PENTAIR

PENBERTHY®

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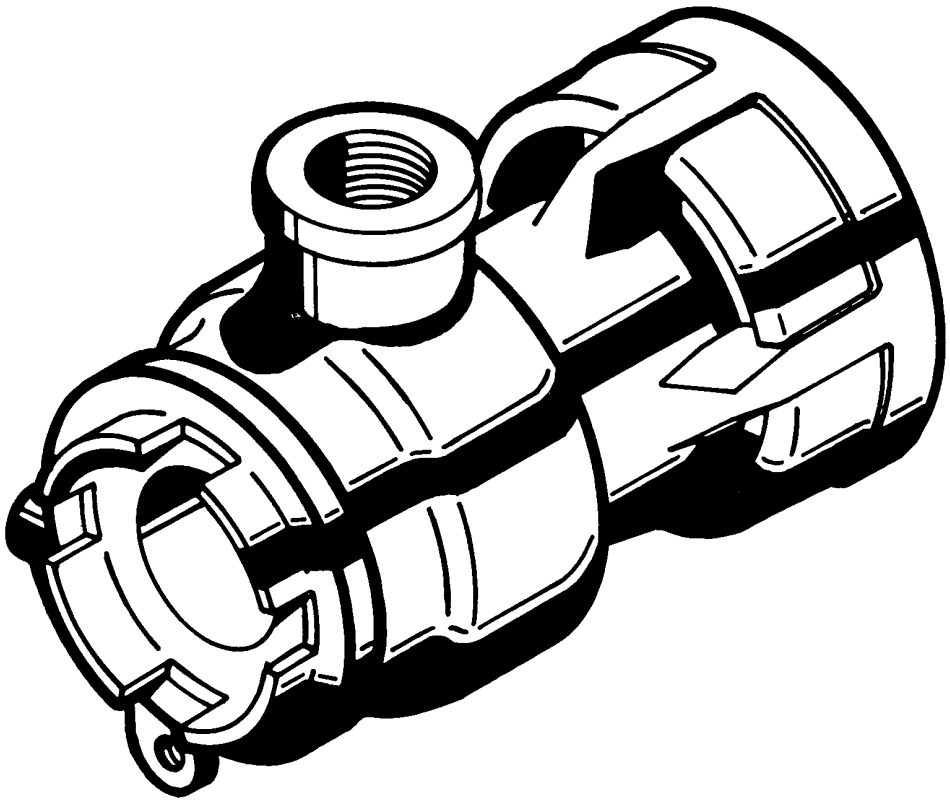
Steam Jet Heaters

IN TANK HEATERS
Models XL-32 & NWH



Installation, Operation and Maintenance Instructions

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PENBERTHY PRODUCT WARRANTY

Pentair Valves & Controls Black Mountain warrants its Penberthy products as designed and manufactured by PV&C Black Mountain to be free of defects in the material and workmanship for a period of one year after the date of installation or eighteen months after the date of manufacture, whichever is earliest. PV&C Black Mountain will, at its option, replace or repair any products which fail during the warranty period due to defective material or workmanship.

Prior to submitting any claim for warranty service, the owner must submit proof of purchase to PV&C Black Mountain and obtain written authorization to return the product. Thereafter, the product shall be returned to PV&C in Black Mountain, North Carolina, with freight paid.

This warranty shall not apply if the product has been disassembled, tampered with, repaired or otherwise altered outside of PV&C Black Mountain factory, or if it has been subject to misuse, neglect or accident.

The responsibility of PV&C Black Mountain hereunder is limited to repairing or replacing the product at its expense. PV&C Black Mountain shall not be liable for loss, damage or expenses related directly or indirectly to the installation or use of its products, or from any other cause or for consequential damages. It is expressly understood that PV&C Black Mountain is not responsible for damage or injury caused to other products, buildings, personnel or property, by reason of the installation or use of its products.

THIS IS PV&C BLACK MOUNTAIN'S SOLE WARRANTY AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED WHICH ARE HEREBY EXCLUDED, INCLUDING IN PARTICULAR ALL WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

This document and the warranty contained herein may not be modified and no other warranty, expressed or implied, shall be made by or on behalf of PV&C Black Mountain unless made in writing and signed by the General Manager or Director of Engineering of PV&C Black Mountain.

INSTALLATION, OPERATION and MAINTENANCE MANUAL FOR PENBERTHY XL-32 & NWH STEAM JET HEATERS

1.0 About the Manual

This manual has been prepared as an aid and guide for personnel involved installation or maintenance. All instructions must be read and understood thoroughly before attempting any installation, operation, or maintenance.

SAFETY INSTRUCTIONS

Penberthy does not have any control over the manner in which its steam jet heater is handled, installed, or used, and Penberthy cannot and does not warrant or guarantee that a Steam Jet is suitable or compatible with the user's specific application.

WARNING

Safety glasses should always be worn when installing a steam jet heater. Failure to follow *any* instruction could possibly result in a malfunction of the heater with resulting physical injury or property damage.

2.0 Introduction

2.1 Features and Specifications

Penberthy NWH and XL-32 Steam Jet Heaters are designed for heating liquids in a tank by direct contact with steam. Steam is injected into the system under pressure causing circulation and suction of liquid to promote even temperatures distribution.

2.2 Design Ratings at Maximum and Minimum Operating Temperatures

Model	Material	Maximum Allowable Working Pressure
NWH	Iron	125 psig [860 kPaG] at -20°F [-29°C] to 350°F [177°C]
	Bronze and STS	140 psig [965 kPaG] at -20°F [-29°C] to 360°F [182°C]
XL-32	Bronze	140 psig [965 kPaG] at -20°F [-29°C] to 360°F [182°C]

Table 1

To determine maximum allowable working pressure for a specific temperature within the design limits stated above, the user must refer to Penberthy dimension sheets, or when provided, the specifically stated design limits on a Penberthy product proposal.

2.3 Application Data

NWH Maximum liquid temperature for noiseless operation is 160°F (71°C). Minimum steam operating pressure is 10 psig (70 kPaG).

XL-32 Maximum liquid temperature for noiseless operation is 160°F (71°C). Minimum steam pressure for noiseless operation is 60 psig (415 kPaG) when not using the air bleed. (Operation at steam pressures below 60 psig (415 kPaG) requires adjustment of an air bleed valve to gain the quietest operation.) Minimum steam operating pressure when using air bleed is 3 psig (20 kPaG).

Note: For specific application data within the above ranges, the user should consult the Penberthy product proposal for the specific model and size NWH and XL-32 heater, or should request Penberthy to supply the applicable Technical Data Bulletin.

Under no circumstances should these design ratings or application data be exceeded. Exceeding design ratings or application data may cause severe physical injury or property damage.

3.0 Inspection and Performance Confirmation

Upon receipt of steam jet heater, check all components carefully for damage incurred in shipping. If damage is evident or suspected, do not attempt installation. Notify carrier immediately and request a damage inspection.

3.1 Users' Rating Inspection

The user should confirm that:

1. The steam jet heater size and model designation (cast on side of body) conforms to the description on the user's purchase order.
2. The operating conditions described in the purchase order agree with the actual conditions at the installation site.
3. The actual operating conditions at the installation site are within the application data shown on the Penberthy Technical Data Bulletin or product proposal referred to above.
4. The materials of construction of the steam jet heater are compatible with both the contained fluid and surrounding atmosphere in the specific application.

If the size, model or performance data does not conform with any of the criteria above, do not proceed with installation. Contact an authorized Penberthy distributor for direction on what to do.

4.0 Installation

Installation should only be undertaken by qualified experienced personnel who are familiar with this equipment and have read and understand all the instructions in this manual.

The user should refer to Penberthy dimension sheets or Penberthy product proposal to obtain dimensional information for the specific size and model steam jet heater.

Check the steam jet heater cut-away view Figure 3, XL-32 or Figure 4, NWH for the location of the inlet and discharge connections to insure correct hook up. (Also the location of the air bleed connection for the XL-32 heater).

4.1 Mounting

Steam jet heaters should be positioned with the tank so as to insure the free flow of liquid to be heated into and out of the unit. The greatest agitation occurs within the discharge plume; therefore, the discharge end should be aimed towards the most remote part of the tank. On the other hand, the intake end of the unit must be far enough from the tank corner or wall to allow the free flow of liquid into the suction openings.

Tank shape and size influence the placement and number of steam jet heaters required to assure even temperature distribution. A spherical tank with a single steam jet heater mounted as shown in Figure 1 makes the best use of the heating and circulating characteristics of the steam jet heater. With no corners to impeded liquid flow, the liquid circulated undisturbed while being heated.

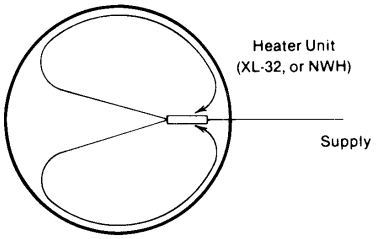

Figure 1 - Spherical Tank

The angular intersection of surfaces in cylindrical, square, or rectangular tanks can interrupt liquid flow patterns and cause liquid stagnation in these areas. A single jet heater mounted as shown in Figure 2 will tend to minimize this effect. However, multiple steam jet heaters can often produce more efficient circulation when using these tank shapes. To avoid significant steam pressure drop, never use smaller steam pipe than the heater connection size.

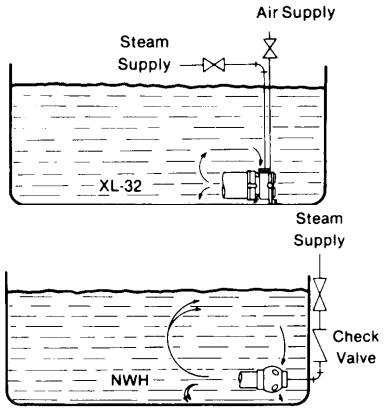

Figure 2

Long, narrow tanks whose ratio of length to diameter is greater thank 2:1 normally require multiple steam jet heaters. This applies to horizontal or vertical tank installations.

Relatively large tanks of any shape may require multiple steam jet heaters to maintain even temperature distribution.

4.2 Effect of Related Piping and Precautions (All Units)

1. Steam must not have over 20°F (-7°C) of superheat, or performance will differ from that published on the Penberthy Technical Data Bulletin or product proposal referred to above.
2. Steam line pressure loss must be taken into account when applying steam jet heaters.
3. Steam line must be clean and provided with a strainer to prevent foreign materials from clogging the heater.
4. Steam line should be installed and as short as possible to prevent condensation and friction losses.
5. Steam jet heaters must be fully submerged to prevent liquid from splashing and to promote condensation of steam.
6. Clearance should be provided for removal of steam jet heater.
7. Provisions should be made for a pressure gage connection in the steam supply line as near to the heater as possible. It may become necessary to install a pressure gage if operating difficulties are encountered.
8. Steam piping must be secured to the tank wall near the steam jet heater to keep strain off piping when in operation.
9. Steam supply valve should be a quick opening type installed as close to the steam jet heater as practical.

4.3 Effect of Related Piping and Precautions (Each Model)

1. NWH

A 10 to 12 inch (254 to 305 mm) long nipple must be installed on the discharge connection for satisfactory operation.

2. XL-32

a. A 12 to 18 inch (305 to 457 mm) long nipple must be installed on the discharge connection for satisfactory operation.
b. A mounting lug is provided to secure the steam jet heater to a tank wall where the steam pipe itself does not provide a rigid mounting.
c. For noiseless operation when steam supply pressure is below 60 psig (415 kPaG), a connection is provided for piping in atmospheric air. The steam jet heater will pull in the outside air which must be regulated with a small valve to the minimum which produces the quietest operation. The air inlet must be turned downward as shown in Figure 2 to help keep out foreign material and to protect against possible back flow of steam through air inlet line.

SAFETY INSTRUCTIONS

Live steam will blow out of the air bleed orifice in the event of back flow. Back flow is possible if the steam nozzle becomes partially or totally clogged.

d. For quietest operation do not submerge heater more than 3 inches for each psi operating steam pressure. Maximum depth to submerge heater is 8' for operating steam pressures above 30 psig (205 kPaG).

5.0 Operation

5.1 Pre-Operational Check

1. Assure that all installation procedures have been completed.
2. Fill tank with sufficient liquid for full submergence of heater.

5.2 Operating

1. Turn steam flow fully on and maintain throughout the heating process.
2. After desired temperature is reached, steam pressure should be turned off.
3. Do not throttle steam supply valve. Throttling of steam flow to conditions outside the recommended operating levels will cause the steam jet heater to hammer with resulting noise and vibration.

SAFETY INSTRUCTIONS

Excessive vibration can become hazardous due to loosening of pipe joints and release of steam.

Temperature of liquid can be thermostatically controlled only if the steam supply is controlled with a snap acting on-off valve.

Do not attempt to heat liquid beyond the maximum stated temperature of 160°F (71°C). Where the user has an open tank installation, heating beyond the maximum does not allow the steam time enough to fully condense by the time it reaches the surface of the liquid, thus splashing can result causing severe personal injury or property damage.

6.0 Maintenance

Maintenance should only be undertaken by qualified, experienced personnel who are familiar with this equipment and thoroughly understand all the instructions in this manual.

Do not proceed with any maintenance unless the steam jet heater has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature and has been drained or purged of all fluids. Failure to comply may cause a sudden release of steam resulting in severe personal injury or property damage.

6.1 Preventative Maintenance

The user must create maintenance schedules, safety manuals, and inspection details for each specific installation of a Steam Jet Heater.

On all installations, the following items should be regularly evaluated by the user for purposes of maintenance:

1. Heater unit(s) for corrosion or debris build up.
2. Piping and fittings for corrosion or debris build up.
3. All connections for tightness.
4. Units for wear.
5. Units for full submergence.
6. The XL-32 strainer for debris build up.

The user must determine upon evaluation of his or her operating experience an appropriate maintenance schedule necessary for his or her own specific application. Realistic maintenance schedules can only be determined with full knowledge of the services and application situation involved.

6.2 Troubleshooting

Problem	Cause	Cure
Insufficient heating taking place	Debris blockage of inlet, suction, discharge or strainer (XL-32 only)	Remove debris
	Loss of steam pressure due to loose connections	Recheck and tighten all connections
	Steam pressure too low	Increase pressure
Partial heating	Inadequately sized heater	Obtain proper size heater
	Debris blockage	Remove debris
	Operating steam pressure too low	Increase pressure
	Increased product demand	Balance product flow to heating capability of unit
Noise, water hammer, vibration	Operating steam pressure too low or liquid temperature too high	Increase pressure or decrease temperature
Noise and vibration after tank has reached temperature set point	Throttling of steam pressure	Thermostatically controlled heating cycles with snap acting on-off valve
	Set point is too high (such as 200°F [93°C])	Decrease to recommended operating level

Table 2

7.0 Disassembly-Reassembly

Do not proceed with removal of steam jet heater from connecting piping unless the steam jet heater has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature and has been drained or purged of all fluids. Failure to comply may cause a sudden release of pressure resulting in personal injury or property damage.

1. The NWH is a one-piece device with tapered pipe threads on both ends, inlet and discharge. The wrench flats on the inlet end should always be used when removing the NWH from the inlet piping, or when removing the discharge nipple. Do not clamp on body.
2. The XL-32 heater is made up of four parts - a body, a steam jet, a water jet, and a strainer. A 12" to 18" (305 to 457 mm) long nipple must be added to the discharge for satisfactory operation.

To disassemble the XL-32 heater, first attach a short piece of pipe to the suction connection to use for leverage. Place a bar across the slots in the water jet (82-A) and unscrew by turning water jet in a counterclockwise direction. Slide out steam jet (82-B) and attached strainer (76). Slide strainer (76) off steam jet (82-B).

When ready to reassemble heater, be sure seat, strainer and body are free of foreign material and raised metal due to nicks. A non-hardening pipe seal compound may be applied to the threads to further promote sealing. Slide strainer (76) on to steam jet (82-B) until it is sealed. Slide strainer and steam jet assembly into body (82) until seated, making sure air bleed port is opposite to steam inlet connection. Thread water jet (82-A) back into body turning in a clockwise direction, and tighten in place.

8.0 Disposal at End of Useful Life

Penberthy Steam Jet Heaters are used in a variety of fluid applications. By following the appropriate federal and industry regulations, the user must determine the extent of preparation and treatment the Jet Heater must incur before its disposal. A Material Safety Data Sheet (MSDS) may be required before disposal services accept certain components.

Metal, glass and polymers should be recycled whenever possible. Refer to order and PV&C - Black Mountain Material Specification sheets for materials of construction.

9.0 Telephone Assistance

If you are having difficulty with your Steam Jet Heater, contact your local Penberthy distributor.
So that we may assist you more effectively, please have as much of the following information available as possible when you call:

Model #
Name of the company from whom you purchased the Steam Jet Heater
Invoice # and date
Process conditions (pressure, flow rates, tank shape, etc)
A brief description of the problem
Trouble shooting procedures that failed

If attempts to solve your problem fail, you may request to return your Steam Jet Heater to the factory for intensive testing. You must obtain a Return Authorization (R.A.) number from PV&C Black Mountain before returning anything. Failure to do so will result in the unit being returned to you without being tested, freight collect. To obtain an R.A. number, the following information (in addition to that above) is needed:

Reason for return
Person to contact at your company
"Ship To" address

There is a minimum charge of $75.00 for evaluation of non-warranty units. You will be contacted before any repairs are initiated should the cost exceed the minimum charge. If you return a unit under warranty, but is not defective, the minimum charge will apply.

10.0 Exploded Parts Drawing

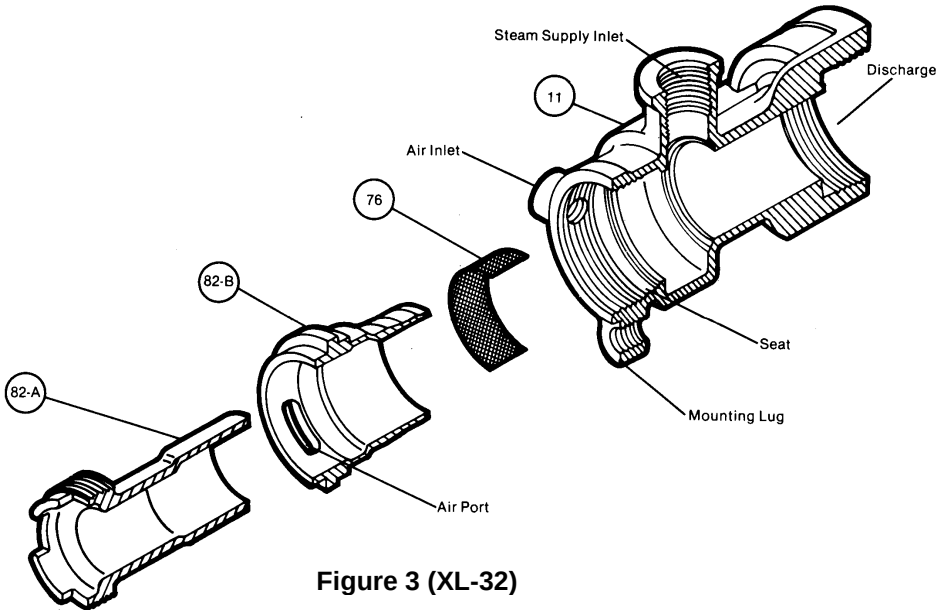

Figure 3 (XL-32)

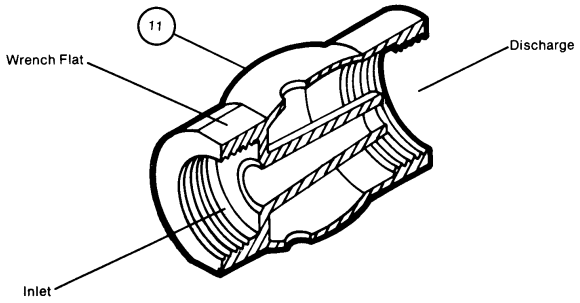

Figure 4 (NWH)

11	Body
76	Strainer
82-B	Steam Jet
82-A	Water Jet

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