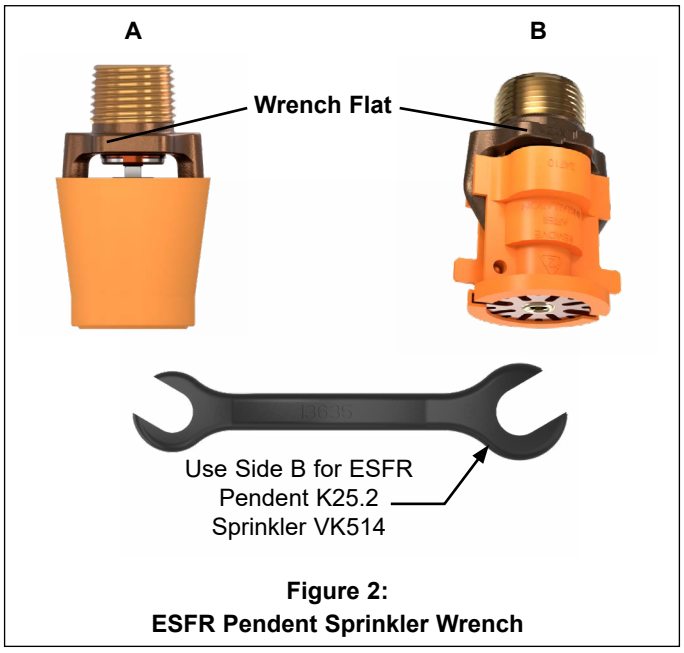

Figure 2:
ESFR Pendent Sprinkler Wrench

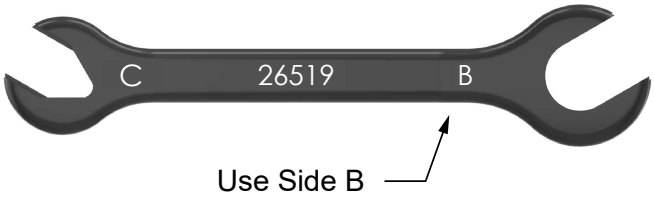

Figure 3:
Sprinkler Wrench 26519M/B

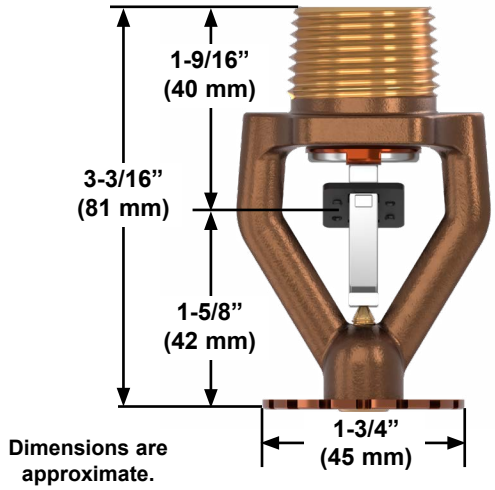

Figure 4:
ESFR Pendent Sprinkler VK514 Dimensions

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5. INSTALLATION

NOTICES

Risk of mechanical damage.

- **Installing sprinklers into piping that is not in place can cause permanent damage. Prior to installing any sprinklers, verify that the piping is in place and properly supported.**
- **Using a tool other than the approved wrench specified in this document can cause permanent damage to the unit. Use ONLY the designated sprinkler wrench.**
- **Take care not to damage the sprinkler operating parts.**
- **DO NOT use the sprinkler deflector or fusible link element to start or thread the sprinkler into a fitting.**
- **DO NOT exeed 30 ft.lbs. of torque (hand tight, plus approximately 2 full turns with the wrench) to install these sprinklers. Higher levels of torque may distort the sprinkler inlet with consequent leakage or impairment of the sprinkler.**
- **If the sprinkler will be installed into an InstaSeal® IS-W2 fitting, refer to Form No. F_021223.**

5.1 Installation Instructions

1. With the sprinkler contained in the plastic protective cap, apply a small amount of pipe-joint compound or tape to the male threads only, while taking care not to allow a build-up of compound in the sprinkler orifice.
2. With the sprinkler contained in the protective cap, install the sprinkler onto the piping by applying the sprinkler wrench to the sprinkler wrench flats.
3. Refer to section “5.2 After Sprinkler Installation”.

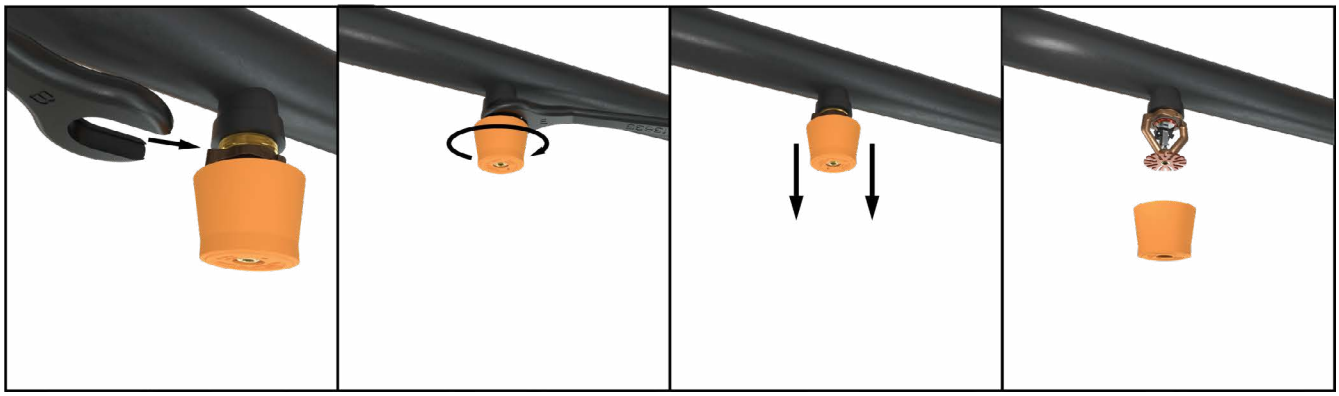

Figure 5:
Sprinkler Installation

5.2 After Sprinkler Installation

1. After installation, the entire sprinkler system must be tested. The test must be conducted to comply with the Installation Standards. Make sure the sprinkler has been properly tightened. If a thread leak occurs, normally the unit must be removed, new pipe-joint compound or tape applied, and then reinstalled. This is due to the fact that when the joint seal is damaged, the sealing compound or tape is washed out of the joint. Immediately replace any damaged units, using the special sprinkler wrench only.
2. After installation and testing and repairing of all leaks, remove the protective caps from the sprinklers.
   ***NOTICE:* When removing caps, use care to prevent dislodging or damaging sprinkler fusible element.**
   - **Do NOT use any type of tool to remove the cap.**
   - **Remove the cap by hand.**
   - **THE CAPS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE.**

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6. OPERATION

During fire conditions, the heat-sensitive fusible element assembly disengages, releasing the seat and belleville spring assembly to open the waterway. Water flowing through the sprinkler orifice strikes the sprinkler deflector, forming a uniform spray pattern to suppress the fire.

7. INSPECTIONS, TESTS AND MAINTENANCE

NOTICE

The owner is responsible for maintaining the fire protection system and devices in proper operating condition. For minimum maintenance and inspection requirements, refer to the NFPA standard that describes care and maintenance of sprinkler systems. In addition, the Authorities Having Jurisdiction may have additional maintenance, testing, and inspection requirements that must be followed.

NOTE: Wet pipe systems must be provided with adequate heat.

A. The sprinklers must be inspected on a regular basis for corrosion, mechanical damage, obstructions, paint, etc. The frequency of inspections may vary due to corrosive atmosphere, water supplies, and activity around the device.

B. Sprinklers that have been painted or mechanically damaged must be replaced immediately. Sprinklers showing signs of corrosion shall be tested and/or replaced immediately as required. Installation standards require sprinklers to be tested and, if necessary, replaced after a specified term of service. For Viking ESFR Pendent Sprinklers, refer to the Installation Standards and the Authorities Having Jurisdiction for the specified period of time after which testing and/or replacement is required. Sprinklers that have operated cannot be reassembled or reused, but must be replaced. When replacing sprinklers, use only new sprinklers.

C. The sprinkler discharge pattern is critical for proper fire protection. Therefore, nothing should be hung from, attached to, or otherwise obstruct the discharge pattern. All obstructions must be immediately removed or, if necessary, additional sprinklers installed.

D. When replacing existing sprinklers, the system must be removed from service. Refer to the appropriate system description and/or valve instructions. Prior to removing the system from service, notify all Authorities Having Jurisdiction. Consideration should be given to employment of a fire patrol in the affected area.

E. Remove the system from service, drain all water, and relieve all pressure on the piping.

F. Using the special sprinkler wrench, remove the old sprinkler and install the new unit. Care must be taken to ensure that the replacement sprinkler is the proper model and style, with the correct orifice size, temperature rating, and response characteristics. A fully stocked spare sprinkler cabinet should be provided for this purpose.

G. Place the system back in service and secure all valves. Check the replaced sprinklers and repair all leaks.

H. Sprinkler systems that have been subject to a fire must be returned to service as soon as possible. The entire system must be inspected for damage and repaired or replaced as necessary. Sprinklers that have been exposed to corrosive products of combustion, but have not operated, should be replaced. Refer to the Authorities Having Jurisdiction for minimum replacement requirements.

8. AVAILABILITY

The Viking Model VK514 Sprinkler is available through a network of domestic and international distributors. See The Viking Corporation web site for the closest distributor or contact The Viking Corporation.

9. GUARANTEE

For details of warranty, refer to Viking's current list price schedule or contact Viking directly.

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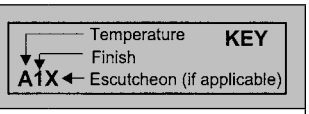
Approval Chart

ESFR Pendent Sprinkler VK514
Maximum 175 PSI (12 bar) WWP



Base Part Number[1]	SIN	Thread Size	Nominal K-Factor		Overall Length		Listings and Approvals[3,4] (Refer also to Tables 3 and 4.)	
			U.S.	metric[2]	Inches	mm	UL[5]	FM[6]
19591	VK514	1” NPT	28.0	404	3-3/16	81	A1	--
19592	VK514	25 mm BSPT	28.0	404	3-3/16	81	A1	--
22894	VK514	1” NPT	28.0	404	3-3/16	81	A1	A1
22958	VK514	25 mm BSPT	28.0	404	3-3/16	81	A1	A1

Approved Temperature Ratings	Approved Finish
A - 165 °F (74 °C) and 205 °F (96 °C)	1 - Brass

Footnotes

1. Base part number shown. For complete part number, refer to the price list.
2. Metric K-Factor measurement shown is when pressure is measured in bar. When pressure is measured in kPa, divide the metric K-Factor shown by 10.0.
3. This chart shows listings and approvals available at the time of printing. Other approvals may be in process.
4. Refer to the latest standards of NFPA 13.
5. Listed by Underwriters Laboratories Inc. for use in the U.S. as an ESFR Sprinkler (refer to the deflector position requirements).
6. FM Approved as a quick response pendent Storage sprinkler. Refer toTables 3 & 5.

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TABLE 4:
COMMODITY SELECTION AND DESIGN CRITERIA OVERVIEW FOR UL SPECIFIC APPLICATION VK514

Description	48 ft. (14.6 m) Ceilings
Sprinkler Type	ESFR
Temperature Rating	165 ºF (74 ºC) and 205 ºF (96 ºC)
Response Type	ESFR
Sprinkler Position	Pendent, frame arms aligned with pipe, deflectors parallel with ceiling or roof
System Type	Wet Pipe System only
Maximum Area of Coverage	100 ft^2 (9,3 m^2)
Minimum Area of Coverage	64 ft^2 (5,9 m^2)
Maximum Ceiling Slope	Refer to NFPA 13.
Maximum Spacing	10 ft. spacing (3,0 m)
Minimum Spacing	8 ft. spacing (2,4 m)
Deflector Distance from Walls	Minimum of 4 in. (102 mm) from walls but no more than 1/2 the allowable distance permitted between sprinklers
Deflector distance measured from ceiling to sprinkler deflector	Minimum of 36 in. (914 mm)
Sprinkler installation from ceiling	For all building heights: 6–14 in. (152–356 mm).
Maximum Ceiling Height	48 ft. (14,6 m)
Maximum Storage Height	43 ft. (13,1 m)
Storage Arrangement	Single- and double-row rack storage (no open top containers or solid shelves) and palletized and solid pile storage (no open top containers or solid shelves).
Commodity	Class I-IV commodities encapsulated or nonencapsulated and cartoned, nonexpanded Group A plastics.
Sprinkler System Design	NFPA 13 for ESFR Sprinklers based upon 35 psi (2,4 bar) design pressure 166 gpm (628,4 lpm) with 12 sprinkler remote area (4x3)
Obstruction Critera	Refer to applicable installation standard.
Minimum Aisle Width	6 ft. (1,8 m)
Hose Stream Allowance and Water Supply Duration	250 gpm (946 lpm) for 60 minutes

* The maximum coverage area must not exceed 100 ft^2 (9,29 m^2).
**Does not include the protection of multiple-row racks.

TABLE 5:
DESIGN CRITERIA FOR FM STORAGE SPRINKLER VK514

Refer to the most current editions of FM Data Sheets 2-0 and 8-9 for the VK514 FM Storage Sprinkler design criteria.

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TABLE 6:
COMMODITY SELECTION AND DESIGN CRITERIA OVERVIEW FOR NFPA 13 SPECIAL SPRINKLER VK514

Description	FM APPROVED 50 Ft. (15,2 m) Ceilings	FM APPROVED 55 Ft. (16,76 m) Ceilings
Sprinkler Type	QR Storage**	QR Storage**
Temperature Rating	165 ºF (74 ºC) and 205 ºF (96 ºC)	165 ºF (74 ºC) and 205 ºF (96 ºC)
Response Type	QR	QR
Sprinkler Position	Pendent, frame arms aligned with pipe, deflectors parallel to floor.	Pendent, frame arms aligned with pipe, deflectors parallel to floor.
System Type	Wet Pipe System only	Wet Pipe System only
Maximum Area of Coverage*	100 ft² (9,29m²) Refer to FM 2-0, Table 17	100 ft² (9,29m²) Refer to FM 2-0, Table 17
Minimum Area of Coverage	64 ft² (5,9 m²) Refer to FM 2-0, Table 17	64 ft² (5,9 m²) Refer to FM 2-0, Table 17
Maximum Ceiling Slope	Up to 10° Refer to FM 2-0, Section 2.2.1.6	Up to 10° Refer to FM 2-0, Section 2.2.1.6
Maximum Spacing	10 ft. (3,0 m)	10 ft. (3,0 m)
Minimum Spacing	8 ft. (2,4 m)	8 ft. (2,4 m)
Deflector Distance from Walls	Refer to FM 2-0, Section 2.2.3.3	Refer to FM 2-0, Section 2.2.3.3
Deflector to Top of Storage	Minimum of 36 inches (914 mm) Refer to FM 2-0 Section 2.2.2.1 and FM 8-9, Section 2.2.6	Minimum of 36 inches (914 mm) Refer to FM 2-0 Section 2.2.2.1 and FM 8-9, Section 2.2.6
Ceiling Sprinkler Installation Guidelines	As per FM 2-0 (DS 2-0), Installation Guidelines for Automatic Sprinklers with the following exception: Vertical distance from underside of the ceiling to the centerline of the sprinkler's thermal element - no more than 13 inches (325 mm)	As per FM 2-0 (DS 2-0), Installation Guidelines for Automatic Sprinklers with the following exception: Vertical distance from underside of the ceiling to the centerline of the sprinkler's thermal element - no more than 13 inches (325 mm)
Maximum Ceiling Height	50 ft. (15,2 m)	55 ft. (16,76 m)
Maximum Storage Height	45 ft. (13,5 m)	50 ft. (15,2 m)
Storage Arrangement	Solid-piled, palletized, shelf, bin-box, as well as single, double, and multi row racks that qualify as open-frame	Solid-piled, palletized, shelf, bin-box, as well as single-row and double-row racks that qualify as open-frame
Storage Aisles Between Racks	Minimum 6 ft (1,8 m) wide	Minimum 8 ft (2,4 m) wide
Commodity	Class 1-4 Cartoned unexpanded plastics	Class 1-4 Cartoned unexpanded plastics
Sprinkler System Design	QR Storage Sprinkler based upon 10 @ 40 psi (2.8 bar) design pressure @177 gpm (670 Lpm) with 9 sprinkler remote area (3x3) on 3 branchlines and 1 sprinkler on 1 branchline. Exception: a sprinkler design of 9 (3x3) @ 40 psi (2.8 bar) design pressure @177 gpm (670 Lpm) when the water supply can also provide a design of 4 (2x2) @ 80 psi (5.5 bar) design pressure @250 gpm (950 Lpm)	QR Storage Sprinkler based upon 9 @ 80 psi (5.5 bar) design pressure with 250 gpm (950 Lpm) with 9 sprinkler remote area (3x3) on 3 branchlines.
Obstruction Criteria	Refer to FM 2-0 Section 2.2	Refer to FM 2-0 Section 2.2
Hose Stream Allowance and Water Supply Duration	250 gpm (950 Lpm) for 60 minutes	250 gpm (950 Lpm) for 60 minutes

* The maximum coverage area must not exceed 100 ft² (9,29 m²).
** Approved storage sprinklers are also FM Approved for use as non-storage sprinklers.