DIVISION 21 - FIRE SUPPRESSION

Section 21 00 00 Fire Suppression - General

1 **Codes, Standards and Approvals**

1.1 The design and installation shall comply with the latest requirements of NFPA and the NFC.

1.2 Water supplies to fire protection equipment or systems require the approval of the Provincial Fire Marshall.

1.3 Hydraulic design calculations with drawings shall be submitted to the Provincial Fire Marshall. Construction of the fire protection system shall not commence until these calculations and drawings are approved by same.

1.4 Where a manufacturer or product name is given, DTIR will also consider other "equal" products if requested in writing. Written approval by DTIR is required before the product will be permitted on the project.

1.5 Refer also to Divisions 22 and 28 for additional requirements. For example, fire pump installations have accessibility, vibration isolation, identification, insulation, ventilation and other requirements which are outlined in the various subsections of Facility Services Subgroup Divisions. Pipe hanger and support requirements shall be as per related Facility Services Subgroup - General (FSS-G) requirements.

1.6 Varying, or deviating from any item(s) indicated in this document must be approved by DTIR. DTIR will not grant a deviation from these requirements unless the deviation has been submitted in writing for review and approved, in accordance with the requirements stated in the Preface of the DC350, prior to proceeding with the design.

2. Fire Protection

2.1 General

2.1.1 The materials, equipment and assemblies shall meet the minimum requirements of Underwriters Laboratories of Canada.

2.1.2 No water main supplying a hydrant system is to be less than NPS 6 diameter. Dead-ended mains are to be avoided where possible by looping of mains. Sectional valves are to be installed so that the majority of hydrants may remain in service during a water outage caused by a break or maintenance.

3. Fire Protection Water Supply Sources

3.1 There may be areas where there is no established water supply, but due to features of construction and occupancy, a water supply for a system of fire hydrants, sprinklers, etc. is

required. Water supply sources may consist of a connection to a public or private water main system, gravity tank, compartmentalized reservoir and fire pumps, rivers, lakes, etc.

3.2 In areas where there is no established water supply and an outside hydrant system is not required, a water supply for an internal fire hose and standpipe system may be required. Water supply sources may consist of a pressure tank or a non-pressurized source, such as a reservoir, cistern or tank with a pumping system.

4. Where water storage is required, fire protection water shall be held in a separate storage device which may be located in or under rooms containing mechanical equipment and/or fuel storage tanks (this is not permitted for other underground cisterns/reservoirs). Potable water shall be stored above grade, but is not permitted in boiler rooms or other spaces with heat generating equipment. The minimum storage volume for water serving the plumbing fixtures shall be two days supply, based on a minimum usage of 12 litres/day per occupant for potable water and 12 litres/day per occupant for non-potable (eg. toilet flushing) water.

   4.1 Mechanical design engineer to consult with DTIR on project requirements for non-potable water supply and rainwater collection systems

5. Protection of Completed Work

   5.1 Protect exposed pipe, fittings and equipment from damage prior to final project completion. Provide cULus listed and approved wire guards for sprinkler in mechanical and electrical rooms, storage rooms and where sprinklers are subject to damage

6. Commissioning shall be as per related Facility Services Subgroup- General (FSS-G) requirements.

Section 21 05 00 Common Work Results for Fire Suppression

1. Piping

   1.1 Steel pipe schedule 10 (rolled grooved) or schedule 40 (screwed, rolled grooved) for sizes up to 51mm (2")

   1.2 Schedule 10 roll grooved or schedule 40 (welded, rolled grooved or flanged) for pipe 64mm (2½") and up.

   1.3 Where rolled grooved products are used they shall be of the same manufacturer.

   1.4 Lightwall pipe up to 51mm (2")

   1.5 Flexible stainless steel sprinkler drop system in lieu of rigid pipe and return bends for sprinkler drops shall be permitted in finished ceilings. The flexible sprinkler drop system shall be cULus listed 25mm (1”) ID with the maximum number of allowable bends at the listed minimum bend radius of 51mm (2") attached to the ceiling using a one piece bracket.

2 Roll Grooved Joints

2.1 General

2.1.1 References

2.1.1.1 American Water Works Association (AWWA)

2.1.1.1.1 AWWA C111/A21.11-17, Rubber Gasket Joints for Ductile-Iron and Fittings.

2.1.1.2 CSA B242-05 (R2016), Groove and Shoulder Type Mechanical Pipe Couplings.

2.1.2 Maintenance

2.1.2.1 Extra materials

2.1.2.1.1 Provide the following spare parts:

2.1.2.1.1.1 Gaskets for flanges: one for every ten flanges.

2.2 Products

2.2.1 Pipe Joints

2.2.1.1 Roll grooved: to CSA B242-05 (R2016) latest edition, Groove and Shoulder Type Mechanical Pipe Couplings.

2.2.1.2 Roll grooved: Joints to be rigid, except at expansion loops, elbows and pumps where flexible couplings shall be used.

2.2.1.3 Roll grooved products shall be of one manufacturer and have CRNS for Nova Scotia.

2.2.2 Fittings

2.2.2.1 Fittings for roll grooved piping malleable iron to ASTM A47/A47M-99(2018)e1 on ductile iron to ASTM A536-84(2019)e1.

2.2.3 Gaskets

2.2.3.1 Roll grooved couplings gaskets: type EPDM

2.2.3.2 Gaskets shall be good for ambient temperatures as required by cULus.

2.2.3.3 Gaskets for other services require approval in writing from DTIR.

2.2.3.4 In lieu of rigid pipe or arm over return bends for sprinkler drops, a flexible stainless steel sprinkler drop system may be used to locate sprinklers in a finished ceiling. The flexible sprinkler drop system shall be cULus listed

25mm (1”) ID at the maximum number of allowable bends at the listed minimum bend radius of 51mm (2") and attached to the ceiling using a one piece bracket.

2.2.4 Valves

2.2.4.1 Connections

2.2.4.1.1 DN 50 (NPS 2) and larger:

2.2.4.1.1.1 Grooved ends: as specified.

2.2.4.2 Butterfly valves: Application: Isolating equipment:

2.2.4.2.1 DN 65 (NPS 2 ½) and larger:

2.2.4.2.1.1 Grooved ends: as specified.

2.2.4.3 Swing check Valves: to MSS-SP-71 (MSS SP-71-2018).

2.2.4.3.1 DN 65 (NPS 2 ½) and larger:

2.2.4.3.1.1 Grooved ends: as specified.

2.2.4.4 Silent check valves;

2.2.4.4.1 DN 65 (NPS 2 ½) and larger:

2.2.4.4.1.1 Grooved ends: as specified.

3 Fittings

3.1 For steel pipe 1034kPa (150 PSI) malleable banded iron screwed or 1034kPa (150 PSI) cast iron flanged.

3.2 Rigid lightweight / standard angle pattern shall conform to ASTM A536 (ASTM A536-84(2019)e1 W/E gasket.

3.3 Bolts shall be square or hex head.

3.4 Flange Gaskets shall be 1.6mm (1/16") thick cloth inserted red rubber.

4 Valves

4.1 Valves up to DN 40 (NPS 1 ½") shall be supervised bronze, screwed ends, O.S.&Y gate or ball valve. Valves DN 50 (NPS 2) and over shall be cast iron flanged or grooved gate valves.

5 Pressure Gauges

5.1 114mm (4½") diameter, cast aluminum, close type black finished ring and clear glass window. Dial to have white finish with jet black embossed figures and graduations. Permanent legibility shall be ensured by a hot dip stamp process. The pointer shall be adjustable black finish, with red tip. Movement shall be bronze with bronze bushing. The bourdon tube shall be Phosphor bronze soldered to socket and tip. Accuracy to be 1% over middle half of scale range and 1½% over balance. All gauges to be c/w snubbers and mini ball valves.

6 Alarm Valves

6.1 Furnish and install regulatory approved automatic alarm valves c/w accessories including excess pressure pump. Provide all necessary trim and connections from alarm valve including valves, drips, drain pipes, gauges, water motor gong and pressure and supervisory switches.

7 Finishes

7.1 Provide chrome plated sprinklers, valves, nozzles, fittings etc., except in unfinished areas where brass finish is acceptable. Underwriters Laboratories labeled.

8 Backflow Preventer

8.1 Refer also to 22 11 19 for backflow preventer requirements related to plumbing.

8.2 A separate building water entry shall be provided for the fire protection system. On the main fire protection system water supply, provide backflow protection to the Municipality requirements with minimum requirement being a double check backflow preventer.

9 Flow and Supervisory Stations for Instrumentation and Control of Fire-Suppression Systems

9.1 Provide supervised shut-off valves and electric supervisory flow switches for bottom and top of hydraulic elevators, kitchen hoods, and any areas requiring zoning.

Section 21 05 29 Hangers and Supports for Fire Suppression Piping and Equipment

1. Bases, Hangers and Supports

1.1 Foundations and Bases

1.1.1 All mechanical equipment shall be mounted on 102mm (4 inch high) (minimum) concrete foundations, curbs, or housekeeping pads. In lieu of these concrete bases, steel or cast iron cradles, saddles or stands may be considered for some equipment but will be allowed only with written permission from DTIR.

1.1.2 Concrete bases shall be a minimum of 102mm (4") larger all around than the equipment, and have chamfered edges. Ensure bases are level prior to placement of equipment.

1.2 Pipe Hangers and Supports

1.2.1 Provide all hangers required for the proper support of piping. Hangers shall be steel adjustable clevis type, epoxy coated or copper plated where in contact with copper piping.

1.2.2 Provide cadmium plated threaded steel rods with nuts and washers. All hanger rod installations to be double nutted (top and bottom).

1.2.3 Hangers to be within 30cm (12") of at least one end of each elbow. Roller hangers to be provided where expansion dictates.

1.2.4 In concrete construction, use self drilling inserts at proper centers securely anchored in concrete.

1.2.5 Beam clamps shall be used when hanging from any structural steel members. No drilling or welding of these members shall be permitted.

1.2.6 Supporting bolts shall be maximum sizes usable with the specified hanger, with adjustable and locking stop units.

1.2.7 All piping to be hung so that if coils, 3 way valves or pumps were disconnected or removed, pipe would remain in place without sagging or requiring additional hanging.

1.2.8 Vertical pipes shall be supported at each floor by means of iron hooks or clamp hangers placed directly below hub or fittings.

1.2.9 Install piping on spring hangers where vertical movement of the pipe is 12.7mm (½") or more, or the transfer of load to adjacent hangers or connected equipment is not permitted.

1.2.10 When roll grooved piping is used, any piece 122cm (48”) or longer shall have a minimum of one support.

1.2.11 Spacing shall be as per the most stringent of the following requirements, code requirements and authorities having jurisdiction.

Nominal Pipe Size	Hanger Rod Diameter	Maximum Spacing:	Maximum Spacing:
Up to 1¼" ***(32mm)***	3/8”" (***10mm***)	7-0" (***2100mm***)	6'-0" (***1800mm***)
1½" (***40mm***)	3/8" (***10mm***)	9'-0" (***2700mm***)	8'-0" (***2400mm***)
2" (***50mm***)	3/8" (***10mm***)	10'-0" (***3000mm***)	9'-0" (***2700mm***)
2½" (***65mm***)	3/8" (***10mm***)	12'-0" (***3700mm***)	10'-0" (***3000mm***)
3" (***80mm***)	½" (***12mm***)	12'-0" (***3700mm***)	10'-0" (***3000mm***)
3½" (***90mm***)	½" (***12mm***)	13'-0" (***4000mm***)	11'-0" (***3300mm***)
4" (***100mm***)	½" (***12mm***)	14'-0" (***4300mm***)	12'-0" (***3700mm***)
6" (***150mm***)	¾” (***20mm***)	15'-0" (***4600mm***)	15’-0” (***4600mm***)
8" (***200mm***)	7/8" (***22mm***)	15'-0" (***4600mm***)	15’-0” (***4600mm***)
10" (***250mm***)	7/8" (***22mm***)	22'-0" (***6700mm***)	
12" (***300mm***)	7/8" (***22mm***)	23'-0" (***7000mm***)	

Section 21 05 48 Vibration and Seismic Controls for Fire Suppression Piping and Equipment

1. Refer also to 13 48 00 Sound Vibration and Seismic Control for general isolation requirements.
2. Install piping on spring hangers, inertia bases, RSR pads, etc. as required to maintain low sound and vibration levels.
3. Where lateral support of pipe risers is required it shall be accomplished by use of resilient lateral supports.
4. Pipes that penetrate the building construction shall be isolated from the building structure by use of unit resilient penetrating sleeve/seals.
5. Parallel running pipes may be hung together on a trapeze which is isolated from the building. Do not mix isolated and non-isolated pipes on the same trapeze.

Section 21 05 53 Identification for Fire Suppression Piping and Equipment

1 Manufacturers Nameplates

1.1 Each piece of equipment shall have a metal nameplate mechanically fastened to equipment, with raised or recessed letters. Nameplates to be located so that they are easily read. Do not insulate or paint over plates.

1.2 Include registration plates (e.g. pressure vessel, Underwriters' Laboratories and CSA approval) as required by respective agency and as specified. The supplier shall indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.

2 System Nameplates

2.1 Major equipment to be identified with laminated plastic plates with black face and white center (lettering) of minimum size 89mm x 38mm x 2.4mm (3½" x 1½" x 3/32") nominal thickness, engraved with 12.7mm (½") high lettering.

2.2 Nameplates to be fastened securely with pop rivets or screws in conspicuous place. Where nameplates cannot be mounted, such as on cool surfaces, provide standoffs.

2.3 Unique mechanical identification tag shall follow naming system laid out on drawings and in specifications. Equipment type, number and service or areas or zone of building it serves to be identified.

3 Pipe Identification

3.1 Medium in piping to be identified as indicated below showing name and service, including temperature and pressure as indicated below, and directional flow arrows where relevant.

3.1.1 Material shall be vinyl/plastic coated cloth with protective over coating and waterproof contact adhesive undercoating, suitable for continuous operating temperature of 149 deg. C (300 deg. F) and intermittent temperature of 204 deg. C (400 deg. F).

3.1.2 Tape shall be 51mm (2") wide single wrap around pipe or pipe covering with ends overlapping not less than 1". Tape is to be cut, not torn.

3.1.3 Block capital letters 51mm (2") high for pipes of 76mm (3") nominal and larger o.d. including insulation and not less than 19mm (¾") high for smaller diameters shall be used.

3.1.4 Direction arrows 152mm (6") long by 51mm (2") wide for piping of 76mm (3") nominal or large o.d. including insulation and 102mm (4") long by 19mm (¾") wide for smaller diameters to be used. Double headed arrows to be used where direction of flow is reversible.

3.1.5 Use black pipe marker letters and direction arrows. Use white on red background for fire protection pipe markers.

3.1.6 Stenciled identification if used shall be from a first quality low VOCpaint, with letters a minimum of 51mm (2"). Use stenciling on all purpose or canvas insulation jackets only.

3.1.7 A high quality pre-manufactured identification system may be used in lieu of the identification noted above. Submit proposed product(s) to DTIR and do not proceed until written approval received.

3.2 Location of Identification

3.2.1 Markers and classifying colours on piping systems to be located so they can be seen from floor or platform.

3.2.2 Piping runs to be identified at least once in each room, regardless of whether concealed or in open areas.

3.2.3 Do not exceed 15m (50'-0") between identification, regardless of whether concealed or in open areas.

3.2.4 In addition, where piping is concealed in pipe chase or other confined space, point of entry and leaving, and each access opening to be identified.

3.2.5 Both sides where piping passes through walls, partitions and floors to be identified.

3.2.6 Piping to be identified at starting and ending points of runs and at each piece of equipment.

3.2.7 Identify branch, equipment or building served after each valve. (ie. heating zones are to be identified in boiler rooms)

3.2.8 Provide primary and secondary colour banding.

3.2.9 Identification and colour coding shall be as per the following:

Pipe Marker	Valve Tag	Primary Colour	Second
Fire Protection Water	F.P.W.	Red	W
Sprinkler Water	S.W	Red	W

4 Valves

4.1 38mm (1½") laminated plastic plates (tags) with corner hole shall be provided for all valves and installed with nonferrous chains, "S" hooks or heavy duty plastic tie wraps. Tags shall have horizontal 12.7mm (½") letters accurately aligned and machine engraved into the core. Required for all valves and operating controllers.

4.1.1 Provide one valve chart for each Operations and Maintenance manual and one chart framed and wall mounted.

4.1.2 Valves in systems to be numbered consecutively.

Section 21 12 00 Fire Suppression Standpipes

1 Standpipe and Hose Systems

1.1 Where they are required, standpipe systems shall be installed in accordance with the NFPA (Fire) 14: 2019 Latest edition.

Section 21 13 00 Fire Suppression Sprinkler Systems

1 Wet/Dry Pipe Sprinkler Systems

1.1 Pipe sizing and layout shall be by hydraulic design. Piping shall be ferrous. Where freeze protection is required, glycol antifreeze loops shall be avoided. If antifreeze loops must be used, antifreeze must be pre-mixed and cULus listed, provide reduced pressure type backflow prevention on the loop only.

1.2 Sprinklers shall be listed with and bear certification marking of nationally recognized testing agency.

1.3 Provide spare sprinkler cabinet with minimum of 6 sprinklers per type installed.

1.4 Provide minimum 12.7mm (½") nominal diameter discharge orifice.

1.5 With suspended ceiling tile systems, locate sprinklers in the center of ceiling tiles (where code, coverage etc. permits).

1.6 All sprinklers in storage rooms mechanical rooms, gymnasium, electrical rooms and underside of stage areas shall be c/w cULus listed guards.

1.7 All piping shall run concealed in finished areas. All main lines shall be kept as high and as neat as possible.

1.8 Install shut-off and check valves as required to complete the system and as required by the code.

1.9 Exposed piping passing through walls shall be supplied with wall plates on both sides.

1.10 Exposed piping passing through floors and ceilings shall be supplied with floor and ceiling plates.

1.11 Co-ordinate locations of all holes required for pipes and otherwise meet specified requirements of this document for installation of sleeves and pipe.

1.12 Install return bends on all sprinklers where the supply is from a well water system. Consult with DTIR on the need for return bends when the supply is from other sources

1.13 The drop at sprinklers located within 61cm (24 inches) of surface mounted light fixtures or other obstructions shall be long enough to accommodate extended (deep) escutcheons.

1.14 Install horizontal valves with handles placed vertically on top, where space allows.

1.15 Arrange drains as indicated or as required so that all parts of the system can be drained.

1.16 Pipe all drip drains from pre-action valve, supervisory valve locations and alarm valves to nearest plumbing drain. Do not hard pipe to the plumbing drain, provide atmospheric break.

1.17 Where roll grooved products are used in dry systems, provide flush seal gaskets.

1.18 Allow 15 extra sprinkler heads and associated piping to cover under large ducts, bulkheads, closets, etc. where unexpected heads may be required.

2 Ventilation Hoods

2.1 Kitchen Hood Extinguishing System

2.1.1 The kitchen cooking exhaust hood shall be protected by a wet chemical extinguishing system in accordance with the NFPA (Fire) 96: 2017 latest edition.

Section 21 30 00 Fire Pumps

1 The need for fire pumps and fire water reservoirs is pending the availability and quality of municipal services.

2 Fire pumps, if required, shall be designed and installed in accordance with the requirements of NFPA Standard No. 20, the National Fire Code of Canada 2015 and authorities having jurisdiction and are to bear the approval label of ULC.

3 Fuel Storage tank for fuel fired fire pumps shall be double wall construction. Single wall fire pump day tanks located indoors shall be complete with a liquid tight 100% volume containment device around and under the tank. This device is to be separate from and independent of the tank.

4 If the fill and vent of the fuel storage tank are at a height where they cannot be reached by a person standing on the ground below, provide a fill service platform complete with stairs (ships ladder not acceptable). Platform/stairs to be 100% galvanized including railings and be complete with non-slip treads.

5 Fill pipe to fire pump fuel storage tank shall be complete with a 25 litre lockable spill container. As described in Section 23 10 00 provide an overfill preventer valve on the fill pipe, and a screened elbow and Vent-A-Larm on the vent pipe.

6 Fuel lines, fill and vent lines shall be Schedule 40 black steel, with socket weld fittings or Type L hard copper with silfos joints, with written permission by DTIR only. Pipes located outdoors shall be primed and painted with corrosion resistant coatings.

7 Fire pump test loops shall use cULus supervised-closed valves only, reverse wired supervised-open valves are not acceptable.

END