



READ & SAVE THESE INSTRUCTIONS

## Herricane CS Series

Installation, Operation & Maintenance

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## I. GENERAL INFORMATION

### Warranty

1. TRION/HERRMIDIFIER warrants to the buyer or any user during the duration of the Warranty that the humidifier described in this manual will be free from defects of material and workmanship for a period of three (3) years from the date of shipment.
2. For this Warranty to be effective, this humidifier must be installed, operated and maintained in accordance with the Installation Instructions, Operations and Maintenance Manual(s) supplied with the humidifier.
3. In the event of a defect or malfunction in this product during the Warranty Period, user may contact the Customer Service Department or their TRION/HERRMIDIFIER Representative for a Material Return Authorization (MRA) number. Items tagged (on the outside of the box) with this number may be returned to TRION/HERRMIDIFIER for replacement. Incidental expenses such as cost of transporting the humidifier to TRION/HERRMIDIFIER or labor associated with removal/replacement of the parts shall be paid by the user. Upon completion of the reconditioning, the humidifier will be returned at no cost to the user. Items returned without an MRA number will not be accepted!
4. **This Warranty does not cover field labor for repairs to this humidifier or any special, indirect or consequential damages.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation may not apply to you.
5. If, after a reasonable number of attempts to do so, TRION/HERRMIDIFIER is unable to remedy any defects or malfunctions in this humidifier, then the user may elect either a replacement of such product or part which may be defective without charge or a refund of the buyer's original purchase price.
6. This Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

### NOTE

**Water quality plays a vital role in the performance and maintenance requirement of any humidifier. Adjustments to the circuit board may be necessary based on the incoming water quality.**

**Performance problems associated with water quality are not warranty issues!**

Evaporative distance can be measured in two ways. "Bulk" evaporative distance beyond which condensation will not occur on objects at duct temperature. "Last Wisp" evaporation is the point beyond which there is no visible steam and it is safe to install high-efficiency filters. TRION/HERRMIDIFIER has published evaporative distance tables for standard conditions (55°F, 70% downstream relative humidity). Steam intensity and air velocity are evaluated at these conditions. A second table is published which allows correction to non-standard (other than 55°F and 70% relative humidity downstream of the humidifier) conditions. **The tables are only useful with Hurricane CS Series humidifiers.** Application to other brands of humidifiers is not recommended. Differences in distribution patterns will cause problems!

If you desire, you may forward your design criteria to TRION/HERRMIDIFIER for a written analysis of your evaporative distances. We will be able to define the "bulk" and "last wisp" evaporative distance based on this criteria only. If any changes are made to the design, a follow-up analysis must be made to assure fail-safe operation.

## Parts Supplied with the Humidifier

The HERRMIDIFIER CS Series steam distribution system is available in four basic configurations. As shown below, each of these systems include at a minimum a method of distributing steam, mounting provisions, a steam inlet connection, and a condensate drain(s) connection.

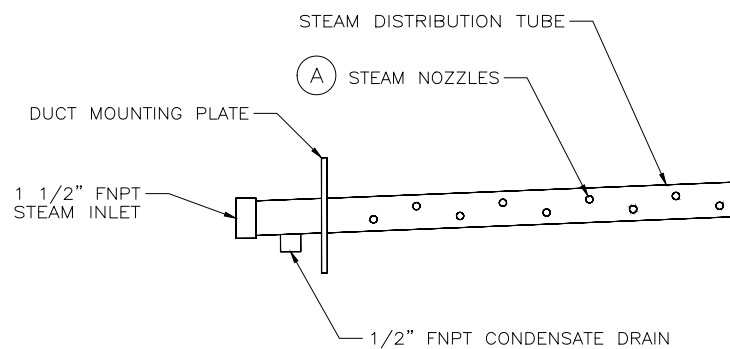
### CS-1100, CS-1102 Steam Distribution Systems

Note: CS-1100 is designed for Horizontal Airflow, CS-1102 is for Vertical Airflow.

CS-1100

CS-1102

A. NOZZLE ORIENTATION VARIES WITH APPLICATION



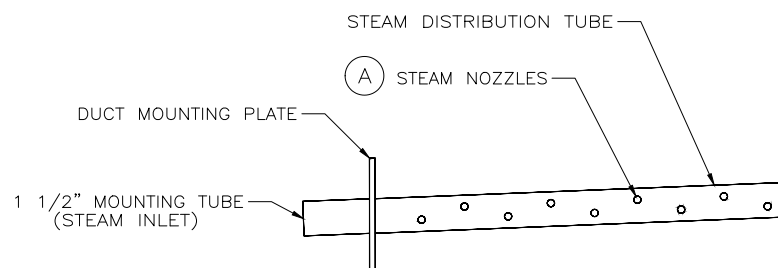
### CS-1101, CS-1103 Steam Distribution Systems

Note: CS-1101 is designed for 1 1/2" hose or hose cuff connection. CS-1103 includes 2" FPT fitting for Steam Inlet.

CS-1101

CS-1103

A. NOZZLE ORIENTATION VARIES WITH APPLICATION



## CS-2105, CS-2106, CS-2107, CS-2108 Steam Distribution Systems

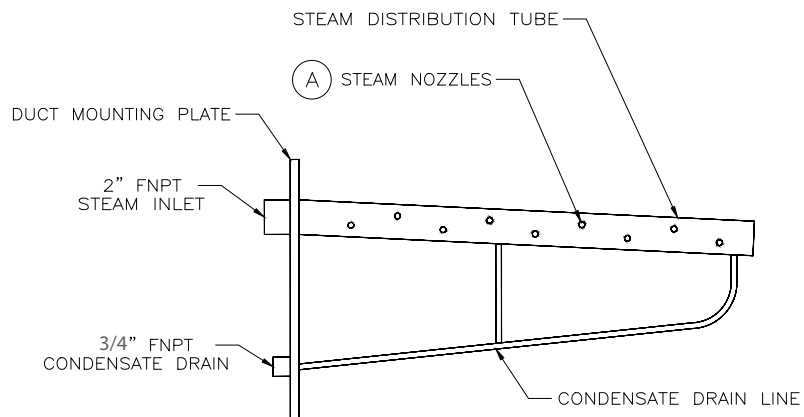
Note: CS-2105 & CS-2106 are designed for Horizontal Airflow.

CS-2107 & CS-2108 are designed for Vertical Airflow.

CS-2105, CS-2106

CS-2107, CS-2108

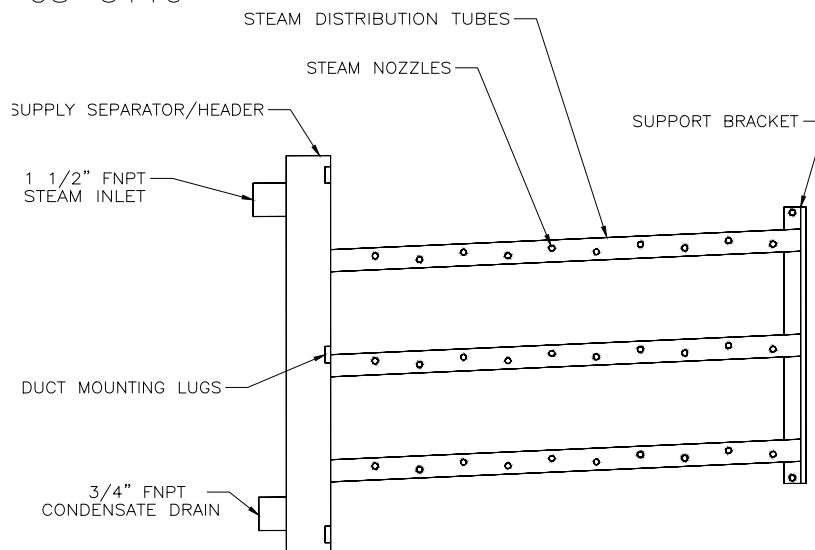
A. NOZZLE ORIENTATION VARIES WITH APPLICATION



## CS-3110 Steam Distribution Systems

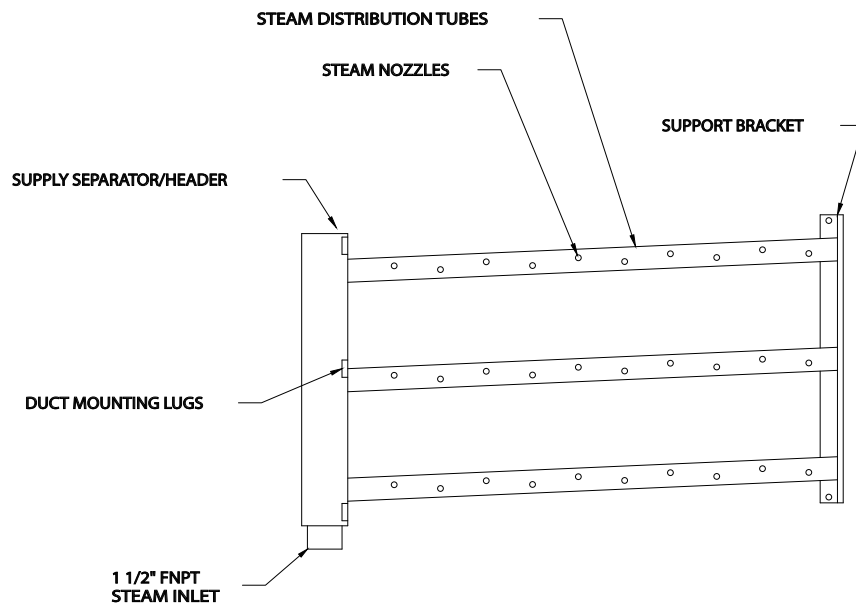
Note: CS-3110 is designed for Horizontal Airflow.

CS-3110



## CS-3113 Steam Distribution Systems

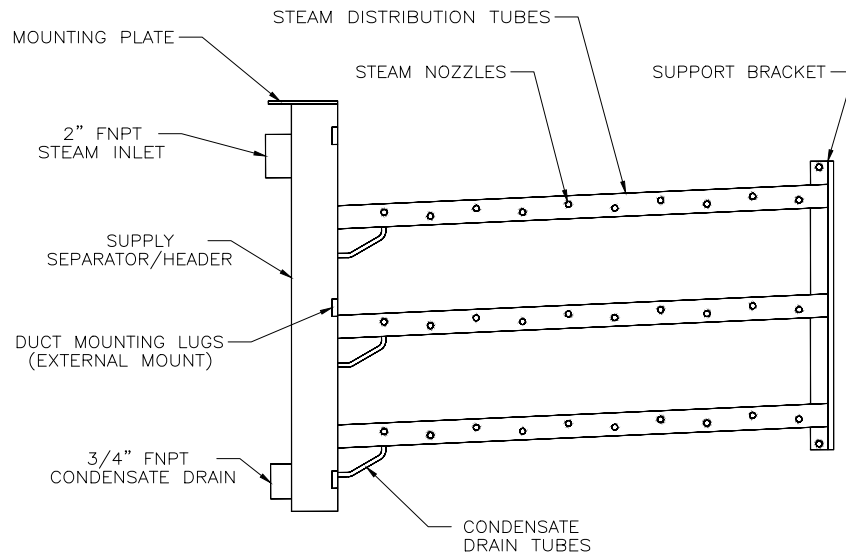
Note: CS-3113 is designed for Horizontal Airflow.



## CS-3115 Steam Distribution Systems

Note: CS-3115 is designed for Horizontal Airflow.

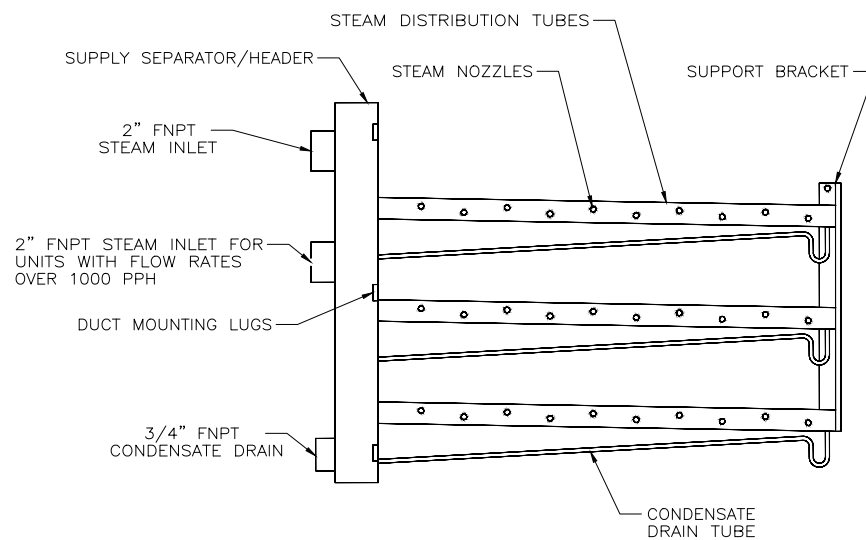
CS-3115



## CS-3119 Steam Distribution Systems

Note: CS-3119 is designed for Horizontal Airflow.

CS-3119

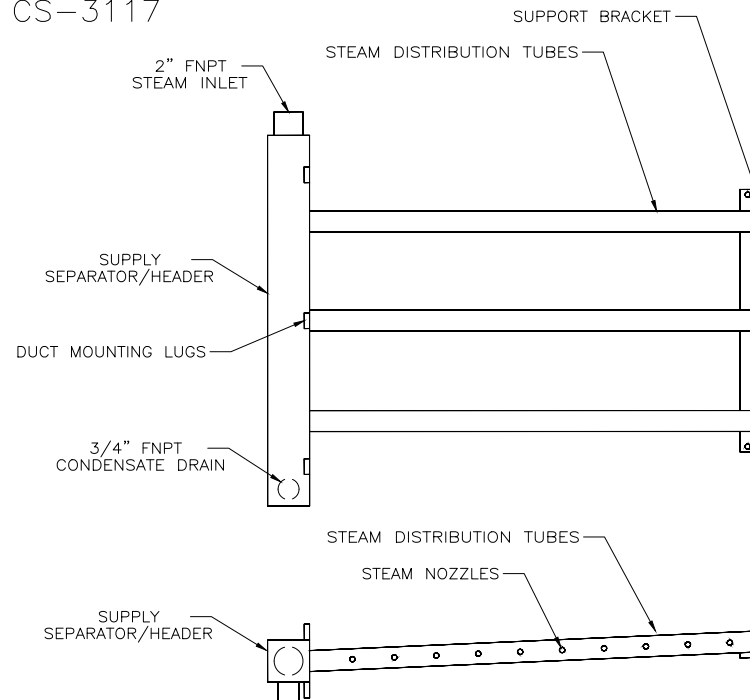


## CS-3112, CS-3117 Steam Distribution Systems

Note: CS-3112 & CS-3117 is designed for Vertical Airflow.

CS-3112

CS-3117

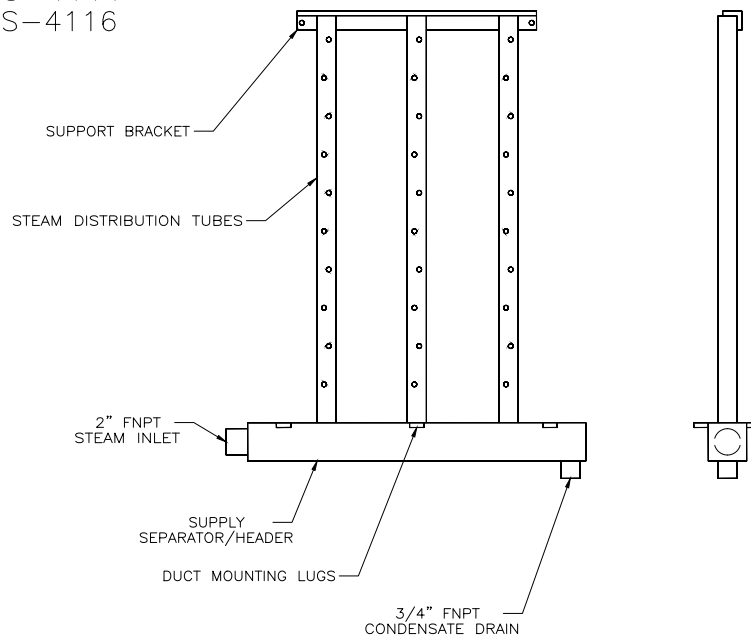


## CS-4111, CS-4116 Steam Distribution Systems

Note: CS-4111 & CS-4116 are designed for Vertical Installation in Horizontal Airflow.

CS-4111

CS-4116





## Optional Parts Supplied with Humidifier or Supplied by Others:

**Steam Valve**

**Valve Actuator:** Pneumatic, ON/OFF Electric, or Electric Modulating Actuators

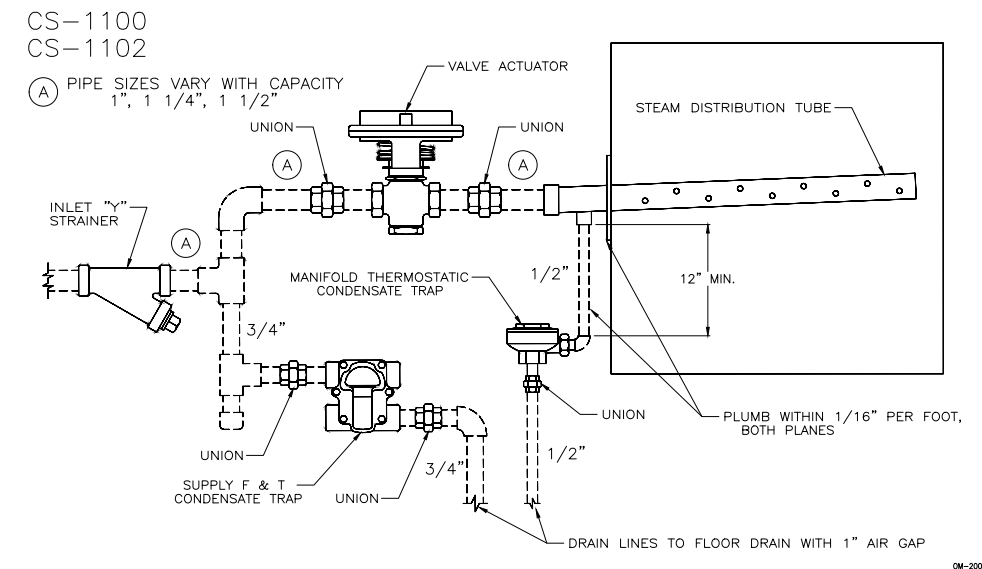
**Inlet Strainer**

**Supply Trap:** F&T Trap or Inverted Bucket Trap

**Manifold Trap(s):** Angle Thermostatic Trap, Vertical Thermostatic Trap, or F&T Trap

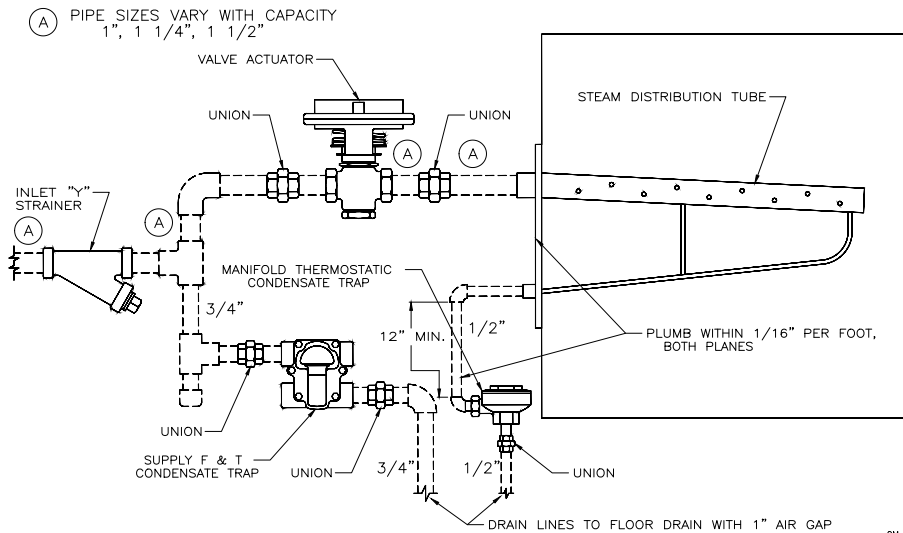
## Parts Supplied by Others (Unions and items shown in dashed lines)

### CS-1100, CS-1102 Steam Distribution Systems



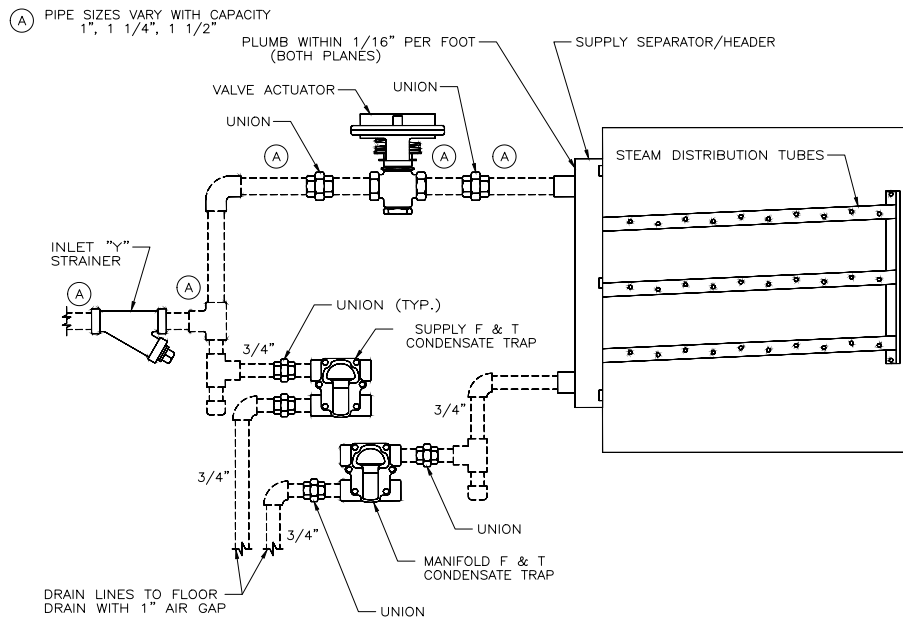
## CS-2105, CS-2106, CS-2107, CS-2108 Steam Distribution Systems

CS-2105, CS-2106  
CS-2107, CS-2108



## CS-3110 Steam Distribution Systems

CS-3110

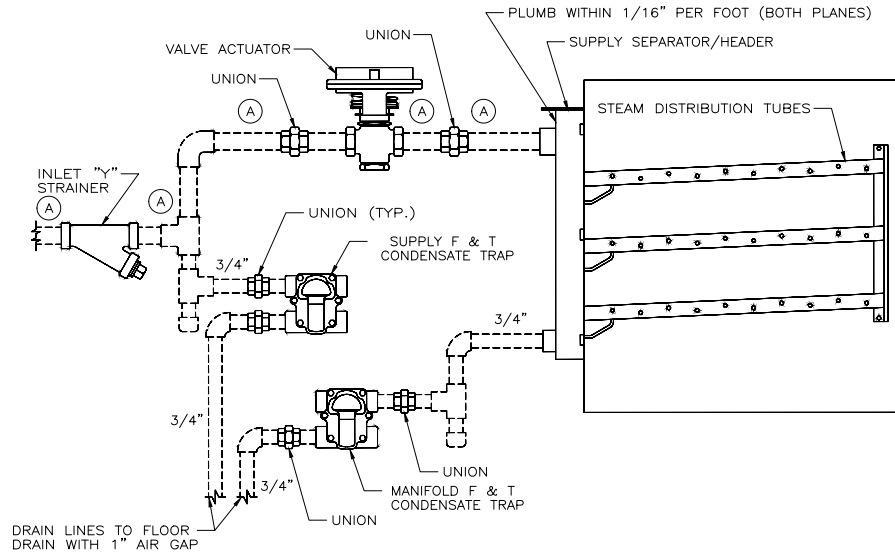


## Parts Supplied by Others (Unions and items shown in dashed lines)

### CS-3115 Steam Distribution Systems

CS-3115

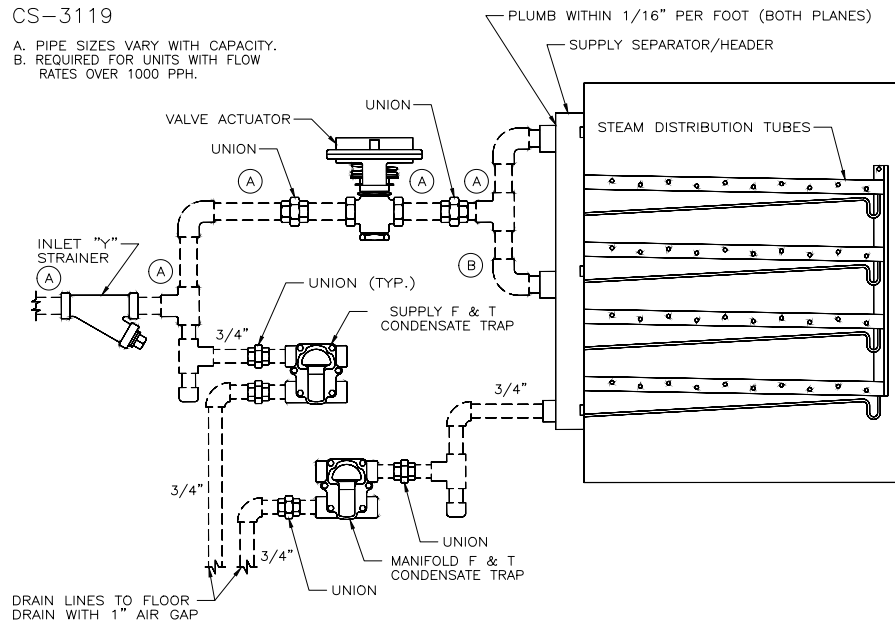
A. PIPE SIZES VARY WITH CAPACITY



### CS-3119 Steam Distribution Systems

CS-3119

A. PIPE SIZES VARY WITH CAPACITY.  
B. REQUIRED FOR UNITS WITH FLOW RATES OVER 1000 PPH.



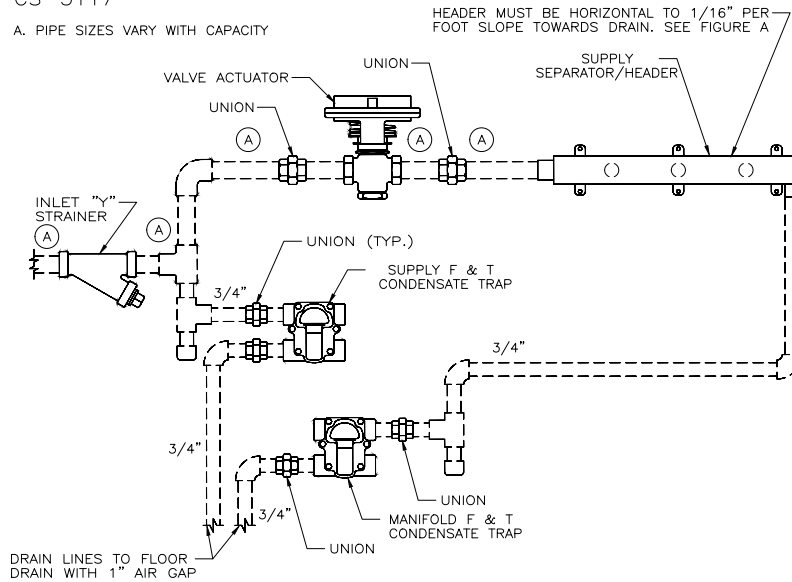
## Parts Supplied by Others (Unions and items shown in dashed lines)

### LPR vs Open Gravity Drain

#### CS-3112, CS-3117 Steam Distribution Systems

CS-3112  
CS-3117

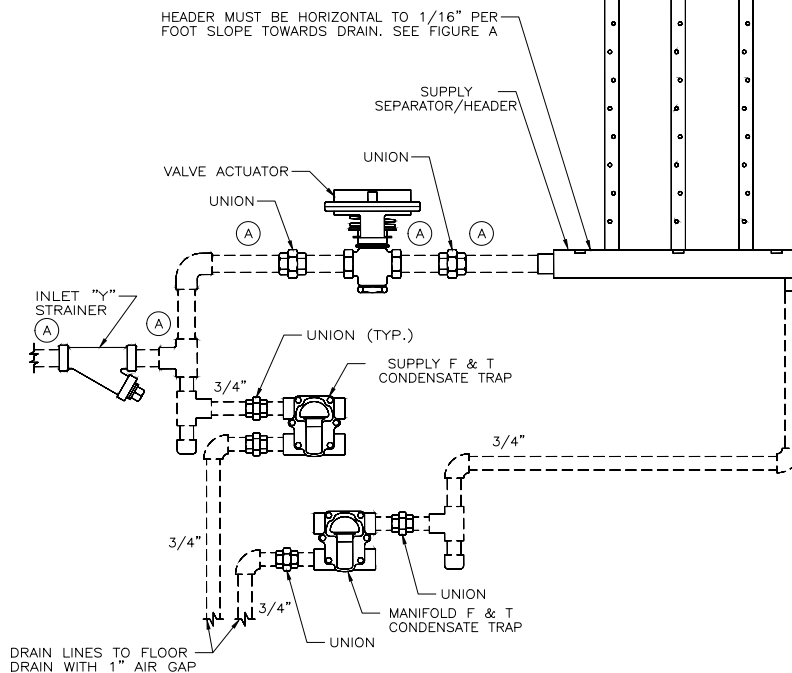
A. PIPE SIZES VARY WITH CAPACITY



#### CS-4111, CS-4116 Steam Distribution Systems

CS-4111  
CS-4116

A. PIPE SIZES VARY WITH CAPACITY



## II. SYSTEM OVERVIEW

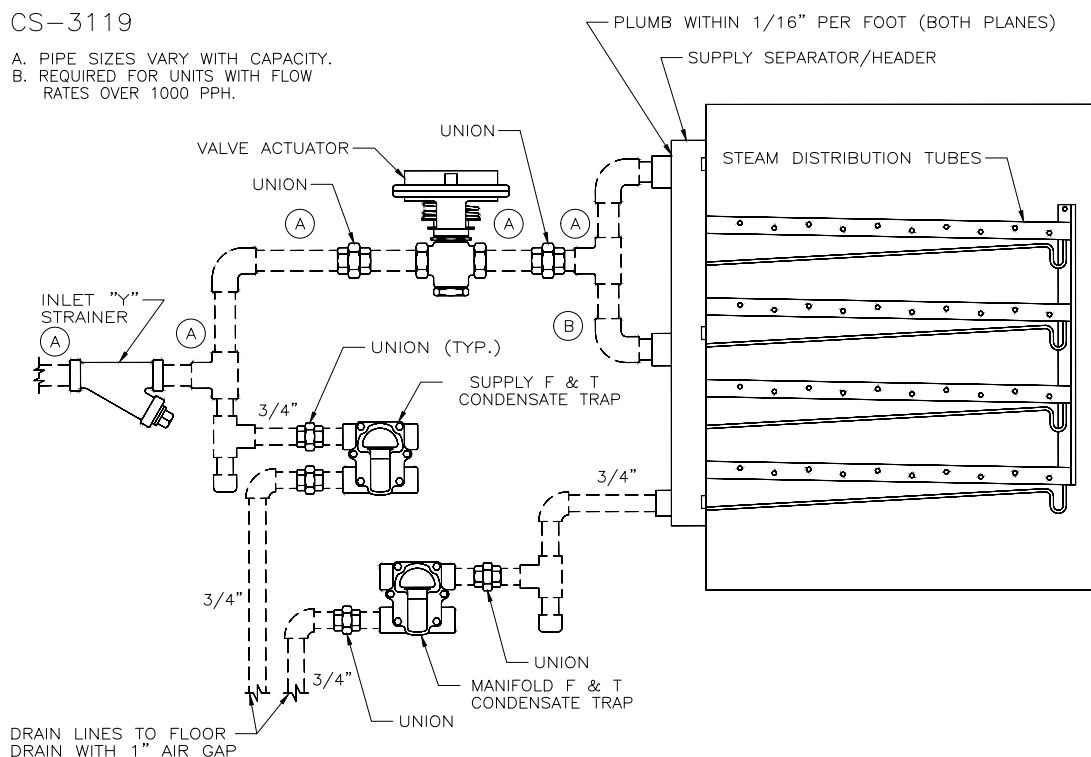
## Humidifier System

The humidifier you have just purchased is the result of years of testing as we refined the original CS-1 humidifier into the current CS-Series of units. The CS-Series offers a family of four different products custom sized to handle all of your steam distribution needs. The distribution system has the following features:

- Zero Maintenance
- Quality Construction - All Stainless Steel Construction, ASME Certified Welds
- Quality Control - Your unit has been pressure tested prior to shipment.
- Flexible Design - Works with pressurized boiler, atmospheric boiler, or unfired boiler.
- Capacity to 2000 lbs/hr.
- Stainless Steel Precision Nozzles
- Available "Guaranteed Evaporative Distance" Performance Guarantee
- Quiet Operation
- Superb Energy Efficiency
- NO FIELD ASSEMBLY of distribution system
- Total system design assures that YOU GET THE CAPACITY YOU PAID FOR!

The system is as ingenious as it is simple. In a system with steam supplied by a central boiler, steam flow from the source first passes the inlet strainer. From here the steam travels to a condensate trap, then on to the steam valve. Depending on the application, the valve could have a solenoid operator, a pneumatic operator, or an electric operator. Once the steam has passed through the steam valve, it enters the steam distribution system. This design is extremely quiet, up to 7.3 times quieter than the competition. It is also efficient, 3-23% more efficient than jacketed designs, depending on the duty cycle. Any condensate that forms in the distribution system will be disposed of through the manifold trap(s).

With a self-generating steam unit, the modulation of steam would occur in the boiler itself, therefore, the strainer, steam valve and supply trap would be eliminated. See Section V for a typical layout.

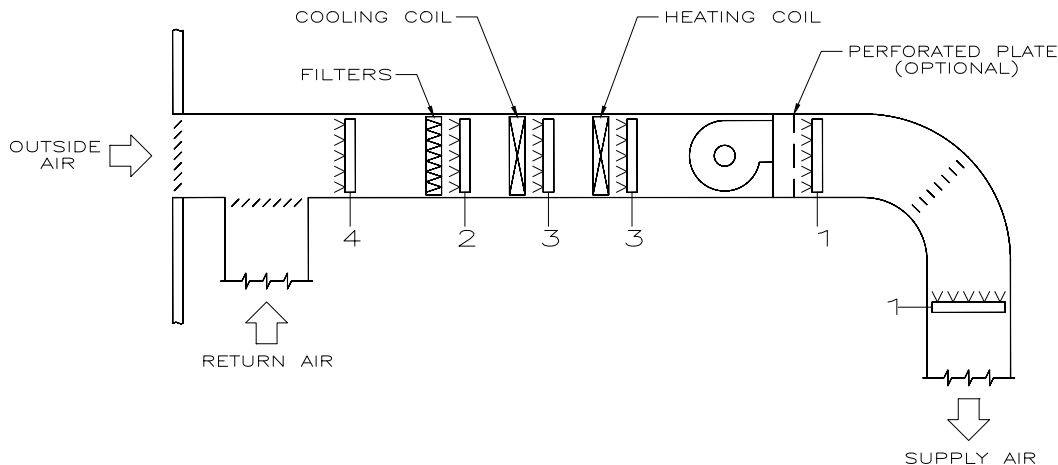


## Installation Guidelines

Steam absorption distance for a system defined in terms of “bulk” and “last wisp.” “Bulk” evaporation is the point beyond which no condensation will occur on objects at the duct temperature. “Last wisp” evaporation is the point beyond which there is no visible steam and it is safe to install high efficiency filters.

### Installation:

1. The first choice for an installation location would be a point where there is sufficient straight run to allow for a “last wisp” evaporation.
2. The second choice would be to locate the system in front of the cooling coil when there is sufficient “bulk” evaporation distance in front of the cooling coil. Since the cooling coil typically has a drain pan, the coil can act as a moisture eliminator in case something should go awry with the total system control.
3. The area prior to the fan or heating coil would be the next choice if sufficient “bulk” evaporation distance is present. If the heating coil is “on” during periods of humidification, the extra heat would help minimize evaporation distance.
4. Locating the system in the mixed air box would be poor choice due to the potential for cold temperature and turbulent airflow, which would lead to creation of wetted areas.
5. Allow six inches of upstream clearance for ease of installation and accessibility. If the upstream object is causing turbulence, additional clearance may be required.
6. Safing is not required for most installation. Safing is best avoided since it adds uncontrollable turbulence to the airflow, which can cause surfaces to become wet and or extend the evaporative distance.

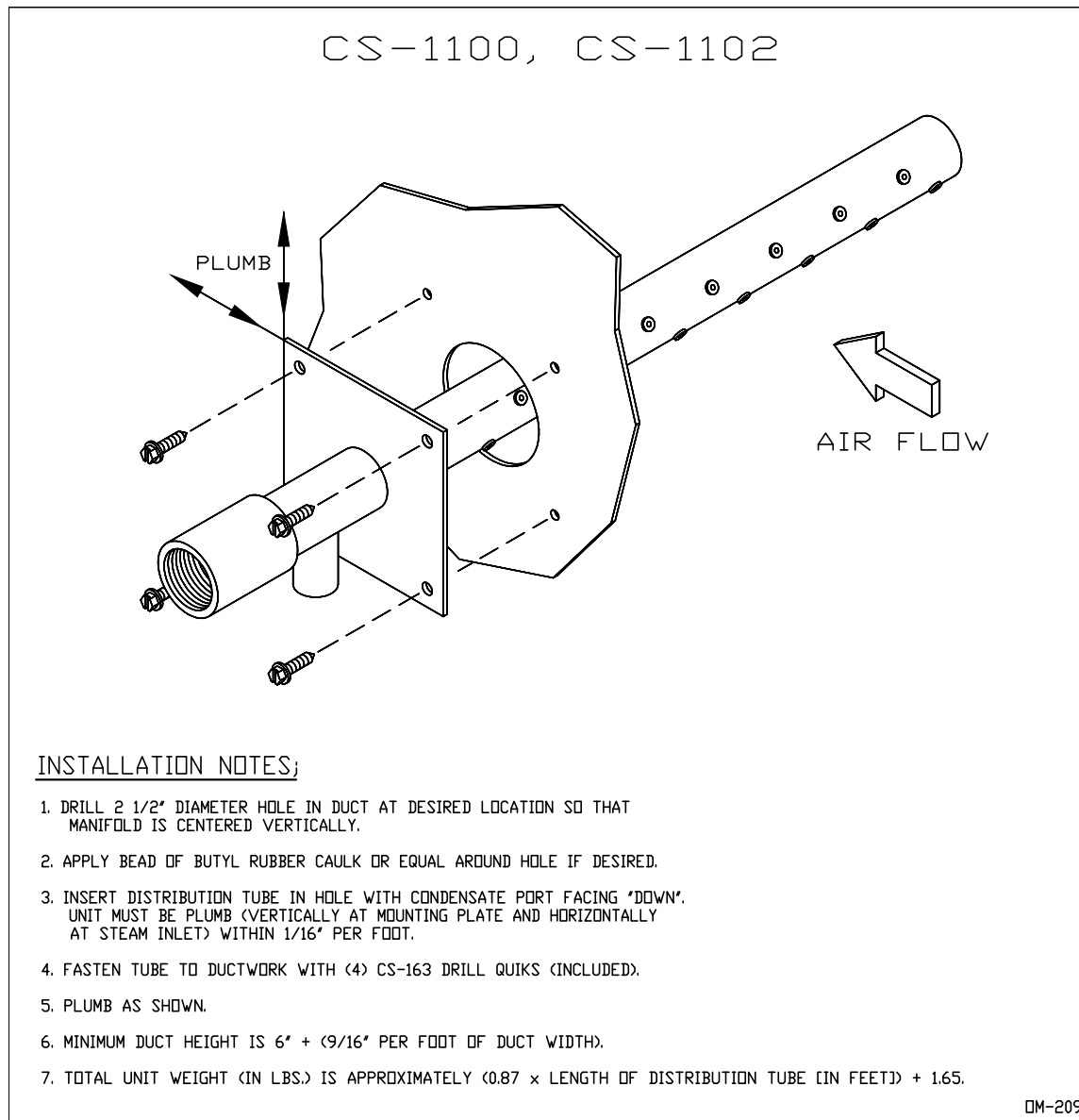


## III. STEAM DISTRIBUTION SYSTEM INSTALLATION

### Installation Guidelines

CS-1100, CS-1102

(see page 8 for typical plumbing arrangement)

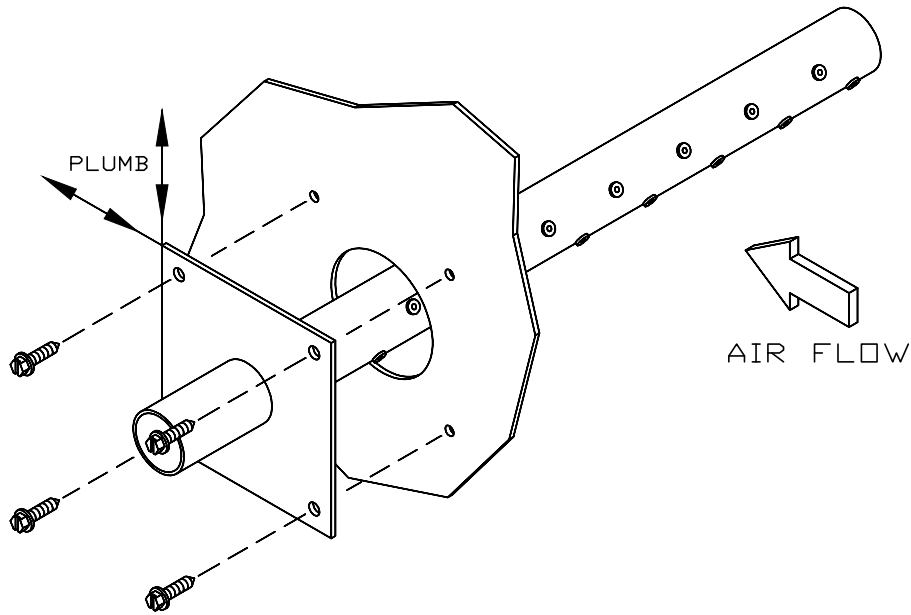


## Installation Guidelines

CS-1101, CS-1103

(see page 8 for typical plumbing arrangement)

CS-1101, CS-1103



### INSTALLATION NOTES;

1. DRILL 2 1/2" DIAMETER HOLE IN DUCT AT DESIRED LOCATION SO THAT MANIFOLD IS CENTERED VERTICALLY.
2. APPLY BEAD OF BUTYL RUBBER CAULK OR EQUAL AROUND HOLE IF DESIRED.
3. INSERT DISTRIBUTION TUBE IN HOLE AS SHOWN.
4. FASTEN TUBE TO DUCTWORK WITH (4) CS-163 DRILL QUIKS (INCLUDED).
5. PLUMB AS SHOWN.
6. MINIMUM DUCT HEIGHT IS 6' + (9/16" PER FOOT OF DUCT WIDTH).
7. TOTAL UNIT WEIGHT (IN LBS.) IS APPROXIMATELY  $(0.87 \times \text{LENGTH OF DISTRIBUTION TUBE (IN FEET)}) + 1.65$ .

DM-239

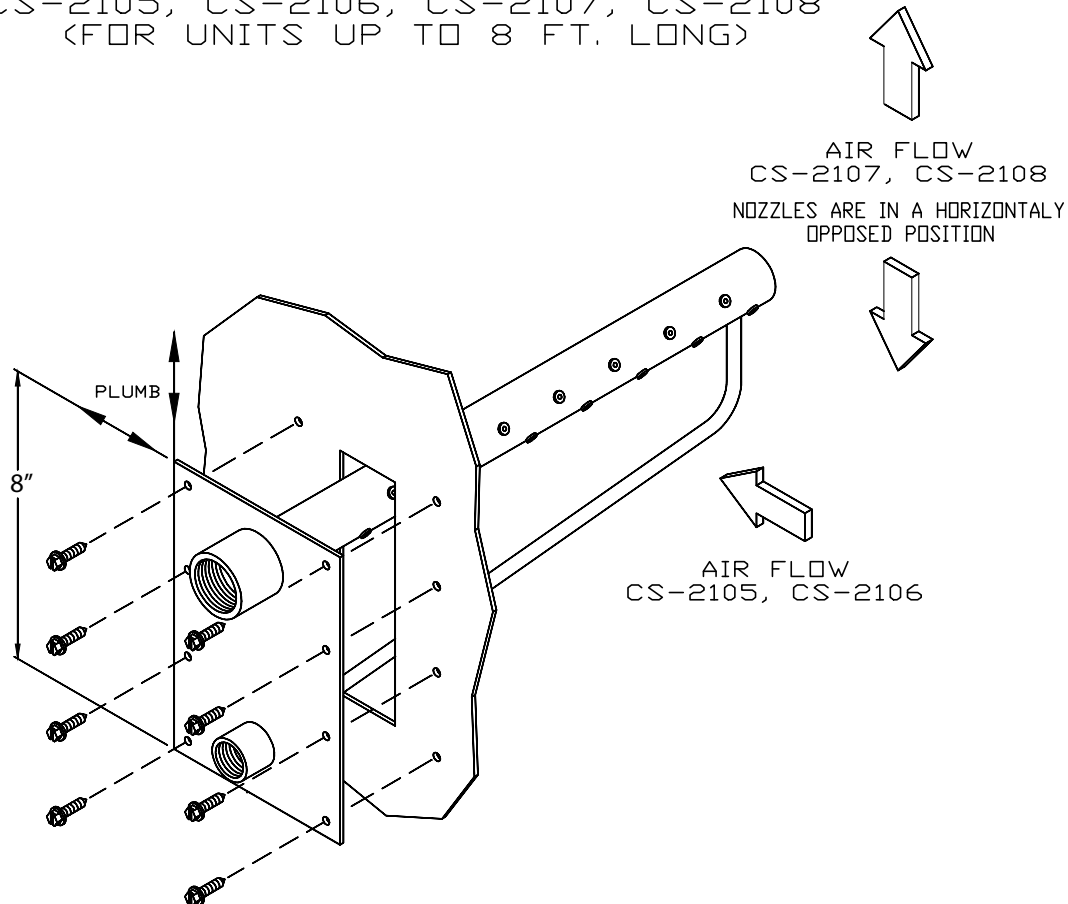


## Installation Guidelines

CS-2105, CS-2106, CS-2107, CS-2108

(see page 9 for typical plumbing arrangement)

CS-2105, CS-2106, CS-2107, CS-2108  
(FOR UNITS UP TO 8 FT. LONG)



### INSTALLATION NOTES:

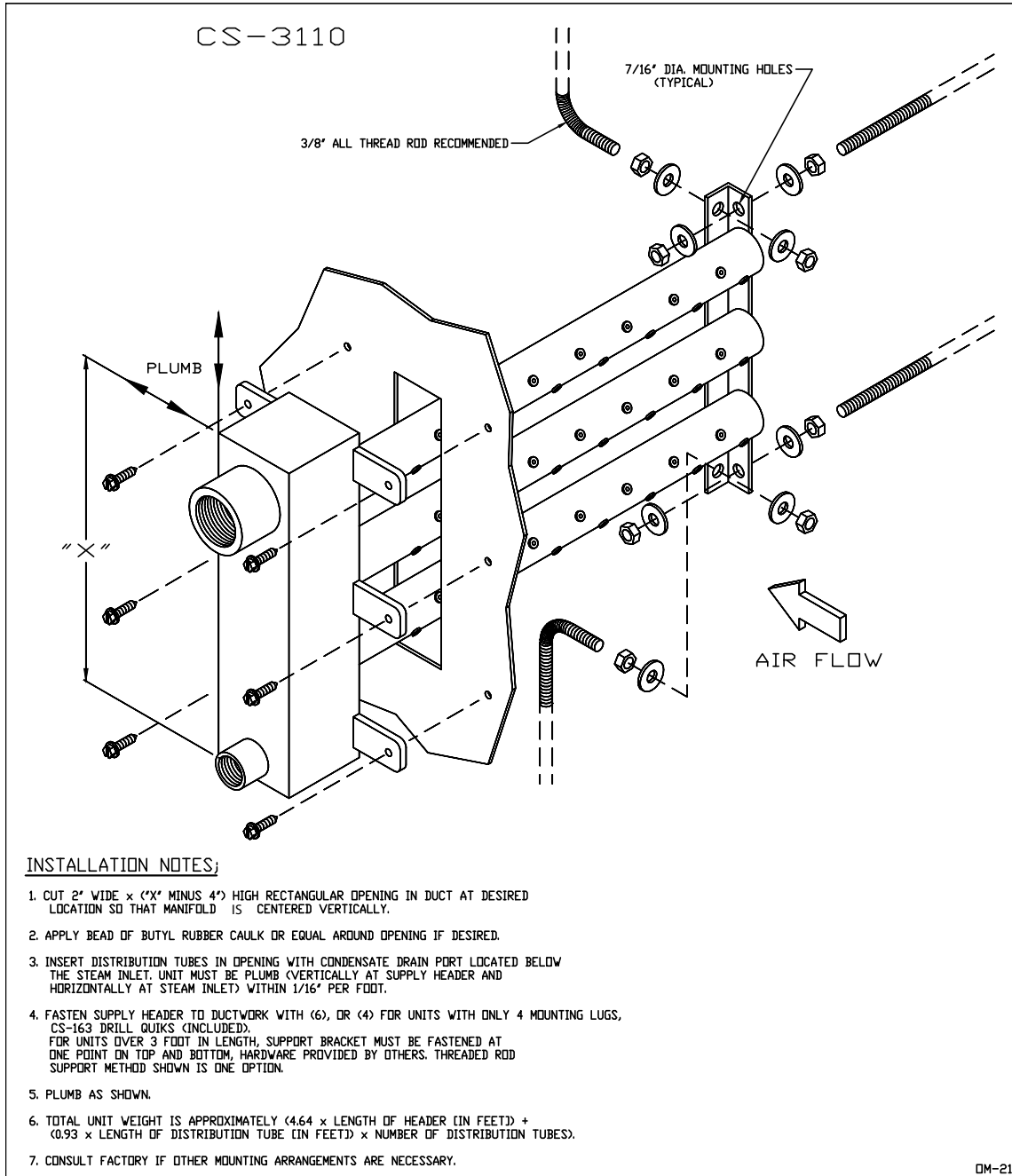
1. CUT 2 1/2" WIDE x 7 1/8" HIGH RECTANGULAR OPENING IN DUCT AT DESIRED LOCATION SO THAT THE MANIFOLD IS CENTERED VERTICALLY.
2. APPLY BEAD OF BUTYL RUBBER CAULK OR EQUAL AROUND OPENING IF DESIRED.
3. INSERT DISTRIBUTION TUBE IN OPENING WITH CONDENSATE PORT FACING "DOWN". UNIT MUST BE PLUMB (VERTICALLY AT MOUNTING PLATE AND HORIZONTALLY AT STEAM INLET) WITHIN 1/16" PER FOOT.
4. FASTEN TUBE TO DUCTWORK WITH (8) CS-163 DRILL QUIKS (INCLUDED).
5. PLUMB AS SHOWN.
6. MINIMUM DUCT HEIGHT IS 12".
7. UNIT WEIGHT (IN LBS.) = (1.74 x LENGTH OF DISTRIBUTION TUBE (IN FEET)) + 2.50.
8. CONSULT FACTORY FOR MOUNTING UNITS OVER 8 FEET LONG.

DM-210

## Installation Guidelines

CS-3110

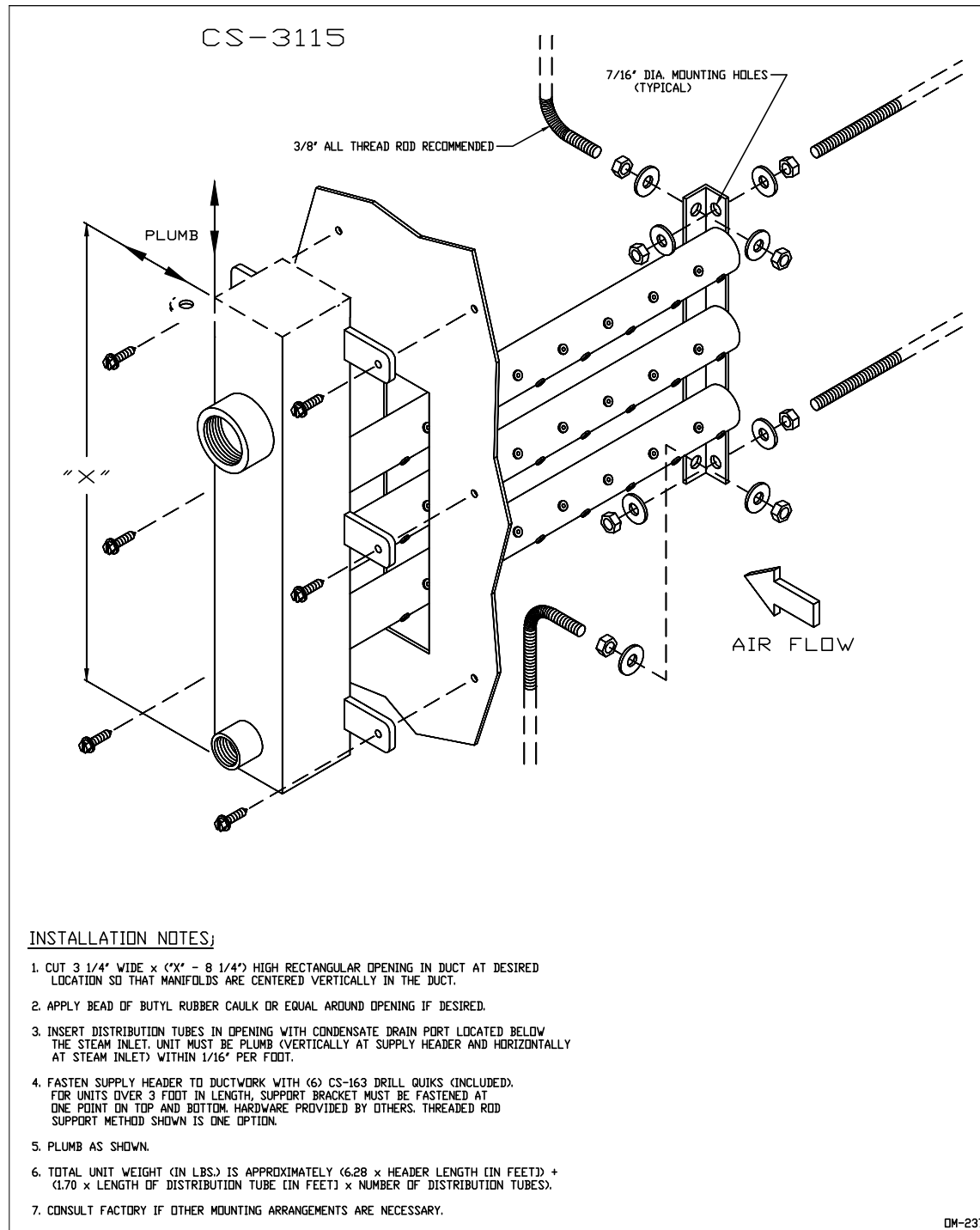
(see page 9 for typical plumbing arrangement)



## Installation Guidelines

CS-3115

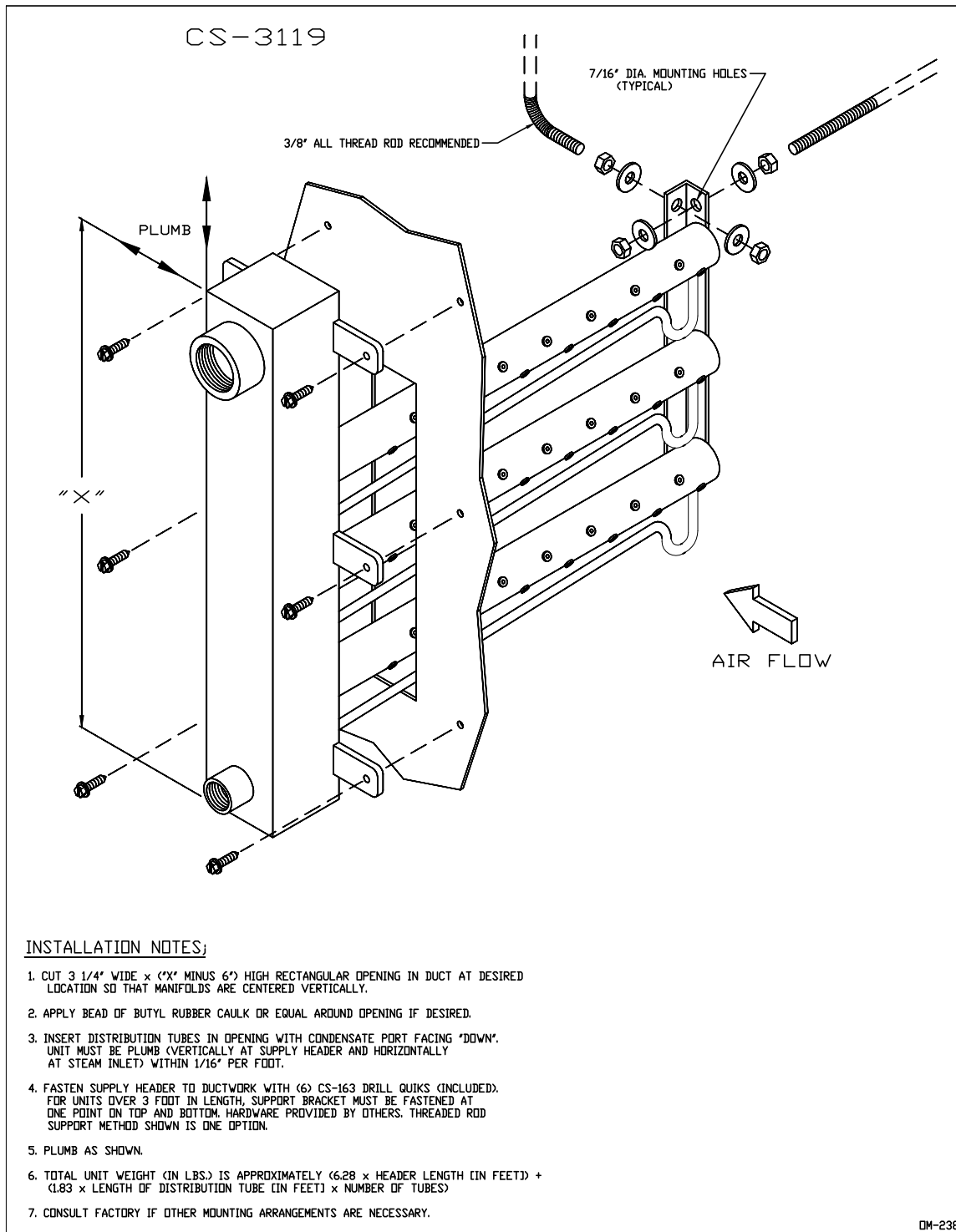
(see page 10 for typical plumbing arrangement)



## Installation Guidelines

CS-3119

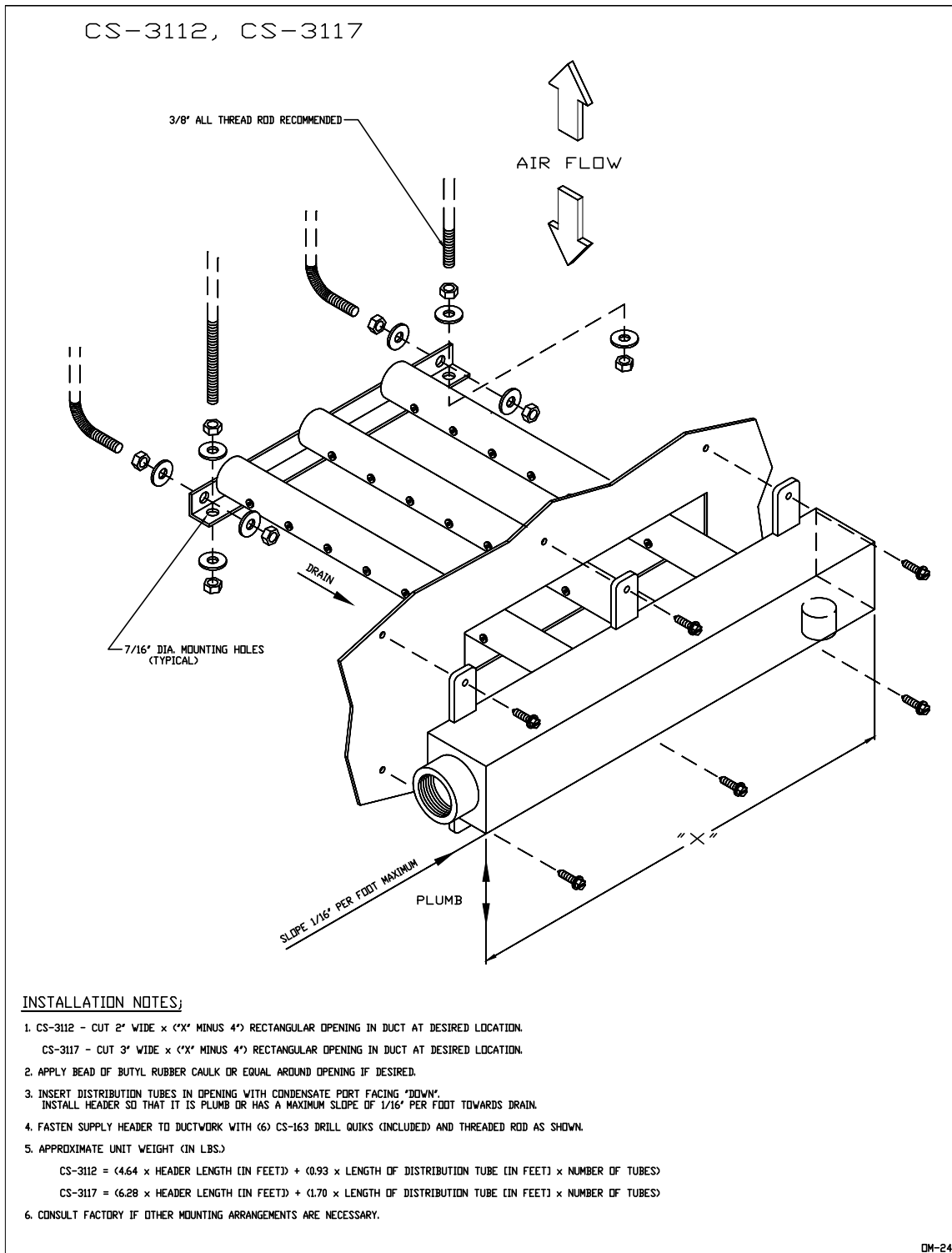
(see page 10 for typical plumbing arrangement)



## Installation Guidelines

CS-3112, CS-3117

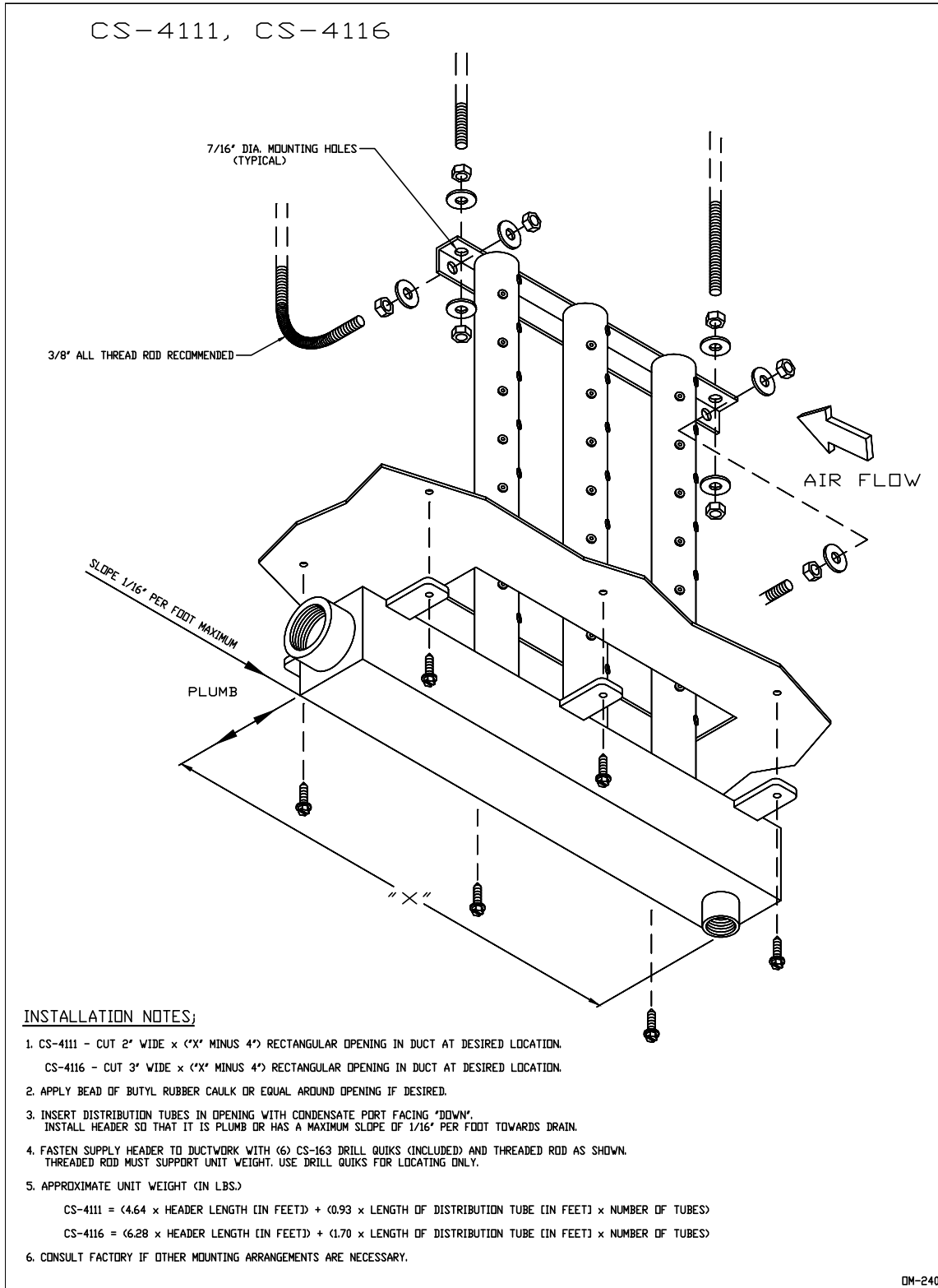
(see page 11 for typical plumbing arrangement)



## Installation Guidelines

CS-4111, CS-4116

(see page 11 for typical plumbing arrangement)



## IV. ACCESSORY INSTALLATION

### **STRAINERS:**

The strainers come in a variety of sizes depending on the steam pressure and flow. The inlet and outlet ports should be mounted in the horizontal position. The exhaust port, located closest to the outlet port should be pointed down to catch debris.

### **TRAPS:**

**Supply:** Standard supply traps offered by HERRMIDIFIER are Float & Thermostatic Traps (F&T). Their model number will be determined by the inlet pressure and capacity requirements. There are two inlet ports and two outlet ports for a total of four possible piping combinations to simplify installation. The inlet ports are the top ports and the outlet ports are the bottom ports. Inverted buckets are also available upon request.

**Manifold:** The manifold traps can be F&T's as described above or thermostatic traps (T&A). The T&A traps are available in two configurations. The vertical traps have the inlet port in the top and the outlet on the bottom. The angle trap[s] have the inlet on the side and the outlet on the bottom. Thermostatic traps should be located a minimum of 12" away from the distribution system to allow for adequate cooling of condensate prior to the trap.

### **TEMPERATURE INTERLOCK SWITCHES:**

The design of the CS Series does not require the use of temperature interlock switches for proper operation. The supply trap will keep the supply line free of condensate and the manifold design allows for rapid heating and the manifold trap can handle any condensate that is formed. If a temperature interlock switch is desired, it would be installed in the steam line between the main steam supply line and the supply trap. It would be wired with the control signal to prevent the humidifier from energizing if condensate is in the system. See figure below.

## V. SELF-GENERATING STEAM (ATMOSPHERIC) AS A SOURCE

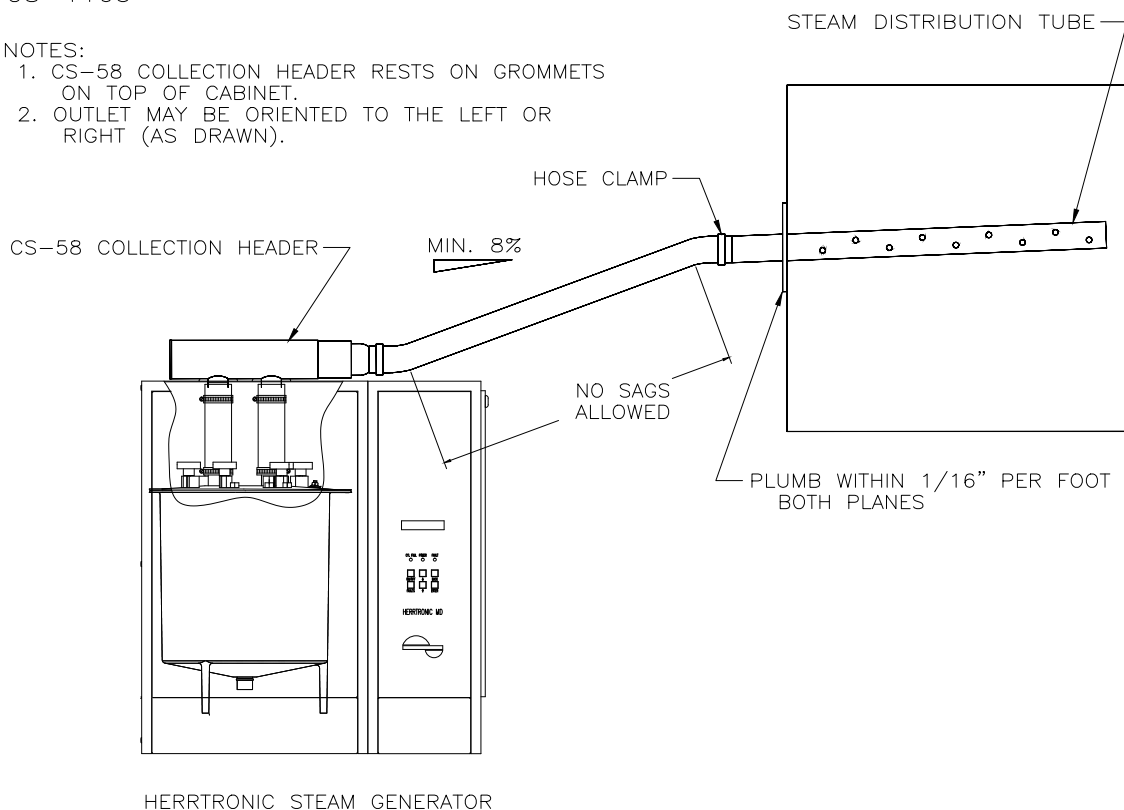
The use of a self-generating source of steam, such as a self-contained electrode boiler requires some special installation considerations with regard to duct air velocity, duct static pressure and interconnecting plumbing between the steam generating unit and the steam distribution system. Following the instructions below will insure a trouble-free installation.

1. Manifolds, header, and nozzles are all stainless steel material.
2. Manifold trap required on CS-2000, CS-3000 and CS-4000 series units. Trap not required on CS-1101, CS-1103, or CS-3113 units.
3. CS-58 collection header may be used to connect a dual outlet steam tank to a single 2" hose or tube for connection to a distribution system.
4. MDD units require a separate distribution system for each cylinder.
5. Exact number of steam distributor tubes may vary.
6. Exact number of steam nozzles per distributor tube may vary.
7. Duct static pressure: <5: H<sub>2</sub>O
8. Air Velocity: <2000 fpm
9. Steam outlets on steam cylinder are 1 1/2" O.D. Recommended supply lines are 1 1/2" Insulated Type L Copper Pipe with 1 1/2" Hose cuffs for single steam outlet (units to 50 lbs/hr) and 2" I.D. insulated copper pipe for two outlet units (units with capacity from 51-100 lbs/hr).
10. Unit shown with CS-1101. Other CS Series may also be used.
11. Plumbing from unit to steam distribution system provided by others.

CS-1101  
CS-1103

### NOTES:

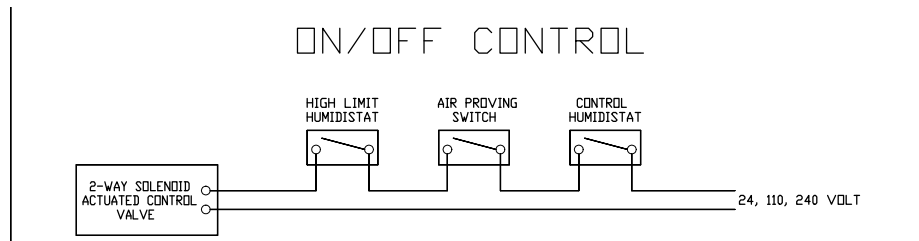
1. CS-58 COLLECTION HEADER RESTS ON GROMMETS ON TOP OF CABINET.
2. OUTLET MAY BE ORIENTED TO THE LEFT OR RIGHT (AS DRAWN).



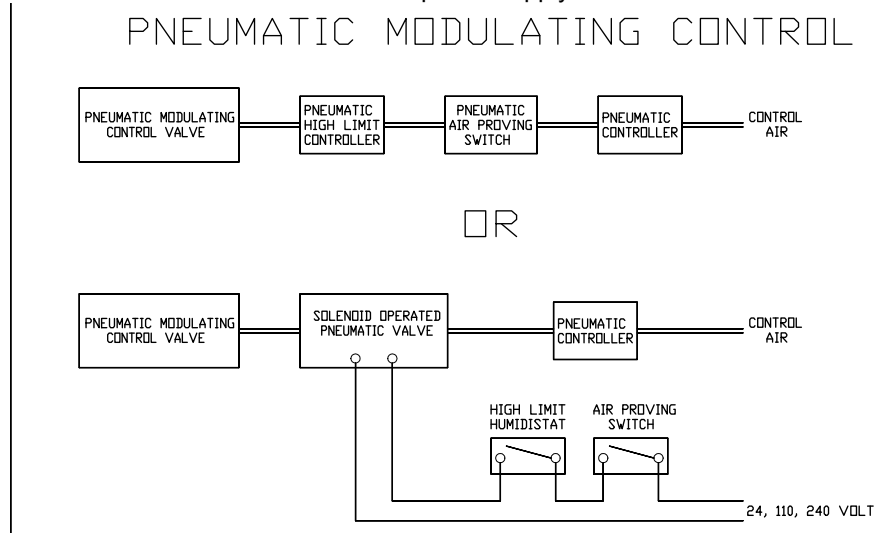


## VI. CONTROL OPTIONS

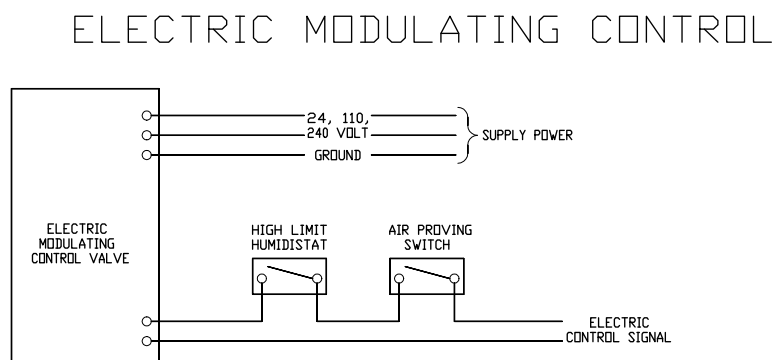
**On/Off Control:** While the simplest to wire, on/off control is also the least accurate control scheme available. Instructions are included with each actuator/linkage package which details the proper connections of power to the actuator. It is always recommended that control, high limit, and air proving devices be used. In the case of on/off control, the three devices are simply wired in series.



**Pneumatic Modulating Control:** As with on/off control, the proper connection methods are included in the actuator/linkage package. Also, control, high limit, and air proving devices are recommended. With pneumatic modulating control, the high limit and air proving devices may be pneumatic, which allows for a modulating high limit and the best possible control, or electric, where a solenoid valve makes or brakes the pneumatic control air. The solenoid power is controlled by the on/off high limit and air proving devices which are wired in series with the power supply to the solenoid.



**Electric Modulating Control:** The wiring schematic is included in the actuator/linkage package. The power supply (24 VAC, 120 VAC, or 240 VAC) and the control signal (4-20 mA, 0-10 VDC voltage signal, etc.) must be specified at the time of order. Double check that what was ordered matches the power available prior to installing the device. High limit and air proving devices are recommended.



## VII. STARTING THE HUMIDIFIER

### Start-Up Procedure

Once the Hurricane system is properly installed and connected to a steam source, condensate drains, and controls, the following sequence of events should be used to activate the humidifier.

1. Turn all humidistats to the "off" position
2. Open the steam supply valve and allow the supply trap to warm up and drain away condensate from supply piping.
3. Set desired relative humidity on the high limit humidistat(s). Recommended setting is 80%.
4. Turn the control humidistat to allow the humidifier to begin operating.
5. After the humidifier has run for a period of time, turn the control humidistat off so that the humidifier control valve closes. Then close the steam supply valve to the humidifier.
6. Remove the strainer screen from the inlet strainer and clean. Check the steam traps to insure they are also clean.
7. Test all humidistats and air flow switches to insure they are operating properly.
8. Reset control device to the desired set point.

## VIII. MAINTENANCE GUIDE

### Steam Distribution System

All models of the CS Series Steam Distribution System are maintenance free. If the steam supply is dirty, it may be necessary to wipe down the external surfaces of the distribution manifolds. If any steam nozzles clog, use a #67 drill bit to clean the nozzle.

### Strainers

Once a year, check the strainer for proper operation. Open a valve or plug on the exhaust port for self-cleaning.

### Traps

Once a year, check for proper operation. All the working parts on the traps are accessible without removing the trap from the system piping. The F&T traps have a clean-out plug at the bottom of the trap body for easy flushing.

## IX. TROUBLESHOOTING GUIDE

### Humidifier Will Not Discharge Steam

- Check humidifier to see if it is hot and charged with steam. If humidifier is cold and does not contain steam, check supply valve to be sure it is open, check strainers to insure that they are not plugged and any pressure regulating device used in the system.
- Check humidistat to insure that it is operating properly. If no output, electrical or pneumatic, is obtained from the humidistat, the humidistat is at fault and should be repaired or replaced.
- Check valve operator and valve. A valve operator could have a damaged motor or ruptured diaphragm which would prevent it from responding to the appropriate signal. Also check valve controller mechanisms and the valve to insure it has not been jammed closed with dirt and debris.

### Humidifier Discharges Steam Continuously Even After Reaching Desired Humidity Level

- Check humidistats and controllers for proper operation and calibration. If they are found to be at fault, repair or replace.
- Check valve operator for defect. Repair or replace as necessary.
- Check valve for build up of dirt. Clean or replace as necessary. Clean inlet strainer at this time.
- Check to see that the actuator is mounted correctly.

### Humidifier Discharges Water

- Nozzles spraying directly on duct walls. System designed for 1" thick walls. If walls are thicker than that, notify factory for simplest remedy. It may be necessary to modify manifolds in some manner.
- Check to see humidifier is plumbed correctly. See installations drawings for appropriate system.
- Check to insure steam traps are correct for application and that they are not clogged with dirt or debris.
- If boiler carryover is reason for flooding of humidifier, check with powerplant operator to correct situation.
- Check to see that all manifold traps drain to a gravity drain.
- Supply trap may be piped to a pressurized condensate return but inlet steam pressure must be sufficiently higher than condensate pressure to compensate for any lifting of the condensate.
- Check to see that humidifier is mounted correctly. See appropriate installation drawing.
- If humidifier is at end of long run of supply line and system has been inactive for period of time, allow supply trap to warm up prior to activating humidistat.
- For CS-3119 models, shut-off steam control valve and open slowly to allow condensate to fill "p" trap on the unit.
- Steam supply pressure is in excess of 125% of design pressure. Adjust as necessary.



TRION®

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