COPES-VULCAN

SPX VALVES & CONTROLS™

GUIDANCE NOTES FOR THE INSTALLATION OF MULTIPLE NOZZLE SPRAY DESUPERHEATERS (MNSD, MNSD-U, MNSD-V & SD2K)

(FORM GN-07)

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1.0 INTRODUCTION

The Copes-Vulcan Multiple Nozzle Spray Desuperheater is a contact type desuperheater that utilizes a number of atomizing spray nozzles to produce a fine spray pattern of coolant, which can easily be absorbed by the vapor being desuperheated. Incorporated, as part of the desuperheater assembly is a flow control plug, which serves two functions. First, it regulates the number of flow nozzles exposed to flow. At the same time, it controls the amount of coolant flow by maintaining a relatively constant back-pressure to the nozzles, which ensures that a satisfactory spray pattern is achieved.

The following guidelines for the correct installation of a Multiple Nozzle Spray Desuperheater Type MNSD, MNSDV, MNSD-U, or SD-2K into a piping system are offered to ensure proper desuperheater operation. These recommendations are based on experience and good piping practice and, if followed, should result in trouble-free commissioning and operation of the desuperheater.

The Multiple Nozzle Spray Desuperheaters incorporate close fitting components which require more attention than that demanded by simple spray type desuperheaters. The operation of the unit is dependent upon a satisfactory supply of coolant and adequate performance of the actuator, which will have been sized to produce sufficient force to overcome the forces normally expected in the desuperheater. Poor installation can result in additional forces being set up, which may impair the performance of the actuator.

2.0 PRIOR TO DELIVERY

Shortly after your order is entered, a certified copy of the Desuperheater Data Specification Sheet will be issued by Copes-Vulcan. The Desuperheater Data Specification Sheet details the operating conditions for which the equipment is being designed. Drawings illustrating the critical installation dimensions of the equipment proposed will also be issued. This information should be reviewed carefully to confirm that our interpretation of the service requirements is correct. Any discrepancies should be pointed out immediately to Copes-Vulcan.

These guidance notes and the drawings illustrating the equipment should be forwarded to the person(s) responsible for locating the desuperheater and designing the associated piping. The recommendations in this document must be followed to achieve a satisfactory installation.

3.0 EQUIPMENT RECEIPT

On receipt, the desuperheater should be inspected to ensure that no damage has been sustained in transit. A packing list containing a complete description of the equipment is included with the shipment. Check the list against the items that have been supplied. Check that the serial number on the desuperheater matches that on the Copes-Vulcan Data Specification Sheet. Report any problems to Copes-Vulcan.

4.0 PROVISIONS FOR PROPER STORAGE

If the desuperheater is not being installed immediately upon receipt, the points below should be considered when placing the equipment into storage. Regular inspections of the stored desuperheater should be made, as detailed in Section 5.

A. Location During Storage

If possible, the desuperheater should be stored indoors in a ventilated area in its original shipping container. If indoor storage is not possible, the equipment should not be stored in contact with the ground.

B. Use of Desiccants

When desiccant bags are supplied in carbon steel desuperheaters, a tag will be attached to an outside surface of the desuperheater identifying the number of bags, their location, and the trade name of the desiccant. The desiccant bags are to be replaced every three months while the equipment is stored.

C. Protection from Rust

Unpainted metal surfaces may be protected from rust by applying a rust preventive compound such as CRC 3-36 or equivalent.

End covers should be removed and a film of rust preventive compound should be sprayed on the desuperheater internals and on the inside surface of the body. The ends should then be securely re-sealed.

NOTE: Before performing the above procedures, make sure that any substance used for this purpose will not be detrimental to the fluid to be passed through the installed desuperheater.

If the equipment is stored for an extended time, the treatment should be applied annually.

When a rust preventive compound is not permissible or cannot be used, the equipment must be enclosed in a vapor-proof envelope, evacuated of all air, and sealed.

D. Motor Operators

Motor operators on MNS desuperheaters should be stored in a dry place until installation. If the unit is being installed but cannot be wired up at the time, it is recommended that the plastic transit cable entry plugs be replaced with metal plugs that are sealed with PTFE tape.

Desuperheaters with Limitorque operators that are to be stored for periods longer than one year require maintenance of the electric contacts located in the limit switch compartment as follows:

When storing for one to two years maximum, spray all electric contacts on Limitorque operators with CRC 2-26 or equivalent. This preservative does not have to be removed prior to use of the operator.

For storage periods from two to five years, spray Limitorque operator electric contacts with CRC Lectra Shield spray coating or equivalent. This coating must be removed with a suitable cleaner--such as any petroleum solvent--prior to making electrical connections.

5.0 INSPECTION WHILE IN STORAGE

While in storage, the desuperheater must be inspected regularly, as detailed below.

A. Inspection Schedule

Visually examine the exterior surfaces of the equipment on a semi-annual basis; visually examine accessible interior surfaces of the equipment on an annual basis.

Disassembly of the equipment is not intended or required during inspection--a satisfactory inspection can be performed while limiting any disassembly to removal of accessory covers and shipping caps.

B. Prevention of Contamination

Water, dirt, oil, grease, or other foreign material should be removed from the equipment. The source of these contaminants should be found and action should be taken to prevent recurrences.

C. Inspection of Desiccants

Equipment stored with desiccants is to be inspected to confirm that the desiccant material is being replaced every three months and is properly located and secured in the equipment.

D. Inspection of Covers, Caps and Plugs

Inspect all equipment covers and temporary shipping caps and plugs to make sure these items are firmly attached and will prevent the entrance of foreign matter into the desuperheater and accessories.

6.0 FOLLOWING STORAGE

If the desuperheater has been in storage, the following steps (as applicable) should be performed before the desuperheater is installed.

A. Replacement of Packing, Seals, Gaskets, O-Rings and Diaphragm

Copes-Vulcan recommends replacing the packing if the desuperheater has been stored for a period longer than a year and a half.

Seals, gaskets, o-rings and diaphragms should be replaced if the desuperheater has been stored for a period longer than three years.

B. Preparation of Motor Operators

On Limitorque motor operators, if the electric contacts have been treated with CRC Lectra Shield spray coating or equivalent, the coating must be removed with a suitable cleaner--such as any petroleum solvent--prior to making electrical connections.

C. Removal of Shipping Caps, Plugs, Covers and Desiccant Bags

When readying the desuperheater for installation, check to make sure that all temporary shipping caps, plugs, covers and desiccant bags have been removed.

D. Copes-Vulcan Assistance After Long-Term Storage

If the storage period has exceeded three years, consideration should be given to hiring a Copes-Vulcan Service Engineer to inspect the equipment before installation.

GUIDANCE NOTES FOR INSTALLATION OF MULTIPLE NOZZLE SPRAY DESUPERHEATERS (MNSD, MNSDV, MNSD-U, & SD2K)

7.0 LOCATION

A. Position in the Pipeline

The MNSD, MNSDV, MNSD-U or SD-2K can be installed in either a horizontal or vertical run of piping.

If a vertical run of piping is chosen, it is recommended that the flow direction be upwards and that a drain be placed at the bottom of the vertical run to remove any liquid that may drop down.

If the unit is installed in a horizontal pipe run, it is recommended that the actuator be positioned on the vertical centerline or at an angle no greater than 45° off the upward vertical.

In all cases the unit must be installed with the nozzles pointing downstream with the vapor flow.

Unless Copes-Vulcan is otherwise advised, the unit will be supplied suitable for installation in a horizontal pipe. Drain plugs will be set to point down to facilitate drainage.

B. Allowing for Access

In selecting the location for the desuperheater, consideration should be given to the need for access to the unit. The positioner and other accessories on the actuator may require adjustment and setting, and the desuperheater will have to be removed from the line for routine maintenance. Adequate access to the equipment, along with provision for suitable lifting gear, should be provided for.

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8.0 UPSTREAM AND DOWNSTREAM PIPING

Attention should be given to the effect that flow disturbances, created by the incoming piping configuration, would have on the performance of the desuperheater. Ideally, the upstream pipe is straight and of uniform diameter, with no expanders, tees, elbows, or valves for a distance of five pipe diameters or 4 feet (1200 mm), whichever is greater.

Reasonable length of straight piping downstream of the desuperheater is required, otherwise centrifugal force may cause coolant particles to separate from the vapor as the mixture travels around a bend. This can result in coolant impingement on the pipe wall. At least two-thirds of the recommended distance to the temperature-sensing device (given on the Desuperheater Specification Data Sheet) should be straight.

9.0 MINIMUM HEADER SIZE

The minimum header size required for successful installation of the desuperheater is as follows:

MODEL*	MINIMUM HEADER SIZE	
MNSD 3/2	5.75-inch	(146-mm)
MNSD 3/3	7.25-inch	(184-mm)
MNSD 3/5	10.25-inch	(260-mm)
MNSD 4/5	10.25-inch	(260-mm)
MNSDV 3/2	5.75-inch	(146-mm)
MNSDV 3/3	6.81-inch	(173-mm)
MNSDV 3/5	10.12-inch	(257-mm)
MNSD-U / SD2K 3/2	5.75-inch	(146-mm)
MNSD-U / SD2K 3/3	7.25-inch	(184-mm)
MNSD-U / SD2K 3/5	10.25-inch	(260-mm)

*This first digit of the model number indicates the body/flange size, the second digit indicates the plug travel.

If the application requires the use of a liner, then the above sizes apply to the liner and a larger header size will be required. (Please refer to Section 15 on thermal liners.)

GUIDANCE NOTES FOR INSTALLATION OF MULTIPLE NOZZLE SPRAY DESUPERHEATERS (MNSD, MNSDV, MNSD-U, & SD2K)

10.0 COOLANT ENTRY BRANCH ORIENTATION

The coolant entry branch can be assembled in any of four locations at 90° intervals from the centerline of the nozzle tube. Unless DeZURIK/Copes-Vulcan is advised to the contrary, the unit will be shipped with the branch assembled at 180° to the nozzle face, allowing the coolant pipe to follow the same line as the vapor main and enter the desuperheater from the upstream direction.

11.0 MOUNTING FLANGE SIZE AND BRANCH HEIGHT

The first digit of the model number indicates the size of the body and mounting flange, i.e., a Model 3/2 unit has a 3-inch (80-mm) mounting flange.

The MNSDV, MNSD-U and SD2K mounting is similar to the mounting for the MNSD, but is designed to bolt up to any universal header mounting. The universal header mounting will accept the Copes-Vulcan MA-IU, MA-IIU, and SAMND-U desuperheaters, as well as the MNSDV, MNSD-U and SD2K.

The height of the mounting branch dictates the location of the nozzle cluster in the header. In the smaller size headers, the nozzle cluster is approximately central. In the larger size headers, the nozzle cluster is allowed to be off-center. These guidance notes show the branch sizes recommended to achieve the optimum positioning of the nozzle cluster for the MNSD Model 4/5 in Figure 1, for the the MNSD and MNSD-U Models 3/2, 3/3 and 3/5 in Figures 2 and 4, for the SD2K in Figures 3 and 4, and for the MNSDV in Figures 5 and 6.

12.0 LOCATION OF TEMPERATURE-SENSOR

The location of the temperature-sensing element is critical to successful operation of the desuperheater. Copes-Vulcan determines this distance taking into account the residual superheat in the vapor, the differential between the temperature of the outgoing vapor and that of the coolant, and the velocity in the vapor main. The recommended distance for a particular application is indicated on the Desuperheater Data Specification Sheet. If it is necessary to deviate from this recommendation to clear an obstruction or a bend, the distance should be lengthened.

When locating the temperature-sensing element, make sure it protrudes far enough into the main to sense the temperature away from the pipe wall. Try to get as close as possible to the pipe center without risking excessive vibration in the pocket or well. In a horizontal line, it is recommended that the element be inserted from the top.

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13.0 PIPELINE VELOCITY

All spray type desuperheaters rely on the velocity in the vapor main to keep the coolant particles in suspension long enough to be absorbed by the vapor. If this does not happen, the coolant particles drop out and collect in the bottom of the vapor main where they are carried along, possibly missing the temperature sensor entirely and thus adversely affecting the temperature control achieved.

Copes-Vulcan will advise the recommended minimum velocity and the size of main needed to achieve this velocity. If the existing main is too large, a 6-foot (1.8 m) length of reduced section piping should be provided, starting one foot (0.3 m) upstream of the desuperheater, to increase the velocity local to the desuperheater. As an alternative, a venturi liner can be inserted in the steam main to achieve the same result.

The required minimum velocity is a function of many variables. Copes-Vulcan makes their recommendation based on experience and good engineering practice.

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CAUTIONARY NOTE;

COPES-VULCAN HAS ANALYTICALLY DETERMINED THAT A COMBINATION OF HIGH STEAM VELOCITY IN THE HEADER, AND NOT HAVING THE DESUPERHEATER IN OPERATION COULD LEAD TO STRUCTURAL DAMAGE. AT STEAM VELOCITIES GREATER THAN 20,000 FT/MIN, THE WAKE FREQUENCY APPROACHES THE NATURAL FREQUENCY OF THE SPRAY TUBE. WHEN THE DESUPERHEATER IS IN OPERATION, THE SPRAY PATTERN DISRUPTS THE STEAM FLOW SUCH THAT REGULAR VORTEX SHEDDING, WHICH CAUSES BOUNDARY LAYER SEPARATION, DOES NOT OCCUR.

IF IT IS EXPECTED THAT STEAM FLOW VELOCITIES WILL BE GREATER THAN 20,000 FT/MIN, AND WATER FLOW WILL BE COMPLETELY SHUT OFF, THEN COPES-VULCAN APPLICATIONS OR ENGINEERING SHOULD BE CONSULTED BEFORE INSTALLING THE UNIT.

14.0 COOLANT SUPPLY

For any desuperheating application where the coolant is mixed with the vapor, it is important that a high grade of coolant be used. Any impurities in the coolant will be left behind when the coolant evaporates and can result in the build-up of solids in the vapor main. Worse still is the risk of chemical attack when diluted chemicals become concentrated as the coolant evaporates.

The ideal coolant is condensate or liquids with no more than 11 parts per million of dissolved solids.

It is important that the coolant is deaerated, otherwise there is a risk of the oxygen in the coolant being released during the evaporation stage. This can give rise to oxygen corrosion, particularly in carbon steel piping.

The MNSD, MNSDV, MNSD-U and SD2K have close fitting components that can be affected by the ingress of foreign matter. The coolant, therefore, should contain no foreign particles. If there is any doubt about the quality of the coolant, it is recommended that a 30 x 30 mesh strainer be installed upstream of the coolant inlet. A 30 x 30 mesh contains 900 holes per square inch (6.5 cm), which will not allow particles larger than 0.025 inch (0.64 mm) to pass.

15.0 THERMAL LINERS

The fitting of thermal liners is a matter of individual choice and the subject of much discussion. The fitting of a thermal liner when certain parameters are exceeded will certainly provide protection to the vapor main against corrosion fatigue and possible failure of the main. However, there is an additional cost involved and some desuperheater manufacturers leave the matter up to the system designer.

Copes-Vulcan's policy is to recommend a thermal liner when the operating parameters warrant but to allow the customer the final choice.

If a liner is to be fitted, it should have a length of approximately 6 feet (1.8 m) and should commence 1-foot (0.3 m) upstream of the desuperheater. The design should be such that 10% of the vapor flow passes around the outside of the liner in order to create a thermal barrier to the vapor header. The liner should be fixed at the inlet end. At the other end, it should be supported but free to expand and contract independently from the vapor header.

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CAUTIONARY NOTE:

IF A LARGE NUMBER OF THERMAL CYCLES IS EXPECTED, IE, COMPLETELY STOPPING AND STARTING WATER FLOW MORE THAN TWICE A WEEK, WITH CONTINUED STEAM FLOW, THE MNSDV CAN BE FITTED WITH AN INTERNAL THERMAL LINER. THIS WILL ACT TO EXTEND THE LIFE OF THE UNIT. CONTACT COPES-VULCAN APPLICATIONS OR ENGINEERING IF THIS IS A CONCERN.

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16.0 STEAM TRAP

It is recommended that a stream trap be placed between the desuperheater and the temperature- sensing point. This will ensure that any unabsorbed coolant that has dropped out of suspension will be removed from the vapor flow before reaching the sensing point.

The trap should be placed at least two-thirds of the distance downstream of the desuperheater to the temperature-sensing point.

17.0 INSTALLATION/SET-UP

A. Lifting the Equipment

Do not suspend the desuperheater from the actuator. Use slings wrapped around the body of the desuperheater, taking care that the actuator accessories and piping are not damaged during installation.

B. Direction of Spray

Make sure that the unit is installed with the spray nozzle cluster pointing downstream.

C. Cleaning the Piping

Before making the final connection to the coolant piping, make sure the piping has been thoroughly cleaned and is free of any foreign matter.

To avoid damaging the nozzle head, it is recommended that the desuperheater not be installed until after the vapor lines have been chemically cleaned and flushed.

D. Pipe Connections

Use good piping practice when installing the desuperheater. To ensure that no pipe strain is imparted to the desuperheater, which could result in distortion when the unit comes up to temperature, care should be taken that all flanges are square to each other.

E. Air Connections to Pneumatic Actuator

When making air connections to the pneumatic actuator, use only brass or stainless steel fittings. Make sure the tubing has been correctly deburred and blown clean before final connections are made.

18.0 COOLANT BLOCK VALVE

Under normal operation when the desuperheater is not in service, the coolant supply will be shut off by the coolant control valve. If prolonged periods during which steam will be flowing through the header without the need for desuperheating are anticipated, a tight shut-off block valve should be installed to ensure that any coolant passing through the coolant control valve does not enter the header.

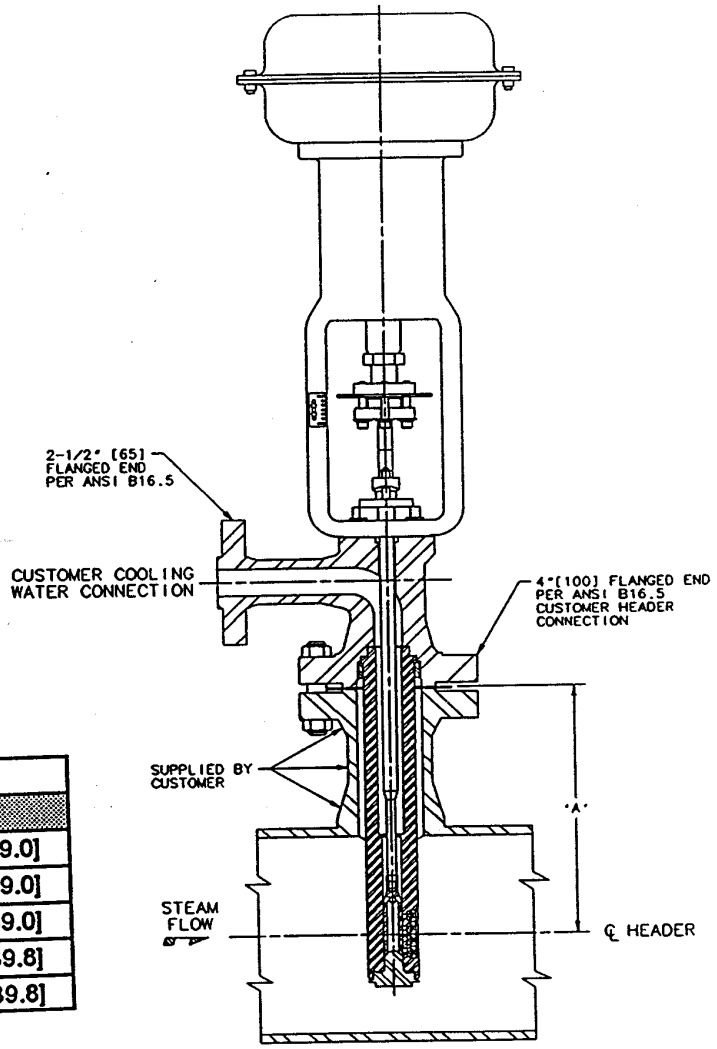
19.0 INSPECTION

It is recommended that periodic inspection be performed on the body, which is the pressure boundary part. The body should be visually examined internally and externally for wear, cracks, or other signs of fatigue every 18 months. Any irregularities should be pursued with appropriate NDE methods.

GUIDANCE NOTES FOR INSTALLATION OF MULTIPLE NOZZLE SPRAY DESUPERHEATERS (MNSD, MNSDV, MNSD-U, & SD2K)

FIGURE 1 - MODEL 4/5 MNSD

[Dimensions in brackets are in millimeters.]

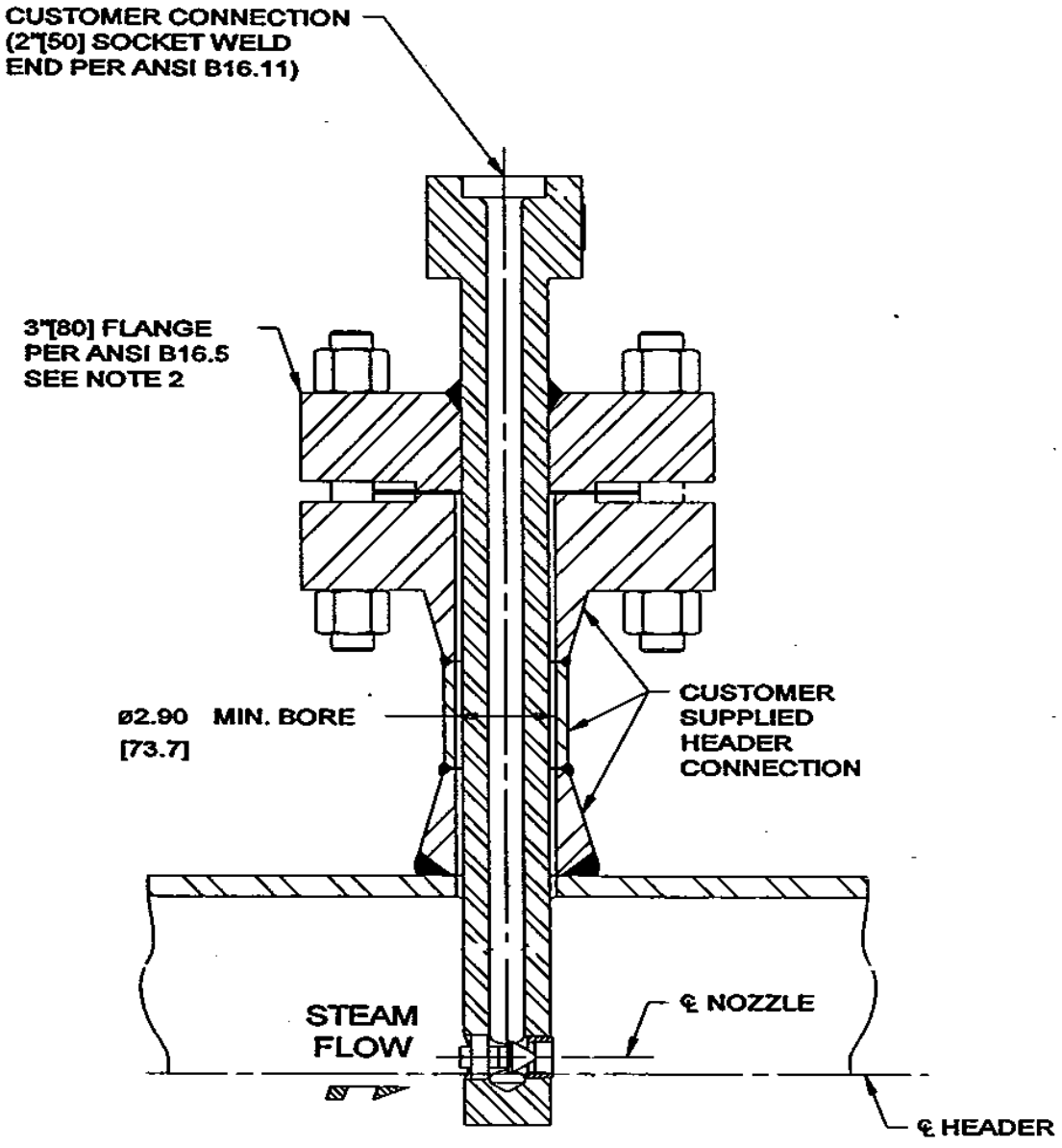


4/5 MNSD			
HEADER SIZE		"A"	
14"	[350]	19.25	[489.0]
16"	[400]	19.25	[489.0]
18"	[450]	19.25	[489.0]
20"	[500]	21.25	[539.8]
24"	[600]	21.25	{539.8]

GUIDANCE NOTES FOR INSTALLATION OF MULTIPLE NOZZLE SPRAY DESUPERHEATERS (MNSD, MNSDV, MNSD-U, & SD2K)

FIGURE 2 - MODELS 3/2, 3/3, & 3/5 MNSD & MNSD-U

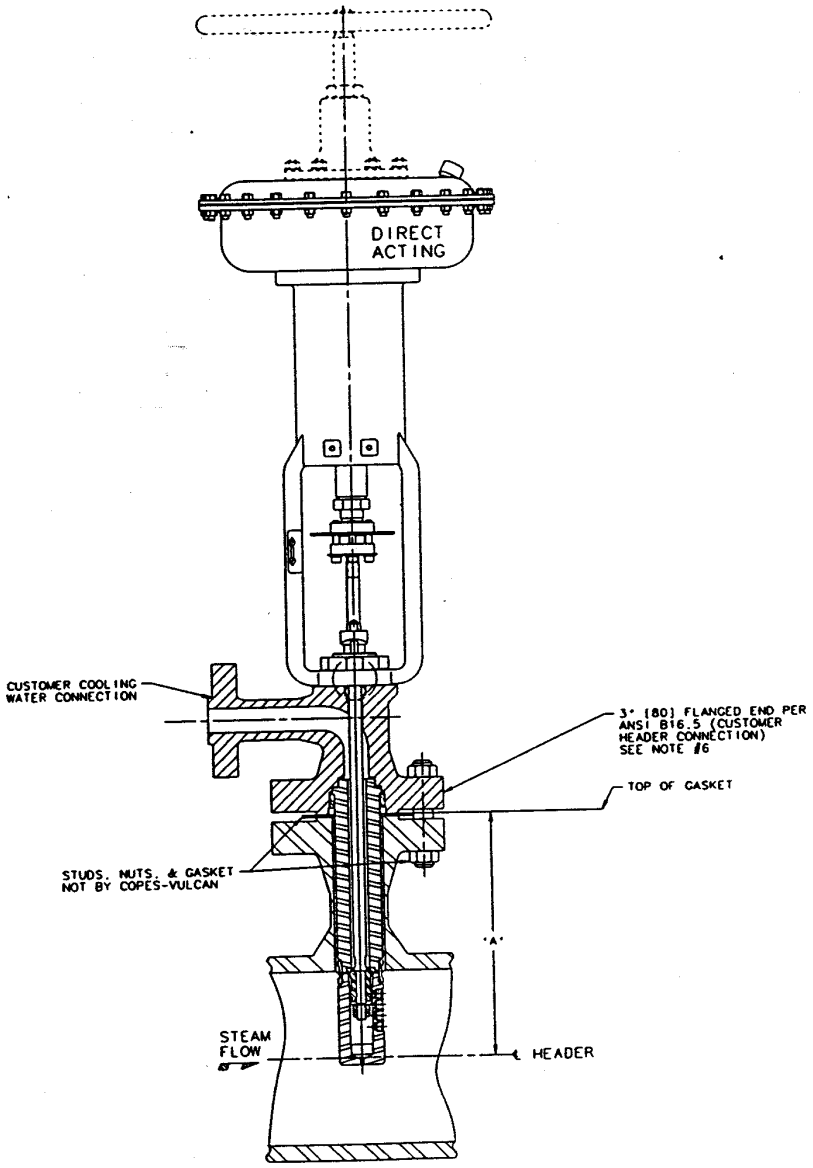
[Dimensions in brackets are in millimeters.] See Figure 4 for Dimension 'A'.



GUIDANCE NOTES FOR INSTALLATION OF MULTIPLE NOZZLE SPRAY DESUPERHEATERS (MNSD, MNSDV, MNSD-U, & SD2K)

FIGURE 3 - MODELS 3/2, 3/3, & 3/5 SD2K

[Dimensions in brackets are in millimeters.] See Figure 4 for Dimension 'A'.



GUIDANCE NOTES FOR INSTALLATION OF MULTIPLE NOZZLE SPRAY DESUPERHEATERS (MNSD, MNSDV, MNSD-U, & SD2K)

FIGURE 4 - DIMENSION 'A' FOR FIGURES 2 & 3

3/2 MNSD				3/2 MNSD-U / SD2K			
HEADER SIZE		□A□		HEADER SIZE		□A□	
6"	[150]	12.75"	[323.8]	6"	[150]	12.06"	[306.3]
8"	[200]	12.00"	[304.8]	8"	[200]	13.06"	[331.7]
10"	[250]	12.00"	[304.8]	10"	[250]	14.12"	[358.6]
12"	[300]	13.00"	[330.2]	12"	[300]	15.12"	[384.0]
14"	[350]	13.62"	[345.9]	14"	[350]	15.75"	[400.0]
16"	[400]	15.62"	[396.7]	16"	[400]	16.75"	[425.4]
18"	450]	15.62"	[396.7]	18"	[450]	17.75"	[450.8]
20"	[500]	16.62"	[422.1]	20"	[500]	18.75"	[476.2]
24"	[600]	18.62"	[472.9]	22"	[550]	19.75"	[501.6]
				24"	[600]	20.75"	[527.0]

3/3 MNSD				3/3 MNSD-U / SD2K			
HEADER SIZE		□A□		HEADER SIZE		□A□	
6"	[150]	12.75"	[323.8]	6"	[150]	12.06"	[306.3]
8"	[200]	12.00"	[304.8]	8"	[200]	13.06"	[331.7]
10"	[250]	12.00"	[304.8]	10"	[250]	14.12"	[358.6]
12"	[300]	13.00"	[330.2]	12"	[300]	15.12"	[384.0]
14"	[350]	13.62"	[345.9]	14"	[350]	15.75"	[400.0]
16"	[400]	15.62"	[396.7]	16"	[400]	16.75"	[425.4]
18"	[450]	15.62"	[396.7]	18"	[450]	17.75"	[450.8]
20"	[500]	16.62"	[422.1]	20"	[500]	18.75"	[476.2]
24"	[600]	18.62"	[472.9]	22"	[550]	19.75"	[501.6]
				24"	[600]	20.75"	[527.0]

GUIDANCE NOTES FOR INSTALLATION OF MULTIPLE NOZZLE SPRAY DESUPERHEATERS (MNSD, MNSDV, MNSD-U, & SD2K)

FIGURE 4 - DIMENSION 'A' FOR FIGURES 2 & 3

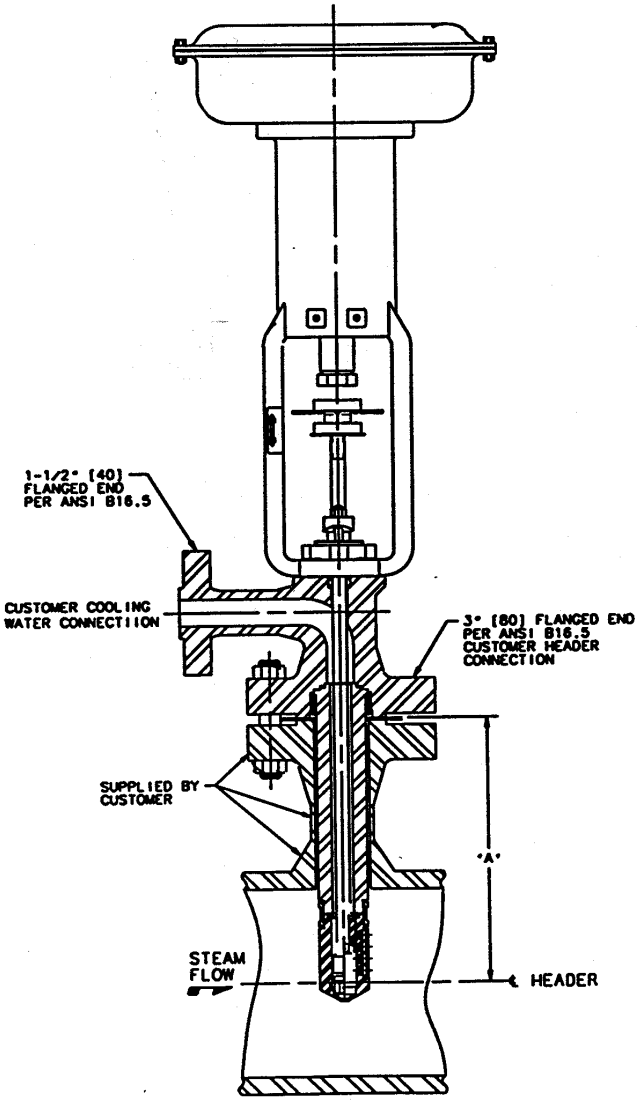
3/5 MNSD				3/5 MNSD-U / SD2K			
HEADER SIZE		□A□		HEADER SIZE		□A□	
				12"	[300]	15.12"	[384.0]
14"	[350]	15.62"	[396.7]	14"	[350]	15.75"	[400.0]
16"	[400]	15.62"	[396.7]	16"	[400]	16.75"	[425.4]
18"	[450]	15.62"	[396.7]	18"	[450]	17.75"	[450.8]
20"	[500]	16.62"	[422.1]	20"	[500]	18.75"	[476.2]
24"	[600]	18.62"	[472.9]	22"	[550]	19.75"	[501.6]
				24"	[600]	20.75"	[527.0]

GUIDANCE NOTES FOR INSTALLATION OF MULTIPLE NOZZLE SPRAY DESUPERHEATERS (MNSD, MNSDV, MNSD-U, & SD2K)

FIGURE 5 - MODELS 3/2, 3/3, & 3/5 MNSDV

[Dimensions in brackets are in millimeters.]

See Figure 6 for Dimension 'A'.



GUIDANCE NOTES FOR INSTALLATION OF MULTIPLE NOZZLE SPRAY DESUPERHEATERS (MNSD, MNSDV, MNSD-U, & SD2K)

FIGURE 6 - DIMENSION 'A' FOR FIGURE 5

3/2 MNSDV				3/3 MNSDV			
HEADER SIZE		□A□		HEADER SIZE		□A□	
6"	[150]	12.06"	[306.3]				
8"	[200]	13.06"	[331.7]	8"	[200]	13.06"	[331.7]
10"	[250]	14.12"	[358.6]	10"	[250]	14.12"	[358.6]
12"	[300]	15.12"	[384.0]	12"	[300]	15.12"	[384.0]
14"	[350]	15.75"	[400.0]	14"	[350]	15.75"	[400.0]
16"	[400]	16.75"	[425.4]	16"	[400]	16.75"	[425.4]
18"	[450]	17.75"	[450.8]	18"	[450]	17.75"	[450.8]
20"	[500]	18.75"	[476.2]	20"	[500]	18.75"	[476.2]
22"	[550]	19.75"	[501.6]	22"	[550]	19.75"	[501.6]
24"	[600]	20.75"	[527.0]	24"	[600]	20.75"	[527.0]
				30"	[750]	23.63"	[599.9]

3/5 MNSDV			
HEADER SIZE		□A□	
12"	[300]	15.12"	[384.0]
14"	[350]	15.75"	[400.0]
16"	[400]	16.75"	[425.4]
18"	[450]	17.75"	[450.8]
20"	[500]	18.75"	[476.2]
22"	[550]	19.75"	[501.6]
24"	[600]	20.75"	[527.0]
30"	[750]	23.63"	[599.9]