Industrial Dry Chemical Fire Suppression System

INSTALLATION, OPERATION AND MAINTENANCE MANUAL, P/N 15040

Revision B, April 9, 2013

AMEREX CORPORATION INC. - 7595 GADSDEN HIGHWAY - TRUSSVILLE, AL 35173 - April 9, 2013

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GENERAL INFORMATION

Manual P/N 15040

AMEREX
Industrial Dry Chemical
Fire Suppression System

Tested and Listed by
Underwriters Laboratories and Underwriters Laboratories Canada
to UL Standard 1254

April 9, 2013

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GENERAL INFORMATION

The Amerex Industrial Dry Chemical Fire Suppression System is designed and has been tested to provide fire protection for industrial operations categorized as Local Application (Overhead), Tankside, Total Flooding, Vehicle Paint Spray Booth, and Open Front Paint Spray Booth hazards. It is manufactured by the Amerex Corporation of Trussville, Alabama.

Amerex Industrial Systems are a pre-engineered type as defined in NFPA 17- Standard for Dry Chemical Extinguishing Systems. The NFPA 17 definition states pre-engineered systems as "having predetermined flow rates, nozzle pressures, and quantities of dry chemical." It also states that "limitations on hazards that are permitted to be protected by these systems and piping and nozzle configurations are contained in the manufacturer's listed installation and maintenance manual, which is part of the listing of the system."

It is essential that all installations, maintenance, and inspections of the Amerex Industrial System be performed in compliance with this manual and NFPA 17. **Those individuals responsible for the design, installation, setting into service, maintenance and recharging of the Amerex Industrial Dry Chemical System must be trained by Amerex and hold a current Amerex Certificate.** All piping limitations, nozzle coverages, detector placements, etc. have been proven and established through exhaustive testing by Underwriters Laboratories, Inc. Use of components other than those referenced in this manual, or installations outside the limitations stated in this manual is unacceptable.

UL and ULC Listing

The Amerex Industrial System is an Underwriters Laboratories (UL) and Underwriters Laboratories Canada (ULC) Listed pre-engineered extinguishing unit. The system has been evaluated in accordance with UL Standard 1254. Tests required for listing under this standard involve fire tests under specific conditions involving a variety of Local Application, Total Flooding, or Screening. Each test fire was allowed to reach its maximum intensity before agent was discharged. Each test was repeated using both maximum and minimum piping, with variations in agent storage pressure to simulate maximum and minimum temperature ratings. Each test fire was extinguished without splashing of the liquid fuel.

Design

The system is composed of an agent cylinder / discharge valve charged with Amerex ABC Dry Chemical and either a Mechanical Release Module (MRM), a Pneumatic Release Module (PRM), an Electrical Release Module (ERM), or an Electric Control Head (ECH). The quantity of detectors, fusible links, nozzles, corner pulleys, pulley tees and manual pull stations will vary depending on design.

The system operates either automatically if actuated by a detector or manually if actuated by a manual pull station. Upon system operation, energy sources for the appliances are shut off immediately. The MRM (ERM) incorporates mechanical and electrical provisions to facilitate the operation of auxiliary devices such as mechanical or electric gas valves and remote audible or visual signal devices.

Temperature Limitations:

Local Application, Overhead:	32°F to 120°F (0°C to 49°C)
Local Application, Tankside:	-20°F to 120°F (-29°C to 49°C)
Total Flood:	-40°F to 120°F (-40°C to 49°C)
Vehicle Paint Spray Booths:	-20°F to 120°F (-29°C to 49°C)
Open Front Paint Spray Booths:	-20°F to 120°F (-29°C to 49°C)

Definition of Terms

Actuation Network
Copper tubing that allows nitrogen to be supplied from the Mechanical Release Module (or Electrical Release Module) to the Pneumatic Control Head mounted on the Agent Cylinder Valve(s).

Agent Cylinder / Discharge Valve
Pressurized vessel with the valve assembly containing Amerex dry chemical fire suppression agent and expellant gas (nitrogen).

Authority Having Jurisdiction (AHJ)
The organization, office or individual responsible for "approving" equipment, an installation or a procedure. The phrase "Authority Having Jurisdiction" is used in NFPA documents in a broad manner since jurisdiction and approval agencies vary as to their responsibilities. Where public safety is primary, the "Authority Having Jurisdiction" may be a federal, state, local, or other regional department or individual such as a fire chief, fire marshall, chief of a fire prevention bureau, labor department, health department, building official, electrical inspector, or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the AHJ. At government installations, the Commanding Officer or department official may be the AHJ.

Auxiliary Equipment
Listed auxiliary equipment, when outlined and installed per the limitations in this manual, can be used in conjunction with the Amerex Industrial System. Auxiliary equipment includes items such as mechanical or electric gas valves and remote audible or visual signal devices. The MRM has not been evaluated as an alarm initiating device and is not intended to be connected to an alarm control panel.

Blow-Off Cap
A plastic cap which covers the nozzle tip to keep grease, dirt, or foreign material from plugging the orifice.

Cable
1/16" diameter Stainless Steel cable (7x7 strand, 480# tensile strength) used to connect Detectors, Mechanical Gas Valves and Manual Pull Stations to the MRM. It is also used to connect Mechanical Gas Valves to the ERM.

Conduit Offset
A factory formed section of conduit, which allows the Cable for Manual Pull Stations, Gas Valves, and Detectors to make a smooth transition into the Mechanical Release Module. It is also used to connect Mechanical Gas Valves to the ERM.

Corner Pulley
A device used with the Detection Network, Mechanical Gas Valve, and Manual Pull Station, which allows the Cable to change direction 90^{o} and still move freely for system operation.

Detector
For our purpose, this is a thermal-mechanical device consisting of a Detector Bracket, Detector Linkage, and Fusible Link, which will automatically actuate the fire extinguishing system at a predetermined temperature. (Electric Thermal Detectors are used with the ERM.)

Detection Network (MRM)
A continuous Cable run through EMT conduit, Corner Pulleys, and Detectors which provides a mechanical input to the Mechanical Release Module in order to actuate the system automatically.

Detector Linkage
The device that supports the Fusible Link on the Cable.

Distribution Network
The piping network serves as a means to deliver agent from the Agent Cylinder/Discharge Valves through the Nozzle

Distribution Test
A means of testing agent distribution piping to guarantee that each nozzle is discharging equal or proper amounts of agent. Upon completion of a system installation, bags are placed over each nozzle and the system is fully discharged. These bags are then weighed and compared for proper agent distribution according to the system design.

Electrical Control Head (ECH)
A pneumatic assembly which, when connected to the Amerex SR-X Releasing Control Panel, will open up to twenty (20) Agent Cylinder / Discharge Valves via the activation of the connected Electric Actuator. Up to four RNA's can be installed in an ECH system for a total system of eighty (80) agent cylinders.

Electrical Release Module (ERM)
An assembly which connects and controls the Nitrogen Actuation Cylinder, the Detectors, the Manual Electric Pull Station(s), the Gas Valve, the Microswitch(es), and the Agent Cylinder / Discharge Valve(s). It receives Inputs and activates appropriate Outputs – including agent release, auxiliary signals and power or gas shut-off. The ERM and Microswitches are intended for indoor use only. All electronic components are supervised. The module is designed to contain back-up batteries for 24 hours in standby and 5 minutes of alarm. Refer to the separate Installation, Operation and Maintenance Manual, P/N 15827, for more information on the ERM.

Fusible Link
A fixed temperature heat detection device used to restrain the operation of the Mechanical Release Module until the Detector's design temperature is reached. At its designated temperature, the Fusible Link will separate, releasing tension in the Cable, causing the system to discharge.

Gas Valve
A mechanical or electrical valve used to shut off the supply of gas to an appliance when the fire suppression system discharges. Gas Valves must be UL listed for use with the Amerex Industrial System. Gas Valves must be manually reset.

Inspection
A "quick check" to give reasonable assurance that the system has not been tampered with and is in a charged, operable condition.

Listed
Equipment, materials, components, and parts included in a list published by an organization acceptable to the Authority Having Jurisdiction and concerned with product evaluation, which maintains periodic inspection of production of listed equipment or materials and whose listing states either that the equipment or material meets appropriate standards or has been tested and found suitable for its use in the specified manner.

Local Application
A Local Application hazard is one involving flammable or combustible liquids, gases, and shallow solids where the hazard is not enclosed or where the enclosure does not conform to the requirements for Total Flooding.

Maintenance
A "thorough check" to give maximum assurance that the extinguishing system will operate as intended. Design parameters should be closely examined for hazard changes since the last inspection. Parts and components should be closely examined and tested or replaced if necessary.

Manual Pull Station
The device which allows the system to be manually discharged either at the hazard or from a remote location. The MRM uses a mechanical version, while the ERM uses an electrical version.

Manual Reset Relay
A device used to manually reset (open) an Electric Gas Valve following a system discharge or a momentary loss of electrical power. This safeguards against an unwanted build up of gas when the electrical power is restored.

Mechanical Release Module (MRM)
An assembly which connects and controls the Nitrogen Actuation Cylinder, the Detectors, the Manual Pull Station(s), the Gas Valve, the Microswitch(es), and the Agent Cylinder / Discharge Valve(s). It receives Inputs and activates appropriate Outputs – including agent release, auxiliary signals and power or gas shut-off. The MRM and Microswitches are intended for indoor use only.

Mechanical Time Delay (for use with the MRM)
An assembly which is used with the MRM when a 15 second discharge time delay is required (by UL 1254, in certain instances). It is installed in the nitrogen outlet port of the MRM, and then the Actuation Tubing is installed into the outlet port of the Time Delay. In this manner, any exhaust fan and electrical appliance (if connected to the Microswitch (es)) will be shut down in advance of the distribution of Dry Chemical through the Discharge Nozzles.

Microswitches
A set of dry (unpowered) electrical contacts arranged in various configurations for initiating appropriate Output functions such as: audible/visual remote signal, electrical power shut-off, electric gas valve shut-off. Microswitches are intended for indoor use only.
Nitrogen Cylinder
A small, sealed, steel cylinder containing nitrogen (refillable by Distributor) used to actuate the Agent Cylinder Valve via the Pneumatic Control Head.

Nozzle
The device used to deliver a specific quantity, flow and discharge pattern of fire suppression agent to a specific hazard.

Open Front Paint Spray Booth
An assembly of volumes or enclosures constructed for the purpose of painting or coating equipment or components. The general configuration of an Open Front Booth is a Work Area that is not enclosed on the front. A filter bank at the rear separates the Work Area from the Plenum. The Amerex Industrial Dry Chemical System meets the requirements of UL 1254 for protection of the various Work Area, Plenum, and Duct sizes and configurations commonly found in the marketplace.

Output
An action that is initiated by the Mechanical Release Module or Electrical Release Module in response to a pre-determined Input. (Examples: agent release, power shut-off, remote signal, Gas Valve closure).

Piston Plug / Gas Trip
A pneumatic device mounted in the MRM (ERM) which upon system actuation, pulls the Cable connected to the Gas Valve causing it to close and stop the flow of gas.

Pneumatic Control Head
An actuating device bolted to the Agent Cylinder Discharge Valve which receives high pressure nitrogen from the Nitrogen Actuation Cylinder.

Pre-Engineered System
A system having pre-determined flow-rates, nozzle pressures and quantities of agent. These systems have the specific pipe size, maximum and minimum pipe lengths, number of fittings and number and type of nozzles prescribed by a testing laboratory. The hazards protected by Pre-Engineered Systems are specifically limited as to type and size by a testing laboratory based on actual fire tests. Limitations on hazards which can be protected by these systems are contained in the manufacturer's installation manual, which is referenced as part of the listing. Distribution Network The piping network which serves as a means to deliver agent from the Agent Cylinder / Discharge Valves through the Nozzles.

Pulley Tee
A device similar to a Corner Pulley except there is a change in direction on the Cable from two Manual (mechanical) Pull Stations or two Mechanical Gas Valves. It unites either two Gas Valves or two Manual Pull Stations to a single control point.

Remote Nitrogen Actuator
An assembly designed to operate as a 'slave' actuation device, controlled by the nitrogen cylinder output of either the MRM or ERM. When the Remote Nitrogen Actuator is used, it can operate a total of twenty (20) agent cylinders. Up to two Remote Nitrogen Actuators can be installed on a given system.

Series Detector (MRM)
Any Detector located between the Mechanical Release Module and the Terminal Detector.

Terminal Detector (MRM)
The last Detector (or only Detector) in the Detection Network. It is at this point that the Cable for the Detection Network ends or is terminated.

Test Link (MRM)
This device is used in place of a Fusible Link in order to easily test the Detection Network. The Test Link is easily cut, simulating a Fusible Link separating under fire conditions. It is usually located on the Terminal Detector and is used solely for test purposes.

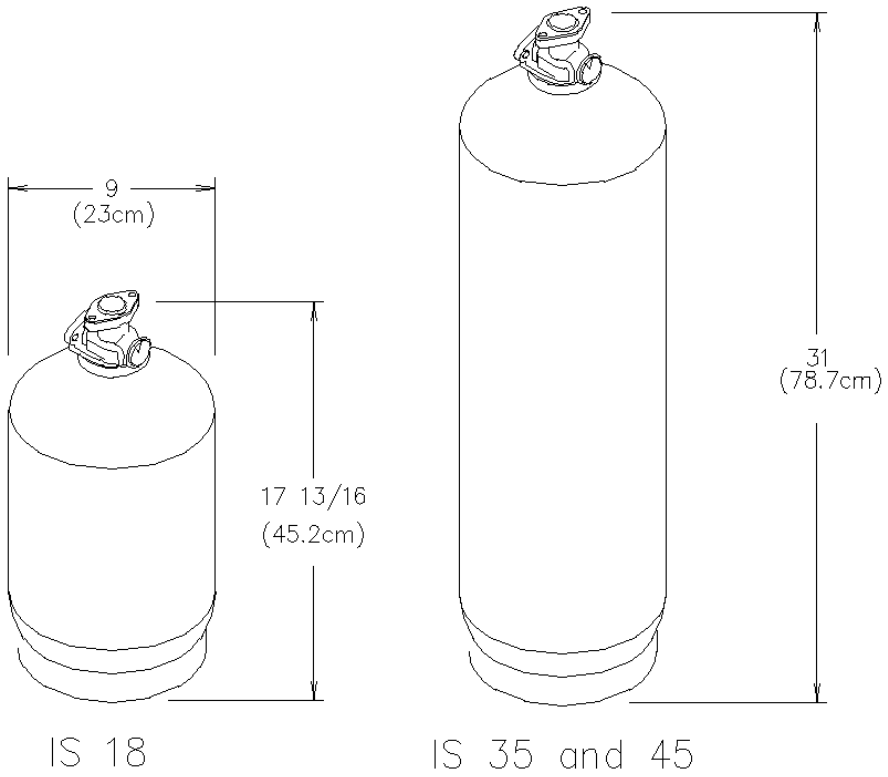
Total Flood
A Total Flooding hazard involves a permanent enclosure surrounding the hazard that adequately enables the required concentration to be built up. The Amerex Industrial Dry Chemical Total Flood System has been evaluated with a total area of uncloseable opening of 5% of the sides, top, and bottom of the enclosure.

Vehicle Paint Spray Booth
An assembly of volumes or enclosures constructed for the purpose of painting or coating automobiles or mobile equipment of any type. The Amerex Industrial Dry Chemical System meets the requirements of UL 1254 for protection of the various Work Area, Plenum, and Duct sizes and configurations commonly found in the marketplace.

Vent Check
A device installed on the last (or only) Pneumatic Actuator, which allows the escape of any slowly built-up pressure in the actuation line. Also can be used to manually bleed off pressure in the actuation line following a system discharge.

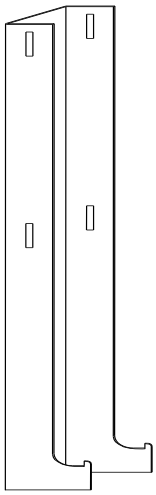
CHAPTER 2
COMPONENT DESCRIPTIONS

Agent Cylinder Assembly (Item 1): The agent cylinder is available in three configurations. Models IS18ABC (**P/N 16206**), IS35ABC (**P/N 16207**) , and IS45ABC (**P/N 16208**) are charged with AMEREX multi-purpose ABC dry chemical agent. The cylinder assemblies are stored pressure designs with an operating pressure of 350 psi (2413 KPa) at 70°F (21°C). The cylinders are constructed of welded steel to DOT 4BW 350 specifications. All three models are 9 inches (22.9 cm) in diameter. The discharge valve, which is common to all agent cylinders, is of rugged forged brass construction. The valve is equipped with a 350 psi (2413 KPa) pressure gauge and a fusible element pressure relief plug. The valve controls agent discharge via a spring loaded, internal sealing stem that must be depressed from the top of the valve to initiate agent discharge. The operating temperature of this and other listed system components is -40°F to 120°F (-40°C to 49°C) for Total Flood, -20°F to 120°F (-29°C to 49°C) for Tankside Local Application, Vehicle and Open Front Paint Spray Booths, and 32°F to 120°F (0°C to 49°C) for Overhead Local Application. **Warning**: Agent cylinders are shipped from the AMEREX factory fully charged with a shipping plate installed on the top of the valve to prevent accidental agent discharge and an anti-recoil plate on the valve outlet to redirect chemical flow should an accidental discharge occur. <u>Both of these plates must be removed at installation.</u>

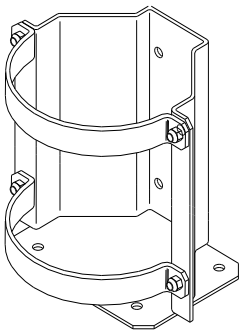


Dry Chemical Agent (Item 2): For recharging of the Agent Cylinder Assemblies, following a discharge: Amerex multi-purpose ABC Dry Chemical in 50 lb. pails is **P/N 09781, (CH 555 Dry Chemical)**
MSDS and HMIS information on these agents are found in the Appendix Section of this manual.

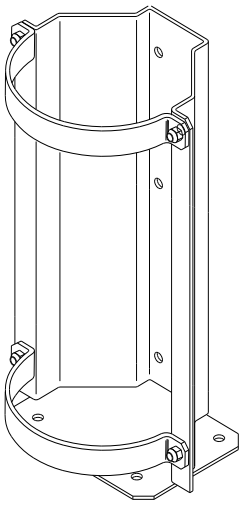
Agent Cylinder Bracket (Item 3): The agent cylinder bracket is constructed from 1/8 inch (3.2mm) steel & painted to resist corrosion. The part number for this cylinder bracket is **P/N 14929**. This bracket assembly will accommodate either the IS18 or the taller IS35/45 agent cylinders, and contains two stainless steel straps for securing the cylinder to the bracket back (use only one strap for the IS18 cylinder).



Heavy–Duty Floor/Wall Mount Brackets

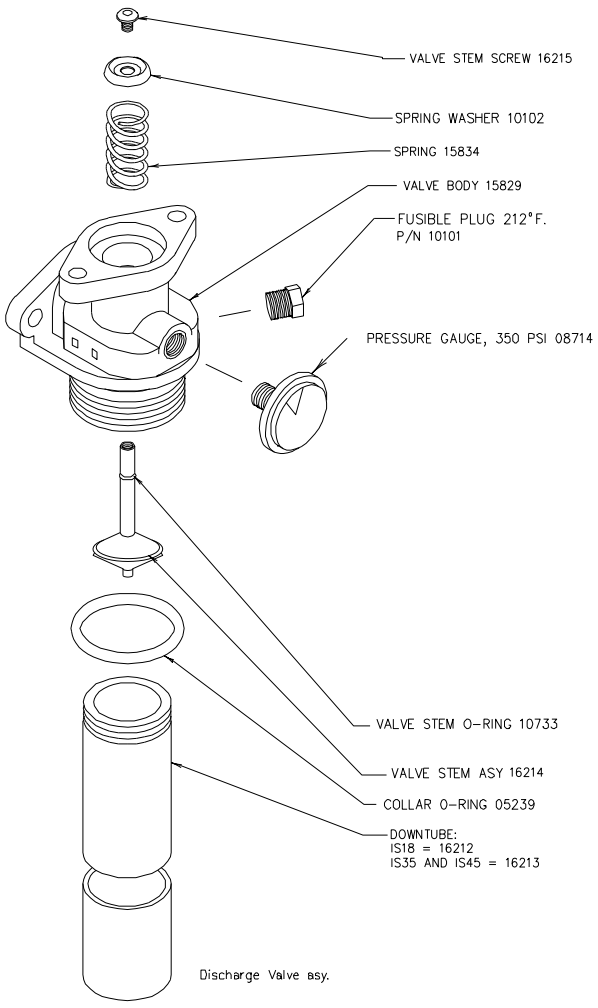


IS18 Bracket,
P/N 10180



IS35/45 Bracket,
P/N 10181

Agent Cylinder Bracket, Heavy-Duty Wall/Floor Mount: These brackets are constructed of heavier-gauge steel (3/16" and 1/4" with stainless steel strap-retaining hardware). Note that **P/N 10180** is used for the IS18, while the **P/N 10181** is used for either the IS35 or the IS45. Each bracket uses two straps

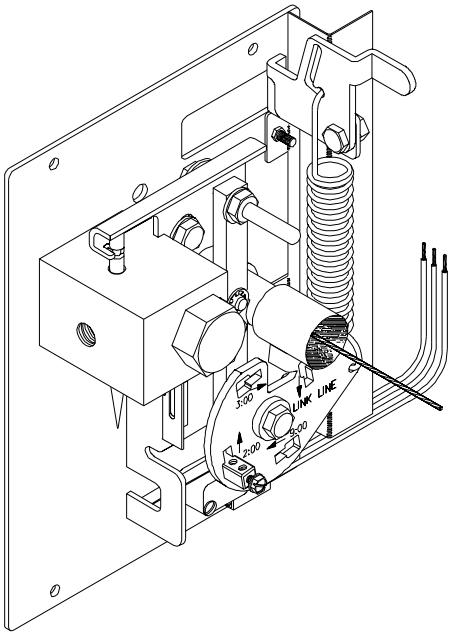


Agent Cylinder Discharge Valve Assembly (Item 4):

The machined brass Discharge Valve, when mated to the Pneumatic Control Head, is actuated pneumatically from either the Mechanical Release Module (MRM), the Pneumatic Release Module (PRM), or the Electronic Control Head (ECH). Valve replacement components are shown at right. The complete Discharge Valve Assembly for the two cylinder sizes are:

IS18 Discharge Valve Asy: **P/N 15830**
IS35 / 45 Discharge Valve Asy: **P/N 15831**

Mechanical Release Module (Item 5): Referred to as the MRM, **P/N 11977** is used to actuate the Agent Cylinder Discharge Valve either automatically or manually by puncturing a Nitrogen Cylinder. The pressure from the cylinder pneumatically actuates the Pneumatic Control Head(s), which, in turn, opens the Agent Cylinder Valve(s).

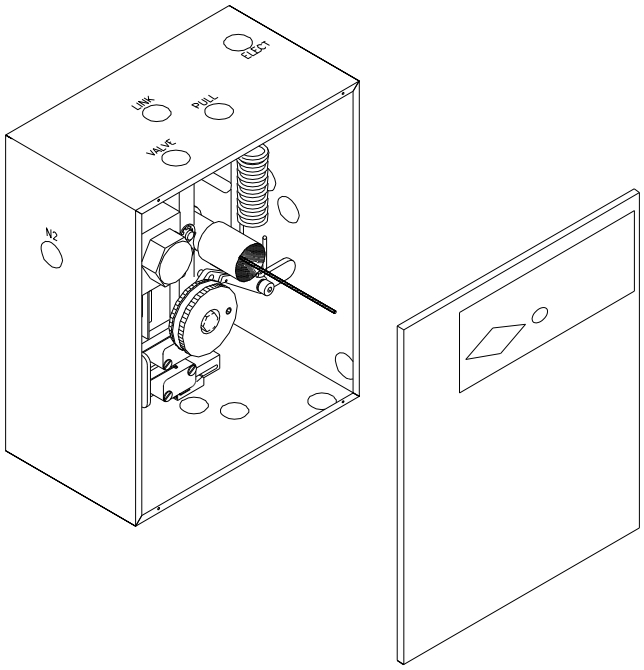


Automatic release of dry chemical agent is accomplished when a Fusible Link Detector separates under a fire condition and releases tension on the cable. This causes a spring-loaded plunger to perforate the seal on the Nitrogen Cylinder and releases nitrogen through the Actuation Hose/ Piping Network to the Pneumatic Control Head(s) / Discharge Valve(s).

Manual release of agent is accomplished by pulling on a Manual Pull Station, which is connected to the Mechanical Release Module by a cable.

The Mechanical Release Module is intended for indoor use only, and is equipped with one Microswitch **(P/N 12524)** for electrical signaling, power shutdown and other auxiliary functions. An additional three Microswitches may be added.

Mechanical Release Module II (Item 5): The new MRM II combines the same features and functionality of the 11977 MRM (see above) along with increased detection capabilities and a far simpler means of setting the detection cable tension. The MRM II is available in the following configurations, now pre-installed in its own enclosure:

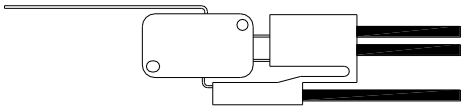


P/N 18000: MRM II with red-painted steel enclosure

P/N 18001: MRM II with stainless steel enclosure

The method of setting the detection cable tension on the MRM II does not require the use of any tools (once the cable is locked down into the large, knurled wind-up spool). A large lever to the right of the spool is used to increase the cable tension. Alignment of the bottom edge of the lever with markings on a label on the mounting plate indicates when the proper tension has been reached. In addition to being easier to set up, lowering cable tension to change out detection links is now also much simpler.

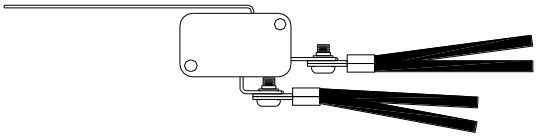
Microswitch (Item 6):



Amerex **P/N 12524**
SPDT, 21 Amps, 125, 250 or 277 VAC,
1HP 125, 250, 277 VAC;
2HP, 250, 277 VAC
Microswitches, **(P/N 12524)**, designed to be mounted in the Mechanical Release Module (MRM / MRM II), the Pneumatic Release Module (PRM) and Electrical Release Module (ERM), are used to control various output functions. These output functions may involve turning off or turning on power. Examples of output functions are: Sounding a visual or audible alarm, operate an Electrical Gas Valve, shut off Supply Air Fans or other electrical devices designed to shut off or turn on upon system actuation. Two field-useable **P/N 12524** SPDT (Single Pole, Double Throw) switches are pre-installed in the both the MRM, the PRM, and the ERM (a wire gutter is provided to aid in electrical installation). Up to two additional SPDT switches may be added to the MRM and PRM (two for the ERM) for the following configurations: SPDT, DPDP, 3PDT, and 4PDT (MRM). Microswitches are intended for indoor use only. All Microswitch connections are to be made outside the MRM / PRM in an approved junction box. Microswitch connections are allowed inside the ERM.

Color Code: Red = Common, Yellow = N.O., Black = N.C.

Alarm-Initiating Microswitch (Item 6):



Amerex **P/N 18312**

SPST 0.25A, 30 VDC, N.O.

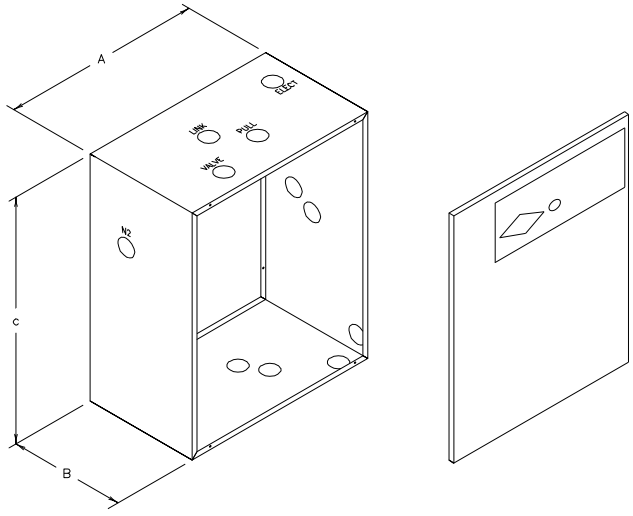
The optional alarm initiating microswitch, **(P/N 18312)** , is used when it is required to be electrically connected to a fire alarm system per NFPA 17 and NFPA 72 in a supervised, four-wire manner. It is designed to be mounted in the Mechanical Release Module (MRM / MRM II) and the Pneumatic Release Module (PRM) **only** for the purpose of initiating an alarm in a fire alarm system. All Microswitch connections are to be made outside the MRM / PRM in an approved junction box.

Enclosure - Mechanical Release Module (Item 7):

[Painted – P/N 12853]

[Stainless Steel – P/N 13393]

Either painted (red) or stainless steel are available for secure mounting of the MRM. Knockouts are provided for installation of all external devices. Viewports for system status indicator and external inspection of nitrogen actuation cylinder are provided.



Size:

(A) width = 10” (25.4 cm)
(B) depth = 5” (12.7 cm)
(C) height = 11 ¾” (51.5 cm)

The cable for the gas valves, manual pull stations and detection network may be attached to the MRM from any of three sides (top, bottom, and right).

Electrical Release Module (Item 8): (DISCONTINUED) Known as the ERM, **P/N 15780** is a Control Panel conforming to UL 864. The ERM is mechanically very similar to the MRM, but with differences that include: Electric Thermostat Actuation, Electric Manual Pull Station(s), electronically-controlled Discharge Time Delay, and Local Alarm capabilities with 24 hour standby (internal back-up batteries). The functions that are similar to the MRM include: Pneumatic Actuation (but with a larger, 15 in^3 Nitrogen Actuation Cylinder) and Mechanical / Electrical Gas Valve capabilities. The ERM contains one useable plate-mounted Microswitch, with provisions to add an additional two Microswitches. Additionally, an Immediate Transfer Relay, switched 24VDC outputs, and a Trouble Relay are included. All electrical components are fully supervised, and the module contains the Status LED Indicators: "System OK", "Fire", "Silence", and "Trouble". The ERM comes with its own 16 gauge, red-painted, locking enclosure. Refer to the Design and Installation Manual, **P/N 15827**, for more details on the ERM.

ERM Back-up Batteries (Item 9): In order to provide the required 24 hours of standby, followed by five minutes of alarm in the event of power failure, two (2) **P/N 16202** Back-up Batteries are required to be installed inside the ERM. Perform your battery calculations per the **P/N 15827** Design and Installation Manual for the ERM.

Electric Control Head (ECH) (Item 10): P/N 19352

The ECH is to be used in cases where electrical detection is desired or required, due to physical hazard size or other design considerations. This control head replaces the ERM which has been discontinued. Other components that are necessary to complete an installation with the ECH are as follows (but not limited to):

P/N 19347 Nitrogen Actuation Cylinder

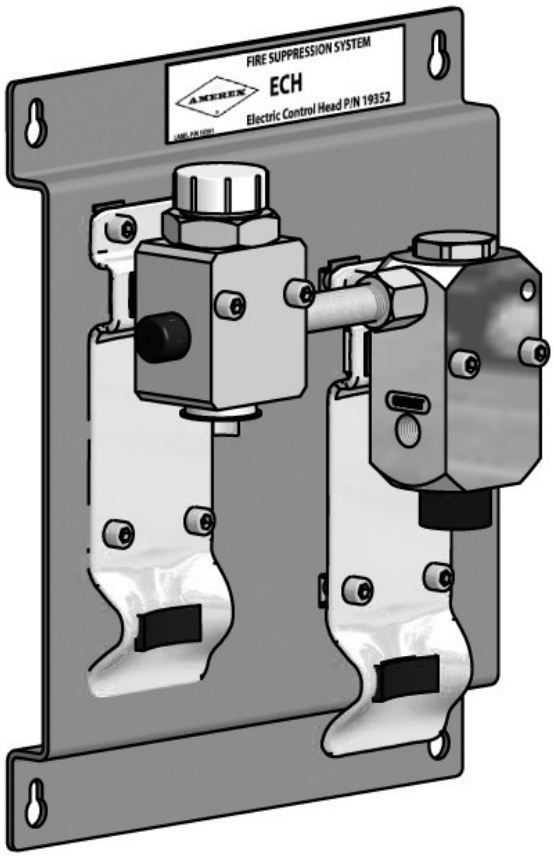
P/N 16197 28 in^3 Nitrogen (RNA) Cylinder

P/N 17014 Electric Actuator

P/N 19340 Releasing Panel, SR-X

P/N 17001 Manual Actuation Button (optional)

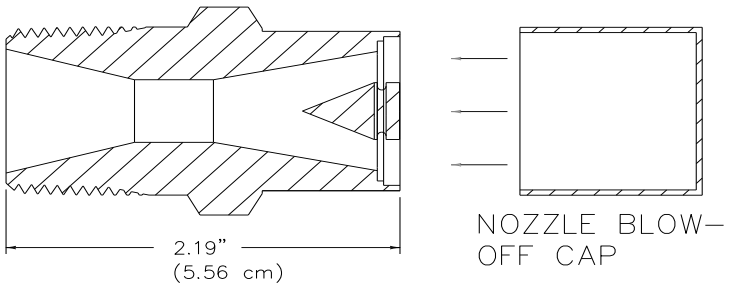
P/N 17839 Cap Electric Actuator (optional)



An installed ECH has the capability of pneumatically firing up to twenty Amerex Dry Chemical cylinders. Additional RNA assemblies in the actuation network can fire a total of 80 (eighty) Amerex Dry Chemical cylinders. Manual actuation can be accomplished with the optional P/N 17001 Manual Actuation Button installed on top of the P/N 17014 Electric Actuator, and/ or with Amerex Electric Pull Station(s) connected to the Amerex SR-X Releasing Panel.

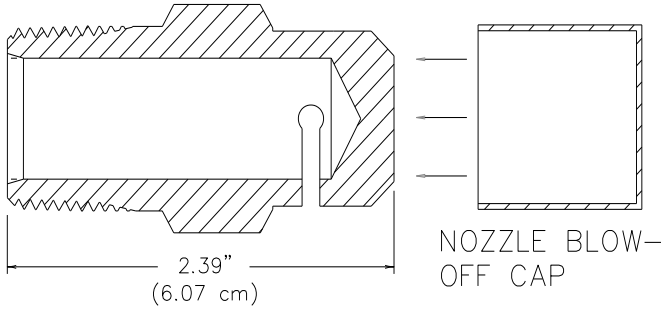
See the relevant sections of this manual for design, installation and servicing requirements. The ECH is intended for indoor use, only. Two stainless steel band clamps (not shown) are included with the ECH assembly for securing the two nitrogen cylinders to their brackets. The ECH is not supplied with an outer enclosure.

Discharge Nozzles (Item 11):



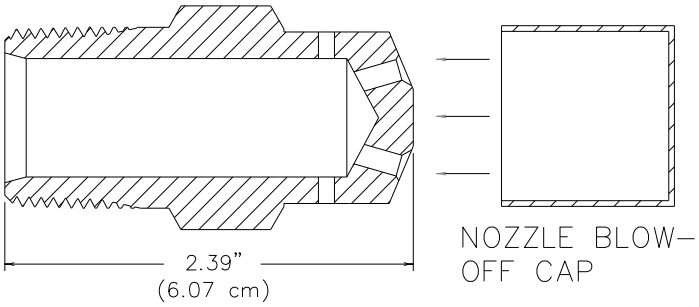
Local Application, Overhead (LAOH) Nozzle (P/N 16216)

This nozzle is designed for Local Application of Dry Chemical Agent from directly overhead the fire hazard.



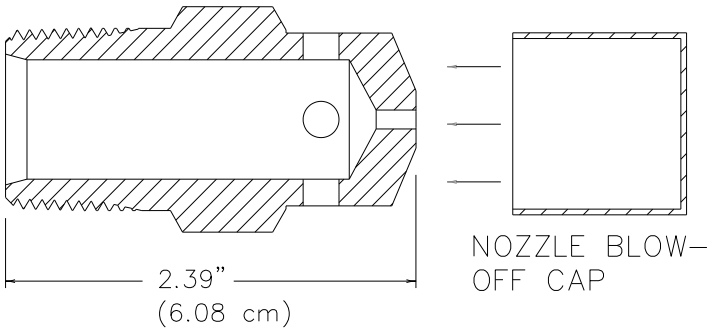
Tankside (TS) Local Application Nozzle (P/N 16170)

This nozzle is designed for Application of Dry Chemical Agent across the surface of the hazard, from the side.



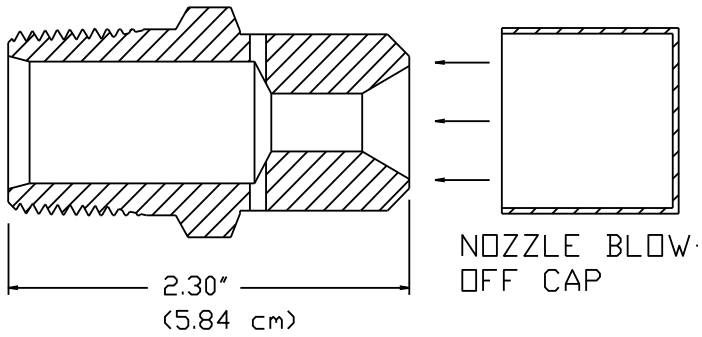
Total Flood (TF) Nozzle (P/N 16172)

This nozzle is designed for Total Flooding Application of Dry Chemical Agent into an enclosure with no more than 5% total uncloseable openings. See Chapter 3A for other limitations. It is also used in Vehicle Paint Spray Booth and Open Front Spray Booth applications (see Chapter 3A).



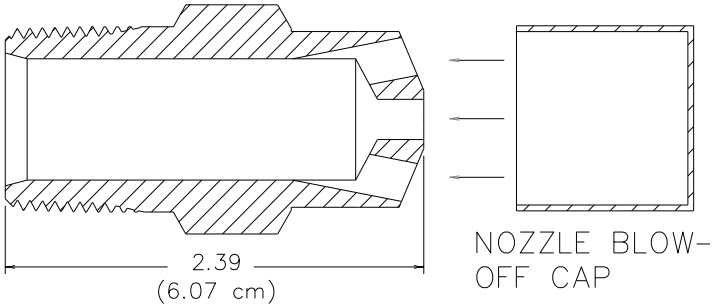
Three-Way Nozzle (P/N 16174)

This nozzle is specifically tailored for certain Vehicle Paint Spray Booth Plenum hazards (see Chapter 3A).



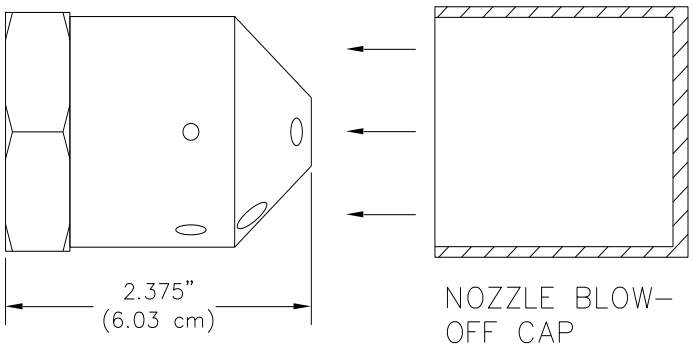
Duct and Plenum (D/P) Nozzle, (P/N 16190)

This nozzle is designed to protect exhaust ducts and certain plenums in Vehicle and Open Front Spray Booths (see Chapter 3A).



Screening (SCR) Nozzle (P/N 16192)

This nozzle is designed to protect the opening of the Work Area in an Open Front Spray Booth (see Chapter 3A).



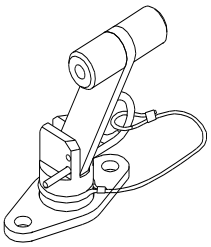
Total Flood, Perimeter, TFP (P/N 17809)

This nozzle is designed to protect the Work Area in a Vehicle Paint Spray Booth. It is also used in Total Flood applications. It is to be installed at the upper perimeter of the module being protected. The TFP nozzle contains a 1" FPT as opposed to the ¾" MPT as found on all the other IS nozzles (see Chapter 3A).

Replacement Nozzle Blow-Off Caps (Item 12):

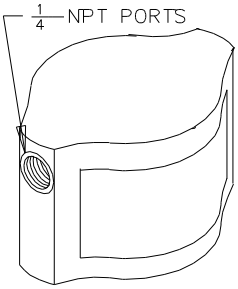
The LAOH, TS, TF, Three-Way, D/P and SCR nozzles use the **P/N 14988** replacement cap.

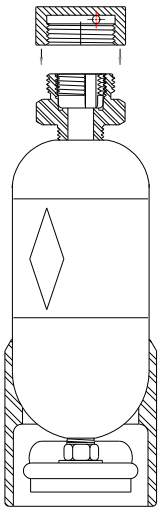
The TFP nozzle uses the **P/N 17810** replacement cap. Caps should be replaced when they become worn, damaged, brittle, or lost.



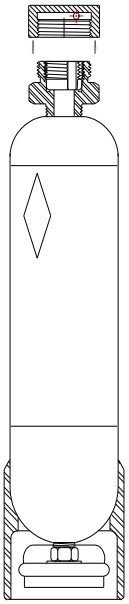
Recharge Adapter: (Item 13): The Recharge Adapter, **P/N 10134** is used as a service tool to open the discharge valve during agent cylinder recharging. This device is a T-handle design constructed of brass and stainless steel and bolts directly to the top of the agent cylinder discharge valve. The T-handle is spring loaded and detented to lock in place only in the FULL OPEN or FULL CLOSED positions.

Pneumatic Control Head: (Item 14): This control head (**P/N 10147**) is necessary in all installations to accomplish either automatic or manual system actuation. This device is constructed of extruded brass and bolts directly to the top of the agent cylinder discharge valve. When supplied with actuation pressure, the piston inside the pneumatic control head extends to depress the stem of the agent cylinder valve releasing the extinguishing agent. Actuation pressure (compressed nitrogen gas) enters the Pneumatic Control Head through 1/4 NPT threaded ports on either side.



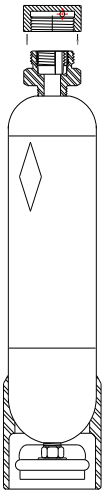


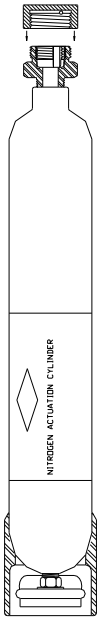
10in^3 Nitrogen (N2) Cylinder: **(Item 15):** The 10 in^3 N2 cylinder, **P/N 12856**, supplies nitrogen gas pressure to the Pneumatic Control Head through the Actuation Network for the purpose of opening the Agent Cylinder Valve. This cylinder is charged to 1800 psig (12410 KPa) at 70°F (21° C) and contains enough nitrogen to actuate up to **six** agent cylinder valves at a maximum distance of 100 feet (21.3 meters) to the last control head. Pressure is retained in the N2 cylinder by a gold plated rupture disc. Replacement rupture discs are available as **P/N 09958**. Only genuine AMEREX rupture discs may be used when recharging nitrogen cylinders. Proper charge pressure is indicated by a pressure gauge located on the cylinder bottom and protected by an impact resistant plastic gauge guard. The N2 cylinder is shipped fully charged from the AMEREX factory with a protective shipping cap installed on the outlet threads. The cap must be removed at installation but must remain in place at all other times. (Retain the shipping cap to reuse when recharging the cylinders) Construction of the N2 cylinder is per DOT 3E. The cylinder is rechargeable by certified AMEREX installers and does not require periodic hydrostatic testing.



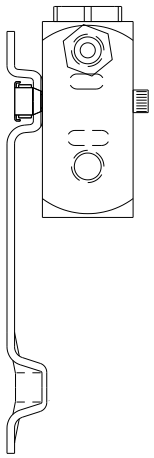
15in^3 Nitrogen (N2) Cylinder: **(Item 16):** The 15 in^3 N2 cylinder, **P/N 09956**, supplies nitrogen gas pressure to the Pneumatic Control Head through the Actuation Network for the purpose of opening the Agent Cylinder Valve. This cylinder is charged to 1800 psig (12410 KPa) at 70oF (21º C) and contains enough nitrogen to actuate up to **ten** agent cylinder valves at a maximum distance of 100 feet (21.3 meters) to the last control head. Pressure is retained in the N2 cylinder by a gold plated rupture disc. Replacement rupture discs are available as **P/N 09958**. Only genuine AMEREX rupture discs may be used when recharging nitrogen cylinders. Proper charge pressure is indicated by a pressure gauge located on the cylinder bottom and protected by an impact resistant plastic gauge guard. The N2 cylinder is shipped fully charged from the AMEREX factory with a protective shipping cap installed on the outlet threads. The cap must be removed at installation but must remain in place at all other times. (Retain the shipping cap to reuse when recharging the cylinders) Construction of the N2 cylinder is per DOT 3E. The cylinder is rechargeable by certified AMEREX installers and does not require periodic hydrostatic testing.

ECH Actuation Cylinder, 15in^3, 500 psig Nitrogen (Item 17): The ECH Actuation Cylinder, **P/N 19347**, is used as the primary pressure source to release the pressure of the larger 28in^3 cylinder (p/n 16197) mounted on the right side of the ECH assembly. The P/N 19347 cylinder is charged to 500 psig (3,447 kPa) at 70°F (21°C). Upon system actuation, a pin inside the ECH depresses a Schrader valve installed inside the fitting of this cylinder. Therefore, the unit is field rechargeable without the need for rupture disc replacement (unlike the larger P/N 16197 cylinder). In order to prevent confusion with existing nitrogen cylinders, the threads of the fitting are different, as is the labeling, and it is designed only to thread into the left side port on the ECH assembly. Proper charge pressure is indicated by a pressure gauge located on the cylinder bottom and protected by an impact resistant plastic gauge guard. The N2 cylinder is shipped fully charged from the AMEREX factory with a protective shipping cap installed on the outlet threads. The cap must be removed at installation but must remain in place at all other times. (Retain the shipping cap to reuse when recharging the cylinders) Construction of the N2 cylinder is per DOT 3E. The cylinder is rechargeable by certified AMEREX installers and does not require periodic hydrostatic testing.

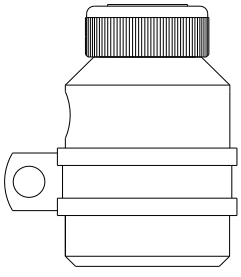




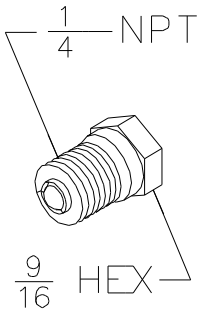
Nitrogen (N2) Actuation Cylinder, for use with the RNA: **(Item 18):** The 28 in^3 N2 cylinder, **P/N 16197**, when installed in the Remote Nitrogen Actuator (**P/N 16166**), supplies nitrogen gas pressure to the Pneumatic Control Heads through the Actuation Network for the purpose of opening the Agent Cylinder Valves. See Chapter 3B for more details. The cylinder is charged to 1800 psig (12410 KPa) at 70°F (21°C). Pressure is retained in the N2 cylinder by a gold plated rupture disc. Replacement rupture discs are available as **P/N 09958**. Only genuine AMEREX rupture discs may be used when recharging nitrogen cylinders. Proper charge pressure is indicated by a pressure gauge located on the cylinder bottom and protected by an impact resistant plastic gauge guard. The N2 cylinder is shipped fully charged from the AMEREX factory with a protective shipping cap installed on the outlet threads. The cap must be removed at installation but must remain in place at all other times. (Retain the shipping cap to reuse when recharging the cylinders). Construction of the N2 cylinder is per DOT 3E. The cylinder is rechargeable by certified AMEREX installers and does not require periodic hydrostatic testing.



MRM / ERM Remote Nitrogen Actuator (RNA) (Item 19): This assembly, **P/N 16166**, contains an actuation head and a mounting bracket. [The 28 in^3 nitrogen actuation cylinder, **P/N 16197** is purchased separately.] The RNA is used when the number of Agent Cylinders in a system exceeds six (MRM systems) or ten (ERM systems). Either one or two RNA's can be used with a single Control Panel. Each Actuator can fire up to 20 Agent Cylinders, branched through a tee, with 10 Agent Cylinders on either side of the tee. Each branch from the tee has a maximum length of 100 feet (21.3 meters) to the last control head. See Chapter 3B for more details.



Mechanical Time Delay – MRM installations: **(Item 20):** This device **(P/N 15765)** is used with MRM-equipped systems when a Discharge Time Delay of 15 seconds is required (Refer to UL 1254 Standard for details). It is the first component to connect into the MRM, and is packaged with its own mounting clamp. In the event of system actuation, the Mechanical or Electrical Gas Valves trip immediately, along with any electrical component connected the Microswitch (es), but the high pressure nitrogen actuation gas will be delayed before entering the Actuation Network. The reason for this is to allow for exhaust fan run-down in certain paint spray booth applications. It is not needed for ERM installations, since the ERM can electronically control the time delay function, if required.

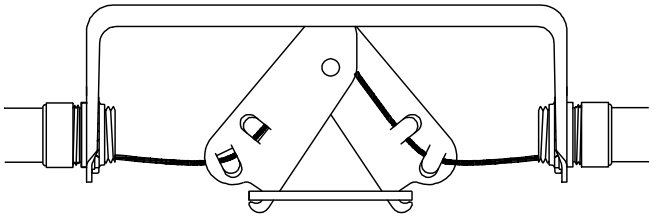


Vent Check (Item 21): The Vent Check, **P/N 10173**, is a safety device that installs in the Pneumatic Control Head. Its function is to bleed any slowly accumulating pressure that could cause the Pneumatic Control Head to open the agent cylinder valve prematurely. Examples of possible pressure sources include a slow leak in the rupture disc of an N2 cylinder, or normal temperature-induced expansion of the air and moisture trapped in the actuation network. A vent check must be used on all pneumatically actuated systems. Use of a pipe plug or other type of "stopper" is unacceptable and can lead to system malfunctions. The body of the vent check is constructed of machined brass. The inside of the vent check contains a spring and nylon ball. Slowly accumulating gas can pass around the nylon ball and bleed to the atmosphere. However, the rapid accumulation of actuation pressure from the N2 cylinder causes the ball to compress the spring and seal on a tapered seat, blocking the bleed hole. Following an actuation, the vent check can be used to exhaust residual actuation pressure by unseating the nylon ball (typically with a small piece of wire or the tip of a ball point pen). In installations using multiple agent cylinders, the vent check is installed only in one Pneumatic Control Head at the end of the actuation network.

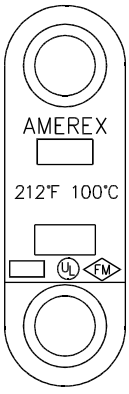
Actuation Tubing (Item 22): P/N 22278 The function of the actuation line is to carry high pressure nitrogen gas from the N2 cylinder to the pneumatic control head. Other Amerex Actuation components are installer supplied.

Detector – MRM Installations (Item 23): P/N 12508

Each Detector in the Amerex Industrial System is comprised of three parts. The Detector Bracket, Detector Linkage, and the Fusible Link or Job Link (ordered separately). The Bracket serves as support for the Linkage and is attached to a rigid surface. The Linkage supports the Link and a continuous Cable under tension. At a predetermined temperature, the Link will separate, relieving tension on the Cable and actuating the system.



This manual will refer to Series and Terminal Detectors. There is no difference in part numbers or dimensions between Series and Terminal Detectors. A Terminal Detector is the last or only detector in the network and the Cable must be "terminated" there. A Series Detector is any detector located between the Terminal Detector and the Mechanical Release Module in the Detection Network.



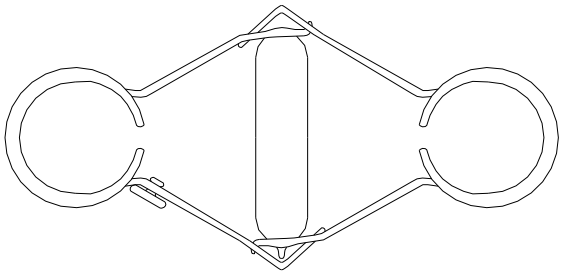
Fusible Links (Item 24): MRM Installations Four temperature ratings of the Fusible Links are used. They are of the electric solder type link which will melt at a predetermined temperature allowing the two halves of the link to separate.

Type – "K"

Load Limit: **Max. Load – 50 lbs. (22.68 kg)**
Min. Load – 3 lbs. (1.37 kg)

Part No.	Link Rating		Max. Ambient Temp.	
12326	212°F	100°C	150°F	66°C
12327	280°F	138°C	225°F	107°C
12328	360°F	182°C	300°F	149°C
12329	450°F	232°C	375°F	191°C

Job Links (Item 25) – MRM Installations Three temperature ratings of the Job Quick Response Links are used. They are constructed of two metal struts held in tension by a small, glass bulb that ruptures at the appropriate temperature rating. The Detector Bracket (P/N 12508) will support either the Fusible Links or the Job Links, and the same detector limitations apply for both types of detectors (see Chapter 4 for installation).



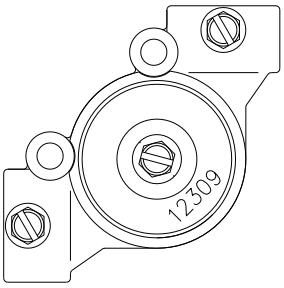
Part No	Response Type	Link Rating		Max. Ambient Temp.	
16225	Quick	200°F	93°C	150°F	66°C
16226	Quick	286°F	141°C	225°F	107°C
16227	Quick	360°F	182°C	300°F	149°C

Test Links – MRM Installations (Item 26): P/N 12891 Test Links are available for conducting functional tests of the Detection System. This device fits the detector in the same manner as the Fusible (Job) Link, normally placed on the Terminal Detector. Test Links can be cut, simulating a link separating under fire conditions

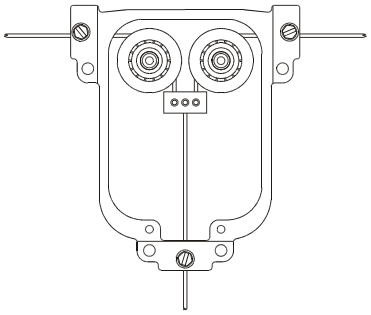
Electric Thermal Detectors for ERM Installations (Item 27): These detectors are resettable, Rate of Rise Compensated. Refer to the Design and Installation Manual for the ERM, P/N 15827 for installation guidance. The following are the Thermal Detectors utilized with the ERM Control Panel:

Exposure Limit				
Part No.	**Detector Rating**		**Max. Ambient Temp.**	
16194	190°F	88°C	125°F	52°C
16236 (Optional)	194°F	90°C	130°F	54°C
16195	225°F	107°C	150°F	66°C
16196	325°F	163°C	250°F	121°C

Corner Pulley – (Item 28): The Amerex Industrial System uses a "high temperature" Corner Pulley to change direction of the Cable by 90°. This Corner Pulley **(P/N 12309)** may be used in environments with temperatures up to 700°F (371°C). Mounting holes (13/64" diameter) are provided for anchoring the Corner Pulley where allowed by local codes. Use with ½" EMT.



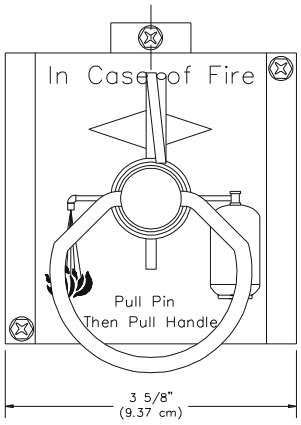
Note: The model CP5 Compression Corner Pulley, manufactured by Brooks Equipment Co. Inc., 131 Stetson Drive, Charlotte, NC 28262-3326, is approved for use with the Industrial Dry Chemical System, within the limitations specified in Sect. 3B.

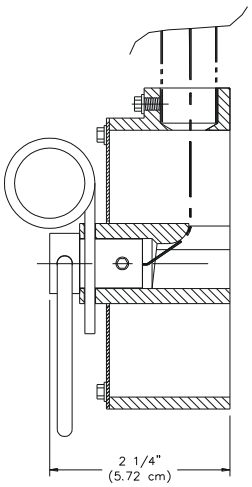


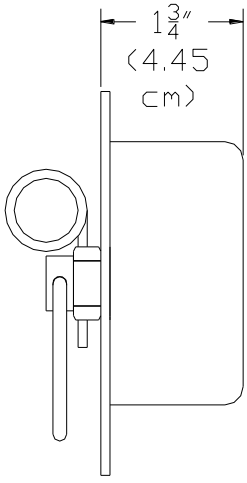
Pulley Tee (Item 29): P/N 12506 Pulley Tee is used to change the direction of two Cables by 90°. This device can be used with the Mechanical Gas Valve and Manual Pull Stations, but **NOT** Fusible Link Detectors. Four 13/64" dia. mounting holes are provided. Use with ½" EMT

Cable (Item 30): P/N 12553 Cable is used to run from the Mechanical Release Module, through conduit and Corner Pulleys to Detectors, Mechanical Gas Valves or Manual Pull Stations. It is 1/16" diameter, stainless steel (7x7 – 480# tensile strength) – available in 500 foot (152 m) spools **.**

Manual Pull Station – MRM Installations (Item 31): Every Amerex Industrial System must use at least one Manual Pull Station **(P/N 11993).** This device provides a means of discharging the system manually. **Manual Pull Stations should be located in a Path of Egress and mounted at a height conforming with the Local Authority Having Jurisdiction.** The Manual Pull Station may be recessed or surface mounted.

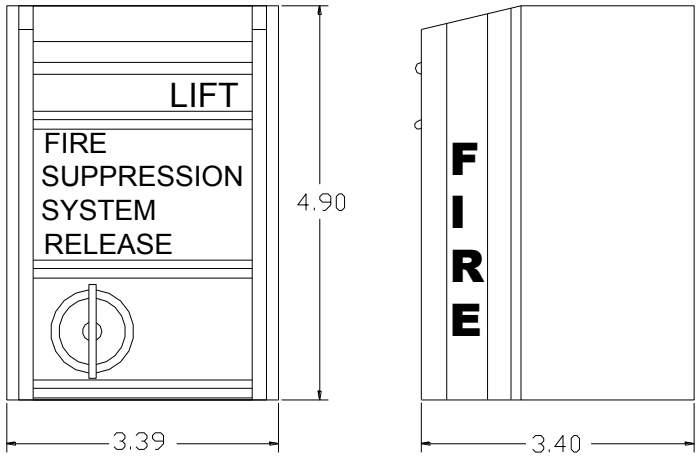


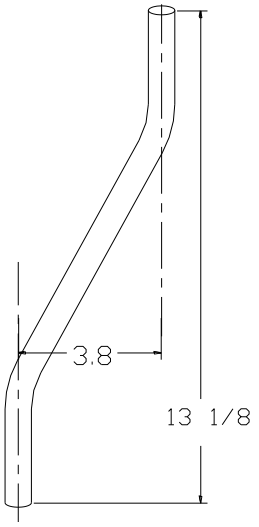




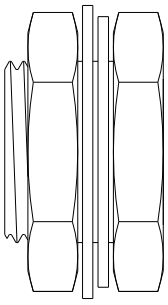
Manual Pull Station (Oversized)– MRM Installations (Item 32): This Manual Pull Station may be either surface or recess mounted. The oversized cover is large enough to cover the sheet rock access hole and remain attractive and functional. Every Amerex Industrial System must use at least one Manual Pull Station **(P/N 14320).** This device provides a means of discharging the system manually. **Manual Pull Stations should be located in a Path of Egress and mounted at a height conforming with the Local Authority Having Jurisdiction**

Manual (Electric) Pull Station – ERM Installations (Item 33): Every Amerex Industrial System must use at least one Manual Pull Station **(P/N 16169).** This device provides a means of discharging the system manually. **Manual Pull Stations should be located in a Path of Egress and mounted at a height conforming with the Local Authority Having Jurisdiction.** The Manual Pull Station may be recessed or surface mounted.



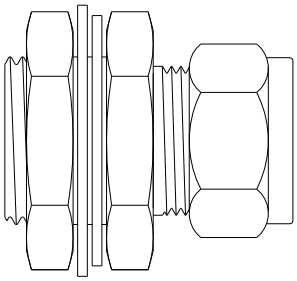


Conduit Offset (Item 34): The Conduit Offset **(P/N 12507)** is used to allow a smooth transition for cable runs into or out of the Mechanical Release Module (or ERM, with Mechanical Gas Valve connections) without using Corner Pulleys. It may be used with the Detection Network, Manual Pull Stations, or Mechanical Gas Valve Actuation Network. The use of this device does not reduce the maximum number of Corner Pulleys allowed in the system. **The Conduit Offset may only be attached to either the MRM or the ERM, and not installed elsewhere in the system.**



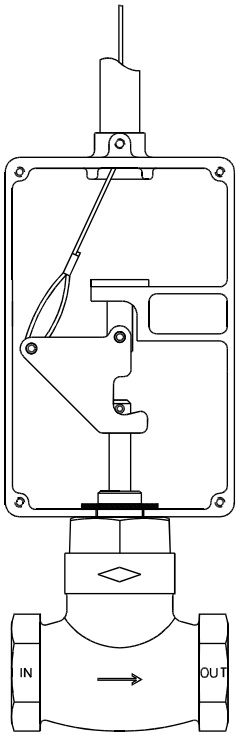
"Quick-Seal" Adapter (Item 35): This adapter is used to create a liquid tight seal around discharge piping where the piping penetrates an enclosure or duct. It is threaded internally to accept either ½" conduit fittings or ¾" pipe.

P/N 14204 is sized for ½" conduit fittings. **P/N 16234** is sized for Schedule 40, ¾" pipe.



"Compression Seal" Adapter (Item 36): This adapter is a "Listed Mechanical Bulkhead" fitting that produces a liquid-tight seal around discharge piping where the piping penetrates an enclosure or duct. Unlike the Quick-Seal Adapter, the Compression Seal Adapter is not threaded to accept pipe and does not require pipe to be cut or threaded.

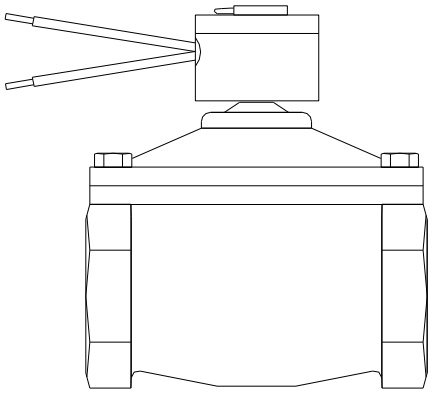
P/N 12512 is sized for ½" conduit. **P/N 16235** is sized for Schedule 40, ¾" pipe.



Mechanical Gas Valve (Item 37): A gas shutoff valve is required on all systems used to protect a gas-fueled appliance to stop gas flow in the event of system actuation. Amerex Mechanical Gas Valves are held open with a latching device. Upon system discharge, a piston in the Mechanical Release Module will pull on a Cable connected to the latch and allow the spring to close the valve. These valves are considered to be "Normally Closed – Held Open". The valve bodies are made of brass and threaded with female NPT threads on both ends. UL Listed for Natural Gas and Propane in ¾", 1" 1¼" 1½ " and 2" sizes.

P/N	Size	Height	Width	Pressure
12790	¾"	10 5/16" (26.19 cm)	3 3/4" (9.53 cm)	10 psig (69 kPa) Max
12791	1"			
12792	1¼"	9/16" (29.37 cm)	4 7/8" (12.38 cm)	
12793	1½"			
12794	2"	12 ½" (31.75 cm)	6" (15.24 cm)	

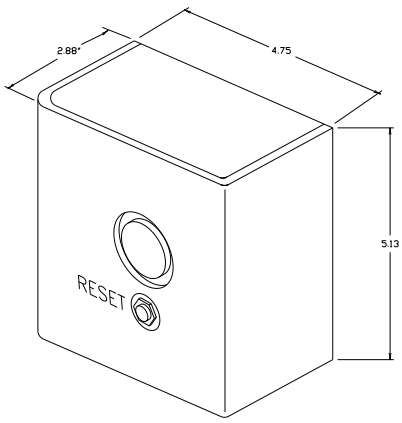
Electric Gas Valves (Item 38): Electric Gas Valves operate on 110 VAC current which powers a solenoid holding the valve open against a spring. Upon System Discharge, current to the solenoid is interrupted by a Microswitch in the Mechanical Release Module, causing the valve to shut. A loss of electrical power will also cause an Electrical Gas Valve to close. A Manual Reset Relay must be used with the Electrical Gas Valves. UL Listed sizes are ¾", 1", 1¼", 1½", 2", 2½", and 3".



P/N	Size	Manufacturer
12870	¾"	Asco
12871	1"	
12872	1¼"	
12873	1½"	
12874	2"	
12875	2 ½"	
12876	3"	

Mechanical Gas Valve Kit (Item 39): The Amerex Gas Valve Kit **(P/N 13622)** provides a means of converting a standard "release to close" ASCO gas shut-off valve to a "pull to close" gas shut-off valve. The gas valve is held open by a latching device. Upon system discharge, a piston in the MRM (ERM) will pull on a cable connected to the latch on the gas valve, release the latch and allow the spring in the gas valve to close the valve. The Kit must be used in combination with the ASCO valve part numbers listed here to be acceptable for use with the U/L listed Amerex Industrial System. **ASCO valves MUST BE purchased separately.**

Applications		
Amerex P/N	ASCO P/N	Size
13772	HV216-585-1	¾"
13773	HV216-585-2	1"
13774	HV216-585-3	1¼"
13775	HV216-585-4	1½"
13776	HV216-585-5	2"
Note: P/N 13622 Mechanical Gas Valve Kit is **sold separately** from the Gas Valve.		



Manual Reset Relay (Item 40): Anytime an Electrical Gas Valve is connected to an Amerex Industrial System, a Manual Reset Relay **(P/N 12526)** must be used. After an Electrical Gas Valve has closed (either because of System discharge or power failure), the Valve cannot be opened without manually pressing the Reset Button on the Manual Reset Relay. This operation is to guard against a momentary loss of power closing the Valve, extinguishing the Pilot Lights and allowing gas to escape when power is restored. The Manual Reset Relay is UL Listed and has a Pilot Lamp to indicate its status.

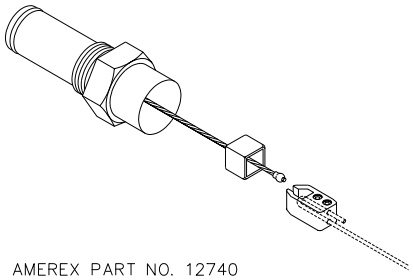
Description: Manual Reset Relay.
Contact Configuration: Double Pole, Single Throw
Minimum Contact Rating: Meter Load=8AFL, 48ALR, 120 VAC, Pilot Duty 120 VA, 120VAC

ASCO Mechanical Gas Valves (Item 41): All Amerex Industrial Dry Chemical Systems configured to shut off any gas-fired appliance must use a "pull to close" type gas shut off valve, which is listed with the system. The valve is held open with a latching device. Upon system discharge, a piston in the MRM /ERM (sold separately) will pull on a cable connected to the latch on the valve to close the valve. The ASCO gas shut-off valves approved for use with the Amerex Industrial System are listed below with appropriate part numbers. See the installation section for further instruction.

Applications		
Amerex Part Number	**ASCO Part Number**	**Size**
13777	JV216-587-2	¾"
13778	JV216-587-3	1"
13779	JV216-587-4	1 ¼"
13780	JV216-587-5	1 ½"
13781	JV216-587-6	2"
13782	JV216-587-7	2 ½"
13783	JV216-587-8	3"
Note: P/N 12740 Gas Trip Assembly must be purchased separately.		

Ansul Mechanical Gas Valve (Item 42): All Amerex Industrial Dry Chemical Systems configured to shut off any gas-fired appliance must use a "pull to close" type gas shut off valve, which is listed with the system. The valve is held open with a latching device. Upon system discharge, a piston in the MRM /ERM (sold separately) will pull on a cable connected to the latch on the valve to close the valve. Ansul's mechanical gas shut-off valves are suitable for use with the Amerex Industrial System. These valves, when used in conjunction with the **P/N 12740** Gas Trip Assembly, perform the same function as Amerex's gas shut-off valves. The part numbers of the valves acceptable for use are listed below. They are intended to be installed using the same installation instructions as Amerex's gas shut-off valves; see the installation section for further instructions.

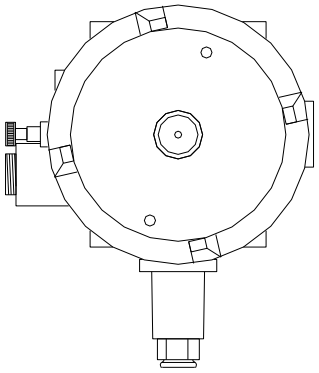
Applications		
Ansul Part Number	**Size**	**Maximum Gas Pressure**
55598	¾"	10 PSI (69 kPa)
55601	1"	
55604	1 ¼"	
55607	1 ½"	
55610	2"	
Note: P/N 12740 Gas trip Assembly must be purchased separately		

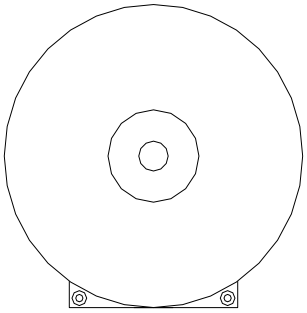


AMEREX PART NO. 12740

Piston Plug/Gas Trip Assembly (Item 43): Operation of one or two Mechanical Gas Valves may be accomplished by adding a Piston Plug/Gas Trip Assembly **(P/N 12740)** to either the Mechanical Release Module or to the Electrical Release Module.

Explosion-Proof Pressure Switch (Item 44): Amerex **P/N 16384**
SPDT, 15 Amps 125 / 250 / 480 VAC resistive. This pressure switch is designed to be installed in the discharge network of an agent cylinder in hazardous locations. Complies with NEMA 4X; 7; 9; IP66 requirements. ¾" NPT electrical connection. ½" NPTF pressure connection. Suitable for the following hazardous locations:
Class I, Division 1 & 2, Groups B, C, D
Class II, Division 1 & 2, Groups E, F, G
Class III



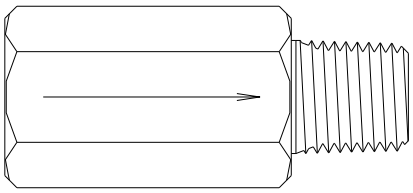


Alarm Bells (Item 45):
Amerex **P/N 16385** - 24 VDC
Amerex **P/N 16386 –** 115 VAC
Alarm Bells are the 6", red, vibrating type.

24 VDC Version: 21-30 VDC input; .070 amp current; 88 dBA typical output. This audible device may be desired or required in ERM installations, or in MRM installations tied into building alarm systems.

115 VAC Version: .085 amp current; 86 dBA typical output. This audible device may be desired or required in MRM installations.

Check Valve (Item 46): Amerex **P/N 10262** is only used in Dual MRM systems, when the actuation outputs of two MRMs are "Teed" together to protect a single fire hazard**.** It is ¼" female NPT by ¼" male NPT, and is to be installed as described in section 3B.



AMEREX PRE-ENGINEERED INDUSTRIAL DRY CHEMICAL FIRE SUPPRESSION SYSTEM COMPONENTS (PAGE 1 OF 2)

Item #	Part Number	Description
1	16206	AGENT CYLINDER ASY – IS18ABC
	16207	AGENT CYLINDER ASY – IS35ABC
	16208	AGENT CYLINDER ASY – IS45BC
2	09781	DRY CHEMICAL, ABC, F11 (CH 558) 50LB.
3	14929	BRACKET, AGENT CYLINDER (ALL SIZES)
	10180	BRACKET, HEAVY-DUTY WALL/FLOOR MOUNT, IS18
	10181	BRACKET, HEAVY-DUTY WALL/FLOOR MOUNT, IS35/45
4	15830	DISCHARGE VALVE ASY, IS18 CYLINDER
	15831	DISCHARGE VALVE ASY, IS35 / 45 CYLINDER
5	11977	MECHANICAL RELEASE MODULE (MRM)
6	12524	MICROSWITCH
7	12853	ENCLOSURE – MRM, PAINTED (RED)
	13393	ENCLOSURE – MRM, STAINLESS STEEL
8	15780	ELECTRICAL RELEASE MODULE (ERM)
9	16202	ERM BACKUP BATTERIES (TWO REQUIRED)
10	19352	ECH ASSEMBLY (ECH) - REPLACES ERM
11	16216	NOZZLE ASY, LOCAL APPLICATION OVERHEAD (LAOH)
	16170	NOZZLE ASY, TANKSIDE LOCAL APPLICATION(TS)
	16172	NOZZLE ASY, TOTAL FLOOD (TF)
	16174	NOZZLE ASY, THREE-WAY
	16190	NOZZLE ASY, DUCT AND PLENUM (D/P)
	16192	NOZZLE ASY, SCREENING (SCR)
	17809	NOZZLE ASY, PERIMETER, (TFP)
12	14988	NOZZLE REPLACEMENT CAP (LAOH, TS, TF, 3-Way, D/P, SCR)
	17810	NOZZLE REPLACEMENT CAP (TFP)
13	10134	MECHANICAL CONTROL HEAD (FOR RECHARGE)
14	10147	PNEUMATIC CONTROL HEAD
15	12856	NITROGEN ACTUATION CYLINDER, 10 IN^3 (MRM)
16	09956	NITROGEN ACTUATION CYLINDER, 15 IN^3 (ERM)
17	19347	NITROGEN ACUTATION CYLINDER, 15 IN^3 (ECH)
18	16197	NITROGEN ACTUATION CYLINDER, 28 IN^3 (RNA)
19	16166	REMOTE NITROGEN ACTUATOR (MRM / ERM)
20	15765	MECHANICAL TIME DELAY (MRM)
21	10173	VENT CHECK
22	22278	ACTUATION LINE (COPPER TUBING)
23	12508	DETECTOR (MRM)
24	12326	FUSIBLE LINK (212°F / 100°C)
	12327	FUSIBLE LINK (280°F / 138°C)
	12328	FUSIBLE LINK (360°F / 182°C)
	12329	FUSIBLE LINK (450°F / 232°C)
25	16225	JOB LINK QUICK RESPONSE (200°F / 93°C)
	16226	JOB LINK QUICK RESPONSE (286°F / 141°C)
	16227	JOB LINK QUICK RESPONSE (360°F / 182°C)
26	12891	TEST LINK
27	16194	ELECTRIC THERMAL DETECTOR (190°F / 88°C)
	16236	ELECTRIC THERMAL DETECTOR (194°F / 90°C) (OPTIONAL)
	16195	ELECTRIC THERMAL DETECTOR (225°F / 107°C)
	16196	ELECTRIC THERMAL DETECTOR (325°F / 163°C)

Item #	Part Number	Description
28	12309	CORNER PULLEY
29	12506	PULLEY TEE
30	12553	CABLE (500 FT)
31	11993	MANUAL PULL STATION (MRM)
32	14320	MANUAL PULL STATION (MRM, OVERSIZED)
33	16169	MANUAL ELECTRIC PULL STATION (ERM)
34	12507	CONDUIT OFFSET
35	14204	QUICK SEAL ADAPTER (1/2" CONDUIT FTNGS)
	16234	QUICK SEAL ADAPTER (3/4" PIPE)------
36	12512	COMPRESSION SEAL AD. (1/2" CONDUIT)
	16235	COMPRESSION SEAL AD. (3/4" PIPE)
37	12790	MECHANICAL GAS VALVE, ¾"
	12791	MECHANICAL GAS VALVE, 1"
	12792	MECHANICAL GAS VALVE, 1¼"
	12793	MECHANICAL GAS VALVE, 1½"
	12794	MECHANICAL GAS VALVE, 2"
38	12870	ELECTRIC GAS VALVE, ¾"
	12871	ELECTRIC GAS VALVE, 1"
	12872	ELECTRIC GAS VALVE, 1¼"
	12873	ELECTRIC GAS VALVE, 1½"
	12874	ELECTRIC GAS VALVE, 2"
	12875	ELECTRIC GAS VALVE, 2½"
	12876	ELECTRIC GAS VALVE, 3"
39	13622	MECHANICAL GAS VALVE KIT (FOR THE FOLLOWING)
	13772	ASCO RELEASE TO CLOSE MECH. GAS VALVE, ¾"
	13773	ASCO RELEASE TO CLOSE MECH. GAS VALVE, 1"
	13774	ASCO RELEASE TO CLOSE MECH. GAS VALVE, 1¼"
	13775	ASCO RELEASE TO CLOSE MECH. GAS VALVE, 1½"
	13776	ASCO RELEASE TO CLOSE MECH. GAS VALVE, 2"
40	12526	MANUAL RESET RELAY
41	13777	ASCO MECHANICAL GAS VALVE, ¾"
	13778	ASCO MECHANICAL GAS VALVE, 1"
	13779	ASCO MECHANICAL GAS VALVE, 1 ¼"
	13780	ASCO MECHANICAL GAS VALVE, 1 ½"
	13781	ASCO MECHANICAL GAS VALVE, 2"
	13782	ASCO MECHANICAL GAS VALVE, 2 ½"
	13783	ASCO MECHANICAL GAS VALVE, 3"
42	N/A	ANSUL MECHANICAL GAS VALVE, ¾"
	N/A	ANSUL MECHANICAL GAS VALVE, 1"
	N/A	ANSUL MECHANICAL GAS VALVE, 1 ¼"
	N/A	ANSUL MECHANICAL GAS VALVE, 1 ½"
	N/A	ANSUL MECHANICAL GAS VALVE, 2"
43	12740	PISTON PLUG / GAS TRIP ASY
44	16384	EXPLOSION PROOF PRESSURE SWITCH
45	16385	ALARM BELL 24 VDC--
	16386	ALARM BELL 115 VAC
46	10262	CHECK VALVE ¼" X ¼"

CHAPTER 3
SYSTEM DESIGN
Section A: Hazard Identification, Nozzle Coverages, and Piping Limitations

General

The Amerex Industrial Fire Suppression System may be used on a variety of hazards in many types of applications. The guidelines listed in this chapter deal with the limitations and parameters of various system configurations. It is the responsibility of the Certified Installer to ensure that the proper system components are being utilized, and that the system meets the limitations and parameters listed in this chapter**. Those individuals responsible for the design of the Amerex Industrial Dry Chemical System must be trained by Amerex and hold a current Amerex Certificate**. Amerex will not be responsible for system design, installation, or maintenance performed by any non-certified person(s).

ABC Dry Chemical

It is necessary for the system designer to consider the combustible material found in the hazard area to ensure proper protection. The agent used in the Amerex Industrial System is suitable for Class A, B, and C hazards. The following are the hazard class definitions:

"A" Class - Ordinary solid carbonaceous combustibles. These include wood, paper, cloth, fiberglass, and plastics.
"B" Class - Flammable liquids and gases. These include paints, solvents, gasoline, oils, and hydraulic fluids.
"C" Class - Electrical appliances. These include computers, power generators, and power transformers.

ABC (monoammonium phosphate-based) is suitable for use with all "A", "B", and "C" Class hazards. Dry Chemical Type extinguishing systems are inappropriate for the protection of Class D hazards. As per NFPA 17, pre-engineered dry chemical systems are not approved for deep-seated or burrowing fires (such as ordinary combustibles, where the agent cannot reach the point of combustion), or on chemicals that contain their own oxygen supply (such as cellulose nitrate). Do not mix different types of agents, or agents from different manufacturers. Chemical reactions may occur when incompatible chemicals are mixed. Keep in mind that the agent used for each system must be acceptable to the Authority Having Jurisdiction (AHJ).

Choosing the Proper Type of System

It is necessary for the system designer to consider the physical characteristics and layout of the hazard area to ensure proper protection. The system must meet the criteria for a particular hazard and the requirements of NFPA 17 for the system to be effective. Underwriters Laboratories, under the UL 1254 test protocol, has evaluated the Amerex Industrial Dry Chemical System in each of five separate hazard categories. Each category has its own specific installation requirements. It is imperative that the system designer properly identify the fire hazard in order to effectively remain within the UL listing parameters. The remainder of Section 3A is dedicated to matching the Amerex system to each of the five separate hazard coverage categories:

3A.1) Local Application – Overhead – This system is used for applying agent to an area from above the area. Typical applications include dip tanks, power generators, and transformers. The maximum nozzle height for overhead protection is 10 feet.

3A.2) Local Application – Tankside – This system is used for applying agent across a hazard area from the side of the area. Typical applications include, but are not limited to, dip tanks, quench tanks, and solvent tanks where overhead obstructions are present.

3A.3) Total Flooding – This system is used to fill a volume with agent to protect any hazard within that volume. Typical applications include hazardous storage containers and warehouses where sprinkler protection is unavailable. Total flooding systems require a fixed enclosure to be present around the hazard area to allow the system to build up the proper concentration of agent within the hazard area. Whether an enclosure is suitable for allowing total flooding protection depends on the unclosable opening percentage of the enclosure. Unclosable opening percentage is calculated as the area of the opening divided by the total area of the sides, top and bottom of the enclosure. Total flooding protection is qualified for use on hazards whose enclosure has up to 5% unclosable opening. For enclosures

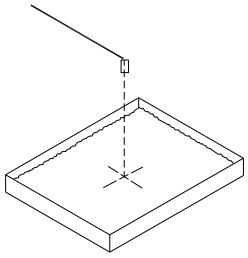
that have greater than 5% unclosable opening, total flooding protection is not qualified. Use Local Application Overhead for these hazards.

3A.4) Vehicle Paint Spray Booths – This system is selected to protect an enclosed structure that is designed for the purpose of painting vehicles. This structure generally comprises of a work area, separated from a plenum by a filter bank, and an exhaust duct. There are numerous configurations of a vehicle paint spray booth, and all areas (work area, plenum, and exhaust duct) must be simultaneously protected with the coverage from the Amerex system.

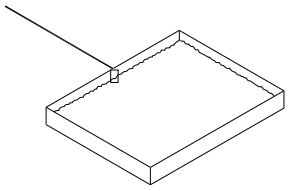
3A.5) Open Front Paint Spray Booths – This system is used to protect a paint spray booth with an open front. The booth structure still comprises of a work area, separated from a plenum by a filter bank, and an exhaust duct. The opening at the front of the booth requires special screening of dry chemical to be effective

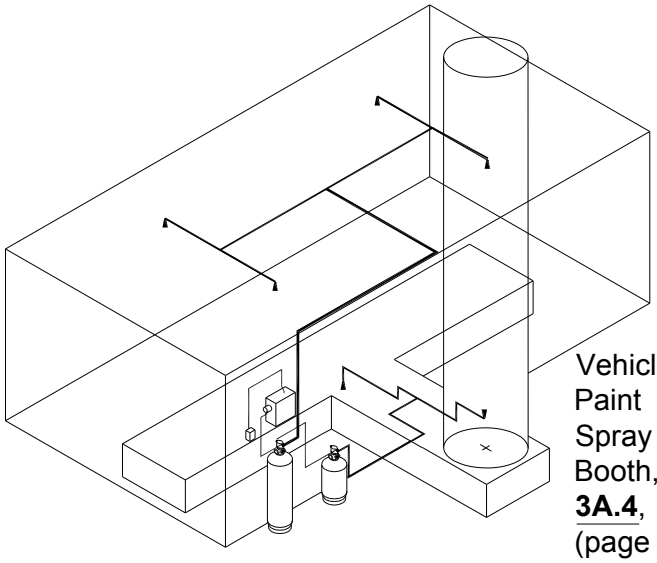
Below are Simplified Examples of Each of the Five Hazard Categories:

Local Overhead Application, **3A.1**, (page 3A-3)



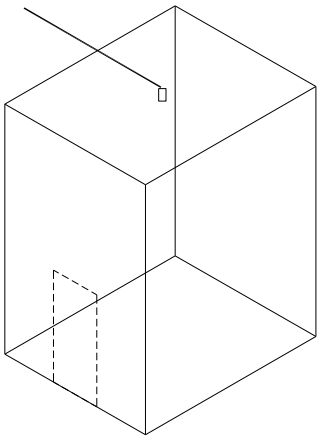
Tankside Local Application, **3A.2**, (page 3A-5)

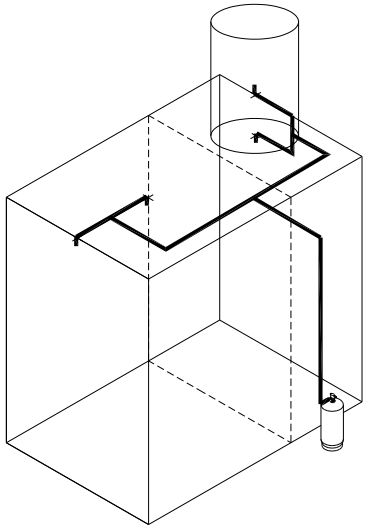




Vehicle Paint Spray Booth, **3A.4**, (page 3A-16)

Total Flooding, **3A.3**, (page 3A-7)





Open-Front Paint Spray Booth, **3A.5**, (page 3A-44)

3A.1 Local Application Overhead:

Cylinder:
The Model IS45ABC is to be used for Local Overhead Applications.

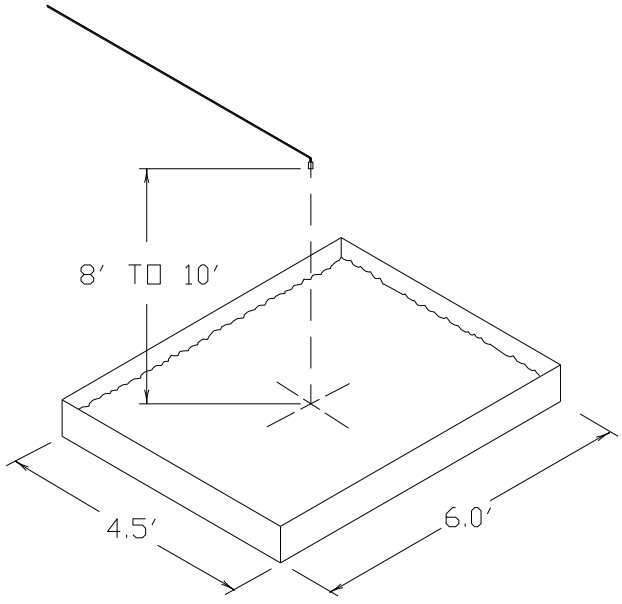
Nozzles:
The Local Application Nozzle, (**P/N 16216**) is used for Local Application, Overhead. The maximum nozzle height is 10 feet. The minimum nozzle height is 8 feet (for fuel in depth splash hazards). The IS45 cylinder supports four Local Application Nozzles. Note: Nozzle height is measured from the hazard surface to the closest point of the nozzle in the installed position.

Temperature Range:
The operating temperature range for the system components used in Local Overhead applications is 32°F to 120°F (0°C to 49°C).

Piping Requirements:
Piping diagrams include limitations on pipe length and fittings. System piping must be balanced. Balanced piping is that in which the difference between the shortest actual pipe length from ***any*** ¾" tee to nozzle and the longest actual pipe length from any ¾" tee to nozzle does not exceed 10% of the longest actual pipe length from any ¾" tee to nozzle. Piping runs from the 1" tee to each of the ¾" tees must be equal in length. The number and type of fittings for all tee to nozzle sections must be equal.

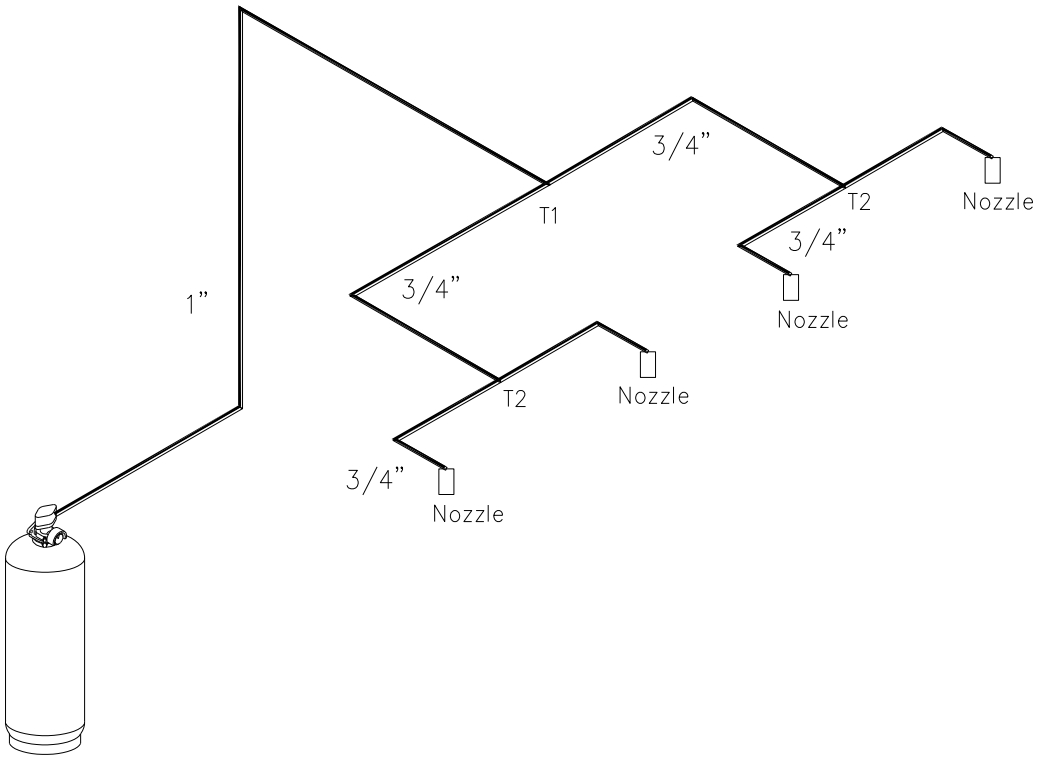
All piping must be Schedule 40, hot-dipped galvanized steel pipe, and all fittings must be 150 lb. class. Examples of acceptable fitting materials include hot-dipped galvanized malleable iron, ductile iron, or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter. Note: Black steel pipe and fittings can be used in relatively noncorrosive atmospheres.

Nozzle Placement and Coverage:
The Local Application Overhead Nozzle has been developed to provide local application of extinguishing agent from an overhead position. Each nozzle will protect a hazard area of 27 ft^2, with a 6 foot maximum side.



Nozzle Placement for Local Overhead Application

3A.1 Local Application Overhead (continued):



Local Application, Overhead, IS45ABC:						
	Pipe Size, in	Maximum Length, ft	Maximum # of Elbows	Minimum Length, ft	Minimum # of Elbows	# of Tees Allowed
Cylinder to T1	1	27	4	12	2	1
T1 to T2	¾	10	2	--	0	1
T2 to Nozzle	¾	6	2	2	1	0
T1 to Nozzle	--	--	--	5	1	1
The maximum nozzle height above the agent cylinder is 10 feet.						

3A.2 Local Application Tankside:

Cylinder:
The Model IS45ABC is to be used for Local Application, Tankside.

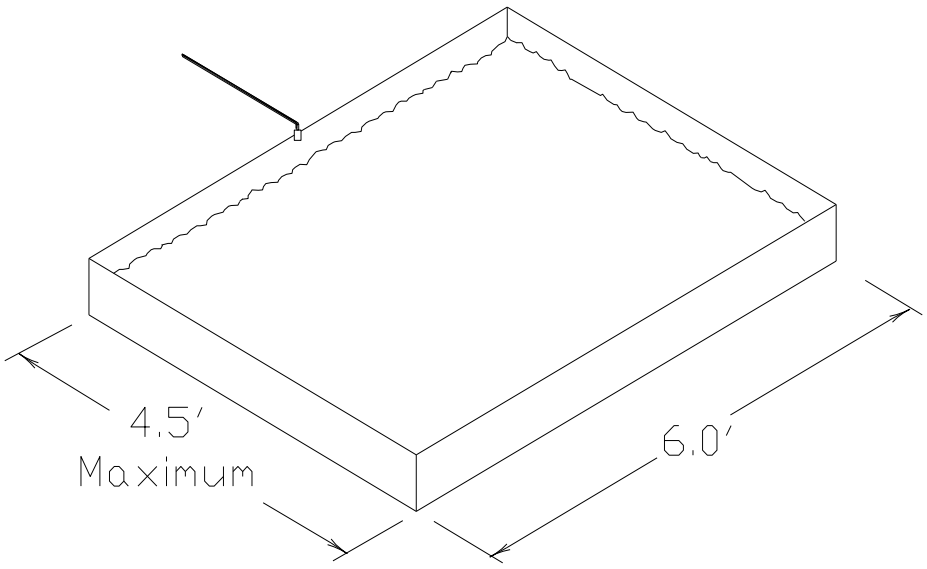
Nozzles:
The Local Application Nozzle, (**P/N 16170**) is used for Tankside coverage. The IS45 cylinder supports four Tankside Application Nozzles.

Temperature Range:
The operating temperature range for the system components used in Local Tankside applications is -20˚F to 120˚F (-29˚C to 49°C).

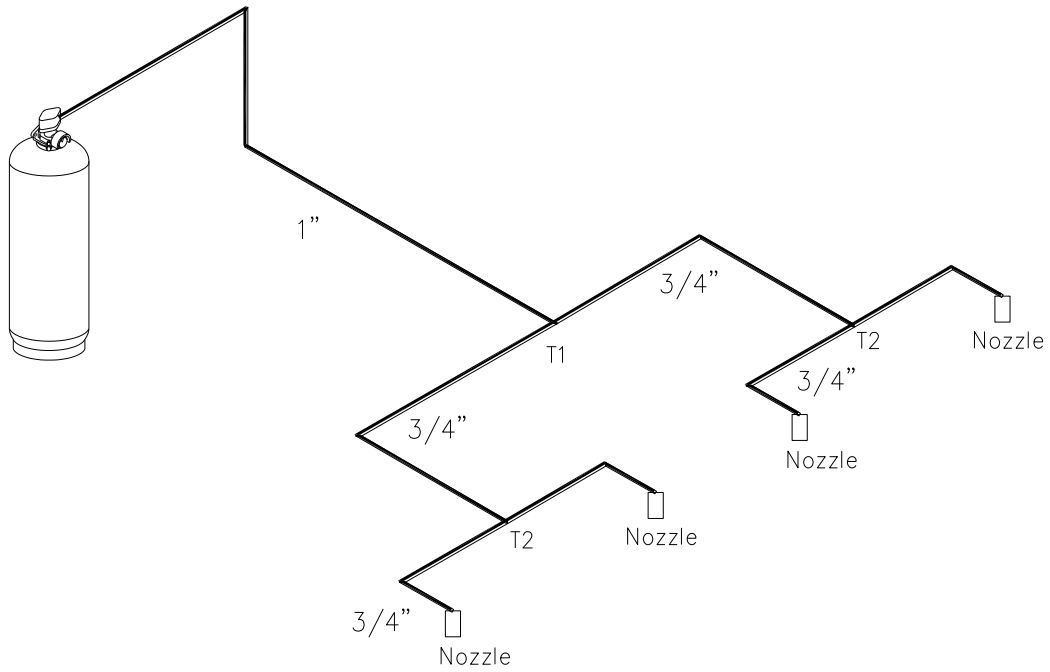
Piping Requirements:
Piping diagrams include limitations on pipe length and fittings. System piping must be balanced. Balanced piping is that in which the difference between the shortest actual pipe length from ***any*** ¾" tee to nozzle and the longest actual pipe length from any ¾" tee to nozzle does not exceed 10% of the longest actual pipe length from any ¾" tee to nozzle. Piping runs from the 1" tee to each of the ¾" tees must be equal in length. The number and type of fittings for all tee to nozzle sections must be equal.

All piping must be Schedule 40, hot-dipped galvanized steel pipe, and all fittings must be 150 lb. class. Examples of acceptable fitting materials include hot-dipped galvanized malleable iron, ductile iron, or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter. Note: Black steel pipe and fittings can be used in relatively noncorrosive atmospheres.

Nozzle Placement and Coverage:
Each nozzle will protect a hazard area of 27 ft^2, with a 6 foot maximum side. The distance from the nozzle across the hazard must not exceed 4.5 feet. The tip of the nozzle must be at least ½ inch below the lip of the pan, located at least five (5) inches above the highest liquid surface. The nozzle slit is oriented horizontally, so that it is aimed at the opposite side of the tank.



3A.2 Local Application Tankside (continued):



Local Application, Tankside, IS45ABC				
	Pipe Size, in	Maximum Length, ft	Maximum # of Elbows	# of Tees Allowed
Cylinder to T1	1	30	5	1
T1 to T2	¾	13	2	1
T2 to Nozzle	¾	6	2	0
The nozzle height should be the same as the agent cylinder.				

3A.3 Total Flood:

Note: Total Flood coverages are offered in two different versions: "Standard" and "Module Perimeter". The system designer must select the appropriate coverage to use prior to installation.

3A.3.1 Standard Coverage, Total Flood

Cylinders:
The Model IS18ABC and IS35ABC are to be used for Standard Coverage Total Flooding applications.

Nozzles:
The Total Flood Nozzle, (TF, **P/N 16172**) is used for both the 18lb. and 35lb. ABC cylinders. The IS18 cylinder supports one Total Flood (TF) Nozzle. The IS35 cylinder supports two Total Flood (TF) Nozzles.

Nozzle Coverages:
Volume: 1,440 $ft.^3$ per nozzle
Maximum Area: 120 $ft.^2$ per nozzle
Maximum Height: 20 ft.
Maximum Side length: 15 ft.
(See chart below for height vs. area restrictions)

Maximum Standard Coverage Per Nozzle			
Hazard Height (ft.)	Longest Side (ft.)	Area ($ft.^2$)	Volume ($ft.^3$)
12 or less	15	120	1440
13	15	110.7	1440
14	15	102.8	1440
15	15	96	1440
16	15	90	1440
17	15	84.7	1440
18	15	80	1440
19	15	75.8	1440
20	15	72	1440

Note: Amerex Industrial Dry Chemical Systems have not been evaluated by Underwriters Laboratories, Inc. with respect to the total flood protection of hazards incorporating uncloseable openings exceeding 5% of the total hazard surface area.

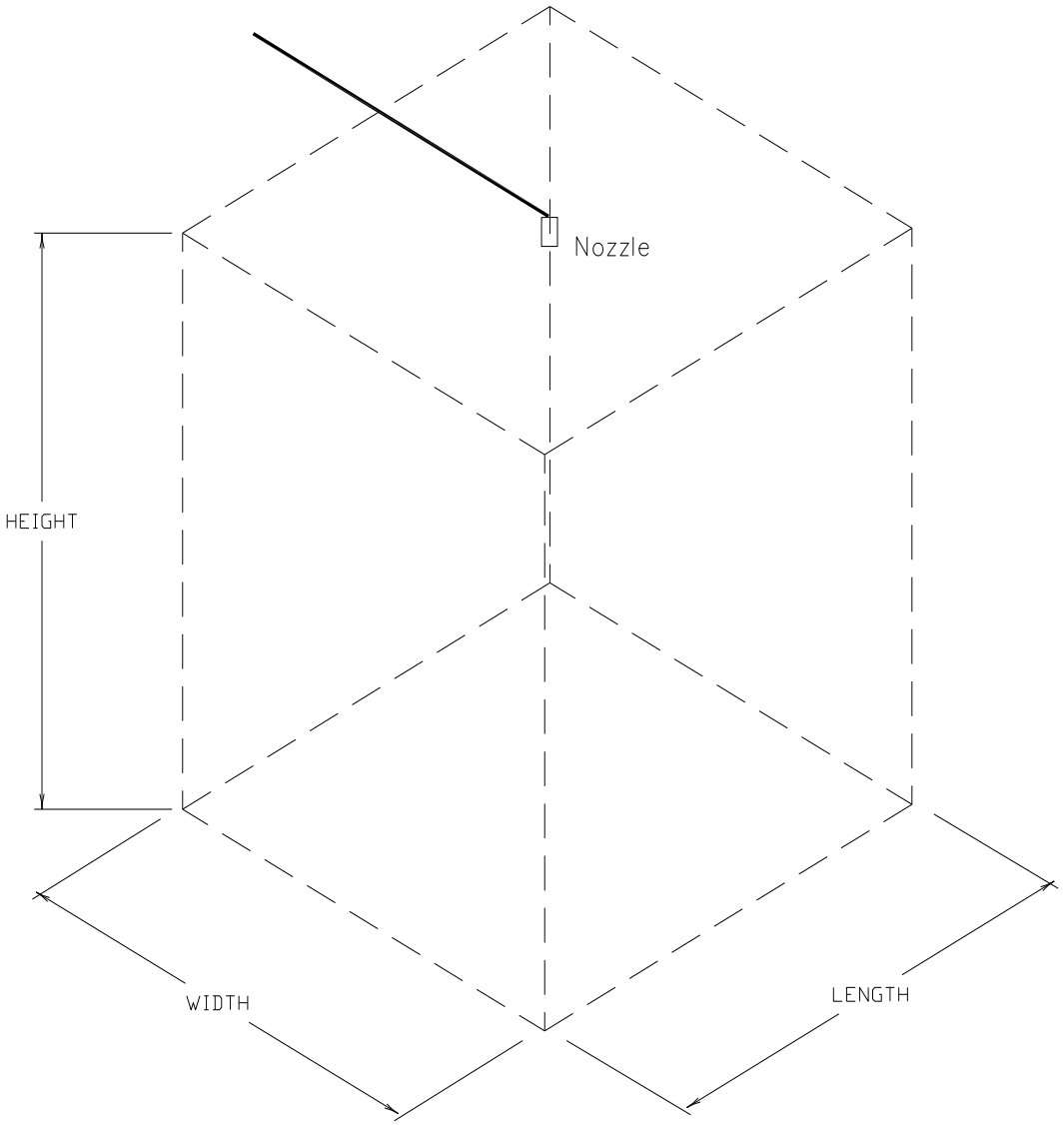
Temperature Range:
The operating temperature range for Standard Total Flood applications is -40°F to 120°F (-40°C to 49°C).

Piping Requirements:
Piping diagrams include limitations on pipe length and fittings. System piping must be balanced. Balanced piping is that in which the difference between the shortest actual pipe length from ***any*** ¾" tee to nozzle and the longest actual pipe length from any ¾" tee to nozzle does not exceed 10% of the longest actual pipe length from any ¾" tee to nozzle. The number and type of fittings for all tee to nozzle sections must be equal.

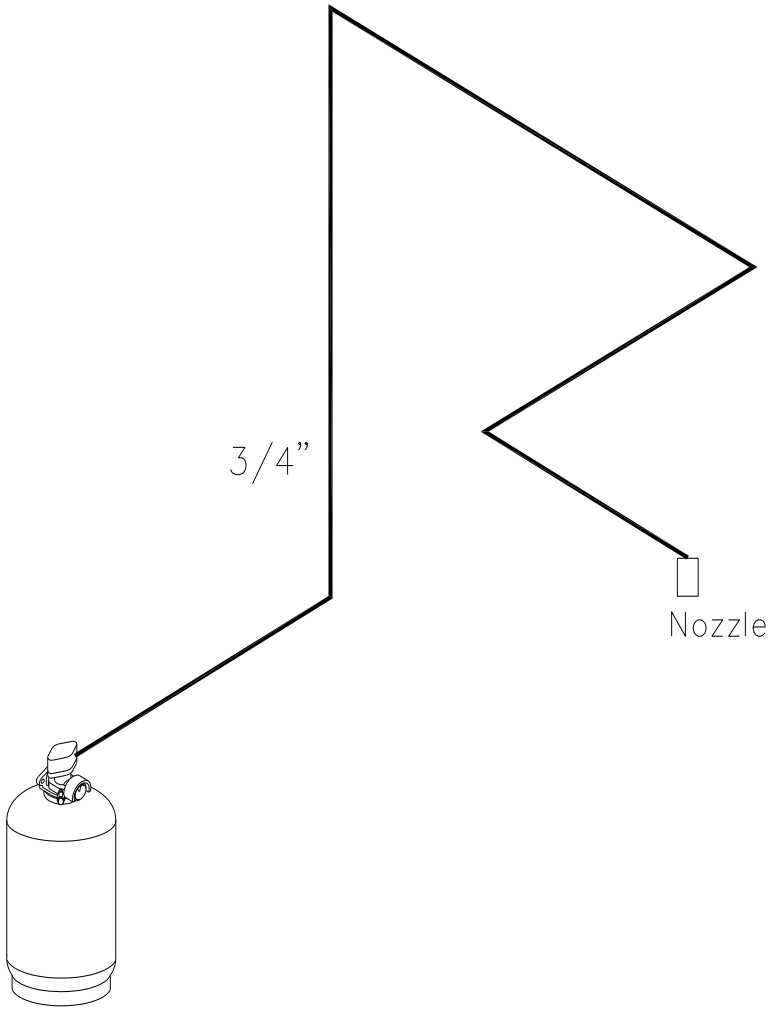
3A.3.1 Standard Coverage, Total Flood (continued)

All piping must be Schedule 40, hot-dipped galvanized steel pipe, and all fittings must be 150lb. class. Examples of acceptable fitting materials include hot-dipped galvanized malleable iron, ductile iron, or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter. Note: Black steel pipe and fittings can be used in relatively noncorrosive atmospheres.

Nozzle Placement: The Total Flood (TF) Nozzle has been developed to provide application of extinguishing agent from an overhead position. The nozzle is to be mounted in the center of the protected area, with the tip of the nozzle no greater than six (6) inches from the ceiling. Proper nozzle placement is shown below:

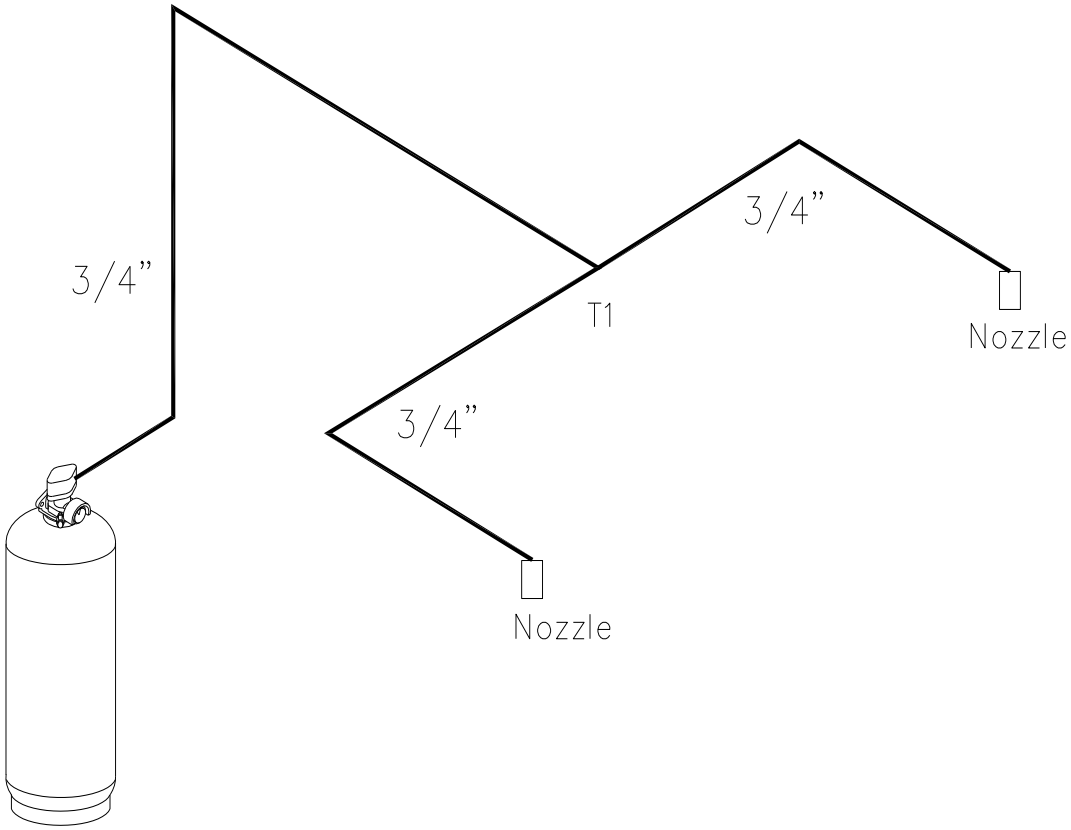


3A.3.1 Standard Coverage, Total Flood (continued)



Standard Total Flooding, IS18ABC, Single TF Nozzle:				
	Pipe Size, in	Maximum Length, ft	Maximum # of Elbows	# of Tees Allowed
Cylinder to Nozzle	¾	60	8	0
Total ¾” Pipe	--	60	--	--
The maximum nozzle height above the agent cylinder is 20 feet.				

3A.3.1 Standard Coverage, Total Flood (continued)



Standard Total Flooding, IS35ABC, Two TF Nozzles:				
	Pipe Size, in	Maximum Length, ft	Maximum # of Elbows	# of Tees Allowed
Cylinder to T1	¾	45	7	1
T1 to Nozzle	¾	15	4	0
Total ¾” Pipe	--	75	--	--
The maximum nozzle height above the agent cylinder is 20 feet.				

3A.3.2 Module Perimeter Coverage, Total Flood

Cylinders:
The Model IS45ABC is to be used for Module Perimeter Total Flooding applications.

Nozzle:
The Total Flood Perimeter (TFP) Nozzle, (**P/N 17809**) is used in both one and two nozzle installations on the IS45ABC. The nozzle must be properly oriented at the upper perimeter of the module being protected.

Nozzle Coverages:
Maximum Module Volume: 2,720 $ft.^3$ per nozzle
Maximum Module Area: 217.6 $ft.^2$ per nozzle at 12.5 ft nozzle height
Maximum Module Height: 12.5 ft.
Maximum Module Side length: 16 ft. (either dimension)

Note: Amerex Industrial Dry Chemical Systems have not been evaluated by Underwriters Laboratories, Inc. with respect to the total flood protection of hazards incorporating uncloseable openings exceeding 5% of the total hazard surface area.

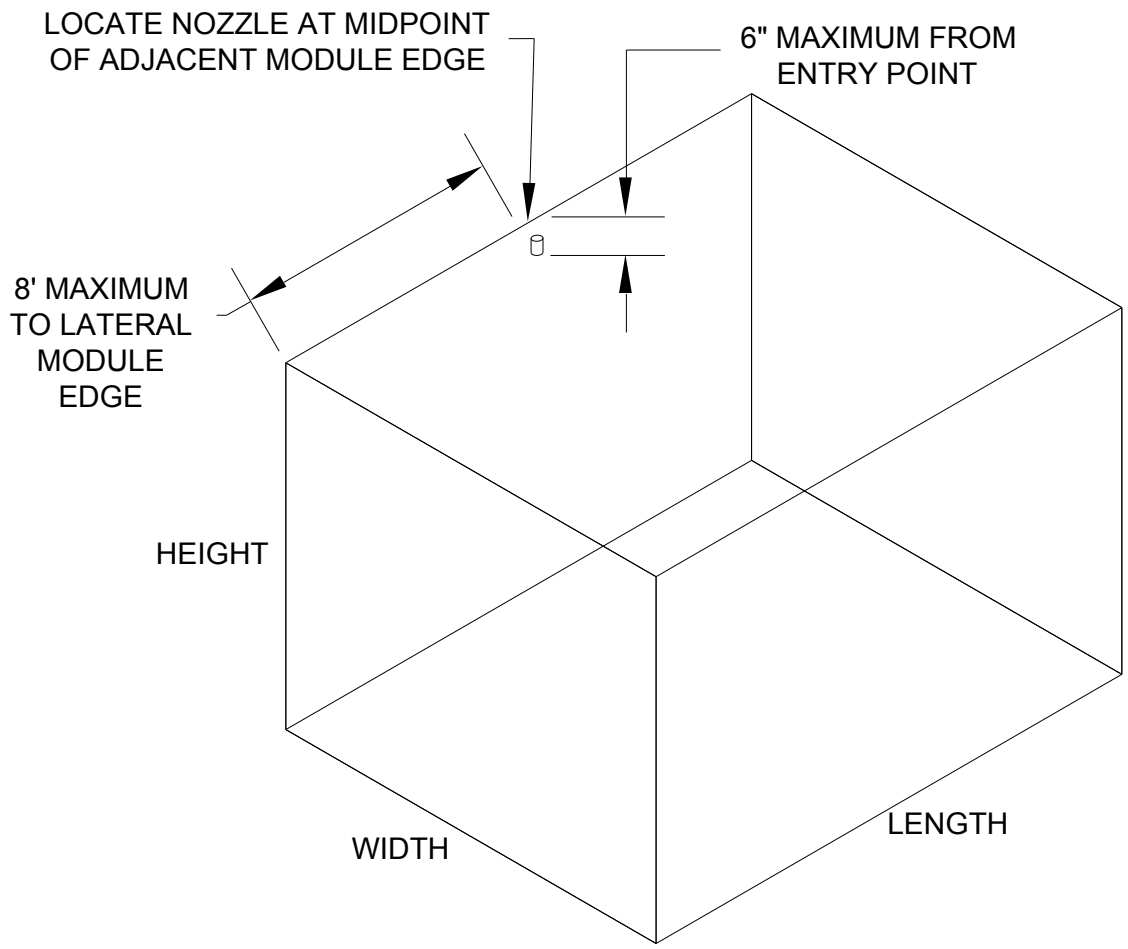
Temperature Range:
The operating temperature range for Module Perimeter Total Flood applications is
-40°F to 120°F (-40°C to 49°C).

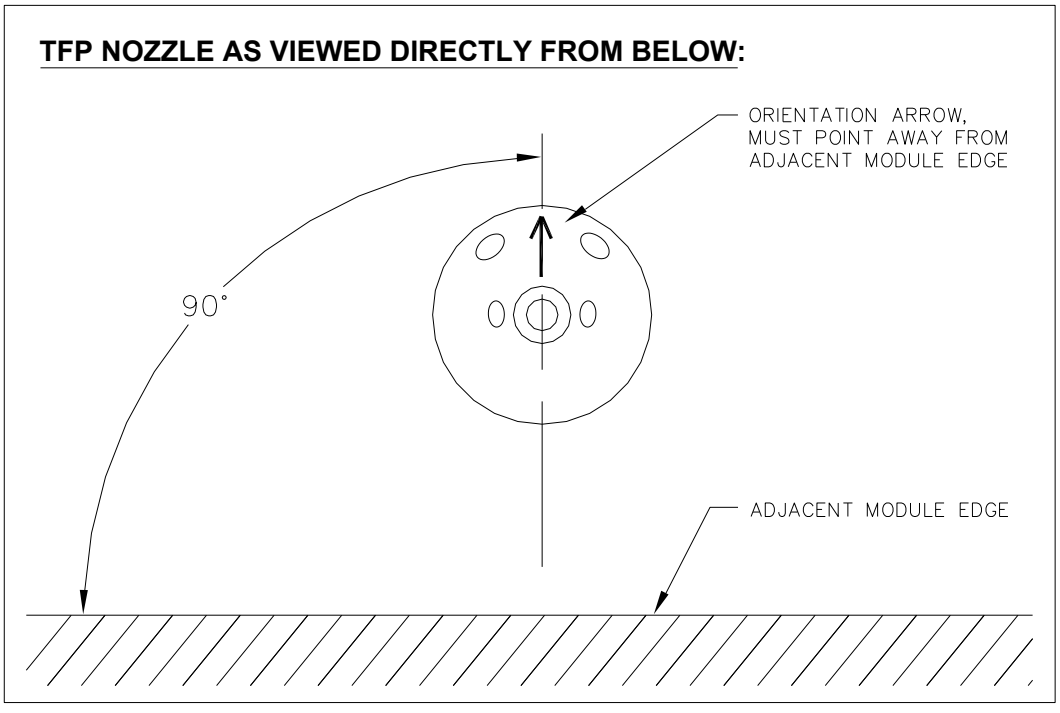
Piping Requirements:
Piping diagrams include limitations on pipe length and fittings. System piping must be balanced. Balanced piping is that in which the difference between the shortest actual pipe length from the 1**"** tee to nozzle and the longest actual pipe length from the 1" tee to nozzle does not exceed 10% of the longest actual pipe length from tee to nozzle. The number and type of fittings for both tee to nozzle sections must be equal.

All piping must be Schedule 40, hot-dipped galvanized steel pipe, and all fittings must be 150lb. class. Examples of acceptable fitting materials include hot-dipped galvanized malleable iron, ductile iron, or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter. Note: Black steel pipe and fittings can be used in relatively noncorrosive atmospheres.

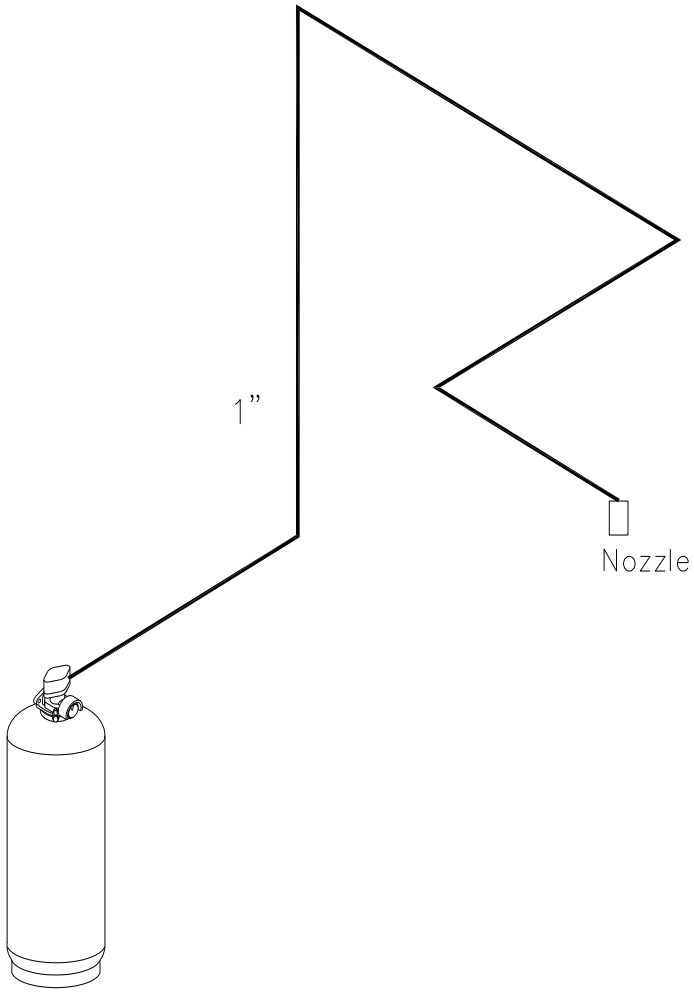
Nozzle Placement and Orientation:
The TFP Nozzle has been developed to provide application of extinguishing agent from the upper perimeter of the module being protected. The nozzle is to be installed through the top of the module, at the closest point to the intersection of the module wall and module top. The nozzle location, laterally, is to be at the midpoint of the adjacent module edge. [The nozzle may be offset laterally (side to side) from the midpoint as long as the maximum lateral horizontal distance from the nozzle to the module edge does not exceed 8 feet.] The tip of the nozzle must be within 6" of its entry point. The nozzle is to be installed vertically, with the orifices pointing downward, and the engraved arrow pointing into the protected module. The arrow must be aligned perpendicular to the adjacent wall, when viewed directly from below. Proper nozzle placement is shown as follows:

3A.3.2 Module Perimeter Coverage, Total Flood (continued)



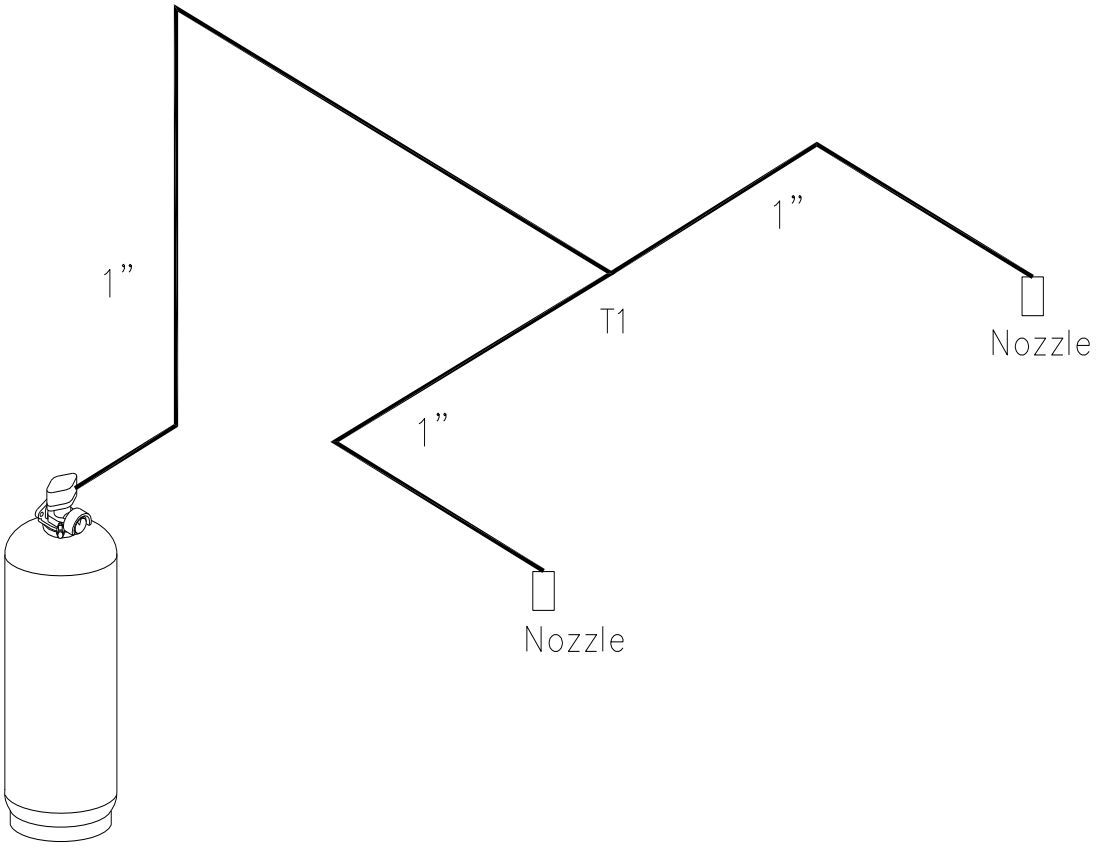


3A.3.2 Module Perimeter Coverage, Total Flood (continued)



Module Perimeter Total Flooding, IS45ABC, Single TFP Nozzle:				
	Pipe Size, in	Maximum Length, ft.	Maximum # of Elbows	# of Tees Allowed
Cylinder to Nozzle	1	40	6	0
Total 1” Pipe	--	40	--	--
The maximum nozzle height above the agent cylinder is 12.5 feet.				

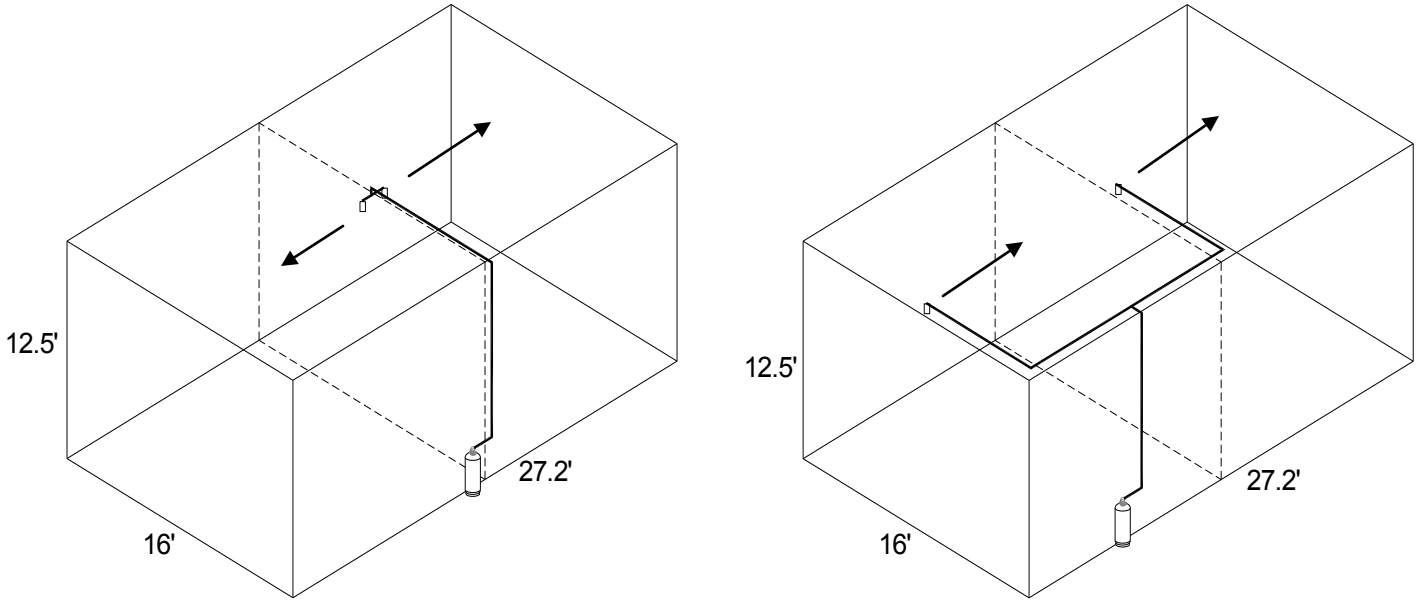
3A.3.2 Module Perimeter Coverage, Total Flood (continued)

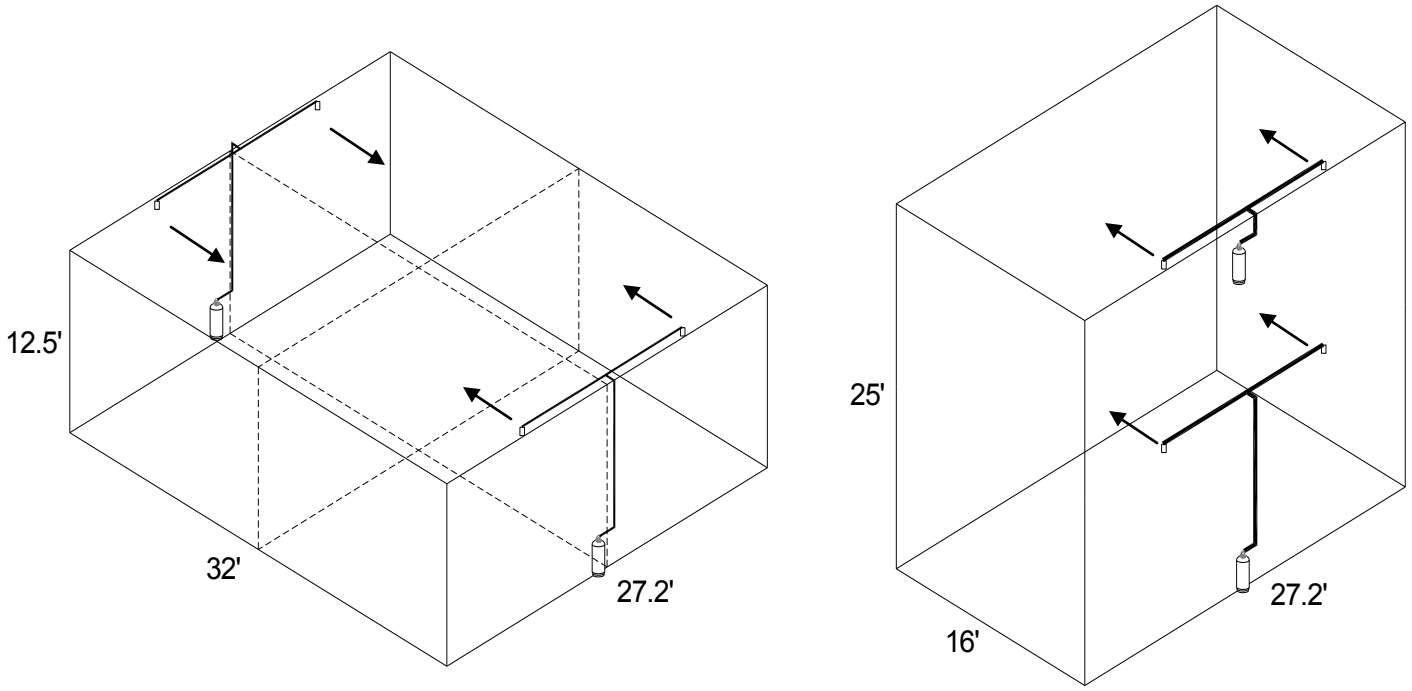


Module Perimeter Total Flooding, IS45ABC, Two TFP Nozzles:				
	Pipe Size, in	Maximum Length, ft	Maximum # of Elbows	# of Tees Allowed
Cylinder to T1	1	36	4	1
T1 to Nozzle	1	10	2	0
Total 1” Pipe	--	56	--	--
The maximum nozzle height above the agent cylinder is 12.5 feet.				

3A.3.2 Module Perimeter Coverage, Total Flood (continued)

Below are Examples of Module Perimeter Total Flood Coverage Using the TFP Nozzle:





Note: When "stacking" modules vertically, the maximum nozzle height above the cylinder is 12.5 feet.

3A.4 Vehicle Paint Spray Booths (VPSB):

The Amerex Vehicle Paint Spray Booth Fire Suppression System is of the pre-engineered type as defined by the NFPA Standard for Dry Chemical Extinguishing Systems, NFPA 17 and the Standard for Spray Application Using Flammable or Combustible Materials, NFPA 33. The extinguishing systems described in this manual are intended to be installed, maintained, and serviced in accordance with NFPA 17 and NFPA 33. The Amerex Vehicle Paint Spray Booth System has been evaluated by Underwriters Laboratories (UL) in accordance with the specific test protocol found in the UL1254 Standard (Pre-engineered Dry Chemical System Units).

Used for painting or coating cars, trucks, buses and large mobile equipment, Vehicle Paint Spray Booths come in a variety of configurations and sizes. The basic volumes of a Vehicle Paint Spray Booth to be protected by the Amerex System consists of three main components. They are:

Work Area - Where the vehicle is painted.
Plenum(s) – Exhaust chambers adjacent to the Work Area. Plenums utilize filters to trap overspray particles that escape from the Work Area. The primary purpose of the plenum is to expose a sufficiently large area of filter media to the overspray that is carried along in a smooth current of air.
Duct(s) - Fan-powered air channels that draw air through the Work Area, the Plenum(s), and finally out through the Duct.

CAUTION:

NFPA 33 Standard for Spray Application Using Flammable and Combustible Materials classifies the interior sections of paint spray booths, and certain areas adjacent to booth openings, as Class-I or Class-II, Division-1 or Division–2 locations. Electrical components of an Industrial Dry Chemical System, such as thermostats located within these areas shall be rated for use in classified areas, and all wiring to these components shall conform to the provisions of NFPA 70, National Electrical Code, for Class –I or Class-II, Division-1 or Division-2 locations. Any Industrial System Control Head with a microswitch is not suitable for use in a classified area.

Most of the time, the air is drawn downward over the vehicle during the painting process (as in either an Under Floor, Pit, or Down Draft (Side-Exhaust) configuration). Other booths, such as a Back Draft or Pant-Leg (Horseshoe) design, draw air down and across, toward the rear of the booth. Fresh air is usually drawn in through intake filters either in the Work Area ceiling or on the upper walls of the Work Area. Many installations utilize a Heated Make-Up / Recirculation option, which re-circulates filtered, heated air through the booth, thereby being more energy efficient.

The Amerex Vehicle Paint Spray Booth System requires that the booth exhaust fan(s) be shut down prior to the discharge of the ABC dry chemical. This is accomplished with the use of the Mechanical Time Delay **(P/N 15765)** with mechanically-released systems, or by the use of the Amerex Electric Control Panel **(P/N 15780)** with the use of the timed discharge circuit. It is the responsibility of the installer to properly identify the configuration of the booth and to follow the requirements of this manual in order to achieve proper fire suppression. Sometimes, additional turns, baffles, or obstructions in the booth's plenum and duct may dictate the use of additional nozzles in order to ensure good distribution of dry chemical.

Nozzles:	**P/N:**	**Application:**
TF	16172	Standard Work Area; Backdraft / Pantleg / Underfloor Plenum
3-Way	16174	Pit w/ Tunnel (center-mount); Downdraft Plenum with or without Vertical Transition (center-mount)
D/P	16190	Exhaust Duct; Pit Plenum (end-position)
TFP	17809	Module Perimeter Work Area Coverage, **ONLY**

Cylinders: The Model IS18ABC, IS35ABC, and IS45ABC can be used for Vehicle Paint Spray Booth applications. The IS18 and IS 35 models are used for Duct and Plenum coverage, using either the DP, TF, or 3-Way nozzles. The IS45 model must use two or four TF nozzles (P/N 16172) under Standard Work Area Coverage. The IS45 model uses one or two TFP nozzles (P/N 17809) under Module Perimeter Work Area Coverage.

3A.4 Vehicle Paint Spray Booths (continued):

Temperature Range: The operating temperature range for Vehicle Paint Spray Booth applications is -20°F to 120°F (-29°C to 49°C).

Piping Requirements: Piping diagrams include limitations on pipe length and fittings. System piping must be balanced. Balanced piping is that in which the difference between the shortest actual pipe length from ***any*** ¾" tee to nozzle and the longest actual pipe length from any ¾" tee to nozzle does not exceed 10% of the longest actual pipe length from any ¾" tee to nozzle. Piping runs from the 1" tee to each of the ¾" tees must be equal in length. The number and type of fittings for all tee to nozzle sections must be equal.

All piping must be Schedule 40, hot-dipped galvanized steel pipe, and all fittings must be 150 lb. class, minimum. Examples of acceptable fitting materials include hot-dipped galvanized malleable iron, ductile iron, or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter. **Note:** Black steel pipe and fittings can be used in relatively noncorrosive atmospheres.

3A.4.1 Work Area Coverage, VPSB

There are two distinctly different nozzle and piping arrangements for protecting the Work Area using the IS45ABC cylinder. The first arrangement is "**Standard Work Area Coverage",** and the second is **"Module Perimeter Work Area Coverage**" outlined as follows:

3A.4.1.1 Standard Work Area Coverage, VPSB

The Amerex Vehicle Paint Spray Booth System is flexible enough to protect a wide variety of Vehicle Booths of various dimensions. The maximum booth height is 23'4". As noted, the IS45 cylinder is used with two or four nozzles, and each of the nozzles has been tested to protect a Work Area Module. A Work Area can be thought of as a series of 'boxes', or Modules, stacked together, each protected with a nozzle. The maximum parameters for each Module are given as follows:

Module Volume: 1,050 $ft.^3$ per nozzle, two or four TF nozzles per IS45ABC
Maximum Module Area: 105 $ft.^2$ per nozzle for booths up to 10 ft. in height;*
45 $ft.^2$ for booths at 23 ft., 4 in. height.*
Maximum Module Height: 23 ft., 4 in.
Maximum Module Side Length:
Module Center: 14 ft. for booths up to 10 ft. tall*
9 ft for booths at 23'4" tall*
Booth Edge: 14 ft for booths up to 10 ft tall
Centerline: 15 ft. (widthwise); booth height limited to 10' tall with this option

***Note**: For Module Center Installations with booth heights between 10' and 23'4", reference table 3A-1

Maximum Nozzle Offset – Module Center Entry: Within a 2.5 ft. radius semicircle from center of module, no less than 12" from any side of the module (booth); the curved portion of the semicircle must curve away from the centerline of the booth; the tip of the nozzle within 6" of ceiling.

Maximum Nozzle Offset – Booth Edge Entry: Entry into the module at the closest point to the intersection of the booth wall and ceiling. The nozzle location, horizontally, is at the midpoint of the longest side of the module, +/- 2 feet. The tip of the nozzle must be within 6" of its entry point. This option is allowable only for booths 10 feet or less in height.

3A.4.1.1 Standard Work Area Coverage, VPSB (continued)

Maximum Nozzle Offset – Booth Centerline Entry: This option is available where nozzle entry is only possible along the centerline of the booth ceiling. Maximum booth height for this option is 10 feet. This installation configuration allows for a maximum module side length of 15', which is the width of the Work Area, in this case. There is no allowable nozzle offset for this option. The first and fourth nozzles are to be located at 12" from the front and back of the booth, respectively. The second and third nozzles are to be spaced equally between the first and fourth nozzles. The tip of the nozzle must be within 6" of the ceiling.

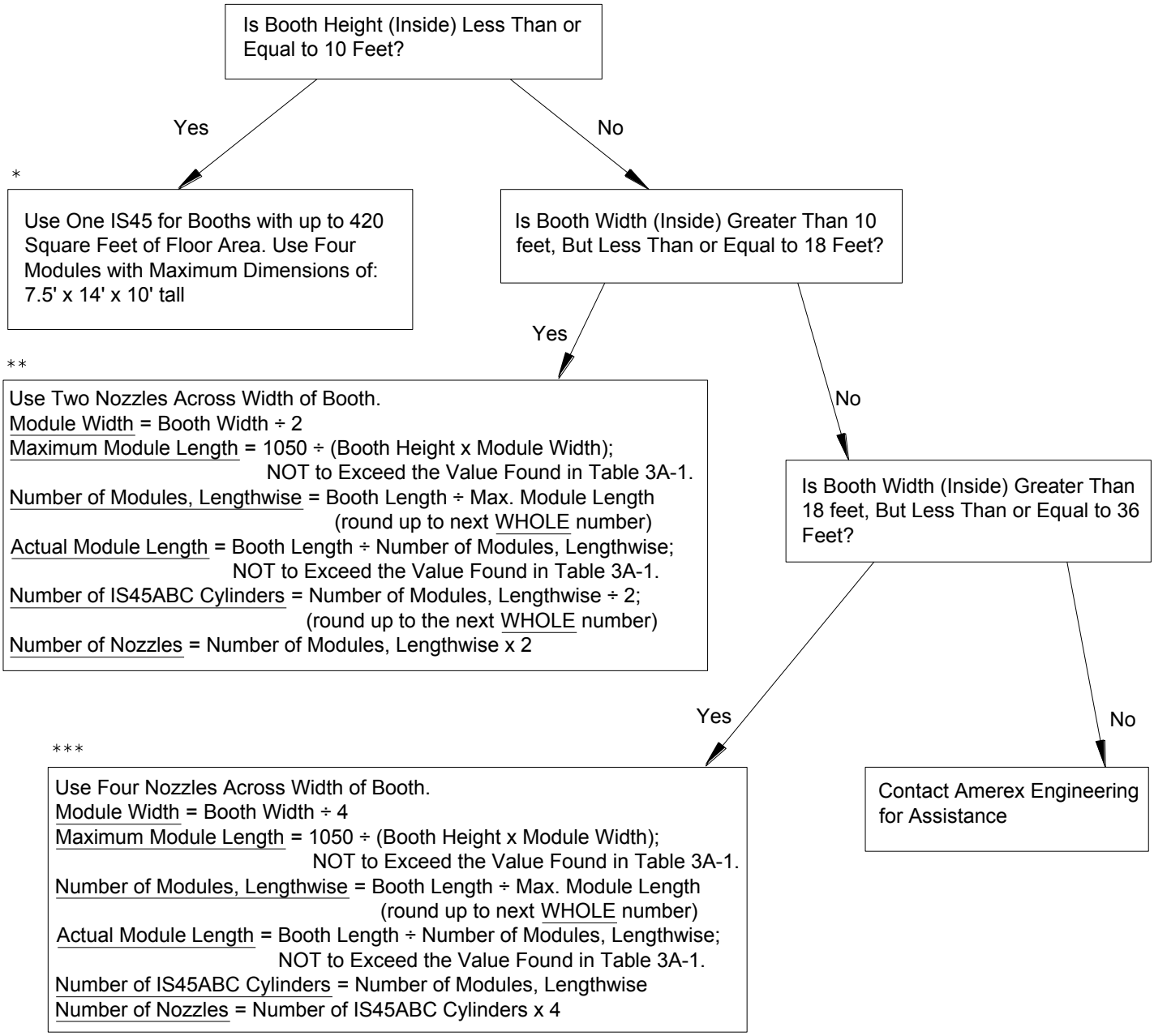
In order to insure that the longest side length is not exceeded for each nozzle module, Table 3A-1 must be used to obtain the side length of the module, when one side is known. For example, a work area that is 16 feet in height and 20 feet in width will need four nozzles across the width of the booth. Therefore, 20 divided by 4 = 5 feet. Looking at the 16 feet (height) column, and following it down until the 5 foot length is located, the remaining side length is: 11.75 feet.

Table 3A-1: Standard Coverage, Vehicle Paint Spray Booth Work Area Coverage

		Height														
		10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**23.33**
Length	**4.5**	14.00	13.63	13.25	12.88	12.50	12.13	11.75	11.38	11.00	10.63	10.25	9.88	9.50	9.13	9.00
	5	14.00	13.63	13.25	12.88	12.50	12.13	11.75	11.38	11.00	10.63	10.25	9.88	9.50	9.13	9.00
	5.5	14.00	13.63	13.25	12.88	12.50	12.13	11.75	11.23	10.61	10.05	9.55	9.09	8.68	8.30	8.18
	6	14.00	13.63	13.25	12.88	12.50	11.67	10.94	10.29	9.72	9.21	8.75	8.33	7.95	7.61	7.50
	6.5	14.00	13.63	13.25	12.43	11.54	10.77	10.10	9.50	8.97	8.50	8.08	7.69	7.34	7.02	6.92
	7	14.00	13.63	12.50	11.54	10.71	10.00	9.38	8.82	8.33	7.89	7.50	7.14	6.82	6.52	6.43
	7.5	14.00	12.73	11.67	10.77	10.00	9.33	8.75	8.24	7.78	7.37	7.00	6.67	6.36	6.09	6.00
	8	13.13	11.93	10.94	10.10	9.38	8.75	8.20	7.72	7.29	6.91	6.56	6.25	5.97	5.71	5.63
	8.5	12.35	11.23	10.29	9.50	8.82	8.24	7.72	7.27	6.86	6.50	6.18	5.88	5.61	5.37	5.29
	9	11.67	10.61	9.72	8.97	8.33	7.78	7.29	6.86	6.48	6.14	5.83	5.56	5.30	5.07	5.00
	9.5	11.05	10.05	9.21	8.50	7.89	7.37	6.91	6.50	6.14	5.82	5.53	5.26	5.02		
	10	10.50	9.55	8.75	8.08	7.50	7.00	6.56	6.18	5.83	5.53	5.25				
	10.5	10.00	9.09	8.33	7.69	7.14	6.67	6.25	5.88	5.56	5.26					
	11	9.55	8.68	7.95	7.34	6.82	6.36	5.97	5.61	5.30						
	11.5	9.13	8.30	7.61	7.02	6.52	6.09	5.71								
	12	8.75	7.95	7.29	6.73	6.25	5.83									
	12.5	8.40	7.64	7.00	6.46	6.00										
	13	8.08	7.34	6.73												
	13.5	7.78	7.07													
	14	7.50														

3A.4.1.1 Standard Work Area Coverage, VPSB (continued)

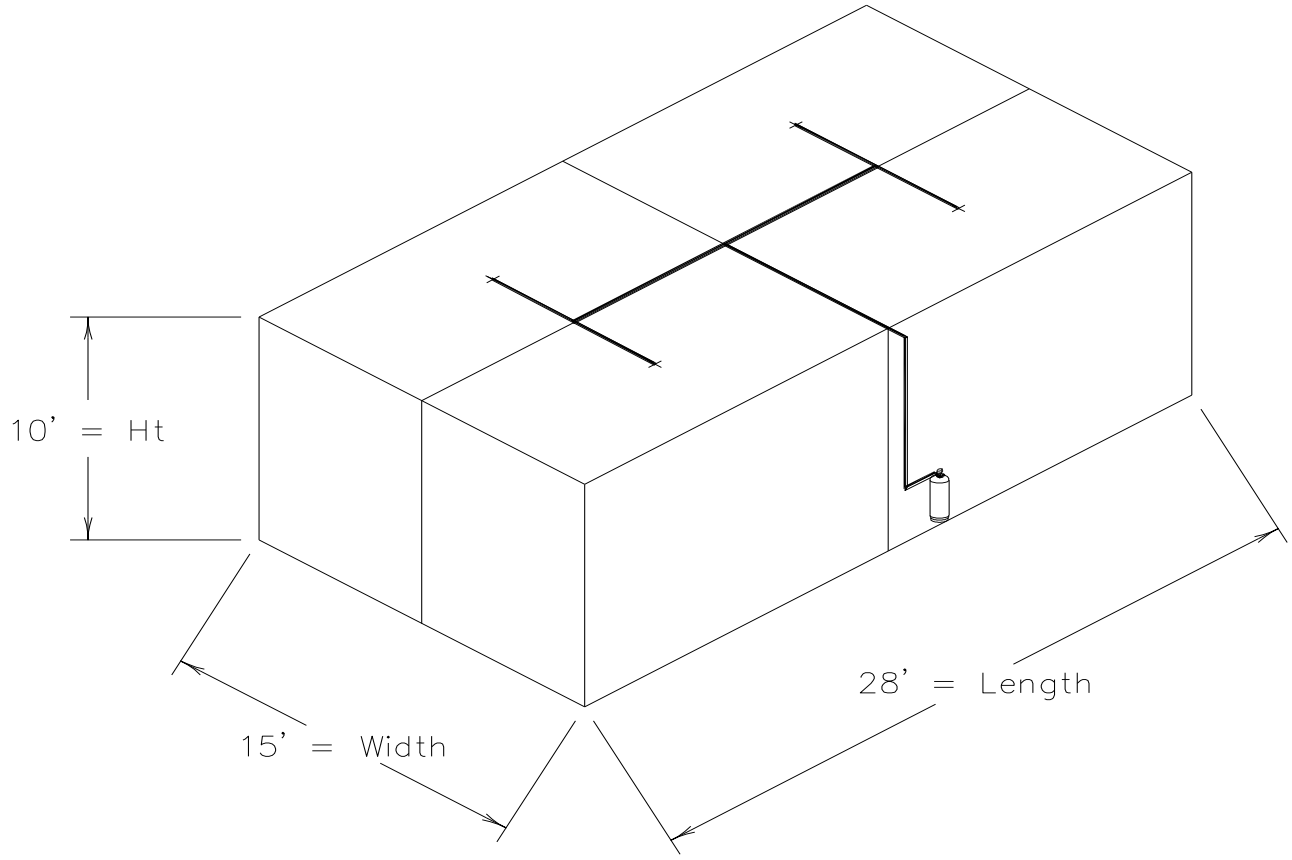
When determining how the Work Area of the Vehicle Paint Spray Booth is to be protected, the following information must be established, based on the total width, length and height of the Work Area:



All module lengths must be the same, even if the last IS45 uses only two nozzles. Always round UP to calculate the number of IS45 cylinders required.

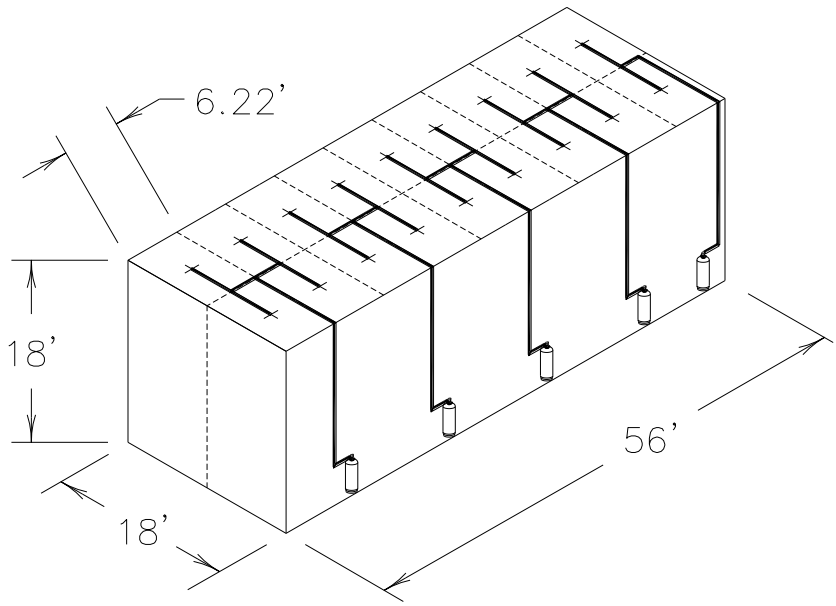
3A.4.1.1 Standard Work Area Coverage, VPSB (continued)

***Example 1**: a booth of dimensions 15' wide x 10' tall x 28' long
Module Dimensions: 7.5' x 14' x 10' tall;
Use one IS45 with four nozzles, centered on each module (Module Center Entry shown).

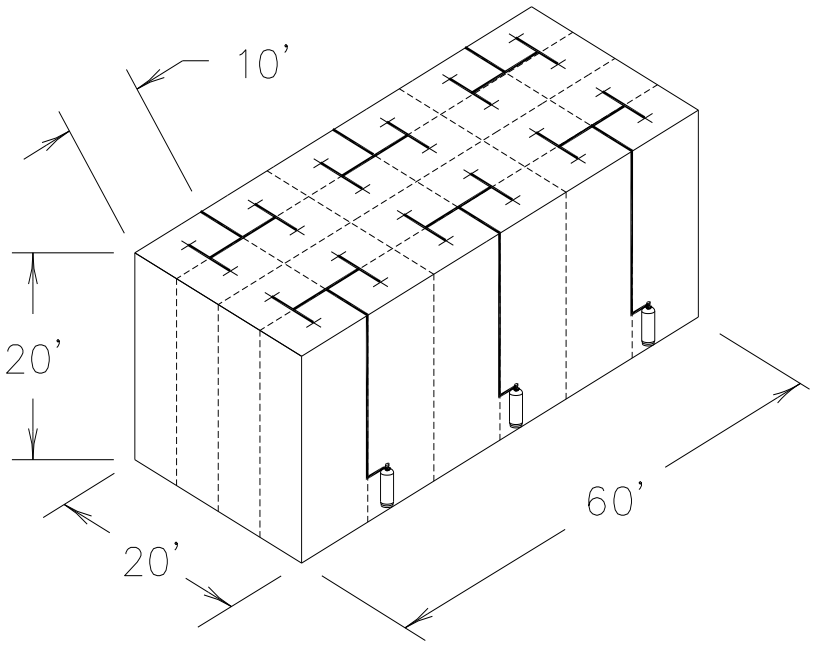


3A.4.1.1 Standard Work Area Coverage, VPSB (continued)

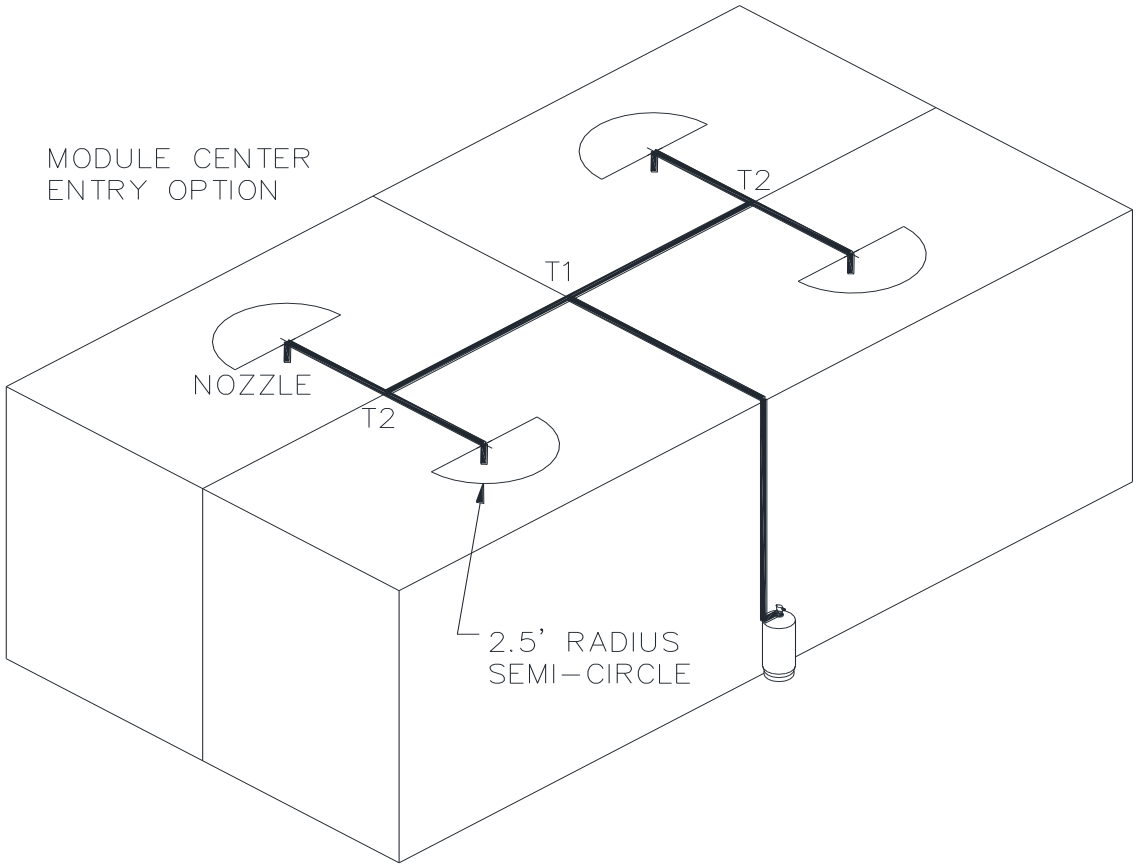
****Example 2:** a booth of dimensions 18’ wide x 18’ tall x 56’ long (Module Center Entry, only)
Module Width = 18’ ÷ 2 = 9’ wide; two nozzles across width of booth.
Maximum Module Length = 1050 ÷ (18’ x 9’) = 6.48’ long.
Number of Modules, Lengthwise = Booth Length ¸ Max. Module Length = 8.64.
Round up to the next whole number = 9 Modules, Lengthwise
Actual Module Length = Booth Length ¸ Number of Modules, Lengthwise = 56’ ¸ 9 = 6.22’ long, actual
Number of IS45ABC Cylinders = 9 ÷ 2 = 4.5, round up to 5 Cylinders required
Number of Nozzles = 9 x 2 = 18 Nozzles required



***Example 3:** a booth of dimensions 20’ wide x 20’ tall x 60’ long (Module Center Entry, only)
Module Width = 20’ ÷ 4 = 5’ wide; four nozzles across width of booth.
Maximum Module Length = 1050 ÷ (20’ x 5’) = 10.5’ long; Cannot exceed 10.25’, from Table 3A-1.
Number of Modules, Lengthwise = 60’÷10.25’ = 5.85’; therefore round up to 6 Modules, Lengthwise.
Actual Module Length = 60’ ÷ 6 = 10’
Number of IS45ABC Cylinders = 6
Number of Nozzles = 6 x 4 = 24



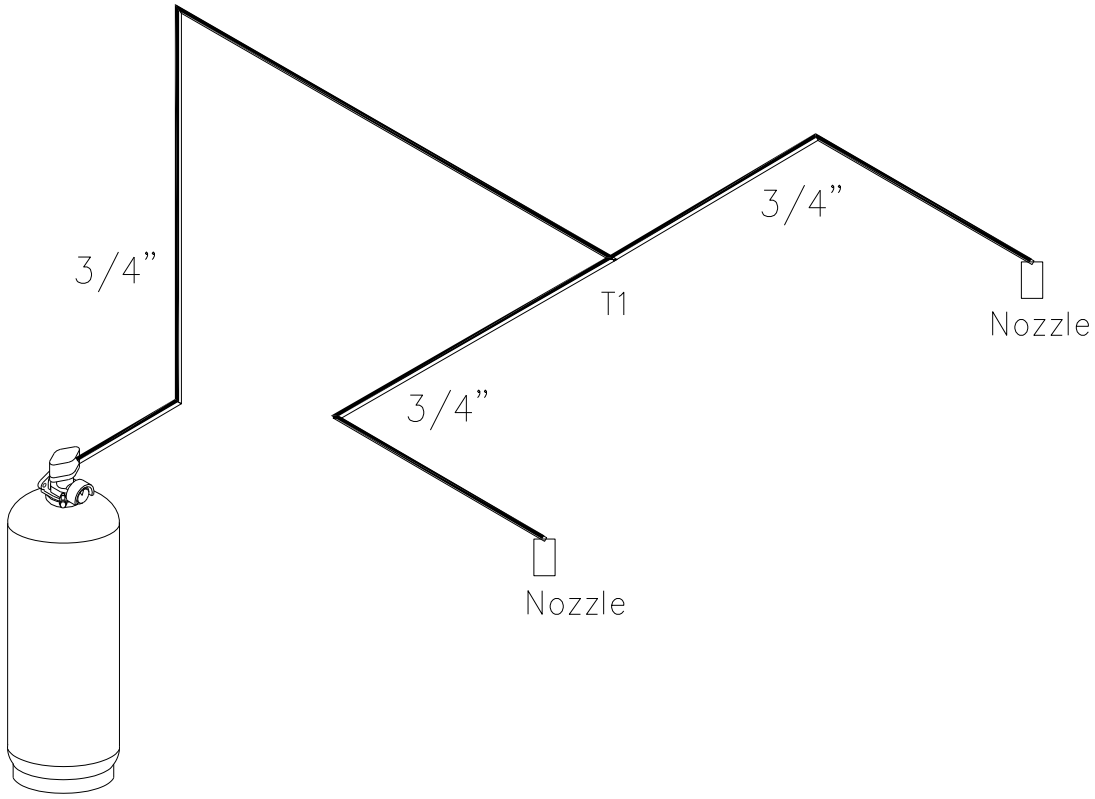
3A.4.1.1 Standard Work Area Coverage, VPSB (continued)



Vehicle Paint Spray Booth STANDARD WORK AREA Coverage, IS45ABC, Module Center Entry Option, Four Nozzles:						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS45ABC	4	TF	Cylinder to T1	1	30	4
			T1 to T2	¾	9	2
			T2 to Nozzle	¾	9	2
The maximum nozzle height above the agent cylinder is 23' 4".						

Note: If using multiple IS45's for a Work Area with this option, and two TF nozzles of the last cylinder are not needed, they may be used to cover a Backdraft Plenum (Option 3). See pages 3A-36 and 3A-37 for Backdraft Plenum (Option 3) size limitations.

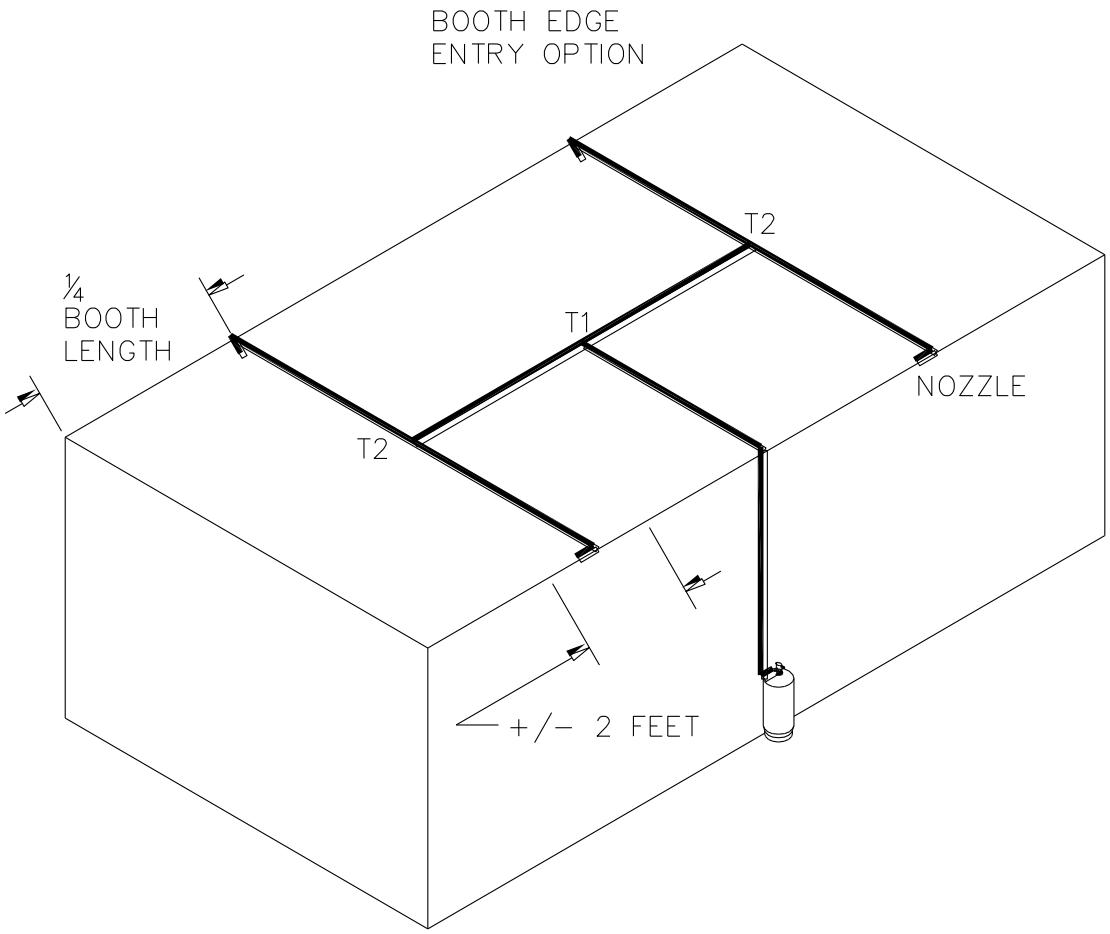
3A.4.1.1 Standard Work Area Coverage, VPSB (continued)



Vehicle Paint Spray Booth STANDARD WORK AREA Coverage and BACKDRAFT PLENUM Option 3, IS45ABC, Two Nozzles:						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS45ABC	2	TF	Cylinder to T1	¾	36	4
			T1 to Nozzle	¾	16	3
The maximum nozzle height above the agent cylinder is 23’4”.						

Note: Use this cylinder / piping configuration when only two of four nozzles are needed to complete the coverage for the Work Area in multiple cylinder applications. Use the same module calculations; all module lengths must be the same. This configuration may also be used to protect a Backdraft Plenum (Option 3).

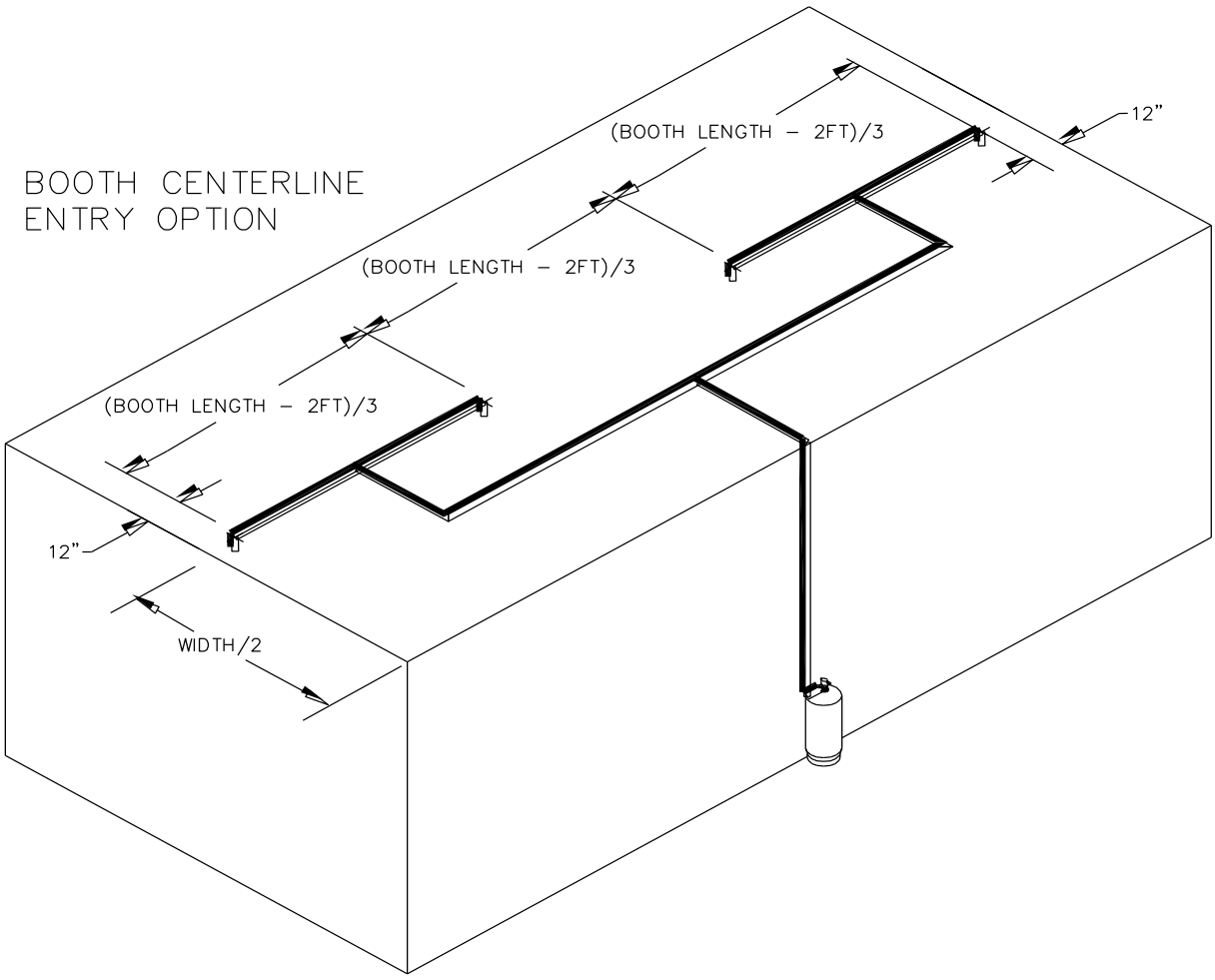
3A.4.1.1 Standard Work Area Coverage, VPSB (continued)



Vehicle Paint Spray Booth STANDARD WORK AREA Coverage, IS45ABC, Booth Edge Entry Option, Four Nozzles:						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS45ABC	4	TF	Cylinder to T1	1	20	5
			T1 to T2	¾	10	2
			T2 to Nozzle	¾	9	2-90 deg. + 1-45 deg.*

*A 45 degree elbow must be used at the nozzle to point it downward and toward the centerline of the booth Work Area. The nozzle must enter at the closest point to the intersection of the booth wall and the ceiling, and the tip of the nozzle must be within 6 inches of its entry point. The Edge Entry Option is only allowable on booths with a maximum height of 10 feet. The maximum nozzle height above the agent cylinder is 10 feet.

3A.4.1.1 Standard Work Area Coverage, VPSB (continued)



Vehicle Paint Spray Booth STANDARD WORK AREA Coverage, IS45ABC, Booth Centerline Entry Option, Four Nozzles:						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS45ABC	4	TF	Cylinder to T1	1	20	5
			T1 to T2	¾	9	1
			T2 to Nozzle	¾	8.5	2

Note: The maximum Work Area dimensions for this option are: 15’ wide x 28’ long x 10’ tall. The Booth Centerline Entry Option is only allowable on booths with a maximum height of 10 feet. The maximum nozzle height above the agent cylinder is 10 feet.

3A.4.1.2 Module Perimeter Work Area Coverage, VPSB

Module Volume: 2,720 ft.^{3} per nozzle, one or two TFP nozzles per IS45ABC
Maximum Module Area: 217.6 ft.^{2} per nozzle for booths up to 20 ft. in height;*
Maximum Module Height: 20 ft.
Maximum Module Side Length: 16 ft.
Maximum Nozzle Offset From Center of Wall: +/- 10% of adjacent wall length

***Note**: Reference Coverage Table 3A-2

Table 3A-2: Module Perimeter Vehicle Paint Spray Booth

Work Area Coverage

Booth Height, Feet	Module Side 2, feet					
	13.60	**14.00**	**14.50**	**15.00**	**15.50**	**16.00**
12.5	16.00	15.54	15.00	14.50	14.03	13.60
13	15.38	14.94	14.42	13.94	13.49	13.07
14	14.28	13.87	13.39	12.95	12.53	12.14
15	13.33	12.95	12.50	12.08	11.69	11.33
16	12.50	12.14	11.72	11.33	10.96	10.62
17	11.76	11.42	11.03	10.66	10.32	10.00
18	11.11	10.79	10.42	10.07	9.74	9.44
19	10.52	10.22	9.87	9.54	9.23	8.94
20	10.00	9.71	9.37	9.06	8.77	8.50

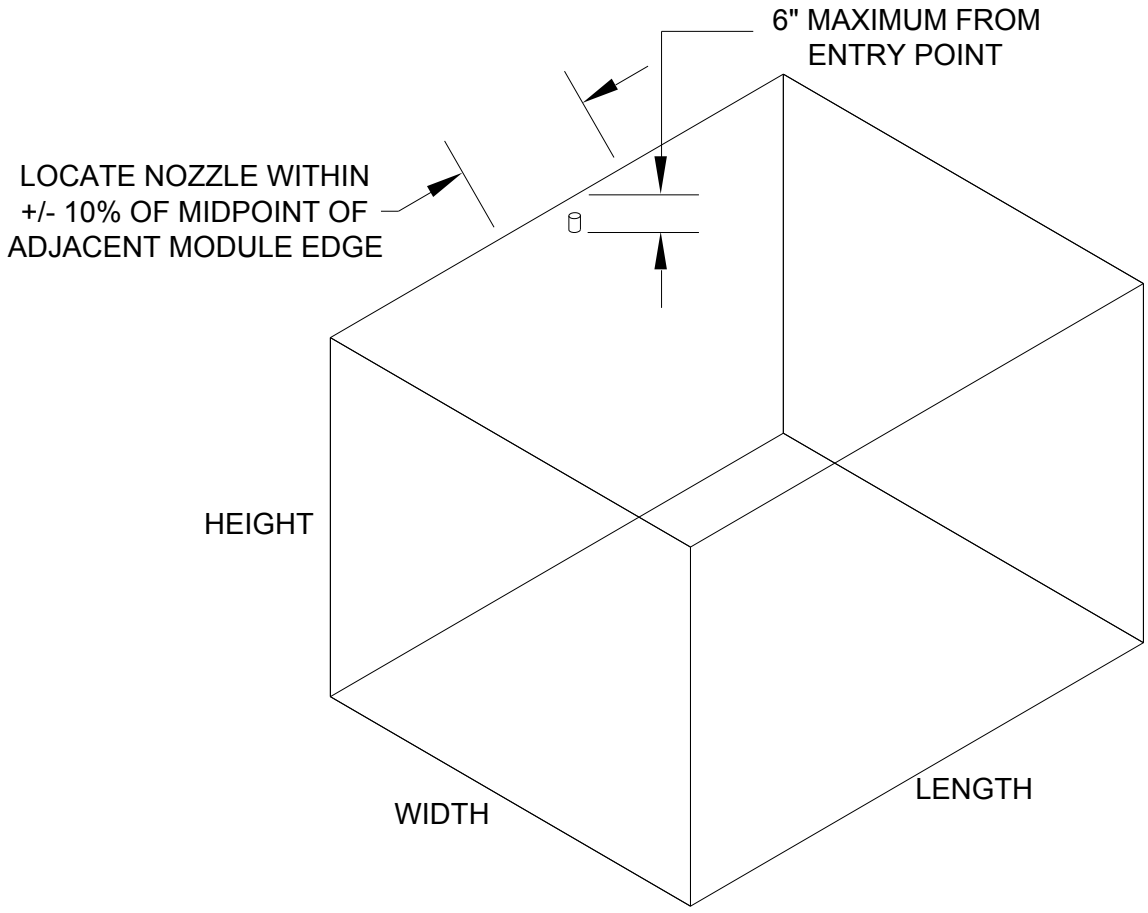
[Dimensions inside of table are Side 1]

Piping Requirements:
Piping diagrams include limitations on pipe length and fittings. System piping must be balanced. Balanced piping is that in which the difference between the shortest actual pipe length from the 1**"** tee to nozzle and the longest actual pipe length from the 1" tee to nozzle does not exceed 10% of the longest actual pipe length from tee to nozzle. The number and type of fittings for both tee to nozzle sections must be equal.

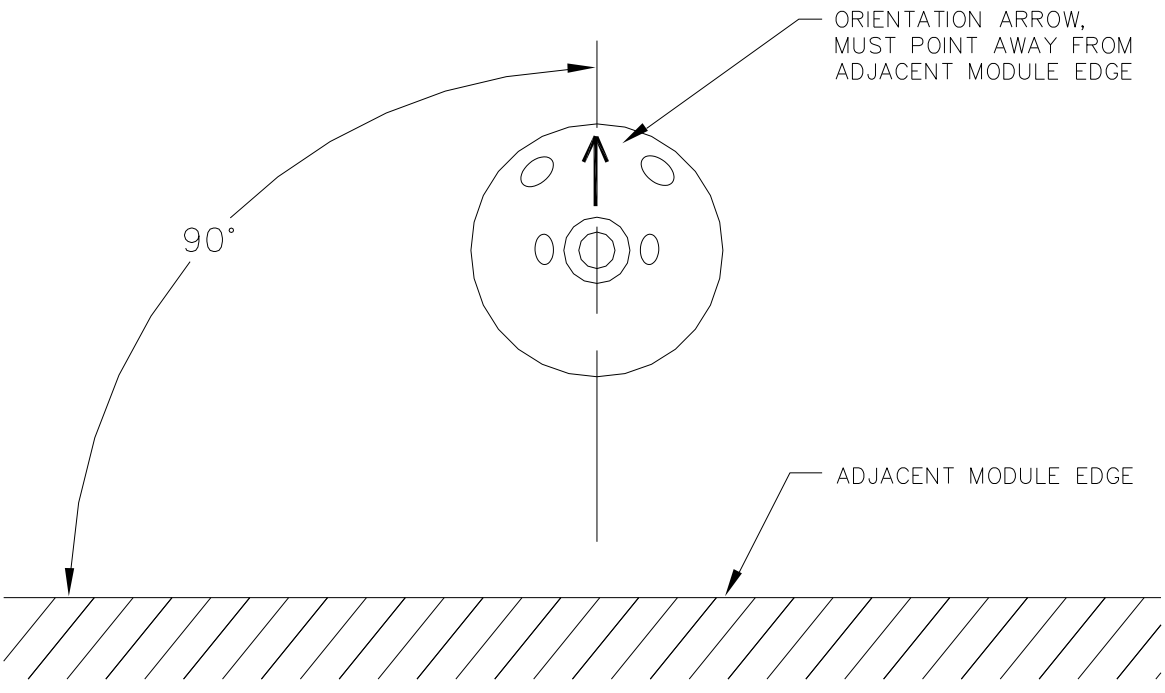
All piping must be Schedule 40, hot-dipped galvanized steel pipe, and all fittings must be 150lb. class. Examples of acceptable fitting materials include hot-dipped galvanized malleable iron, ductile iron, or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter.
Note: Black steel pipe and fittings can be used in relatively noncorrosive atmospheres.

Nozzle Placement and Orientation:
The TFP Nozzle has been developed to provide application of extinguishing agent from the upper perimeter of the module being protected. The nozzle is to be installed through the top of the module, at the closest point to the intersection of the module wall and module top. The nozzle location, laterally, is to be at the midpoint (+/- 10%) of the adjacent module edge. The tip of the nozzle must be within 6" of its entry point. The nozzle is to be installed vertically, with the orifices pointing downward, and the engraved arrow pointing into the protected module. The arrow must be aligned perpendicular to the adjacent wall, when viewed directly from below. Proper nozzle placement is shown as follows:

3A.4.1.2 Module Perimeter Work Area Coverage, VPSB (continued)

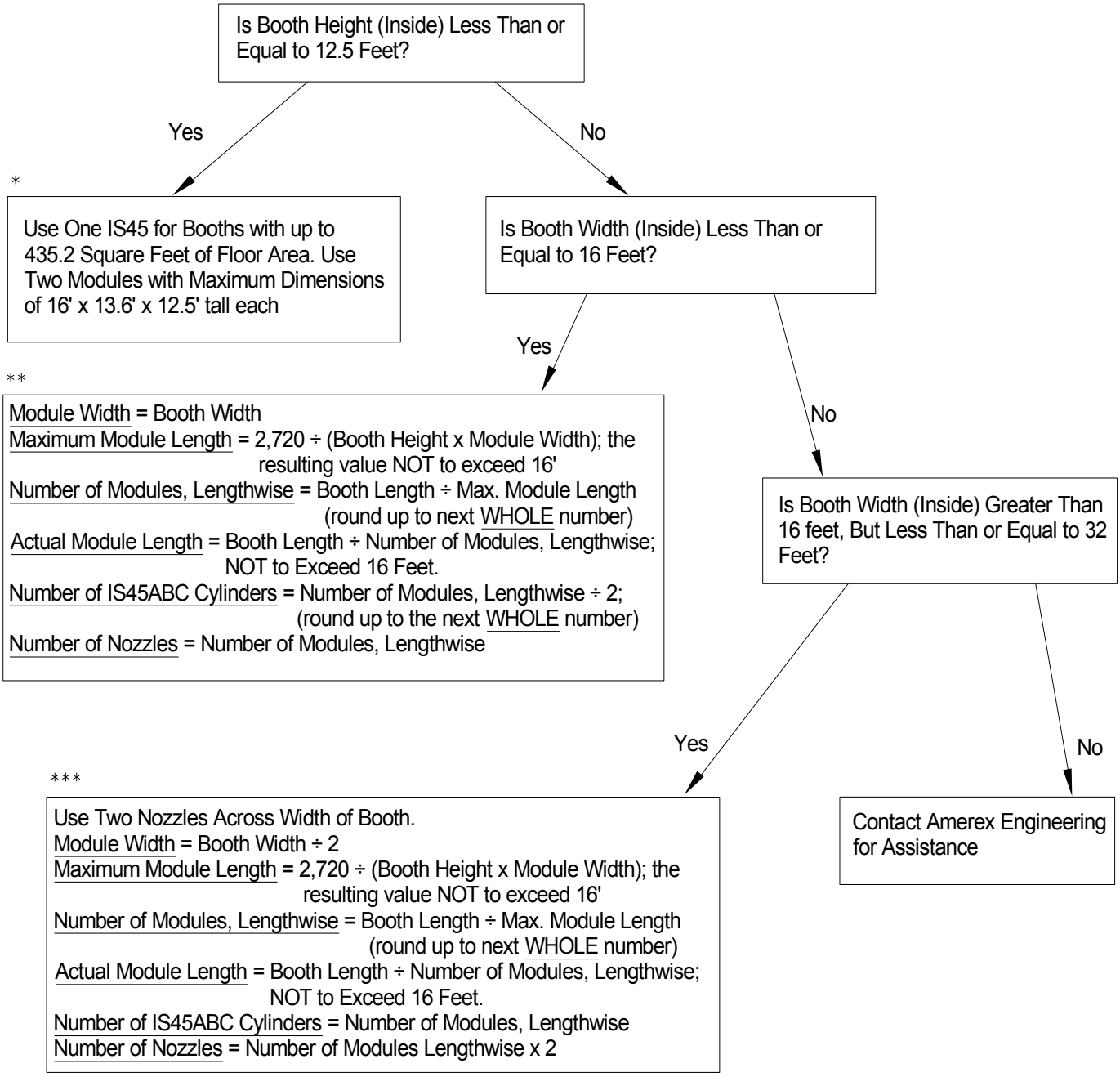


TFP NOZZLE AS VIEWED DIRECTLY FROM BELOW:



3A.4.1.2 Module Perimeter Work Area Coverage, VPSB (continued)

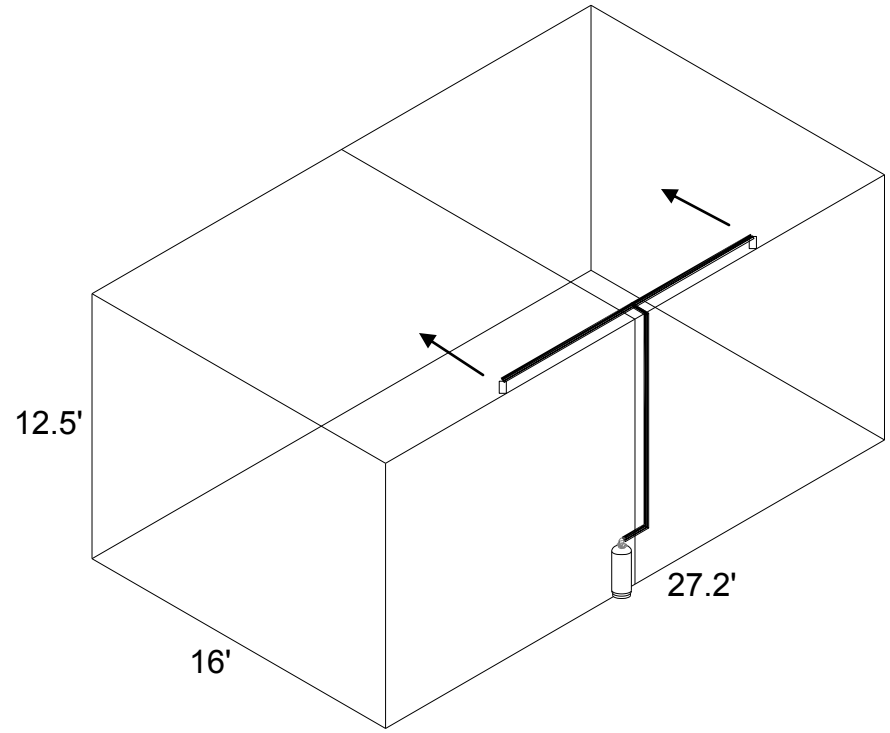
When determining how the Work Area of the Vehicle Paint Spray Booth is to be protected, the following information must be established, based on the total width, length and height of the Work Area :

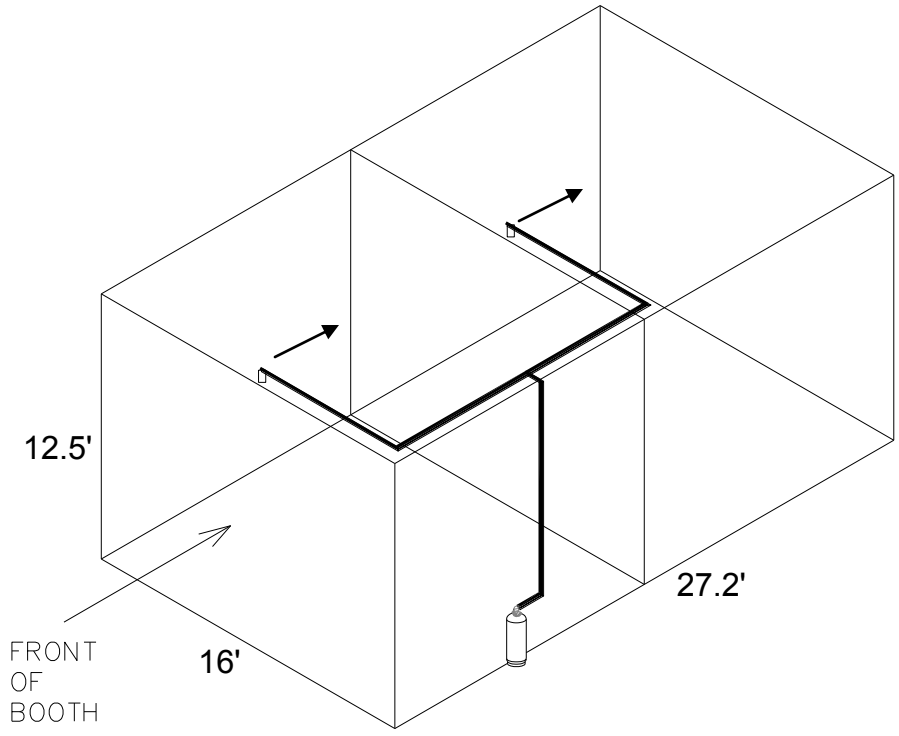


Always round UP to calculate the number of IS45 cylinders required.

3A.4.1.2 Module Perimeter Work Area Coverage, VPSB (continued)

***Example 1:** a booth of dimensions 16' wide x 12.5' tall x 27.2' long
Module Dimensions: 16' x 13.6' x 12.5' tall;
Use one IS45 with two TFP nozzles, two possible piping options are shown.

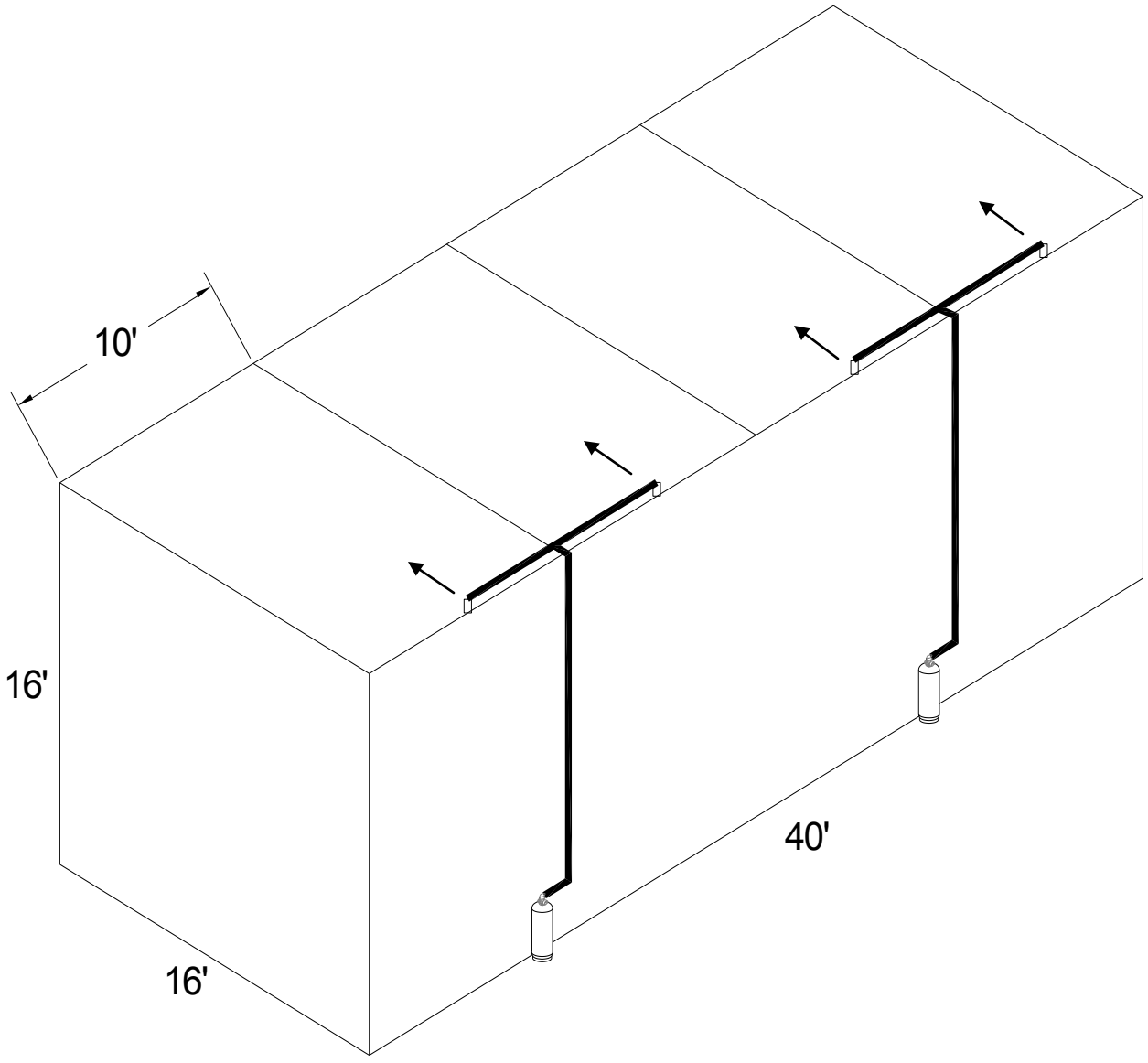




NOTE: As in the figures above, the nozzle must either be located on the side of the module (booth) or with one nozzle located at the edge of the module over the front end of the booth.

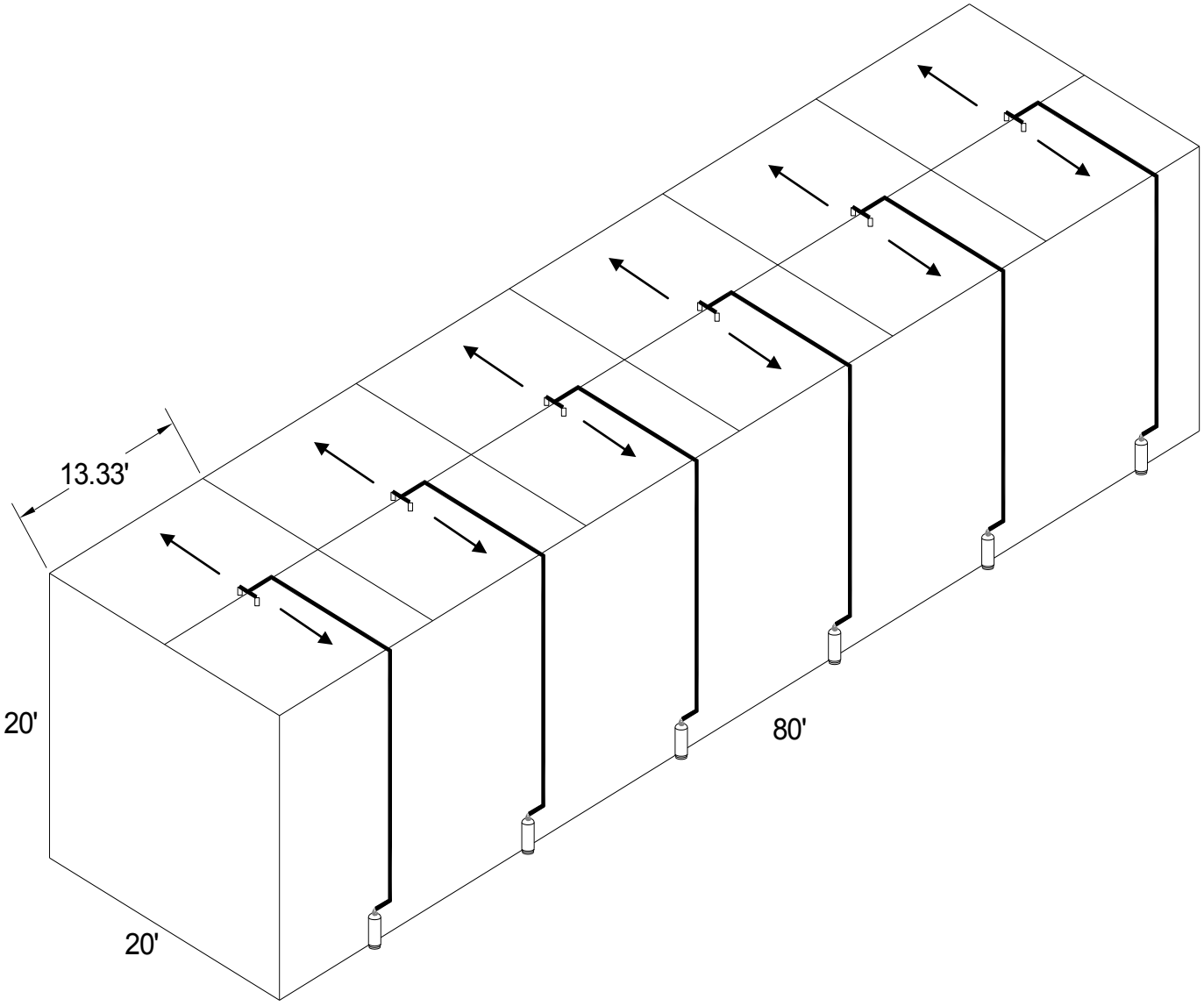
3A.4.1.2 Module Perimeter Work Area Coverage, VPSB (continued)

**__Example 2__: A booth of dimensions 16’ wide x 16’ tall x 40’ long
Module Width = Booth Width = 16’
Maximum Module Length = 2,720 ÷ (16 x 16) = 10.625’
Number of Modules, Lengthwise = Booth Length ÷ Max. Module Length = 3.76; round up to the next whole number = 4 Modules, Lengthwise
Actual Module Length = 40’ ÷ 4 = 10’ long, actual
Number of IS45ABC Cylinders = 4 ÷ 2 = 2 Cylinders required
Number of Nozzles = Number of Modules, Lengthwise = 4 TFP Nozzles required

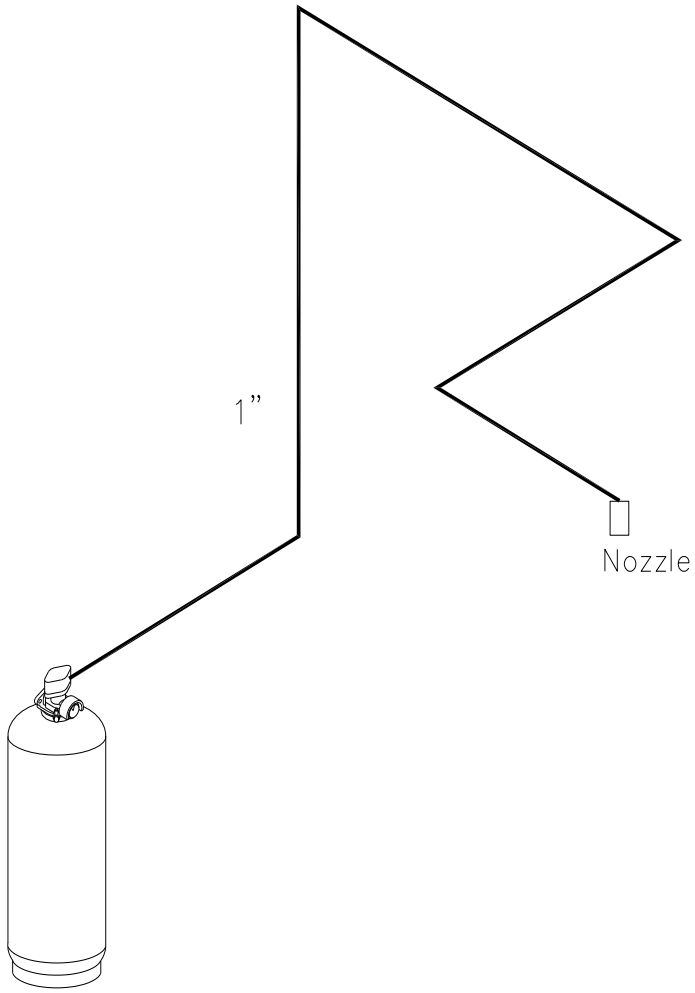


3A.4.1.2 Module Perimeter Work Area Coverage, VPSB (continued)

***__Example 3:__ a booth of dimensions 20’ wide x 20’ tall x 80’ long
Module Width = Booth Width ÷ 2 = 10’
Maximum Module Length = 2,720 ÷ (20 x 10) = 13.6’
Number of Modules, Lengthwise = Booth Length ÷ Max. Module Length = 5.88’; round up to the next whole number = 6 Modules, Lengthwise
Actual Module Length = 80’ ÷ 6 = 13.33’ long, actual
Number of IS45ABC Cylinders = Number of Modules, Lengthwise = 6 Cylinders required
Number of Nozzles = Number of Modules, Lengthwise x 2 = 12 TFP Nozzles required

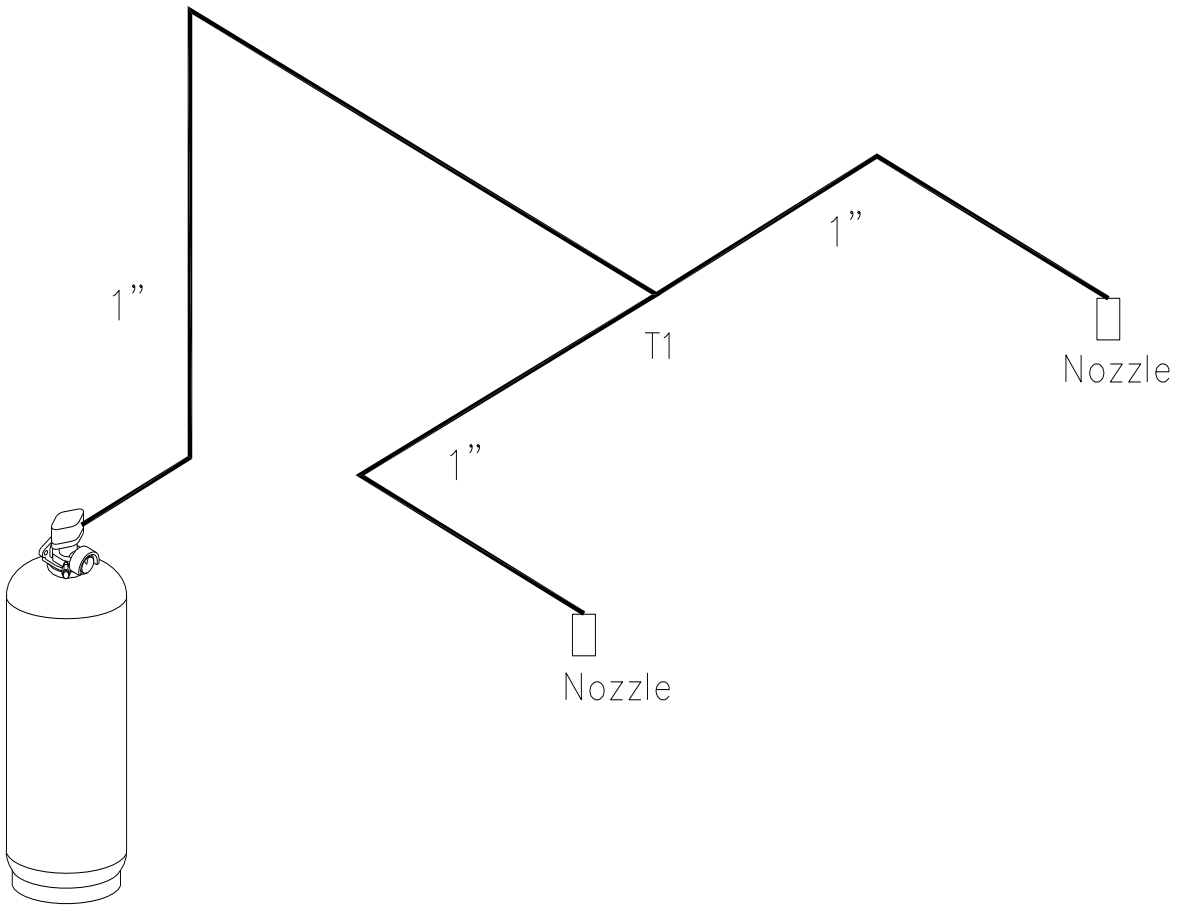


3A.4.1.2 Module Perimeter Work Area Coverage, VPSB (continued)



Module Perimeter Work Area, VPSB, IS45ABC, Single TFP Nozzle				
	Pipe Size, in	Maximum Length, ft	Maximum # of Elbows	# of Tees Allowed
Cylinder to Nozzle	1	40	6	0
Total 1” Pipe	--	40	--	--
The maximum nozzle height above the agent cylinder is 20 feet.				

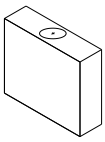
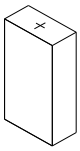
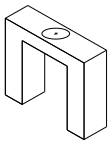
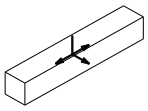
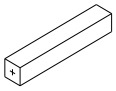
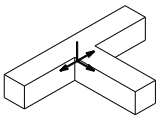
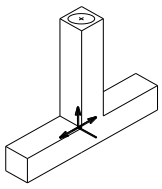
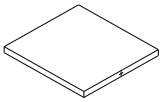
3A.4.1.2 Module Perimeter Work Area Coverage, VPSB (continued)



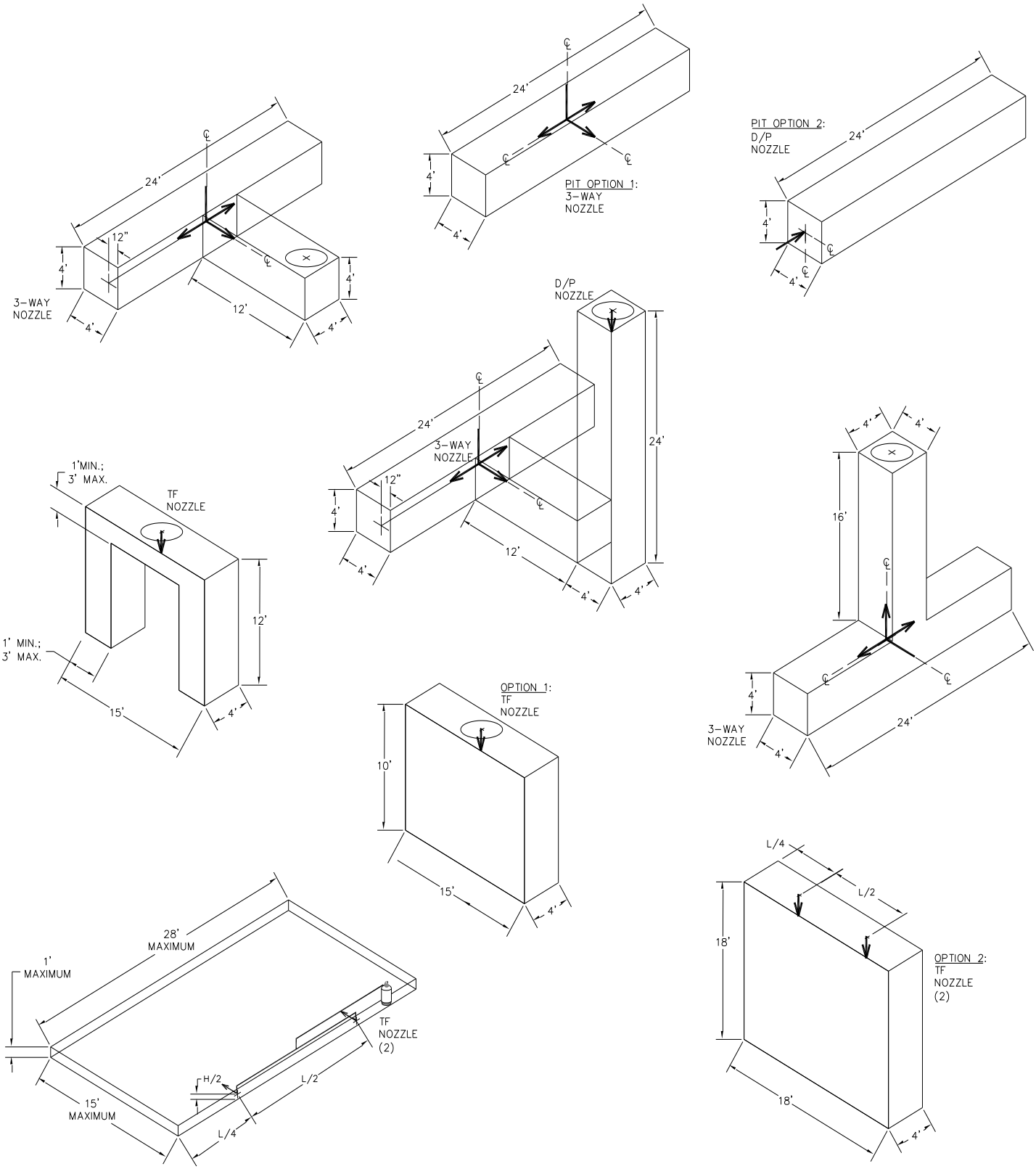
Module Perimeter Work Area, VPSB, IS45ABC, Two TFP Nozzles				
	Pipe Size, in	Maximum Length, ft	Maximum # of Elbows	# of Tees Allowed
Cylinder to T1	1	36	4	1
T1 to Nozzle	1	10	2	0
Total 1” Pipe	--	56	--	--
The maximum nozzle height above the agent cylinder is 20 feet.				

3A.4.2 Plenum Coverage, VPSB

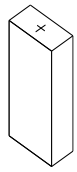
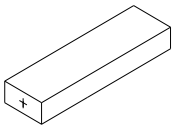
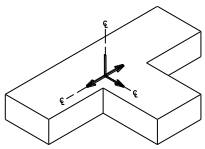
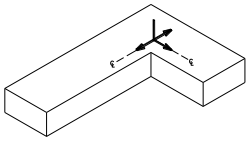
3A.4.2.1 Standard Plenum Coverage, VPSB

Plenum Type	Nozzle Used	Dimensions Per Nozzle L x W x H	Maximum Specifications	Nozzle Location	Nozzle Offset*	Nozzle Orientation
Backdraft (Option 1) 	TF	4’ x 15’ x 10’	Volume = 600ft^3 Area = 60ft^2 Side = 15’	12” x 12” Square, Centered at Ceiling	0” to 6”	Vertical, Pointing Downward
Backdraft (Option 2) 	TF	4’ x 9’ x 18’	Volume = 648ft^3 Area = 36ft^2 Side = 9’	12” x 12” Square, Centered at Ceiling	0” to 6”	Vertical, Pointing Downward
Pantleg 	TF	4’ x 15’ x 12’ (Pantleg width dimensions: 1’ minimum to 3’ maximum)	Volume = 720ft^3 Area = 60ft^2 Side = 15’	12” x 12” Square, Centered at Ceiling	0” to 6”	Vertical, Pointing Downward
Pit (Option 1) 	3-Way	24’ x 4’ x 4’	Volume = 384ft^3 Area = 96ft^2 Side = 24’	Centered, Length, Width, and Height of Plenum	0” to 6”	Vertical, Pointing Downward; Two Opposite Side Holes Parallel to Longest Side
Pit (Option 2) 	D/P	24’ x 4’ x 4’	Volume = 384ft^3 Area = 96ft^2 Side = 24’	End, Centered	0” to 6”	Horizontal
Pit with Tunnel (Option 1) 	3-Way	Pit: 24’ x 4’ x 4’ (Nozzle No Further Than 12’ From Either Pit End.) Tunnel: 12’ x 4’ x 4’	Volume = 576ft^3 Area = 144ft^2 Side = 24’	Centered, Vertically; Centered, Length of Pit; 12” From Start of Tunnel	½ Pit Height	Vertical, Pointing Downward; Each Side Hole Aligned Parallel with Pit and Tunnel Sections
Downdraft, Side Exhaust With Vertical Transition 	3-Way	Plenum: 24’ x 4’ x’ 4’ (Nozzle no Further Than 12’ From Either End of Plenum.) Transition: 4’ x 4’ x 16’ tall	Volume = 640ft^3 Area = 96ft^2 Side = 24’	Centered, Length of Plenum; Centered, Width of Plenum; Centered, Height of Plenum	--	Horizontal, Each Side Hole Aligned Parallel with Plenum and Transition Sections
Under Floor 	TF	14’ x 15’ x 1’	Volume = 210ft^3 Area = 210ft^2 Side = 15’	Side-Entry; Centered, Vertically; Centered, Lengthwise (±6”)	0” to 6”	Horizontal
*Nozzle Offset is the maximum distance from the tip of the nozzle to the nearest edge of the protected zone.						

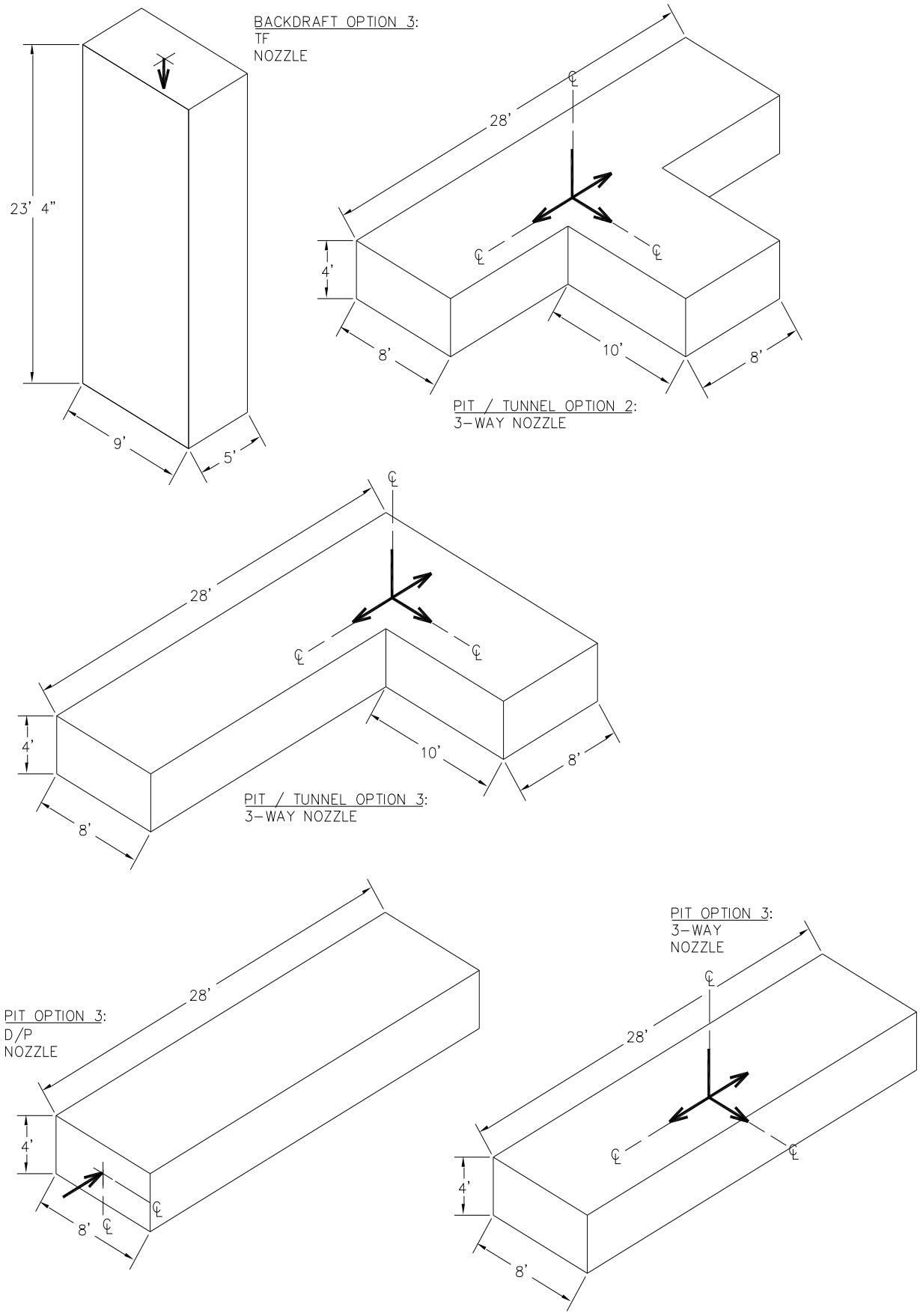
3A.4.2.1 Standard Plenum Coverage, VPSB (continued)



3A.4.2.2 Expanded Plenum Coverage, VPSB

Plenum Type	Nozzle Used	Dimensions Per Nozzle L x W x H	Maximum Specifications	Nozzle Location	Nozzle Offset*	Nozzle Orientation
Backdraft (Option 3) 	TF (See pages 22 and 37)	5 x 9 x 23'4"	Vol. = 1050ft^2 Area = 45ft^2 Side = 9'	12" x 12" Square, Centered at Ceiling	0" to 6"	Vertical, Pointing Downward
Pit (Option 3) 	D/P	28' x 8' x 4'	Volume = 896ft^3 Area = 224ft^2 Side = 28'	End, Centered	0" to 6"	Horizontal
Pit with Tunnel (Option 2) 	3-Way	Pit: 28' x 8' x 4' Tunnel: 10' x 8' x 4'	Volume = 1,216ft^3 Area = 304ft^2 Side = 28'	Centered, Vertically; Centered, Width of Pit; Centered, Width of Tunnel	½ Pit Height	Vertical, Pointing Downward; Each Side Hole Aligned Parallel with Pit and Tunnel Sections
Pit with Tunnel (Option 3) 	3-Way	Pit: 28' x 8' x 4' Tunnel: 10' x 8' x 4'	Volume = 1,216ft^3 Area = 304ft^2 Side = 28'	Centered Vertically; Centered, Width of Pit; Centered Width of Tunnel	½ Pit Height	Vertical, Pointing Downward; Each Side Hole Aligned Parallel with Pit and Tunnel Sections
*Nozzle Offset is the maximum distance from the tip of the nozzle to the nearest edge of the protected zone.						

3A.4.2.2 Expanded Plenum Coverage, VPSB (continued)



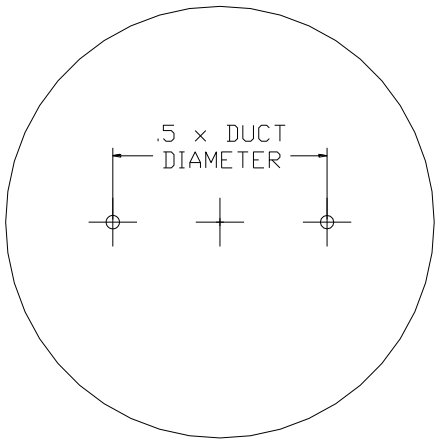
3A.4.3 Duct Coverage, VPSB

The D/P Nozzle will protect either round or rectangular ducts up to 28 feet in length. Any change in duct direction or additional length requires an additional D/P nozzle. The duct nozzle must be centered at the duct entrance, pointed in the direction of air flow. The tip of the duct nozzle must be within 6" of the duct entrance.

Round Ducts

Maximum Diameter, Single Nozzle = 46 Inches
Maximum Diameter, Two Nozzles = 52 Inches
(nozzle spacing: .5 x duct diameter, located on the same plane)

Spacing for two nozzles, protecting a duct diameter larger than 46", up to 52" maximum

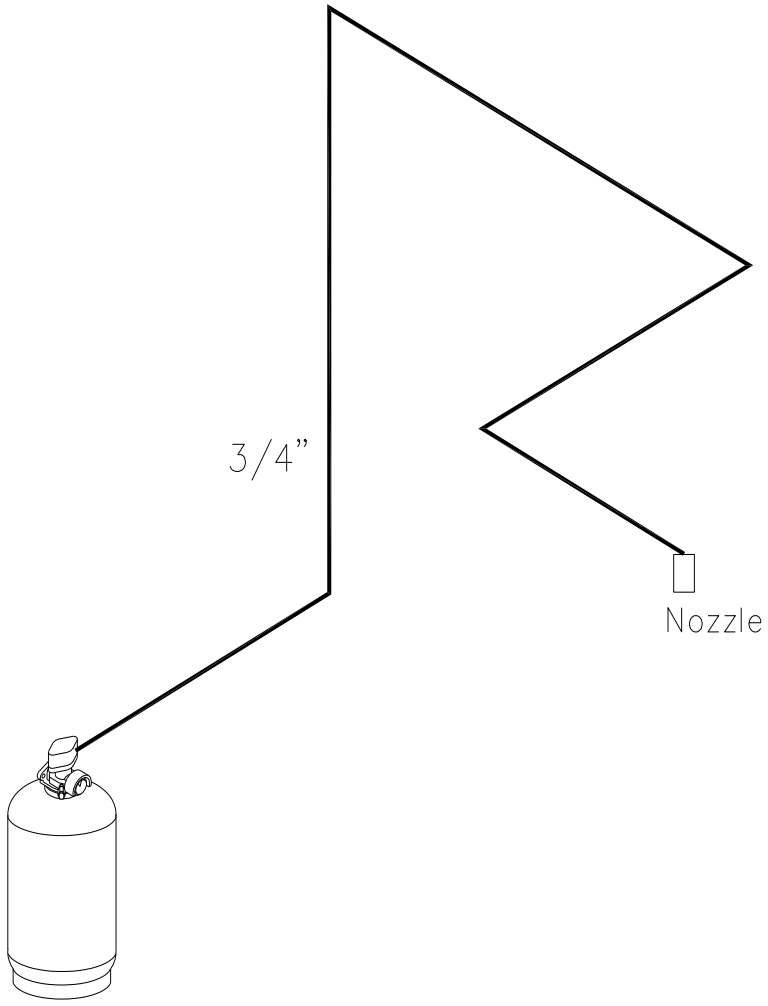


Rectangular Ducts

The following table shows sample maximum rectangular dimensions, based on the following two requirements:
Maximum Perimeter = 144.5 Inches
Maximum Diagonal = 46 Inches

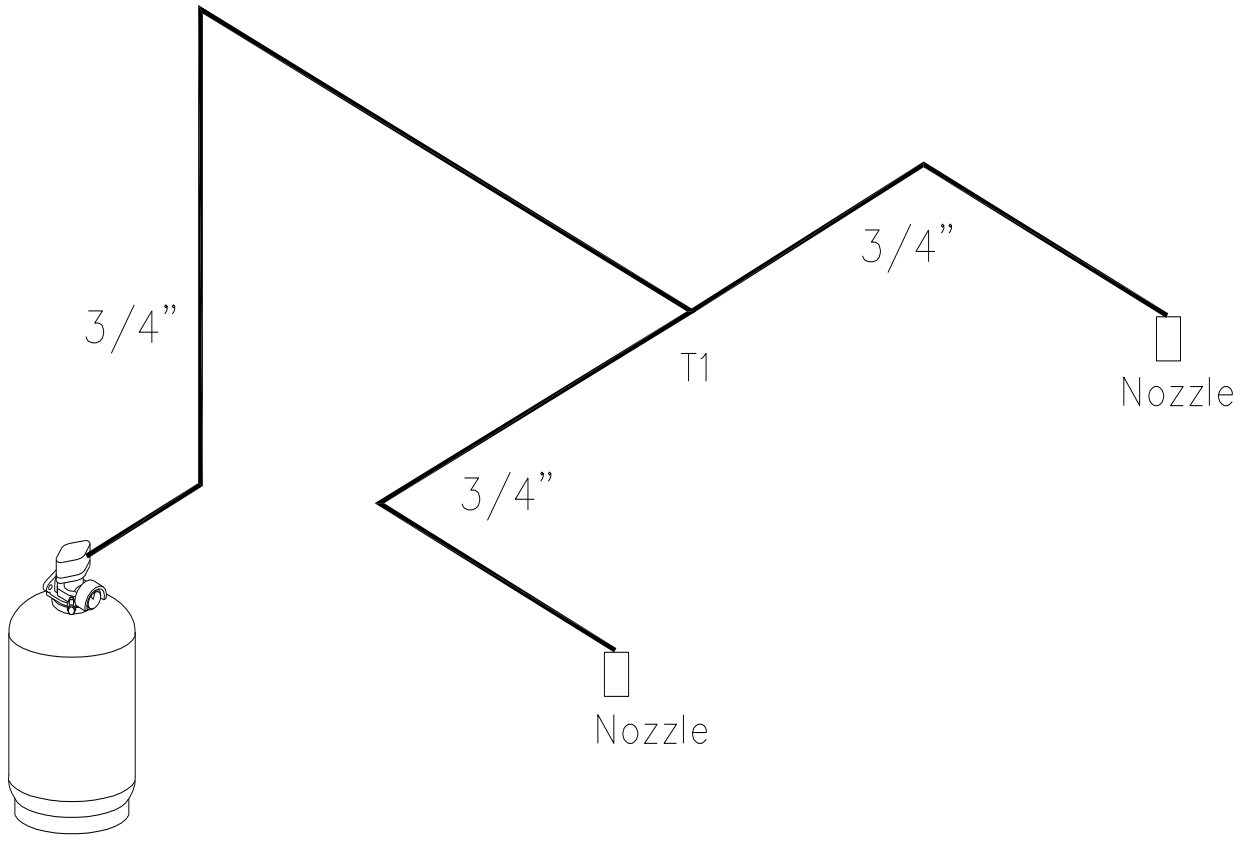
Rectangular Ducts	
Side 1, Inches	Side 2, Inches, Maximum
12	44.4
14	43.8
16	43.1
18	42.3
20	41.4
22	40.4
24	39.2
26	37.9
28	36.5
30	34.8
32	33.0
32.5	32.5
34	31.0
36	28.6
38	25.9
40	22.7
42	18.7
44	13.4

3A.4.4 Piping Limitations, Plenum and Duct, VPSB



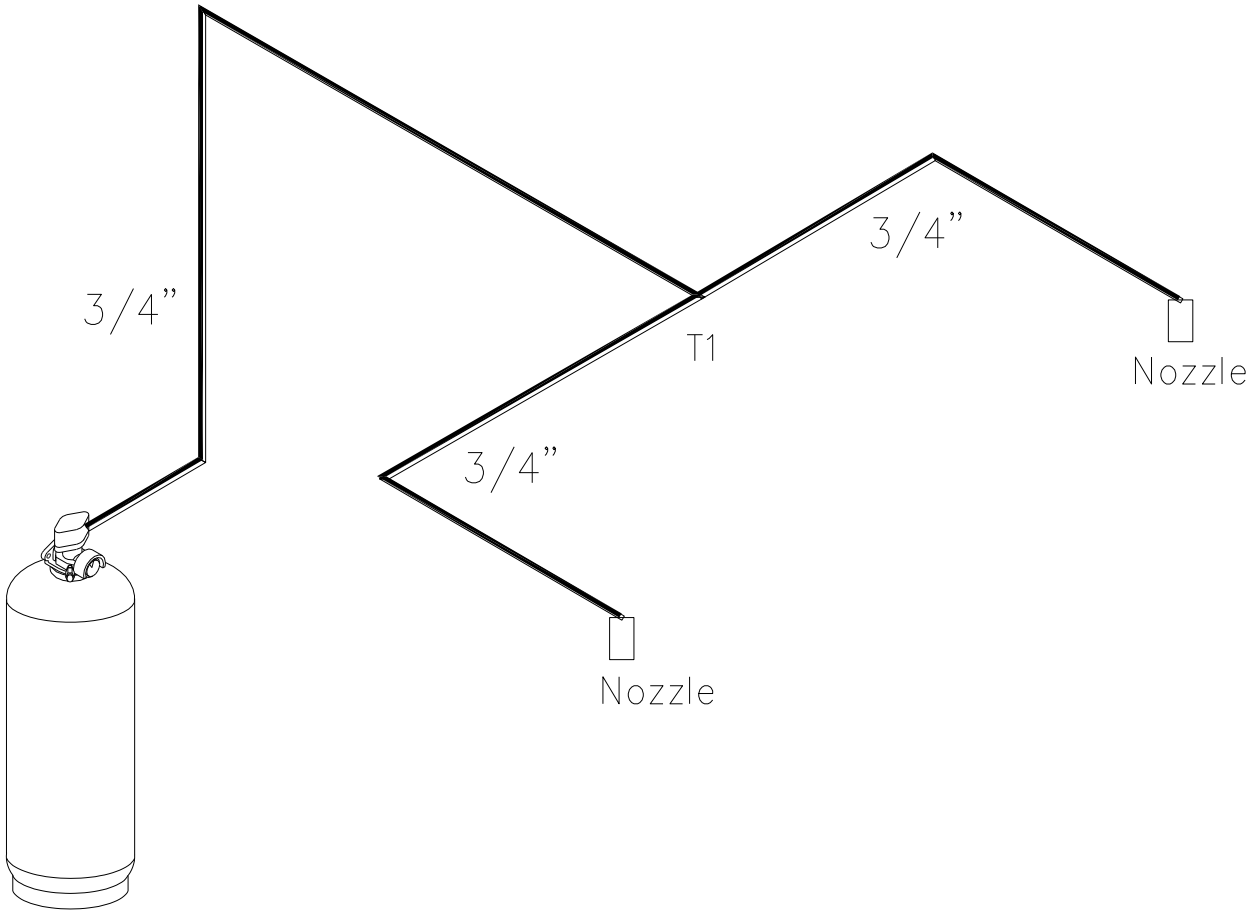
Vehicle Paint Spray Booths DUCT, STANDARD, or EXPANDED Plenum Coverages, IS18ABC, Single Nozzle						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS18ABC	1	D/P or 3-WAY	Cylinder to Nozzle	¾	40	5
The maximum elevation of the D/P or 3-way nozzle above cylinder is 23’4”.						

3A.4.4 Piping Limitations, Plenum and Duct, VPSB (continued)



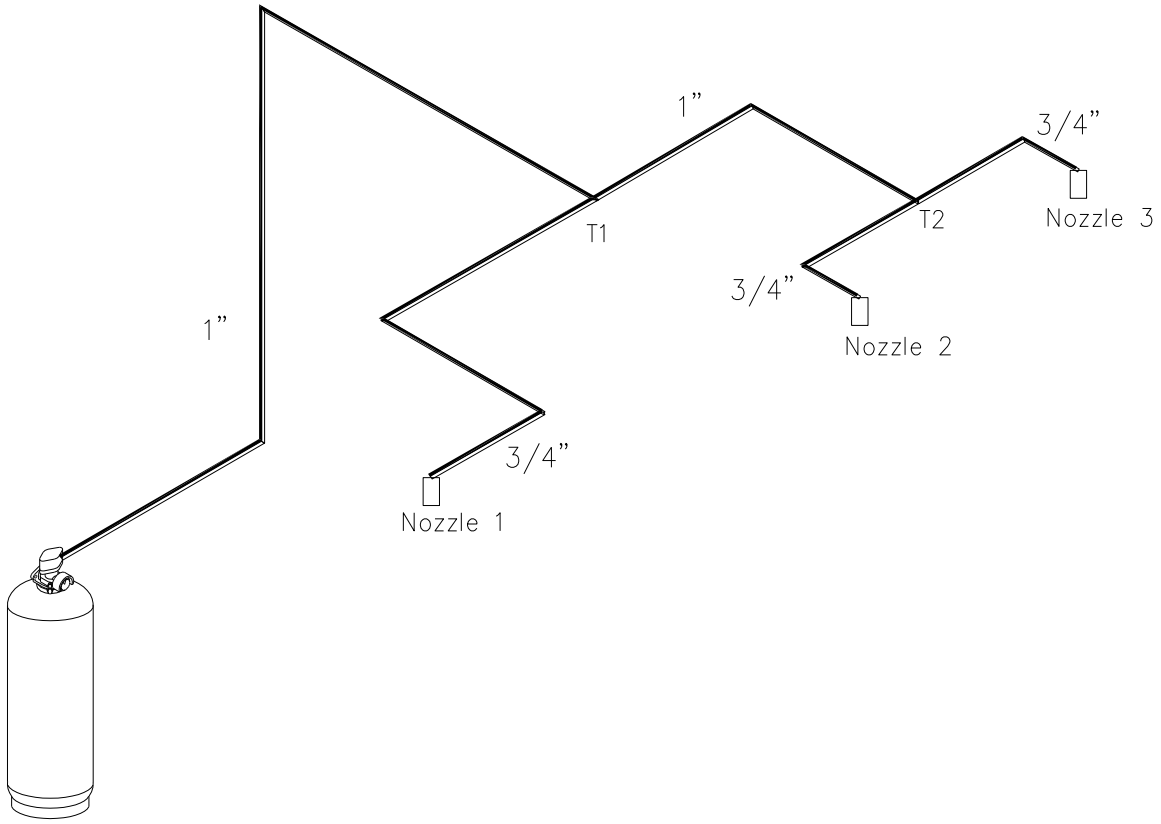
Vehicle Paint Spray Booths, DUCT and STANDARD Plenum Coverages, IS18ABC, Two Nozzles						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS18ABC	2	Any of the following combinations: - one 3-Way and one D/P; - two D/P’s; - two TF’s; - one TF and one D/P	Cylinder to T1	¾	36	4
			T1 to Nozzle	¾	16	3
The maximum elevation of the D/P, TF and 3-way nozzles above cylinder is 23’4”.						

3A.4.4 Piping Limitations, Plenum and Duct, VPSB (continued)



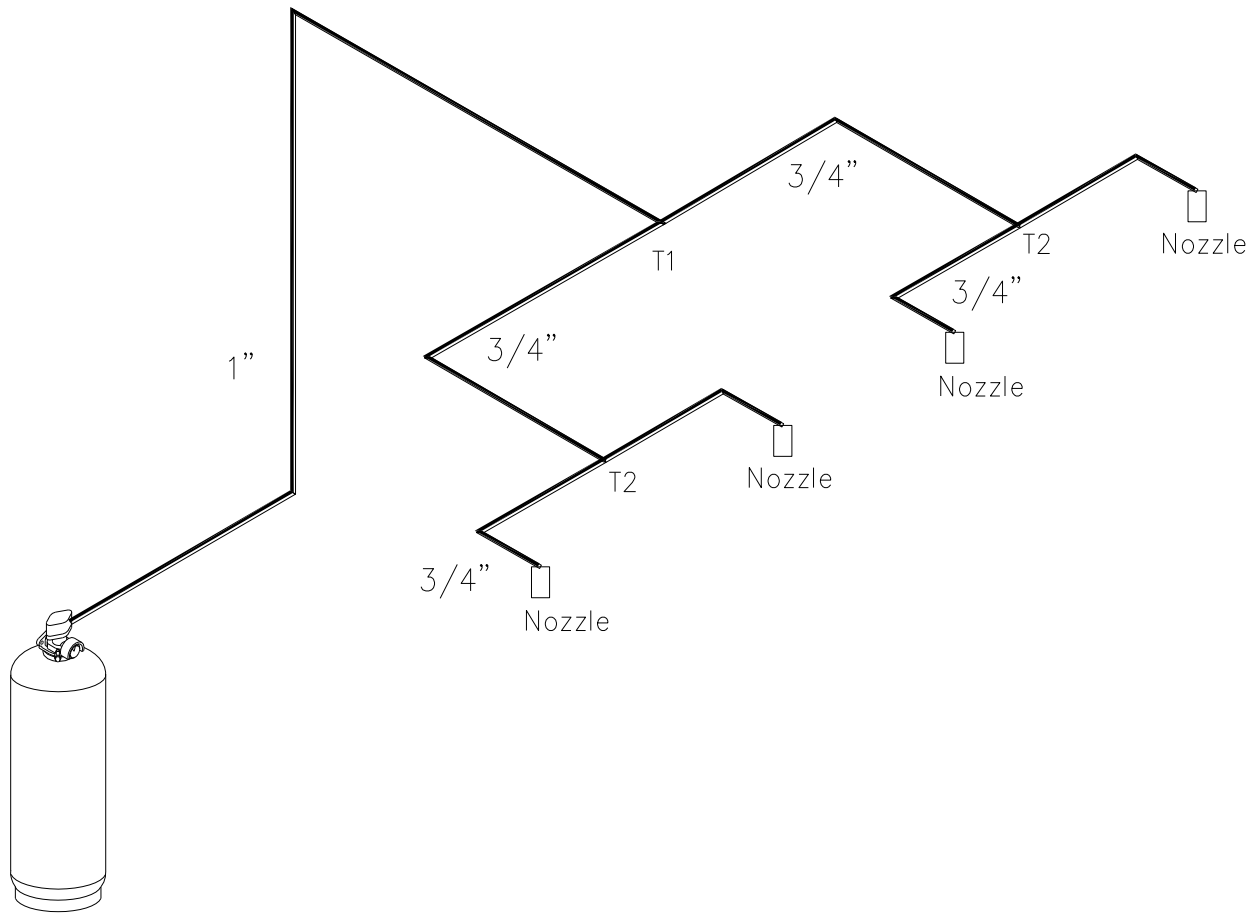
Vehicle Paint Spray Booths, DUCT, STANDARD or EXPANDED Plenum Coverages, IS35ABC, Two Nozzles						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS35ABC	2	Either of the following combinations: - one 3-Way and one D/P; - two D/P’s; - two 3-Way’s;	Cylinder to T1	¾	36	4
			T1 to Nozzle	¾	16	3
The maximum elevation of the D/P, TF and 3-way nozzles above cylinder is 23’4”.						

3A.4.4 Piping Limitations, Plenum and Duct, VPSB (continued)



Vehicle Paint Spray Booths DUCT and STANDARD Plenum Coverages, IS35ABC, Three Nozzles						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS35ABC	3	Any of the following four combinations: -N1: 3-Way -N2 / N3: D/P **or** -N1: D/P -N2 / N3: TF **or** -N1 / N2 / N3: D/P **or** -N1 / N3: D/P -N2: TF	Cylinder to T1	1	12	3
			T1 to T2	1	8	2
			T1 to N1	¾	14	3
			T2 to N2/N3	¾	8	3
The maximum elevation of the D/P, TF and 3-way nozzles above cylinder is 23'4".						

3A.4.4 Piping Limitations, Plenum and Duct, VPSB (continued)



Vehicle Paint Spray Booths DUCT and STANDARD Plenum Coverages, IS35ABC, (NOT FOR WORK AREA), Four Nozzles						
Cylinder Size	Nozzle Quantitiy	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS35ABC	4	- two TF's and two D/P's - four TF's - four D/P's	Cylinder to T1	1	30	4
			T1 to T2	¾	9	2
			T2 to Nozzle	¾	9	2
The maximum elevation of the D/P and TF nozzles above cylinder is 23'4".						

3A.5 Open Front Paint Spray Booths (OFPSB)

The Amerex Open Front Paint Spray Booth Fire Suppression System is of the pre-engineered type as defined by the NFPA Standard for Dry Chemical Extinguishing Systems, NFPA 17 and the Standard for Spray Application Using Flammable or Combustible Materials, NFPA 33. The extinguishing systems described in this manual are intended to be installed, maintained, and serviced in accordance with NFPA 17 and NFPA 33. The Amerex Open Front Paint Spray Booth System has been evaluated by Underwriters Laboratories (UL) in accordance with the specific test protocol found in the UL1254 Standard (Pre-engineered Dry Chemical System Units). **Although NFPA 33 (Chapter 9) permits Dry Chemical Systems to protect dry powder and electrostatic liquid spray booths under certain criteria, Amerex prohibits installation of the IS system in such booths.**

Open Front Paint Spray Booths come in a variety of dimensions, but only one basic configuration. The basic volumes of an Open Front Paint Spray Booth to be protected by the Amerex System consists of three main components. They are:

Work Area - Where the part or equipment is painted with possibly flammable or combustible material (i.e. paints, finishes, lacquers, etc.). The Work Area is open on the front, but enclosed on the sides and top, with a filter bank at the back.
Plenum – Exhaust chamber at the rear of the Work Area. Plenums utilize filters to trap overspray particles that escape from the Work Area. Air is drawn in through the front of the booth, across the Work Area, and back through the Plenum.
Duct - Fan-powered air channel that draws air through the Work Area, the Plenum, and finally out through the Duct.

It is not necessary to shut the exhaust fan down upon system discharge; however, check with the authority having jurisdiction. It is the responsibility of the installer to properly identify the configuration of the booth and to follow the requirements of this manual in order to achieve proper fire suppression.

CAUTION:
NFPA 33 Standard for Spray Application Using Flammable and Combustible Materials classifies the interior sections of paint spray booths, and certain areas adjacent to booth openings, as Class-I or Class-II, Division–2 Locations. Electrical components of an Industrial Dry Chemical System, such as thermostats located within these areas shall be rated for use in classified areas, and all wiring to these components shall conform to the provisions of NFPA 70, National Electrical Code, for Class –I or Class-II, Division-2 Locations. Any Industrial System Control Head with a Microswitch is not suitable for use in a classified area.

Nozzles:	P/N:	Application:
TF	16172	Work Area; Plenum
SCR	16192	Screening the opening of the Work Area
D/P	16190	Exhaust Duct

Cylinders:
The Model IS18ABC and IS35ABC are used for Open Front Paint Spray Booth applications in various configurations.

Temperature Range:
The operating temperature range for Open Front Paint Spray Booth applications is -20°F to 120°F (-29°C to 49°C) for booths up to 12 feet high. The operating temperature is 0°F to 120°F (-18°C to 49°C) for booths above 12 feet high to booths 18 feet 6 inches high .

Piping Requirements:
Piping diagrams include limitations on pipe length and fittings. System piping must be balanced. Balanced piping is that in which the difference between the shortest actual pipe length from ***any*** ¾" tee to nozzle and the longest actual pipe length from any ¾" tee to nozzle does not exceed 10% of the longest actual pipe length from any ¾" tee to

3A.5 Open Front Paint Spray Booths (OFPSB) (continued)

nozzle. Piping runs from the 1" tee to each of the ¾" tees must be equal in length. The number and type of fittings for all tee to nozzle sections must be equal.

All piping must be Schedule 40, hot-dipped galvanized steel pipe, and all fittings must be 150 lb. class, minimum. Examples of acceptable fitting materials include hot-dipped galvanized malleable iron, ductile iron, or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter. Note: Black steel pipe and fittings can be used in relatively noncorrosive atmospheres.

3A.5.1 Open Front Paint Spray Booths (OFPSB) Nozzle Coverages

Work Area and Plenums:

The Amerex Industrial System is flexible enough to protect a wide variety of Open Front Booth dimensions. The maximum parameters for each Module are given in the following table:

Protection	Nozzle Used	Dimensions Per Nozzle L x W x H	Maximum Specifications	Nozzle Location within Protection Zone	Nozzle Offset*	Nozzle Orientation
Screening	SCR	-- 8' x 18'6"	Side = 8'	Length-At Front Edge Width-Center	0" to 6"	Vertical, Pointing downward; nozzle holes parallel with booth front
Work Area	TF	8' x 8' x 18'6"	Area = 64 ft.^{2} Side = 8'	Length-Center Width-Center	0" to 6"	Vertical, Pointing Downward
Plenum	TF	4' x 8' x 18'6"	Volume = 384ft.^{3} Area = 32ft.^{2} Side = 8'	Length-Center Width-Center	0" to 6"	Vertical, Pointing Downward
*Nozzle Offset is the maximum distance from the tip of the nozzle to the nearest edge of the protected zone.						

3A.5.1 Open Front Paint Spray Booths (OFPSB) Nozzle Coverages (continued)

Ducts:
The D/P Nozzle will protect either round or rectangular ducts up to 28 feet in length. Any change in duct direction or additional length requires an additional D/P nozzle. The duct nozzle must be centered at the duct entrance, pointed in the direction of air flow.

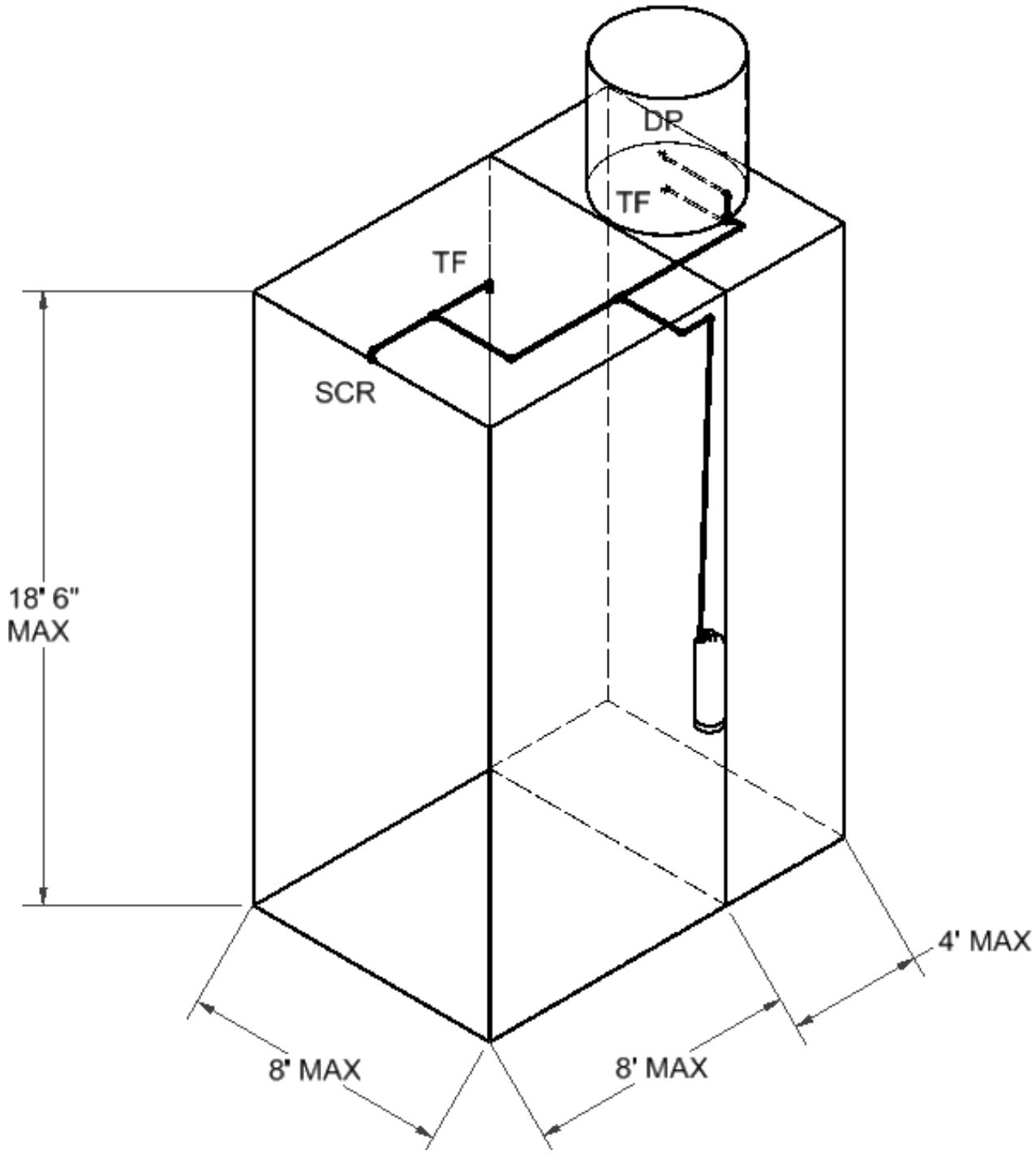
Round Ducts
Maximum Diameter = 46 Inches

Rectangular Ducts
The following table shows sample maximum rectangular dimensions, based on the following two requirements:
Maximum Perimeter = 144.5 Inches
Maximum Diagonal = 46 Inches

Rectangular Ducts	
Side 1, Inches	Side 2, Inches, Maximum
12	44.4
14	43.8
16	43.1
18	42.3
20	41.4
22	40.4
24	39.2
26	37.9
28	36.5
30	34.8
32	33.0
32.5	32.5
34	31.0
36	28.6
38	25.9
40	22.7
42	18.7
44	13.4

3A.5.1 Open Front Paint Spray Booths (OFPSB) Nozzle Coverages (continued)

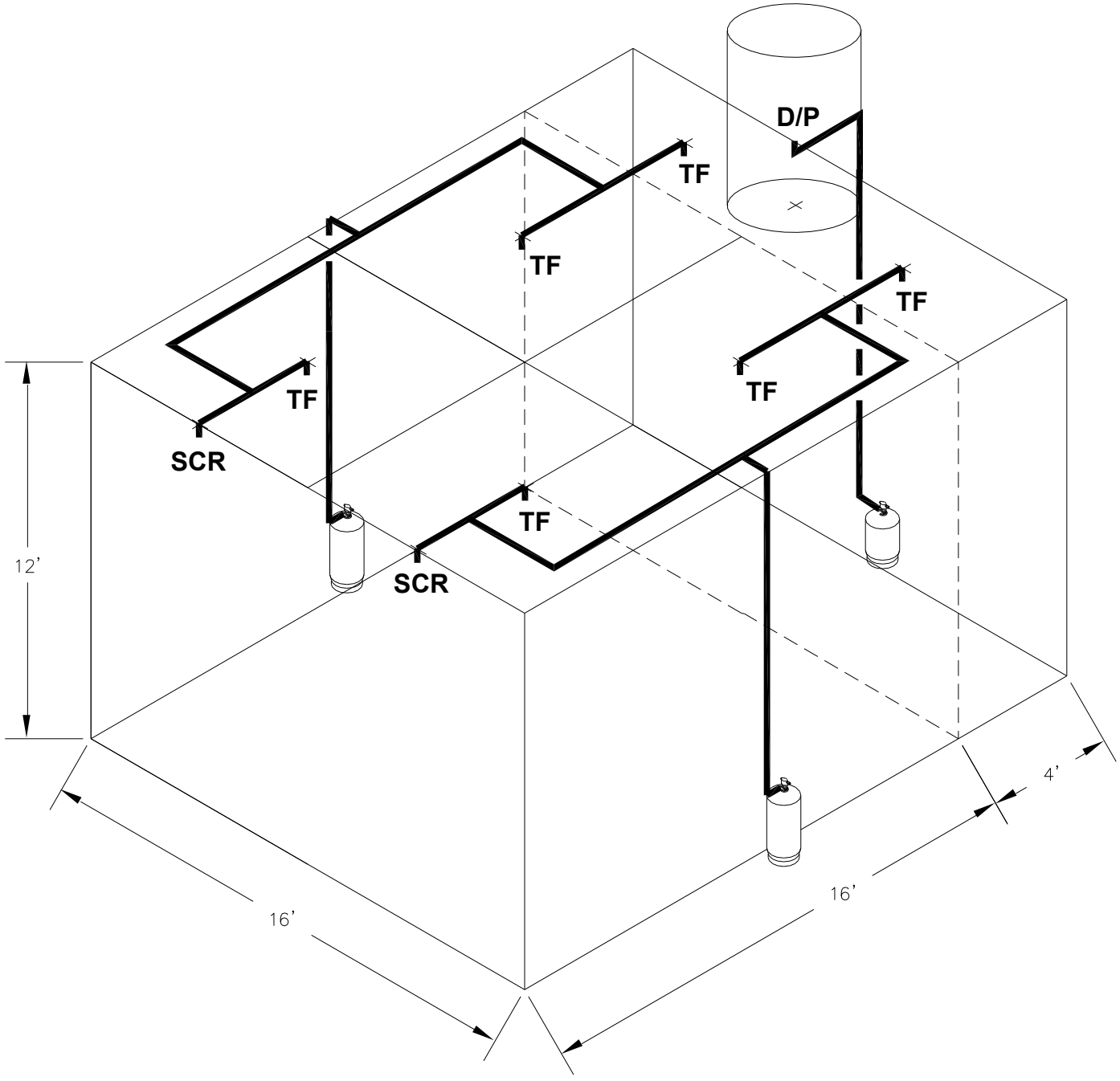
The following are the maximum dimensions of an Open Front Booth protected with a single IS35ABC. The network consists of SCR, WA (TF), Plenum (TF), and Duct (D/P) nozzles.



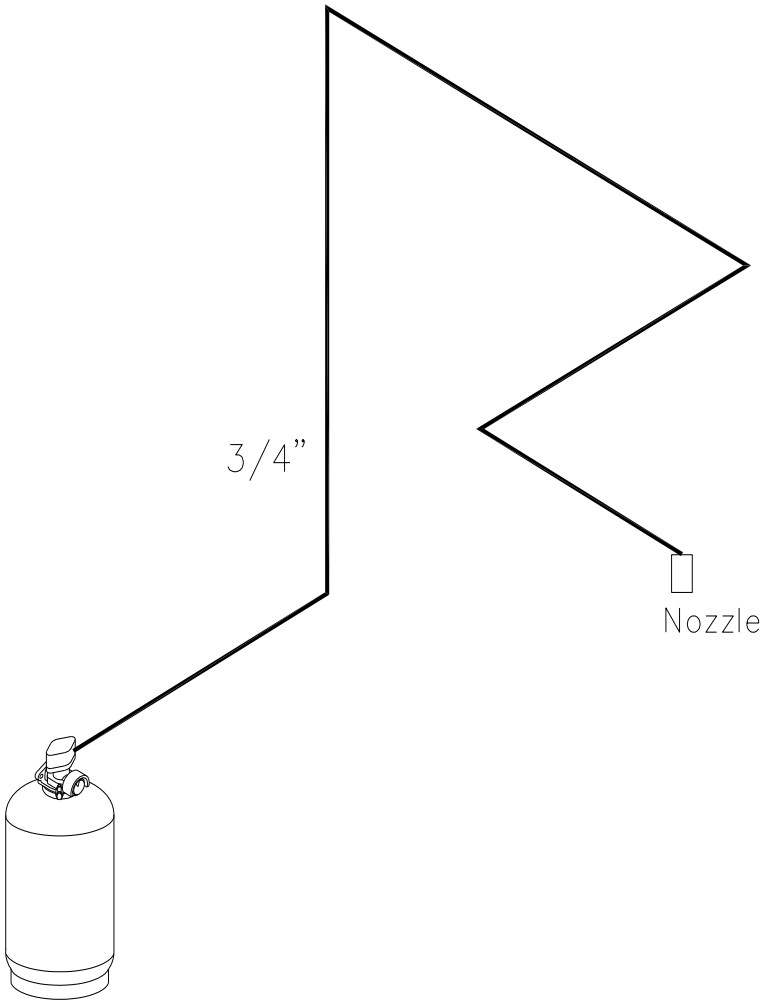
3A.5.1 Open Front Paint Spray Booths (OFPSB) Nozzle Coverages (continued)

Below are the maximum dimensions of an Open Front booth utilizing two IS35ABC cylinders and an IS18ABC. The two IS35ABC's each support an SCR Nozzle, two Work Area Nozzles (TF), and a Plenum Nozzle (TF). The single IS18ABC is used for either one or two Duct Nozzles (D/P); one D/P is shown.

This example illustrates that by utilizing multiple IS35ABC cylinders, the coverage of the booth can be expanded in 8 foot width increments. Examples: a 24' wide by 16' deep Work Area (with 4' deep Plenum) is covered with three IS35ABC cylinders. Likewise, a 32' wide by 16' deep Work Area (with 4' deep Plenum) is covered with four IS35ABC cylinders. Duct protection would be covered with separate cylinders, in both cases.

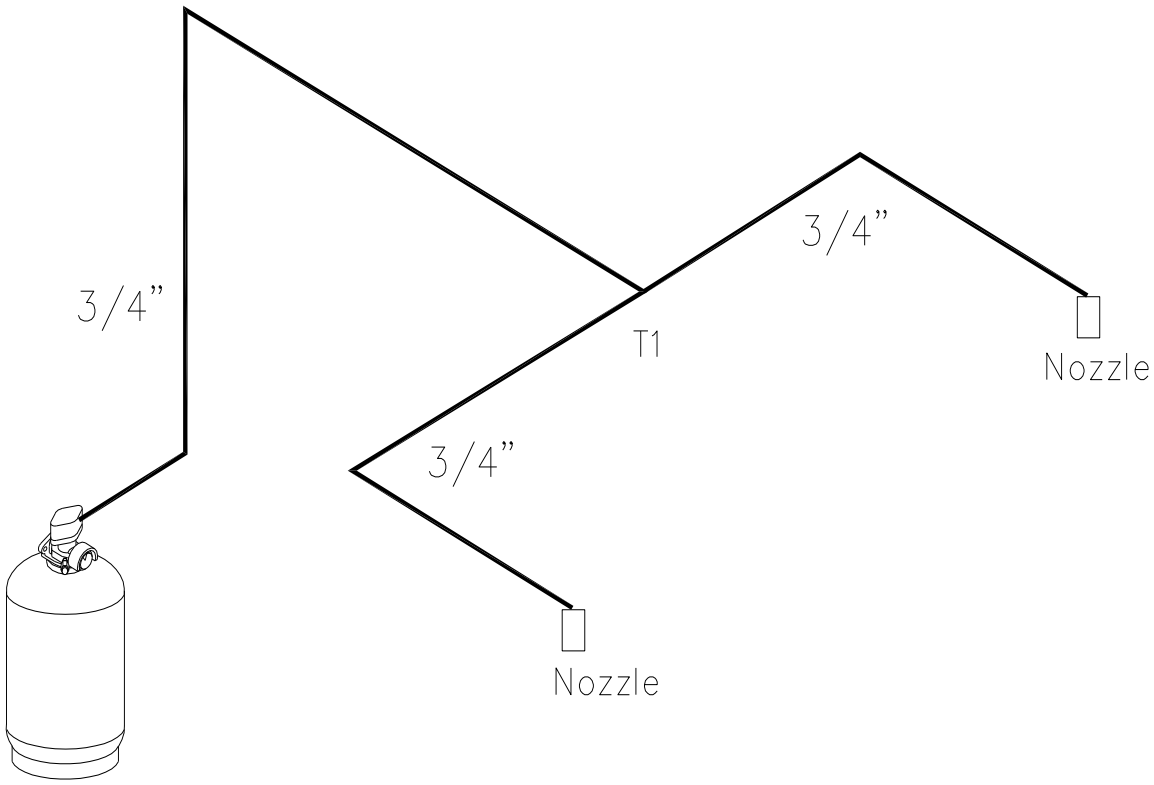


3A.5.2 Piping Limitations, Open Front Paint Spray Booths (OFPSB)



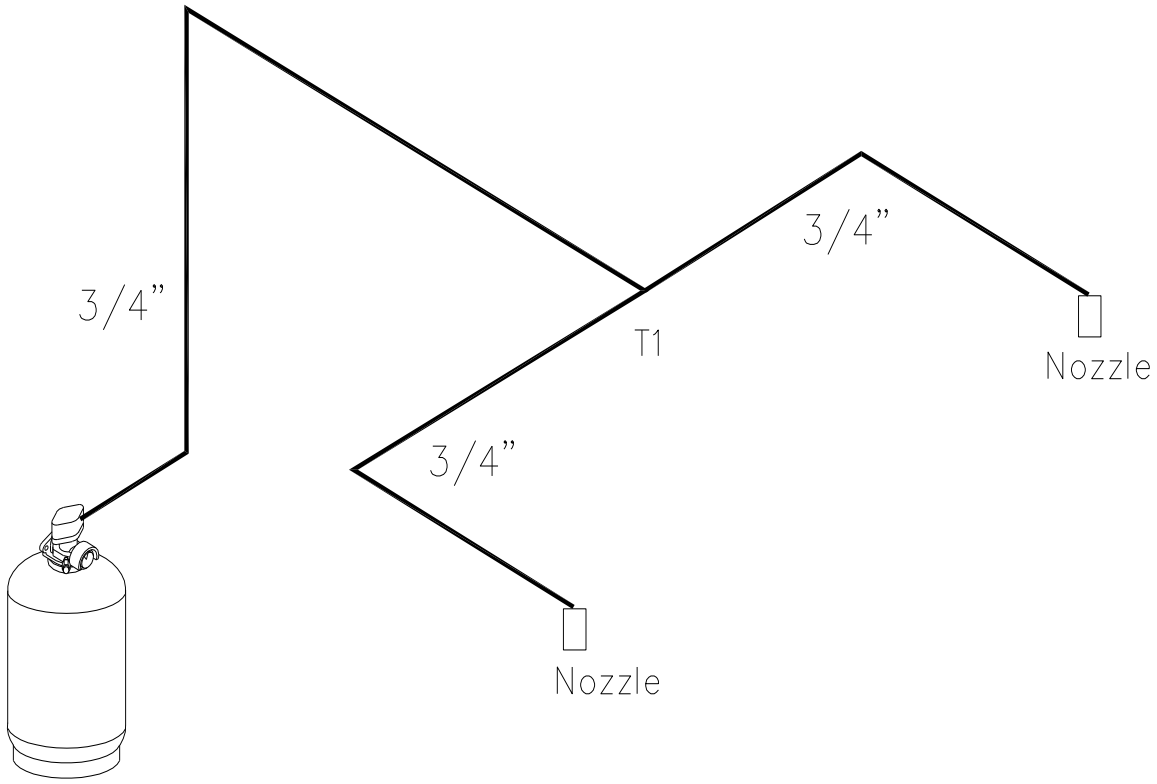
Open Front Paint Spray Booths DUCT Coverages, IS18ABC, Single Nozzle						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS18ABC	1	D/P	Cylinder to Nozzle	¾	40	5
The maximum elevation of any D/P nozzle above cylinder is 23’4”.						

3A.5.2 Piping Limitations, Open Front Paint Spray Booths (OFPSB) (continued)



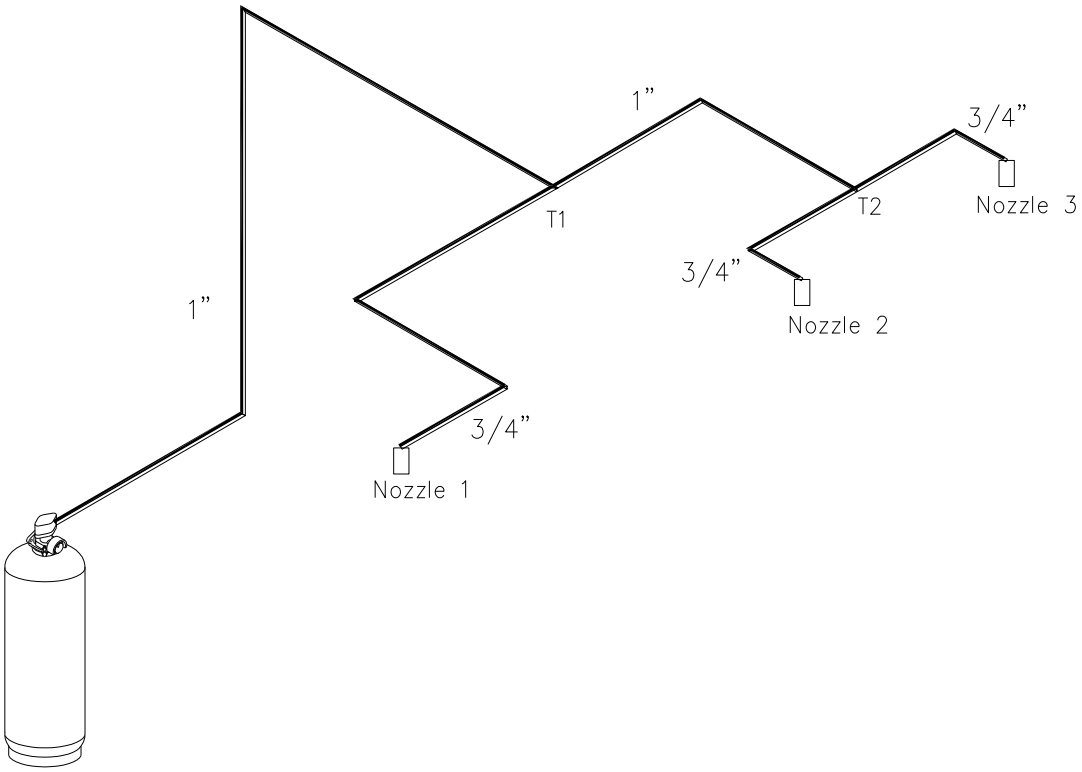
Open Front Paint Spray Booths, SCREEN and WORK AREA Coverages, IS18ABC, Two Nozzles						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS18ABC	2	Either of the following combinations: -Two SCR nozzles; -Two TF nozzles	Cylinder to T1	¾	22	3
			T1 to Nozzle	¾	5	2
The maximum nozzle elevation above cylinder is 12 feet						

3A.5.2 Piping Limitations, Open Front Paint Spray Booths (OFPSB) (continued)



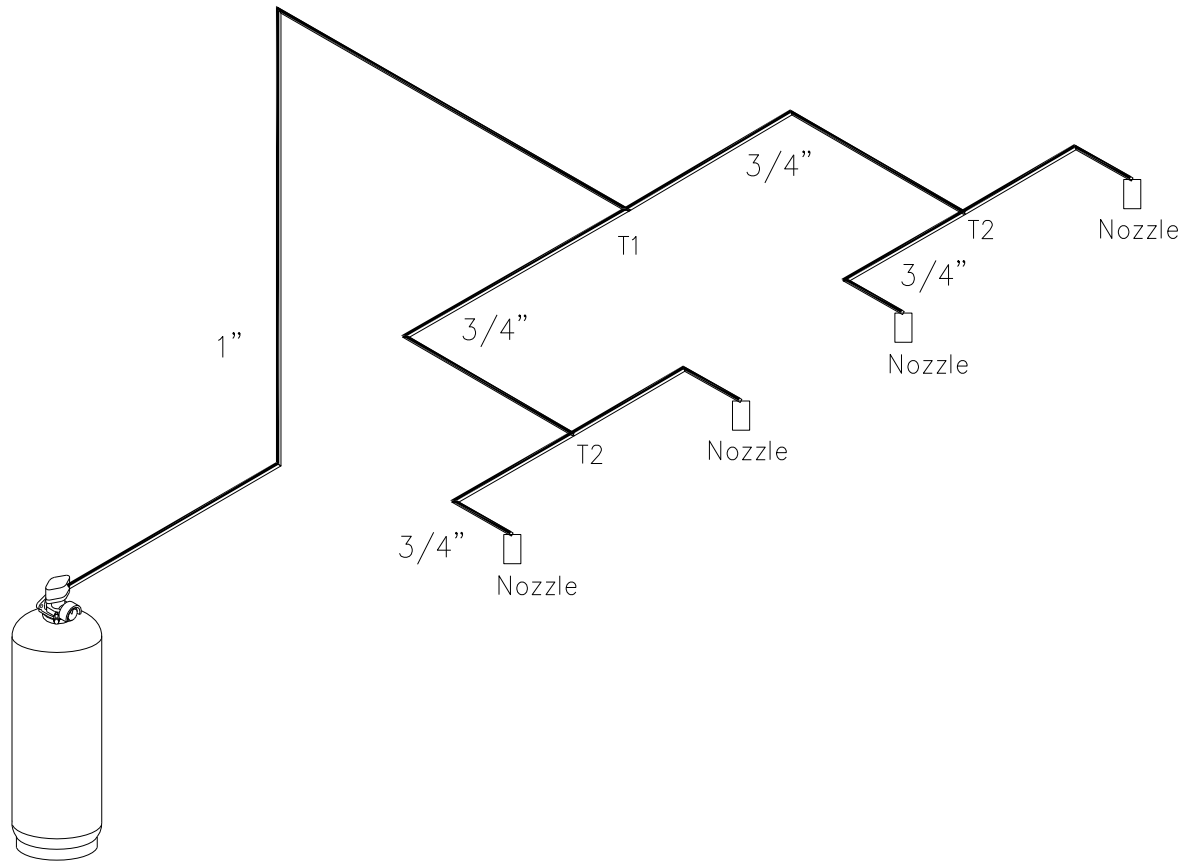
Open Front Paint Spray Booths, DUCT Coverages, IS18ABC, Two Nozzles						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS18ABC	2	D/P	Cylinder to T1	¾	36	4
			T1 to Nozzle	¾	16	3
The maximum elevation of any D/P nozzle above cylinder is 23’4”.						

3A.5.2 Piping Limitations, Open Front Paint Spray Booths (OFPSB) (continued)



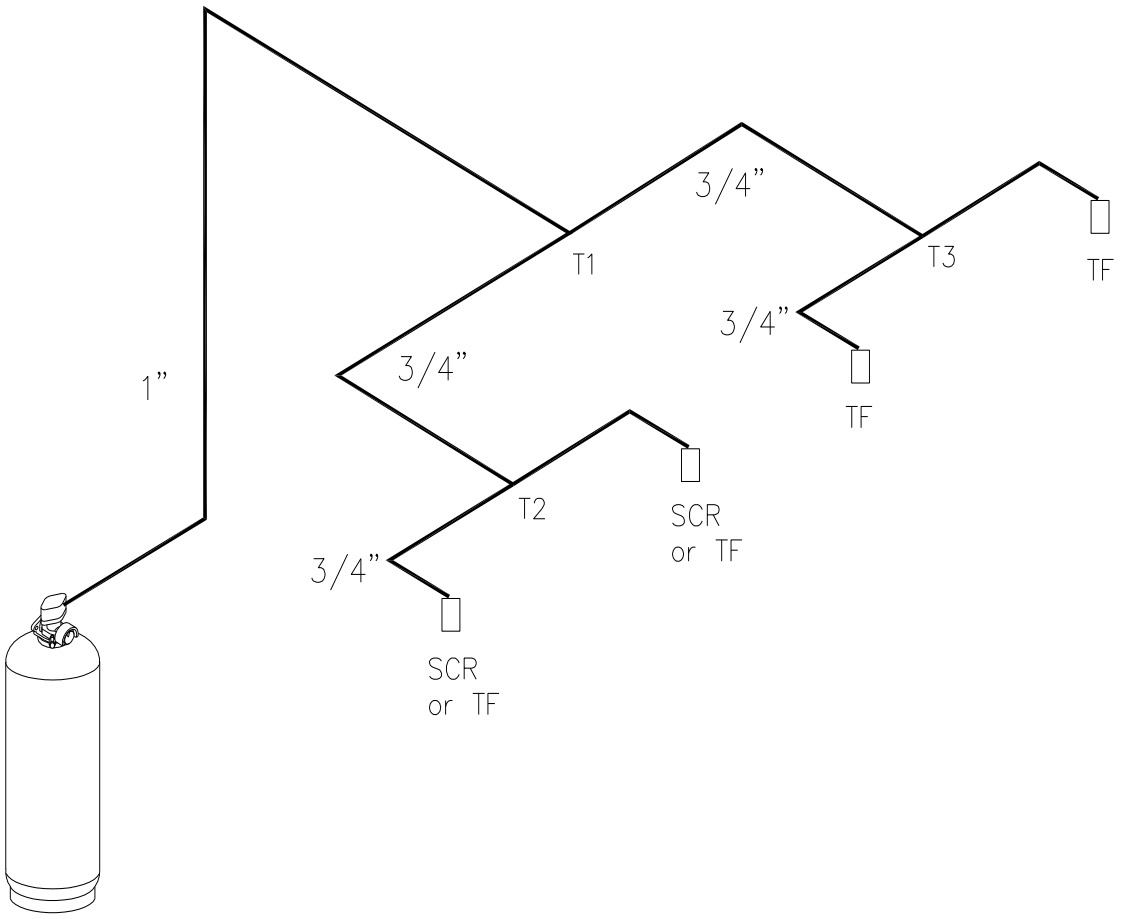
Open Front Paint Spray Booths, SCREEN, WORK AREA, PLENUM, and DUCT Coverages, IS35ABC, Three Nozzles						
Cylinder Size	Nozzle Qty.	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS35ABC	3	Any of the following three combinations: -N1: D/P -N2 / N3: TF **or** -N1: TF -N2: SCR -N3: TF **or** -N1 / N2 / N3: TF	Cylinder to T1	1	20	3
			T1 to T2	1	8	2
			T1 to N1	¾	14	3
			T2 to N2/N3	¾	8	2
The maximum nozzle elevation above cylinder is 12 feet.						

3A.5.2 Piping Limitations, Open Front Paint Spray Booths (OFPSB) (continued)



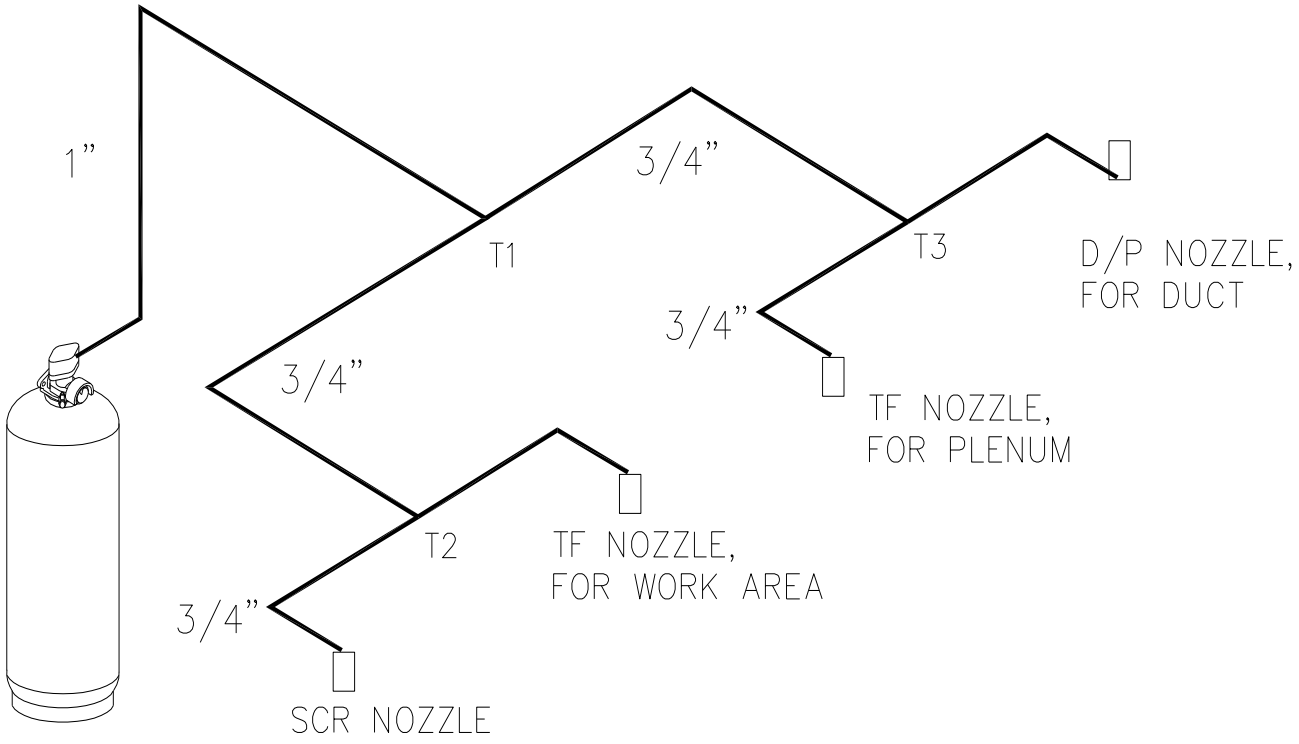
Open Front Paint Spray Booths, DUCT Coverages, IS35ABC, Four Nozzles						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS35ABC	4	D/P	Cylinder to T1	1	30	4
			T1 to T2	¾	9	2
			T2 to Nozzle	¾	9	2
The maximum elevation of any D/P nozzle above cylinder is 23'4".						

3A.5.2 Piping Limitations, Open Front Paint Spray Booths (OFPSB) (continued)



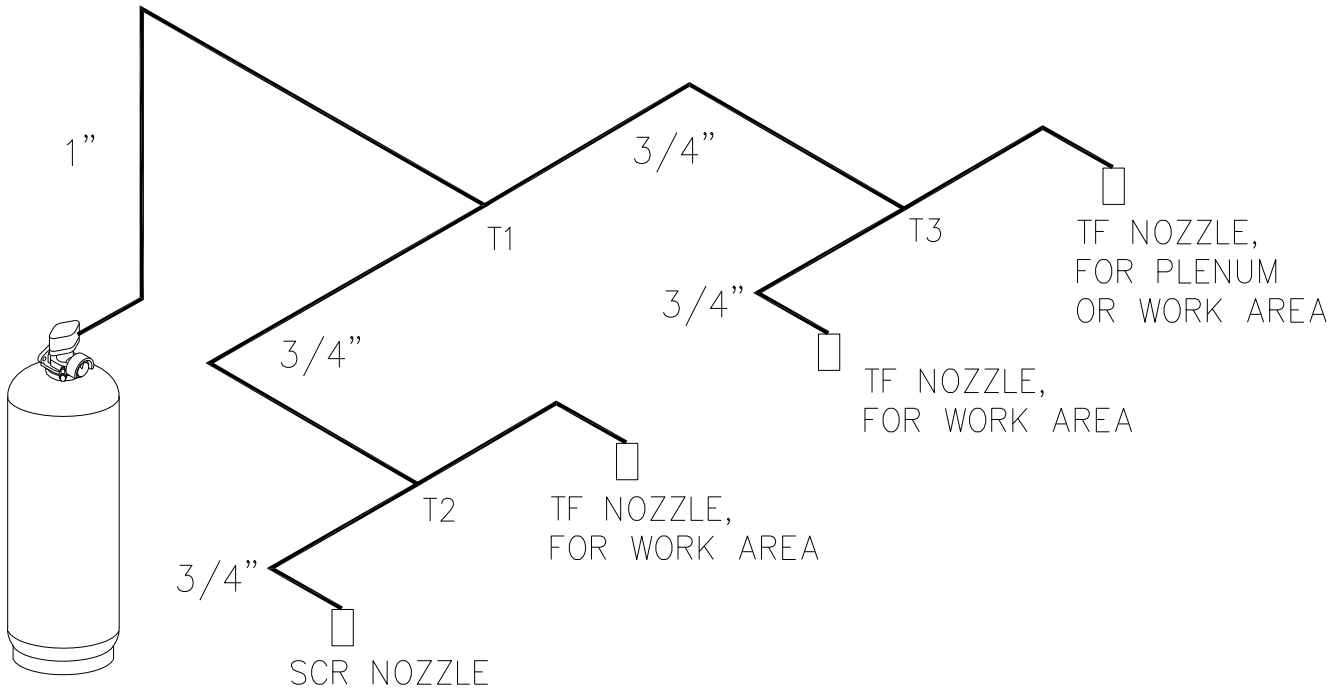
Open Front Paint Spray Booths, SCREEN and WORK AREA Coverages, IS35ABC, Four Nozzles						
Cylinder Size	Nozzle Qty.	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS35ABC	4	Either of the following combinations: Two SCR Nozzles and Two TF Nozzles **or** Four TF Nozzles	Cylinder to T1	1	20	4
			T1 to T2	¾	5	1
			T2 to Nozzle	¾	5	2
The maximum nozzle elevation above cylinder is 12’						

3A.5.2 Piping Limitations, Open Front Paint Spray Booths (OFPSB) (continued)



Open Front Paint Spray Booth, IS35ABC, Four Nozzles, With Duct Protection						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS35ABC	4		Cylinder to T1	1	22	4
			T1 to T2/T3	¾	10	1
		SCR	T2 to SCR	¾	8	2
		TF	T2 to TF (Work Area)	¾	8	2
		TF	T3 to TF (Plenum)	¾	8	2
		D/P	T3 to D/P (Duct)	¾	10	3
The maximum elevation of any D/P nozzle above cylinder is 23'4". The maximum elevation of the remaining nozzles is 12 feet above cylinder.						

3A.5.2 Piping Limitations, Open Front Paint Spray Booths (OFPSB) (continued)



Open Front Paint Spray Booth, IS35ABC, Four Nozzles, Independent Duct Protection						
Cylinder Size	Nozzle Quantity	Nozzle Type	Piping Section	Pipe Size, in.	Maximum Length, ft.	Maximum # of Elbows
IS35ABC	4		Cylinder to T1	1	22	4
			T1 to T2/T3	¾	10	1
		SCR	T2 to SCR	¾	8	2
		TF	T2 to TF (Work Area)	¾	8	2
		TF	T3 to TF (Work Area)	¾	8	2
		TF	T3 to TF (Plenum or Work Area)	¾	8	2
The maximum nozzle elevation above cylinder is 12 feet.						

CHAPTER 3, SYSTEM DESIGN
Section B: Hardware Selection and Limitations

Those individuals responsible for the design of the Amerex Industrial Dry Chemical System must be trained by Amerex and hold a current Amerex Certificate.

1. Detection Network, MRM Installations:

Optimum Fire Suppression System performance depends on proper Detection Network design. This section discusses the type of Detectors used, their selection, placement and design limitations.

The Amerex Industrial Fire Suppression System uses a continuous cable, Corner Pulleys, Detector Bracket, Detector Linkage, Fusible Links, Conduit Offset, and a Terminal Link Connector for the Detection Network.

The quantity of detectors to be used in an MRM system will depend on the ceiling area and height. Fusible Links of the metal-alloy type (**P/N 12326**,**12327**, **12328**, and **12329**) can be spaced every 10 feet for smooth ceilings up to 12 feet high. The Job Quick Response Links (**P/N 16225**, **16226**, and **16227**) can be spaced every 20 feet for smooth ceilings up to 12 feet high. A detector is required at the interface of the duct and plenum, as well as downstream of any obstruction (such as a damper) or ignition source (such as a fan). Consult NFPA 72 for reductions in spacing for ceiling heights in excess of 12 feet, and for spacing guidelines when different arrangements are encountered.

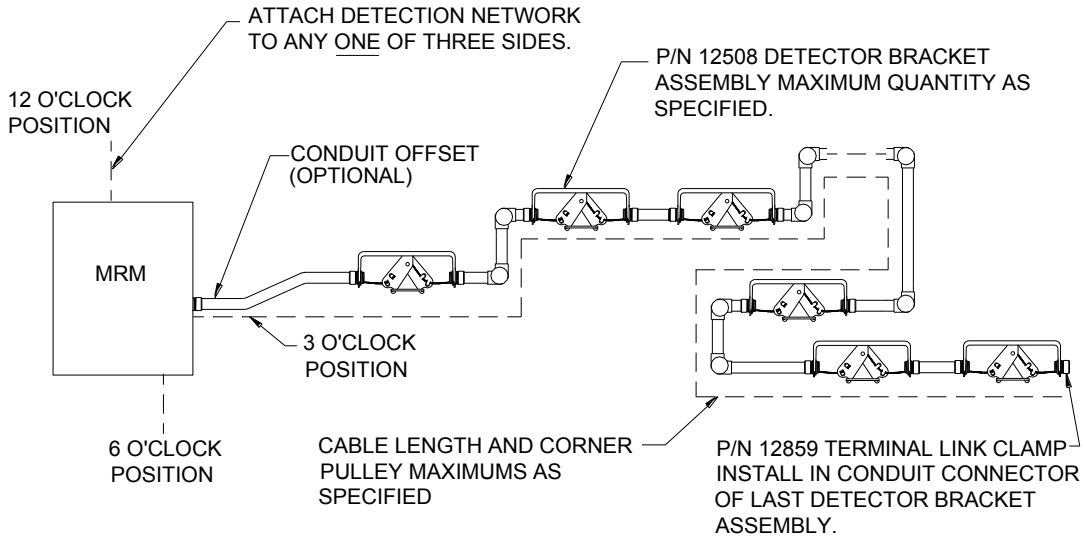
Note: Standard Response Fusible Links are **NOT** recommended for use in Paint Spray Booths because of their slow reaction time. For this reason, Amerex recommends either the Job Quick Response Links, or the Electric Thermal Detectors (see section on ERM Detection Networks). However, Standard Response Fusible Links may be used if permitted by the authority having jurisdiction.

Fusible Link Detectors are required in all hazard areas protected by the Amerex Industrial Fire Suppression Systems for automatic system operation. The adaptation of Fusible Links to the Mechanical Release Module is described in Chapter 4. A temperature survey must be performed to determine the maximum ambient temperature of the hazard survey. The selection of the Fusible Links should be made according to the temperature measured:

Temperature Measured	Link Rated Temperature	Fusible Link Part Number
70° to 150°F (21° to 65°C)	212°F (100°C)	12326
151° to 225°F (66° to 107°C)	280°F (138°C)	12327
226° to 300°F (108° to 149°C)	360°F (182°C)	12328
301° to 375°F (150° to 191°C)	450°F (232°C)	12329
376°F (192° C) and above	Consult Factory	Consult Factory

Temperature Measured	Link Rated Temperature	Job Link Part Number
70° to 150°F (21° to 65°C)	200°F (93°C) Quick Response	16225
151° to 225°F (66° to 107°C)	286°F (141°C) Quick Response	16226
226° to 300°F (108° to 149°C)	360°F (182°C) Quick Response	16227

General Limitations of Detection Network:
Maximum of 30 Corner Pulleys, **P/N 12309**.
Maximum of 30 Detectors **P/N's 12326, 12327, 12328, 12329, 16225, 16226, 16227**; any combination.
Maximum of 200 feet of cable, **P/N 12553**, on the Detection Network.
No Pulley Tees are allowed on Detection Network.
No Remote Manual Pulls are allowed on Detection Network.
Maximum of 1 Conduit Offset, **P/N 12507** (must be located at Mechanical Release Module, if needed).



2. Detection Network, ERM/ECH Installations:

The Electrical Release Module (ERM) and Electronic Control Head (ECH) uses four-wire, rate of rise Thermal Detectors as the system initiating device. The advantages over fusible link systems are that the response time is faster, and the device is resettable. Refer to Design and Installation Manual, **P/N 15827**, for more information on the ERM.

CAUTION:

It is likely that industrial applications involving FLAMMABLE or COMBUSTIBLE liquids will be enclosed within or surrounded by areas that will be classified as CLASS I or CLASS II, DIVISION 1 or DIVISION 2 locations. Dry chemical system electrical components, such as thermostats, located within these areas shall be rated for use in classified areas, and all wiring to these components shall conform to the provisions of NFPA 70, National Electrical Code, for CLASS I or CLASS II, DIVISION 1 or 2 locations. Any industrial system Control Head with a microswitch is not suitable for use in a classified area.

In order to minimize delays in thermostat response, it is imperative that a temperature survey be performed at all locations where thermostats will be installed. The survey must be conducted under maximum operating conditions to determine the peak temperatures that are expected to be reached. Readings should taken with and without airflow. Once this information is established, select a detector with a set point between approximately 75 and 100°F HIGHER than the maximum expected temperature for that particular mounting location. The probe of the detector should be mounted so that it will be exposed to escaping hot gases, in the event of a fire. The following are the Thermal Detectors utilized with the ERM Control Panel:

Temperature Rating		Part Number
°F	°C	
190	88	16194
194	90	16236
225	107	16195
325	163	16196

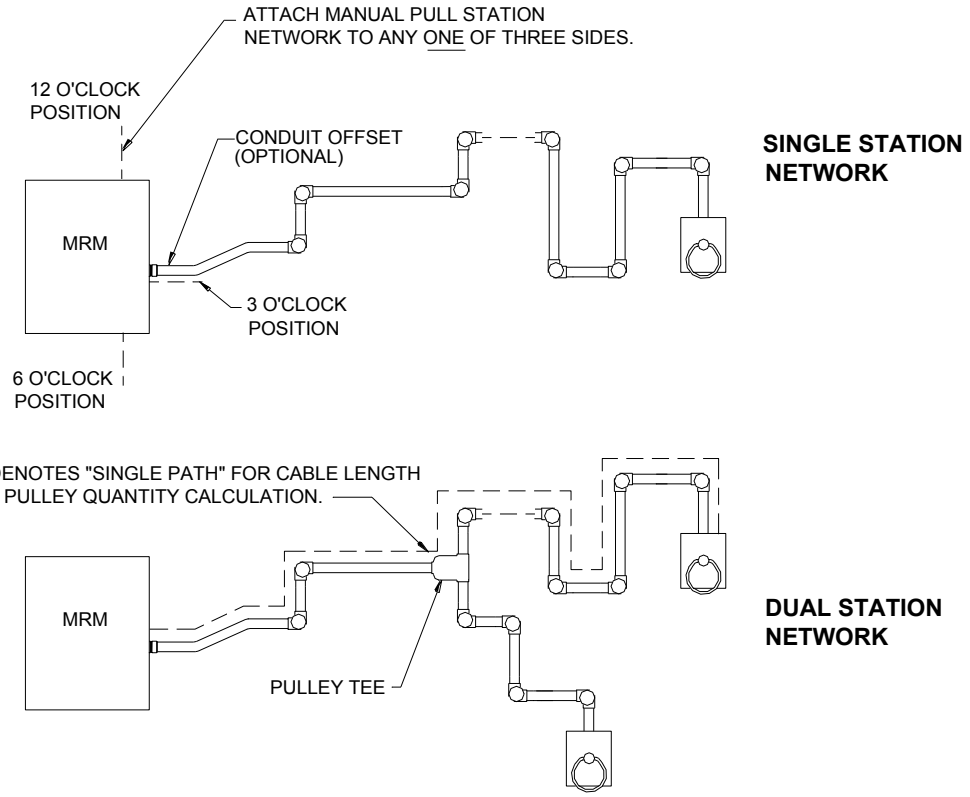
The quantity of detectors to be used in a system will depend on the ceiling area and height. The maximum number of detectors that can be used for a given system is 400. Detectors can be spaced every 20 feet for smooth ceilings up to 12 feet high. A detector is required at the interface of the duct and plenum, as well as downstream of any obstruction (such as a damper) or ignition source (such as a fan). Consult NFPA 72 for reductions in spacing for ceiling heights in excess of 12 feet, and for spacing guidelines when different arrangements are encountered.

3. Manual Pull Station Network, MRM Installations:

Every Amerex Industrial Fire Suppression System installation must have at least one Manual Pull Station. The Manual Pull Station Network consists of Cable, Corner Pulleys, Pulley Tee, Manual Pull Station(s) and one Conduit Offset.

General Limitations of Manual Pull Station Network:
Maximum of 20 Corner Pulleys, **P/N 12309**, per Manual Pull Station.
Maximum of 130 feet of Cable, **P/N 12553**, per Manual Pull Station.
Maximum of 1 Pulley Tee, **P/N 12506**, per network (counts as one Corner Pulley for each Manual Pull Station).
Maximum of 1 Conduit Offset, **P/N 12507**, per network (must be attached to the MRM and before the Pulley Tee when chosen).

Note:
Manual Pull Stations should be installed no higher than 48 inches from the floor and must be along a path of egress. Consult the local Authority Having Jurisdiction for the final approval for Manual Pull Station quantity, location, and mounting height and other considerations prior to finalizing Manual Pull Station mounting details.



NOTE: The Manual Pull Station(s) are the only MANUAL means of activating the Amerex Industrial Fire Suppression System equipped with an MRM.

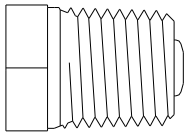
4. Manual Pull Station Network, ERM Installations:

Every Amerex Industrial Fire Suppression System installation must have at least one Manual Pull Station. The Manual (electric) Pull Station provided for use with the ERM is **part number 16169**. Multiple Pull Stations may be used on the ERM. Refer to the Design and Installation Manual, **P/N 15827**, for more information.

5. a) <u>Actuation Network Limitations, MRM Installations</u>:

The Actuation Network for the Amerex Industrial Fire Suppression System consists of installer supplied copper tubing that connects the MRM to each Pneumatic Control Head on top of each cylinder discharge valve. A single MRM is capable of actuating up to 6 Agent Cylinder Discharge Valves by discharging a single 10 in^3 nitrogen cylinder (**P/N 12856**) through the actuation network. The maximum length of copper tubing is 100 feet. If a 15 second discharge delay is required (such as with a Vehicle Paint Spray Booth), the Mechanical Time Delay (**P/N 15765)** must be used. Refer to Chapter 4 for installation instructions of the Mechanical Time Delay.

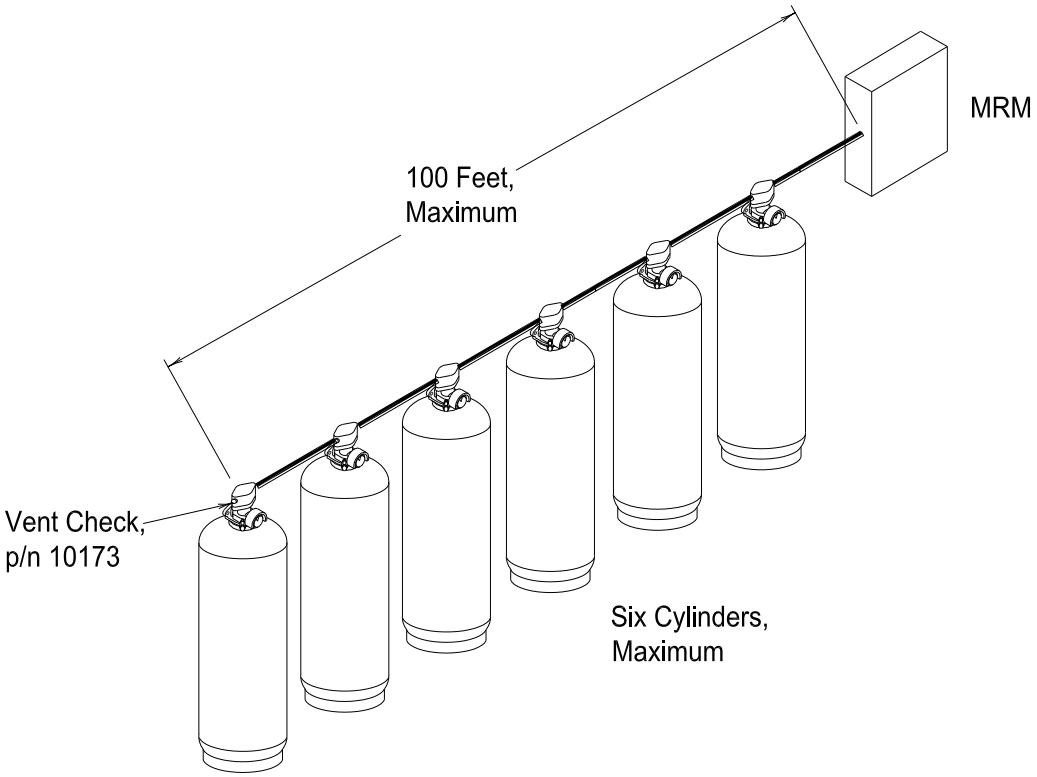
NOTE: A single vent check (**P/N 10173**) must be used on the last Pneumatic Control Head on the last Agent Cylinder. It is designed to release any slowly built up pressure from the actuation lines. This device should be accessible for pressure bleed-off after system discharge.



Limitations (Single or Multiple Cylinder Systems):

<u>Temperature Limitations for Nitrogen Actuation Cylinders</u>: -20°F to 120°F (-29°C to 49°C)

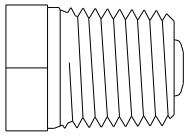
<u>Copper Tubing</u>: ¼" O.D. Refrigeration Type, with a minimum .049" wall thickness (meeting ASTM B251and B75). Use with brass or steel SAE 45° Flared Tube fittings. Maximum Total Length (including all fittings, from Mechanical Release Module to last Pneumatic Control Head) = 100 feet (30.48 meters).



5. b) <u>Actuation Network Limitations, ERM Installations</u>:

The Actuation Network for the Amerex Industrial Fire Suppression System consists of installer supplied copper tubing that connects the ERM to each Pneumatic Control Head on top of each cylinder discharge valve. A single ERM is capable of actuating up to 10 Agent Cylinder Discharge Valves by discharging a single 15 in^3 nitrogen cylinder (**P/N 09956**) through the actuation network. The maximum length of copper tubing is 100 feet. If a 15 second discharge delay is required, the ERM is capable of being programmed internally for the discharge delay. Refer to Design and Installation Manual, **P/N 15827**, for more information on the ERM.

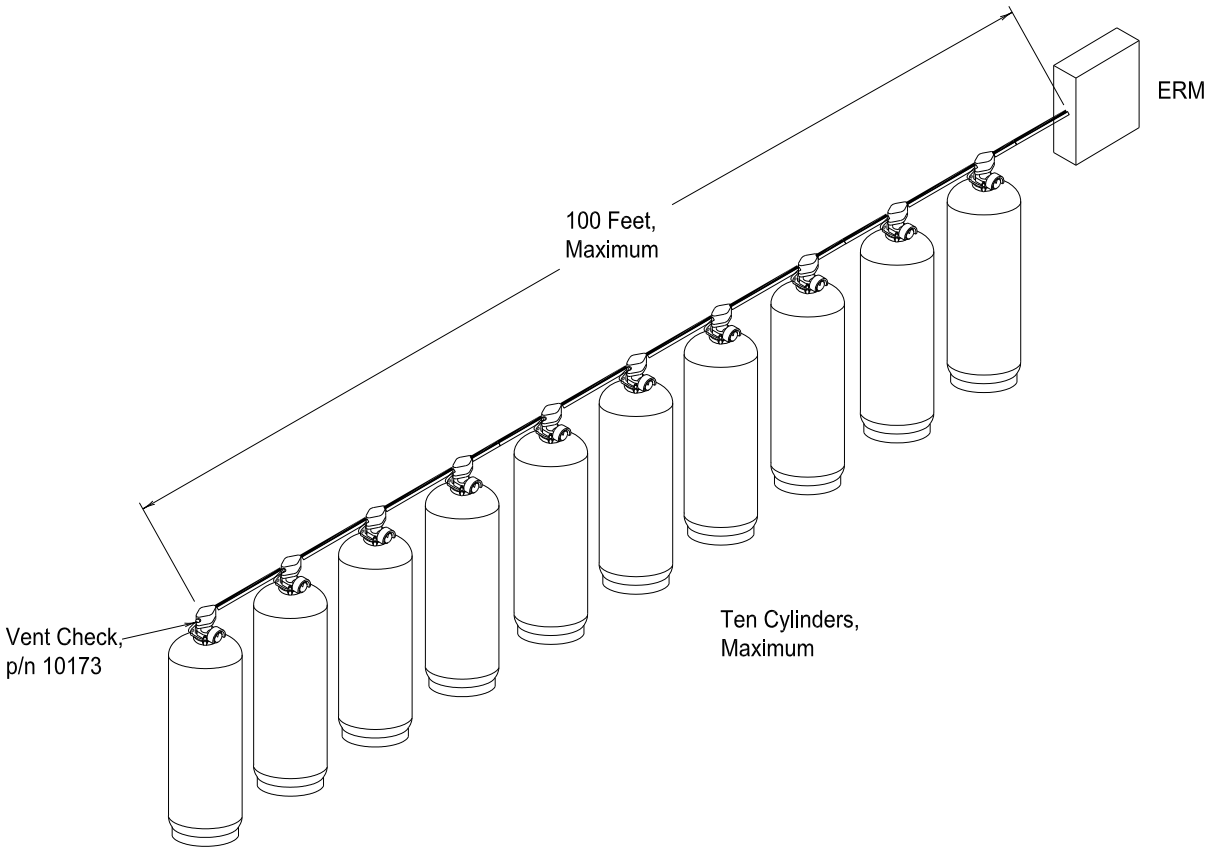
NOTE: A single vent check (**P/N 10173**) must be used on the last Pneumatic Control Head on the last Agent Cylinder. It is designed to release any slowly built up pressure from the actuation lines. This device should be accessible for pressure bleed-off after system discharge.



Limitations (Single or Multiple Cylinder Systems):

<u>Temperature Limitations for Nitrogen Actuation Cylinders</u>: -20°F to 120°F (-29°C to 49°C)

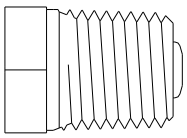
<u>Copper Tubing</u>: ¼" O.D. Refrigeration Type, with a minimum .049" wall thickness (meeting ASTM B251and B75). Use with brass or steel SAE 45° Flared Tube fittings. Maximum Total Length (including all fittings, from Mechanical Release Module to last Pneumatic Control Head) = 100 feet (30.48 meters).



5. c) <u>Actuation Network Limitations, ECH Installations</u>:

The Actuation Network for the Amerex Industrial Fire Suppression System consists of installer supplied copper tubing that connects the ECH to each cylinder discharge valve. A single ECH is capable of actuating up to 20 Agent Cylinder Discharge Valves by discharging its integrated 28 in^3 RNA nitrogen cylinder **(P/N 16197** - sold separately) through the actuation network. A total of 200 feet of copper tubing is allowed when teed from the port marked "OUTLET" from the ECH; the longest distance allowed from the ECH to the last Pneumatic Control Head is 100 feet. Each 100 foot long section of tubing can support ten (10) Pneumatic Control Heads. Therefore, each ECH can support 20 Agent Cylinders. See the following illustration for ECH limitations.

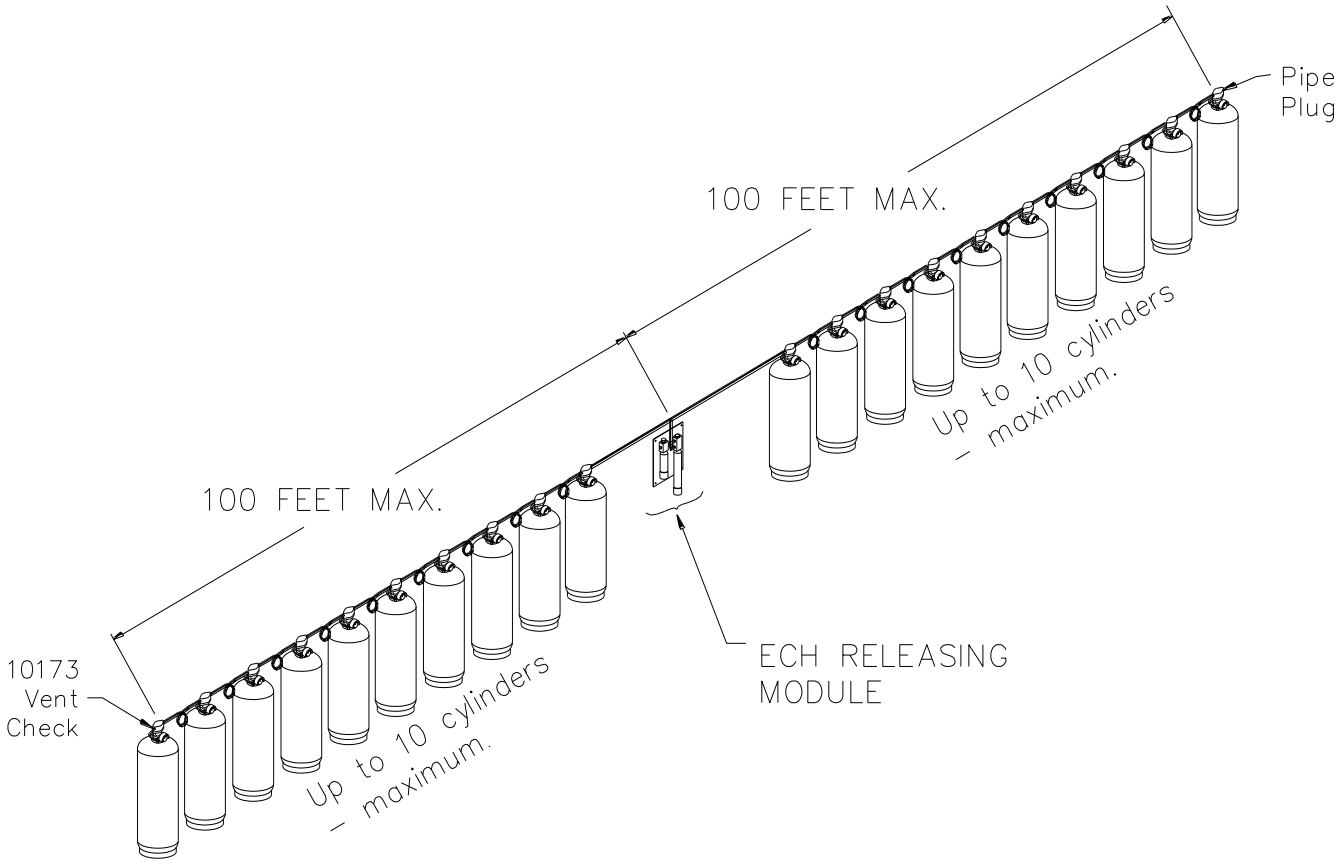
Note: A Vent Check (**P/N 10173**) must be used on the last Pneumatic Control Head on the last Agent Cylinder of one of the tubing branches from the ECH. The last Pneumatic Control Head on the opposite branch must be plugged with a high pressure ¼" NPT pipe plug. The Vent Check is designed to release any slowly built up pressure from the actuation lines. This device should be accessible for pressure bleed-off after system discharge.



Limitations (Single or Multiple Cylinder Systems):

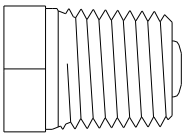
<u>Temperature Limitations for Nitrogen Actuation Cylinders</u>: -20°F to 120°F (-29°C to 49°C)

<u>Copper Tubing</u>: ¼" O.D. Refrigeration Type, with a minimum .049" wall thickness (meeting ASTM B251and B75). Use with brass or steel SAE 45° Flared Tube fittings. Maximum Total Length (including all fittings, from the ECH to last Pneumatic Control Head) = 100 feet (30.48 meters).



5. d) <u>Remote Nitrogen Actuation (RNA) Network Limitations:</u>

The Remote Nitrogen Actuator, **P/N 16197**, is a device used in conjunction with either the MRM or the ERM when the number of Agent Cylinders required exceeds the maximum number supported by the Control Panel. When an RNA is used, the high pressure gas from the MRM or ERM is used to fire the RNA, which, in turn, fires the Pneumatic Actuators attached to the Agent Cylinders. A total of 200 feet of copper tubing is allowed when teed from the outlet of the RNA; the longest distance allowed from the RNA to the last Pneumatic Control Head is 100 feet. Each 100 foot long section of tubing can support ten (10) Pneumatic Control Heads. Therefore, each RNA can support 20 Agent Cylinders. See the following illustration for RNA limitations.

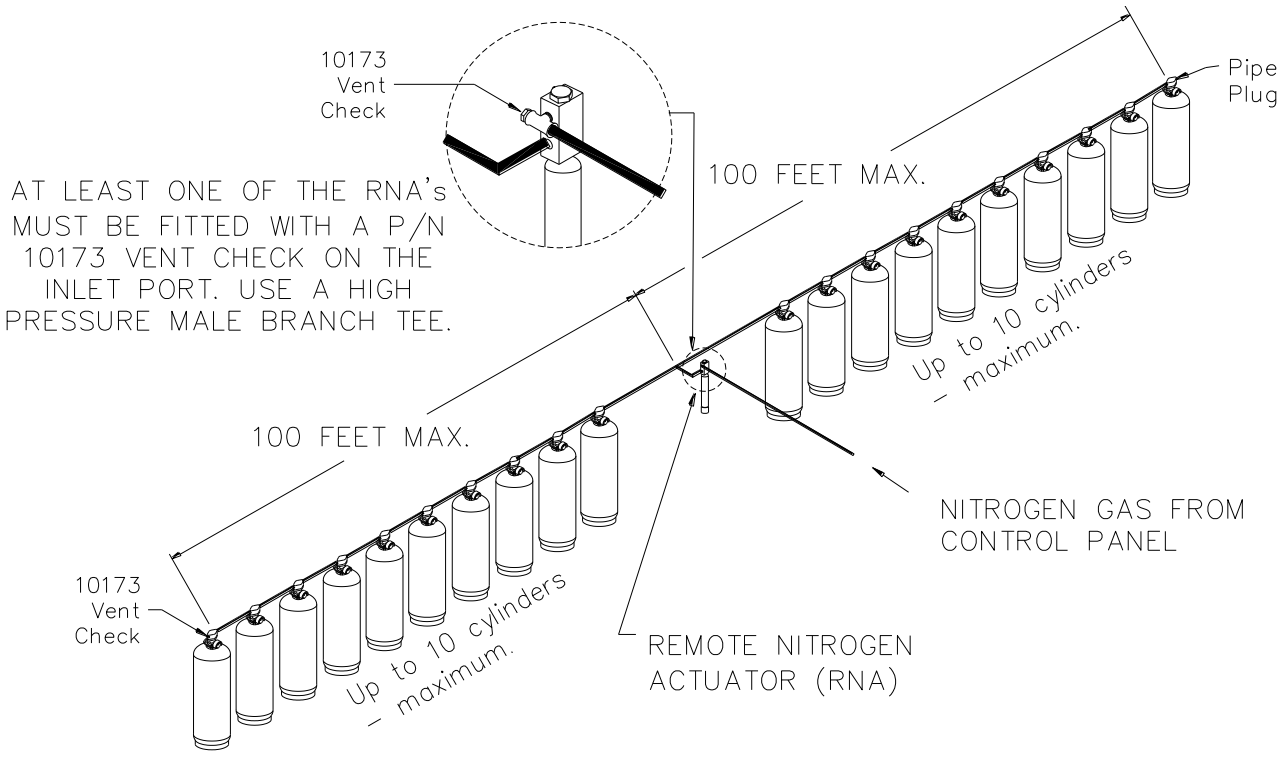


Note: A Vent Check (**P/N 10173**) must be used on the last Pneumatic Control Head on the last Agent Cylinder of one of the tubing branches from the RNA. The last Pneumatic Control Head on the opposite branch must be plugged with a high pressure ¼" NPT pipe plug. Also, a Vent Check is required at the pressure inlet of the RNA (where the copper tubing from the control panel enters the RNA). If there are more than one RNA's installed, only one vent check is required on the control panel-to-RNA network. Use a high pressure ¼" male branch tee at the RNA to install the Vent Check. The Vent Check is designed to release any slowly built up pressure from the actuation lines. This device should be accessible for pressure bleed-off after system discharge.

Limitations:

<u>Temperature Limitations for Nitrogen Actuation Cylinders</u>: -20°F to 120°F (-29°C to 49°C)

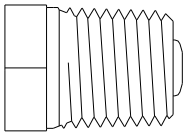
<u>Copper Tubing</u>: ¼" O.D. Refrigeration Type, with a minimum .049" wall thickness (meeting ASTM B251 and B75). Use with brass or steel SAE 45° Flared Tube fittings.



<u>Limitations of Each Remote Nitrogen Actuator</u>

5. e) <u>Remote Nitrogen Actuation (RNA) Network Limitations With MRM Installations:</u>

If a system installation requires more than six Agent Cylinders with an MRM, it is possible to use either one or two Remote Nitrogen Actuators in the Actuation Network. Each Remote Nitrogen Actuator **(P/N** 16197) is capable of firing up to twenty (20) Agent Cylinders; two Remote Nitrogen Actuators could therefore fire a maximum of forty (40) Agent Cylinders when used with one MRM. All Agent Cylinders are fired by the Remote Nitrogen Actuator(s), when used, and the nitrogen cylinder in the control panel is dedicated **<u>only</u>** to firing the Remote Actuator(s).



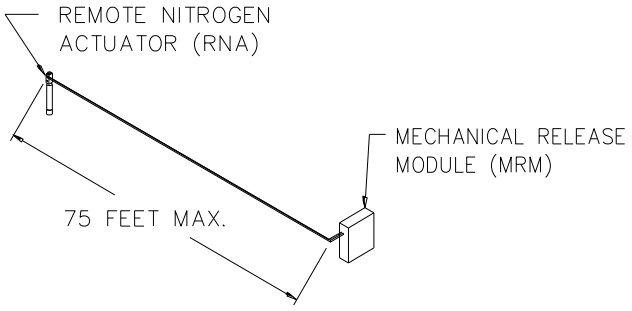
Note: A Vent Check (**P/N 10173**) must be used on the last Pneumatic Control Head on the last Agent Cylinder of one of the tubing branches from the RNA. The last Pneumatic Control Head on the opposite branch must be plugged with a high pressure ¼" NPT pipe plug. Also, a Vent Check is required at the pressure inlet of the RNA (where the copper tubing from the control panel enters the RNA). If there are more than one RNA's installed, only one vent check is required on the control panel-to-RNA network. Use a high pressure ¼" male branch tee at the RNA to install the Vent Check. The Vent Check is designed to release any slowly built up pressure from the actuation lines. This device should be accessible for pressure bleed-off after system discharge.

Limitations:

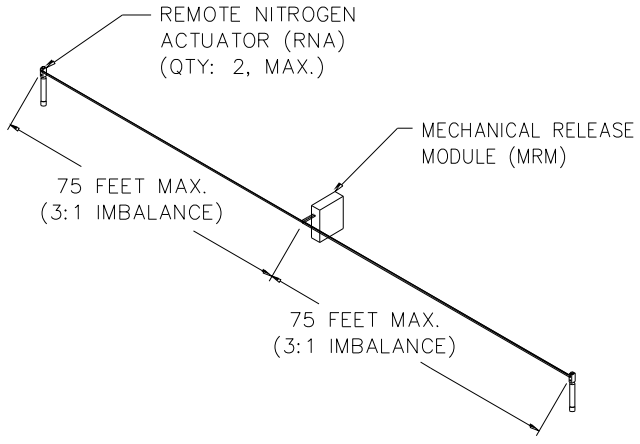
<u>Temperature Limitations for Nitrogen Actuation Cylinders</u>: -20°F to 120°F (-29°C to 49°C)

<u>Copper Tubing</u>: ¼" O.D. Refrigeration Type, with a minimum .049" wall thickness (meeting ASTM B251and B75). Use with brass or steel SAE 45° Flared Tube fittings.

Tubing Run	Maximum # of Feet	Maximum # of Agent Cylinders Per Remote Nitrogen Actuator
From the MRM to Each Remote Nitrogen Actuator (RNA)	*75' per Branch	--
From the RNA to Last Agent Cylinder on Each Branch	100' per Branch	10 Agent Cylinders per Branch x 2 Branches per RNA = 20 max.
*For tubing runs from the control panel to each of the two RNA's, a 3:1 maximum length imbalance is required. For example, if one side is 75', then the other side must be from 25' to 75' in length.		



<u>MRM With One Remote Nitrogen Actuator</u>

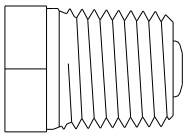


<u>MRM With Two Remote Nitrogen Actuators</u>

5. f) <u>Remote Nitrogen Actuation (RNA) Network Limitations with ERM/ECH Installations</u>:

If an ERM system installation requires more than ten Agent Cylinders (or more than 20 Agent Cylinders with an ECH installation), one, two, three or four Remote Nitrogen Actuators (RNA's) may be used with the following tubing limitations. Each Remote Nitrogen Actuator **(P/N 16197)** is capable of firing up to twenty (20) Agent Cylinders; four Remote Nitrogen Actuators could therefore fire a maximum of eighty (80) Agent Cylinders when used with the ERM or ECH. All Agent Cylinders are fired by the Remote Nitrogen Actuator(s), when used, and the nitrogen cylinder in the control panel is dedicated **<u>only</u>** to firing the Remote Actuators.

Note: A Vent Check (**P/N 10173**) must be used on the last Pneumatic Control Head on the last Agent Cylinder of one of the tubing branches from the RNA. The last Pneumatic Control Head on the opposite branch must be plugged with a high pressure ¼" NPT pipe plug. Also, a Vent Check is required at the pressure inlet of the RNA (where the copper tubing from the control panel enters the RNA). If there are more than one RNA's installed, only one vent check is required on the control panel-to-RNA network. Use a high pressure ¼" male branch tee at the RNA to install the Vent Check. The Vent Check is designed to release any slowly built up pressure from the actuation lines. This device should be accessible for pressure bleed-off after system discharge.

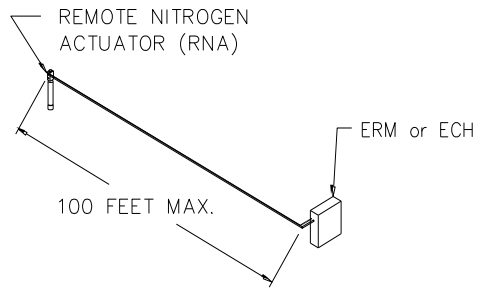


Limitations:
<u>Temperature Limitations for Nitrogen Actuation Cylinders</u>: -20°F to 120°F (-29°C to 49°C)
<u>Copper Tubing</u>: ¼" O.D. Refrigeration Type, with a minimum .049" wall thickness (meeting ASTM B251and B75). Use with brass or steel SAE 45° Flared Tube fittings.

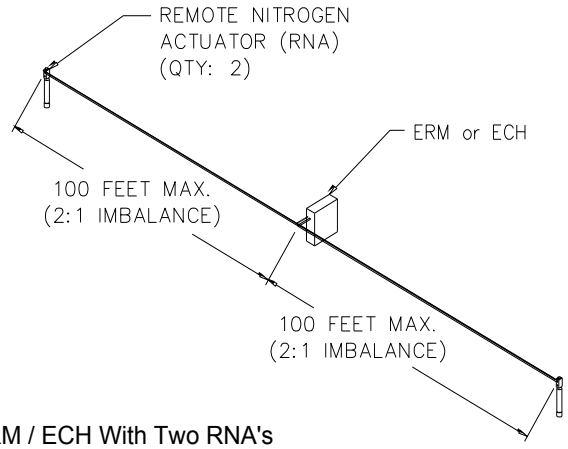
		<u>Tubing Limitations, From ERM to RNA, in Feet*</u>	
<u>Number of RNA's Used:</u>		**<u>First Teed Branch:</u>**	**<u>Second Teed Branch:</u>**
One RNA		100' maximum from ERM/ECH to RNA	--
Two RNA's:	1st RNA	100' maximum from ERM/ECH to RNA	--
	2nd RNA	--	100' maximum from ERM to RNA
Three RNA's:	1st RNA	100' maximum from ERM/ECH to 1st RNA	--
	2nd RNA	at least ½ the longest tubing length	--
	3rd RNA	--	100' maximum from ERM to 3rd RNA
Four RNA's	1st RNA	100' maximum from ERM/ECH to 1st RNA	--
	2nd RNA	at least ½ the longest tubing length	--
	3rd RNA	--	at least ½ the longest tubing length
	4th RNA	--	100' maximum from ERM to 4th RNA

*The longest tubing run from the ERM/ECH to any RNA cannot be longer than twice the length of the shortest tubing run from the ERM to any RNA. For example, if a system using four RNA's uses 60 feet of tubing from the ERM to the 1st RNA (on the 1st teed branch) then the length of tubing from the ERM to the 2nd RNA cannot be less than 30 feet. Likewise, the length of tubing from the ERM/ECH to the 3rd RNA cannot be less than 30 feet.

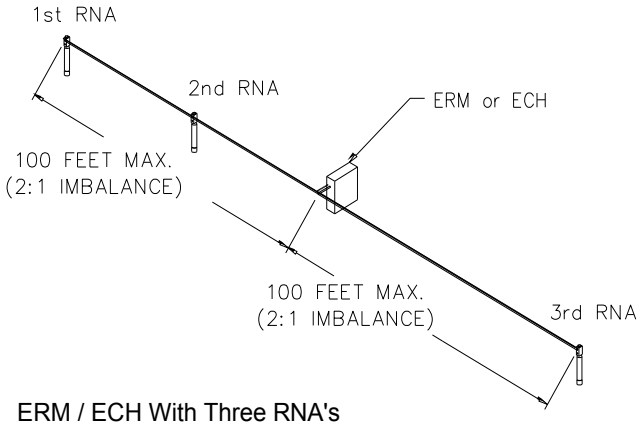
5. f) Remote Nitrogen Actuation (RNA) Network Limitations with ERM/ECH Installations: (continued)



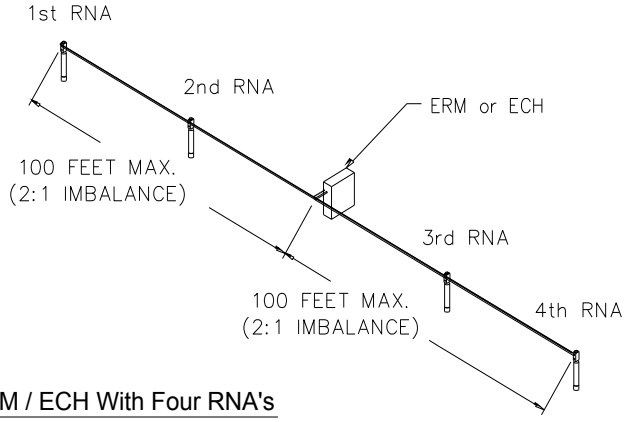
ERM / ECH With One RNA



ERM / ECH With Two RNA's



ERM / ECH With Three RNA's



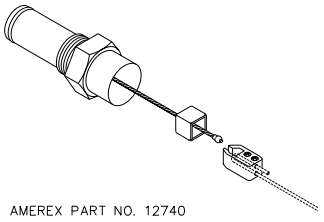
ERM / ECH With Four RNA's

6. <u>Mechanical Gas Valve Applications (MRM or ERM)</u>:

Both the MRM and the ERM close the Mechanical Gas Valve immediately upon system discharge. A pneumatic and mechanical action in the Module pulls on a cable attached to the mechanical gas valve, unlatching the valve and allowing an internal spring within the valve body to provide the closing force. Connection of the cable from the valve to the MRM under tension maintains gas valve in an open position.

Mechanical Gas Valve:

A Mechanical Gas Valve Trip Cylinder assembly must be used with any mechanical gas valve. The gas valve trip cylinder assembly (**P/N 12740**) is included with all Amerex manufactured gas valves, but may be ordered separately for use with gas valves listed in this manual supplied by other manufacturers.



AMEREX PART NO. 12740

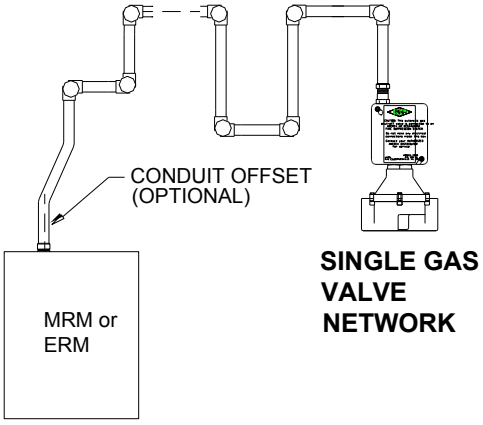
See Chapter 1 "System Components" for all mechanical gas valves that are suitable for use with the Amerex Industrial Dry Chemical System. **The use of any other mechanical gas valves will void the UL Listing for the system installation**. All of the listed valves have female NPT threads. The location of the gas valve should be accessible and approved by the Local Authority Having Jurisdiction. Installation should be performed by a contractor licensed and qualified for such work.

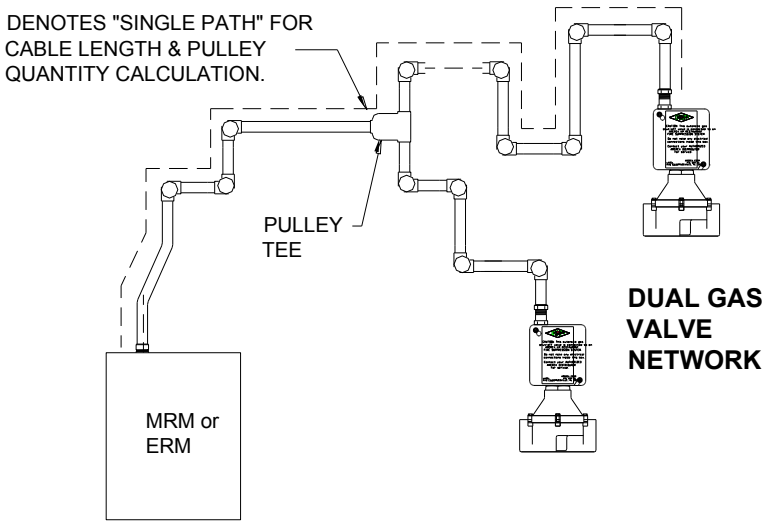
Mechanical Gas Valve Actuation Network Limitations:

The Mechanical Gas Valve Actuation Network consists of Cable, Corner Pulleys, Pulley Tee, Gas Valve and Conduit Offset.

General Limitations of Mechanical Gas Valve Network:

Maximum of 20 Corner Pulleys (**P/N 12309**) per Mechanical Gas Valve
Maximum of 130 feet of Cable (**P/N 12553**) per Mechanical Gas Valve
Maximum of 1 Pulley Tee (**P/N 12506**) per network (counts as one Corner Pulley for each Mechanical Gas Valve)
Maximum of 1 Conduit Offset (**P/N 12507**) per network (must be located at MRM (or ERM) and before Pulley Tee when chosen)





7. Electrical Gas Valve Operation:

110 VAC Electrical Gas Valves may be used in place of the Mechanical Gas Valves. The Electrical Shut-Off Valve used with the Amerex Industrial Dry Chemical System must be UL Listed for use with natural gas or propane, be held open by energizing an electrical solenoid and be wired through a microswitch and manual reset relay. Any field wiring and connections involving the shutdown of electrical equipment or an electrical gas valve must be done by a qualified electrician.

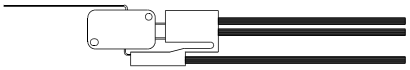
Power to the Electrical Gas Valve is run through the normally closed contact on a microswitch located in either the MRM or ERM to the Manual Reset Relay and from the Manual Reset Relay to the Electrical Gas Valve. In a normal, non -fire condition, current is allowed to flow to the solenoid on the Electrical Gas Valve, holding the valve open. In a fire condition, when the suppression system actuates, the microswitch contacts will transfer, opening the normally closed contacts in the Manual Reset Relay, interrupting the current to the gas valve and cause it to close.

Resetting the MRM (or ERM) and transferring the contacts back to a normal (normally closed) position will not cause the Electrical Gas Valve to open. The Manual Reset Relay must be reset before current will flow to the valve and cause it to open. A loss in electrical power, even temporary, will require someone to manually reset the relay before the Electrical Gas Valve will open again.

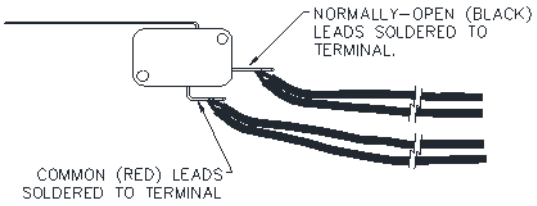
Note: see wiring schematics on the following page.

MICROSWITCH APPLICATIONS:

One **P/N 12524** microswitch is installed in the MRM and ERM. The MRM and PRM is capable of supporting four total microswitches. Two additional switches may be added to the ERM. The **P/N 12524** microswitch may be used to perform a variety of output functions such as: sounding an auxiliary audible or visual alarm signaling device, shutting down electrical appliances, or disrupting power to an electrical gas valve.



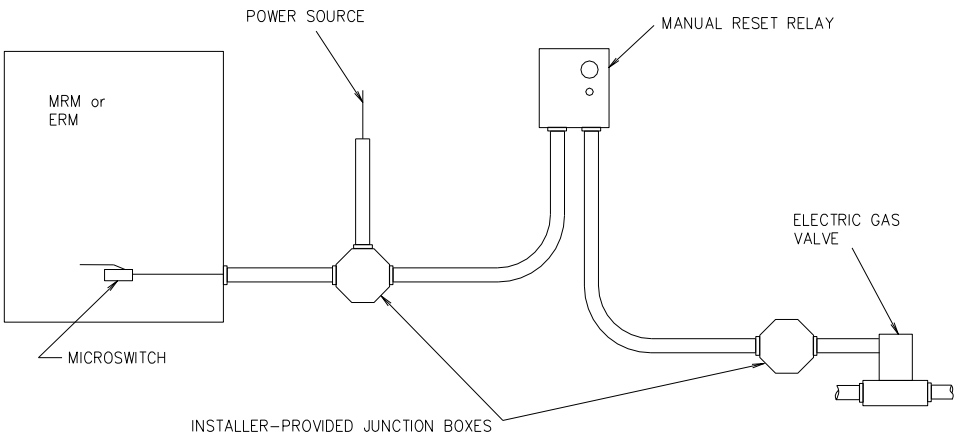
RED: COMMON
YELLOW: N.O.
BLACK: N.C.



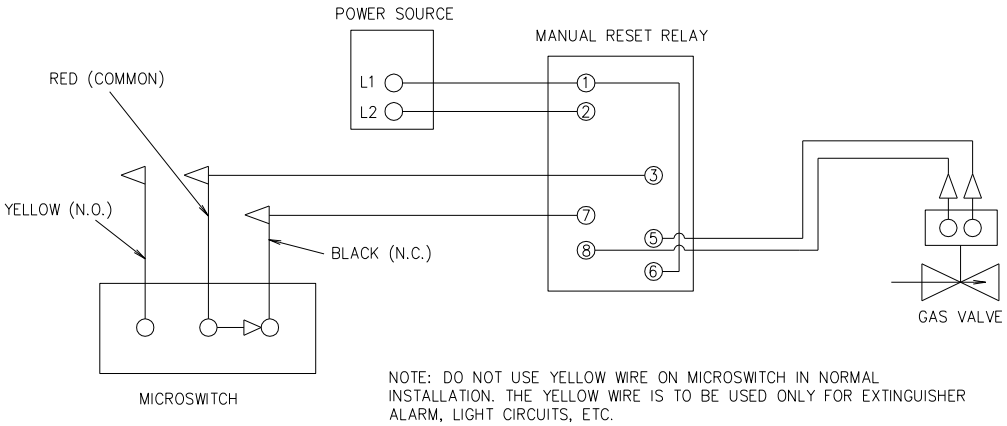
The **P/N 18312** Alarm Signaling Mircoswitch (one installed) is used when it is required to be electrically connected to a fire alarm system per NFPA 17 and NFPA 72 in a supervised, four-wire manner. It is designed to be mounted in the Mechanical Release Module (MRM / MRM II) and the Pnuematic Release Module (PRM) **only** for the purpose of initiating an alarm in a fire alarm system. All microswitch connections are to be made outside the MRM/PRM in an approved junction box.

Part Number	Contacts	Rating
12524	SPDT Single-Pole, Double-Throw	21A 1HP 125, 250, 277 VAC, 2HP 250, 277 VAC
18312	SPDT Single-Pole, Single-Throw	0.25A, 30 VDC

Warning: All Electrical Field Wiring Should be Performed by a Licensed Electrician per NFPA 70.

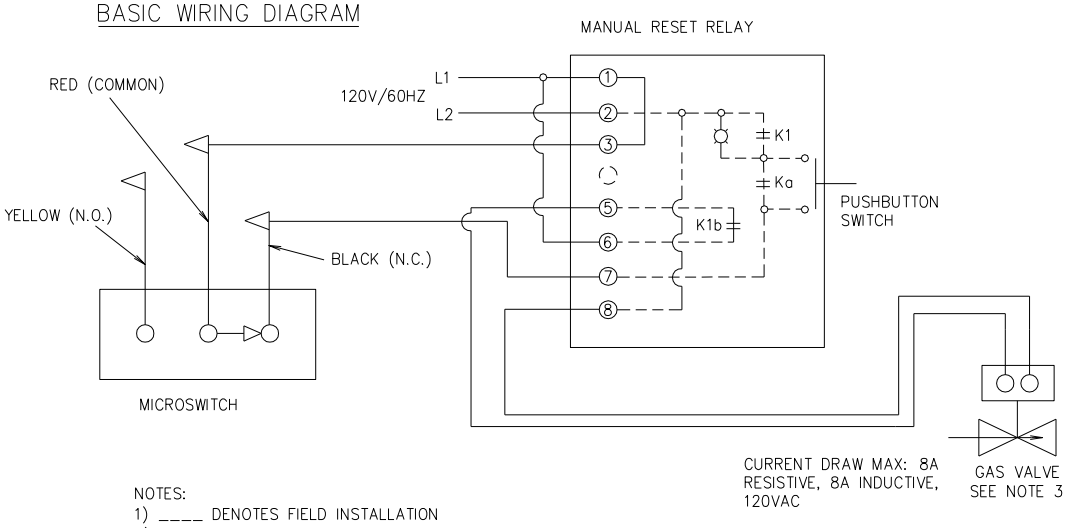


BASIC WIRING DIAGRAM



NOTE: DO NOT USE YELLOW WIRE ON MICROSWITCH IN NORMAL INSTALLATION. THE YELLOW WIRE IS TO BE USED ONLY FOR EXTINGUISHER ALARM, LIGHT CIRCUITS, ETC.

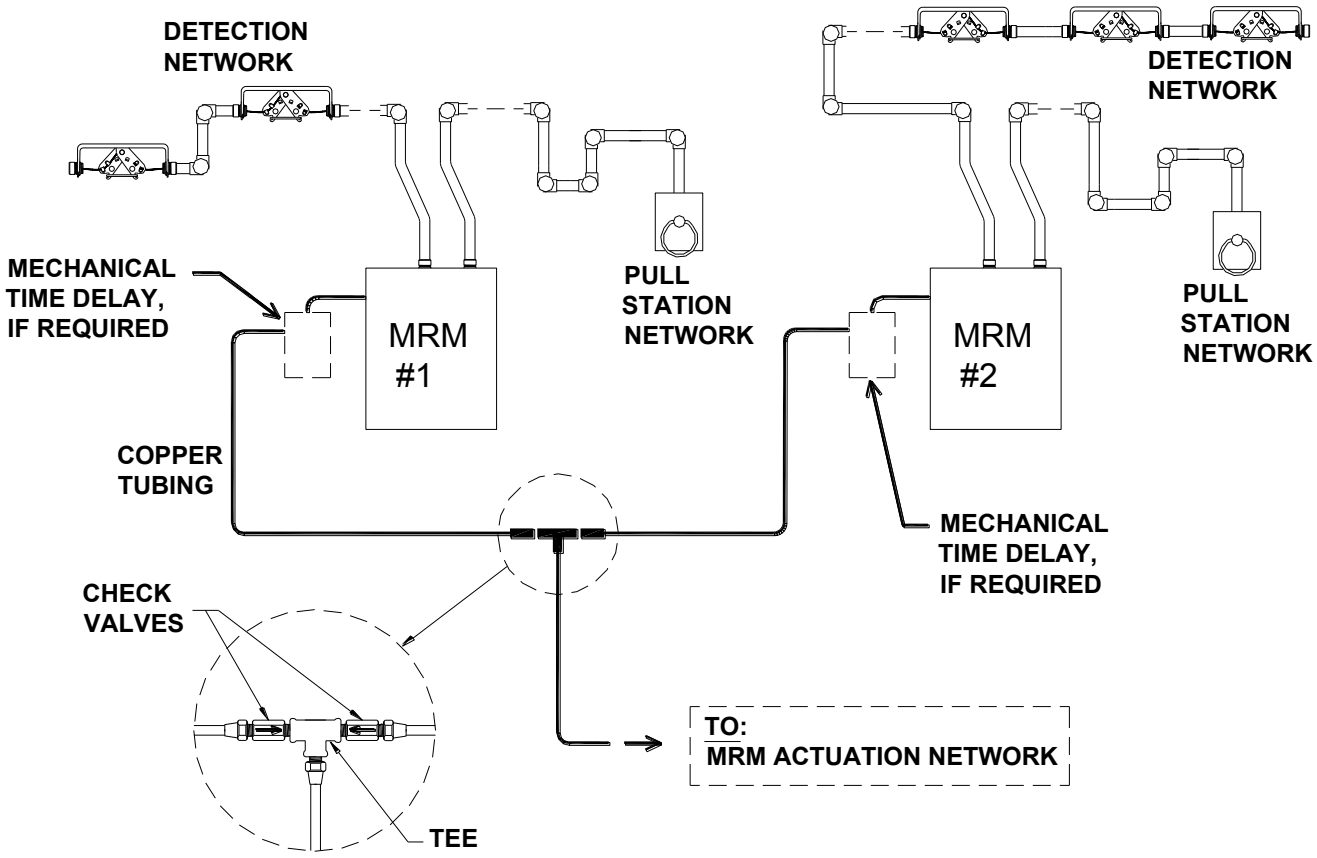
BASIC WIRING DIAGRAM



NOTES:
1) ____ DENOTES FIELD INSTALLATION
2) ---- DENOTES FACTORY INSTALLATION
3) GAS VALVE: UL LISTED ELECTRICALLY–OPERATED SAFETY VALVE FOR NATURAL OR LP GAS AS NEEDED OF APPROPRIATE PRESSURE AND TEMPERATURE RATING, 110V/60HZ OR AMEREX GAS VALVES, P/N 12870, 12871, 12872, 12873, 12874, 12875 AND 12876.
4) K1a AND K1b ARE N.O. WHEN K1 IS DE–ENERGIZED.

8. <u>Dual MRM Installations Protecting a Single Hazard</u>:

Certain circumstances may require additional link line capability, detectors, or manual pull stations to protect a single hazard. Examples would include multiple fire hazards in close proximity to one another (or interconnected) or large paint spray booths. It is possible to install two MRM's to protect such hazards as a single hazard zone.



<u>Note</u>: Ensure that the arrows on the **P/N 10262** Check Valves are pointed into the Tee, as shown above. Use only two Check Valves, oriented at the Tee, as shown. The purpose of the Check Valves is to prevent one MRM from back-pressurizing the MRM that does not trip.

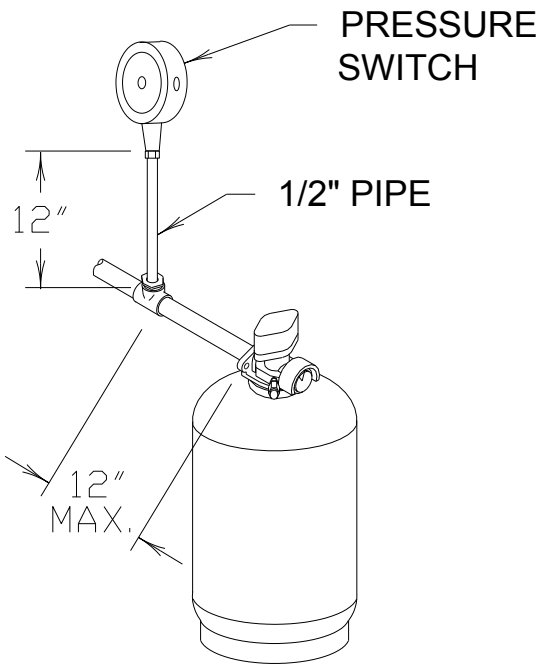
<u>Limitations:</u>

1) Adhere to the MRM actuation limitations as given on pages 3B-4, 6 and 7. The maximum length of tubing from the MRM, either to the last Agent Cylinder, or to the RNA(s), is determined as the direct single path from ***each*** MRM through the Tee.
2) If the discharge time delay function is required, then two Mechanical Time Delays must be used, one adjacent to each MRM, and installed in accordance with the Installation section of this manual.
3) Detection Networks are to remain independent from MRM #1 to MRM #2, and must adhere to previously stated limitations.
4) Manual Pull Networks are to remain independent from MRM #1 to MRM #2, and must adhere to previously stated limitations.
5) There is no Mechanical Gas Valve function with this installation option.
6) Any electrical function must be wired in either series (Normally-Closed function) or in parallel (Normally-Open function) through a microswitch in each MRM. This will ensure that the firing of either MRM will facilitate the required function.

7) A clearly visible sign or placard must be placed securely adjacent to each of the two MRMs with the wording similar to the following: "This Releasing Control Head is One of Two Units. Both Units Must be Seviced Together, in Conjunction with the Fire Suppression System".
8) An audible device must be used with this system configuration, wired through microswitches of each MRM's, so that the firing of either MRM will provide an audible signal.

Warning: All Electrical Field Wiring Should be Performed by a Licensed Electrician per NFPA 70.

9. <u>Explosion Proof Pressure Switch</u>:
Amerex **P/N 16384** Explosion Proof Pressure Switch is used in hazardous locations, where standard electrical microswitches are prohibited. It is designed to be installed in the distribution piping of **any** of the system's agent cylinders. It must be installed within 12" of the Agent Cylinder Valve outlet with an inline tee. Place the switch on a 12" vertical section of ½" pipe, in order to separate it from the flow of dry chemical, as shown below:



<u>Note:</u>
The 12" section of vertical ½" pipe counts as one foot of pipe from cylinder to T1 when tabulating pipe lengths. Also, the Tee counts as one elbow from cylinder to T1. The pressure setting is not field-adjustable.

<u>Warning</u>: All Electrical Field Wiring Should be Performed by a Licensed Electrician per NFPA 70.

CHAPTER 4
SYSTEM INSTALLATION

A) General

Those individuals responsible for the installation of the Amerex Industrial Dry Chemical System must be trained by Amerex and hold a current Amerex Certificate. Before starting the installation of a system, a complete analysis of the hazards, a system design and a drawing of the proposed system layout should be accomplished. The design, drawings, and bill of materials shall be compared with conditions found at the jobsite and discrepancies noted before proceeding.

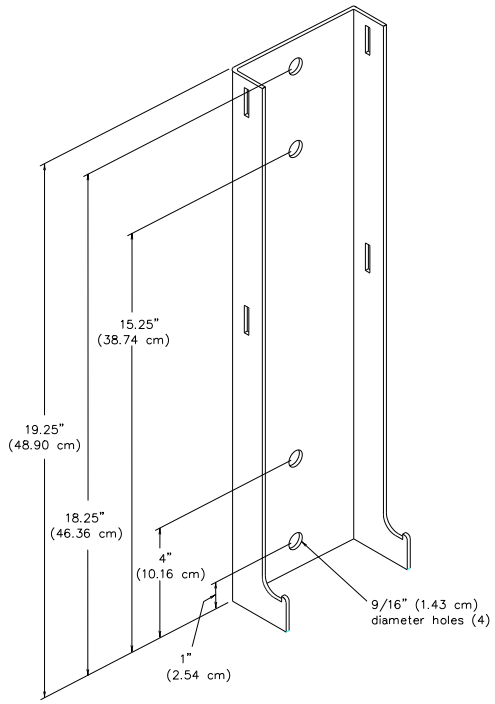
Materials such as pipe, fittings, copper tubing, EMT conduit, fasteners, mounting and securing hardware for pipe and conduit are not supplied by Amerex with the Industrial Fire Suppression System. These items are chosen and supplied by the installer.

All components must be installed in an environment that does not exceed the system's temperature range listing of -40°F to 120°F (-40°C to 49°C) for Total Flood, 32°F to 120°F (0°C to 49°C) for Local Application Overhead, and –20°F to 120°F (-29°C to 49°C) for Local Application Tankside, Vehicle Paint Spray Booth and Open Front Booth installations.

All system components – Release Module, Cylinder Assembly, Mounting Brackets, Detectors, Fusible Links, Agent, Nozzles, Manual Pull Stations, Gas Shut Off devices, Corner Pulleys, Pulley Tee, Nitrogen Cylinders, etc. must be UL Listed for use with the Amerex Industrial Fire Suppression System. Only those components outlined by part number in this manual have been evaluated for use with the Amerex Industrial Dry Chemical System. The use of non-Amerex parts or components may void the manufacturer's warranty.

B) Installing the Agent Cylinder Bracket

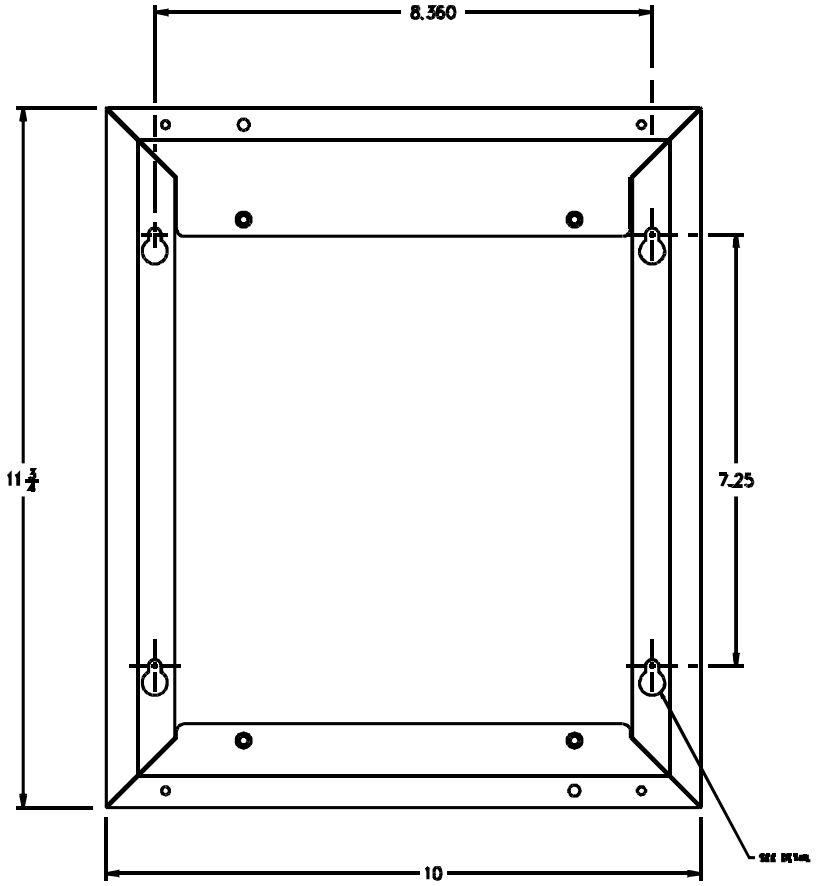
Choose an appropriate location for the Agent Cylinder Bracket and valve assembly where the pressure gauge can be read and the cylinder accessible for recharge and service. Also, it is important that the location be acceptable to the Authority Having Jurisdiction (AHJ). The agent cylinder bracket must be secured to a structure that is sufficient to accept the weight. Using the bracket back as a template, mark the top hole, secure the bracket loosely with the appropriate fastener, adjust for level and plumb, mark the remaining holes and fasten securely.

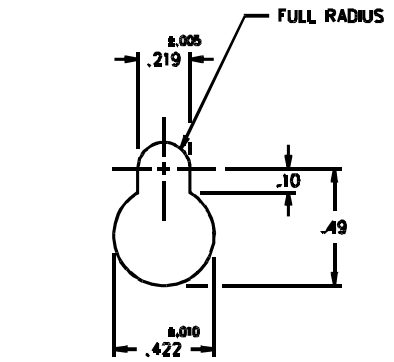


Warning: Agent cylinders are shipped from the AMEREX factory fully charged with a shipping plate installed on the top of the valve to prevent accidental agent discharge and an anti-recoil plate on the valve outlet to redirect chemical flow should an accidental discharge occur. Both of these plates must be removed at installation.

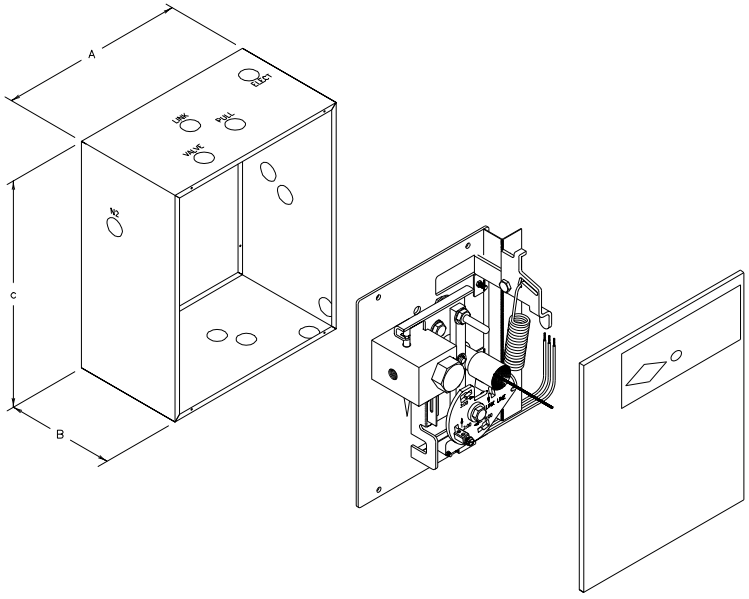
C)1) Installing the Mechanical Release Module (MRM)

Select a suitable location for the Mechanical Release Module that allows access for installation, service, recharge and where both the Nitrogen Actuation Cylinder pressure gauge and system status indicator can be viewed. The MRM must be fastened to a surface which has sufficient structure to support the loads anticipated. Knockouts are provided on three sides of the two available enclosures (painted or stainless steel) and each cable run may enter the enclosure from any of the three sides (top, bottom or right). Using the enclosure as a template, mark the top two holes for mounting and anchor the enclosure loosely, adjust to level and mark bottom holes, anchor securely using appropriate fasteners. Once the enclosure is firmly attached to the mounting surface, the MRM "motherboard" can be installed into the enclosure stand-offs using the four machine screws provided with the MRM. **Do not install the Nitrogen Cylinder at this time.**





MOUNTING HOLE DETAIL
SCALE: 4:1

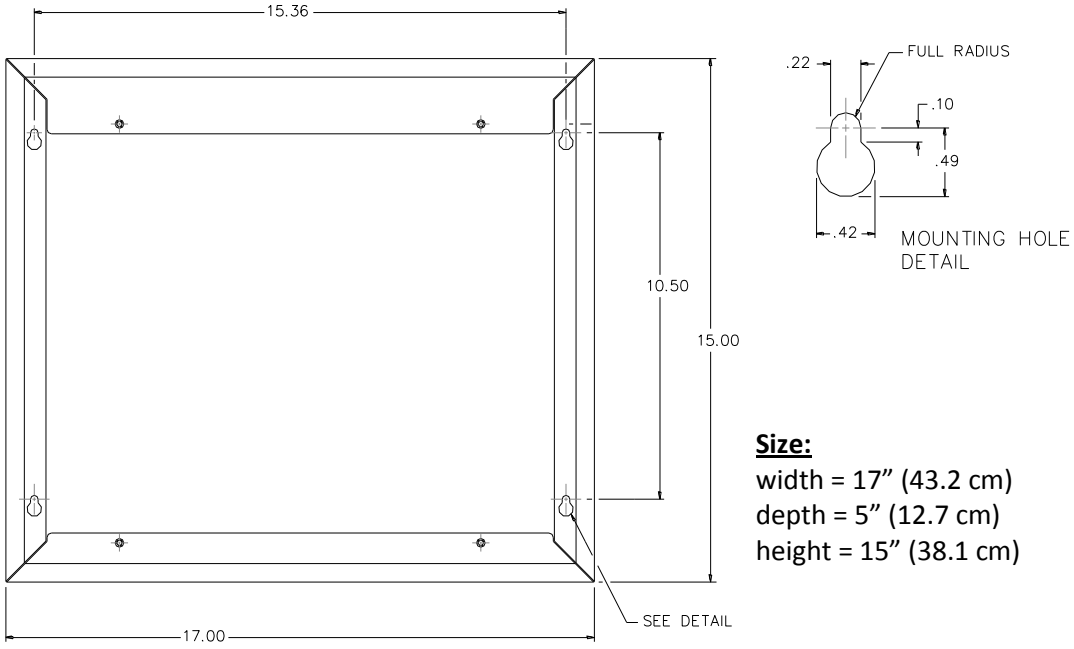


Size:

A) width = 10" (25.4 cm)
B) depth = 5" (12.7 cm)
C) height = 11 ¾" (51.5 cm

C)2) Installing the Electrical Release Module (ERM; Optional to the MRM)

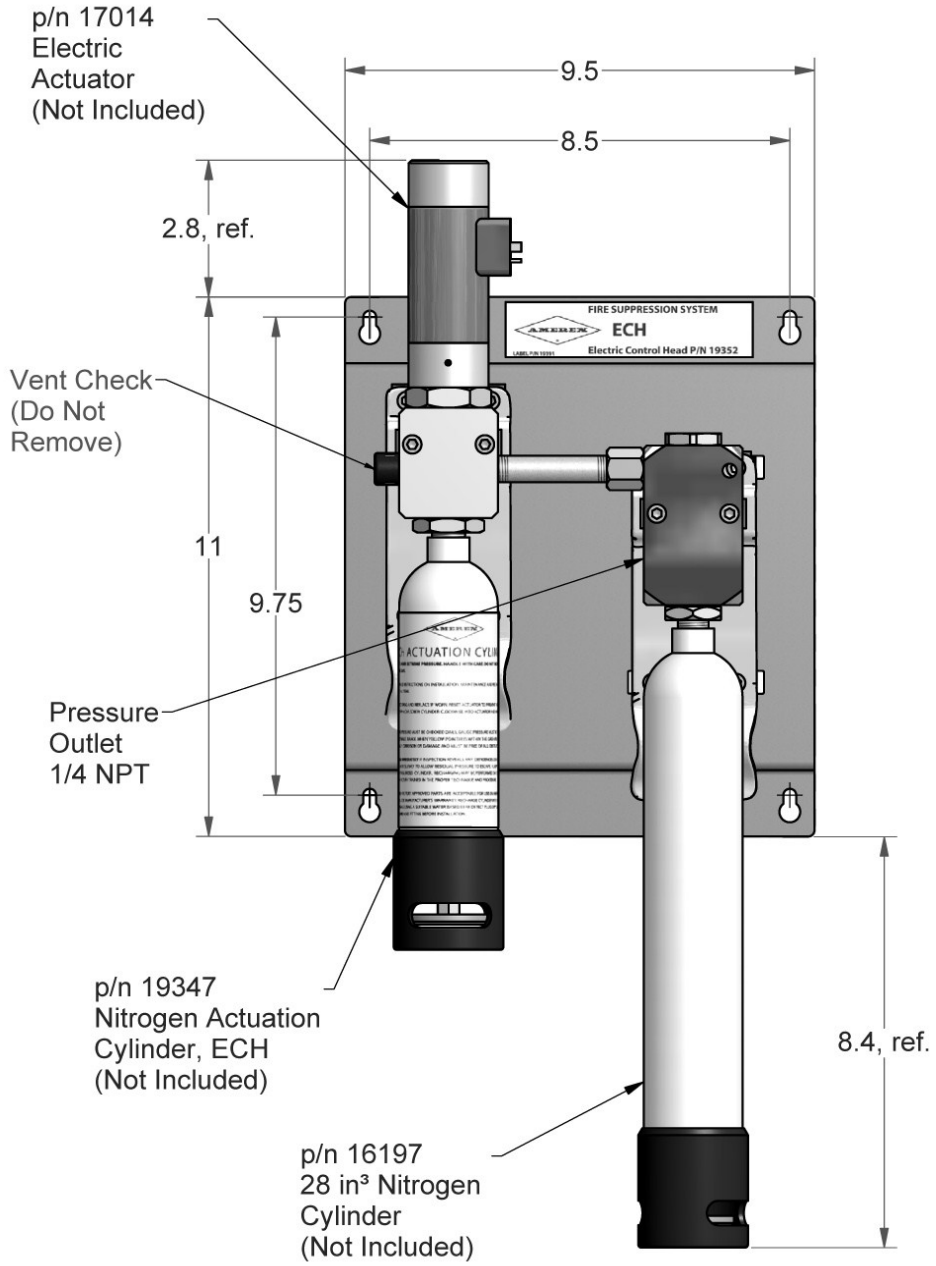
Select a suitable location for the Electrical Release Module that allows access for installation, service, recharge and where both the Nitrogen Actuation Cylinder pressure gauge and system LED's can be viewed. The ERM must be fastened to a surface which has sufficient structure to support the loads anticipated. Knockouts are provided on three sides of the enclosure. Using the enclosure as a template, mark the top two holes for mounting and anchor the module loosely, adjust to level and mark bottom holes, anchor securely using appropriate fasteners. **Do not install the Nitrogen Cylinder at this time.**



Size:
width = 17" (43.2 cm)
depth = 5" (12.7 cm)
height = 15" (38.1 cm)

C)3) Installing the Electric Control Head (ECH; Optional to the MRM)

Select a suitable location for the Electric Control Head that allows access for installation, service, recharge and where both pressure gauges of the Nitrogen Actuation Cylinder and the RNA Actuation Cylinder can be viewed. The ECH must be fastened to a surface which has sufficient structure to support the loads anticipated. Using the backplate as a template, mark the top two holes for mounting and anchor the module loosely, adjust to level and mark bottom holes, anchor securely using appropriate fasteners. **Do not install the Nitrogen Cylinders at this time**. The ECH requires the following components for completion of the control equipment: p/n 19347 Actuation Cylinder, **P/N 16197** 28 in³ Nitrogen Actuation (RNA) Cylinder, and the **P/N 17014** Electric Actuator. The Electric Acutator of the ECH, and all other electrical components, must be connect to the Amerex-supplied Releasing Control Panel, **P/N 19340**, model designation: SR-X.



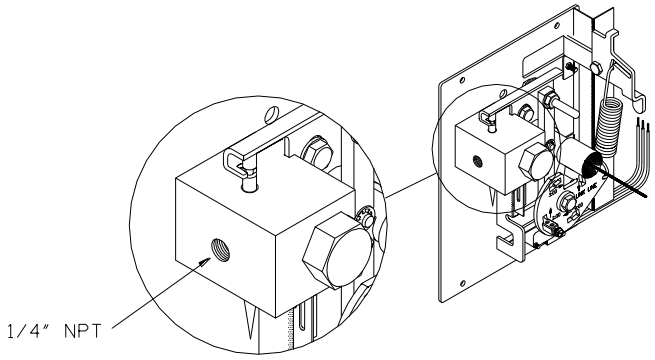
D) Installing the Actuation Network

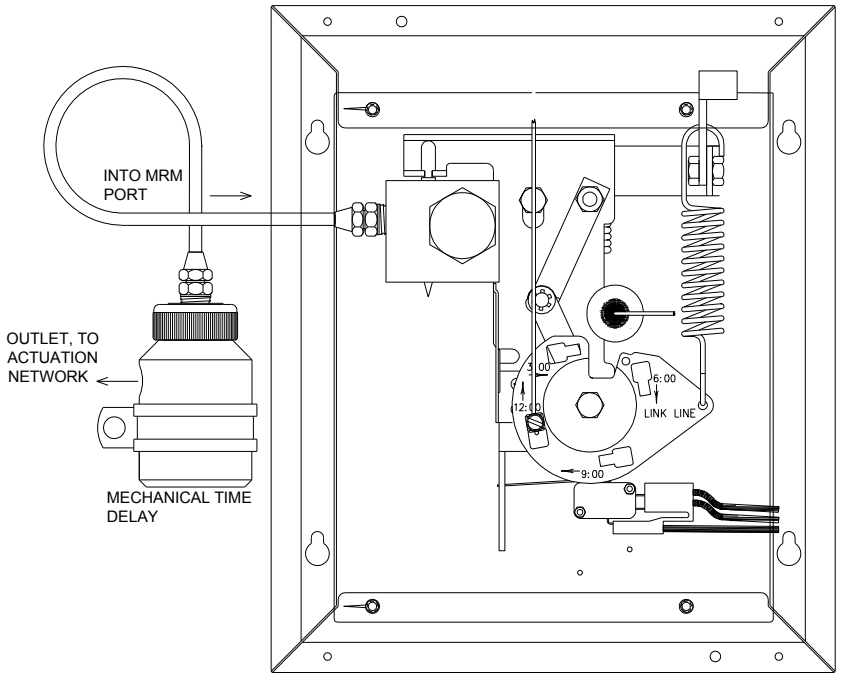
Refer to the Design Section (Chapter 3) for limitations of the Actuation Network. The network originates at the pipe outlet of the MRM (or ERM) and continues to each Pneumatic Control Head (**P/N 15157**) mounted to the top of each Agent Cylinder Valve assembly. The protective plug at the port on the MRM must be removed.

If the Pneumatic Time Delay (**P/N 15765)** is required on MRM installations, it must be installed adjacent to the MRM, connected directly into the outlet port of the MRM (see figures on the following page).

All threaded connections in the Actuation Network must be sealed with Teflon tape (applied to male threads only). Starting with the second thread from the fitting opening, wrap the tape clockwise around the threads away from the fitting opening. Make certain that tape does not extend past the end of the fitting. Below is the outlet port (1/4" NPT) of the MRM.

Note: Only one Vent check (**P/N 10173**) is required for an Actuation Network (without RNA's). It must be placed on the last ¼" NPT port of the last Pneumatic Control Head (**P/N 15157**) in the Actuation Network.





E) Installing the Distribution Piping Network

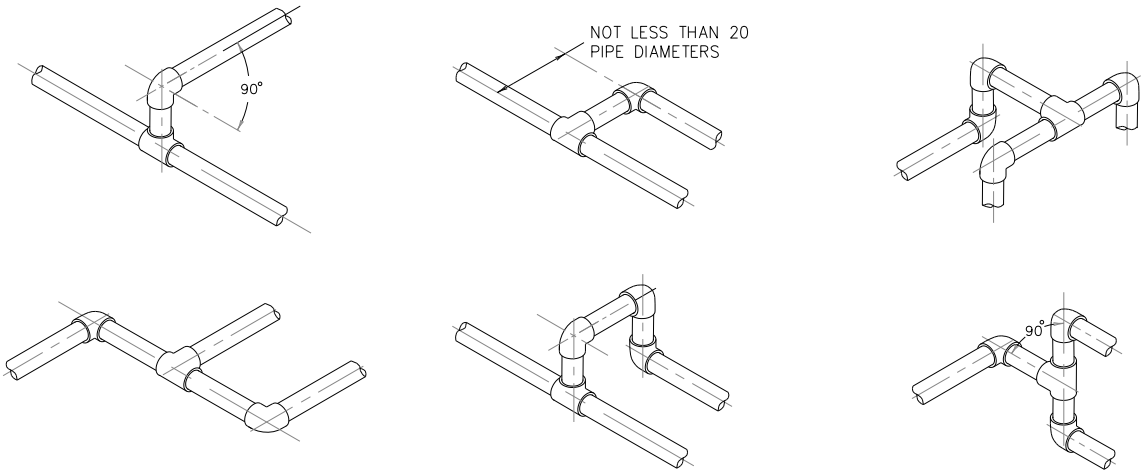
For limitations on the Distribution Piping Network, refer to Chapter 3, System Design.

All piping must be Schedule 40, hot-dipped galvanized steel pipe, and all fittings must be 150 lb. class. Examples of acceptable fitting materials include hot-dipped galvanized malleable iron, ductile iron, or steel. Couplings and unions may be used where necessary, and reducing bushings or reducing tees can be used for changes in pipe diameter.
Note: Black steel pipe and fittings can be used in relatively noncorrosive atmospheres.

All pipe must be reamed and blown clear. Dirt and/or cutting oil must be removed from the inside of all pipe and fittings before assembly. Assemble all pipe and fittings tight – 3 turns past hand-tight is recommended. The use of Teflon tape, joint sealant, or pipe compound is not necessary on the Distribution Piping Network and must not be used.

Secure all piping to a rigid surface using appropriate hangers and/or clamps in accordance with accepted plumbing techniques. Once Discharge nozzles are installed, ensure that the plastic blow-off caps are in place.

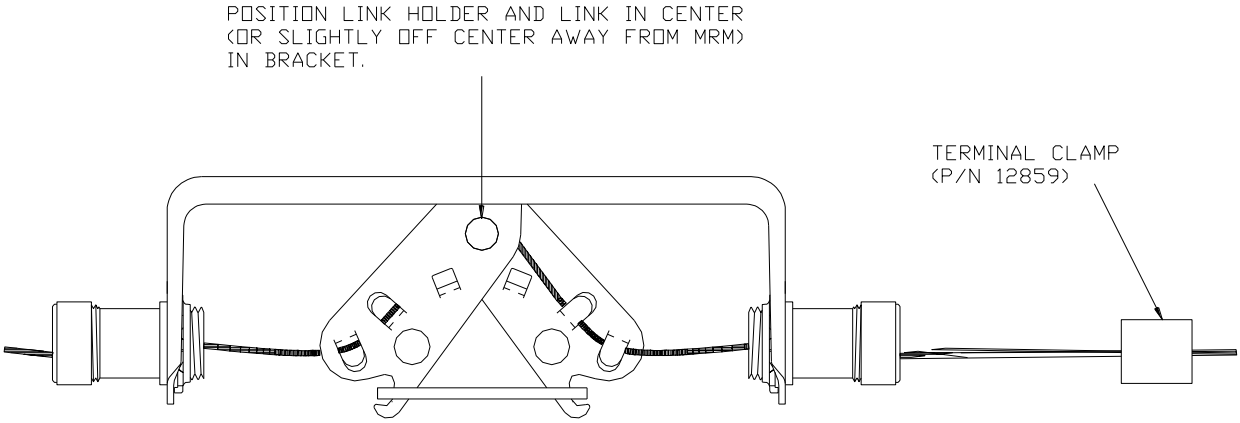
The flow of the mixture of dry chemical and gas does not strictly follow general hydraulic principles because it is a two-phase flow. Changes in direction of flow cause separation of expellant gas and dry chemical. To provide proper distribution of dry chemical upon splitting the stream, special attention must be given to the method in which an approach is made to a tee after a change in direction. Certain acceptable methods are shown below, which are taken from NFPA 17, the Standard for Dry Chemical Extinguishing Systems:



F)1) Installing the Detection Network – MRM Installations

Refer to Chapter 3, System Design, for limitations on Detection Networks. There is only one type of detector bracket and linkage used with this system. There are, however, two different names for detectors in the network – Series and Terminal. The Terminal Detector is the detector located at the end of the cable run, furthest away from the MRM. A Series Detector is any detector located between the MRM and the Terminal Detector in the network.

Starting at any of three sides (top, bottom, or right) of the MRM at the corresponding knock-out, install ½" EMT conduit running from the MRM to each detector location, using a corner pulley at every change in direction. Each detector must be securely fastened to a rigid surface.



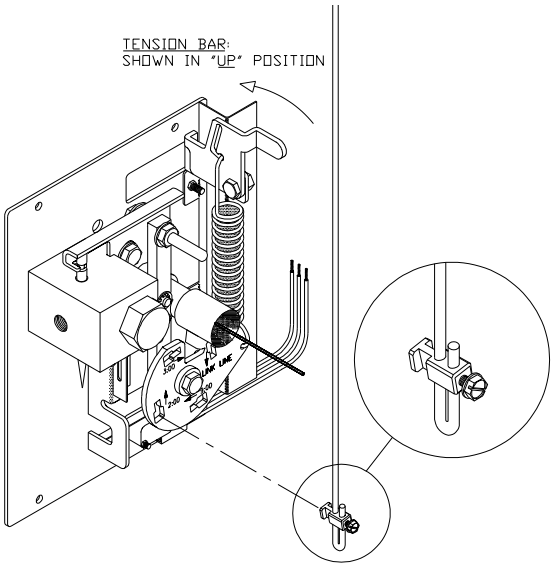
To install the cable, start at the Terminal Detector, affix the cable with a Terminal Clamp (**P/N 12859**), provided with the MRM) leaving a minimum of 6 inches between the end of the cable and the terminal clamp. From the Terminal Detector, continue to feed the cable through each Corner Pulley, detector, and length of EMT conduit back to the MRM.

To install the detector linkage, place a weighted object on the cable at the MRM, allowing a minimum of 3 inches of slack for every detector in the network. Starting at the Terminal Detector, place the linkage upside down on the cable, run the cable over the rivet and through each of the four tabs as shown above, insert the appropriate Fusible Link (see the design section for the proper selection of Fusible Links) and turn upright. Repeat these steps for each detector.

Each link and link holder, once assembled and placed on the cable, should be positioned in the bracket on center or slightly off center away from the MRM.

Setting Detection Cable Tension, Original MRM (P/N 11977):

To set the tension on the cable, first make sure that the tension bar in the MRM is in the "down" position and that the spring is relaxed.

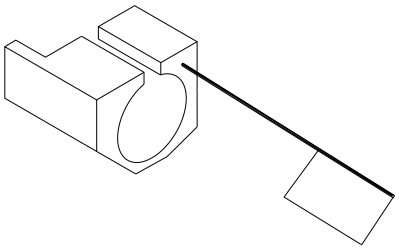


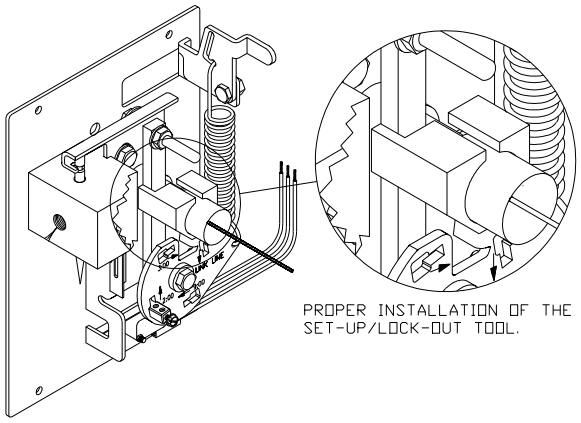
Caution: Do not attempt to set the tension bar in the "up" position (spring stretched) without having a fusible link line installed and secured or the MRM will fire. Take additional caution; DO NOT install the Nitrogen Actuation Cylinder at this time.

Attach the cable to the link plate connector. Do not clamp tightly (slack must be taken up in a later step).
Insert the connector into the slot on the link plate that corresponds with the direction of pull on the cable. The link plate is marked with clock positions (6:00, and 12:00). Insert the connector at 12:00 if the cable enters the MRM at the TOP and 6:00 if it enters at the BOTTOM.

Note: any excess cable must be secured out of the way of any parts in the MRM. We suggest taping it back to the link cable.

Slip the Set-up/Lock-out Tool, (P/N 12738) over the manual pull cam housing until it rests against the outside edge of the link plate





Draw tension on to the cable through the connector until the link plate is drawn against the set-up tool, then tighten the set screw on the connector. Remove the set-up tool and raise the tension bar to test cable run. **Lower tension bar until system is ready to test**. To test the Detection Network, refer to Chapter 5, Setting the System into Service.

Setting Detection Cable Tension, New MRM II (P/N 18000 and 18001):

Refer to the following images in this section for properly setting the detection cable tension:

1) To set the tension on the cable, first make sure that the tension bar in the MRM is in the "down" position and that the spring is relaxed. Lower the top hook of the blue spring into the bottom of the tension bar slot.

Caution: Do not attempt to set the tension bar in the "up" position (spring stretched) without having a fusible link line installed and secured or the MRM will fire. Take additional caution; DO NOT install the Nitrogen Actuation Cylinder at this time.

2) Feed the cable end into the small hole in the side of the ratchet pulley. The end of the cable must be cleanly cut. Push the cable into the hole until the end is visible at the head of the central hex-bolt. Securely tighten the Allen-head set screw onto the cable. Aside from the use of the cocking tool, no further tools should be used to set the mechanism. [The cable may be routed from either the bottom or the top of the MRM II; the ratchet pulley will always turn counter-clockwise to remove cable slack].

3) Spool up the excess cable slack by turning the ratchet pulley counter-clockwise by hand. Continue to hold the ratchet pulley while proceeding to the next step.

4) While maintaining the position of the ratchet pulley with your left hand, press down on the engagement pawl and the linkage bar with your index and middle fingers of your right hand in order to begin the final tensioning process. You will feel and hear the pawl click several times as tension is taken up.

5) Inspect your progress by pulling the upper hook of the blue spring into the top notch of the tension bar; then raise the tension bar. Refer to the illustrations on the following page for proper setting**.** Repeat steps 1-5 until the bottom of the linkage bar is essentially horizontal, and is aligned within the gray "pie" zone of the indicator label (see Figure B). Lower tension bar until system is ready to test**.** To test the Detection Network, refer to Chapter 5, Setting the System into Service.

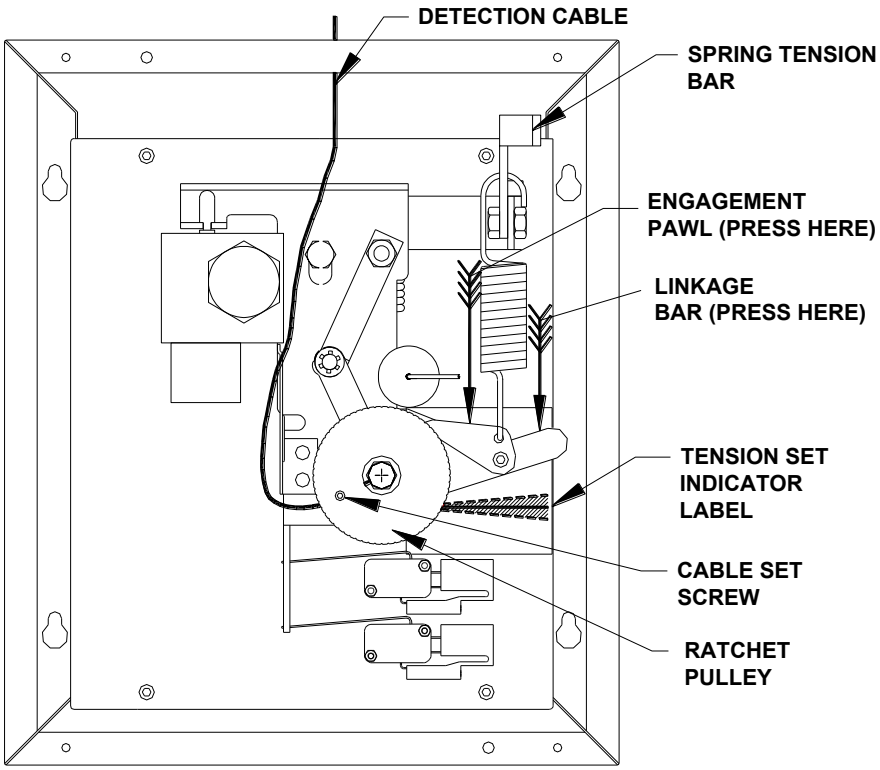
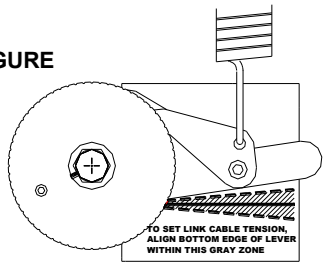
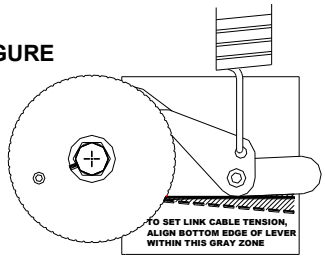


FIGURE A)



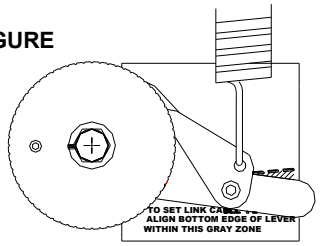
Not enough cable tension.
Lower spring tension bar. The lever and pawl must be pulled downward while the ratchet pulley is prevented from rotating. Approximately 2-4 more clicks are required from this position; then raise spring tension bar and re-examine results.
Caution: The MRM may inadvertantly cause system discharge if left in this position.

FIGURE B)



Proper Cable Tension. Correct Detection Cable tension is obtained when the bottom edge of the linkage bar is aligned within the gray "pie" region of the indicator label, with the spring tension bar in the "up" position. Stand directly in front of the MRM while viewing. The lower edge of the linkage bar will essentially be horizontal.

FIGURE C)



Too Much Cable Tension.
Lower spring tension bar and unhook the blue spring from the tension bar, releasing all tension. Repeat the process until Figure B is achieved. **Caution: damage to the MRM can result from careless over-tensioning of the assembly.**

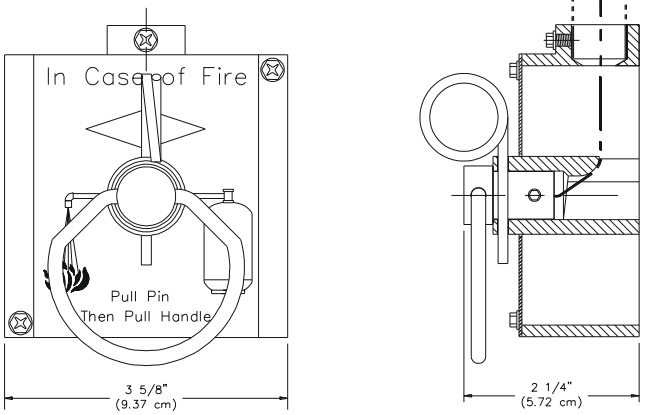
F)2) Installing the Detection Network - ERM Installations

Thermostats are to be installed in the anticipated path of convective heat flow from the fire, and spaced at a maximum on-center distance of 20 feet for smooth ceiling heights up to 12 feet. Observe other spacing minimums as outlined in NFPA 72. The four-wire electric thermostats are to be installed in a vertical orientation (horizontally in vertical duct sections) in standard 4" octagonal outlet boxes. Wiring must be done per NFPA 70. See ERM Installation Manual **P/N 15827** for further details.

G)1) Installing the Manual Pull Station(s) – MRM Installations

To install the Manual Pull Stations, first confirm that the Set-Up/Lock-out Tool is in place, that the tension bar is down, and that the Nitrogen Actuation Cylinder is **NOT** installed. **Failure to follow these instructions could result in the discharge of the system.**

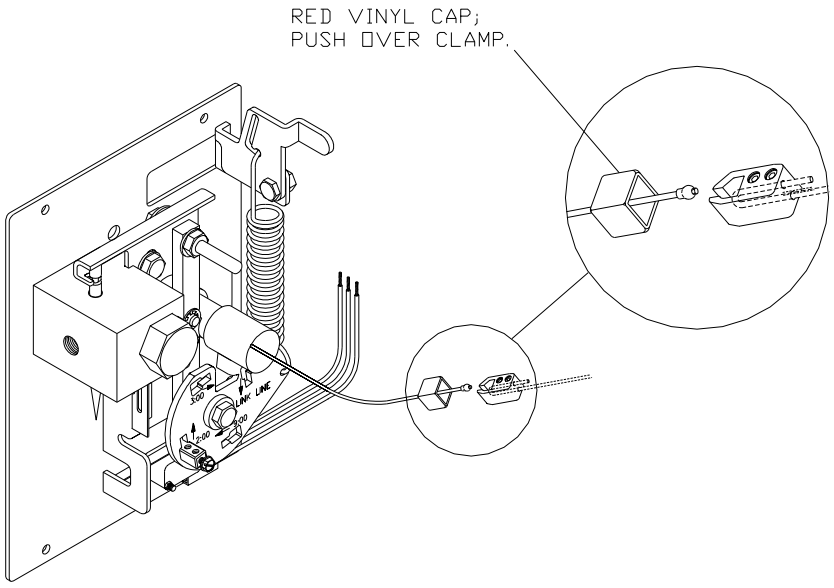
Refer to the Design Section, Chapter 3, for the limitations on the Manual Pull Station. The local AHJ should have the final approval for Manual Pull Station location and mounting height.



The Mechanical Release Module allows the cable for the Manual Pull Station(s) to enter from any of the three sides (TOP, BOTTOM, or RIGHT). Once a location for the pull station has been established, ½" EMT conduit is run from the MRM (using whichever exit side is the most convenient) through corner pulleys to the pull station.

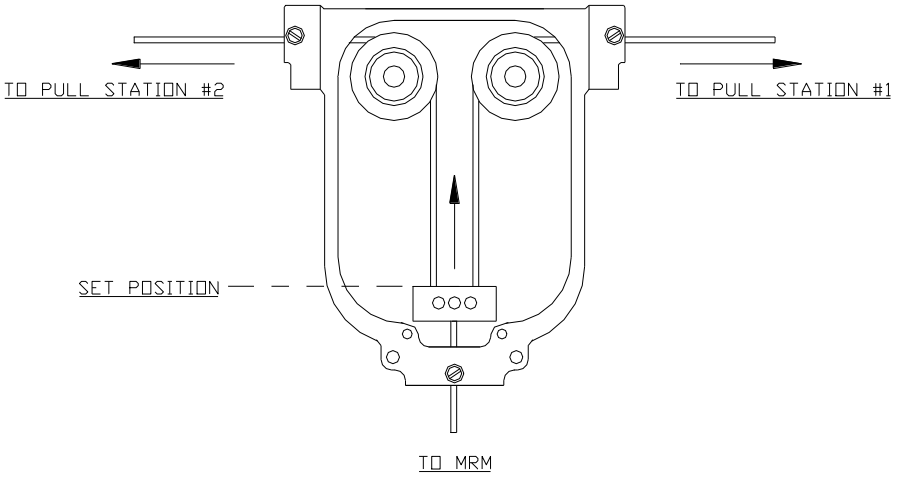
The Manual Pull Station may be mounted to the wall in any orientation necessary for surface mounting. The conduit and Pulley Elbows must be mounted and securely anchored. Then the cable can be fed from the Manual Pull Station back to the MRM.

The cable attaches to the pull station at the handle by using set screws. At the MRM, the cable attaches to the Cable Clamp extending from the Manual Pull Cam. Excess cable must be secured out of the way of any parts in the MRM. We suggest taping it back to the manual pull cable. **The Red Vinyl Cap MUST be pushed back over the Cable Clamp once connection is secured.**



Note: The Manual Pull Cam requires a travel distance of ¾" to actuate the system. It is not necessary to leave excess slack in the cable when installing the Manual Pull Station. Any splices used in the cable must be located at least 12 inches from the Pulley Tee or any pulley. **The connector inside the Pulley Tee should be located as far toward the MRM as possible, so as to allow sufficient cable travel**.

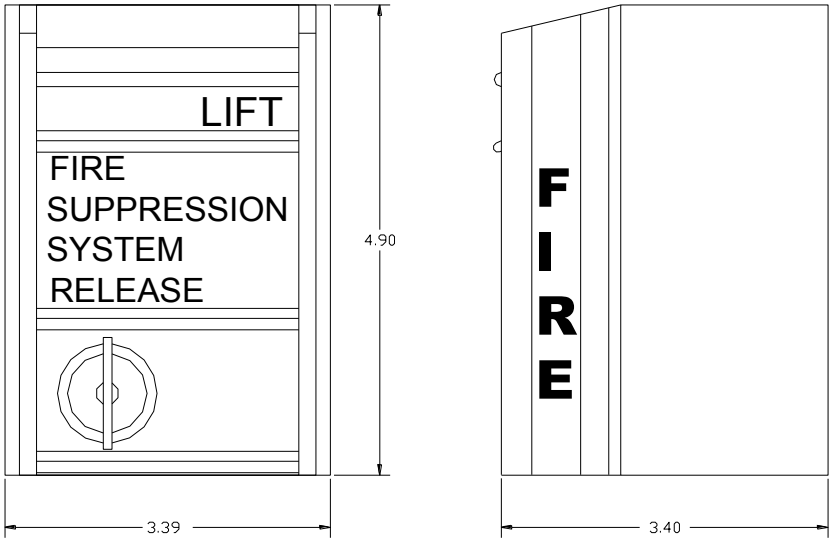
The function of the Pulley Tee is to allow the use of two Manual Pull Stations on a single MRM. Below is an illustration of a Pulley Tee in the "set position". Note that there is sufficient cable travel for actuation.



MANUAL ELECTRIC PULL STATION

G)2) Installing the Manual Electric Pull Station – ERM Installations

Refer to the Design Section, Chapter 3, for the limitations on the Manual Electric Pull Station. Wiring must be done per NFPA 70. See ERM Installation Manual P/N 15827 for further details. The local AHJ should have the final approval for Manual Pull Station location and mounting height.



H) Installing a Mechanical Gas Valve, for either MRM or ERM

Refer to the Design Section (Chapter 3) for limitations regarding Mechanical Gas Valve installations.

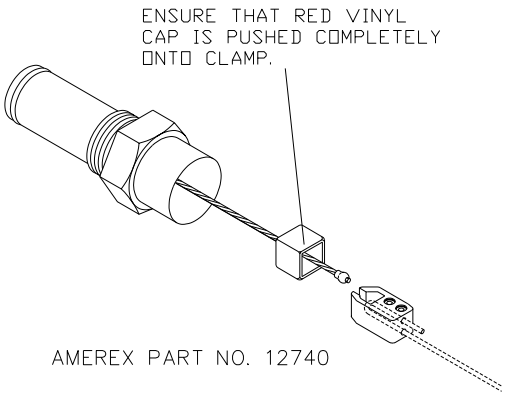
WARNING: Confirm that the gas is shut off at the source of supply before attempting to install the Mechanical Gas Valve. Installation of the Gas Valve into the gas line should be performed by a qualified, licensed contractor.

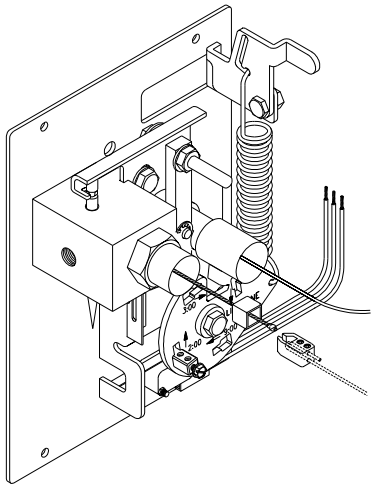
The Mechanical Gas Valve shall be located where it can be accessed for resetting, maintenance, service and where the status indicator may be viewed. The listed temperature range for the mechanical gas valves is 32°F to 120°F (0°C to 49°C).

Before beginning installation of the mechanical gas valve, associated cable, conduit and fittings, confirm that:

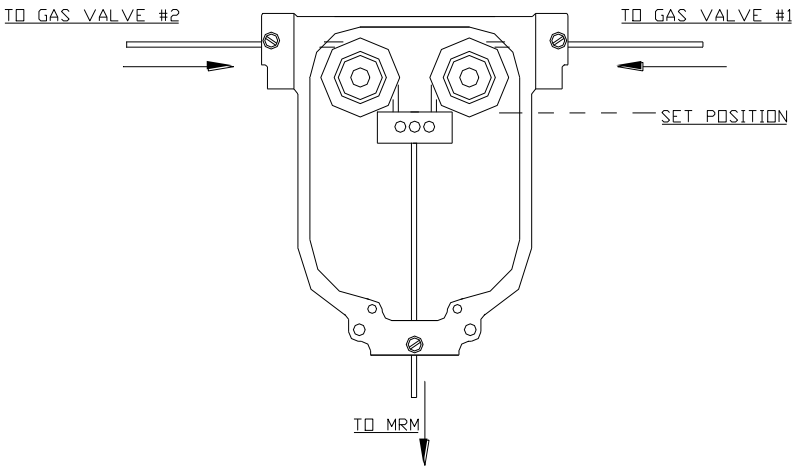
1. The MRM has the Set-Up/Lock-Out Tool installed.
2. The tension bar is in the "down" (relaxed spring) position (MRM).
3. The Nitrogen Actuation Cylinder has not been installed (MRM and ERM).

Remove the protective plug from the MRM (ERM) and install the Gas Valve Trip Assembly (**P/N 12740**). The Gas Trip Assembly must be purchased separately for use with the ASCO and Ansul gas valves.





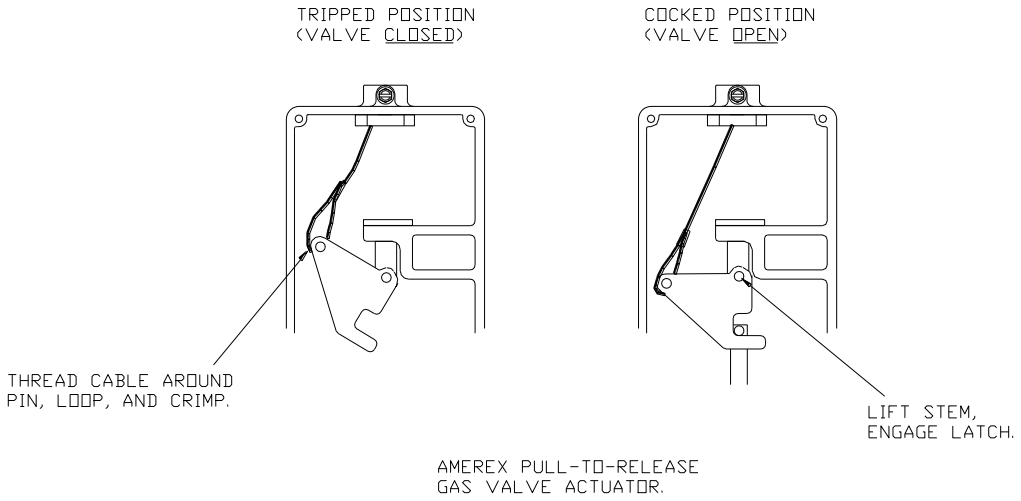
Note: The cable for the Mechanical Gas Valve may enter the MRM enclosure from three sides (top, bottom, or right). The cable may enter the ERM enclosure from either the top or the bottom.



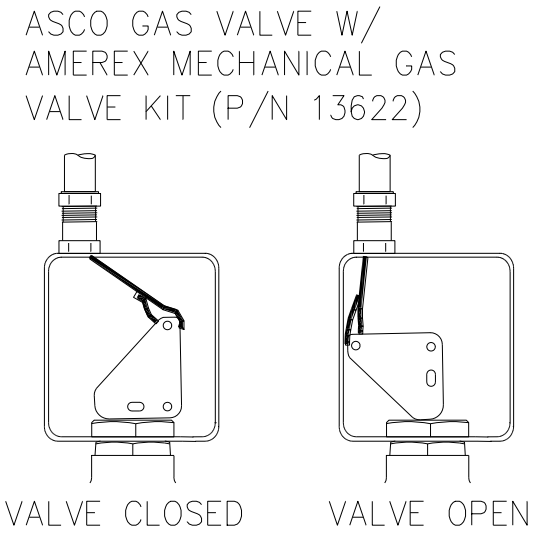
Above is an illustration of a Pulley Tee used to operate two Gas Valves from a single MRM (ERM). Note that the "set position" allows sufficient cable travel for actuation.

At the Mechanical Gas Valve:

1. Connect the cable to the latching lever in the gas valve actuator housing by threading it around the pin in the latch (Amerex Actuator) or through the hole in the latch (all others). Secure it with a loop and crimp. Note: When using an Ansul Gas Valve – make certain that the loop is large enough so that the crimp is inside of the conduit when the valve is cocked.
2. Lift the gas valve stem up and slide the latch into the engaged position.

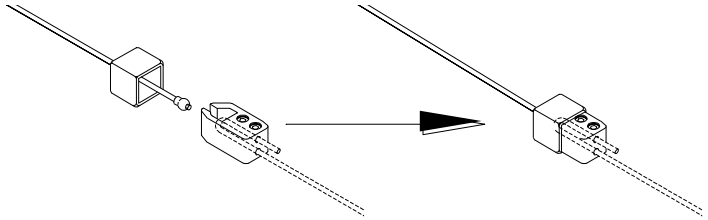


AMEREX PULL-TO-RELEASE
GAS VALVE ACTUATOR.



At the MRM (ERM):

1. Confirm that the cable is moving freely in the Corner Pulleys and the valve is in the Cocked Position.
2. Thread the cable through the cable connector (provided with the Gas Valve Trip Assembly).
3. With the Red Vinyl Cap slipped on, join the swaged ball fitting of the Gas Valve Trip Assembly to the cable connector. Install the Red Vinyl Cap over the end of the cable connector as illustrated. **WARNING: IMPROPER INSTALLATION OF THE RED VINYL CAP MAY CAUSE FAILURE OF THE GAS VALVE TO CLOSE**.



4. Draw the slack out of the cable. Make certain that the piston component of the Gas Trip Assembly is pulled forward to its fully extended position.
5. When all of the slack is drawn out of the cable, secure it with the set screws.
6. Test the valve by pulling on the cable inside the MRM (ERM) until tension is relieved. Confirm that the gas valve has closed.
7. Secure all excess cable so that it is out of the way of any parts in the MRM (ERM). We suggest taping it back to the gas valve cable.

To test the operation of the gas valve:

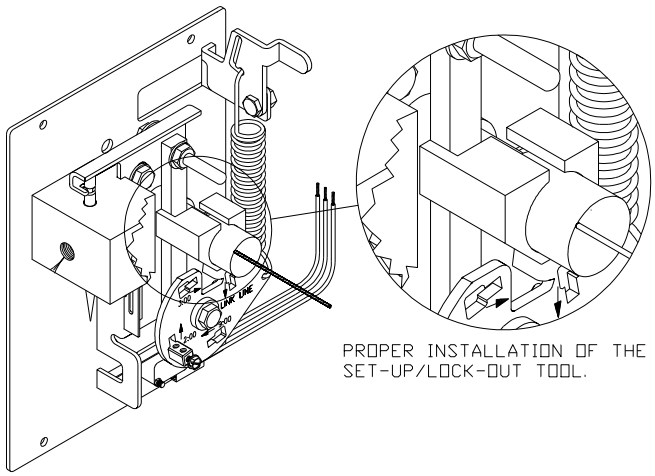
1. Disconnect actuation tubing and plug the outlet port of the MRM (ERM).
2. Insert an Amerex **P/N 12856** Nitrogen Cylinder into the MRM (ERM).
3. Pull on the Manual Pull Station. **Warning: Actuation Network is Under Pressure – Proceed with Caution**.
4. Relieve pressure in Actuation Network by inserting a paperclip into the small opening of the Vent Check and allowing the gas pressure to bleed off.
5. Reset the MRM (ERM).
6. Reset all accessory items.
7. Install a fully charged Nitrogen Cylinder.
8. Securely connect actuation tubing. Do not over tighten tube fittings into the MRM (ERM) pipe threads. Over tightening could cause the MRM to malfunction.
9. Reset the Mechanical Gas Valve.
10. Remove all set-up tools from the MRM (ERM).
11. Replace and seal the enclosure cover on the MRM. (Replace and lock the ERM cover.)
12. Replace and seal the cover on the Mechanical Gas Valve.

Warning: The Mechanical Gas Valve and associated components should be tested and exercised every time that system maintenance is performed. <u>Maintenance should be performed at intervals not exceeding six months</u>. Failure to test the Mechanical Gas Valve and related components could result in a total system failure during a fire.

I) Installing an Electrical Gas Valve, for either MRM or ERM

Before beginning the installation of an Electric Gas Valve:

1. Confirm that the gas has been shut off at the supply.
2. The tension bar in the MRM is in the "down" (spring relaxed) position.
3. The Set-Up/Lock Out Tool has been installed (MRM) and that the Nitrogen Actuation Cylinder is not in place (MRM and ERM).



PROPER INSTALLATION OF THE SET-UP/LOCK-OUT TOOL.

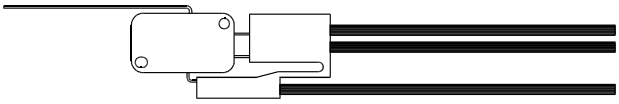
4. Install the gas valve into the gas line. If any strainers are to be used, they shall be placed upstream of the gas valve. Confirm that the valve is installed with correct gas flow direction as indicated by the arrow on the gas valve body. Wrenches must be placed on the valve at the point closest to the connection being tightened and a "hold" must be placed on the valve when fitting pipe downstream of the valve body. DO NOT USE THE GAS VALVE AS A LEVER FOR TIGHTENING PIPE. If pipe joint compound is used, it must be applied sparingly to the back male threads. Pipe joint compound entering the gas valve could cause the valve to fail.
5. Test the gas valve and connections for leaks using a soapy solution.
6. Install necessary EMT conduit connecting the MRM (ERM) to the Electrical Gas Valve.

Warning: Confirm that the gas has been shut off at the source of supply and that the electrical power has been turned off before attempting to install the Electric Gas Valve in the gas line or do any work on electrical wiring. Installation of the valve into the gas line should be performed by a qualified, licensed contractor. All electrical installation should be performed by a qualified electrician according to the instructions provided by the gas valve manufacturer. All wires should be clearly tagged, the schematic noted for future reference in the permanent job file and all disconnected wires must be taped or have wire nuts installed.

For installation of the microswitch see section labeled "Microswitch Installation". Unlike the Mechanical Gas Valve, the Electric Gas Valve has specific limitations regarding its orientation on the gas line – please refer to the manufacturer's instructions. Confirm that the valve is installed in the proper direction of flow according to the arrow on the valve body and that wrenches are used in the proper manner.

J) Microswitch Installation, for either MRM or ERM

One SPDT microswitch is pre-installed in the MRM. Two SPDT microswitches are installed in the ERM. However, only one is available for use by the owner, since one microswitch is dedicated to interrupting the actuation current to the solenoid, after system firing. Before beginning the installation of any additional Microswitches, confirm that the tension bar (MRM) is in the "down" (relaxed spring) position, that the Set-Up/Lock-Out Tool is in place (MRM), and that the Nitrogen Actuation Cylinder has not been installed (MRM and ERM). The SPDT switch is mounted with two screws that attach to the "motherboard" in the MRM (screws are provided with the MRM). If a DPDT switch is required, a second SPDT switch should be mounted or "stacked" onto the first switch. An additional three SPDT switches may be mounted above and on top of the original switch for a 4PDT configuration. For the ERM, an additional two SPDT switches may be mounted on top of the original switches for a 3PDT configuration. A metal wire gutter is provided with the MRM to assure a neat and orderly installation. Microswitches are intended for indoor use only.



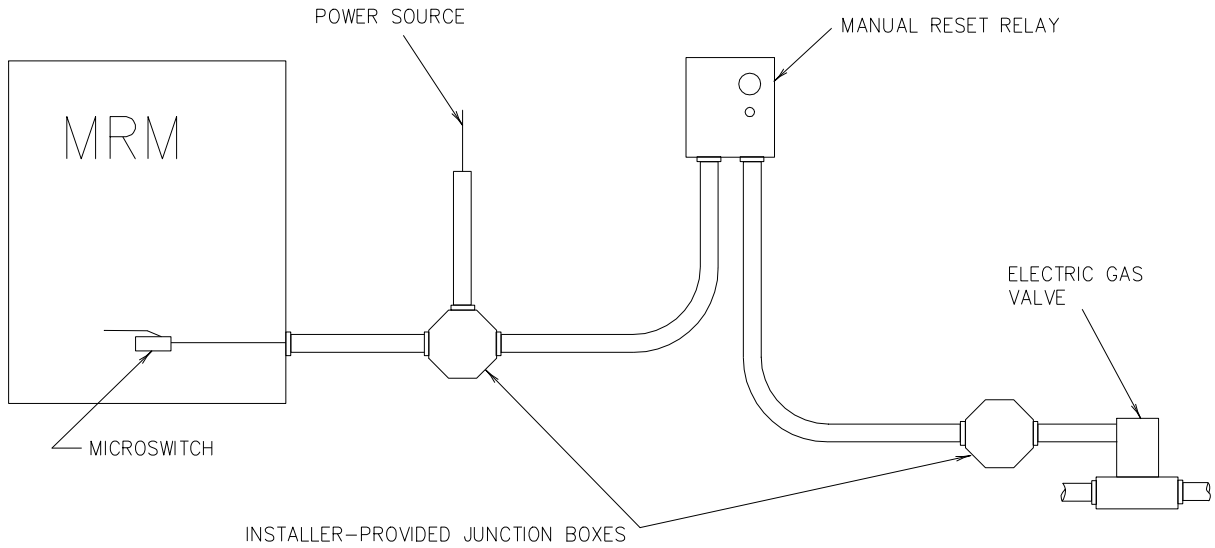
RED: COMMON
YELLOW: N.O.
BLACK: N.C.

Part Number	Contacts	Rating
12524	SPDT Single-Pole, Double-Throw	21A 1HP 125m 250, 277 VAC 2HP 250, 277 VAC

Auxiliary connections can now be made to perform required output functions.

Warning: Power to electrical appliances should never be run through the Microswitch. The switch should be used to operate a separate, contractor-supplied, electrical contactor or magnetic switch of sufficient rating to handle the power requirements of the appliances. All electrical field wiring should be performed by a licensed electrician.

Electric Gas Valve Installation Overview

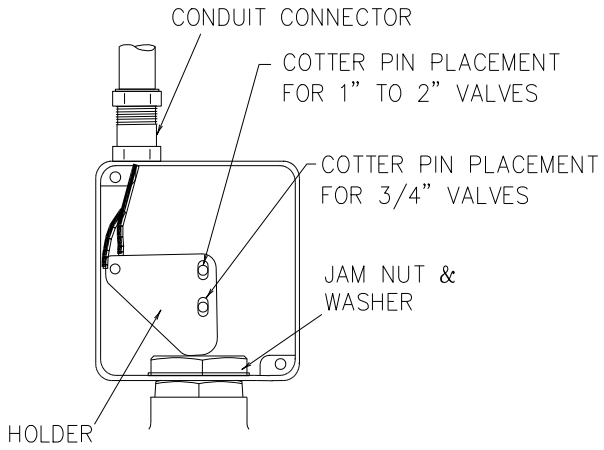


K) Installing a Mechanical Gas Valve Kit, for either MRM or ERM

The gas shut-off valve to be converted to a "pull to close" type should be located where it can be easily accessed for resetting, maintenance and service.

Note: This kit is designed to allow certain specified gas shut-off valves to be interconnected to an Amerex Industrial Fire Suppression System. It is not intended for repair of damaged or inoperable gas shut-off valves or to be used with industrial systems other than an Amerex Industrial Fire Suppression System.

1. Insure that the MRM has been locked-out properly and that the nitrogen actuation cylinder is not installed (MRM and ERM). Refer to the section on installing a Mechanical Gas Valve. **Warning: Verify that the main gas supply has been shut off prior to installing the gas shut-off valve. Gas valve installation should be performed by a qualified, licensed contractor.**
2. Visually inspect the gas shut-off valve stem for cleanliness and damage. Replace the gas shut-off valve if the stem appears damaged or if it will not operate properly.
3. Install the conduit connector as shown below.



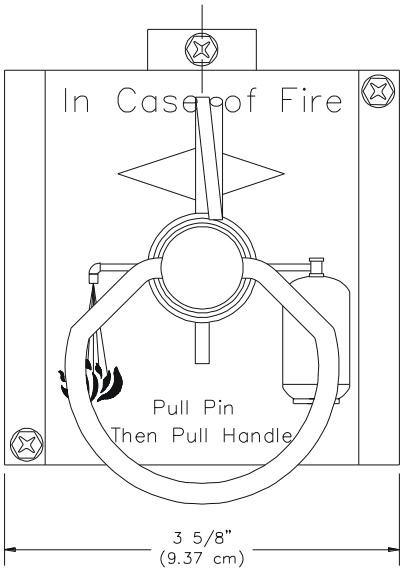
4. Install the Outlet Box (**P/N 13626**) using the Jam Nut (**P/N 13625**) and the Washer (**P/N 13624**).
5. Install the Cotter Pin (**P/N 08292**) through the gas shut-off valve stem and hole that corresponds to the size of the valve. Bend the tabs of the Cotter Pin over to secure it in place. Be sure that the tabs do not interfere with the operation of the holder.
6. Install the necessary ½" EMT conduit, Corner Pulleys (**P/N 12309**), Tee Pulleys (**P/N 12506**), and Cable (**P/N 12553**) to connect the gas shut-off valve to the MRM (ERM). For gas shut-off valve cable limitations and installation instructions see the Design and Installation Sections .
7. Insert one end of the cable through the crimp, through the hole in the rear of the holder, then back through the crimp and compress the crimp to secure it in place.
8. To install, set, and test the Gas Valve Trip Assembly, refer to the section on "Installing the Mechanical Gas Valve".
9. After testing the actuation of the gas shut-off valve, insure that all components of the system are reset. Place the cover on the outlet box and secure it in place.

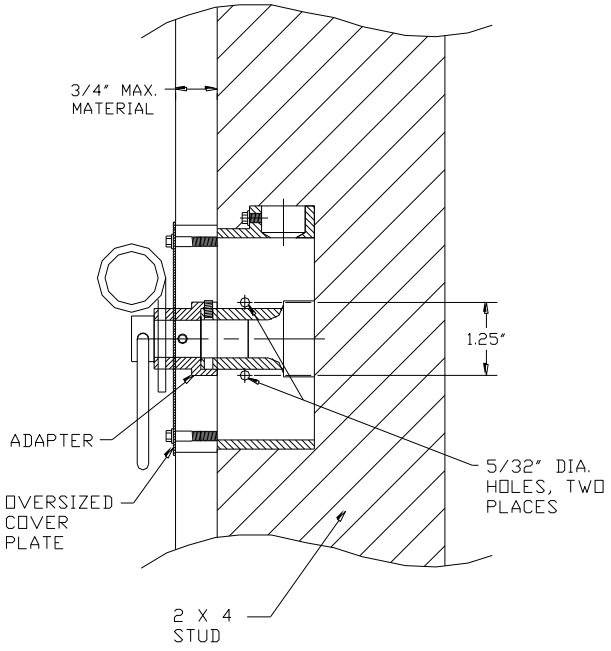
L) Recessed Installation of Manual Remote Pull Station for MRM, only

When installing the Manual Pull Station in a recessed configuration, utilize the Adapter Kit (**P/N 14193**). The Manual Pull Station Adapter Kit includes an oversize cover plate to cover the hole cut in the sheetrock. A pull handle extension collar to compensate for the thickness of the wall and two longer attachment screws for the cover plate are also enclosed.

Using the Manual Pull Station Adapter Kit (**P/N 14193**):

1. Drill 5/32" diameter mounting holes (two places) as shown. Holes are located in the side of the box which will be mounted to the stud. Holes may be enlarged to accommodate the mounting screws.
2. Mount box to the wall stud so that the front edge of the box is flush with the front edge of the stud. Attach the box to the stud with two suitable screws.
3. Complete the installation by running ½" conduit with the Corner Pulleys back to the MRM.
4. Install the "adapter" provided to compensate for the wall thickness. A thickness of up to ¾" is allowed. Orient the adapter so that the securing screw falls directly over the pull pin hole of the Manual Pull Station. Tighten the set screw firmly in place.
5. Run the Cable from the Remote Manual Pull Station to the MRM.
6. Install the Cover Plate on the Remote Manual Pull using the two longer screws provided.
7. Install the Pull Handle by attaching the Cable to the Pull Handle end – secure Cable with the set screw.
8. Insert the Handle and secure with the Pull Pin.
9. Complete the installation at the MRM as outlined in Section 4G)1).





CHAPTER 5
PLACING THE SYSTEM INTO SERVICE

Those individuals responsible for placing the Amerex Industrial Dry Chemical System into service must be trained by Amerex and hold a current Amerex Certificate.

Once the Amerex Industrial Fire Suppression System has been completely installed, **and BEFORE INSTALLING THE NITROGEN ACTUATION CYLINDER**, the system must be given a complete functional test to confirm proper operation.

Testing the Detection Network

A) **Mechanical Releasing Module (MRM) Systems:**

The Terminal Detector must have a test link (**P/N 12891**) installed in place of the fusible link. With the Nitrogen Actuation Cylinder removed from the MRM, the release mechanism cocked, the tension bar in the "up" (stretched-spring) position and the Set-Up/Lock-Out Tool removed, cut the test link with a wire cutter or similar device. The MRM must fire at this time.

If the MRM **did** fire, follow reset instructions, place the proper fusible link on the terminal detector and continue with the system test.

If the MRM **did** NOT fire, check to see that:

- The detectors are installed properly.
- The cable is not binding at any point in the conduit or Corner Pulleys.
- The cable is connected to the link plate properly.
- The tension bar is in the "up" position and that the Set-Up/Lock Out Tool is not in place.

Once these items have been investigated and resolved, retest.

B) **Electrical Releasing Module (ERM) Systems:**

With the Nitrogen Actuation Cylinder removed from the ERM, the panel cocked, with the green "System OK" LED on, successively apply heat, from a heat gun, to each thermostat. Each time, the ERM should fully activate and indicate the following:

- The red Fire LED and the internal Audible Sounder is on. Remote Audible Device is on, if present.
- The green System OK LED is off.
- The Gas Trip Assembly, if present, will have pulled the gas valve closed.
- Any auxiliary electrical components wired through the plate-mounted microswitches will have transferred.

Note: When the Discharge Delay button displays 15 seconds, then the Nitrogen Actuation will be delayed by 15 seconds, while the Alarm indications will transfer immediately.

Testing the Manual Pull Station

A) **Mechanical Releasing Module (MRM) Systems**:

After the Detection Network has been tested and **BEFORE INSTALLING THE NITROGEN ACTUATION CYLINDER**, the Manual Pull Station must be tested:

Remove the pull pin on the Manual Pull Station, grab the handle and pull away from the mounting surface. The MRM must fire at this time.

If the MRM **did** fire, replace the pull pin, attach the tamper seal and follow the reset instructions.

If the MRM **did NOT** fire, check to see that:

- The Pull Station has been installed properly.
- The cable is not binding anywhere in the conduit, Corner Pulleys, or Pulley Tee.
- The cable is connected properly to the manual pull cam in the MRM.
- The Set-Up/Lock Out Tool is not in place.

Once these items have been investigated and resolved, retest.

B) **Electrical Releasing Module (ERM) Systems:**

After the Detection Network has been tested and BEFORE INSTALLING THE NITROGEN ACTUATION CYLINDER, the Manual Pull Station must be tested:

Pull the FIRE handle on the Manual Electric Pull Station. The ERM must fire at this time (or be delayed by 15 seconds, if so configured). The following will be indicated:

- The red Fire LED and the internal Audible Sounder is on. Remote Audible Device is on, if present.
- The green System OK LED is off.
- The Gas Trip Assembly, if present, will have pulled the gas valve closed.
- Any auxiliary electrical components wired through the plate-mounted microswitches will have transferred.

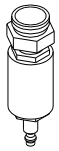
Note: When the Discharge Delay button displays 15 seconds, then the Nitrogen Actuation will be delayed by 15 seconds, while the Alarm indications will transfer immediately.

C) **Electric Control Head (ECH) Systems:**

After the Detection Network has been tested and BEFORE RE-INSTALLING THE ELECTRIC ACTUATOR AND NITROGEN ACTUATION CYLINDERS, the Manual Pull Station must be tested: Pull the FIRE handle on the Manual Electric Pull Station. The pin of the Electric Actuator must extend at this time (or be delayed by 15 seconds, if so configured) with an audible 'click'. Use the back of a writing pen (or similar) to manually push the pin back up into the Electric Actuator after firing. Reset the Amerex SR-X Releasing Panel upon completion of testing. Re-install the Electric Actuator onto the ECH. **Warning**: Failure to reset the Electric Actuator prior to re-installation will result in system actuation.

Testing the Actuation Network

Pressure test the Actuation Network. Thread the Amerex **P/N 10895** Actuation Network Test Adapter into the MRM (or ERM) in place of the Nitrogen Cylinder and connect a regulated air or nitrogen source.



— 10895 ACTUATION NETWORK TEST ADAPTER

Caution: This test must be performed only with the Pneumatic Control Head removed from the Agent Cylinder Discharge Valve or discharge will occur. Additionally, the Nitrogen Cylinders of any Remote Nitrogen Actuators must be removed.

Pressurize the Actuation Network to 70 psi from the Control panel to the Pneumatic Control Heads. If Remote Nitrogen Actuator(s) are present, pressurize from the Control Panel to the Remote Nitrogen Actuators and from the Remote Nitrogen Actuators to the Pneumatic Control Heads. Inspect as follows:

1. Check all Actuation tubing connections between the Control Panel and the Pneumatic Control Head (and between Remote Nitrogen Actuators and the Pneumatic Control Heads). Repair any connections found to be leaking.
2. Check that the piston on the Pneumatic Control Head is fully extended ½" (12mm) and that no pressure is escaping around the piston. Disassemble and reset the control head; rebuild if required.
3. For Remote Nitrogen Actuators, check that the puncture point fully extends 3/8" (9.5mm) and that no pressure is escaping around the piston. Rebuild if required.
4. Examine the Vent Check to confirm the nylon ball is sufficiently seated. Replace Vent Check if improper operation is detected.
5. Confirm that no leaks exist at the MRM (or ERM) around the puncture stem or Gas Trip Assembly (or plug). Disassemble and repair, if necessary.
6. When completed, remove test adapter and pressure source. Disassemble and reset the Pneumatic Control Head into the fully retracted position.

Once completed, bolt the Pneumatic Control Head(s) back onto the Agent Cylinder Valve(s), install the Nitrogen Actuation Cylinders into any Remote Nitrogen Actuators in the system. Remove the Actuation Network Test Adapter.

Testing the Distribution Piping Network

To confirm that the Distribution Network Piping is clear and intact, connect to a compressed air source and blow air through the Discharge Network at the Agent Cylinder. Confirm that the Nozzle Blow-Off Caps are forced off, and that air is free-flowing through each nozzle. Reconnect the piping back to the Agent Cylinder Valve. Replace Nozzle Blow-Off Caps onto Nozzles.

Testing the Mechanical Gas Valve

With the gas on and the gas appliance working, pull on the cable leading to the Gas Valve where it connects to the piston/gas trip assembly in the MRM (or ERM). The Gas Valve must release at this time.

If the Gas Valve **does** release, follow the reset instructions and continue with the test.

If the Gas Valve **does NOT** release, check to see that:

1. It has been installed properly.
2. The cable is not binding in the conduit or in a Corner Pulley (MRM sytems).
3. It has been connected to the MRM properly and that the cable has been secured properly where it connects to the gas valve trip mechanism.

Once these items have been investigated and resolved, retest.

Testing the Electrical Gas Valve

With the Gas Valve on and the gas appliance operating, follow the procedure for testing the Manual Pull Station. When the Manual Pull Station is activated and the MRM (or ERM) fires, the Microswitch(es) must transfer contacts, cutting off current to the Electric Gas Valve. The Manual Reset Relay shall show an "off" condition. If this is not the case, turn the power to the relay and Electric Gas Valve off and check all electrical connections. Retest once problem is resolved.

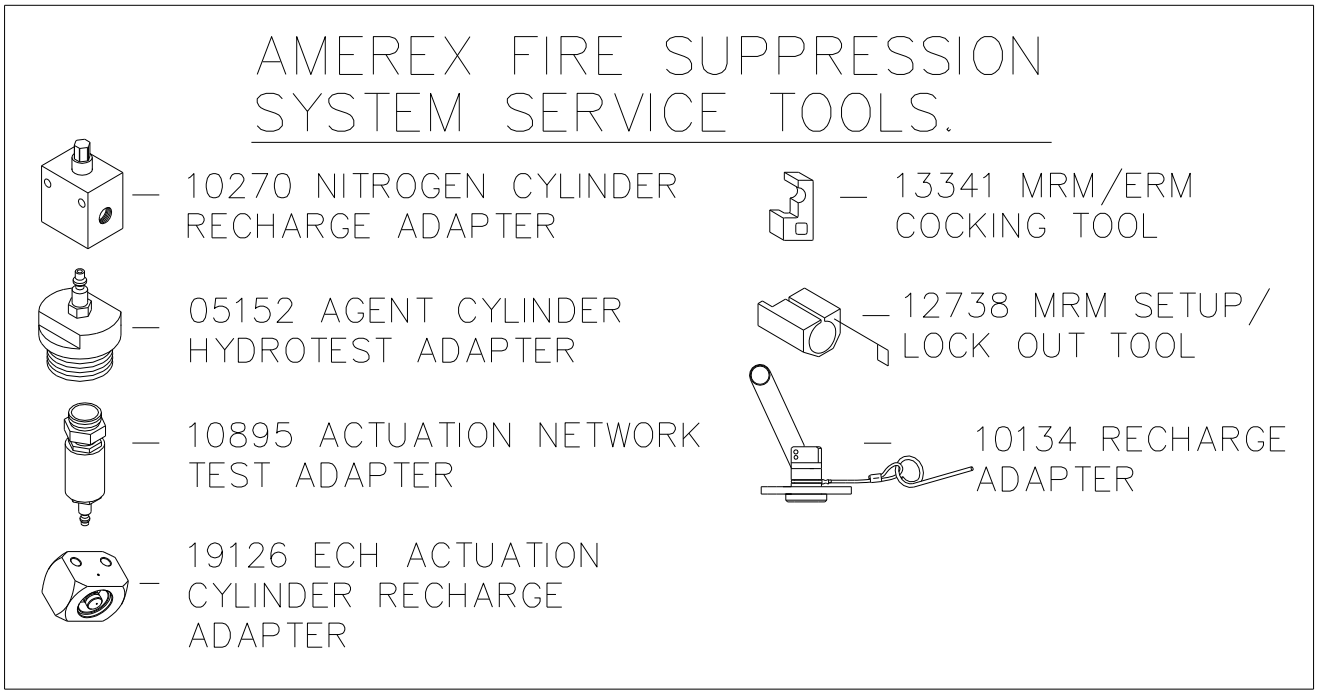
Testing Completed

After all testing has been completed, follow reset instructions and put the system on line, including the Nitrogen Actuation Cylinder and all tamper seals. The testing procedures and results should be documented in written form, with photographs taken, with copies left for the owner/manager, local AHJ (if required) and put into the permanent job file. A short instruction period on the operation of the system and procedures to use during a fire incident shall be given to the owner, owner's agent and appropriate employees. A copy of the Amerex **P/N 15064** "Owner's Manual" must be given to the owner along with a Material Safety Data Sheet on the Dry Chemical Agent used in the system. Review the Owner's Manual with the owner or owner's agent.

Any discrepancies found between the finished installation and the design sketches or drawings should be noted and an "as-built" drawing prepared for the permanent job file.

CHAPTER 6
SYSTEM MAINTENANCE

The Amerex Industrial Dry Chemical Fire Suppression System must be properly maintained at intervals <u>not exceeding six (6) months</u> in order to assure proper operation.



Those individuals responsible for the maintenance of the Amerex Industrial Dry Chemical System must be trained by Amerex and hold a current Amerex Certificate. Maintenance shall be performed in accordance with NFPA 17 and local code requirements.

Scheduling Maintenance: It is the owner's responsibility to conduct daily and monthly inspections, and semi-annual maintenance by your Certified Amerex Distributor. Amerex Corporation warrants only those systems that are properly maintained. Inspections and maintenance will often reveal the need for 12 year hydrostatic retest or 6 year teardown of the Agent Cylinder as required by the National Fire Protection Association (NFPA).

<u>A) Owner's Inspection:</u>
In accordance with the Owner's Manual, **P/N 15064**

On a daily basis: Check the pressure gauges on all agent cylinders and N2 cylinders, for proper operating pressure. Proper pressurization is indicated when the pointer is in the "green pie" zone.

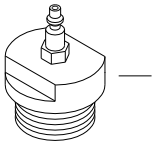
On a weekly basis: Confirm that the "Status Indicator" on the Mechanical Release Module (MRM) does not show a "Discharged" (red) condition. For systems controlled by the Electrical Releasing Module (ERM), confirm that there are no off-normal LED's on. For ECH systems, confirm readiness status of Amerex SR-X Releasing Panel, and that the Electric Actuator is secured to the ECH. Ensure that no obvious damage has occurred that could prevent the system from operating properly. Check to make sure that the Inspection/Maintenance tag is in place. Check all system components for corrosion or damage, and to insure that all mountings are secure. Check all 3/4 and 1 inch chemical delivery piping for tightness and orientation. Ensure that all 1/4 inch system actuation tubing is free from cuts, abrasion or kinks, and that all joints are tight. Carefully clean thermostats to remove caked residue when required. Check all Manual Pull Stations to insure that tamper indicators are in place, that operating instructions are clearly legible, and that access is unobstructed. Finally, check that all nozzles are unobstructed and that blow-off caps are in place.

On a monthly basis: In addition to the items shown above in the daily and weekly sections, perform the following: Confirm that all components of the extinguishing system are in their proper location. Inspect the system to determine that no physical damage or condition exists that might prevent operation. Verify that neither the protected equipment nor the hazard has been replaced, modified, or relocated. If any deficiencies are found, appropriate corrective action shall be taken immediately. Personnel making inspections shall keep records for those extinguishing systems that were found to require corrective actions. At least monthly, the date the inspection is performed and the initials of the person performing the inspection shall be recorded. The records shall be retained until the next semi-annual maintenance.

B) Maintenance:

Semi-Annual (Six Month) Maintenance Interval. This is to be performed only by a Factory-Trained, Authorized Amerex Industrial Dry Chemical Fire Suppression Systems Distributor, performed in accordance with this manual, NFPA 17, and Local Code requirements: A complete functional test of the system as described in Chapter 5, "Setting the System into Service", shall be performed at every maintenance interval along with the following:

1. Prior to performing any maintenance, remove the cover of the MRM, install the Set-Up/Lock-Out Tool and remove the Nitrogen Actuation Cylinder. For ERM-controlled systems, remove the cover and remove the Nitrogen Actuation Cylinder. For ECH systems, remove the **P/N 17014** Electric Actuator from the ECH.
2. Compare the number, type and location of each appliance with the "as-built" drawings or the previous system service. Note any changes, which may include obstructions to components of the Amerex System, in writing to the owner or the owner's agent and put a copy of the notification in the permanent job file. Changes made to any equipment could have a major effect on the system design and performance. A constant re-evaluation of fire hazards should be performed, in order to assure optimal system performance.
3. Examine all Detectors, Nitrogen Cylinders, Agent Cylinders, Manual Pull Stations, Gas Shut-Off devices, Actuation Tubing, Discharge Piping, and Nozzles for signs of degradation or build-up of foreign material which may hinder operation. Nitrogen Cylinders and Agent Cylinders should show proper pressure on their gauges. If pressure is low, check for leaks, or partial discharge. Depressurize the Agent Cylinder, clean valve components, and recharge. If over pressurized (overcharged), depressurize the Agent Cylinder and follow recharge instructions.
4. **Service the Agent Cylinders.** Clean cylinder to remove dirt, grease or foreign material. Check to make sure that the instruction nameplate is securely fastened and legible. Inspect the cylinder for corrosion, abrasion, dents or weld damage. If any of these conditions are found and you doubt the integrity of the cylinder, hydrostatic test to factory test pressure (700 psi, 4827 kPa), with **P/N 05152** Hydrotest Adapter, using the proof pressure method, in accordance with CGA Pamphlet C-6 and NFPA 17. Always thoroughly dry cylinders following hydrotest. See proper method of depressurizing and reclaiming chemical in System Recharge procedures. The hydrostatic test interval is not to exceed 12 years.

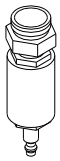


05152 AGENT CYLINDER
HYDROTEST ADAPTER

Warning: Always install shipping plate and anti-recoil plate when transporting a pressurized Agent Cylinder.

Note: When cleaning, avoid the use of solvents around the pressure gauge. They could seriously damage the plastic gauge face.

5. **Service the Discharge Valve**. Inspect the Discharge Valve for damaged, missing or substitute parts. Only factory replacement parts are approved for use on Amerex fire suppression systems. Check the fusible plug pressure relief to confirm that it is free of corrosion and has not been altered. Remove control head and check the valve stem return spring and retaining washer in the top of the valve for corrosion. Depressurize cylinder and rebuild valve if defects are found. See proper method of depressurizing and reclaiming chemical in System Recharge procedures in Chapter 7. System rebuilding and recharging may only be done by individuals certified by Amerex and those having jurisdiction in your area.
6. **Verify the contents of the Agent Cylinder.** On a yearly basis, weigh the Agent Cylinder and compare with the weight printed in the "Maintenance" Section on the agent cylinder nameplate (label). Recharge Agent Cylinder if weight is not within indicated allowable tolerances. Check the last recharge date on the Agent Cylinder inspection tag. As required by NFPA 17, the dry chemical in stored pressure systems must be examined every 6 years to confirm that the chemical is free flowing. If six years have elapsed, follow instructions in Chapter 7, "System Recharge" for proper depressurization and chemical reclaim. Check the date of manufacture stamped on the extinguisher cylinder dome. Cylinder must be hydrostatic (proof pressure) tested every 12 years to the test pressure indicated on the nameplate (700 psi, 4827 kPa). Follow the proof pressure method per CGA Pamphlet C-6 and NFPA 17 if hydrostatic testing is due. Always thoroughly dry cylinders following the hydrostatic test.
7. **Service the Discharge Network.** Inspect discharge outlet for extinguishing chemical residue. Extinguishing chemical residue is often the sign of an unreported discharge. Confirm that all piping is free of obstructions. Remove all Nozzle Blow-Off Caps. Attach a compressed air source to the discharge piping. Blow air through the piping. Confirm that free flow is present at each nozzle. Check all pipe connections along the entire network, and verify tightness. Confirm that the nozzles are properly aimed. Inspect all Blow-Off Caps and replace any that are worn or loose.
8. **Service the Pneumatic Control Head**. Remove the Pneumatic Control Head from the Agent Cylinder Discharge Valve by removing the two 5/16" bolts. Inspect the retaining ring, the retaining ring groove, the control head body, and the Vent Check for signs of damage or corrosion. Disassemble and rebuild if the integrity of the control head is in doubt.
9. **Pressure test the Actuation Network**.
   Thread the Amerex P/N 10895 Actuation Network Test Adapter into the MRM, PRM, ERM, or ECH in place of the Nitrogen Cylinder and connect a regulated air or nitrogen source to the adapter. **Caution: This test must be performed only with the Pneumatic Control Head removed from the Agent Cylinder Discharge Valve or discharge will occur. Additionally, the Nitrogen Cylinders of any Remote Nitrogen Actuators must be removed .** Pressurize the Actuation Network to 70 psi from the Control panel to the Pneumatic Control Heads. If Remote Nitrogen Actuator(s) are present, pressurize from the Control Panel to the Remote Nitrogen Actuators and from the Remote Nitrogen Actuators to the Pneumatic Control Heads. Inspect as follows:



   a. Check all Actuation tubing connections between the Control Panel and the Pneumatic Control Head (or between Remote Nitrogen Actuators and the Pneumatic Control Heads). Repair any connections found to be leaking.
   b. Check that the piston on the Pneumatic Control Head is fully extended ½" (12mm) and that no pressure is escaping around the piston. Disassemble and reset the control head; rebuild if required.
   c. For Remote Nitrogen Actuators, check that the puncture point fully extends 3/8" (9.5mm) and that no pressure is escaping around the piston. Rebuild if required.
   d. Examine the Vent Check to confirm the nylon ball is sufficiently seated. Replace Vent Check if improper operation is detected.
   e. Confirm that no leaks exist at the MRM (or ERM) around the puncture stem or Gas Trip Assembly (or plug). Disassemble and repair, if necessary. Likewise confirm that there is no leakage at the ECH
   f. When completed, remove test adapter and pressure source. Make sure piston on Pneumatic Control Head is fully retracted and bolt head securely on top of discharge valve.

10. **Service the Nitrogen Cylinders**. Clean all N2 Cylinders to remove dirt, grease, and foreign material. Check to make sure that the nameplate is in place and fully legible. Inspect the cylinder for corrosion, abrasion, or dents. Relieve pressure and discard if integrity of cylinder has been compromised. **Note: When cleaning N2 Cylinders, avoid the use of solvents. They could seriously damage the gauge face, the gauge guard, or the nameplate.** Visually inspect the pressure gauge. The pressure must be in the "green pie" zone. Follow instructions for N2 Cylinder recharge if pressure is below operable range. Visually inspect the rupture disc. Check for signs of rupture or corrosion. Check that the disc is not a substitute. Only an Amerex factory supplied rupture disc marked with A7 or AX is acceptable. Follow instructions for N2 Cylinder recharge if disc is corroded or otherwise unacceptable. **Warning: Always install shipping cap when transporting a pressurized N2 Cylinder.**
11. **Service the Detection Network**. **Amerex recommends that all fusible links (on MRM systems) be replaced every 6 (six) months. Under no circumstances shall Fusible Links be allowed to remain on line for more than ONE year**. Links that do not need replacing must be thoroughly cleaned before being put back into service. Any Fusible Link found to be damaged, painted, or having excess foreign material must be replaced regardless of age. On ERM-equipped systems, confirm that the electric thermostats are free from dents and any build-up of paint or foreign debris. Replace if necessary.
12. Replace Nitrogen Actuation Cylinder, **Remove Set-Up/Lock-Out Tool** (MRM systems), replace the cover and install new tamper seals.
13. After performing a complete functional test of the system, the owner or owner's agent shall receive some documentation on the maintenance performed (with a copy to be placed in the permanent job file) and instruction on how the system and related hand portable fire extinguishers work, including procedures for incidents.
14. Record date of service on Inspection/Maintenance tag and attach to system.

CHAPTER 7
RESET AND RECHARGE

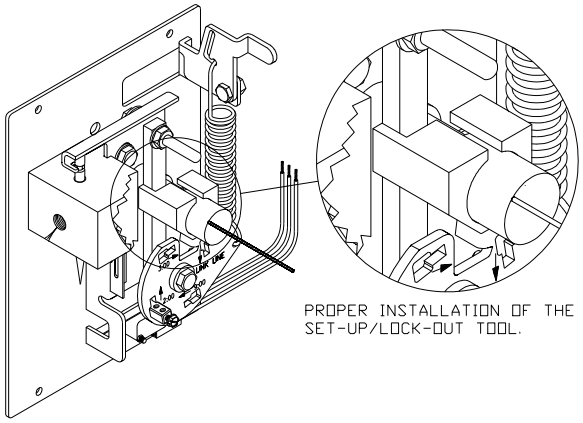
Those individuals responsible for the reset and recharge of the Amerex Industrial Dry Chemical System must be trained by Amerex and hold a current Amerex Certificate.

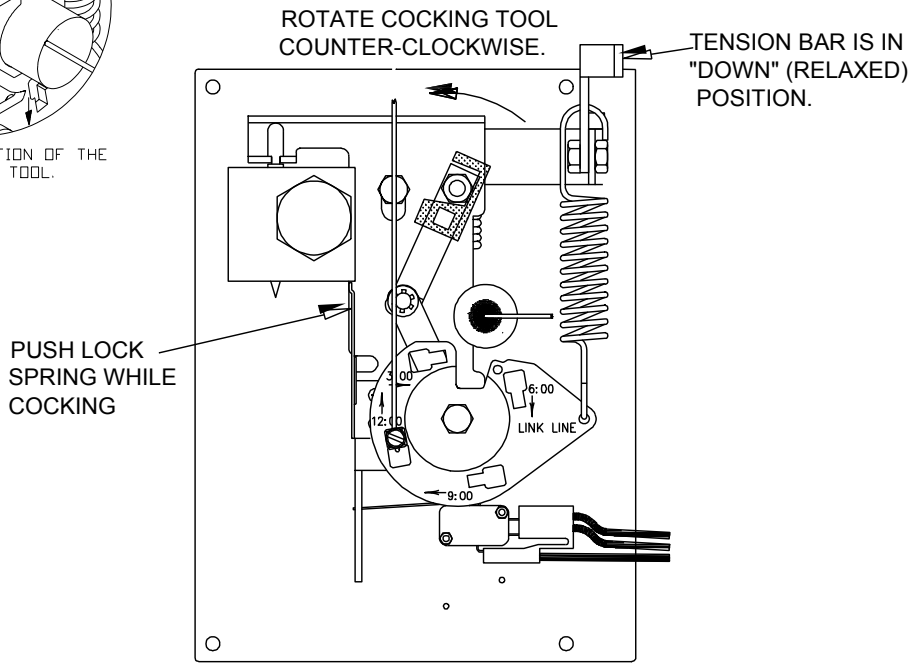
Reset Procedures

Each time the MRM is fired, the following procedures must be performed to accomplish reset:

1. Remove cover of the MRM and move the tension bar to the “down” (relaxed spring) position.
2. Cock the MRM by simultaneously pushing in on the lock spring and turning the Cocking Tool counterclockwise. The Mechanical Pull Piston must be pushed in all the way.
3. Insert the Set-Up/Lock-Out Tool after cocking.

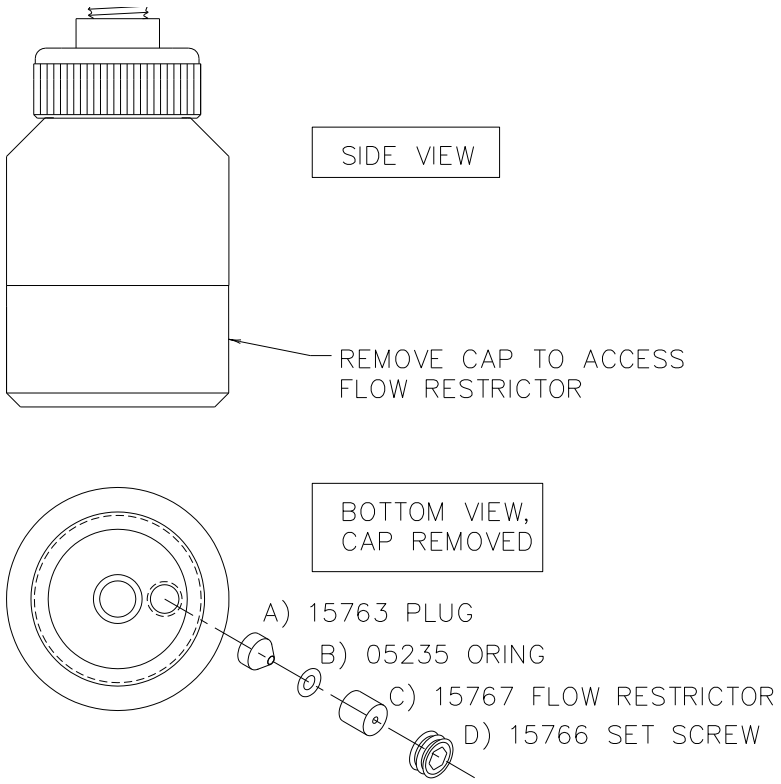
Note: Refer to the Design and Installation Manual, P/N 15827, for instructions on how to reset the Electrical Release Module, P/N 15780, if the system is so equipped. Refer to the Design and Installation Manual, P/N 16456, for instructions on how to reset the Pneumatic Release Module, P/N





4. If a Nitrogen Actuation Cylinder was expelled, relieve pressure from the Actuation Network by depressing the ball in the Vent Check. Remove the Nitrogen Actuation Cylinder.
5. Confirm that all detectors are assembled and Fusible Links are properly installed.
6. Leave the Set-Up/Lock Out Tool in place and verify that the cable for the detection network is properly attached to the link plate.
7. Confirm that the Manual Pull Stations have pull pins inserted and tamper seals installed.
8. Check to see that the Manual Pull Cam in the MRM is pushed in all the way and the cable to the pull station is properly attached.
9. If the discharge was caused by a fire incident, replace **ALL** of the Fusible Links in the Detection Network.

10. If a Mechanical Time Delay (**P/N 15765**) is used, the Flow Restrictor (**P/N 15767**) must be replaced. The following is an assembly schematic:

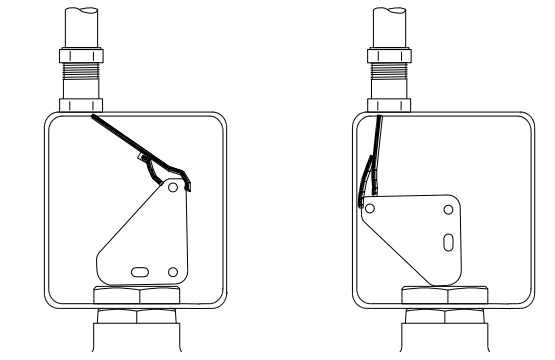


Replacement of P/N 15767 Flow Restrictor, Assembly Schematic of Mechanical Time Delay Notes:

a. Ensure proper order of components as they are inserted into the opening, as shown below.
b. Do not allow any sealants or contaminants to enter the bottom to the Time Delay.
c. The Set Screw (**P/N 15766**) should be hand-tightened (no thread sealant) with an Allen hex wrench.

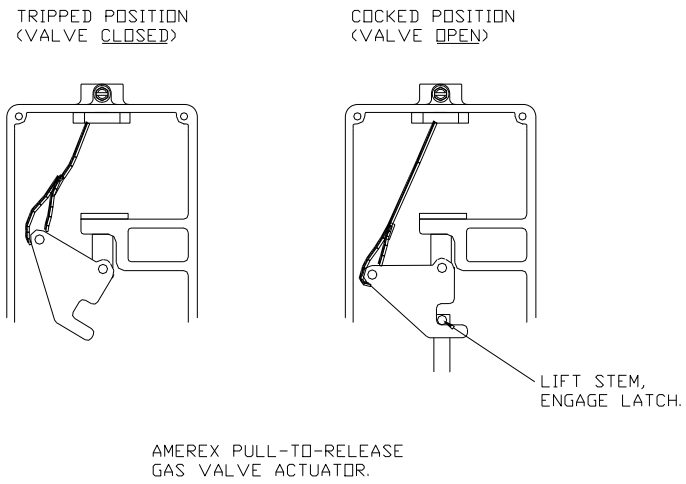
Mechanical Gas Valves – Do All Except Step 14
Electric Gas Valves – Skip Steps 11 Through 13

ASCO GAS VALVE W/ AMEREX MECHANICAL GAS VALVE KIT (P/N 13622)



11. Confirm that the swaged ball fitting of the Gas Valve Trip Assembly is pulled all the way out and that the cable connected to the gas valve is properly attached using the cable connector and secured by the Red Vinyl Cap.
12. To reset the Mechanical Gas Valve, disconnect the cable for the Mechanical Gas Valve where it attaches to the connector on the Piston Plug/Gas Trip Assembly.

13. Go to the Mechanical Gas Valve location, remove the cover, lift the Valve Stem and latch it open, re-attach the cable in the MRM (ERM) to the Piston Plug/Gas Trip Assembly. Replace the cover.
14. To reset the Electrical Gas Valve, the microswitches will transfer the contacts back to normal position when the MRM (ERM) is cocked. The Manual Reset Relay must be reset in order to open the Electrical Gas Valve.
15. To reset other auxiliary electrical functions, the same procedure as used for the Electrical Gas Valve must be followed.
16. Any alarm signals that are connected to a building fire alarm system can be cleared after cocking the MRM (ERM) and resetting the building fire alarm panel.



AMEREX PULL-TO-RELEASE
GAS VALVE ACTUATOR.

17. After all input and output functions have been restored or reset, insert a fully charged Nitrogen Actuation Cylinder, **remove the Set-Up/Lock-Out Tool**, replace the MRM cover and install two new tamper seals on the cover. There are two locations on the cover for tamper seals: one at the top left, and one at the bottom right.

Warning: The Set-Up/Lock-Out Tool MUST be removed from the MRM or the system WILL NOT fire.

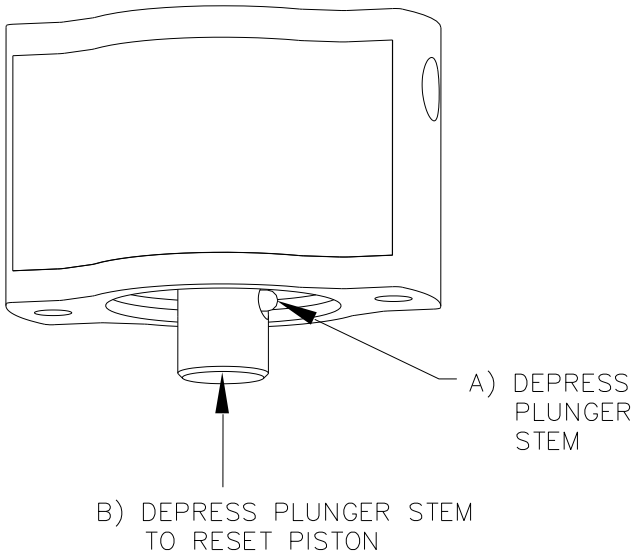
Recharge Procedures

Warning: Before attempting any recharge procedures, first confirm the reason for the discharge. The Amerex Industrial Fire Suppression System must be recharged immediately after any discharge regardless of the cause of the discharge. If recharge cannot be accomplished immediately – Do not leave the system incapacitated for any reason without giving written notification to the owner, owner's agent, local AHJ, and documenting the incident in the permanent job file.

Clean up: Following a system discharge, IMMEDIATELY CLEAN ALL SURFACES contacted with ABC dry chemical to avoid corrosion. If the dry chemical has not been heated and is dry, it may be swept, vacuumed, or blown from any surface it has contacted. If it has been wetted or come in contact with heat, scrubbing, power washing with a soap solution, or steam cleaning may be necessary. The dry chemical is slightly corrosive to metals after being wetted similar to a mild salt water solution.

Caution: The dry chemical extinguishing agent is completely non-toxic in all forms. However, it is classified as a "**Nuisance Dust**" irritant, and may cause temporary irritation to the eyes, skin, or respiratory system. A complete MSDS sheet is available upon request, or can be found either in the Appendix, or on the Amerex website.

Recharging Agent Cylinders



1. Relieve all pressure in the actuation line by depressing the nylon ball in the Vent Check.
2. Unbolt the Pneumatic Control Head from the Agent Cylinder Discharge Valve. The piston of the control head will be locked in the "fired" position, and it must be reset. To reset the control head, use a small flat tool to depress the small plunger ball on the side of the extended brass piston while simultaneously pushing the piston back into the head. Do not attempt to unscrew the small plunger from the brass piston. The piston should be pushed back into the fully retracted position while depressing the plunger ball. See the adjacent image:
3. Remove the Agent Cylinder from the bracket, after securing the anti-recoil plate to the discharge port.
4. Discharge all chemical and pressure as dictated by recharge requirements. Using **P/N 10134** Mechanical Control Head, discharge unit into the recovery system.
5. Remove the Discharge Valve from the Agent Cylinder. A 2½" open-end, thin head wrench will fit the wrench boss of the side of the Agent Cylinder Valve. Empty the Agent Cylinder of all remaining agent. Properly dispose of any chemical that is contaminated or caked. Inspect the interior of the cylinder for residue (clean if necessary). Inspect cylinder threads and O-ring seat for evidence of damage.
6. Disassemble the valve by removing the return spring retaining screw (use a 1/8" Allen hex wrench), spring retaining washer, return spring, valve stem and downtube. Do not remove gauge or fusible plug unless replacement is necessary. Thoroughly clean all parts with a soft bristle brush or soft cloth. Blow out the valve and downtube (and air valve if used to depressurize cylinder) with air or nitrogen. Inspect the collar O-ring, valve stem, and other hardware – replace parts only with Amerex factory replacements if worn or damaged. Inspect sealing area in valve body. Discard valve body if seat is damaged. Lubricate the collar O-ring and small O-ring on the valve stem with Bluestar V-711 (do not lubricate the valve seat O-ring). Reassemble the valve.
7. Service the Agent Cylinders. Clean cylinder to remove dirt, grease or foreign material. Check to make sure that the instruction nameplate is securely fastened and legible. Inspect the cylinder for corrosion, abrasion, dents or weld damage. If any of these conditions are found and you doubt the integrity of the cylinder, hydrostatically test to factory test pressure (700 psi, 4827 kPa), using the proof pressure method, in accordance with CGA Pamphlet C-6 and NFPA 17. Inspect the Agent Cylinder interior following CGA Visual Inspection Standard, Pamphlet C-6.
8. Fill Agent Cylinder with the proper amount of only Amerex Formula 11 ABC (**P/N 22682**; CH 558) by weight as specified on the Agent Cylinder nameplate. The fill tolerances for the 18 lb., 35 lb., and the 45 lb. Agent Cylinders are: +0.1 lb., -0.0 lb.

   WARNING: Use only fresh, free flowing dry chemical.

   WARNING: Filling by eye alone could cause potentially dangerous overfilling - always use a scale.

   WARNING: If Agent Cylinder is hydrostatically retested, thoroughly dry interior of cylinder prior to adding chemical.

9. Clean Agent Cylinder collar O-ring seating surface and threads with a small brush, then wipe surfaces with a clean damp cloth to remove dust. Lightly brush the O-ring seat with Bluestar V-711. Install discharge valve assembly and tighten using a 2½" open-end, thin head wrench. **HINT**: Tapping on the side of the cylinder with a rubber mallet as the downtube is inserted will aid in assembly.

Warning: Always completely depressurize extinguisher before attempting to recharge.

Never have any part of your body over the extinguisher while removing the valve assembly.

Always use a protective shield between you and the pressure gauge while charging an extinguisher. Do not stand in front of the gauge if a shield is not available.

Always use a REGULATED pressurizing source of dry nitrogen only with a minimum dew point of minus 70°F (minus 57°C). Set the regulator to no more than 400 psi (2758 kPa).

Check and calibrate regulator gauge at frequent intervals. The regulator gauge should be used to determine when the intended charging pressure has been reached. Do not rely on the extinguisher gauge for this purpose.

Never leave an extinguisher connected to a regulator of a high pressure source for an extended period of time. A defective regulator could cause the cylinder to rupture due to excessive pressure.

Do not mix types of dry chemicals in extinguishers, recharge or recovery systems. Mixing ABC (acidic base) with Regular, Purple K, Super K, or Monnex (alkaline base) dry chemicals may result in a chemical reaction capable of developing dangerous pressure buildup.

10. Pressurize the Agent Cylinder: Attach a pressurizing adapter to the discharge port (1" NPT thread; construct a fitting from a 1" to ¼" pipe reducing bushing and a "quick-connect" air fitting) and a **P/N 10134** Recharge Adapter to the top of the valve. Connect the adapter to a regulated nitrogen supply. Rotate the recharge adapter lever to "open" position and pressurize the cylinder to 350 psi (at 70°F). When the desired pressure has been reached, rotate the operating lever to the "closed" position. Shut off nitrogen supply and disconnect the supply line. Remove the pressurizing adapter and the control head.

NOTE: Pressurizing the cylinder in this manner will allow for proper aeration of the chemical through the downtube.

11. Check the agent cylinder for leaks: Apply leak detect fluid (soapy water) to the collar seal, discharge outlet, fusible plug threads, gauge threads, and cylinder welds. Look for bubbles in the leak detect fluid. Bubbles may take several minutes to appear. Blow dry all areas contacted by leak detect fluid when complete.
12. Install shipping plate to top of valve and anti-recoil plate to valve outlet. Record date of recharge on inspection tag. Reinstall agent cylinder per Installation Section, Chapter 4.

Recharging Nitrogen Cylinders

WARNING: Nitrogen actuation cylinders operate at extremely high (1800 psi) pressures. Handle with extreme caution. Perform all recharging with cylinder contained inside a suitable safety cage.

1. Remove nitrogen cylinder from MRM. Install shipping cap on N2 cylinder. **WARNING: Actuator body may have become pressurized as result of system actuation. Unscrew N2 cylinder slowly to allow residual pressure to escape.**
2. Service the Nitrogen Cylinders. Clean all N2 cylinders to remove dirt, grease, and foreign material. Check to make sure that the nameplate is in place and fully legible. Inspect the cylinders for corrosion, abrasion, or dents. Relieve pressure and discard if integrity of a cylinder has been compromised. **NOTE: When cleaning N2 cylinders, avoid use of solvents. They could seriously damage the gauge face, the gauge guard, or the nameplate.**
3. Remove old rupture disc assembly: Install cylinder in a P/N 10270 N2 cylinder recharge adapter. Hold cylinder in place using a 1-1/8 inch wrench on hex portion of N2 cylinder fitting. Loosen rupture disc fitting by turning the recharge adapter wrench 1/4 turn. On cylinders containing previously unruptured discs, allow residual pressure to escape. Unscrew cylinder from recharge adapter. Unscrew old rupture disc assembly and discard. **WARNING**: **Never reuse a rupture disc, even if it appears undamaged**.
4. Inspect sealing seat on rupture disc fitting. Discard N2 cylinder if seat is damaged.
5. Install new rupture disc assembly: The rupture disc on Amerex N2 cylinders may be replaced only with P/N 10712. Substitute parts will void manufacturer's warranty. Wipe sealing seat on N2 cylinder rupture disc fitting and copper gasket on new rupture disc with a clean damp cloth. Apply one drop of light machine oil or small amount of petroleum jelly to copper gasket on new safety disc and spread across entire gasket. Screw disc assembly into fitting hand tight.
6. Pressurize N2 cylinder: Reinstall cylinder in **P/N 10270** N2 cylinder recharge adapter. Tighten cylinder by hand 1 to 1-1/2 turns past contact with sealing gasket. Hold cylinder in place using a 1-1/8 inch wrench on hex portion of N2 cylinder fitting. Loosen rupture disc 1/8 turn. Connect a regulated nitrogen supply to the N2 cylinder recharge adapter. Pressurize the N2 cylinder to 1800 psi at 70°F.
7. For ECH Nitrogen Actuation Cylinder, **P/N 19347**: Install cylinder by wrench into **P/N 19126** ECH Actuation Cylinder Recharge Adapter. Install a ball valve of adequate pressure rating into the ¼"-npt female port, to which the regulated nitrogen supply is connected. Pressurize the nitrogen cylinder to 500 psig at 70°F. Close the ball valve, then slowly remove the **P/N 19347** cylinder from the recharge adapter

Warning: Check and calibrate regulator gauge at frequent intervals. The regulator gauge should be used to determine when the intended charging pressure has been reached. Do not rely on the nitrogen cylinder gauge for this purpose.

Never leave an extinguisher connected to a regulator of a high pressure source for an extended period of time. A defective regulator could cause the cylinder to rupture due to excessive pressure.

NOTE: The nitrogen, as it compresses into the N2 cylinder, may experience a significant temperature rise. This temperature rise must be compensated for by pressurizing to the value corresponding to 1800 psi at the higher temperature. The best method to accomplish proper pressurization is to attach a commercially available magnetic base thermometer to the side of the N2 cylinder. Pressurize and hold the cylinder at 1800 psi (Make sure there are no leaks in the nitrogen supply plumbing).

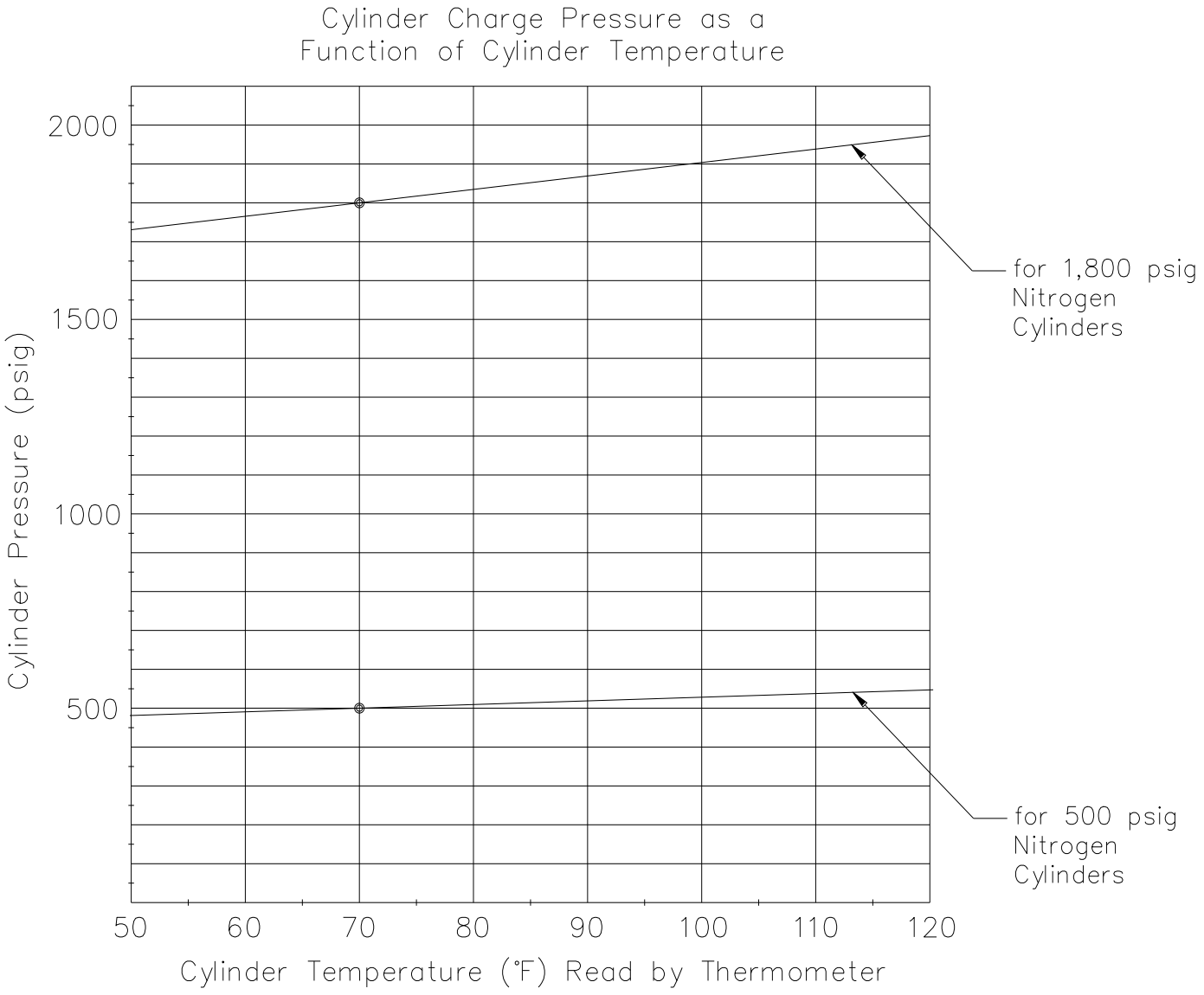
Let the apparatus sit undisturbed for a minimum of 2 minutes to allow the temperature to stabilize. Read the temperature on the thermometer. Refer to Figure 9.1. Locate the temperature on the "Cylinder Temperature" (horizontal) axis of the graph. Draw a line vertically upward from that temperature until it crosses the "nominal pressure" line. Draw a second line horizontally from the point of intersection to the "charge pressure" (vertical) axis of the graph. Increase the pressure from the regulated nitrogen supply to match the value read from the "charge pressure" axis of Figure 9.3.

NOTE: Nitrogen used for pressurizing must be dry with a dew point of -70°F (-57°C) or lower.

When the determined pressure is reached, tighten the rupture disc by applying a torque wrench to the recharge adapter wrench and tightening (clockwise) to 40 ft. lbs. Shut off nitrogen supply. Bleed and disconnect the supply hose. Remove nitrogen cylinder from recharge adapter. Check for leaks by applying leak detect fluid (soapy water) to the rupture disc, the threads on the rupture disc fitting where it joins the cylinder, and the pressure gauge threads. Look for bubbles in the leak detect fluid. Bubbles may take several minutes to appear. Blow dry fluid from all surfaces and inside of rupture disc following leak detect. Install shipping cap. Reinstall N2 cylinder into MRM per Installation Section, Chapter 4. Make certain that puncture pin of actuator is fully retracted before installing cylinder, and the MRM is properly reset.

Servicing the Discharge Network

1. Purge the Discharge Network: Connect **P/N 12129** Discharge Network Blow Out Adapter to the discharge fitting. Blow pressurized dry nitrogen or compressed air through until no dry chemical residue is visible escaping at any nozzle.
2. Service the Discharge Nozzles: Clean and inspect nozzles and nozzle blow-off caps. Replace blow-off caps **P/N 14988**, if damaged. Wipe inside of skirt of nozzle blow-off cap with a light coating of silicone grease. Reinstall caps onto nozzles.
3. Replace Hardware: Reinstall Agent and Nitrogen Actuation Cylinder per procedures in Chapter 4, "System Installation". Be sure to replace all tamper indicators, and lock wire seals.
4. Return the system to “READY”: Use the procedures given in Chapter 5, "Placing the System into Service “.



Limited Warranty:

Amerex warrants its Industrial Dry Chemical Fire Suppression Systems to be free from defects in material and workmanship for a period of three (3) years from the date of purchase. During the warranty period, any defective part will be repaired or replaced (at Amerex option). This warranty is valid only if each system is installed, serviced, and maintained by an Amerex factory trained Authorized Distributor in strict accordance with Amerex Manual No. 15040; all work must be performed using genuine Amerex replacement parts. This Warranty does not cover defects resulting from modification, alteration, misuse, exposure to corrosive conditions or improper installation or improper maintenance. Warranties on component items not manufactured by Amerex are provided by others whose warranty, evaluation, and judgment will be final.

ALL IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF FITNESS FOR PURPOSE AND MERCHANTABILITY, ARE LIMITED TO THE TIME PERIOD AS STATED ABOVE. IN NO EVENT SHALL AMEREX CORP. BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so that the above limitations or exclusions may not apply to you. Amerex Corp. neither assumes nor authorizes any representative or other person to assume for it any obligation or liability other than as expressly set forth herein. This Warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. To obtain performance of the obligation of this Warranty, write to Amerex Corp., P.O. Box 81, Trussville, AL 35173-0081, U.S.A. for instructions.

SYSTEM SPECIFICATIONS
AMEREX INDUSTRIAL FIRE SUPPRESSION SYSTEM

General

The Industrial fire suppression system shall be the Amerex pre-engineered, dry chemical, stored-pressure type with a fixed nozzle agent distribution network. **The system shall be listed by** Underwriter's Laboratories, Inc. to Standard 1254 "Pre-Engineered Dry Chemical Extinguishing System Units". The system shall be designed, installed and maintained in accordance with: Amerex part number 15040 "Installation, Operation, and Maintenance Manual", NFPA 17 (Extinguishing Systems), NFPA 72 (Detection and Alarm-Controlled Units), NFPA 70 (for electrical connections), local codes and ordinances, by an Authorized Amerex Industrial Fire Suppression Systems Distributor using Factory Trained personnel.

Upon completion of system installation and final testing with the local Authority Having Jurisdiction, an Owner's Manual for the system shall be given to the owner or owner's agent. The Authorized Amerex Industrial Systems Distributor shall give instruction on the use of the system and hand portable fire extinguishers to those employees designated by the owner or owner's agent.

Agent

The system agent shall be Amerex ABC Dry Chemical, Model 555 only.

Agent Cylinder / Discharge Valve Assembly

The Agent Cylinder shall be a mild steel DOT 4BW 350 specification cylinder, tested to 700 psi (4827 kPa). The Agent Cylinder / Discharge Valve assembly shall be fully charged and pressurized at the factory. The agent cylinder shall require hydrostatic testing at intervals not to exceed 12 years. The Discharge Valve shall be made of forged brass with a gauge showing cylinder pressure and a pressure relief device. The top of the valve shall be configured for interfacing with a Pneumatic Control Head.

Detection

The Detection Network shall be a continuous cable run using detectors specifically listed for use with the Amerex Industrial Dry Chemical System. No "S" hooks are allowed. The detectors shall consist of a detector bracket made of 14 gauge steel, a link holder made of aluminum, and a fusible link. Electric Detection is possible with the Electrial Release Module, or ERM.

Mechanical Release Module (MRM)

The Mechanical Release Module shall be of the spring-loaded type using a mechanical input and electrical, mechanical, or pneumatic outputs. It shall be capable of actuating from one to six Agent Cylinder assemblies using a nitrogen cylinder and shall be operated either automatically by the Detection Network or manually by a remote Manual Pull Station. The addition of up to two (2) Remote Nitrogen Actuators shall increase the total number of Agent Cylinder assemblies to forty (40).

The remote Manual Pull Station, Detection Network and the Mechanical Gas Valve shall all be operated by separate 1/16" stainless steel cable runs through EMT conduit using corner pulleys with stainless steel ball bearings and factory supplied conduit offsets. NO FIELD BENDING OF CONDUIT IS ALLOWED. The Detection Network cable, Manual Pull Station, and Mechanical Gas Valve cables may enter the MRM through any of three sides.

The MRM enclosure shall have a system status indicator and a window to observe the nitrogen cylinder pressure. The enclosure shall be capable of surface or semi-recessed- mounting and shall have provisions for applying tamper seals after final testing or periodic maintenance. The MRM enclosure shall have knockouts on all four sides to accept conduit or pipe for field devices. The MRM shall have one SPDT Microswitch and wire gutter pre-installed.

Electrical Release Module (ERM) (Optional)

The Electrical Release Module is UL listed to Standard 864, as a Local Alarm and Releasing type Control Panel. The Electrical Release Module shall be of the spring-loaded type using an electrical input and electrical, mechanical, or pneumatic outputs. Electrical outputs shall include Trouble, Switched 24 VDC, and Remote Audible contacts. The ERM shall be capable of either an immediate or a 15 second delayed system discharge. The cause of a Trouble condition shall be revealed by a coded pulsing sequence in the Trouble LED. The ERM contains an internal 24VDC Power Supply / Charger and provisions for two (2) back-up batteries for 24 hours of standby, in the event of main

power loss. All Electrical Connections shall be electrically supervised.

The ERM shall be capable of actuating from one to ten Agent Cylinder assemblies using a nitrogen cylinder and shall be operated either automatically by the Electrical Detection Network or manually by a remote Manual Electric Pull Station. The addition of up to four (4) Remote Nitrogen Actuators shall increase the the total number of Agent Cylinder assemblies to eighty (80).

The Mechanical Gas Valve shall be operated by 1/16" stainless steel cable runs through EMT conduit using corner pulleys with stainless steel ball bearings and factory supplied conduit offsets. NO FIELD BENDING OF CONDUIT IS ALLOWED. The Mechanical Gas Valve cable may enter the ERM through either the top or the bottom.

The ERM enclosure shall contain a locking cover, with all user interaction internal. Four status LED's and the nitrogen cylinder pressure gauge shall be visible through the enclosure. The enclosure shall be capable of surface mounting. The ERM enclosure shall have knockouts on all four sides to accept conduit for field devices. The ERM shall have one SPDT microswitch pre-installed for owner usage.

Electric Control Head (ECH) (Optional)

The Electric Control Head is a releasing module designed to operate in conjunction with the Amerex Electric Actuator, P/N 17014, and the Amerex SR-X Releasing Control Panel. All electrical inputs and outputs shall extend from the SR-X Releasing Control Panel. The P/N 17014 Electric Actuator shall release the high-pressure contents stored in a Nitrogen Cylinder mounted in the ECH assembly.

The ECH shall be capable of actuating from one to twenty (20) Agent Cylinder assemblies and shall be operated either automatically by the Electrical Detection Network or manually by a remote Manual Electric Pull Station (or the optional P/N 17001 Manual Push Button installed on the P/N 17014). The addition of up to four (4) Remote Nitrogen Actuators shall increase the the total number of Agent Cylinder assemblies to eighty (80).

Pneumatic Release Module (PRM)

The Pneumatic Release Module shall be of the spring-loaded type using a pressure-drop input and electrical, mechanical, or pneumatic outputs. It shall be capable of actuating from one to ten Agent Cylinder assemblies using a nitrogen cylinder and shall be operated either automatically by the Pneumatic Detection Tubing or manually by a remote Manual Pull Station. The addition of up to two (4) Remote Nitrogen Actuators shall increase the total number of Agent Cylinder assemblies to eighty (80).

The remote Manual Pull Station and the Mechanical Gas Valve shall all be operated by separate 1/16" stainless steel cable runs through EMT conduit using corner pulleys with stainless steel ball bearings and factory supplied conduit offsets. NO FIELD BENDING OF CONDUIT IS ALLOWED. The Manual Pull Station and Mechanical Gas Valve cables may enter the MRM through any of three sides. The Detection Tubing may exit from either of two sides.

The PRM enclosure shall have a system status indicator and a window to observe the nitrogen cylinder pressure. The enclosure shall be capable of surface or semi-recessed- mounting and shall have provisions for applying tamper seals after final testing or periodic maintenance. The PRM enclosure shall have knockouts on all four sides to accept conduit or pipe for field devices. The PRM shall have two SPDT microswitches and wire gutter pre-installed.

Nitrogen Cylinder

The nitrogen cylinder shall be a 10 cu. in. (15 cu. in. for the ERM) cylinder with an integral pressure gauge which can be observed when installed in the MRM or ERM. The 28 cu. in. nitrogen cylinder is used in the Remote Nitrogen Actuator. The nitrogen cylinder shall be capable of being refilled in the field by an Authorized Amerex Industrial Systems Distributor. The nitrogen cylinder shall be of DOT 3E specification and be exempt from periodic hydrostatic testing.

Agent Cylinder Bracket

The Agent Cylinder Bracket shall be steel, painted red, with stainless steel support bands.

Agent Distribution Network Piping

Pipe used for the Distribution Network shall be ¾" and 1" schedule 40 hot-dipped galvanized steel pipe, standard weight, at a minimum. Fittings shall be galvanized malleable iron, ductile iron, or steel, in the 150 lb. class rating, minimum. Black steel pipe and fittings can be used in relatively non-corrosive environments.

Discharge Nozzles

Discharge Nozzles shall be made of brass, and shall include a Blow-Off Cap. Each nozzle shall be listed for specific applications under UL 1254.

Manual Pull Stations

The Manual Pull Station shall be a "Dual Action" type.

Mechanical Gas Valves – ¾" to 2 Inch Sizes

A Mechanical Gas Valve, specifically listed by UL for use with the Amerex Industrial System, shall be provided for automatic shut off of gas whenever gas appliances are used. The Mechanical Gas Valve shall have a cast brass body and stainless steel internal parts. The valve shall be a "pull to close" design requiring a pull force to trip a latch which holds the valve in the open position. The cover of the gas valve shall have a visual indicator showing the valve's position.

Electrical Gas Valve

If an electrically operated gas valve is required, it shall be UL listed for use with the Amerex Industrial System and shall operate by using a micro switch and a UL listed Manual Reset Relay.

Electrical Microswitch

UL listed electric microswitches shall be provided to accomplish system output functions. The switches shall be "stackable" inside the Mechanical Release Module without requiring extra mounting hardware. From one to four sets of dry form C contacts shall be available for the MRM, and one to three shall be available for the ERM.

Note: All gas valves are to be installed in the gas line by a qualified utility or mechanical contractor under Division 15. All electrical installation shall be done by qualified electricians under Division 16. Requirements for auxiliary outputs such as building fire alarm connections or central station connections are to be coordinated with the fire alarm contractor under Division 16.