1.0 PURPOSE

This specification describes the minimum requirements for design, material of construction, and installation requirements for Automatic Sprinkler Systems for all plants at Vale – Ontario Operations both surface and underground.

2.0 APPROVALS

Sprinkler system designs and hydraulic calculations are to be submitted to Vale for review prior to starting work or ordering materials. The design, materials, and construction is to meet the requirements of NFPA 13 “Standard for the Installation of Sprinkler Systems – latest edition” and Factory Mutual.

Follow the requirements of NFPA 13 Chapter 22 “Plans and Calculations” and submit plans and calculations to the Authority having jurisdiction (AHJ) and Vale Project Management Organization (PMO) contact; which will be the local Building department, and obtain approval prior to the installation or remodeling of any equipment, piping, etc. Deviation from approved plans shall require permission of the AHJ, or Vale PMO.

All electrical systems and components require CSA approval stamped on the nameplate of the heater.

3.0 DEVIATIONS FROM SPECIFICATIONS

Bids for alternative components or equipment, in whole or in part for the specified, are permitted where it is considered that savings in capital, or operating costs, or improvement in service is obtained by deviating from this specification.

Alternatives must be clearly identified as such in the bid and where necessary, a separate alternative bid submitted.

4.0 SUBMITTALS

Supply the following engineering data with Bid cost submission:

At Bid Stage
The bid information shall include:
- The contractor shall confirm that his bid is in accordance with the contract documents or if any alternate equipment is being proposed. It is to be clearly identified so the tenders can be assessed for price, quality, compliance and performance.

When Order is Placed
Certified information of the following:
- “Plans and Calculations” in accordance with NFPA Chapter 22 “Plans and Calculations” are to be submitted to Vale PMO, and AHJ for review.
- Shop drawings for the alarm valve, sprinkler heads, flow switches and pressure switches.
• Documentation shall confirm that all equipment is FM and ULC approved, and only FM and ULC approved equipment, fittings, and valves shall be used in the system as per the specifications.
• The Designer and or contractor shall submit to Vale prior to starting the design of the sprinkler system a “Design Brief” that outlines the basis for design, which includes the selection of hazard, area of sprinkler operation, selection of K-factor for sprinkler heads.
• Electrical control schematics, if the system is being monitored by a fire alarm panel or Industrial PLC. (PDF file and CAD file)
• Maintenance and installation manual, PDF format.
• Plan drawings for layout in PDF and CAD format, as well as a hard copy sealed by a licensed professional Engineer (province of Ontario)

Final Documents
• As built drawings with any field approved changes shown, and revised hydraulic calculations if necessary. Service manuals, including a list of materials, electrical schematic.

5.0 QUALITY ASSURANCE

All Fire Protection components (including couplings, fittings, valves and accessories) to be supplied by one manufacturer and shall be cULus, UL, and/or ULC listed and/or FM Global approved. Grooving tools shall be of the same manufacturer as the grooved components being used.

The sprinkler system, after it has been installed, shall be inspected and tested in accordance with NFPA 25 “Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.”

Contractor is to submit “Contractor Material and Data Sheet” completed and signed for each system, as well as the “Flow Test Summary Sheet”.

6.0 SPECIFIC REQUIREMENTS FOR SYSTEMS

6.1 General Requirements Regardless of type of Sprinkler System:
All piping shall meet the requirements of this specification and be painted red. Paint System is to be to Vale Standards to suit the environment it is being installed in. Every sprinkler system installed on a potable water supply shall be provided with a backflow preventer to meet the requirements of the Ontario Building Code Chapter 7 Plumbing. Every sprinkler system installed on a process water system is to be provided with a duplex basket strainer with a 1/16" mesh stainless steel screen.

Temperature ratings for sprinkler heads shall be selected based on the requirements of NFPA 13, and shall be rated to 165°F Ordinary Temperature unless the environment in the area requires a higher temperature to avoid premature discharge.
Sprinkler systems for surface plants and buildings shall be hydraulically designed by a licensed professional engineer with experience in the design and installation of sprinkler systems. The hazard classification shall be selected in consultation with Vale personnel who reserved the right to consult with the Vale Insurance underwriter.

The system design shall follow the requirements of NFPA 13 in all matters, including the selection of type of sprinkler heads, temperature ratings of heads, hydraulic flow calculations, determination of adequate water supply, additional sprinkler heads required when encountering obstructions, installation height of sprinkler heads.

No installation or modification of a sprinkler system shall be undertaken until design drawings and hydraulic calculations are completed and submitted to Vale indicating all work to be completed. No field revision to sprinkler piping shall be made without drawings being updated, and the effect of the hydraulics is taken into consideration, and the revised drawings being stamped by an engineer.

6.2 Wet Pipe Sprinkler Systems – Surface Plants:

A wet pipe sprinkler system is to be hydraulically designed to the proper water density to suit the hazard identified. The hazard and water density is to be determined by NFPA 13, and the system is to meet the requirements of NFPA 13.

6.3 Dry type and Pre-action Sprinkler Systems Surface Plants:

Dry Pipe Sprinkler Systems are to be designed in accordance with NFPA 13 and FM Global Property Loss Prevention Data Sheet 2-10R “Dry-Pipe, Deluge, Pre-action Valves and Accessories.

These systems shall be installed using black iron pipe. In order to extend the life of the dry or pre-action piping, the system shall be filled with Dry Nitrogen, not compressed air.

6.4 Wet Pipe Sprinkler Systems – Underground Mines:

6.4.1 OHSA for Mines and Mining Plants (R.R.O. 1990, Reg.)

OHSA Definition of “Fire Hazard Area”

(a) an area where a fire hazard may be created by smoking, matches or other means of producing heat or fire and which has been designated as such by the supervisor in charge of the mine, or
(b) a storage area where oil, grease or flammable liquids are stored in excess of 500 litres;

Section 28 of the OHSA for Mines and Mining Plants (R.R.O. 1990, Reg. 854)
(2) A fire suppression system consisting of sprinklers, foam or other suitable means of suppressing fire shall be provided,
   (a) in an underground mine,
     (i) on equipment containing more than 100 litres of flammable hydraulic fluids,
     (ii) in every storage area where more than 500 litres of oil, grease or flammable liquids are stored,
     (iii) in every service garage; and
     (iv) in every permanent fuelling station; and
   (b) on the surface, in a building or structure, except a fan house, located above or adjacent to an opening to an underground mine.

Section 30 of the OHSA for Mines and Mining Plants (R.R.O. 1990, Reg.)
(2) Oil, grease and flammable liquids with a flashpoint below 52° Celsius shall,
   (a) when being used underground, be transported and stored only in metal containers or receptacles or in portable plastic containers for Petroleum Fuels as specified in CSA Standard, B376-M1980 "Portable Containers for Gasoline and Other Petroleum Fuels"; and
   (b) when stored underground, be restricted in quantity to the requirement for,
     (i) the current day's work in the case of volatile flammable liquids, and
     (ii) seven days in the case of oil and grease.

6.4.2 Requirements for Underground (below collar) Fire Suppression Sprinkler Systems:

Wet sprinkler systems are used underground (below collar) to protect service garages and oil storage rooms. Underground sprinkler systems are exempt from the requirements of the “Ontario Building Code” and NFPA 13 “Standard for the Installation of Sprinkler Systems” shall be used for guidance in the selection of sprinkler heads, temperature ratings, spacing, and hydraulic design. Vale does not require sprinkler alarm valves underground, and has a standard “Fire Water Piping Details” drawing number 99-999-G-004254 is to be used as the basis of design.

Underground “service garages” are to be protected with an automatic sprinkler system designed to Ordinary Hazard Group 2 in accordance with NFPA 13.

Oil Storage Rooms that contain in excess of 500 liters of oil, grease or flammable liquids must be provided with an Automatic Fire Protection System, consisting of sprinklers designed to NFPA 30, NFPA 13 and Vale Standards. Note that the oil storage room must not
exceed 500 sq. feet in area; products cannot be stored more than one pallet in height, one pallet deep (against the side wall), and a corridor between pallets at least 6 feet wide shall be provided. This arrangement will allow a maximum of 10 pallets in the room. If this room contains no diesel fuel, it can be protected with an Automatic sprinkler system designed to Ordinary Hazard Group 2.

If Diesel fuel is stored in a self-contained Satellite Fuel Station that has its own self-contained fire suppression system, no further fire suppression is required.

If Diesel fuel is stored in an “above ground fuel” tank single or double wall, without fire suppression equipment, the area must be protected by a fire suppression system designed to NFPA 13, and NFPA 30. The hazard classification is to be determined by these standards based on the quantity of fuel being stored.

7.0 APPLICATION

This specification describes the minimum requirements for sprinkler system for fire protection at Vale Operations, both Surface Plants, Office Buildings, and Underground Mines.

<table>
<thead>
<tr>
<th>Sprinkler systems to NFPA 13:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Conditions</strong></td>
<td>175PSIG @ 149°F</td>
</tr>
<tr>
<td></td>
<td>Lowest component rating in system.</td>
</tr>
<tr>
<td><strong>Hydrostatic Testing – operating &lt;150 psig</strong></td>
<td>200 psig – 2 hours</td>
</tr>
<tr>
<td><strong>Hydrostatic Testing – operating &gt;150 psig</strong></td>
<td>50 psig in excess of Operating Pressure – 2 hours.</td>
</tr>
<tr>
<td><strong>Operating Conditions – Surface Building</strong></td>
<td>60 psig @ base of riser</td>
</tr>
<tr>
<td><strong>Operating Conditions – Underground Mines</strong></td>
<td>Mine Water Pressure - TBD</td>
</tr>
</tbody>
</table>

**Design, Fabrication, Installation, Approval Requirements**

| SPEC-35001 | Piping – Classification and Identification Identify and paint the piping system according to the requirements indicated on the project drawings or the scope of work. |
| SPEC-35002 | Piping – General Requirements |
| SPEC-35003 | Welding Process Requirements |
| NFPA 25 | Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems |
| OBC | Ontario Building Code |
| OFC | Ontario Fire Code |
AHJ  Authority Having Jurisdiction – Local Building department.
Vale SPEC-11014 Building Permits – City of Greater Sudbury
ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded, and Seamless.
ASTM A153 Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A183 Carbon Steel Track Bolts and Nuts
ASTM A449 Quenched and Tempered Steel Bolts and Nuts
ASTM A536 Ductile Iron Castings
ASTM B16 Free-Cutting brass rod, Bar and Shapes for Use in Screw Machines
ASTM B62 Composition Bronze or Ounce Metal Castings
ASTM B124 Copper and Copper Alloy Forging Rod, Bar, and Shapes
ASTM B584 Copper Alloy Sand Castings for General Applications
AWWA C606 Grooved and Shouldered Joints

8.0 MATERIALS

8.1 ABOVE GROUND STEEL PIPE

Carbon Steel, A-53B/A-106B - Roll or cut grooved-ends as appropriate to pipe material, wall thickness, pressures, size and method of joining. Pipe ends to be grooved in accordance with Victaulic current listed standards conforming to ANSI/AWWA C-606.
8.2 VICTAULIC MECHANICAL COUPLINGS

Victaulic Mechanical Couplings for Joining Carbon Steel Pipe

Manufactured in two segments of cast ductile iron, conforming to ASTM A-536, Grade 65-45-12. Gaskets shall be pressure-responsive synthetic rubber, grade to suit the intended service, conforming to ASTM D-2000. Mechanical Coupling bolts shall be zinc plated (ASTM B-633) heat treated carbon steel track head conforming to ASTM A-449 and A-183, minimum tensile strength 110,000 psi as provided standard Victaulic

a. Rigid Type:
1) “Installation Ready” rigid joints shall be Victaulic FireLock® EZ Style 009H [cULus, FM] and 107N [cULus], in sizes 1-1/4” through 12” sizes. Designed for direct “stab” installation onto grooved pipe without prior disassembly of the coupling.
2) Housings shall be cast with offsetting, angle-pattern bolt pads to provide system rigidity and support and hanging in accordance with NFPA 13.
3) Rigid couplings shall require visual pad-to-pad verification of complete installation. Tongue and recess type couplings which require the use of a torque wrench to achieve the exact required gap between housings are not permitted.

b. Flexible Type: Use in seismic areas where required by NFPA 13.
1) “Installation Ready” flexible joints shall be Victaulic Style 177N QuickVic™ [cULus, FM], in sizes 2” through 8”, which shall be designed for direct “stab” installation onto grooved pipe without prior disassembly of the coupling.
2) Standard flexible couplings shall be Victaulic Style 77 [UL, ULC, FM].

Mechanical Coupling Gaskets: Pressure-responsive, synthetic rubber listed for use with the housings.

Flange Adapters: For use with grooved end pipe and fittings, for mating to ANSI Class 125 / 150 flanges. Victaulic Style 741 or 744 [UL, ULC, FM]. For mating to ANSI Class 300 flanges use Victaulic Style 743 [UL, ULC, FM].
for Carbon Steel Pipe

may be used for NPS 1 (DN 25) Schedule 10 and Schedule 40 carbon steel pipe in fire protection applications. System rated for a working pressure to 365 psi (2517 kPa).

   a. Grooving Tool: Victaulic RG2100, with IGS Confirmation Gauge.

2. Fittings:
   a. Ductile iron housing conforming to ASTM A-536, Grade 65-45-12. Orange enamel coated or galvanized.
      i. Victaulic Style 101 (90-degree elbow), Style 102 (tee), and Style 108 (coupling) with Installation-Ready™ ends.
      ii. Style 108 single-bolt coupling provided with EPDM Type A pressure responsive gasket with Vic-Plus lubricant, and ASTM A449 compliant electroplated steel bolt and nut. CrMo alloy steel coupling linkage.
   b. Thread x Groove adapter fittings and welded outlets with IGS grooved end, ASTM A53, grade A.

Installation-Ready™ Fittings for Fire Protection Systems

Installation-Ready™ fittings for grooved end steel piping in fire protection applications sizes NPS 1-¼ thru 2½ Fittings shall consist of a ductile iron housing conforming to ASTM A-536, Grade 65-45-12, with Installation-Ready™ ends, red enamel coated for wet systems and galvanized for dry pipe systems. Fittings complete with prelubricated Grade “E” EPDM Type ‘A’ gasket; and ASTM A449 electroplated steel bolts and nuts. System shall be UL listed for a working pressure of 300 psi and FM approved for working pressure 365 psi.

a. Fittings shall have a shorter center-to-end dimensions for installation in tight spaces.

b. Fittings are rigid, for direct stab installation without field disassembly.

c. Installation-Ready™ Fittings shall be Victaulic FireLock® Style 101, Style 102, and style 103, which shall be designed for direct “stab” installation onto grooved pipe without prior disassembly of the fitting.

d. Fittings shall require visual pad-to-pad verification of complete installation.

Fitting Gaskets: Pressure-responsive, synthetic rubber listed for use with the housings

Victaulic Grooved End Fittings

Fittings shall be cast of ductile iron conforming to ASTM A-536, Grade 65-45-12 (FireLock®), forged steel conforming to ASTM A-234, Grade WPB 0.375” wall or fabricated from Std. Wt. Carbon Steel pipe
conforming to ASTM A-53, Type F, E or S, Grade B. Fittings provided with an alkyd enamel finish for wet pipe systems or hot dip galvanized to ASTM A-153 for dry pipe systems. Zinc electroplated fittings and couplings conform to ASTM B633. [UL, ULC, FM]

**Victaulic Hole-Cut Branch Outlets:**

**Bolted Branch Outlet:**
1. Branch reductions on 2” through 8” header piping. Bolted branch outlets shall be manufactured from ductile iron conforming to ASTM A-536, Grade 65-45-12, with synthetic rubber gasket, and heat treated carbon steel zinc plated bolts and nuts conforming to physical properties of ASTM A-183. Victaulic Style 920 / 920N. [UL, ULC, FM]

2. Header connections for sprinklers, drop nipples, springs, gauges, and drains on 1-1/4” through 2-1/2” header piping. Outlets shall be manufactured from ductile iron conforming to ASTM A-536, Grade 65-45-12, with synthetic rubber gasket, and heat treated carbon steel zinc plated bolts and nuts conforming to physical properties of ASTM A-183. Victaulic FireLock Outlet Tee Style 922. [UL, ULC, FM]

**Strapless Outlet:** 1/2” or 3/4” NPT outlet on 4” and larger header sizes rated for 300 PSI. Victaulic Style 923. [UL, ULC]

**Victaulic Grooved End Valves**

**Ball Valves:** [cULus, FM] 350 psi (2410 kPa), grooved or threaded ends, bronze body (ASTM B-584 Alloy 844), standard port, chrome-plated brass ball, stainless steel stem, TFE seats, brass gearbox, with pre-wired supervisory switches. Victaulic Series 728 FireLock®.

**Butterfly Valves:** [cULus, FM] 300 psi, grooved ends, black enamel coated ductile iron body (ASTM A-536, Grade 65-45-12). Electroless-nickel coated ductile iron disc, with pressure-responsive elastomer seat and stainless steel stem. (Stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating.). Complete with weatherproof actuator and pre-wired supervisory switches. Victaulic Series 705 FireLock® or Series 707C FireLock®. Victaulic FireLock® Series 765 shall be used for high pressure systems up to 365 psi CWP.

Victaulic Series 705 FireLock® or Series 707C FireLock® may also be used for fire pump metering test lines per NFPA 20 and rooftop test units, as well as pressure reducing valve by-pass
lines per NFPA 14.

Note: Refer to latest published Victaulic literature, Butterfly Valve Material Selection section, for liner/seat and disc material recommendations for chemical service.

**Gate Valves:** cULus, & FM approved.

a. 2-1/2” through 12” Sizes OS&Y Gate Valves: 250 psi (1725 kPa), grooved ends. Ductile iron body conforming to ASTM A-536, cast iron yoke and handwheel conforming to ASTM A-126-B; EPDM coated ASTM A-126-B cast iron disc; ASTM B16 brass rising stem; flanged and epoxy coated cast iron bonnet; EPDM o-ring stem seals and body gasket. Victaulic Series 771.

b. 2-1/2” through 12” Sizes NRS Gate Valves: 250 psi (1375 kPa), grooved ends. Ductile iron body conforming to ATSM A-536, bronze mounted; EPDM coated ASTM A-126-B cast iron disc; ASTM B-16 brass non-rising stem; flanged and epoxy coated cast iron bonnet; EPDM o-ring stem steals and body gasket. Victaulic Series 772.


**Check Valves:** [cULus, FM]

a. 2" through 3" Sizes Spring Assisted: Black enamel coated ductile iron body, ASTM A-536, Grade 65-45-12, non-slam tilting disc, stainless steel disc and spring, brass shaft, 365 psi (2517 kPa). Victaulic Series 717H.

b. 4" through 12" Sizes Spring Assisted: Black enamel coated ductile iron body, ASTM A-536, Grade 65-45-12, elastomer encapsulated ductile iron disc suitable for intended service, stainless steel spring and shaft, welded-in nickel seat, 250 psi. Victaulic Series 717. Designed to accept a riser check kit. Victaulic Series 717R.

**Alarm Check Valve:** [UL, ULC, FM] Black enamel coated ductile iron body conforming to ASTM A-536, grade 65-45-12, aluminum bronze clapper, stainless steel spring and shaft, EPDM seal, and Nitrile seat O-rings. Valve internal parts shall be replaceable without removing the valve from the installed position. Water working pressure is 300 psi. Suitable for
constant and variable pressure systems with optional Series 752 retard chamber. Victaulic FireLock® Series 751.

Optional Accessories (when shown on the drawings):
- Series 752 Retard Chamber: High strength ductile iron body with corrosion resistant exterior and interior coating, suitable for operating pressures to 300 psi.
- Series 752V Retard Vent Kit: For use with Series 752 retard chamber when an electric alarm pressure switch is installed without a water motor alarm.
- Series 760 Water Motor Alarm: Red enamel finished gong shell, with internal components of non-corrosive stainless-steel or aluminum, with upstream strainer.
- Alarm Pressure Switch: System Sensor Model “EPS”.
- Waterflow Detectors: System Sensor Model “WFD”.

Dry System Check Valve: [cULus, FM] Low differential, latched clapper design, black enamel coated ductile iron body conforming to ASTM A-536, grade 65-45-12, aluminum bronze clapper, stainless steel spring and shaft, peroxide cured EPDM diaphragm, EPDM seal, brass seat, and Nitrile seat O-rings. Valve internal parts shall be replaceable without removing the valve from the installed position. Valve shall be externally resettable. Required air pressure is 13 psi. Water working pressure is 300 psi. Valve is available bare, pre-trimmed, as a Vic®-Quick Riser, or in a Fire-Pac cabinet. Victaulic FireLock® NXT Series 768.

Optional Accessories:
- Series 746-LPA Dry Accelerator: Bronze body, stainless steel spring, restrictor, and bolts, with EPDM diaphragm, seal, and O-ring, for use with system air pressures ranging from 13 psi to 18 psi.
- Series 760 Water Motor Alarm: Red enamel finished gong shell, with internal components of non-corrosive stainless-steel, aluminum, etc., with upstream strainer.
- Series 75B Supplemental Alarm Device: For use with systems using a water motor gong as the alarm device. 304 stainless steel flexible braided hose, with brass pilot valve and galvanized steel trim and nipples, rated to 300 psi.
- Series 75D Water Column Kit: Ductile iron body with stainless steel internal components and Nitrile seal, rated to 300 psi, designed to minimize residual water in the riser.
- Series 7C7 Compressor Package: Consisting of a riser-
mounted compressor, Series 757P air maintenance device and flexible hoses for installation. Available with 1/3 HP compressor for an up to 500 gallon system.

• Alarm Pressure Switch: System Sensor Model “EPS”.

**Preaction Valve**: [cULus, FM] Low differential, latched clapper design, black enamel coated ductile iron body conforming to ASTM A-536, grade 65-45-12, aluminum bronze clapper, stainless steel spring and shaft, peroxide cured EPDM diaphragm, EPDM seal, brass seat, and Nitrile seat O-rings. Valve internal parts shall be replaceable without removing the valve from the installed position. Valve shall be externally resettable. Water working pressure is 300 psi. Does not require a separate check valve downstream of preaction valve. Valve is available bare, pre-trimmed, as a Vic®-Quick Riser, or in a Fire-Pac cabinet. Victaulic FireLock® NXT Series 769.

Optional Accessories (refer to drawings):

• **Series 746-LPA Dry Accelerator**: Bronze body, stainless steel spring, restrictor, and bolts, with EPDM diaphragm, seal, and O-ring, for use with system air pressures ranging from 13 psi (90kPa) to 18 psi (124 kPa).

• **Series 760 Water Motor Alarm**: Red enamel finished gong shell, with internal components of non-corrosive stainless-steel, aluminum, etc., with upstream strainer.

• **Series 75B Supplemental Alarm Device**: For use with systems using a water motor gong as the alarm device. 304 stainless steel flexible braided hose, with brass pilot valve and galvanized steel trim and nipples, rated to 300 psi .

• **Series 75D Water Column Kit**: Ductile iron body with stainless steel internal components and Nitrile seal, rated to 300 psi , designed to minimize residual water in the riser.

• **Series 757 / 757P Air Maintenance Trim Assembly**: Consisting of a pressure-reducing air regulator, strainer, brass restrictor, spring-loaded in-line check valve, and associated piping components.

• **Series 7C7 Compressor Package**: Consisting of a riser-mounted compressor, Series 757P air maintenance device and flexible hoses for installation. Available with either a 1/6 HP compressor for an up to 400 gallon system using only a solenoid valve and no Auto-Vent, or a 1/3 HP compressor for an up to 750 gallon system.
using only a solenoid valve and no Auto-Vent.

- **Alarm Pressure Switch**: System Sensor Model “EPS”.

**Sprinkler Heads**

UL, ULC, and/or FM Die-cast brass frame to 65-30, bronze upright pendant deflector, beryllium nickel spring, with stainless steel lodgement spring and teflon tape seal. Glycerin filled glass bulb, rated for working pressure to 175 psi. Body shall be coated [with UL listed and FM approved anti-corrosion VC-250 coating (silver coloring)]. The sprinkler body shall be cast with hex shaped wrench boss to reduce the risk of damage during installation. (Sprinklers shall not contain rubber O-rings.) Quick or standard response type.

Guards and escutcheons shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.

Model V38 adjustable concealed pendant sprinkler for clean room applications provided with cover plate and white nitrile sealing gasket to prevent debris from entering the protected area.

In lieu of rigid pipe offsets or return bends for sprinkler drops, the Victaulic VicFlex™ Multiple-Use Flexible Stainless Steel Sprinkler Drop System [with captured coupling Style 108] may be used to locate sprinklers as required by final finished ceiling tiles and walls. The drop system shall consist of a braided type 304 stainless steel flexible tube, zinc plated steel Male threaded nipple or Victaulic FireLock IGS Groove Style 108 coupling for connection to branch-line piping, and a zinc plated steel reducer with a female thread for connection to the sprinkler head.

**Captured Coupling** IGS Groove Style 108: Single-bolt, consisting of two ductile iron housings, Grade E “EPDM” gasket, and a zinc electroplated steel bolt and nut conforming to ASTM A449.

The drop shall include a UL approved Series AH1 with 3” bend radius; AH2 or AH2-CC braided hose with a bend radius to 2” to allow for proper installation in confined spaces. The hose shall be listed for [(4) bends at 31” length] [(5) bends at 36” length] [(8) bends at 48” length] [(10) bends at 60” length] [(12) bends at 72” length].

Union joints shall be provided for ease of installation. The flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB1 or AB2 bracket. The bracket shall allow installation before the ceiling tile is in place. The braided drop system is UL listed for sprinkler services to 175 psi and FM Approved to 200 psi.
All hoses shall be factory-pressure tested to 400 psi. (2760 kPa). AB6 Bracket Assembly, for use in cold storage applications with Victaulic Model V36 dry sprinklers.

Approvals:
1) FM-1637
2) UL 2443

Refer to the Victaulic I-VICFLEX installation manual and the Victaulic VicFlex™ Design Guide, as shown in product submittal 10.85 to ensure proper installation.

Victaulic Fire Protection Specialties


Alarm Test Module: [UL, ULC, FM] Grooved or threaded ends, bronze body and bonnet, bronze and copper alloy internals with stainless steel spring, dual polycarbonate sight glasses, and malleable iron handwheel. UL listed and FM Approved for services to 300 psi. Victaulic Series 720 TestMaster™ II.

Zone Control Riser Module: [UL, ULC, FM] Grooved end riser control module consisting of an orange enamel coated ductile iron body, System Sensor model WFDN / WFDNTH vane type waterflow detector, integral drain and test, pressure gauge and optional pressure relief valve.

Victaulic Series 747M: Designed for NFPA-13 commercial requirements, and working pressures to 365 psi.
  i. Series 747MP for pressure relief option.

Victaulic Series 247: Designed for NFPA-13, 13D, and 13R commercial and residential requirements, and working pressures to 300 psi. Pressure relief valve kit is UL and ULC listed and FM approved for working pressures to 175 psi.

Pressure Reducing Valve:

UL Listed and FM Approved pressure reducing valve to reduce higher upstream pressure to lower preset downstream pressure regardless of fluctuating demand or varying upstream pressure. Valve shall consist of a grooved, flanged, or threaded end ductile iron body conforming to ASTM A536 with electrostatic powder coated polyester red coating.
carbon steel body to ASTM A216. Valve internal components shall be reinforced polyisoprene EPDM elastomer seals. The valve shall have a straight-through Y-type-body with unobstructed flow path, and no stem guide or supporting ribs. Valve actuation shall be accomplished by a fully peripherally supported, one-piece balanced rolling-diaphragm, vulcanized with a rugged radial seal disk. The diaphragm assembly shall be the only moving part. Control trim system shall be 316 stainless steel. The control system shall consist of a 2-Way adjustable, pressure reducing pilot valve. The valve shall be UL listed and FM approved, 365 psi rated, line pressure driven and pilot operated and water operating temperatures to 122°F. Basis of design: Victaulic Series 867-42T.

UL Listed pressure reducing valve to reduce higher upstream pressure to lower preset downstream pressure regardless of fluctuating demand or varying upstream pressure. The main valve shall be a center guided, diaphragm actuated globe valve of either oblique (Y) or angle pattern design with an unobstructed flow path, no stem guides, bearings, or supporting ribs. Valve body shall be ductile iron, and include a replaceable, raised, stainless steel seat ring. All external bolts, nuts, and studs shall be Duplex® coated. Valve shaft shall be stainless steel, center guided by a bearing in the separating partition. The replaceable radial seal disk shall include a resilient seal and shall be capable of accepting a V-Port Throttling Plug. The actuator assembly shall be double chambered with an inherent separating partition between the lower surface of the diaphragm and the main valve. All fittings shall be nickel-plated brass or stainless steel. The control system shall consist of a 2-Way adjustable, pressure reducing pilot valve. Valve shall be suitable for working pressure to 300 psi and water operating temperatures to 122°F. All internal components shall be replaceable without removing the valve from the installed position. Basis of design: Victaulic Series 867-7UL.

Level Control Valve: Level control valve to maintain constant water level regardless of fluctuating demand. Valve shall consist of a grooved, flanged, or threaded end ductile iron body conforming to ASTM A536 with electrostatic powder coated polyester red coating carbon steel body to ASTM A216. Valve internal components shall be stainless steel, with polyamide fabric reinforced polyisoprene EPDM elastomer seals. The valve shall have an unobstructed flow path, with no stem guide or supporting ribs. Valve actuation shall be accomplished by a fully peripherally supported, one-piece balanced rolling-diaphragm, vulcanized with a rugged radial seal disk. The diaphragm assembly shall be the only moving part. Control trim system shall be 316 stainless steel.
Control Options:

i. Series 866-460 – Modulating Horizontal Float.
ii. Series 866-465 – Bi-level Electric Float
iii. Series 866-466 – Bi-level Vertical Float
iv. Series 866-467 – 2-Way Vertical Float
v. Series 866-480 – 3-Way Altitude Pilot
vi. Series 866-482 – Modulating Altitude Pilot

Valve shall be suitable for working pressure to 250 psi and water operating temperatures to 122°F. All internal components shall be replaceable without removing the valve from the installed position. Basis of Design: Victaulic Series 866-4XX.

### Victaulic FireLock®

**Fire-Pac:**

1. Provide a pre-assembled [Dry] [Preaction] [Deluge] fire protection valve mounted completely within a steel cabinet for sizes 1½” through 8”. Cabinet shall be coated with red ASA-61 electrostatically applied polyester powder coating. Cabinet shall have field removable access panels on three sides to allow for ease of valve maintenance, servicing, and installation. Unit shall be [cULus, FM] with all materials and wiring conforming to NFPA requirements. Unit shall be provided with Series 728 ball valve or Series 705 butterfly shutoff valve with pre-wired supervisory switches, the sprinkler system fire protection valve, alarm line pressure switches, air supervisory pressure switches, alarm pressure switch and pressure gauges for proper operation and shall be pre-wired to Model RP-2001 control panel. All external electrical connections shall be able to be connected through a factory provided conduit connection to an enclosure inside of the cabinet. Water inlet, system supply, and drain connections shall be grooved for ease of installation. Victaulic FireLock® Series 745 Fire-Pac.

2. [Dry] [Preaction] [or] [Deluge] valve [with specified configuration], valve shall be low differential, latched clapper design with a black enamel coated ductile iron body conforming to ASTM A536, aluminum bronze clapper, stainless steel spring and shaft, EPDM diaphragm and seal, brass seat with nitrile seat o-rings. Valve internal parts shall be replaceable without removing the valve from the installed position and shall be externally resettable. 300 psi pressure rating in sizes 1½” through 8” and shall be grooved ends for vertical installation only. Victaulic FireLock® NXT [Series 768] [and] [or] [Series 769].

3. Trim configurations:
   a. Dry Valve: Pneumatic operation.
   b. Pre-action Valve:
      - Double interlock; Pneumatic and Electric.
4. Electric Release Panel: Notifier Model RP-2001 is a compact single enclosure unit containing power supply, two 12Amp-hr batteries and availability to have factory installed all accessory options.

5. Preassembled cabinet shall have factory options to have pipe penetrations sealed to meet NEMA 4 protection of equipment inside of the enclosure with respect to the ingress of water, whether rain, sleet, snow, splashing water or hose directed water.

### Installation

1. Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove.

2. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified.

3. See the latest copy of Victaulic's Field Assembly and Installation Instruction Pocket Handbook (I-100) for grooved fittings. Supplemental handbooks for specific product installations (I-009/009V, I-40, I-705W, etc.) shall be provided by Victaulic and used by the contractor.

4. Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs. Sprinkler bulb protector shall be removed by hand after installation. Do not use tools or any other device(s) to remove the protector that could damage the bulb in any way.

### Training

All Contractor personnel are to be trained and certified by Victaulic's factory trained field representative prior to starting work.

### Application

1. Victaulic’s representative shall periodically visit the job site and review installation. Contractor shall remove and replace any improperly installed products.

2. Victaulic grooved mechanical pipe couplings, fittings, valves and other grooved components may be used as an option to welding, threading or flanged methods.

3. All grooved components shall conform to local code approval and/or as listed by UL/ULC, cULus, FM, or NFPA.

4. Grooved end product manufacturer to be ISO-9001 certified

### 9.0 PAINTING

All piping is to be painted RED in accordance to Vale Standards for Material Protection as follows:

1. SPEC-15001 Paints – General Requirements.

2. SPEC-35001 Piping Classification and Identification

3. SPEC-15006 Paints Steel Medium Industrial – Epoxy for Surface Plants.

Sprinkler Systems Acceptance shall be in accordance with Chapter 24 of NFPA 13 “System Acceptance.” The installing contractor shall do the following:

1. Notify the authority having jurisdiction and the property Vale’s authorized representative of the time and date testing will be performed.
2. Perform all required acceptance tests listed in section NFPA 13 – “24.2 Acceptance Requirements”.
3. Complete and sign the appropriate contractor’s material and test certificate(s).

The installing contractor shall provide Vale with the following:

1. All literature and instructions provided by the manufacture describing proper operation and maintenance of any equipment and devices installed.

11.0 HYDRAULIC DESIGN INFORMATION SIGN (NFPA 13 24.5).

The installing contractor shall identify the hydraulically designed sprinkler system with a permanently marked weather proof metal or rigid plastic sign secured with corrosion resistant wire, chain or other approved means. Such signs shall be placed at the alarm valve, dry pipe valve, pre-action valve or deluge valve supplying the corresponding hydraulically designed Area.

The sign shall include the following information:

1. Location of the design area or areas.
2. Discharge density over the design area or areas
3. Required flow and residual pressure demand at the base of the riser.
4. Occupancy classification or commodity classification and maximum permitted storage height and configuration (if applicable)
5. Hose stream allowance included in addition to the sprinkler demand.
6. The name of the installing contractor.

12.0 GENERAL INFORMATION SIGN (NFPA 13 24.6)

The installing contractor shall provide a general information sign used to determine system design basis and information relevant to the inspection, testing and maintenance requirements required by NFPA25. Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. Such general information shall be provided with a permanently marked weatherproof metal or rigid plastic sign, secured with corrosion-resistant wire, chain, or other acceptable means, Such signs shall be placed at each system control riser, antifreeze loop, and auxiliary system control valve.

The sign shall include the following information:

1. Name and location of the facility protected
2. Presence of high-pilled and or rack storage
3. Maximum height of storage planned
4. Aisle width planned
5. Commodity classification
6. Encapsulation of pallet loads
7. Presence of solid shelving
8. Flow test data
9. Presence of flammable / combustible liquids
10. Presence of hazardous materials
11. Presence of other special storage
12. Location of auxiliary drains and low point drains
13. Original results of main drain flow test
14. Name of installing contractor or designer
15. Indication of presence and location of antifreeze or other auxiliary systems.
13.0 REVISION AND TRANSITION NOTES

Revision notes describe: what was changed, and if applicable, why it was changed, and the plan to implement the change, including whether changes are retroactive.

**Note:** The revision notes are a summary of the changes and may not necessarily be a complete list.

A risk code is entered for each revision and if applicable, the revision notes will describe how risk was addressed for the revision.

<table>
<thead>
<tr>
<th>Risk Code</th>
<th>Risk Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>This revision is a minor change and/or introduces no risk.</td>
</tr>
<tr>
<td>B</td>
<td>Risk has been addressed for this revision by the reviewer and approver. Low risk or no new hazards identified.</td>
</tr>
<tr>
<td>C</td>
<td>For this revision, a PHR or other risk management tool has been used to address risk and minimize hazards. This risk assessment has been documented and is available through Central Engineering.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rev</th>
<th>Revision Notes</th>
<th>Risk Code</th>
<th>Approved by</th>
<th>Reviewed by</th>
<th>Issue Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>First issue of Standard</td>
<td>B</td>
<td>BM</td>
<td>MF</td>
<td>2017/11/21</td>
</tr>
</tbody>
</table>