TECHNICAL DATA

ESFR DRY PENDENT SPRINKLER VK504 (K16.8)

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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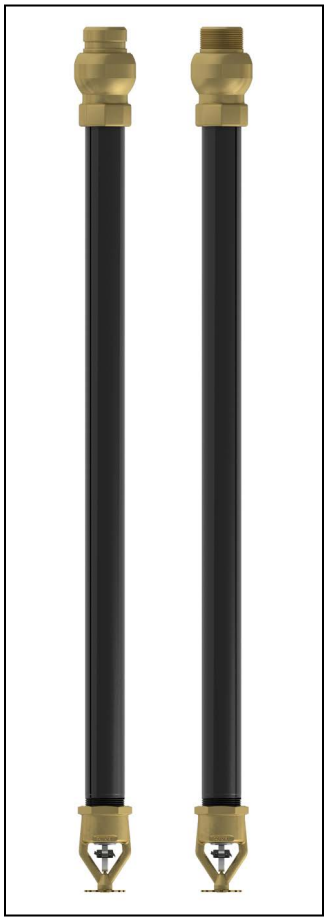
1. DESCRIPTION

Viking Early Suppression Fast Response (ESFR) Dry Pendent Sprinkler VK504 is a fast response fusible element type sprinkler designed for use in storage areas subject to freezing and supplied from a **wet system only**, in an adjacent heated area. With a 16.8 (242 metric*) nominal K-Factor and special deflector, this sprinkler produces large, high-momentum water droplets in a hemispheric pattern below the deflector. This permits penetration of the fire plume and direct wetting of the burning fuel surface while cooling the atmosphere early in the development of a high-challenge fire.

The dry ESFR sprinkler consists of a fusible element style ESFR sprinkler permanently secured to a special supply nipple. The sprinkler assembly features a sealed brass inlet that's grooved or threaded. Also included with the ESFR dry sprinkler are two insulating boot assemblies (optional) to help seal the clearance space around the dry sprinkler barrel. The dry sprinkler boot assembly is intended to slow the exchange of air between the inside and outside of the freezer (or any dry sprinkler installation) to help mitigate condensation and humidity and temperature differentials in the area around the sprinkler. Condensation can lead to ice build-up, which could inhibit sprinkler operation or cause premature operation.

NOTICE

Viking recommends use of the included insulating boot assemblies in accordance with the installation instructions in this technical data page. Insulating boot assemblies (optional) shall be installed on smooth, flat, and clean surfaces. There are specific situations, such as corrugated ceiling panels, where alternative penetration sealing methods are utilized. For additional information contact Viking Technical Services.



ESFR Sprinkler VK504 (Grooved and Threaded)

2. LISTINGS AND APPROVALS

WARNING: Cancer and Reproductive Harm- www.P65Warnings.ca.gov

FM Approved: Class 2027

CE CPR: EAD 100002-00-1106 March 2016, Declaration of Performance DOP_VK504.

Refer to the Approval Chart and Design Criteria for FM Approval requirements that must be followed.

⚠ WARNING

ESFR Dry sprinklers can ONLY be installed in Wet systems! Not for installation in dry or preaction systems.

3. TECHNICAL DATA

Specifications:

Available since 2013.
Tube diameter: 1-11/16" (43.86 mm)
Minimum Operating Pressure: Refer to NFPA 13 or FM Loss Prevention Data Sheets 8-9.
Maximum Working Pressure: 175 psi (12 bar). Factory tested hydrostatically to 500 psi (34.5 bar).
Connections: 1½" grooved or 1½" NPT or BSPT threaded
Nominal K-Factor: 16.8 U.S. (242 metric*)
*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.
Deflector Diameter: 1-3/4" (44.5 mm)
Overall Length:
Threaded: 18-1/2" (470 mm), 24-1/2" (622 mm), 30-1/2" (775 mm), 36-1/2" (927 mm)
Grooved: 19-1/2" (495 mm), 25-1/2" (648 mm), 31-1/2" (800 mm), 37-1/2" (953 mm)
Insulating Boot Assembly: The boot consists of a rubber foam seal covered with a two-piece ring fastened to the ceiling or deck with four screws.
Outside Diameter: 6" (152 mm)
Depth: 1" (25 mm)

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Material Standards:

Sprinkler Frame Casting: Brass UNS-C84400
Deflector: Phosphor Bronze UNS-C51000
Seat: Brass UNS-C36000
Belleville Spring Sealing Assembly: Nickel Alloy, coated on both sides with PTFE Tape
Spring Base: Brass UNS-C31400 or UNS-C31600
Back-Up Nut: Brass UNS-C36000
Compression Screw: Stainless Steel UNS-S31603
Trigger and Support: Stainless Steel UNS-S31600
Fusible Element Assembly: Beryllium Nickel, coated with polyurethane
Tube: Steel Tube ASTM A-513
Orifice: Brass UNS-C36000
Inlet: Brass UNS-C84400
Support (Internal): Brass UNS-C36000
Barrel: Steel Tube ASTM A-513, Electrodeposited Epoxy Base finish

Boot Assemblies:

Seal: ASTM D1056 2A0/1 4015-EL EPDM-Butyl-PE Foam Rubber OR ASTM D1056 2A1 Neoprene/EPDM/SBR OR ASTM D1056 2C1 Neoprene/EPDM
Over Seal Ring and Under Seal Ring: Cold Rolled Steel Finish: White Paint; #10 Screws: Stainless Steel

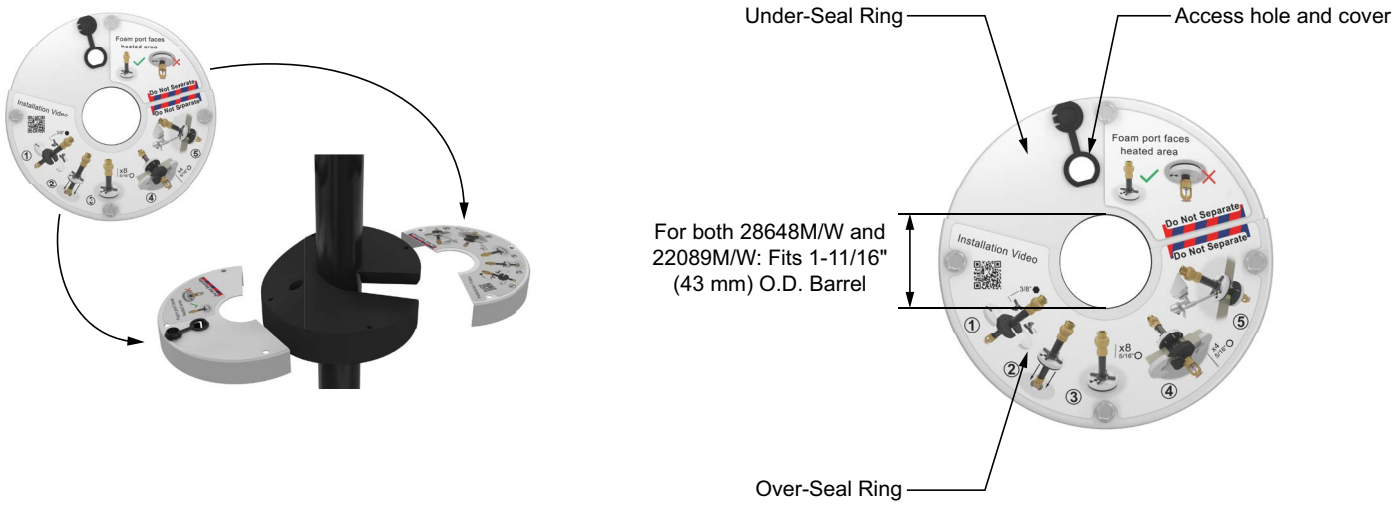


Figure 1: Replacement Boot 28648M/W Components and Dimensions

NOTICE Installation Instructions

Refer to document F_030107 for insulation boot installation instructions on a dry sprinkler.

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Ordering Instructions (Refer to Table 1)
1. Choose a sprinkler size (brass is the only available finish) to determine the base part number then,
2. add the suffix for the desired temperature rating.

NOTE: Sprinkler assemblies include 2 insulating boots (part no. 22090) unless noted below.

EXAMPLE: 19913AC = VK504 at 25½" with a 165 °F (74 °C) temperature rating. This sprinkler is to be installed into an area with a maximum ambient temperature of 100 °F (38 °C) meaning if the area will experience temperatures above the maximum ambient rating, you shall use a higher temperature-rated sprinkler

Accessories Sprinkler cabinet (part no. 01725A) (Also refer to the Viking website.)
Replacement Insulating Boot Assemblies:
Part No. 22089M/W (includes 1 boot assembly and hardware)
Part No. 28648M/W (includes 1 boot assembly with access hole, installation label, and hardware)

NOTE: These sprinklers do not require custom wrenches. For grooved sprinklers, install the coupling per the manufacturer's instructions.

TABLE 1: BASE PART NUMNBER

1. Available Part Numbers and Styles

Base Part Number	Nominal Length (L)	Connection Style	Connection Size
19225A	19½"	Grooved	1½"
19912A*	19½"		
19229A	25½"		
19913A*	25½"		
19233A	31½"		
19911A*	31½"		
19015A	37½"		
19905A*	37½"		
19226A	18½"	NPT Threaded	
19230A	24½"		
19234A	30½"		
19016A	36½"		
19227A	18½"	BSPT Threaded	
19231A	24½"		
19235A	30½"		
19907A*	36½"		
19017A	36½"		

* Does not include insulating boots.

TABLE 2: TEMPERATURE RATINGS

2. Available Temperature Ratings

Suffix	Temperature Classification	Nominal Temperature Rating	Maximum Ambient Ceiling Temperature	Frame Paint Color
C	Ordinary	165 °F (74 °C)	100 °F (38 °C)	None
E	Intermediate	205 °F (96 °C)	150 °F (65 °C)	White

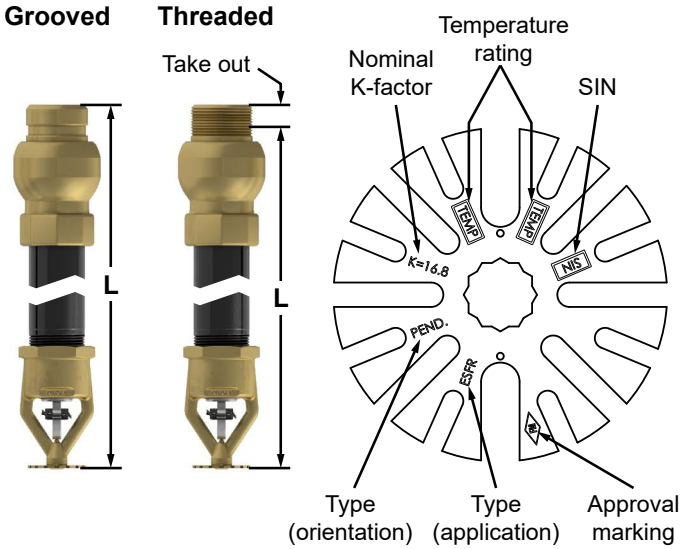


Figure 2: Sprinkler Dimensions and Markings

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4. INSTALLATION

Sprinklers must be handled with care. They must be stored in a cool, dry place in their original shipping container. Never install sprinklers that have been dropped or damaged in any way. Such sprinklers should be destroyed immediately.

NOTICE

Wet pipe systems must be provided with adequate heat.

Viking ESFR dry sprinklers are to be installed into the 1½" grooved or 1½" threaded run of malleable, ductile iron tee fittings that meet the dimensional requirements of ANSI B16.3 (Class 150), or cast iron threaded tee fittings that meet the dimensional requirements of ANSI B16.4 (Class 125), even at branch line ends.

- **DO NOT** install the dry sprinkler into a threaded elbow, coupling, or any other fitting that could interfere with thread penetration. Such installation would damage the brass seal.
- **NEVER** try to modify dry sprinklers. They are manufactured for specific dimensions and must NOT be modified.

1. The sprinklers must be installed after the piping is in place to prevent mechanical damage. Before installing, be sure to have the appropriate sprinkler model and style, with the correct orifice size, temperature rating, and response characteristics.
2. For grooved sprinklers, with the sprinkler contained in the plastic protective shield, apply a lube such as Gruvlok Xtreme™. For threaded sprinklers, apply a small amount of pipe-joint compound or tape to the external threads of the barrel only, while taking care not to allow a build-up of compound or tape over the brass inlet and seal.
3. **For grooved sprinklers, DO NOT use a wrench, as it will damage the unit. Install the coupling according to the manufacturer's instructions. To install threaded sprinklers, use an open-ended wrench applied to the sprinkler inlet housing. With the sprinkler contained in the protective shield, install the sprinkler onto the piping, while taking care not to damage the sprinkler.**
   - DO NOT use any other type of wrench on the threaded sprinkler, as this could damage the unit.
   - DO NOT use the sprinkler deflector or fusible element to start or thread the a sprinkler into a fitting.
   - Higher levels of torque may distort the sprinkler inlet with consequent leakage or impairment of the sprinkler.
4. Clean the contact surfaces of the dry sprinkler insulating boot assemblies and the surfaces are recommended to be smooth and flat.

NOTICE

Refer to document F_030107 for insulation boot installation instructions on a dry sprinkler.

5. Refer to Figures 3A, 3B, and 4. Install the dry sprinkler boot assemblies around the dry sprinkler barrel and to the freezer until the seals rest flush against the top of the freezer.
6. Assemble the rings onto the seals, hold in place, and tighten the screws through the holes provided in the assemblies to secure the insulating ring to the top of the freezer. NOTE: A #29 drill is required for a pilot hole in metallic ceilings.
7. 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. Air testing the sprinkler piping prior to testing with water may be considered in areas where leakage during testing must be prevented. Refer to the appropriate technical data and the AHJ prior to air testing the sprinkler piping. Immediately replace any damaged units, using the designated wrench only.
8. **After installation and testing and repairing of all leaks, remove the protective shields from the sprinklers by hand. Do NOT use any type of tool to remove the shield. When removing shields, use care to prevent damaging sprinkler fusible element. THE SHIELDS MUST BE REMOVED FROM SPRINKLERS BEFORE PLACING THE SYSTEM IN SERVICE!**
9. System design must be based on ESFR design guidelines described in the latest National Fire Protection Association standards, FM loss prevention data sheets, and the Authorities Having Jurisdiction. All requirements of recognized ESFR storage sprinkler system design standards apply to systems utilizing Viking ESFR Dry Pendent Sprinklers.

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⚠ WARNING

Viking sprinklers are manufactured and tested to meet rigid requirements of the approving agency. The sprinklers are designed to be installed in accordance with recognized installation standards. System design must be based on ESFR design guidelines described in the latest edition of Viking technical data, applicable FM Global Loss Prevention Data Sheets, the latest NFPA Standards, the Authorities Having Jurisdiction, and also with the provisions of governmental codes, ordinances, and standards whenever applicable. 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.

5. OPERATION

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

6. 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.

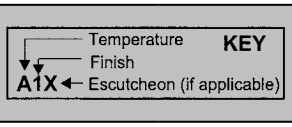
1. The sprinklers must be inspected on a regular basis for corrosion, mechanical damage, obstructions, paint, etc. The frequency of inspections may vary due to corrosive atmosphere, water supplies, and activity around the device.
2. Sprinklers that have been painted or mechanically damaged must be replaced 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 Dry Pendent Sprinklers, refer to the Installation Standards (e.g., NFPA 25) 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.
3. 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.
4. 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.
   a. Remove the system from service, drain all water, and relieve all pressure on the piping.
   b. Remove the ESFR dry sprinkler insulating boot assemblies.
   c. Using the designated 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.
   d. Install new ESFR dry sprinkler boot assemblies.
   e. Place the system back in service and secure all valves. Check the replaced sprinklers and repair all leaks.
5. 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.

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7. APPROVAL DESIGN REQUIREMENTS

Approval Chart

ESFR Dry Pendent Sprinkler VK504
Maximum 175 PSI (12 bar) WWP



Base Part Number[1]				SIN	Connections	Nominal K-Factor		Listings and Approvals[2,3] (Refer also to Design Criteria below.)	
19-1/2" (495 mm)	25-1/2" (648 mm)	31-1/2" (800 mm)	37-1/2" (953 mm)			U.S.	metric[2]	FM	CE
19225	19229	19233	19015	VK504	1½" Grooved	16.8	242	A1	A1
19912	19913	19911	19905	VK504	1½" Grooved	16.8	242	A1	A1
18-1/2" (470 mm)	24-1/2" (622 mm)	30-1/2" (775 mm)	36-1/2" (927 mm)						
19226	19230	19234	19016	VK504	1½" NPT Threaded	16.8	242	A1	A1
19227	19231	19235	19017	VK504	1½" BSPT Threaded	16.8	242	A1	A1
--	--	--	19907	VK504	1½" BSPT Threaded	16.8	242	A1	A1
Approved Temperature Rating A - 165 °F (74 °C), 205 °F (96 °C)								**Approved Finish** 1 - Brass	

Footnotes

[1] Base part number shown. For complete part number, refer to the price list.
[2] This chart shows listings and approvals available at the time of printing. Other approvals may be in process.
[3] Refer to the latest standards of NFPA 13.

TABLE 3:
COMMODITY SELECTION AND DESIGN CRITERIA OVERVIEW FOR MODEL VK504 ESFR PENDENT SPRINKLERS

Storage Type	NFPA	FM
Sprinkler Type	ESFR	Storage*
Response Type	ESFR	QR
System Type	Wet Pipe system only	Wet Pipe system only
Temperature Rating(s) ºF (ºC)	165 ºF (74 ºC) and 205 °F (96 °C)	165 ºF (74 ºC) and 205 °F (96 °C)
Open Frame Single, Double, or Portable Rack Storage of Class I-IV and Group A or B Plastics	Refer to NFPA 13.	Refer to FM 2-0 and 8-9.
Solid Pile or Palletized Storage of Class I-IV and Group A or B Plastics	Refer to NFPA 13.	Refer to FM 2-0 and 8-9.

* Approved Storage sprinklers are also FM approved for use as non-storage sprinklers.

IMPORTANT: Always refer to Bulletin Form No. F_091699 - Care and Handling of Sprinklers. Viking ESFR Pendent Sprinklers are to be installed in accordance with the latest edition of Viking technical data, the latest standards of NFPA, VdS, LPCB, and any other Authorities Having Jurisdiction, and also with provisions of governmental codes, ordinances, and standards whenever applicable.

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TABLE 4:
COMMODITY SELECTION AND DESIGN CRITERIA OVERVIEW FOR MODEL VK504 AS PER NFPA CRITERIA

Description	40 ft. (12.2 m) Ceilings
Sprinkler Type	ESFR
Temperature Rating	165 ºF (74 ºC) and 205 °F (96 °C)
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 to Top of Storage	Minimum of 36 in. (914 mm)
Deflector to Ceiling Distance	For all building heights: 6–14 in. (152–356 mm).
Maximum Ceiling Height	40 ft. (12,2 m)
Maximum Storage Height	35 ft. (10,7 m)
Clearance Opening Diameter	Refer to Figure 3A. Note that the dry sprinkler boot must seat and seal against the smooth surface of the top of the freezer in order to close the air gap.
Sprinkler Fitting	Install into the 1-1/2” grooved or 1-1/2” threaded run of malleable, ductile iron tee fittings that meet the dimensional requirements of ANSI B16.3 (Class 150), or cast iron threaded tee fittings that meet the dimensional requirements of ANSI B16.4 (Class 125) only.
Maximum Distance Between Sprinklers	For buildings over 30 ft (9.1 m) high, spacing between sprinklers and/or branch lines must be from 8 to 10 ft (2.4 to 3.1 m)**.
	For building heights up to 30 ft (9.1 m), the spacing allowed between sprinklers and/or branch lines is 8 to 12 ft (2.4 to 3.7 m), provided the area covered per sprinkler does not exceed the maximum 100 ft^2 (9.3 m^2) allowed*.

*Refer to the Installation Standards for permissible deviations from the maximum sprinkler spacing rules above, to eliminate obstructions created by trusses and bar joists when using ESFR sprinklers.

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FM Approval Requirements:

1. Sprinkler VK504 is FM Approved as a quick response pendent Storage sprinkler as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheets 2-0 and 8-9).
2. Approved storage sprinklers are also FM Approved for use as non-storage sprinklers as indicated in the FM Approval Guide. For specific application and installation requirements, reference the latest applicable FM Loss Prevention Data Sheets (including Data Sheet 2-0).

FM Global Loss Prevention Data Sheets contain guidelines relating to, but not limited to: minimum water supply requirements, hydraulic design, ceiling slope and obstructions, minimum and maximum allowable spacing, and deflector distance below the ceiling.

NOTICE: The FM installation guidelines may differ from NFPA criteria.

TABLE 5:
COMMODITY SELECTION AND DESIGN CRITERIA OVERVIEW FOR MODEL VK504
SPECIFIC APPLICATION LISTING - FM

Description	40 ft. (12.2 m) Ceilings
Sprinkler Type	ESFR
Temperature Rating	165 ºF (74 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	2 in 12
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 to Top of Storage	Minimum of 36 in. (914 mm)
Ceiling to Center of Operating Element	For all building heights: 2–13 in. (51–330 mm)
Maximum Ceiling Height	40 ft. (12,2 m)
Maximum Storage Height	35 ft. (10,7 m)
Clearance Opening Diameter	Refer to Figure 3A. Note that the dry sprinkler boot must seat and seal against the smooth surface of the top of the freezer in order to close the air gap.
Sprinkler Fitting	Install into the 1-1/2” grooved or 1-1/2” threaded run of malleable, ductile iron tee fittings that meet the dimensional requirements of ANSI B16.3 (Class 150), or cast iron threaded tee fittings that meet the dimensional requirements of ANSI B16.4 (Class 125) only.
Maximum Distance Between Sprinklers	For buildings over 30 ft (9.1 m) high, spacing between sprinklers and/or branch lines must be from 8 to 10 ft (2.4 to 3.1 m)**.
	For building heights up to 30 ft (9.1 m), the spacing allowed between sprinklers and/or branch lines is 8 to 12 ft (2.4 to 3.7 m), provided the area covered per sprinkler does not exceed the maximum 100 ft^2 (9.3 m^2) allowed*.

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8. AVAILABILITY

The Viking Model VK504 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.

OPTIONAL ALTERNATIVE PENETRATION SEAL METHODS
NOTE: Actual conditions may vary.

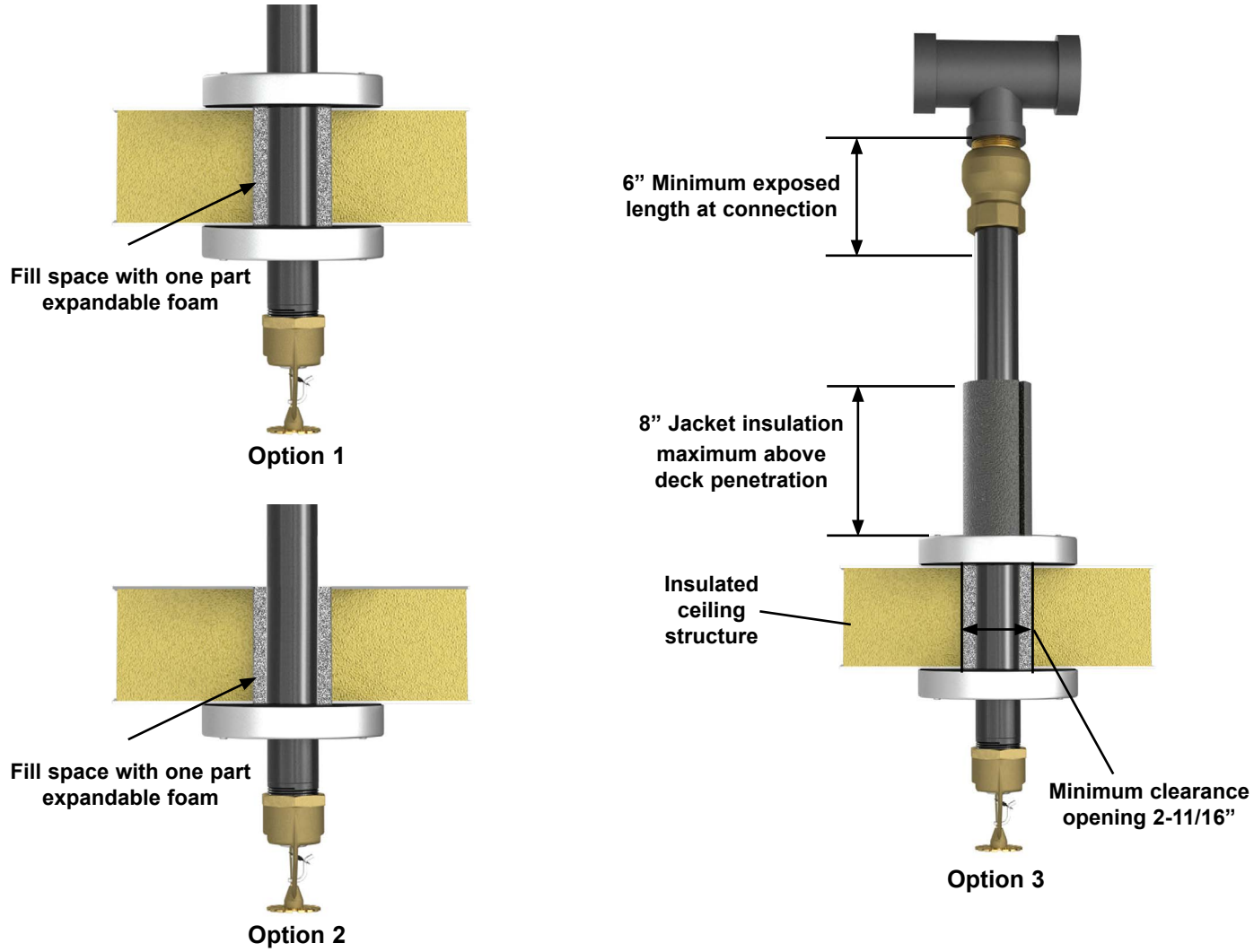
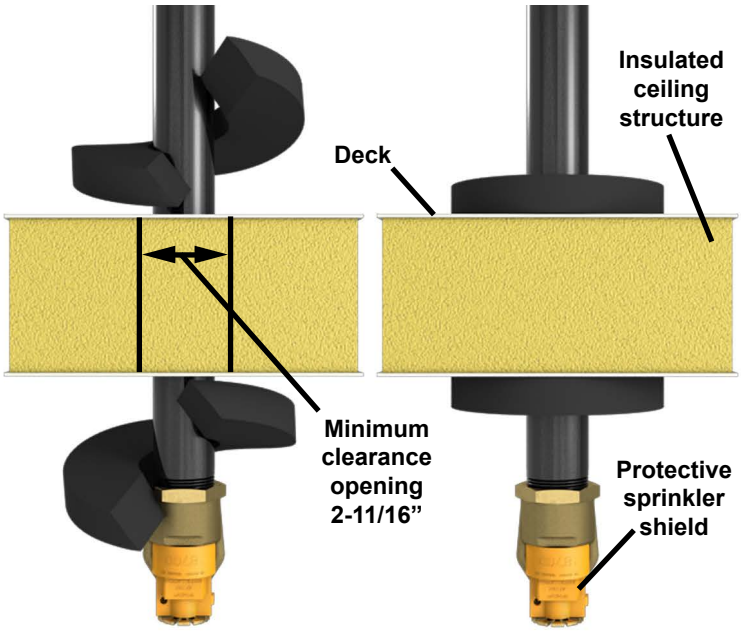


Figure 3A

NOTICE

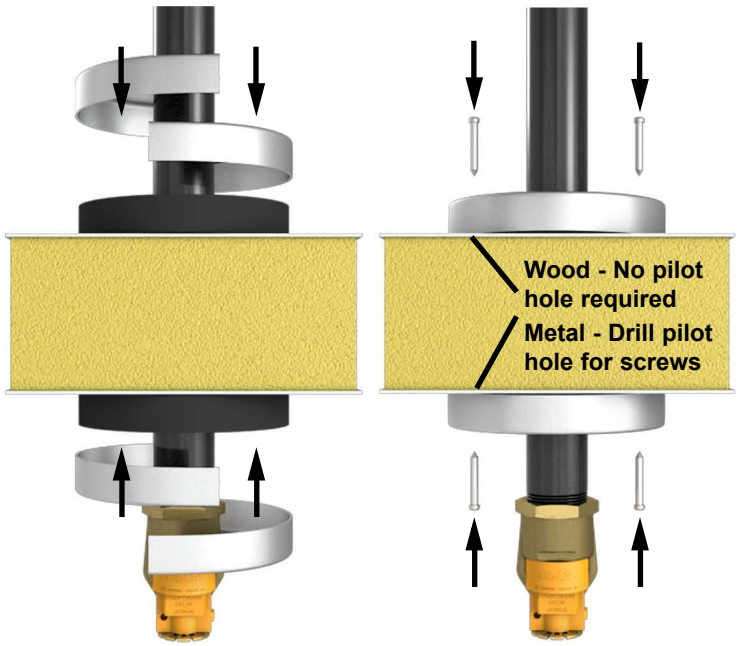
Specific situations and conditions may exist that require alternative sealing methods. A few of these methods are shown above as Options 1–3. Additional sealing methods may also be utilized; the material(s) used must not break down, drip, over-spray, or otherwise interfere with or impede the operation of the sprinkler—especially during fire conditions.

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Step 1: Install seal around barrel of dry ESFR sprinkler

Step 2: Place seal flush with top of freezer and secure around barrel



Step 3: Intall underseal ring and overseal ring onto seal

Step 4: Secure insulating ring to top of ceiling with #10 tapping screws

Figure 3B: Installation of ESFR Dry Sprinkler Boot Assemblies with Grooved ESFR

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Table 6: NFPA Exposed Barrel Lengths For Dry Sprinklers

Ambient Temperature of the Protected Area at the discharge end of the Sprinkler	Exposed Barrel Ambient Temperature		
	40 °F (4 °C)	50 °F (10 °C)	60 °F (16 °C)
	Minimum Exposed Barrel Lengths (based on ambient temperaures above)		
	Inches (mm)	Inches (mm)	Inches (mm)
40 °F (4 °C)	0	0	0
30 °F (-1 °C)	0	0	0
20 °F (-7 °C)	4 (100)	0	0
10 °F (-12 °C)	8 (200)	1 (25)	0
0 °F (-18 °C)	12 (300)	3 (75)	0
-10 °F (-23 °C)	14 (350)	4 (100)	1 (25)
-20 °F (-29 °C)	14 (350)	6 (150)	3 (75)
-30 °F (-34 °C)	16 (400)	8 (200)	4 (100)
-40 °F (-40 °C)	18 (450)	8 (200)	4 (100)
-50 °F (-46 °C)	20 (500)	10 (250)	6 (150)
-60 °F (-51 °C)	20 (500)	10 (250)	6 (150)

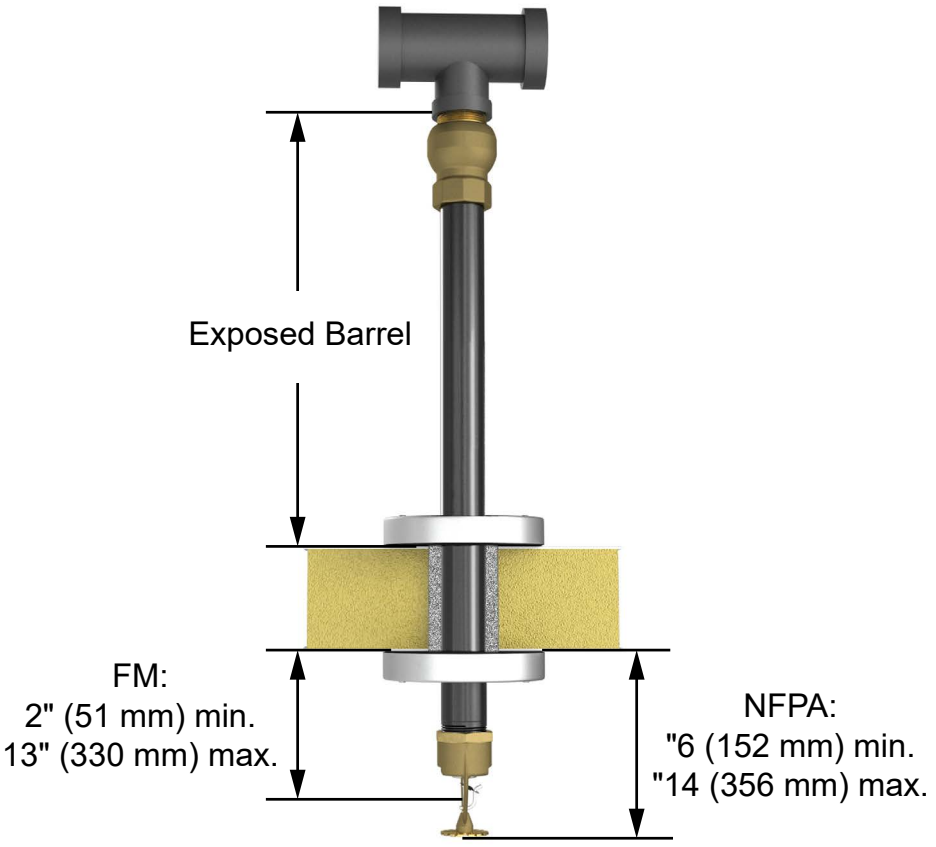


Figure 4: Minumum Exposed Barrel Length