Storage Sprinkler
U.S. Quick Reference Guide

This guide is intended for general reference only. Prior to the design, layout, and/or installation of any sprinkler system, please refer to Viking’s technical documentation and always consult with the AHJ. Viking makes no representation or warranty as to whether following this guide will satisfy any rule or requirement. Please visit www.vikinggroupinc.com for the most current technical data and product specifications. All products must be installed in accordance with the manufacturer’s current installation instructions. Viking reserves the right to change product specifications at any time without notice and without incurring obligation.

Early Suppression Fast Response (ESFR) Sprinklers

14.0 (202) K-factor

**VK520, ESFR Upright**

- Protects up to 35 ft (10.7 m) high buildings without using in-rack sprinklers
- Upright design provides more options for designing around obstructions
- Install directly onto system piping up to 3 in (75 mm) diameter pipe
- Easy to retrofit into existing upright sprinkler systems
- Can be installed on same branch line as K14 ESFR pendent sprinklers

| NFPA 13 - Required Minimum Flow (GPM) - Single-Row, Double-Row, and Multi-Row Rack Storage (without solid shelves) |
|---|---|---|---|---|---|---|---|---|
| ceiling height (ft) > 45’ | 40’ | 35’ | 30’ | 25’ | 20’ | 15’ | 10’ | 5’ |
| storage height (ft) > 10’ | 40’ | 35’ | 30’ | 25’ | 20’ | 15’ | 10’ | 5’ |
| Class I-IV Commodity | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |
| Carton Nonexpanded Plastic | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |
| Carton Expanded Plastic | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |
| Exposed Nonexpanded Plastic | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |

* Required flow per sprinkler calculated using Q=K*(√p) multiplied by number of design sprinklers (12)

14.0 (202) K-factor

**VK500, ESFR Pendent**

- Protects up to 35 ft (10.7 m) high buildings without using in-rack sprinklers
- Sprinklers may be spaced up to 12 ft (3.7 m) for buildings up to 30 ft (9.1 m)
- Coverage area per sprinkler may not exceed 100 ft² (9.3 m²)
- AVAILABLE IN 165°F AND 205°F TEMPERATURE RATINGS

| NFPA 13 - Required Minimum Flow (GPM) - Single-Row, Double-Row, and Multi-Row Rack Storage (without solid shelves) |
|---|---|---|---|---|---|---|---|---|
| ceiling height (ft) > 45’ | 40’ | 35’ | 30’ | 25’ | 20’ | 15’ | 10’ | 5’ |
| storage height (ft) > 10’ | 40’ | 35’ | 30’ | 25’ | 20’ | 15’ | 10’ | 5’ |
| Class I-IV Commodity | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |
| Carton Nonexpanded Plastic | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |
| Carton Expanded Plastic | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |
| Exposed Nonexpanded Plastic | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |

* Required flow per sprinkler calculated using Q=K*(√p) multiplied by number of design sprinklers (12)

14.0 (202) K-factor

**VK502, ESFR Dry Pendent**

- Protects up to 35 ft (10.7 m) high buildings without using in-rack sprinklers
- INSTALL ON WET SYSTEMS ONLY (not approved for dry/preaction systems)
- Uses same design criteria as standard 14.0 (202) K-factor ESFR pendent
- Includes two dry sprinkler insulation boots (p/n 19330M/W)
- Offered with either a threaded or grooved connection
- AVAILABLE IN 165°F TEMPERATURE RATING

| NFPA 13 - Required Minimum Flow (GPM) - Single-Row, Double-Row, and Multi-Row Rack Storage (without solid shelves) |
|---|---|---|---|---|---|---|---|---|
| ceiling height (ft) > 45’ | 40’ | 35’ | 30’ | 25’ | 20’ | 15’ | 10’ | 5’ |
| storage height (ft) > 10’ | 40’ | 35’ | 30’ | 25’ | 20’ | 15’ | 10’ | 5’ |
| Class I-IV Commodity | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |
| Carton Nonexpanded Plastic | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |
| Carton Expanded Plastic | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |
| Exposed Nonexpanded Plastic | 1455 | 1455 | 1455 | 1302 | 1188 | 1188 | 1188 | 1188 |

* Standard length is 36-5/8”. Also available in lengths of 18-5/8”, 24-5/8”, and 30-5/8”. Refer to Viking’s List Price Book for ordering information.

* Required flow per sprinkler calculated using Q=K*(√p) multiplied by number of design sprinklers (12)
Early Suppression Fast Response (ESFR) Sprinklers

Viking ESFR sprinklers with K-factor of 16.8 and greater successfully meet the new UL 1767 test standard and compliance program for high clearance storage arrangements.

### 16.8 (242) K-factor

**VK503, ESFR Pendent**

- **Base Part Number:** 14073
- **Technical Datasheet:** F_120106
- **NPT Thread:** 3/4 in

**NFP 13 - Required Minimum Flow (GPM) - Single-Row, Double-Row, and Multi-Row Rack Storage (without solid shelves)**

<table>
<thead>
<tr>
<th>ceiling height (ft)</th>
<th>45'</th>
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**VK504, ESFR Dry Pendent**

- **Threaded Part Number:** 19016
- **Grooved Part Number:** 19015
- **Technical Datasheet:** F_062613
- **NPT Thread/Grooved:** 1-1/2 in

**NFP 13 - Required Minimum Flow (GPM) - Single-Row, Double-Row, and Multi-Row Rack Storage (without solid shelves)**

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**VK506, ESFR Pendent**

- **Base Part Number:** 18493
- **Technical Datasheet:** F_081612
- **NPT Thread:** 1 in

**NFP 13 - Required Minimum Flow (GPM) - Single-Row, Double-Row, and Multi-Row Rack Storage (without solid shelves)**

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**VK510, ESFR Pendent**

- **Base Part Number:** 12080
- **Technical Datasheet:** F_100102
- **NPT Thread:** 1 in

**NFP 13 - Required Minimum Flow (GPM) - Single-Row, Double-Row, and Multi-Row Rack Storage (without solid shelves)**

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1. Required flow per sprinkler calculated using Q=K*(√(ceiling height (ft) - storage height (ft)) multiplied by number of design sprinklers (12)

2. Requires one row of in-rack sprinklers

16.8 (242) K-factor

- **Protects up to 35 ft (10.7 m) high piled storage without using in-rack sprinklers in buildings with 40 ft (12.2 m) high ceilings**
- **Requires lower starting pressures than VK500 K14 (202) ESFR pendent**
- **Approved for up to 45 ft (13.7 m) ceilings with one row of in-rack sprinklers**
- **Available in 165°F and 205°F temperature ratings**

22.4 (320) K-factor

- **Protects up to 40 ft (12.2 m) high piled storage without using in-rack sprinklers with ceilings up to 45 ft (13.7 m)**
- **May reduce or eliminate the need for a fire pump**
- **Available in 165°F and 205°F temperature ratings**

25.2 (363) K-factor

- **Protects up to 40 ft (12.2 m) high piled storage without using in-rack sprinklers with ceilings up to 45 ft (13.7 m)**
- **May reduce or eliminate the need for a fire pump**
- **cULus Listed with deflector installed 6-18 in (102-330 mm) below ceiling**
- **Ceiling heights up to 40 feet (6-14 in down for up to 45 ft ceiling heights)**
- **Available in 165°F and 205°F temperature ratings**

### Additional Information

- **VK503, ESFR Pendent**
  - Available in 165°F and 205°F temperature ratings
  - Requires lower starting pressures than VK500 K14 (202) ESFR pendent
  - Protects up to 35 ft (10.7 m) high piled storage without using in-rack sprinklers in buildings with 40 ft (12.2 m) high ceilings

- **VK504, ESFR Dry Pendent**
  - Available in 165°F and 205°F temperature ratings
  - Includes two dry sprinkler insulation boots (p/n 19330M/W)
  - INSTALL ON WET SYSTEMS ONLY (not approved for dry/preaction systems)

- **VK506, ESFR Pendent**
  - Available in 165°F and 205°F temperature ratings
  - Protects up to 40 ft (12.2 m) high piled storage without using in-rack sprinklers with ceilings up to 45 ft (13.7 m)

- **VK510, ESFR Pendent**
  - Available in 165°F and 205°F temperature ratings
  - Protects up to 40 ft (12.2 m) high piled storage without using in-rack sprinklers with ceilings up to 45 ft (13.7 m)
ESFR Sprinklers continued from Page 2

Early Suppression Fast Response (ESFR) Sprinklers

Viking ESFR sprinklers with K-factor of 16.8 and greater successfully meet the new UL 1767 test standard and compliance program for high clearance storage arrangements.

28.0 (404) K-factor

**VKS14, ESFR Pendent**

- FM Approval protects up to 55 ft (16.7 m) high storage facilities with up to 50 ft (15.2 m) high-piled storage, without using in-rack sprinklers.
- 8 ft (2.4 m) aisle width required.
- UL Listing protects up to 48 ft (14.6 m) high storage facilities with up to 43 ft (13.1 m) high-piled storage, without using in-rack sprinklers.
- 6 ft (1.8 m) aisle width required.
- Available in 165°F and 205°F temperature ratings.

**FM - Required Minimum Flow (GPM) - Single-Row and Double-Row Rack Storage (without solid shelves)**

<table>
<thead>
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<th>ceiling height (ft)</th>
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**NFPA 13 - Required Minimum Flow (GPM) - Single-Row and Double-Row Rack Storage (without solid shelves)**

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<th>ceiling height (ft)</th>
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1 Required flow per sprinkler calculated using \(Q = K^* \sqrt{p}\) multiplied by number of design sprinklers (9).

**Control Mode Specific Application (CMSA) Sprinklers**

11.2 (161) K-factor

**VKS540, Large Drop, CMSA Upright**

- Available in 155°F, 200°F, and 286°F temperature ratings.
- Provides protection from severe challenge fires by creating larger water drops that penetrate the fire plume and cool the storage commodity.
- Approved for storage of class I-IV Commodities, heavyweight rolled paper, and expanded and nonexpanded plastics (cartoned and exposed).
- VKS540 is approved for wet, dry, and preaction systems.
- Eliminates the need for in-rack sprinklers in certain storage scenarios.

**NFPA 13 - Required Minimum Flow (GPM) - Single-Row, Double-Row, and Multi-Row Rack Storage (without solid shelves)**

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1 Required flow per sprinkler calculated using \(Q = K^* \sqrt{p}\) multiplied by number of design sprinklers (12).

1 Required flow per sprinkler calculated using \(Q = K^* \sqrt{p}\) multiplied by number of design sprinklers (Refer to NFPA 13).

1 Dry systems only. Requires 30 second water delivery time. High temperature sprinklers only.

1 Flows based upon wet systems.

19.6 (283) K-factor

**VKS92, CMSA Pendent**

- Available in 160°F and 205°F temperature ratings.
- Protects up to 40 ft (12.2 m) high buildings without using in-rack sprinklers.
- Requires lower overall water usage than ESFRs and other CMSA products.
- Overcomes many obstruction challenges that impact ESFR sprinklers.
- 12 ft (3.7 m) spacing between sprinklers provides enhanced design flexibility.
- Listed and Approved for warehouses with aisles as narrow as 4 ft (1.2 m).
- UL Listed for concrete tee construction (prohibited for ESFR sprinklers).

**NFPA 13 - Required Minimum Flow (GPM) - Single-Row, Double-Row, and Multi-Row Rack Storage (without solid shelves)**

<table>
<thead>
<tr>
<th>ceiling height (ft)</th>
<th>45'</th>
<th>40'</th>
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<td>storage height (ft)</td>
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<td>1610</td>
<td>1610</td>
<td>1610</td>
<td>1470</td>
<td>1470</td>
</tr>
</tbody>
</table>

1 Required flow per sprinkler calculated using \(Q = K^* \sqrt{p}\) multiplied by number of design sprinklers (see data page).

1 40 ft ceiling height is UL listed only. FM approved for up to 35 ft ceiling height (30 ft of storage).

1 Based on UL listed design criteria. VKS92 is not FM approved at 40' ceiling heights.

May 2019
### Control Mode Density Area (CMDA) Sprinklers

**11.2 (161) K-factor**

#### VK530, Standard Response ELO Upright

<table>
<thead>
<tr>
<th>Base Part Number</th>
<th>Technical Datasheet</th>
<th>Response</th>
<th>Element</th>
<th>NPT Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>09679</td>
<td>F_010692</td>
<td>Standard</td>
<td>Glass Bulb</td>
<td>3/4 in</td>
</tr>
</tbody>
</table>

**11.2 (161) K-factor**

#### VK531, Quick Response ELO Upright

<table>
<thead>
<tr>
<th>Base Part Number</th>
<th>Technical Datasheet</th>
<th>Response</th>
<th>Element</th>
<th>NPT Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>10633</td>
<td>F_120699</td>
<td>Quick</td>
<td>Glass Bulb</td>
<td>3/4 in</td>
</tr>
</tbody>
</table>

- Also available with fusible link (VK533 p/n 13978)
- UL Listed ONLY

**11.2 (161) K-factor**

#### VK536, Standard Response ELO Pendent

<table>
<thead>
<tr>
<th>Base Part Number</th>
<th>Technical Datasheet</th>
<th>Response</th>
<th>Element</th>
<th>NPT Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>07961</td>
<td>F_072213</td>
<td>Standard</td>
<td>Glass Bulb</td>
<td>3/4 in</td>
</tr>
</tbody>
</table>

**11.2 (161) K-factor**

#### VK377, Quick Response ELO Pendent

<table>
<thead>
<tr>
<th>Base Part Number</th>
<th>Technical Datasheet</th>
<th>Response</th>
<th>Element</th>
<th>NPT Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>08337</td>
<td>F_030993</td>
<td>Quick</td>
<td>Glass Bulb</td>
<td>3/4 in</td>
</tr>
</tbody>
</table>

### Control Mode Density Area (CMDA) Sprinklers

**16.8 (242) K-factor**

#### VK580, Standard Response CMDA Upright

<table>
<thead>
<tr>
<th>Base Part Number</th>
<th>Technical Datasheet</th>
<th>Response</th>
<th>Element</th>
<th>NPT Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>12739A</td>
<td>F_041904</td>
<td>Standard</td>
<td>Glass Bulb</td>
<td>3/4 in</td>
</tr>
</tbody>
</table>

**25.2 (363) K-factor**

#### VK598, Standard Response CMDA Upright

<table>
<thead>
<tr>
<th>Base Part Number</th>
<th>Technical Datasheet</th>
<th>Response</th>
<th>Element</th>
<th>NPT Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td>19522A</td>
<td>F_090414</td>
<td>Standard</td>
<td>Glass Bulb</td>
<td>1 in</td>
</tr>
</tbody>
</table>

- FM Approved Only - Design and install per FM Global Loss Prevention Data Sheet 8-9 (July 2018) only
- FM Approved for use in dry or preaction systems to protect Class I-III commodities with storage heights of up to 40 ft (12.2 m) in refrigerated areas and freezers as high as 45 ft (13.7 m), without the need for additional in-rack sprinkler protection
- VK598 design criteria requires specific water delivery times, as indicated on the product's technical data sheet. Viking's Technical Services team will assist customers with performing the required fluid delivery calculations

<table>
<thead>
<tr>
<th>ceiling height (ft) &gt;</th>
<th>45'</th>
<th>40'</th>
<th>35'</th>
<th>30'</th>
<th>25'</th>
<th>20'</th>
<th>15'</th>
<th>10'</th>
<th>5'</th>
</tr>
</thead>
<tbody>
<tr>
<td>storage height (ft) &gt;</td>
<td>40'</td>
<td>35'</td>
<td>30'</td>
<td>25'</td>
<td>20'</td>
<td>15'</td>
<td>10'</td>
<td>5'</td>
<td></td>
</tr>
<tr>
<td>Dry/Preaction</td>
<td>2140</td>
<td>2140</td>
<td>2140</td>
<td>2140</td>
<td>2140</td>
<td>2342</td>
<td>2342</td>
<td>2342</td>
<td>1992</td>
</tr>
<tr>
<td>Wet System</td>
<td>1352</td>
<td>1352</td>
<td>1352</td>
<td>1352</td>
<td>1352</td>
<td>1352</td>
<td>1352</td>
<td>1352</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class II Commodity</th>
<th>2140</th>
<th>2140</th>
<th>2140</th>
<th>2140</th>
<th>2140</th>
<th>2342</th>
<th>2342</th>
<th>2342</th>
<th>1992</th>
<th>1992</th>
<th>1333</th>
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</thead>
<tbody>
<tr>
<td>Class III Commodity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Intermediate Level Sprinklers (In-Rack)

Preassembled with Water Shield

5.6 (81) K-factor VK550 SR Upright
- Base Part Number: 12986—U
- Technical Datasheet: F_012498
- Response: Standard
- NPT Thread: 1/2 in
- Finish: Std. Brass
- Also available with fusible link (VK552-p/n 12973—U)
- Shield protects sprinkler from water discharge above
- Use where sprinkler guards are not required

Preassembled with Sprinkler Guard

5.6 (81) K-factor VK100 SR Upright
- Base Part Number: 12986—G
- Technical Datasheet: F_052014
- Response: Standard
- NPT Thread: 1/2 in
- Finish: Std. Brass
- Also available with fusible link (VK108-p/n 12973—G)
- Preassembled guard protects sprinkler from damage

Preassembled with Water Shield

5.6 (81) K-factor VK556 QR Upright
- Base Part Number: 12987—U
- Technical Datasheet: F_012498
- Response: Quick
- NPT Thread: 1/2 in
- Finish: Std. Brass
- Also available with fusible link (VK551-p/n 12279—U)
- Shield protects sprinkler from water discharge above
- Use where sprinkler guards are not required

Preassembled with Sprinkler Guard

5.6 (81) K-factor VK102 SR Pendent
- Base Part Number: 12987—G
- Technical Datasheet: F_031414
- Response: Standard
- NPT Thread: 1/2 in
- Finish: Std. Brass
- Also available with fusible link (VK110-p/n 12973—G)
- Preassembled guard protects sprinkler from damage

Preassembled with Water Shield

5.6 (81) K-factor VK300 QR Upright
- Base Part Number: 12987—G
- Technical Datasheet: F_052114
- Response: Quick
- NPT Thread: 1/2 in
- Finish: Std. Brass
- Also available in high pressure (250 PSI)-VK315
- Also available with fusible link (VK301-p/n 17535—G)
- Preassembled guard protects sprinkler from damage

Preassembled with Sprinkler Guard

5.6 (81) K-factor VK302 QR Pendent
- Base Part Number: 12979—G
- Technical Datasheet: F_033314
- Response: Quick
- NPT Thread: 1/2 in
- Finish: Std. Brass
- Also available in high pressure (250 PSI)-VK317
- Also available with fusible link (VK303-p/n 17536—G)
- Preassembled guard protects sprinkler from damage

Preassembled with Water Shield

8.0 (115) K-factor VK560 SR Upright
- Base Part Number: 18263—U
- Technical Datasheet: F_012498
- Response: Standard
- NPT Thread: 3/4 in
- Finish: Std. Brass
- Also available with fusible link (VK562-p/n 18253—U)
- Shield protects sprinkler from water discharge above
- Use where sprinkler guards are not required

Preassembled with Sprinkler Guard

8.0 (115) K-factor VK200 SR Upright
- Base Part Number: 10141—G
- Technical Datasheet: F_032814
- Response: Standard
- NPT Thread: 3/4 in
- Finish: Std. Brass
- Also available with fusible link (VK206-p/n 05516—G)
- Preassembled guard protects sprinkler from damage

Preassembled with Water Shield

8.0 (115) K-factor VK202 SR Pendent
- Base Part Number: 10142—G
- Technical Datasheet: F_033014
- Response: Standard
- NPT Thread: 3/4 in
- Finish: Std. Brass
- Also available with fusible link (VK208-p/n 05514—G)
- Preassembled guard protects sprinkler from damage

Preassembled with Sprinkler Guard

8.0 (115) K-factor VK350 QR Upright
- Base Part Number: 06665B—G
- Technical Datasheet: F_033414
- Response: Quick
- NPT Thread: 3/4 in
- Finish: Std. Brass
- Also available with fusible link (VK352-p/n 05518—G)
- Preassembled guard protects sprinkler from damage

Preassembled with Sprinkler Guard

8.0 (115) K-factor VK352 QR Pendent
- Base Part Number: 06666B—G
- Technical Datasheet: F_033314
- Response: Quick
- NPT Thread: 3/4 in
- Finish: Std. Brass
- Preassembled guard protects sprinkler from damage

Optional Water Shields

Model E-1 (upright)
- Part Number: 10326
- Size: 1/2 in & 3/4 in

Model F-1 (pendent)
- Part Number: 10323 1/2 in
- Part Number: 10324 3/4 in
- Size: 1/2 in & 3/4 in

For intermediate level sprinklers preassembled with guard, the Model F-1 water shield may be ordered separately, and field installed (not available preassembled).
Extended Coverage Storage Sprinkler

**VK595, EC Upright (CMDA and CMSA Applications)**

<table>
<thead>
<tr>
<th>Example Density</th>
<th>Sprinkler Spacing</th>
<th>(Q) Flow Rate / Sprinkler</th>
<th>(P) Starting Pressure</th>
<th>Example Water Demand (2,000 ft² design area)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3 gpm/ft²</td>
<td>196 ft²</td>
<td>66.7 gpm</td>
<td>7.0 psi</td>
<td>734 gpm</td>
</tr>
<tr>
<td>0.4 gpm/ft²</td>
<td>196 ft²</td>
<td>78.4 gpm</td>
<td>9.7 psi</td>
<td>863 gpm</td>
</tr>
<tr>
<td>0.5 gpm/ft²</td>
<td>196 ft²</td>
<td>98.0 gpm</td>
<td>15.1 psi</td>
<td>1,078 gpm</td>
</tr>
<tr>
<td>0.6 gpm/ft²</td>
<td>196 ft²</td>
<td>117.6 gpm</td>
<td>21.8 psi</td>
<td>1,294 gpm</td>
</tr>
<tr>
<td>0.7 gpm/ft²</td>
<td>196 ft²</td>
<td>137.2 gpm</td>
<td>29.6 psi</td>
<td>1,509 gpm</td>
</tr>
<tr>
<td>0.8 gpm/ft²</td>
<td>196 ft²</td>
<td>156.8 gpm</td>
<td>38.7 psi</td>
<td>1,725 gpm</td>
</tr>
</tbody>
</table>

- 14 ft x 14 ft maximum coverage area (4.3 m x 4.3 m)
- Suitable for "unobstructed" and certain "non-combustible obstructed" construction
- FM Approved as a quick response, extended coverage sprinkler for both storage and non-storage applications (refer to FM Loss Prevention datasheets and Viking technical datasheet F_121610 for FM design and installation details)
- Available in 165°F and 214°F temperature ratings

General Inquiries and Technical Services

**General Inquiries**
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(269) 945-9501  
www.vikinggroupinc.com/contact-us

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(269) 945-9501  
technsvcs@vikingcorp.com