
# Context Plus

## Method Statement

## for

## Installation of Clean Agent

## Fire Suppression System

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## Notice

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# 1 Objective

This document is used to describe the standard procedure on how the Fire Suppression System is installed.

# 2 Scope

This procedure covers complete Fire Suppression System installation in the project site which is carried out by Installation Company.

# 3 Handling and Storage

Prior to installation, all delivered components shall be checked visually all its quantity and shall be verified in accordance to Bill of Materials provided and shall be inspected if there is any evidence of damage.

# 4 Installation

## 4.1 Conduits and Cables Installation

### 4.1.1 Measurement / Location of G.I. Conduit and Marking of Conduit Route

1. Proposed locations of the conduit as per engineering drawing shall be checked and reviewed by site supervisor thoroughly.
2. Length of G.I. conduit required for installation shall be measure by site supervisor and shall give proper instruction to the workers in preparing these conduits. In order not to delay the project, project shall be planned properly.
3. As for conduits horizontal installation, mark first a straight lines using string coated with white powder, and nail both ends. Before marking a straight line, ensure that the string tension is enough by plucking and releasing the string. As for conduits vertical installation, the same procedure shall be followed as mentioned steps from 1 to 3.

### 4.1.2 Fixing of Surface GI Conduit

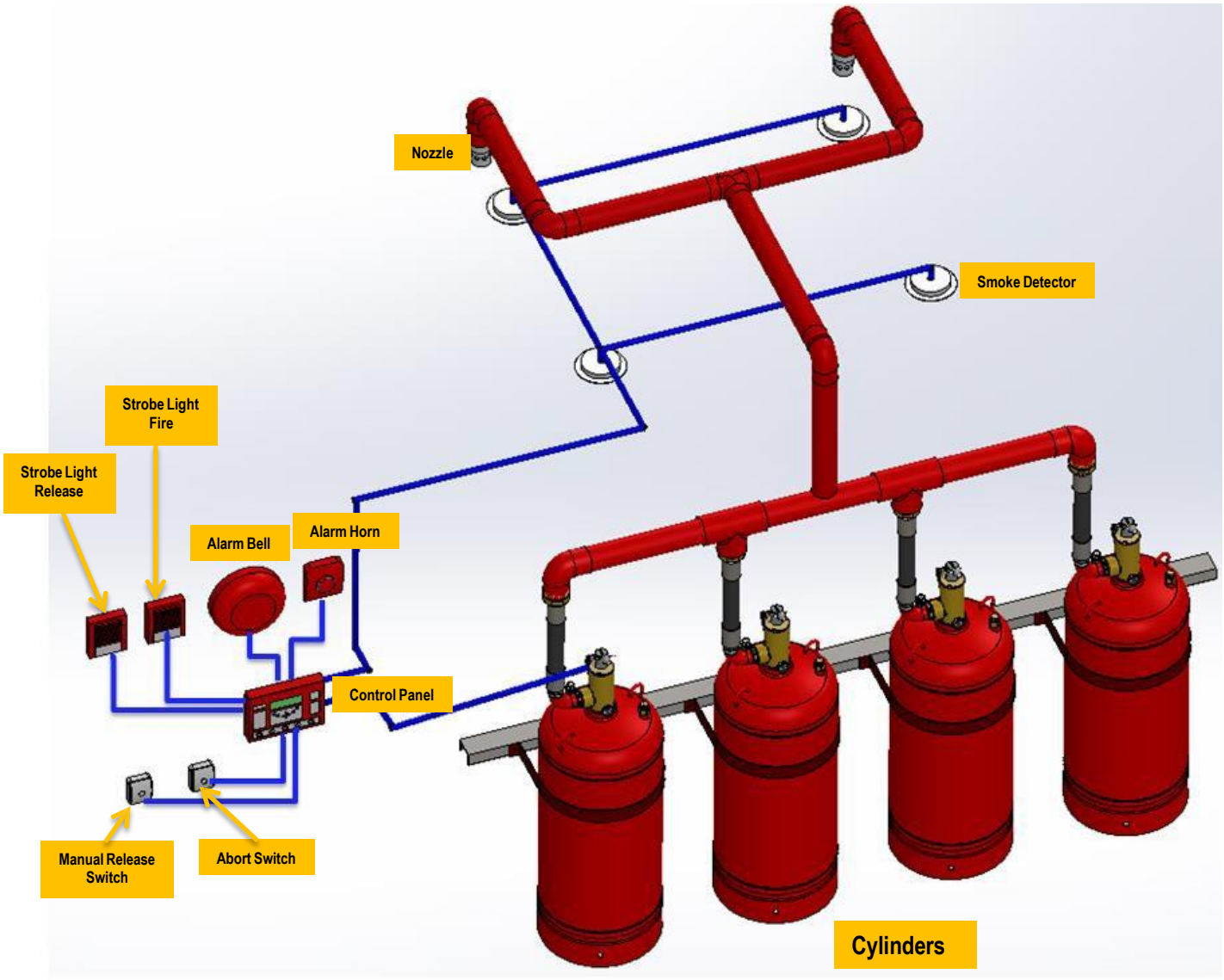
1. When strings and the nails have been already disassembled, holes shall be drilled along the white lines. Drop-in anchor bolt shall be inserted into the holes prior to rod installation.
2. G.I. conduits shall be clipped to the rods using fasteners.
3. When required, the G.I. conduit shall be cut to its required length and be threaded. The process of threading is through stocks and dies. Stocks and dies shall be rotated by two and a half turns in a clockwise direction and in clearing away the accumulated debris, it shall be rotated in a counter clockwise direction. In this manner, thread will be cut cleanly and efficiently without any cause of stripping. After everything is completed, file across the leading edge of the thread and reamer the inner periphery to prevent cable snagging on burred edges.
4. Horizontal or vertical runs shall be supported by saddles at an interval of 1 meter maximum. Bends shall be supported with two saddles on each side.
5. After every two bends or more than 15 meters of straight runs shall be provided with draw in boxes.

6. Two lengths of conduits shall be joined by conduit sockets with thread. To link up conduits pipes, usually cross-boxes, “Tee” boxes, “Thru” boxes are normally used for crossing or ending or at ‘T’ Junction.
7. After fixing the conduits, site supervisor shall check and inspect thoroughly the site. This is to ensure that installations are based on the engineering drawings.
8. Conduits shall be tightened the full saddle using screws.
9. When extending the conduits length by connecting another length of conduit, GI coupler shall be used.

## 4.2 Clip Cables Installation

Fire Suppression System electrical cabling can be installed either after marking the cable route in accordance to approved shop drawing or installing the cables using the cable clips using screw.

## 4.3 Installation of Fire Suppression System Devices



The following are the procedure on how to install the fire suppression system devices:

1. Location of the devices shall be marked in accordance to approved shop drawings.
2. Civil contractor shall mark for the cutting location.
3. Base of the devices shall be fixed the using screw.
4. Cables shall be marked in accordance to the requirements (IN/OUT LOOP) if required.
5. Cables to all devices shall be terminated in accordance to the product installation guide manual.

## 4.4 Installation of Control Panels

The following are the procedure on how to install the fire suppression system panels:

1. Location of the panels shall be marked in accordance to the approved engineering drawings.
2. Civil contractor shall mark for the cutting location accurately.
3. PVC conduits shall be installed inside the wall cutting as required.
4. GI conduits/trunk shall be installed to run the cable to the control panel.
5. Conduit shall be provided also for system main power supply.
6. Holes are to be drilled on the panels, where necessary, thereafter, adapters shall be installed.
7. The panel shall be installed with screw.
8. The cables are to be run through the conduits/trunks up to panel.
9. Use tags to identify the cables. At the end of each cable, ferrules shall be installed.
10. Fire Alarm Circuit Board shall be the termination point for the cables in accordance to the approved shop drawing and product catalogue.

## 4.5 Clean Agent Fire Suppression System Installation

### 4.5.1 Cylinder Installation

1. The cylinders should be located as close to the protected hazard area as possible. The assemblies shall be located in a readily accessible location to allow for manual actuation and ease of inspection, service and maintenance.
2. The cylinders shall be located in an environment protected from the weather and where the ambient temperature does not exceed 54˚C (130˚F) nor fall below 0˚C (32˚F). External heating or cooling may be required to maintain this temperature range. Cylinders must be located and mounted where they will not be subject to accidental damage or movement. Suitable protection to prevent accidental cylinder damage or movement must be installed when necessary to prevent accidental discharge, bodily injury or property damage.
3. Position cylinders in designated location and secure in place with cylinder bracket and attaching hardware. ContextPlus cylinders to that valve outlet are angled towards discharge piping.
4. Connect flexible discharge hose to cylinder outlet port. Repeat for each cylinder in system.
5. Connect Copper tubing or pilot hose between the pilot cylinder or the Master Cylinder and the first slave cylinder, pneumatic actuation port. Repeat for the other slave cylinders.

6. Each cylinder bracket must be securely anchored to structural supports to absorb the force generated by cylinder discharge.

### 4.5.2 Cylinder Support Installation

1. Locate the drill holes coordinates for the bracket to be mounted and drill the holes on the wall.
2. Use drop-in anchor bolts to mount the bracket on the wall.

### 4.5.3 Cylinder to Bracket Installation

The cylinder brackets are manufactured from galvanized steel band. They are formed to the radius of the cylinder with flanges for bolting and to continuous slot metal framing channel (12-gauge steel with corrosion-resistant paint or galvanized 1100 H Unistrut). The channel is to be supplied by the installer. The cylinder bracket must be secured to a surface such that the bracket will withstand a load up to 5 times of the cylinder weight. This precaution is to have the bracket safely supports the weight of the cylinder and the reaction force of the Clean Agent when discharge.

One cylinder bracket is required for the 20 lb, 35 lb, 70 lb, 100 lb, 150 lb, and 250 lb cylinders. For the 375 lb, 560 lb, 800 lb, 1000 lb and 1200 lb cylinders, two bracket straps should be used. All cylinders must be mounted vertically only, with valve up, resting firmly on the floor.

### 4.5.4 Painting of Pipes

1. Clean the hot dipped galvanized Pipe
   Using cotton rag, remove any dirt or grease on the hot dipped galvanized pipes.

2. Paint the Pipes with Zinc Chromate Primer
   Paint the galvanized pipes evenly on both sides with 1 layer undercoat of Zinc Chromate Primer.

3. Wait for Dry
   Leave the painted pipes in a well-ventilated area for 24 hours in order for the paint to dry.

4. Paint with Finish Coat
   Paint a finishing coat of Nippon 9000, Vermilion #9004-for metal with 1 layer on both sides evenly. Leave it to dry.
5. Install the Pipes
   Install the pipes when it is dry.

6. Paint Final Layer
   Paint the final layer of paint (Nippon 9000, Vermilion #9004-for metal) on both sides evenly after installation

### 4.5.5 Pipe Support Installation

1. Location of the hanger shall be identified the actual in accordance to the approved shop drawing. Mark the position shop drawing. Mark the position for the installing the drop in anchor after coordination with structural engineer
2. Required length of the GI angle shall be cut in accordance to site condition.
3. Construct the support by welding the angles in accordance to the approved shop drawing.
4. Holes shall be drilled on the constructed support.
5. Check and mark the location of the hole to be drilled based on the approved shop drawing.
6. Drop in anchor shall be inserted in the hole.
7. GI angles on drop in anchor shall be tightened using bolts
8. At each directional change fitting, firm and rigid bracing shall be required.

### 4.5.6 Pipe Grooving Procedure

1. Required length of the pipe to be grooved shall be cut. Ensure that the cut ends of the pipe are in square shape.
2. Correct die shall be properly selected and installed on the grooving machine based on corresponding pipe size.
3. End of the pipe shall be inserted to be grooved in between the groover dies.
4. Pipe stand shall be used in supporting the other end of the pipe.
5. Machine operation can be started after everything is properly fixed. At the same time, pressure shall be applied on the pipe toward the machine in order the pipe not to slip out of the groover die.
6. When the required depth of the groove is achieved, machine operation shall be stopped.

### 4.5.7 Pipe Threading Procedure

1. Pipe Cutting
   a. Required length of the pipe threads shall be cut.
   b. Ensure that the cut ends of the pipe are in square shape.
2. Threading dies installation
   a. Correct die head shall be properly selected and installed. Die head shall have a threading teethes based on the pipe size.
3. Pipe Threading
   a. End of the pipe to be threaded shall be inserted in-between the die head. Then, ensure that the chuck is holding the pipe properly.
      i. Pipe stand shall be used in supporting the other end of the pipe.
      ii. Machine operation can be started after everything is properly fixed. Ensure that the die head into threading position is engaged properly.
      iii. When the required thread is achieved, machine operation shall be stopped.
      iv. Loosen the chuck and remove the pipe.
4. Residual threading oil shall be drained into the threading machine tray.

### 4.5.8 Pipe Coupling Installation Procedure

1. Groove Pipe
   Pipe ends shall be grooved according to the manufacturer's specification.

2. Check Pipe Ends
   Ensure that all pipes are free from any indentations, burrs or roll marks to avoid leaking in the gasket seat area.

3. Check Gasket & Lubricant
   Ensure that the gasket supplied is suited for intended service. Apply a thin coat of silicone lubricant to the gasket.

4. Install Gasket
   Place the gasket over pipe ends. Ensure that the gasket seating area does not overlap the pipe end.

5. Join Pipe Ends
   Ends of two pipes shall be aligned together and insert the gasket into position centered between the grooves on each pipe. No portion of the gasket should extend into the groove on either pipe.

6. Apply Housing
   Place housings over gasket and ensure that the housing keys are engaged into grooves.

7. Apply Nuts
   Insert nuts and tightened it.

8. Tighten Nuts
   Nuts shall be tightened properly and after that, ensure that the housing bolt pads are firmly together. Nuts shall not be tightened excessively.

### 4.5.9 Mechanical-T Installation

1. Drill Hole
   Follow the drill hole size according to the manufacturer's specification.

2. Prepare for Assembly
   Uninstall the nut and bolt from housing. Loosen the other nut until it is flush with the end of the bolt. Remove the tape and lift the gasket from Mechanical-T outlet.

3. Check Gasket & Lubricants
   Ensure that the gasket supplied is suited for intended service and conform to the specifications required. Silicone lubricant shall be applied to the gasket evenly.

4. Position Gasket
   Use alignment tabs to position gasket into housing properly.

5. Position Mechanical-T
   a. (Style 920)

      Lower housing shall be rotated by 90 degree away from the upper housing. Place the upper section onto the face of the pipe in line with outlet hole. Rotate the lower section around the pipe end and close the 2 halves.

   b. (Style 921)

      Upper section shall be placed onto the face of the pipe together with the locating collar mounted into the hole. Slide U-bolt end with nut into slot, swing opposite end into other slot. Apply nut and tighten both sides evenly until finger tight.

6. Check Locating Collar
   Check if that the locating collar is located in the outlet hole. This is by rocking the upper housing in the hole.

7. Insert Bolt
   After inserting the bolt into its hole, both nuts shall be finger tightened. Be certain oval-neck of bolt engages recess in housing. Ensure that the locating collar is in the outlet hole and the positioning lugs are properly aligned.

8. Tighten Nuts
   Ensure the upper housing is in complete contact with the gasket pocket area by tightening the bolt nuts uniformly. Ensure that the assembly is rigid.

### 4.5.10 Pipe Screw Fitting Installation

1. Check Pipe Length
   Length required shall be checked thoroughly in accordance to the approved shop drawing.

2. Marking & Cutting
   Put a mark on the pipe to get the desired length and use hacksaw to cut it. Ensure the pipe is perpendicular to the hacksaw cut.

3. Threading
   Load the pipe in the threading machine and thread it according to the required size. Ensure the thread of the pipe is in good condition.

4. Wrap Teflon Tape
   After the threading procedure, clean the pipe end by removing the oil and wrap it with Teflon tape.

5. Installation
   Install the pipe to the fittings.

### 4.5.11 Nozzle Installation

1. Nozzles shall be installed with the inlet of the nozzle perpendicular to the ceiling. When installing the 180o sidewall nozzle, the side holes of the pattern are to be parallel with the wall on which the nozzle is being installed.
2. All nozzles are rated for a maximum hazard height of 16 ft. If hazard exceeds 16 ft in height, multiple tiers of nozzles must be used for each 16 ft increment of the height of enclosure.
3. The maximum area coverage per nozzle is 1600 ft2 (40 ft x 40 ft). The longest side length is 40 ft (maximum). This maximum length limitation applies for a range in hazard height from 1 ft (minimum) to 16 ft (maximum).
4. The 180° sidewall nozzle shall be adjacent to a wall. The area coverage cannot be exceeded. Two 180˚ sidewall nozzles may be used at the center of the hazard. They may be applied back to back, providing area coverage of 3200 ft2 (40 ft x 80 ft).
5. The 180° sidewall nozzle may be installed from 2” to 12” down when referenced from the ceiling. When referencing the wall to the nozzle, the range of installation is from 0 to 12” off the wall. For the 180˚ sidewall nozzle reference, the centerline is between the top orifice and the bottom orifice.
6. The 360° central nozzle shall be installed at the center of the hazard. The area coverage cannot be exceeded. The nozzle may be installed from 2”to 12” down when referenced from the ceiling.
7. During nozzle installation, pipe supports shall be rated to support the dead weight of the piping and the thrust forces of the agent discharge.

# 5 Testing and Commissioning

This section described the commissioning procedure.

Before commencement of commissioning tests visually check the following:

1. Check that the installation conforms to the engineering drawings. Any deviations from drawings must be reported.

2. All work, e.g. electrical wiring, carried out by other contractors has been completed satisfactorily.

3. Check the protected area for confinement of the extinguishing agent, i.e. that no passage is allowed to other spaces through floor or ceiling voids, ductwork, holes in partitions or vents, unless allowance has been made.

4. Check that all manual controls are accessible and correctly identified.

5. Check that the discharge nozzles are unobstructed and are adequately secured. Check that the nozzles comply with sizes shown on the drawings.

6. Check that the cylinder and valve manifolds (where applicable) are correctly sized, and that check valves (where applicable) and Directional valves (where applicable) are installed for correct directional flow.

7. Check the manifold to cylinder installation (where applicable) for undue strain on connecting loops because incorrect installation can cause service problems.

8. Check the cylinders are installed in an accessible location, that the area is clean, dry and ventilated and meets the safe temperature requirements.

9. Check that all system controls, such as valves, lock off, pull boxes, manually or electrically operated devices, and are accessible to operating personnel. If located outdoors ensure that they conform to the required standards and that adequate shelter has been provided.

10. Check that pipes and fittings are sized in accordance with the drawings and are adequately secured. All piping must be rigidly secured to the nozzle to prevent damage from recoil.

11. Check that all warning labels and notices give correct information for system operation and that they are suitably located.

12. Check weigh of cylinders to ensure net content is in accordance with the requirements.

13. Check all discharge hose are screw and secure tight at both ends.

14. Check all copper tubing for pneumatic actuation is secure and screw tight at both ends.

15. Check that manual lever on the valve is available and is in standby position.

16. Discharge test should be recommended when there is any question about the adequacy of the system.

17. Ensure the pressure gauges are calibrated and valid calibration certificates available.

**WARNING:** Do not proceed with any functional tests until every precaution has been taken to prevent accidental discharge, ensure that all personnel in protected areas know that you are there and of the work you are doing.

This section described the functional test procedure.

1. Using Nitrogen as a medium, system shall be pressure tested.
2. After the test pressure is reached, Nitrogen cylinder valve shall be closed.
3. Check the pipes, pipe joints and accessories for the possible leakage of air while pressurizing the pipework and if any, check the fault and rectify.
4. Ensure all the leakages are repaired and the pressure test shall be repeated many times until a completely tight system is going well. Testing procedure is as follows:
   - Pipe line shall be pressurized at 40 psi for 10 minutes. After 10 minutes, the pressure should not drop more than 20% of the test pressure.

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