Integration of Rainwater Catchment with Fire Suppression Systems

By
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FIGURE 10.11.8  Basic Components of a Wet-Pipe Sprinkler System (for SI units: 1 in. = 25.4 mm)
FIGURE 10.11.7  Hypothetical Sprinkler System
Installation Illustrating Various Water Supply Sources and System Attachments

Source:
NFPA Fire Protection Handbook
### Table 4-1 Sprinkler System and Water Supply Design Requirements for Sprinklered Facilities

<table>
<thead>
<tr>
<th>OCCUPANCY CLASSIFICATION</th>
<th>SPRINKLER SYSTEM</th>
<th>HOSE STREAM ALLOWANCE</th>
<th>DURATION OF SUPPLY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DESIGN DENSITY L/min/m² (GPM/ft²)</td>
<td>DESIGN AREA m² (ft²)</td>
<td></td>
</tr>
<tr>
<td>Light Hazard</td>
<td>4.1 (0.10)</td>
<td>280 (3000)</td>
<td>950 (250)</td>
</tr>
<tr>
<td>Ordinary Hazard Group 1</td>
<td>6.1 (0.15)</td>
<td>280 (3000)</td>
<td>1900 (500)</td>
</tr>
<tr>
<td>Ordinary Hazard Group 2</td>
<td>8.2 (0.20)</td>
<td>280 (3000)</td>
<td>1900 (500)</td>
</tr>
<tr>
<td>Extra Hazard Group 1</td>
<td>12.2 (0.30)</td>
<td>280 (3000)</td>
<td>2840 (750)</td>
</tr>
<tr>
<td>Extra Hazard Group 2</td>
<td>16.3 (0.40)</td>
<td>280 (3000)</td>
<td>2840 (750)</td>
</tr>
</tbody>
</table>

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**Note:** The protection requirements identified in Table 4-1 are based on standard commercial practices followed throughout civilian industry for highly protected risk (HPR) properties. Table 4-1 represents the minimum requirements necessary to establish minimum comprehensive life, mission, and property loss prevention. Table 4-1 was adapted as a result from detailed studies by Factory Mutual of loss experience from 1956 to 1965, loss experience in selected occupancies from 1966 to 1977 and from 1981-1990, and fire test data.
For a Light Hazard Application:

- Sprinkler Volume: Design Density (.1 gallons per minute (gpm) / square foot) x Design Area (3000 sf) = 300 gpm.
For a Light Hazard Application:

- Design Density (0.1 gallons per minute (gpm) / square foot) x Design Area (3000 sf) = 300 gpm.

- Fire Hose Operation: The volume required for sprinkler operation is added to the water volume needed for Fire Hose operation (250 gpm). In this example, Total Design Flow is (300 fpm + 250 gpm) = 550 gallons / minute
For a Light Hazard Application:

- **Design Density (.1 gallons per minute (gpm) / square foot) x Design Area (3000 sf)**
  \[ \text{Design Density} \times \text{Design Area} = 300 \text{ gpm} \]

- **Fire Hose Operation:** The volume required for sprinkler operation is added to the water volume needed for Fire Hose operation (250 gpm). In this example, Total Design Flow is \((300 \text{ fpm} + 250 \text{ gpm}) = 550 \text{ gallons / minute} \)

- **Flow duration is 60 minutes, resulting in the minimally required water volume for automatic fire sprinkler system operation to be (550 gpm x 60 minutes) = 33,000 gallons**
For a Light Hazard Application:

- **Design Density** (.1 gallons per minute (gpm) / square foot) x **Design Area** (3000 sf) = 300 gpm.

- **Fire Hose Operation**: The volume required for sprinkler operation is added to the water volume needed for Fire Hose operation (250 gpm). In this example, **Total Design Flow** is (300 fpm + 250 gpm) = 550 gallons / minute

- **Flow duration** is 60 minutes, resulting in the minimally required water volume for automatic fire sprinkler system operation to be (550 gpm x 60 minutes) = 33,000 gallons

- **Tank volume** is (33,000 gallons/ 7.481 gallons per cubic foot) = 4411 Cubic Feet.
For a Light Hazard Application:

- **Design Density (.1 gallons per minute (gpm) / square foot) x Design Area (3000 sf)**
  
  \[ \text{Design Density} = 0.1 \text{ gpm/sf} \times 3000 \text{ sf} = 300 \text{ gpm} \]

- **Fire Hose Operation**: The volume required for sprinkler operation is added to the water volume needed for Fire Hose operation (250 gpm). In this example, Total Design Flow is (300 fpm + 250 gpm)
  
  \[ = 550 \text{ gallons / minute} \]

- **Flow duration is 60 minutes, resulting in the minimally required water volume for automatic fire sprinkler system operation to be (550 gpm x 60 minutes)= 33,000 gallons**

- **Tank volume is (33,000 gallons/ 7.481 gallons per cubic foot) = 4411 Cubic Feet.**

- **Size of tank (Cubic Feet) = (length * width * height)**
For a Light Hazard Application:

- **Sprinkler Volume:** Design Density (4.1 liter / m²) is the volume of water needed to be delivered to the Design Area (289 m²)
  \[= 1148 \text{ liters / minute}\]

- **Hose Volume:** The volume required for sprinkler operation is added to the water volume needed for Fire Hose operation. In this case,
  \[= 2100 \text{ liters / minute}\]

- **Flow duration** is 60 minutes, resulting in the minimally required water volume for automatic fire sprinkler system operation to be
  \[= 125,000 \text{ liters}\]

- **Tank volume** is 
  \[= 125 \text{ Cubic Meters}\]
Spray Pattern
NFPA 13 A.8.5.5.1
**FIGURE 10.7.16 Vertical-Shaft-Turbine-Type Pump Installation.** Note: The distance between the bottom of the strainer and the bottom of the wet pit should be one-half of the pump bowl diameter but less than 12 in. (305 mm).
CISTERN PIPING WITH FIRE RESERVE

NOT TO SCALE
For Further Information

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Questions ??