YORK BY JOHNSON CONTROLS	SINGLE STAGE ABSORPTION CHILLER	
INSTALLATION MANUAL	Supersedes: 155.21-N1 (413)	Form 155.21-N1 (513)

MODEL YIA
STEAM / HOT WATER ABSORPTION CHILLER
WITH OPTIVIEW™ CONTROL CENTER

LD14498

1A1 THROUGH 14F3

Issue Date:
May 31, 2013

IMPORTANT!

READ BEFORE PROCEEDING!

GENERAL SAFETY GUIDELINES

This equipment is a relatively complicated apparatus. During installation, operation maintenance or service, individuals may be exposed to certain components or conditions including, but not limited to: refrigerants, materials under pressure, rotating components, and both high and low voltage. Each of these items has the potential, if misused or handled improperly, to cause bodily injury or death. It is the obligation and responsibility of operating/service personnel to identify and recognize these inherent hazards, protect themselves, and proceed safely in completing their tasks. Failure to comply with any of these requirements could result in serious damage to the equipment and the property in which it is situated, as well as severe personal injury or death to themselves and people at the site.

This document is intended for use by owner-authorized operating/service personnel. It is expected that these individuals possess independent training that will enable them to perform their assigned tasks properly and safely. It is essential that, prior to performing any task on this equipment, this individual shall have read and understood this document and any referenced materials. This individual shall also be familiar with and comply with all applicable governmental standards and regulations pertaining to the task in question.

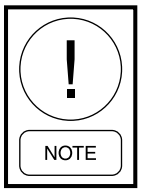
SAFETY SYMBOLS

The following symbols are used in this document to alert the reader to specific situations:

Indicates a possible hazardous situation which will result in death or serious injury if proper care is not taken.

Identifies a hazard which could lead to damage to the machine, damage to other equipment and/or environmental pollution if proper care is not taken or instructions and are not followed.

Indicates a potentially hazardous situation which will result in possible injuries or damage to equipment if proper care is not taken.



Highlights additional information useful to the technician in completing the work being performed properly.

External wiring, unless specified as an optional connection in the manufacturer's product line, is not to be connected inside the control cabinet. Devices such as relays, switches, transducers and controls and any external wiring must not be installed inside the micro panel. All wiring must be in accordance with Johnson Controls' published specifications and must be performed only by a qualified electrician. Johnson Controls will NOT be responsible for damage/problems resulting from improper connections to the controls or application of improper control signals. Failure to follow this warning will void the manufacturer's warranty and cause serious damage to property or personal injury.

CHANGEABILITY OF THIS DOCUMENT

In complying with Johnson Controls' policy for continuous product improvement, the information contained in this document is subject to change without notice. Johnson Controls makes no commitment to update or provide current information automatically to the manual owner. Updated manuals, if applicable, can be obtained by contacting the nearest Johnson Controls Service office.

Operating/service personnel maintain responsibility for the applicability of these documents to the equipment. If there is any question regarding the applicability of these documents, the technician should verify whether the equipment has been modified and if current literature is available from the owner of the equipment prior to performing any work on the chiller.

CHANGE BARS

Revisions made to this document are indicated with a line along the left or right hand column in the area the revision was made. These revisions are to technical information and any other changes in spelling, grammar or formatting are not included.

ASSOCIATED LITERATURE

MANUAL DESCRIPTION	FORM NUMBER
Unit Installation	155.21-N1
General Long Term Storage Requirements	50.20-NM1
Absorption Chiller Long Term Storage	50.20-NM4
Field Connections	155.21-W3
Unit Wiring and Field Control Modifications	155.21-W1
OptiView™ Replacement Parts	155.21-RP1
Unit Replacement Parts	155.21-RP2
Unit Operations and Maintenance	155.21-OM1
OptiView™ Operation	155.21-O1
All Products - Replacement Parts Electrical Connectors	50.20-RP1
All Products - Replacement Parts Fittings	50.20-RP2

NOMENCLATURE

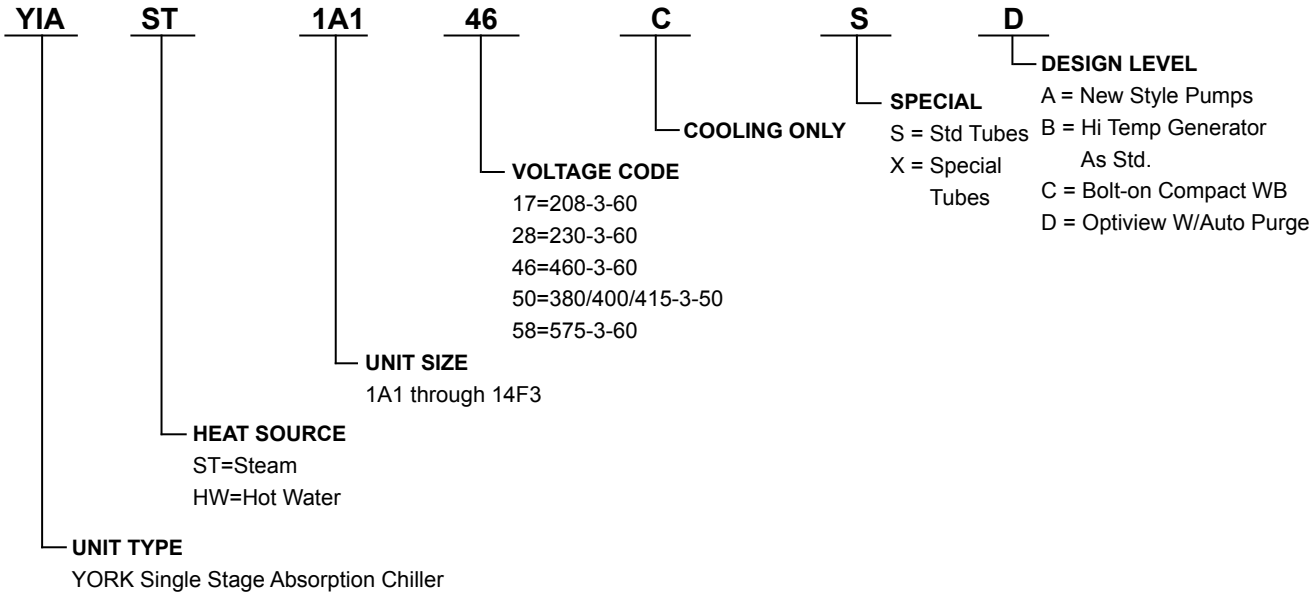


TABLE OF CONTENTS

TABLE OF CONTENTS (CONT'D)

TABLE OF CONTENTS (CONT'D)

LIST OF FIGURES

LIST OF TABLES

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SECTION 1 - INSTALLATION RESPONSIBILITIES

The following steps must be completed for the proper installation of a YORK absorption chiller. These lists are not intended to be the final steps for each installer to complete, but only used as a guideline. Because some of the work may be completed by others, there may be duplicated steps. The most important part of a successful installation is that each installer knows ahead of time what to do and when to do it.

MECHANICAL CONTRACTOR

1. Construct a housekeeping pad and floor drains.
2. Rig and level the unit into place, set the unit on neoprene pads if applicable.
3. Move the solution, refrigerant drums and unit ship loose parts into the building.
4. If the unit is a two-piece shipment, install the Condenser/Generator section on the Absorber/ Evaporator section and weld the interconnecting piping between the two shells.
5. Install the absorber, evaporator and condenser lines. Construct and install Crossover Piping on applicable units. Provide flanges and taps in the piping for monitoring, control, and safety devices.
6. Install the steam/hot water lines and all applicable components, including; control valve, failsafe & condensate drain valves (if applicable). Provide flanges and taps in the piping for monitoring, control, and safety devices.
7. Install the rupture disk piping.
8. Installing/mechanical contractor is responsible for completely filling out and signing the "Installation Checklist and Request for Authorized Start-up Engineer" *Form 155.21-CL1*.

ELECTRICAL CONTRACTOR

1. Supply, mount, and wire a fused unit disconnect switch prior to the power panel of the absorption chiller.
2. Wire the main power supply lines into unit mounted power panel.
3. Run conduit where necessary and pull conductors to the flow switches, control valve, and fail closed valve on steam/hot water piping (if applicable). Run wiring to the condensate drain solenoid on steam units. Do NOT land wiring on devices.

JOHNSON CONTROLS SERVICE OFFICE

1. Charge the unit with solution and refrigerant. Fill the Vacuum Pump with oil. Refer to *Appendix A* for proper oil volumes in the Vacuum Pump.
2. Re-check the levelness of the unit.
3. Johnson Controls is to land the wires on the devices.
4. If the unit was a two-piece shipment, leak check all field assembled chiller piping connections.
5. Check all unit-mounted pumps for correct rotation direction.
6. Mount and connect the manometer pressure gauge. Refer to SECTION 4 in this manual.
7. Install all sensors, switches, and indicating devices pertaining to the unit in their appropriate wells on customers piping.
8. Perform all normal and customary unit pre-startup and start-up procedures (TCA). Refer to the *Fill-Out Forms* section of the Absorption Chillers area of the Johnson Controls Portal.

INSULATION CONTRACTOR

1. Insulate the chilled water lines and water boxes. Refer to the Insulation section in this manual.
2. Insulate the steam/hot water lines and boxes. Refer to the Insulation Section in this manual.
3. Insulate the unit refrigerant piping, if applicable.
4. Insulate the evaporator shell if necessary. Refer to the Insulation Section in this manual.

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SECTION 2 - INTRODUCTION

INTRODUCTION

This manual describes the installation of an Iso-Flow absorption chiller with the new style (internally cooled) circulation pumps. The unit is a complete self-contained, forced circulation refrigeration system using steam or hot water as the activation medium. De-ionized water is used as the refrigerant and lithium bromide solution is used as an absorbent. The system consists of a generator-condenser shell mounted on top of an absorber-evaporator shell. The system also utilizes a solution pump, refrigerant pump; purge pump, and interconnecting piping. *See Appendix A* for the location of the above listed components.

For more detailed information about design, specifications or operation on the particular unit being installed, please contact your local Johnson Controls office.

When using this manual, the installer should pay particular attention to the Safety Symbols: **DANGER**, **WARNING, CAUTION** and **NOTE**. These symbols alert the installer of areas of potential hazard. For further explanation, Refer to the Safety Symbols section at the beginning of this manual.

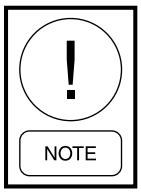
The contractor is advised to become thoroughly familiar with the installation requirements of the YORK YIA Chiller. Careful study of the factory submittal drawing package and this manual is highly recommended. Johnson Controls representatives are available to answer any questions and to coordinate delivery of the unit and the accessories.

Johnson Controls must be advised by the contractor of the scheduled start-Up time so that qualified personnel can be made available on the start-up date. Complete the "Installation Checklist and Request for Authorized Start-up Engineer" *Form 155.21-CL1* and submit the form. A minimum of four weeks advance notice must be allowed to schedule a unit Start-up and to have the Lithium Bromide Solution delivered to the jobsite.

ADVANCED PREPARATION SITE SELECTION

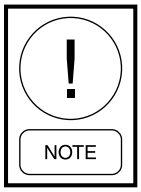
It is recommended the installer make a first-hand on site, job site inspection to ensure a smooth installation process. Check all factory submittals and drawings to verify unit clearances, overall dimensions and weight. Electrical requirements, steam or hot water pressure and temperature, foundation dimensions, and floor drains should also be verified before the chiller arrives.

When selecting an installation site, consider structural support, access of service and service equipment, overhead space, floor drains, and tube pulling space.



Tube pull area is approximately equal to the length of the main shell.

Follow standard engineering practices in designing the piping system and other services. See the *Appendix* for a listing of the unit rigging and operational weights.



Johnson Controls does not recommend the YIA unit to be installed outside. During unit operation the ambient temperatures in the immediate surrounds of the unit must not become lower than 35°F (1.67°C) or above 104°F (40°C).

The equipment room must be enclosed, well lighted, and properly ventilated. Relative humidity in the equipment room must never reach the saturation point.

Condensation of moisture may cause corrosion and damage to electrical components.

UNIT CLEARANCES

The minimum recommended Unit clearances are listed in the following Table. If the site selection fails to meet these minimums, contact the local Johnson Controls office for special considerations.

TABLE 1 - UNIT CLEARANCES

Unit Side Opposite Panel	40” (1.0 m)
Panel Side of Unit	Per Code
Tube Pull End of Unit	One Unit Length
Opposite Tube Pull End of Unit	60" (1.5 m)
Top of Unit	See Below
Bottom of Unit	Level with Floor

For clearance on top of the unit Johnson Controls recommends allowing enough room for removal of unit skids, ventilation, and accessibility for maintenance or unit cleaning. For unit overall dimensions refer to Form 155.21-EG1.

FOUNDATION

In many situations YORK YIA absorption units are set on concrete housekeeping pads to help with machine room cleanliness. These foundations are usually made of concrete with a compressive strength rating of not less than 4000 psi and are able to support the full operating weight of the unit (see Appendix A for tables within this document for specific unit weights). When installing a concrete foundation, use steel to reinforce the concrete and finish the surface smoothly. The concrete foundation pad must be level within .25 inches (6.35mm) at all contact surface locations of the unit to the pad. Where equipment headroom allows, it maybe desirable to elevate the portions of the housekeeping pad just where the chiller’s mounting feet are. This will provide additional clearance under the unit for maintenance and cleaning purposes. For foundation sizes, footprints and unit dimensions (see Form 155.21-EG1).

UNIT SHIPMENTS

There are two types of shipments for the YORK YIA absorption units, One-piece or two-piece. Model sizes 1A1 through 10E3 are shipped standard in one piece (completely assembled). Model sizes 12F1 through 14F3 are shipped in two separate sections, which require field assembly at the jobsite.

Unit Models 12F1 through 14F3 are assembled at the factory for fit-up then separated for shipment. The Condenser/Generator top shell is one piece and the Absorber/Evaporator bottom shell is the other.

An option is available to have any size unit ship as a two-piece, if specified at the time of factory order submittal. However, if the unit model is smaller than a 12F1, the unit will ship as one-piece but will be separable at the jobsite, for a two-piece rig into the building.

Shipments outside of North America will normally be shipped without a solution and refrigerant charge. The shells will have a nitrogen holding charge. All other unit shipments will normally be uncharged and in a vacuum.

All split ship (two-piece) units will be shipped with a nitrogen holding charge.

Depending on the unit shipping instructions, there will usually be two wooden crates of ship loose items included with the unit shipment. One crate will contain miscellaneous unit materials necessary to complete the unit re-assembly and or start-up. For an itemized listing of what is included in the ship loose items, see the “Ship Loose Items List” (see Form 155.21-RP2). The other crate will contain a unit control valve, if ordered with the unit.

SOLUTION AND REFRIGERANT SHIPMENT

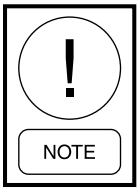
North America and Canada Orders

Johnson Controls Factory Customer Service will place an order with the solution supplier and send a release form to the local service office responsible for the chiller start-up. The local service office is then responsible for completing and forwarding the release form to the solution/refrigerant supplier 2 weeks before they require shipment.

International Orders

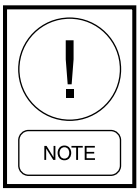
If the solution and refrigerant is purchased with the unit, Johnson Controls Factory Customer Service will place an order with the solution/refrigerant supplier. The solution and refrigerant will ship in barrels with the chiller to the port for packaging and consolidation. If the solution and refrigerant were not ordered with the unit, the local service office would be responsible for obtaining this.

INITIAL INSPECTION OF UNIT



The "Installation Checklist" (155.21-CL1) must be filled out during the initial inspection and given to the local service office upon completion. It is advisable to have a qualified service technician on site during the initial unit inspection process.

The unit should be checked on the trailer or rail car when received and before unloading, for any visible signs of damage.



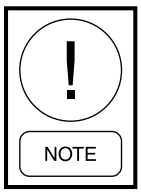
Any signs of damage or possible damage must be reported to the transportation company immediately! Negating this step if unit is damaged during transit could result in the unit warranty being void!

Johnson Controls will not be responsible for any unit damage during shipment or at the jobsite during installation or rigging.

Make sure all pieces of the shipment, such as boxes and crates are received with the unit. The solution and refrigerant charge is usually not part of the initial unit shipment; normally these materials must be ordered by requisition, contact the local service office when these materials are required.

If the unit is a one-piece shipment, a pressure gauge will be mounted directly off the unit's Purge System line on the lower shell. If a two-piece shipment is received, an additional pressure gauge will be installed at one of the pipe closure plates on the upper shell. The gauge(s) must either read a vacuum or a pressure depending on the type of shipment. If any gauge(s) indicates "0", **notify the local service office immediately.** Bring the unit into the building as soon as possible after it has been off loaded.

A "Field Material Catalog" can be found in with the unit's ship loose parts. This catalog is a pictorial listing of all parts that were shipped with the unit before it left the factory. Use this catalog along with the unit's package list to identify and determine if all ship loose items arrived with the unit.



Any missing or damaged ship loose items must be reported to the local service office immediately!

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SECTION 3 - UNIT RIGGING

NOTE

Under no circumstances should the unit internals be opened to the atmosphere during the rigging operation.

ONE-PIECE UNIT LIFTS

See *Appendix A* in this document for complete and partial unit weights.

CAUTION

When lifting the complete unit, use a spreader bar equal to or greater in length as the unit. Keep the chains vertical! Attach the chains at the Absorber/Evaporator endsheets lifting holes as shown in Figure 4.

DO NOT lift a one-piece unit from a single point as shown in Figure 5. Damage to the external unit components may occur.

Care should be used at all times during the rigging and handling of the unit to avoid damage to any projecting brackets, pipes, fittings, or any apparatus. These components may be damaged under the weight of the unit when lifted. **Keep the unit Horizontal and level at all times.**

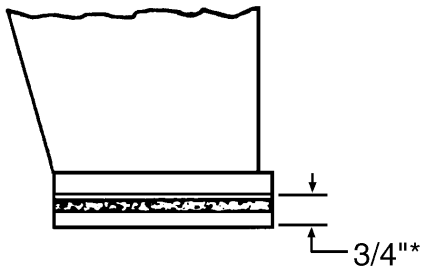
DANGER

Do not rig the unit in a vertical position, the unit must be kept horizontal during the entire rigging operation! The unit is not designed to be in a vertical position. Internal unit damage and/or personal injury may result.

DANGER

Do not attempt to lift the complete unit via the holes located in the top shell! These holes are plugged at the factory. Do not unplug these holes for any reason! Lifting from these holes will not support the entire weight of the unit and personal injury and/or unit damage will result!

If the unit has skids, remove them before setting the unit into its final position. If the unit is to receive neoprene pads, set the unit squarely on the pads as shown below.



*Compressed Thickness of Isolation Pad Assembly

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FIGURE 1 - UNIT NEOPRENE PADS

TWO-PIECE UNITS

See *Appendix A* in this document for complete and partial unit weights.

All units have the option of being a two-piece unit. This means the unit will ship in one piece but will allow for separation at the jobsite for a two-piece rigging into the building. Some of the larger model units, due to their physical size, always ship in two pieces, these units are model sizes 12F1 through 14F3.

CAUTION

When lifting the bottom shell of the unit, attach the chains at the Evaporator/Absorber endsheets lifting holes as shown in Figure 6.

When lifting the top shell of the unit, attach the chains at the Condenser/Generator endsheets lifting holes as shown in Figure 7.

Care should be used at all times during the rigging and handling of the unit to avoid damage to any projecting brackets, pipes, fittings, or any apparatus. These components may be damaged under the weight of the unit when lifted.

DANGER

Keep the unit Horizontal and level at all times.

Do not rig the unit in a vertical position, the unit must be kept horizontal during the entire rigging operation! The unit is not designed to be in a vertical position. Internal unit damage and/or personal injury may result.

Place the lower shell on the foundation pad. Disconnect any skidding from the upper shell and rig using spreader bar and hooks into the end sheets holes. Hoist the top shell assembly into position above the bottom shell assembly (refer to *Figure 2 on page 18*).

Make sure the ends of the top shell assembly are in the correct orientation. See note below.

NOTE

Match identification numbers are stamped on each shell end sheet. Do not mismatch the upper and lower shell assemblies!

The inside end sheets of the top and lower shells have a mounting angle bracket with mounting holes installed at the factory. Using two tapered pins (supplied by others) at opposite corners, align the brackets and carefully set the top shell on the lower shell. Install the four factory supplied bolts and nuts to hold the shell assemblies in place (refer to *Figure 2 on page 18*).

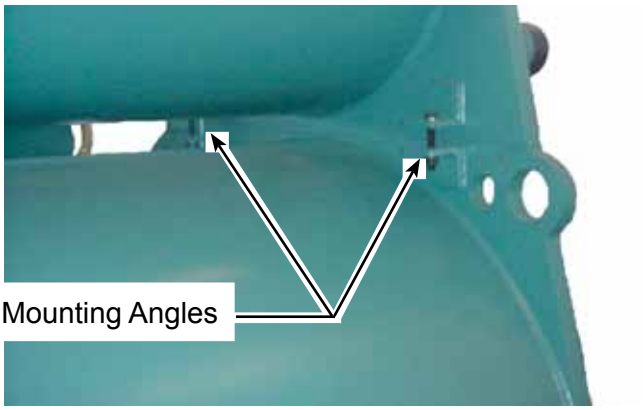

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FIGURE 2 - MOUNTING ANGLES

UNIT LEVELING AND MOUNTING

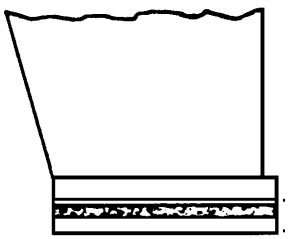
YORK YIA absorption units do not have any leveling marks on the unit. Do not attempt leveling the unit by corresponding locations on the unit.

Leveling is accomplished by setting the unit on a flat, level surface of the foundation pad as described in *SECTION 2 - Introduction*, “Foundation” in this document. The foundation pad must be level within .25 inches (6.35mm) at all four unit contact locations with the pad. If the concrete foundation pad is not level within Johnson Controls’s specified requirements, metal shims may be placed between the bottom of the unit feet and the concrete pad to compensate. Do not place any shims between the top shell and the lower shell.

Whether the unit is shipped as a one-piece or two-piece, the mounding feet on the lower shell at the steam inlet end are 1/2" (12.7 mm) thicker than the mounting feet at the steam outlet end. The steam inlet end is always on the right when looking at the unit control panel. This design allows for generator tube drainage during unit operation in the event of wet steam.

Neoprene Pads

YORK YIA absorption units are quiet and operate free of vibration. Normally the unit will not require fasteners into the concrete to hold the unit in place. Johnson Controls does offer neoprene isolator pads to set the unit on if the unit is going to be installed in an area where even mild noise would be objectionable. If the unit is to set on neoprene pads, the unit mounting feet must make direct contact with the neoprene. If shims must be used, they must be placed between the concrete and the neoprene pad. Please keep in mind that total pad compression will not take place until the unit is fully charged with solution and refrigerant and each tube bundle section is completely filled with fluid.



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Floor to be level within 1/4" (6.35 mm). Place optional isolation pads squarely under all four unit feet. No bolting to floor required. Approximate height after deflection is 3/4" (19 mm).

FIGURE 3 - ISOLATION PADS

Spring Isolators

Spring-type vibration eliminating mountings are not necessary and therefore not recommended. If the unit is being installed in a seismic restraint area, Johnson Controls recommends seeking the advise of a professional vibration consultant for mounting requirements.

UNIT MOUNTING

Due to the nature of operation, YORK YIA absorption units do not normally require bolting down. Simply set the unit on a level surface according to the "Foundation" recommendations in *SECTION 2 - Introduction* of this document.

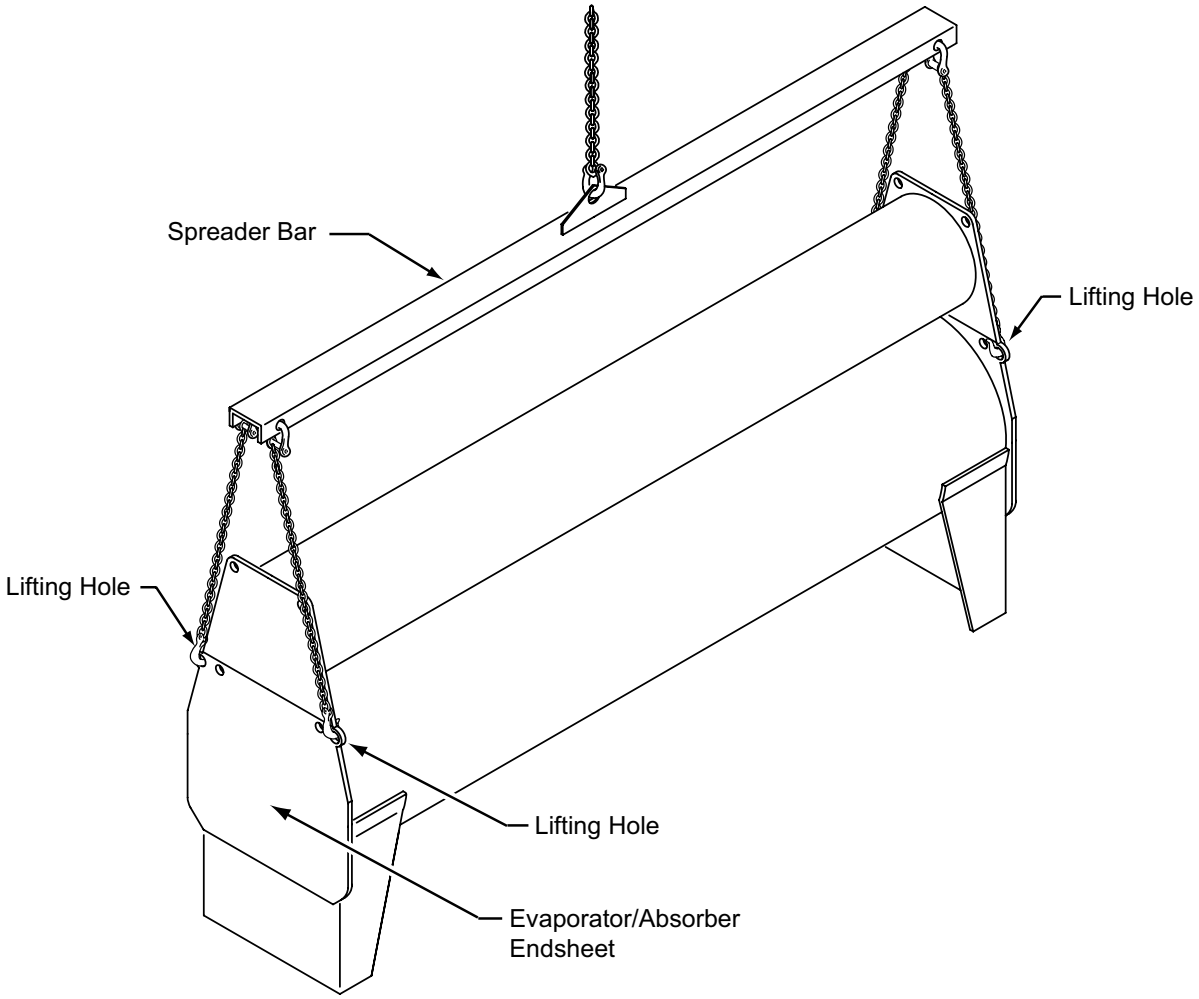

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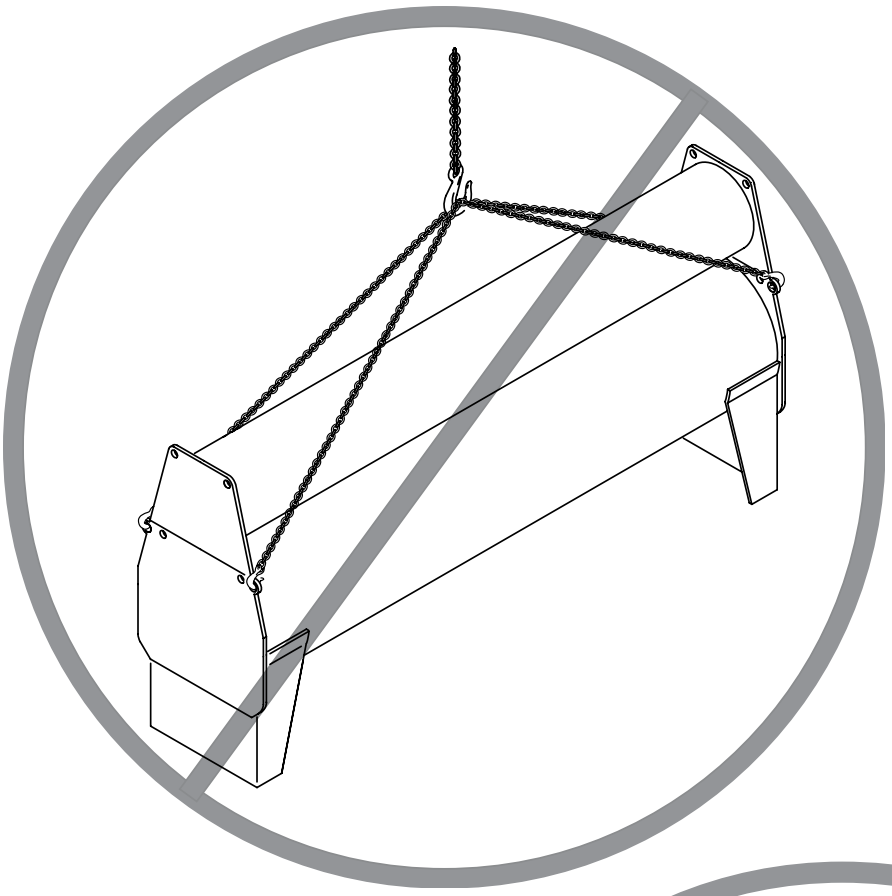
FIGURE 4 - CORRECT ONE-PIECE UNIT LIFTING METHOD

ONE-PIECE SHIPMENTS



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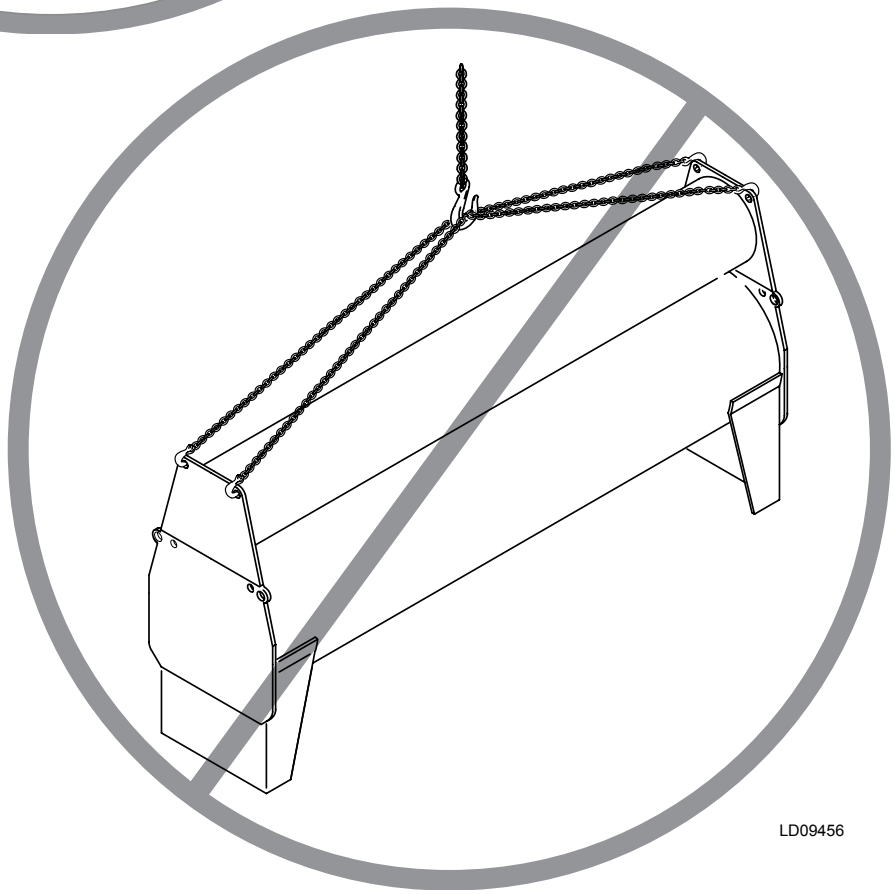

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FIGURE 5 - INCORRECT ONE-PIECE UNIT LIFTING METHODS

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TWO-PIECE SHIPMENTS (BOTTOM SHELL)

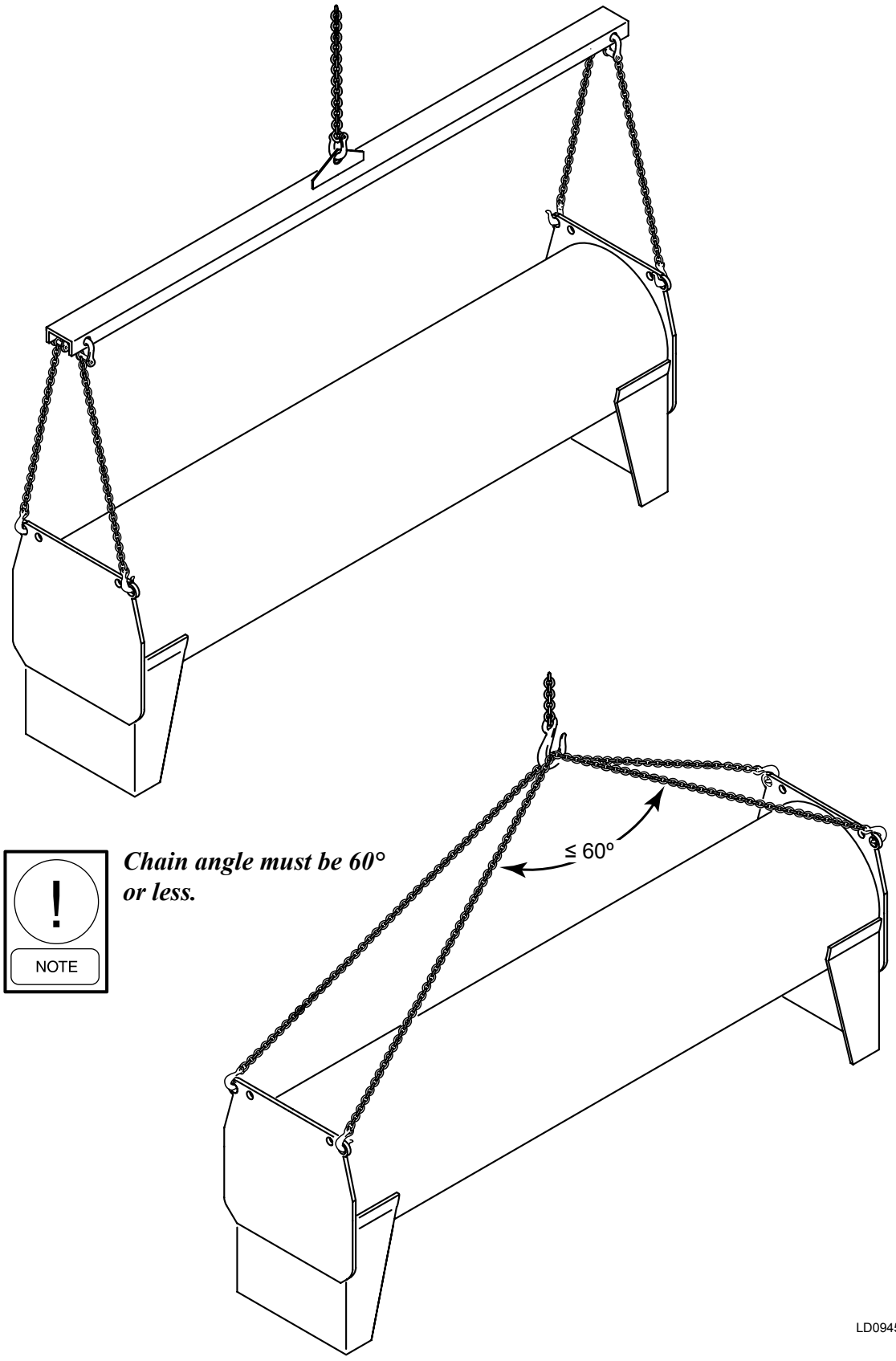
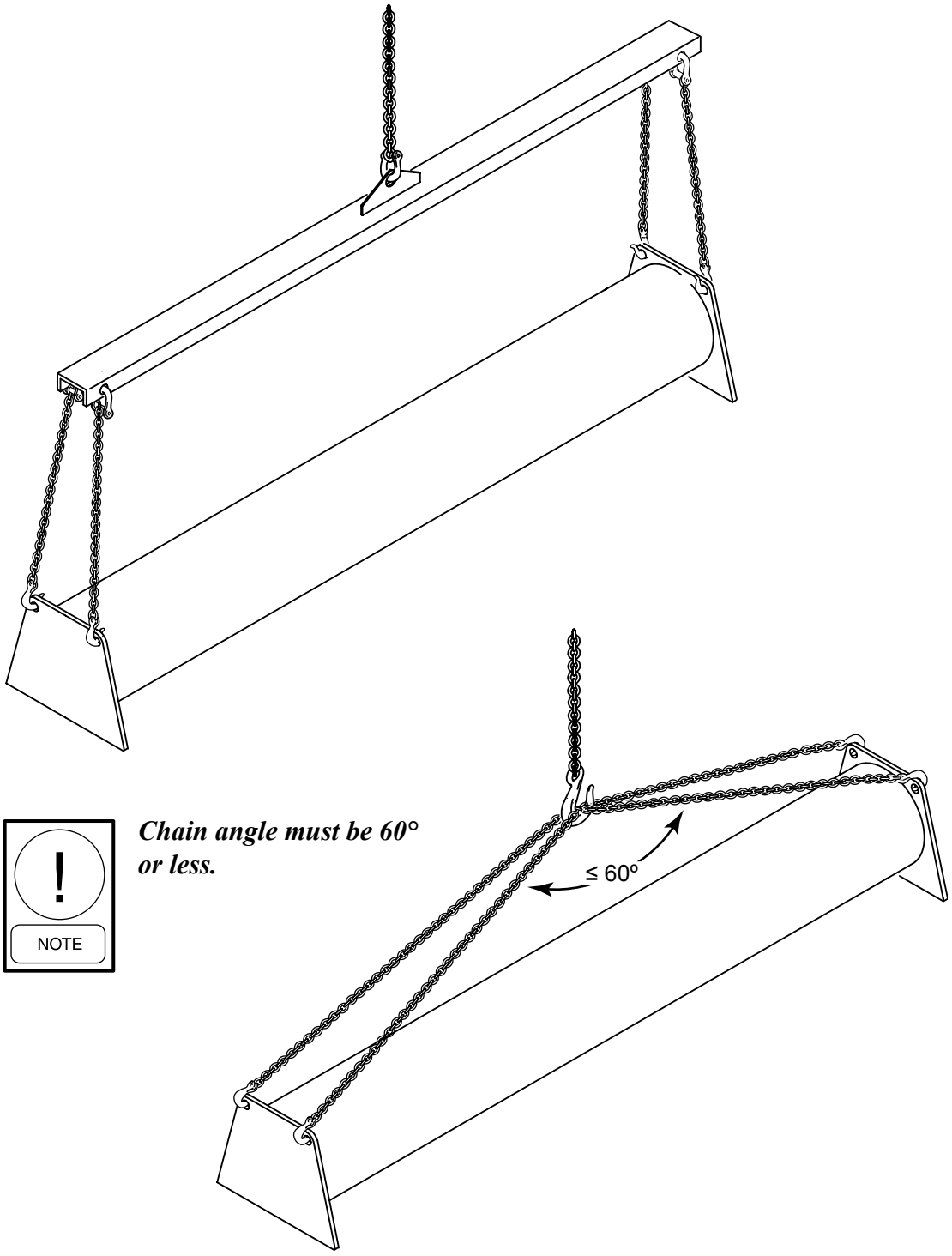


FIGURE 6 - EVAPORATOR/ABSORBER CORRECT LIFTING METHODS

TWO-PIECE SHIPMENTS
(TOP SHELL)



NOTE

Chain angle must be 60° or less.

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FIGURE 7 - CONDENSER/GENERATOR CORRECT LIFTING METHODS

SECTION 4 - UNIT RE-ASSEMBLY

TWO-PIECE SHIPMENTS

Units shipped in two pieces require field welding to re-connect the piping between the upper and lower shells.

NOTE

Notify the local service office before proceeding with the unit re-assembly. Do not open the unit to expose the interior surfaces to atmospheric conditions unless a qualified service technician is present. Johnson Controls must provide guidance and supervision during the welding, re-assembly, and leak check process.

NOTE

All YORK units are shipped in either a vacuum or a nitrogen holding pressure. The Johnson Controls Service Technician can instruct how to bring the unit to atmospheric pressure. Do not open the unit to atmospheric pressure without Johnson Controls guidance.

The factory installs pressure gauges on each shell section (total 2 for each unit). These gauges will indicate whether the unit is in a vacuum or pressure. Two-piece unit shipments will always be pressurized.

BREAKING THE UNIT PRESSURE

There are two standard forms of shipment for YIA units: one piece or two-piece (sometimes called, Split Shipment). Units shipped as one piece with destinations in North America are shipped uncharged and in a vacuum. Units with overseas destinations and two-piece shipments will be shipped uncharged with a nitrogen holding pressure. A service valve with pressure indicator will be attached to the purge piping of the lower shell and off a closure plate on the upper shell (refer to *Figure 8 on page 23*). The following are procedures for breaking the unit pressure.

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FIGURE 8 - BREAKING UNIT PRESSURE

Procedures

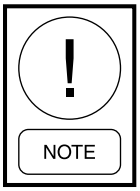
1. Open the service valves and read the pressure.
2. Close the service valves and remove the factory-supplied pressure gauge.
3. After the gauge has been removed, slowly open the service valves again to discharge the pressure from the shells.

CAUTION

For safety reasons, do not open the valves to a complete full open position.

4. Close the service valves when the unit pressure approaches atmospheric pressure (~ 0.5 psig, 3.4 KPa).

UNIT RE-ASSEMBLY

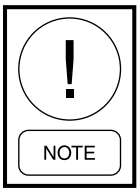


If order consists of multiple units, before assembly ensure each shell serial number matches correctly. The serial number is stamped on the tubesheet edge.

For a detail of what pipes and unit connections are required for each unit model, please refer to Appendix A of this document. Read the notes carefully on the appropriate figures to determine how many lines require welding and what is included in the unit's ship loose parts.

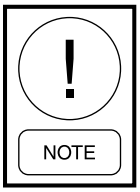
All factory pipe connections will have factory welded closure caps or flat plates that will require removal in the field. When removing the closure caps or flat plates, always grind these enclosures from the pipes. DO NOT CUT INTO THE PIPE. Each pipe is at the correct length to accept the factory supplied filler piece. Cutting into these pipes will shorten the length and an improper connection will result.

Carefully remove all debris from the filler pieces, fittings, and sections of pipe before installing on the unit.



Care must be taken to keep dirt and other foreign matter out of the unit during the grinding and welding processes. If there is any delay in the work and the pipes will be open for a long period of time, tape the ends of the pipes shut and apply a nitrogen blanket to the unit.

When welding in the filler pieces, all welds must be full penetration welds. To achieve full penetration welds, grind both sides of each joint to a 75° angle prior to welding . Leave a small gap (~3/32 – 5/32") (2.5 – 4mm) between the two mating parts.

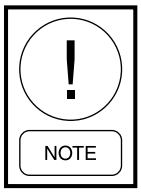


NEVER USE BACKUP RINGS FOR ANY JOINTS. For field welding details refer to Johnson Controls Form 155.17-M3.

All weld root passes and second (hot) passes must be made using Gas Tungsten-Arc Welding commonly called TIG. The purpose of using TIG for the first two passes is primarily to provide a smooth gap free surface on the inside of the pipe. Historically it is impossible to achieve the gap free surface using Shielded Metal Arc (commonly called stick) welding.

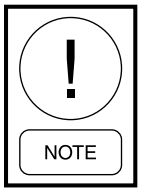
Never use any type of oil on any materials, tools or surfaces that may come in contact with the internals of the absorption unit. Oil in the system could seriously hinder the units performance.

Do not do any welding on the shell vessels of the unit. Doing so may void the unit's factory warranty!



Every field weld MUST be leak checked before unit commissioning can begin.

The leak check method used must, at minimum, be completed with an Electronic Halide leak detection device. This leak check must be completed or supervised by a qualified service technician.



Testing by soap or vacuum decay is not a recommended method for leak checking.

INSTALLING THE ABSOLUTE PRESSURE GAUGE

The Absolute Pressure gauge and a 1/4" copper connecting line can be found within the unit's ship loose parts container. The following are procedures for installing the Absolute Pressure Gauge.

Procedures

1. Locate the Absolute Pressure Gauge and inspect it for any damage.
2. The new gauge will replace the existing factory shipping gauge (see *Figure 9 on page 25*) .
3. From the existing piping connections, connect the necessary fittings so the new gauge will be in a vertical position (20 Torr at the 12 O'clock position).
4. It is highly recommended to always have the gauge isolated from the system unless it is in use.

Factory Installed Gauge LD14554

Field Installed Gauge LD14554a

FIGURE 9 - GAUGE CONNECTIONS

COMPLETING THE PURGE PUMP CONNECTIONS

The purge pump is factory mounted and wired on all YIA units. The following are procedures for the Purge Pump connections.

Procedures

1. Carefully remove the shrink-wrap from the Purge Pump.

   The only required connection is to connect the Purge Pump suction inlet to the unit. The line is a 3/4" ID clear, wire-enforced hose that is included with the ship loose parts.

2. Connect the Suction line onto the suction port connector located at the top of the Purge Pump with the factory supplied hose clamp (refer to *Figure 10 on page 25*).

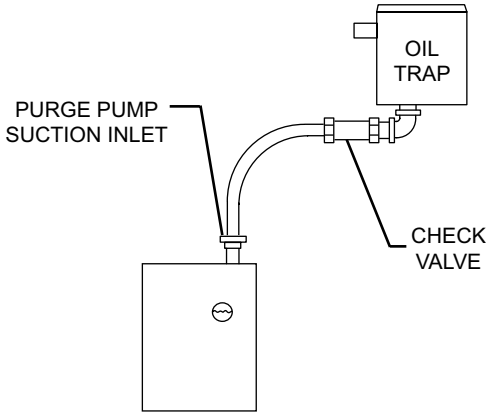
NOTE

It is NOT recommended to use any oil, or vacuum grease on the line to make the assembly easier.

3. Install the other end of the Suction line over a factory installed pipe nipple. The pipe nipple is threaded, into a check valve, just below the oil trap (refer to *Figure 10 on page 25*).

4. Remove the pipe cap on the nipple and discard.

5. Tighten the Suction line over the nipple with a factory supplied hose clamp (refer to *Figure 10 on page 25*).



LD09815

FIGURE 10 - PURGE PUMP CONNECTIONS

LD09817

FIGURE 11 - PURGE PUMP

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SECTION 5 - UNIT WATER PIPING

UNIT WATER PIPING

Once the unit is placed on the foundation pad and leveled according to Johnson Controls's recommendations, the customer's piping connections may be fitted to the unit.

Johnson Controls does not mandate that any specific piping codes be followed for the unit's water piping fabrication. However good piping practices should be followed for best results. Johnson Controls recommends the responsible parties for the piping fabrication check to make sure all, if any, local codes be followed during the system piping fabrication.

The absorber, evaporator and condenser tube bundles come from the factory rated for 150 PSIG (10 Bar) designed working pressure (DWP) on the tubeside of the bundle. The water connections (nozzles) will be a pipe stub suitable for Victaulic couplings or welding. Tube bundles can also be specially ordered for 300 PSIG (21 Bar) DWP. Also, raised faced, ANSI flanges for the water connections can be supplied if ordered with the unit. When flanges are specified, they are selected in accordance with the design pressure of the vessel.

The nozzle diameter is based on the customer's requirements. The local sales office can provide information on the sizes of the nozzles, the DWP of the vessel and whether or not the unit will have flanges, if not known.

GENERATOR NOZZLE CONNECTIONS

Refer to the following tables for the unit's generator DWP and nozzle connections. The standard is always supplied unless a special option is ordered from the factory.

Hot Water units shipped to USA, Europe and the rest of the world

GENERATOR SECTION DWP	
Standard	150 psig (10 Bar)
Option 1	300 psig (21 Bar)
GENERATOR CONNECTIONS	
Standard	Pipe stub grooved *
Option	ANSI, RF Flanges

* = (ANSI/AWWA C-606)

Hot Water units shipped to Europe (PED)

GENERATOR SECTION DWP	
Standard	150 psig (10 Bar)
Option	300 psig (21 Bar)
GENERATOR CONNECTIONS	
Standard	Pipe stub grooved *
Option	N/A

* = (ANSI/AWWA C-606)

Steam units shipped to USA, Europe and the rest of the world

GENERATOR SECTION DWP	
Standard	150 psig (10 Bar)
Option	N/A
GENERATOR CONNECTIONS	
Standard	150 psi ANSI, RF Flanges
Option	N/A

Steam units shipped to Europe (PED)

GENERATOR SECTION DWP	
Standard	150 psig (10 Bar)
Option	N/A
GENERATOR CONNECTIONS	
Standard	Pipe stub grooved *
Option	N/A

* = (ANSI/AWWA C-606)

For Hot Water units shipped to USA, Europe and the rest of the world. The supplied flange rating will be in accordance with the vessel DWP. Others must obtain all gaskets required for completing flange connections.

When connecting the piping to the unit nozzles take note to which nozzle is the inlet and which is the outlet. Factory supplied labels will identify all unit nozzles. First the tower water return line must be piped into the absorber nozzle. The tower water supply line will come off the condenser outlet nozzle.

CAUTION

All water piping MUST be adequately supported and braced independent of the unit. No strain is to be placed on the unit nozzles and/or connection flanges.

All unit system piping must be arranged with offsets for flexibility and movement. All piping must be fabricated so that waterbox removal can be facilitated easily. Installing a set of flanges close to the water box nozzles may do this. All piping must be adequately supported and braced independently of the unit to avoid strain on the unit and vibration transmission. Hangers must allow for alignment of pipe. Isolators (supplied by others, if required) in the piping are not necessary but may be desirable in some cases.

PIPING COMPONENTS

Wells For Sensors

Various temperature and pressure sensors are required for building and tower water circuits. Please make sure both the supply and return lines to the unit have these connections installed. Seek the advice of the systems piping engineer if uncertain about the proper location or sizing of these wells.

Flow Switches

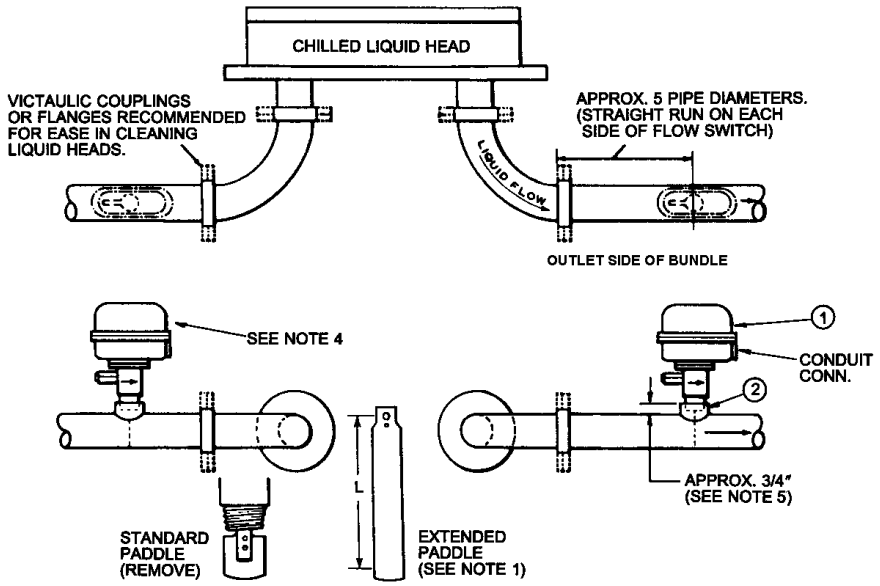
Units fabricated as the release of this literature will be equipped with factory supplied and mounted analog thermal type flow sensors in the outlet nozzle of the evaporator and condenser sections. These devices will be wired to the OptiView Control Panel, NO further installation or adjustments are necessary.

If a digital flow switch is desired in place of the thermal device (see *Figure 12 on page 28*).

It is recommended that the flow switch be installed in the leaving chilled water line (as depicted in the following figure). Johnson Controls highly recommends the mounting of this switch in a horizontal length of pipe with the switch in a vertical position. It is NOT recommended to mount the flow switch in a vertical pipe with an upward flow due to the fact that minimum flow may not be substantial enough to lift the switches paddle. Please see the following *Figure 12 on page 28* for additional assembly and installation guidelines of this device.

Tower Water (Condenser) Flow Switch

Please follow the same assembly and installation guidelines for this device as you did the chilled water flow switch.



Notes:

1. Adjust the Flow Switch Paddle to the size of the pipe in which it is to be used. Trim extended paddle to the "L" dimension as follows:

DIAMETER OF PIPE (INCHES)	"L" DIMENSION (INCHES)
5	4-5/8
6	5-5/8
8 AND LARGER	FULL PADDLE

2. The Flow Switch is to be installed and upright, as shown.
3. Screw the Flow Switch in position so that the paddle is at a right angle to the liquid flow. (Arrow mark on side of casting must point in same direction as liquid flow.)
4. The Flow Switch must be installed in outlet flow connection of the bundle.
5. Before installing Item (2), make sure it is 1 inch long maximum.

Item	Description
1	Switch, Flow Control
2	Coupling, Pipe, 1" x 1" Lg.
3	Compound, Heat Conductive

LD09813

FIGURE 12 - INSTALLATION OF DIGITAL FLOW SWITCH (OPTIONAL)

Differential Pressure Control

Differential pressure control may be substituted in the place of a flow switch. Johnson Controls has options for this type of control if the device is not purchased locally. Differential control serves the same function as a flow switch – to ensure that flow is established for chiller operation. This is accomplished by determining a difference between two sample points in the chiller's water piping, usually near the inlet and outlet of a heat exchanger bundle. It is very important that the pressure differential switch be installed as close to the heat exchanger bundle as possible so that only the pressure difference across the bundle is sensed. Do not put the pressure differential switch across the suction and discharge of a heat exchanger pump. Doing so may not absolutely ensure flow across the chiller bundle due to other piping valves that could be closed.

Another important aspect to remember when using a pressure differential switch is to ensure both the sample points are on the same elevation with each other. If one connection to the control is higher than the other, static pressure becomes a factor in reading total differential across the switch. In this condition, the control could possibly read a difference in pressure even when no flow is present.

Strainers

Permanent strainers (supplied by others) are required in both the tower water and chilled water circuits to protect the chiller water bundles and controls. The strainer should be a #10 mesh and be installed in the entering water piping line, directly upstream of the chiller. Water piping circuits should be arranged so that the pumps discharge to maintain essentially constant chilled and tower water flows through the unit at all load conditions. If pumps discharge through the chiller, the strainer may be located upstream from the pumps to protect both pump and chiller. If pumps are remotely installed from chiller, strainers should be located directly upstream of the chiller.

Unit Crossover Line

The crossover line is a unit-mounted line that is the same diameter as the tower water (condenser) water lines. It serves the purpose of transferring the tower water from the outlet of the absorber bundle to the inlet of the condenser bundle. THIS LINE IS ALWAYS FIELD FABRICATED. Others must obtain all fabrication materials. In some rare cases, the factory can supply this line but it must be ordered as a special at the time when the chiller is ordered.

Johnson Controls recommends the following for fabrication of the Unit Crossover line:

1. The arrangement of this line must be made so that easy access to the bundle tubes can be accomplished. For every time the Absorber/Condenser tube bundle gets cleaned, this line must be removed.
2. The crossover line should be positioned so that the evaporator water boxes can be removed without removal of this line. This may not be possible in some cases.
3. **The crossover line must be fabricated so that the pressure drop across the line is kept to an absolute minimum!** The average pressure drop should be 1 psi or less. The following tips are suggested to accomplish this:
    a. Use butt-welded connections. Do not use Victaulic connections other than at the unit nozzles.
    b. If the absorber and condenser nozzles are not the same size, use a gradual reducer. Do not go from one diameter size to another abruptly!
    c. Use long radius elbows if possible.
    d. Make the line as short as possible.
    e. Do not use back-up welding rings.
    f. Use the couplings on the absorber outlet box and condenser inlet box to check the pressure drop across the line.

The design working pressure rating on the crossover line must be the same pressure rating as the remainder of the tower water system piping.

Tower Water (Condenser) Bypass Valve

This valve is sometimes referred to as a three-way mixing valve. This valve is not a requirement, due to the fact that YIA units are capable of operating with entering tower water temperatures down to 45°F (7.2°C). However, Johnson Controls recommends installing this valve if efficient chiller operation is desired (see Detail "A" on *Figure 13 on page 30* for piping).

The valve functions to keep a constant tower water temperature to the absorption unit. It does this by monitoring the tower water temperature just before entering the unit via an attached temperature sensor. The valve, located upstream, will open or close to allow warmer leaving tower water to mix with the colder entering tower water to maintain a constant temperature.

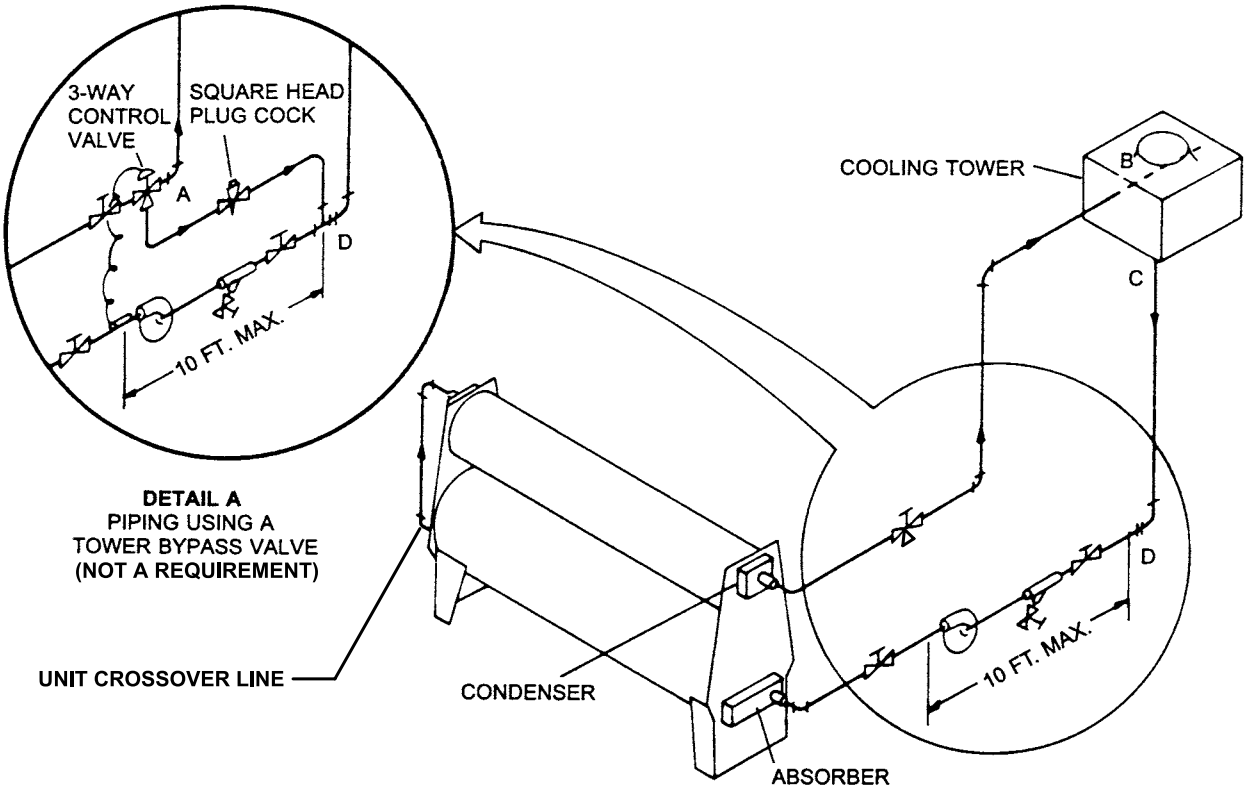


FIGURE 13 - INSTALLATION OF FLOW SWITCH

COMPLETING THE PIPING

Upon completion of the piping, a connection in each line as close to the unit as possible should be opened, by removing the flange bolts or coupling and check for piping alignment. If any of the bolts are bound in their holes, or if the connection springs out of alignment, the misalignment must be corrected by properly supporting the piping or by applying heat to the anneal the pipe.

NOTE

If piping is annealed to relieve stress, the inside of the pipe must be cleaned of scale before it is finally bolted in place.

Foreign objects that could lodge in, or block flow through the chiller's tubes must be cleaned or flushed before being connected to the chiller pumps, or other equipment. Furthermore, when flushing the water piping, **DO NOT flush through the chiller tubes**. Make sure the chiller is out of the circuit when doing this operation. Otherwise, dirt, small particles and fabrication debris may become lodged in the chiller bundles.

WARNING

All chiller water piping must be properly cleaned and flushed before putting the unit into service!

Johnson Controls will not be held responsible for failures or damages of any kind to the chiller or the piping due to construction debris in the chiller tubes and unit piping.

SYSTEM PUMP CONTROL

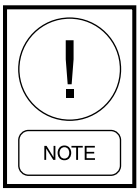
Since absorption chillers require a dilution cycle of an unpredictable amount of time, it is important that the unit's control panel control the operation of the chilled water and Absorber/Condenser water pumps.

Johnson Controls prescribed method to employ pump control is to hardwire the pump starter control circuit through the appropriate contacts on the relay board.

Should a customer insist on using another device such as an Energy Management System (EMS) to control the pumps, that device must turn on and off as a result of this direct interface with the contacts on the relay board.

If there is a desire to interface the pumps with some device other than the unit control panel, that device must receive its instructions from the control panel and not from the EMS.

As a minimum, the customer must monitor the dry contacts in the unit's control panel and control his pumps in response to these contacts opening and closing.



Johnson Controls will NOT be responsible for any costs associated with equipment problems, failures or damage due to Johnson Controls not controlling the system pumps.

Failure to adhere to the instructions given in this section could result in evaporator tube freeze-up and unit crystallization.

VARIABLE FLOW SYSTEMS

Variable flow through the evaporator and absorber/condenser can be applied to the YORK YIA Chillers, with a couple of notes of caution:

- The minimum velocity through the tubes is 3 fps (feet/second), so systems designed for variable flow should be selected with higher velocities at design conditions.
- The reduction in water flow rate should not exceed the reduction in load. For example, at 50% load the water flow rates should be 50% or greater of the design value. The leaving chilled water temperature should not be allowed to drop below the design value and the leaving absorber/condenser water temperature should not be allowed to rise above the design value.
- The rate of evaporator flow change should be slow, to make sure that the chiller controls can track the building load.

Below is a rough guideline for an allowable variable evaporator flow rate of change. This may require modification based on specific application criteria.

Maximum allowable rate of change is 125 minutes to go from 100% to 50% of design flow, based on a minimum chilled water system turnover rate of 15 minutes. System Turnover Rate (STR) is a measure of the chilled water system volume as compared to the design chilled water flow rate, and is defined as:

$$\text{STR (minutes)} = \frac{\text{Volume of chilled water system (gal)}}{\text{Design chilled water flow rate (gpm)}}$$

As noted above, if the STR is above 15 minutes, chilled water flow rate of change must be modified as follows:

Rate of change :

100% to 50% flow (min.) = 15+15-STR

WATER QUALITY

Water quality is a term used to describe the chemical, physical and biological characteristics of water, usually in respect to its suitability for a particular purpose. As customers utilize increasingly lower quality sources for chiller water, such as treated sewage effluent and sea water, chiller material selection becomes even more critical. For additional details *see Form 160.00-AD5*.

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SECTION 6 - RUPTURE DISK AND DISCHARGE PIPING

RUPTURE DISK AND RELIEF PIPING

NOTE

The ANSI/ASHRAE 15-2001 safety standard code was recently revised to include absorption chiller relief devices. Please read and follow these instructions closely to ensure the chiller installation is compliant to the revised code.

Both the steam and hot water YIA units are fitted with an ANSI/ASHRAE 15-2001 safety standard code compliant pressure relief device. For YIA units, this device is a metallic, one time use, rupture disk burst rated at 7.0 PSIG, +/- 2.0 PSI (48.2 kPa, +/- 13.8 kPa).

The rupture disk will protect the chiller's integrity should there ever be a tube rupture or in the very unlikely event that the unit's refrigerant vapor pressure gets too high. Unlike vapor compression cooling machines that relieve refrigerant vapor, if the rupture disk bursts, absorption machines could expel a vapor and a liquid.

CAUTION

Liquid coming out of the rupture disk could be in excess of 200°F (93.3°C)!

The metallic disk is mounted at the factory between two special flanges. The flanges have a knife-edge that perforates a special flange on the disk to create an airtight seal.

NOTE

Do not loosen the bolts around the flange or remove the disk from the holder. If the disk is removed for any reason, it must be replaced with a new one!

The outer flange of the disk holder has a plastic pipe stub supplied by the factory for shipping purposes. The PLASTIC stub must be removed! Refer to *Figure 14 on page 33*.

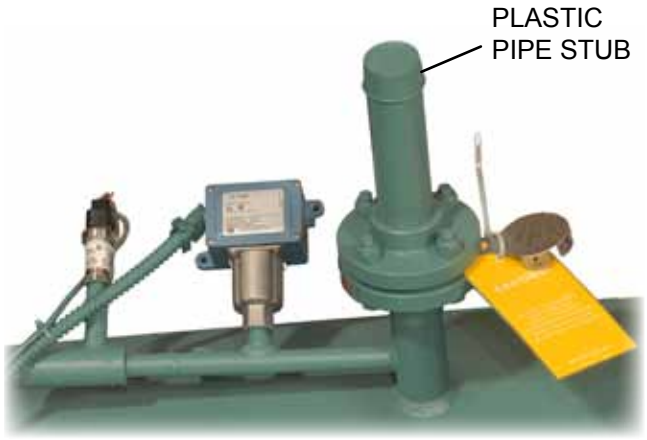


FIGURE 14 - PLASTIC PIPE STUB

Rupture Disk Discharge Piping Material

ANSI/ASHRAE 15-2001 calls for the relief piping material to be compatible with the refrigerant in the system. The refrigerant is de-ionized water that could exceed 200°F (93.3°C) in some cases. Johnson Controls recommends using schedule 40 steel pipe for the rupture disk discharge line material.

Rupture Disk Discharge Piping Construction

For the piping material, Johnson Controls recommends carbon steel. The relief piping must be fabricated and constructed in accordance with piping best practices. Follow any local codes (if applicable) governing the rupture disk discharge relief piping. Due to the high temperatures of an absorption unit during operation, and the expansion and contraction associated with this, the rupture disk vent piping must have a flexible connection between the rupture disk outlet and the relief piping. The installing contractor must supply the flexible connection and the relief piping.

Piping supports must be spaced according to the pipe material, size and temperature.

NOTE

At no time should there be any weight or moment arm forces imposed on the flanges of the rupture disk!

Rupture Disk Discharge Piping Sizing

The sizing of the rupture disk discharge piping must not be less than the rupture disk diameter. Where two or more relief devices are connected to a common line or header the effect of backpressure that will be developed when more than one relief device operates shall be considered. The sizing of the discharge line for above condition must be based on the sum of each rupture disk outlet area in addition to the pressure drop allowance through the outlet piping. Please see the following table for the rupture disk outlet areas.

Rupture Disk Discharge Piping Lengths

The maximum length of the discharge piping installed on the outlet side of the rupture disk discharging to the atmosphere must not exceed the equivalent length valve column in the following table.

LD09819

FIGURE 15 - RUPTURE DISK FROM FACTORY

TABLE 2 - DISCHARGE PIPING

MAXIMUM DISCHARGE PIPING LENGTH FOR SCHEDULE 40 STEEL PIPE							
UNIT MODELS 1A1 THROUGH 4B4							
DISK SIZE	**CAPACITY LBS AIR/MIN.**	**P PSI.**	**NPS IN**	**ID IN**	**F**	**DISK AREA SQ. IN.**	**L * FT.**
1-1/2	24.55	7.0	1-1/2	1.610	0.0202	1.623	19.12
1-1/2	24.55	7.0	2	2.067	0.019	1.623	77.55
1-1/2	24.55	7.0	2-1/2	2.469	0.0182	1.623	201.86
1-1/2	24.55	7.0	3	3.068	0.0173	1.623	637.89
UNIT MODELS 4C1 THROUGH 10E3							
2	47.50	7.0	2	2.067	0.019	3.140	17.88
2	47.50	7.0	2-1/2	2.469	0.0182	3.140	50.38
2	47.50	7.0	3	3.068	0.0173	3.140	165.77
2	47.50	7.0	4	4.026	0.0163	3.140	701.91
UNIT MODELS 12F1 THROUGH 14F3							
3	106.95	7.0	3	3.068	0.0173	7.070	27.63
3	106.95	7.0	4	4.026	0.0163	7.070	131.40
3	106.95	7.0	5	5.047	0.0155	7.070	444.83
3	106.95	7.0	6	6.065	0.0149	7.070	1175.38

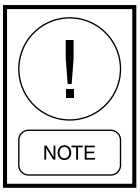
Note: Length calculation per ANSI/ASHRAE 15-2001, Appendix H

SECTION 7 - INLET STEAM PIPING

INLET STEAM PIPING

The generator section is hydro tested at a pressure of 150 PSIG DWP, (10 bar if PED code is specified), and a maximum steam temperature of 337°F (169°C). The generator tubeside will be ASME coded unless otherwise indicated on the factory order submittal.

Since generator nozzle connections can vary, refer to the Unit Water Piping section of this document to determine which type of standard connection is supplied on your unit.



Steam piping should be designed in accordance with good engineering practice. All field installed steam piping must be in accordance with all local, state, or federal codes that may apply.

The steam inlet piping support system must be capable to adequately support the full weight of all piping and components independent of the unit. The support system must account for the expansion and contraction of the steam piping. **No imposing forces or strains are to be on the generator inlet nozzle.**

All piping must be fabricated so that water box removal can be facilitated easily. Flanges or grooves located close to the generator head will satisfy this requirement.

INLET STEAM CONDITIONS

Pressure/Type of Heat

The main steam supply may be either low-pressure steam or high-pressure steam that is reduced to a low pressure via a pressure reducing station or other process. The preferred steam quality is dry and saturated (D&S) with minimal superheat. The generator is designed for latent heat transfer, increasing the sensible heat by allowing higher steam temperatures will provide little, if any, performance improvement. Since steam saturation pressure corresponds to a specific temperature, the YORK YIA chiller's available capacity will vary greatly with the steam pressure at the inlet to the generator. Steam pressure into the inlet nozzle of the generator should not exceed 17.0 PSIG (2.2 bar). Exceeding this pressure will result in a warning message, and at 20.3 psig (2.4 bar) a unit safety shutdown will occur. All pipe design and fabrication must be done so the pressure drop is kept to a minimum.

Generator operating pressure may not exceed the specified unit operating pressure. Under no circumstances may the chiller operate with steam pressure exceeding 17.0 psig (2.2 bar)! Doing so will over fire the unit and cause operational problems as well as shorten the unit's longevity!

Flow

Steam flow is equally important as steam pressure. Flow is usually measured in pounds per hour (lb/hr) or (liters/min). Each YORK YIA chiller is rated at a specific steam flow and pressure at time of unit selection. It is very important that these values are maintained throughout the operational lifetime of the unit. Not adhering to this specification will drastically affect the performance and longevity of the chiller.

Consideration should be given to the steam flow velocity, especially in applications where noise will be a factor. Generally speaking, steam velocities up to 6,000 fpm (30 m/s) will not produce an objectionable noise level.

Steam Purity

It is the responsibility of the customer to engage the services of an experienced and reputable steam / condensate treatment specialist to constantly maintain the purity. Improperly treated or maintained steam / condensate will result in decreased efficiency, high operation costs and premature tube failure due to steam / condensate side corrosion.

Steam/condensate samples should be collected and analyzed on at least a monthly basis by the treatment specialist. A quarterly review with the treatment supplier should address the conditions of the steam systems and develop action plans based on these analysis. A third party consulting company can help oversee the treatment programs in order to properly protect the physical plant and avoid costly downtime.

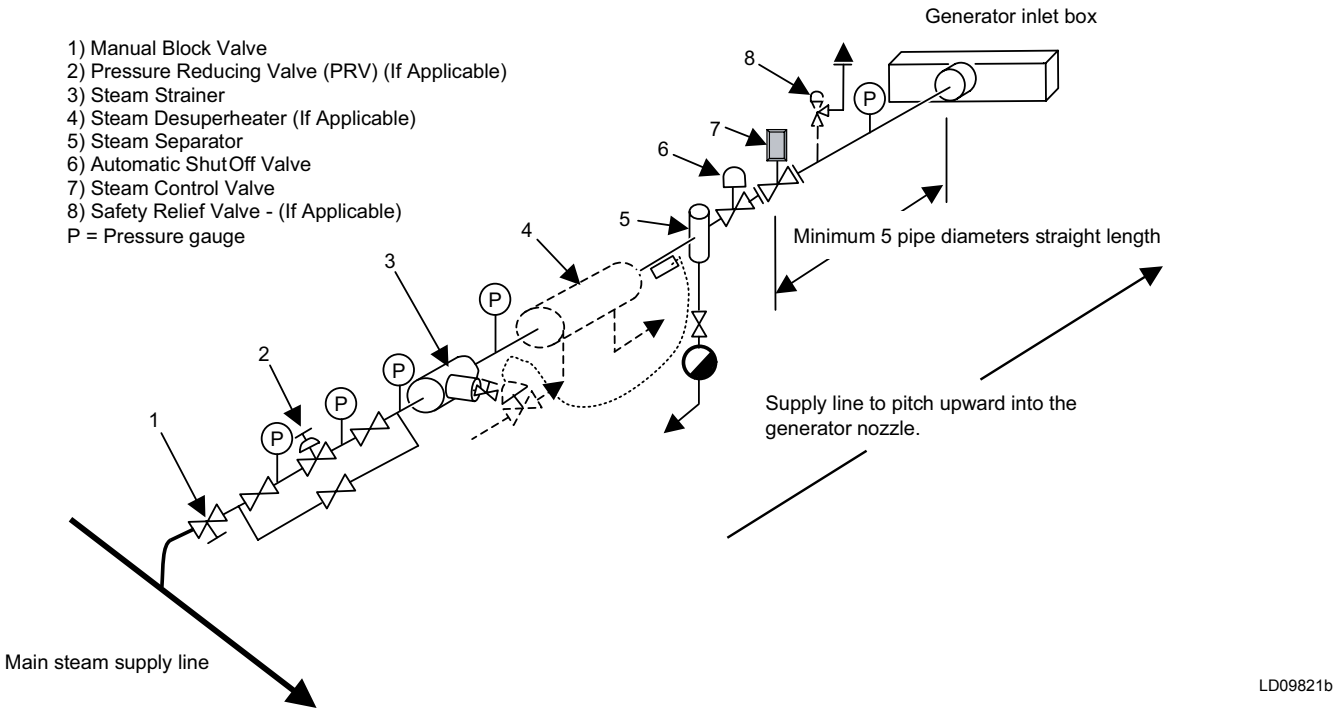


FIGURE 16 - TYPICAL STEAM PIPING ARRANGEMENT

It is equally important that the customer of the equipment perform an inspection of the generator tubes at the frequencies recommended in the *preventive maintenance schedule located in manual 155.16-OM1*. In addition to periodic cleaning with tube brushes, tubes must be inspected for wear and corrosion. Tube failures usually occur due to corrosion, erosion, and fatigue due to thermal stress. Eddy current analysis and visual inspection by boroscope of all tubes are invaluable preventative maintenance methods. These provide a quick method of determining waterside / steam generator tube condition at a reasonable cost.

STEAM PIPING ARRANGEMENT

NOTE

Refer to Figure 16 for the proceeding discussion and correct placement of the steam inlet components.

Steam piping mains, condensate pipes and the steam line to the unit must be properly sized in accordance with the required unit full load steam flow rate and acceptable pressure drops. The steam inlet piping should avoid sharp curves and abrupt piping size changes. Whenever possible, the steam supply line to the unit should be taken off the main steam supply line from the topside to minimize the possibility of condensate carry-over into the unit. Both steam supply and condensate pipes must be properly sized and pitched to prevent liquid hammering. Johnson Controls recommends a straight length of pipe approximately 5 to 10 pipe diameters long just before the steam enters the generator.

INLET PIPING COMPONENTS

Manual Block Valve

The Manual Block Valve is required to manually shut off steam supply to all devices downstream for serviceability (refer to *Figure 16 on page 36*). This valve is often closed during prolonged chiller shutdown periods to prevent steam flow into the generator bundle. A tap may be installed just downstream of this valve to allow for draining the condensate from the steam line. The Manual Block Valve must be bubble tight to ensure no leakage of steam.

Pressure Reducing Valve (PRV) (If Applicable)

The pressure-reducing valve reduces high-pressure steam to a lower pressure. A pressure reducing station will also act to help steady fluctuating steam pressures. As a general rule of thumb, if the steam pressure fluctuates more than 5 lbs (1.3 bar A) it is recommended to

incorporate a pressure reducing station. When selecting a pressure-reducing valve, it should be sized on the basis of the pressure drop at the unit's full load design steam conditions. **Do not size this valve based solely on the pipe size.** The valve must be suitable for dead-end service.

The pressure-reducing valve should be provided with stop valves and pressure gauges on both the inlet and outlet sides of the valve. A full size bypass with a globe valve will permit manual operation during maintenance periods.

Two pressure reducing valves; one large and one small, piped in parallel may be desirable for those applications with continued operation at low loads or where highly variable upstream pressures exist. The smaller valve would be set at a slightly higher pressure than the large valve so it will stay open at low flow rates while the larger valve closes, thus protecting the seat of the larger valve. The use of a two-step steam pressure reduction method may be desirable on applications with pressure differentials in excess of 100 psig (8.0 bar A). Furthermore, the noise generation in a single step pressure reduction system may be objectionable.

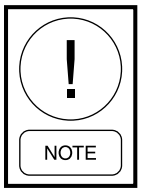
Steam Strainer

A fine mesh steam strainer (#50 mesh) is used to capture any impurities in the steam supply line. These impurities may manifest themselves in the form of dirt, rust, or precipitates. This strainer will prevent the chiller system components form getting plugged. Plugged components will reduce system capacity and increase maintenance costs. A pressure gauge must be installed just before and after the steam strainer. If the pressure drop as read from these two gauges increases to an unacceptable level, the steam strainer should be removed and cleaned.

Steam Desuperheater (If Applicable)

Latent heat at saturation temperature is much larger than the sensible heat that is extracted when superheated steam cools down. Therefore, superheated steam has little benefit to the absorption process. For this reason superheated steam should be kept to a minimum.

In some applications, high-pressure steam expanding through a pressure-reducing valve can be at an undesirable high temperature, which is not recommended for use in the absorption process. In these cases a desuperheater must be incorporated to reduce the steam temperature before entering the unit.



Damage to the unit and/or chiller warranty will be VOID if the steam temperature exceeds Johnson Controls's specified recommendations.

The desuperheater must be located downstream of the pressure reducing valve, if one is utilized. The flow of coolant to the desuperheater should be automatically controlled to maintain a constant steam supply temperature to the absorption unit within the design limits specified. Suitable automatic means should be provided to remove any condensate that may accumulate within the desuperheater. This task could also be accomplished by a steam separator located downstream of the desuperheater. Care should be taken to ensure that the desuperheater is installed according to the manufacturer's recommendations.

Steam Separator

All YORK YIA absorption chillers must operate with only dry steam entering the generator section. Wet steam will lessen the heating content of the steam, which in turn will affect unit performance. Wet steam may also cause excess tube erosion or water hammer. Both of these conditions could be detrimental to generator tubes or steam piping components. If dry stream can be supplied to the chiller with minimal superheat, it may not be necessary to install a steam separator. In cases where a desuperheater is utilized and the desuperheater does not automatically remove liquid condensate, a steam separator must be installed.

The steam separator is installed in the steam supply line downstream of the desuperheater. It is used to separate any liquid present in the steam after leaving the desuperheater and before entering the unit. All trapped condensate liquid should normally be piped through a steam trap before going back to the condensate tank. The steam trap will prevent any steam from blowing through the separator into the condensate return system. The use of a steam separator and trap will ensure only dry steam to enter the unit at all times.

Automatic Shut-Off Valve (4SOL) (If Applicable)

This valve may not be applicable to all units and is under the discretion of the customer or his representative to supply and install this valve. The below table and the explanations following is a brief description of what is sourced as a STANDARD from the factory. This table is not applicable for units that adhere to stringent restrictions, regulations or codes due to the process or environment in which they have to operate. See your local sales representative if you feel your unit may be subject to the above.

1. Hot water units usually have a dedicated hot water pump; therefore if a power failure was to occur, the hot water pump will also shut down to stop the supply of heat to the unit. If the unit has a 3-way hot water control valve, a by-pass diverts the supply of hot water back to the pump suction or to other hot water appliances at valve closure. If the unit is supplied with a 2-way hot water control valve, provisions must be taken by the customer or customer's contractor to avoid dead end conditions at valve closure.
2. Steam units with a 2-way globe or cage valve, if factory supplied, will have a spring return, fail-closed feature. If a power failure was to occur, the control valve will spring closed. This feature will keep most of the steam supply from entering the generator. However, due to the nature of steam and the operating conditions of the unit, the valve seat is not guaranteed to keep a 100% tight shut off over the life of the steam valve. Therefore, In addition to the manual block valve, a customer supplied automatic shut-off valve (4SOL) is recommended to provide a 100% tight shut off at control valve closure.
3. Butterfly valves are usually not of the spring return, fail-closed design for economic reasons. At a power failure, this valve will remain in whatever position it happened to be in at the time of the power failure. Since the steam boiler will emit steam for an undetermined period of time, steam will be allowed to enter the unit. The factory will supply a condensate drain solenoid valve (6SOL) in these cases that is field mounted at the outlet of the generator. This valve is wired into the unit so that when a power failure occurs and the unit goes off line, it will close to stop the condensate flow out of the unit. Eventually, this will stop the steam from entering the unit. * If the customer desires, a shut off valve (4SOL) at the inlet side of the generator can also be installed as a redundant safety feature. Please note, if the factory supplied condensate valve is not installed, an inlet side automatic shut off valve is required.

The type of Automatic shut-off valve (4SOL) is not critical as long as it meets the following. The valve's size is usually the same size as the steam inlet line; however, sizing determination must be based upon the steam system design, applications and condition. Valve wiring will originate in the unit-mounted junction box 3, (JB3) terminals 2 & 5. The coil should be 120 volts, 60 Hz; a transient suppressor must be wired in parallel with the coil. Maximum allowable current draw is 1 amp holding, 10 amps inrush. Please *see Form 155.21-W1* for more details on the wiring and voltage requirements. The valve must be a NC, bubble tight (100% tight shut off), designed to keep the pressure drop through the valve to a minimum. The valves closing time should not exceed 2 minutes.

TABLE 3 – AUTOMATIC SHUT-OFF VALVE APPLICATIONS

TYPE UNIT	TYPE VALVE	SPRING RETURN CONTROL VALVE	SHUT OFF VALVE (4SOL) RECOMMENDED	CONDENSATE DRAIN SOLENOID VALVE (6SOL) SUPPLIED BY FACTORY
Hot Water1	2 or 3 way Globe	NO	NO	NO
Steam2	2-way Globe	YES	YES	NO
Steam3	Butterfly	NO	NO*	YES

The valve type is not critical as long as it meets the following.

The valve's size is usually the same size as the steam inlet line; however, sizing determination must be based upon the steam system design, application and condition. Valve wiring will originate in unit-mounted junction box 3, (JB3) terminals 2 & 5. The coil should be 120 volts, 60 Hz, a transient suppressor must be wired in parallel with the coil. Maximum allowable current draw is 1 amp holding, 10 amps inrush. Please *see Form 155.21-W2* for more details on the wiring and voltage. The valve must be a NC, bubble-tight (100% tight shut off), designed to keep the pressure drop through the valve to a minimum. The valve's closing time should not exceed 2 minutes.

STEAM CONTROL VALVE

This valve is selected and supplied by the Johnson Controls factory unless otherwise specified on the chiller order. If not supplied by Johnson Controls factory others must supply the control valve.

The Johnson Controls factory will not be responsible for the valve or consequential equipment damage if not supplied by the Johnson Controls factory.

If supplied by the factory, it will be found among the unit's ship loose parts. The control valve assembly consists of a valve, positioner and actuator. A separate set of installation and operation instructions will be packaged along with each valve from the valve's original manufacturer. Please make sure these instructions are kept safe for future use. All personnel involved in the installation of the control valve must read and understand the safety and installation instructions.

The valve controls the steam flow into the unit and is wired to unit-mounted junction box 3, (JB3). The micropanel will throttle the valve open or closed based upon the customers cooling load demands and/or built-in unit safety controls. All Johnson Controls supplied steam valves are two-way valves of either the cage or butterfly design. Cage valves have a fail-safe, spring-return feature included within the actuator. If loss of power is experienced the valve will fail-closed. The Johnson Controls supplied butterfly type control valves do **NOT** have the fail-safe, spring-return closed feature. Please see the previous discussion under "Automatic shut-off valve" for these installations.

DO NOT under any circumstances remove the factory-sealed screws on the type 3274 actuator case cover. Opening this cover will render the valve assembly inoperative!

STEAM CONTROL VALVE INSTALLATION

The valve will mount between flanges that are to be supplied by others. Please note the valve body size and pressure rating before selecting the mounting flanges. Also note the flow direction arrow as indicated on the valve body before inserting between the flanges. The valve assembly must be installed in a location where ambient temperatures are between 0 to +140°F (-20 to + 60°C). If high temperature fluctuations or high humidity will be a factor, it is suggested that a heating resistor be fitted to prevent the buildup of condensation within the actuator enclosure.

Steam Control Valve Wiring

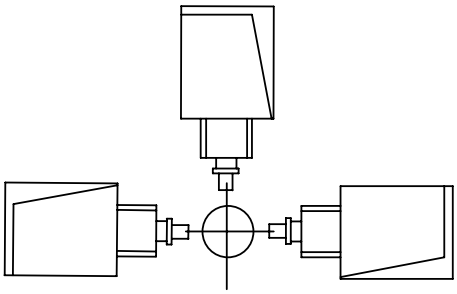
Johnson Controls supplies the control signal wiring to the valve, however Johnson Controls does NOT supply the power wiring to the control valve. For the power wiring, Johnson Controls recommends the following: #18 AWG, AWG dia 0.049, UL or CSA (nom) 1620 with 16 strands, 600 volt rating, AWM/UL style 1015.

Insulation with minimum temp rating 221°F (105°C), nominal thickness 2/64, color white for the wire #2 because it will be the neutral and black for the other wires. These wires should be routed using 1/2" (12.7 mm) metallic flexible conduit and appropriate fittings at each end. The length is determined by how far the control valve is mounted from the JB3 terminal box, which is mounted on the right side of the unit.

Steam Control Valve Orientation & Placement

The normal arrangement for all actuated control valves is to install the valve in a horizontal line with the actuator vertical above the valve. Other positions may result in uneven valve plug and cage wear and improper operation. If the actuator is not completely vertical, it may require additional support to keep the weight off the valve body. Never install the control valve actuator where condensate could drip or flow into it. **It is NOT RECOMMENDED to mount the control valve in a vertical line.**

Johnson Controls recommends that the Steam Control Valve not to be installed more than 10 feet (3 meters) away from the generator inlet nozzle. Pressure drops may result from greater installation distances. Refer to *Figure 22 on page 44*, *23, 24, 25 and 26 starting page 44* for the 3274 or PSQ Actuator orientation to the steam line.



No installation is permitted where actuator is beneath the centerline of the steam line or where condensate could drip or flow into actuator.

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FIGURE 17 - 3274 ACTUATOR ORIENTATION

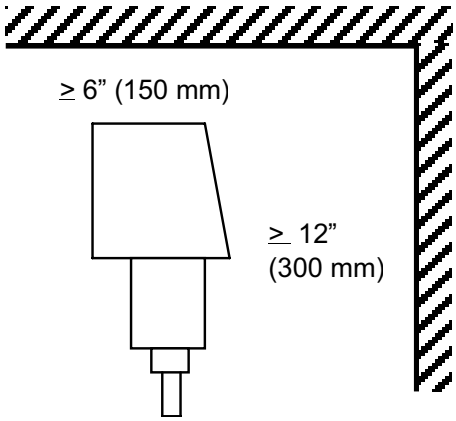

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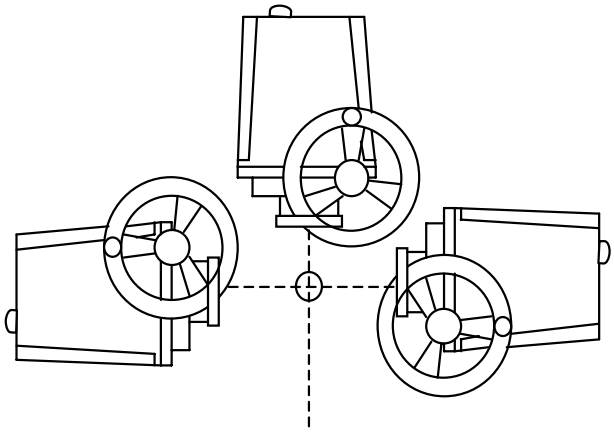
FIGURE 18 - 3274 ACTUATOR INSTALLATION CLEARANCES

Safety Relief Valve (Supplied by Others)

The safety relief valve size, location and installation is provided by the owner (or owners representative) in accordance with local code requirements.



No installation is permitted where actuator is beneath the centerline of the steam line or where condensate could drip or flow down into actuator. Do not mount actuator so that it’s cover points downwards.

LD09824

FIGURE 19 - PSQ ACTUATOR ORIENTATION

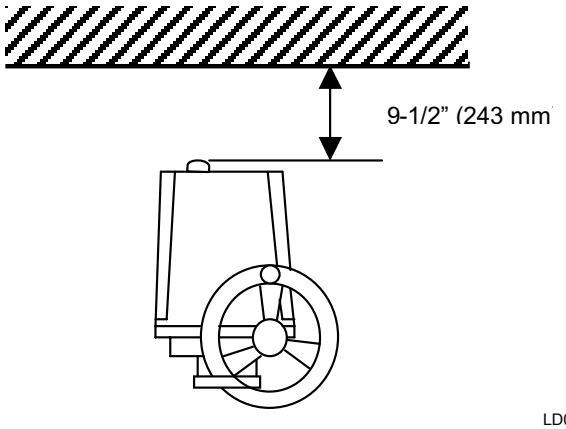


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FIGURE 20 - PSQ ACTUATOR INSTALLATION CLEARANCES

SECTION 8 - STEAM CONDENSATE RETURN SYSTEM

STEAM CONDENSATE RETURN SYSTEM

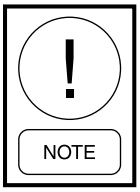
This section is not intended to provide complete design and application criteria for the selection of a steam condensate return system on the unit. There are too many job specific variables that will dictate which system is best to use. Furthermore, adherences to local code requirements vary from region to region. Each installation will require an experienced individual, knowledgeable in the before mentioned areas to review job specifics pertaining to the steam piping and condensate system and know which is best for each application.

The intent of this section is to briefly describe the importance of a properly designed steam condensate drain system and to familiarize the reader with some of the complexity and components that make up such system.

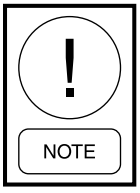
The chiller's steam condensate return system is designed for the purpose of removing condensate from the absorption unit's generator and returning it to the boiler. An inefficient or poorly designed condensate return system could interfere with steam flow through the unit causing poor chiller capacity and/or damage to the unit.

In some cases the chiller maybe be adapted into and an already existing condensate drain system, in other cases it my go to the floor drain. Whether it is as simple as a floor drain or an elaborate vacuum condensate system, there are three basic types:

1. Atmospheric
2. Atmospheric/vacuum
3. Total vacuum



The customer or customer's representative must employ an individual that is knowledgeable in steam condensate systems; Local codes, restrictions or customer requirements all take a part in the selection of a system which is best for the customer and the application.



Johnson Controls will NOT be responsible for any problems, costs, lack of performance, or damaged equipment due to improper condensate drain systems.

CONDENSATE RETURN SYSTEM COMPONENTS

As mentioned in the Inlet Steam section of this document, the generator section is designed for the transfer of latent heat. Latent heat is the heat rejected when a fluid changes state, such as a saturated steam vapor to a saturated liquid. However, this is the case at unit full load, if the unit was not at full load or the inlet steam conditions were other than a saturated vapor, some vapor maybe present at the outlet of the generator.

Condensate Drain Solenoid Valve (6SOL)

This component may or may not be installed depending on the type of steam inlet valve. See the Steam Inlet section of this document for application criteria on this component. The condensate drain solenoid (if installed) will be the first component the condensate will reach on its journey back to the boiler. This valve is a fail closed (NC) valve that will stop the condensate from leaving the generator section at a power failure or anytime the chiller is shutdown. At this location most of the steam should be a condensate liquid.

The valve should be installed within 24 inches (0.6 m) of the generator condensate outlet box. The preferred valve orientation is horizontal however other positions are acceptable. Wiring for this valve is supplied by the factory and comes already pre-wired to the control panel (I/O board, terminal #17 on TB1). The valve will be shipped loose for field installation. The remainder of the wire will be coiled up and tie-wrapped in the vicinity of the generator condensate outlet box. Locate electrical junction box (JB3) among the unit ship loose parts. This box is directly connected to the valve's coil housing via a ridged conduit connection and lock nut, also supplied in the ship loose parts.

Remove one MOV out of the cloth bag located in the Optiview panel. Connect the MOV between wire #17 and the white natural wire #2. JB3 houses the MOV and the remainder of the valves connections (*refer to Form 155.21-W1*).

The condensate drain solenoid valve will work in conjunction with the automatic shut-off valve (4SOL).

UNIT MODEL FAMILY	VALVE SIZE
A & B	2 inch
C,D,E & F	3 inch

Vacuum Breaker

As the name implies, a vacuum breaker will keep the generator circuit from going into a vacuum. It is mounted close to the generator outlet box and is not used in every application. Please be aware that the vacuum breaker will allow air into the condensate system, which in some cases maybe objectionable. After the unit shuts down and cools off the steam will condensate back into a condensate, this collapsing action results in a vacuum being present in the generator tubes. This could induce some of the condensate back into the generator or give problems at unit re-start in the form of water hammer that could cause damage to the unit tubes or components in the steam inlet or steam condensate system.

Strainer

A fine mesh strainer with a blow-off valve should be provided ahead of any steam traps in the condensate system. A stop valve should be installed upstream of the strainer for isolation.

Steam Trap

The main function of a steam trap is to separate the liquid condensate from the steam vapor. It can also be used to remove air or non-condensables from one part of the system to another part or to the atmosphere.

Steam traps come in many types and forms, a few are listed as follows: Float & Thermostatic, Thermostatic, Bi-metallic, Float and lever, and inverted bucket.

The most common is the Float & Thermostatic or (F&T) trap. This device uses two groups of traps in one, mechanical and thermostatic. A float located at the bottom of the trap rises with increased condensate level to open a valve. When steam enters the trap, the float drops, closing the valve. At the top of the trap is a thermostatic vent. This trap is essential if the condensate is to be used for other in plant operations where air in the condensate must be removed.

Any steam trap should have a by-pass line piped around it with isolation valves for trap maintenance. The trap should be located below and as close to the generator's outlet as possible in a horizontal plane. A full size trap outlet line size connection and valve should be provided for blow-down and testing purposes. Consult the trap's manufacturer for applications, sizing, and installation recommendations.

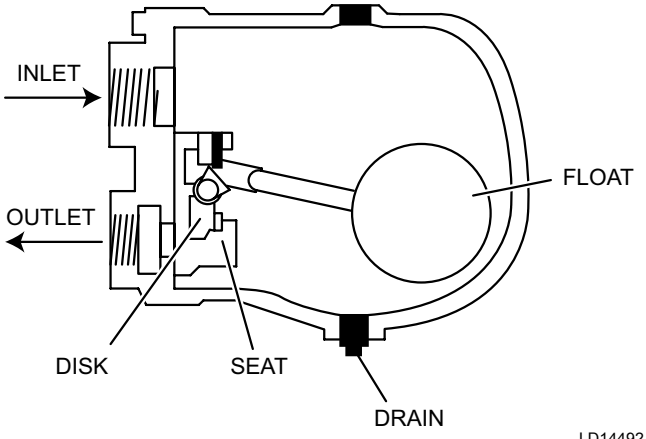


FIGURE 21 - STEAM TRAP

Check Valve

A check valve installed in the condensate drain line will prevent condensate or air from back flowing in the condensate system during reduced load conditions.

Condensate Cooler

The condensate cooler is installed in the drain system between the steam trap and condensate receiver. The purpose is to sub cool the condensate 5 to 10°F (3 to 6°C) below its flash point. The usage of this device is especially important in all vacuum drain systems where flashing of the condensate liquid would be more likely to occur.

SECTION 9 - HOT WATER PIPING

HOT WATER PIPING

YORK YIA single-stage absorption chillers are designed absorption units are designed for a maximum generator inlet hot water temperature of 266°F (130°C) and a generator working hot water pressure of 150 PSIG (10 bar). A special option can be purchased to enable the hot water working pressure up to 300PSIG (21 bar).

Do not exceed the unit's design hot water temperature or pressure ratings. Possible damage to the unit, components or serious personal injury could result!

Generator Hot Water Connections

GENERATOR TUBE BUNDLE DWP	
Standard	150 psig (10 bar)
Option	300 psig (21 bar)
GENERATOR CONNECTIONS	
Standard	Pipe stub w/Victaulic groove
Option	ANSI, RF flanges
Units shipped to Germany	Pipe stub w/groove (per ANSI/AWWA C-606)

All field hot water supply and return piping should be installed in accordance with all local, state, or federal codes that may apply. All piping must be adequately supported and braced independent of the chiller. The chiller water boxes and nozzles are not designed to handle any load bearing stress or strain. The support system must account for the expansion and contraction of the hot water being supplied to and from the unit. All hot water piping should be designed in accordance with good engineering practice.

The hot water piping must be fabricated so that water box removal can be facilitated easily for maintenance purposes. Installing a set of flanges close to the water box nozzles may do this.

Hot water piping must be properly sized in accordance with the required unit full load flow rates and pressure drops. Piping must be designed to avoid abrupt pipe size changes and sharp curves to keep system pressure drops to a minimum. For the inlet to the generator, Johnson Controls recommends a straight length of pipe down stream of the control valve approximately 5 to 10 pipe diameters long.

HOT WATER FLOW & CONTROL

There are basically two types of hot water valves that can be utilized on YIA absorption chillers: two-way and three-way valves. The three-way valve is the more common type of control method. Three-way valves can be further broke down into two categories.

1. Diverging (flow-splitting), (1 inlet - 2 outlets)
2. Converging (flow-mixing), (2 inlets - 1 outlet)

Normally a tag fixed on the valve will indicate which type it is and how it operates; see the below example.

DIVERGING FLOW

The three-way, diverging type valve will have its inlet on the bottom (sometimes called the branch or common port) and flow will go either to the left port or right port or both ports depending on the position of the valve's plug. Whether the hot water goes to the generator or by-pass depends on how it's piped.

3-Way Diverging Valves

The valves will vary the water flow rate through the generator while keeping the temperature constant. This is the recommended valve for hot water temperatures equal to or below 266ºF (130ºC).

A three-way, diverting valve will have one inlet and two outlets. The valve will vary the flow rate through the generator section of the chiller as load increases or decreases. At a full load condition, the by-pass port will be completely shut off allowing all the flow of the hot water to go directly to the generator section of the chiller. As the load decreases, the by-pass port will begin to open, allowing some of the hot water to bypass the generator section of the chiller. When there is no demand for cooling, the by-pass port on the control valve will be completely open while the port to the chiller will be completely closed (refer to *Figure 22 on page 44*).

2-WAY HOT WATER VALVES

The valves are a straightforward open/shut type of valve. One important thing to keep in mind is that the hot water circulator pump must be kept from dead-heading when the hot water control valve completely closes. If the hot water pump does not have other hot water appliances in the same loop, the piping must be arranged so that an upstream "by-pass" valve will automatically open upon hot water control valve closing. This will allow the hot water flow to travel back to the pump suction (refer to *Figure 23 on page 45*).

3-WAY CONVERGING VALVES

These valves have two inlets and one outlet; they will vary the water temperature while the flow remains the same. This type of flow is recommended for hot water temperatures above 266º F (130º C). The outlet of this valve is piped to an inlet of a diverting valve, the outlets of this valve will go the generator and by-pass. This configuration incorporates an inner loop circulation pump. Hot water is continually circulated around this piping loop while a temperature sensor throttles the valve open or closed to keep the water temperature at a preset temperature less than 266 ºF (130ºC) (refer to *Figure 24 on page 66*).

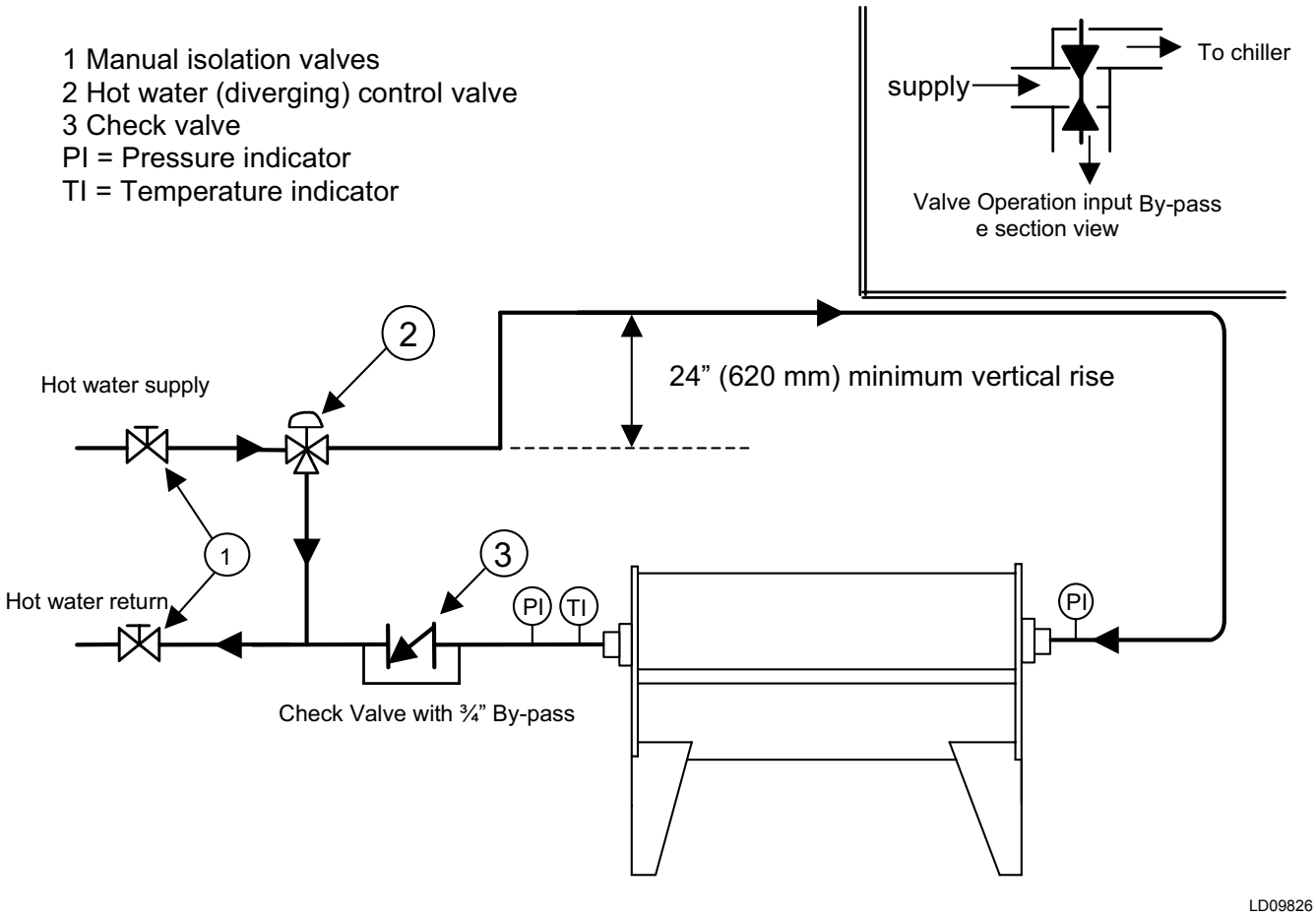


FIGURE 22 - TYPICAL 3-WAY DIVERGING CONTROL VALVE ARRANGEMENT

HOT WATER PIPING COMPONENTS

Manual Isolation Valves

These valves are furnished and installed by others for serviceability of the inlet hot water piping system. For convenience purposes, they should only isolate the unit and it's required components.

Hot Water Control Valve

As a standard, one hot water control valve is furnished with each absorption unit. This valve may be separately packaged in it's own create or it may be among the remainder of the unit's shipped loose parts. The control valve may also be omitted from the unit's factory order if preferred by the customer. In these cases, others must supply the valve.

NOTE

Johnson Controls will not be responsible for the control valve or its operation if NOT supplied by the Johnson Controls factory.

A separate set of installation and operation instructions will be packaged along with each valve from the valve's original manufacturer. All personnel involved in the installation of the control valve must read and understand the safety and installation procedure. These instructions may have more details in valve installation than what this document covers; in these cases follow the valve's manufacturers instructions. Always keep the valve's instructions in a safe place for future use.

9

1 Manual isolation valves
2 Hot water control valve
3 Check valve
4 By-pass valve (if required)
PI = Pressure indicator
TI = Temperature indicator

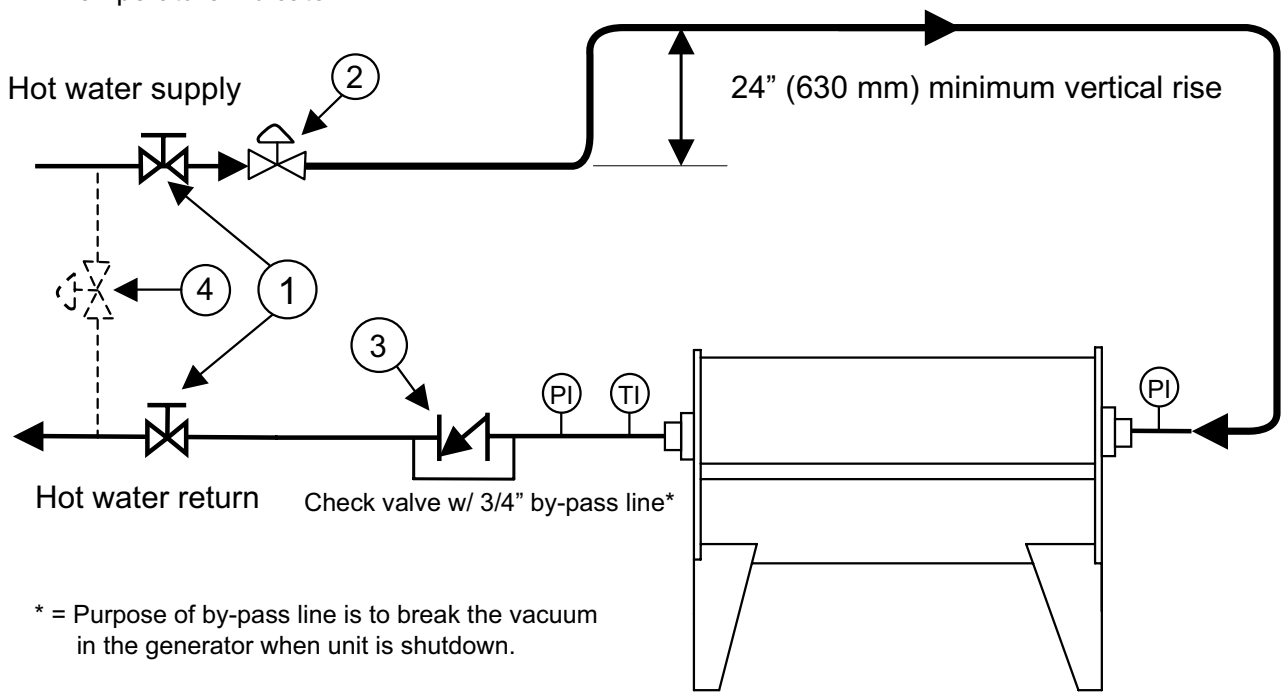


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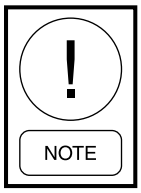
FIGURE 23 - TYPICAL 2-WAY CONTROL VALVE ARRANGEMENT

VALVE INSTALLATION

The mechanical contractor is usually the responsible party for installation of the control valve. Please refer to the appropriate piping diagram in this section for a guideline on how this valve is arranged in the piping system. The valve will mount between mating flanges supplied by others, these flanges must comply with the same size and body pressure design as the valves. A label on the valve will indicate flow directions, please study this to make sure the valve gets installed correctly. The valve assembly must be installed in a location where ambient temperatures are between 0 to +140ºF (-20 to +60ºC). If high temperature fluctuations or high humidity will be a factor, it is suggested that a heating resistor be fitted to prevent the buildup of condensation within the actuator enclosure.



No installation is permitted where the actuator is beneath the centerline of the hot water line or where liquid could drip or enter the actuator.

Always support the actuator if it is not completely vertical above the valve. It is not recommended to install the control valve in a vertical line. Refer to *Figure 17 and Figure 18 on page 40* for actuator installation orientation and clearances.

1 Manual block valves
2 3-way converging (mixing) valve
3 Check valve
4 Manual isolation valve
5 Strainer
6 Pump
7 3-way diverging (flow splitting) valve
PI Pressure indicator
TI Temperature Indicator

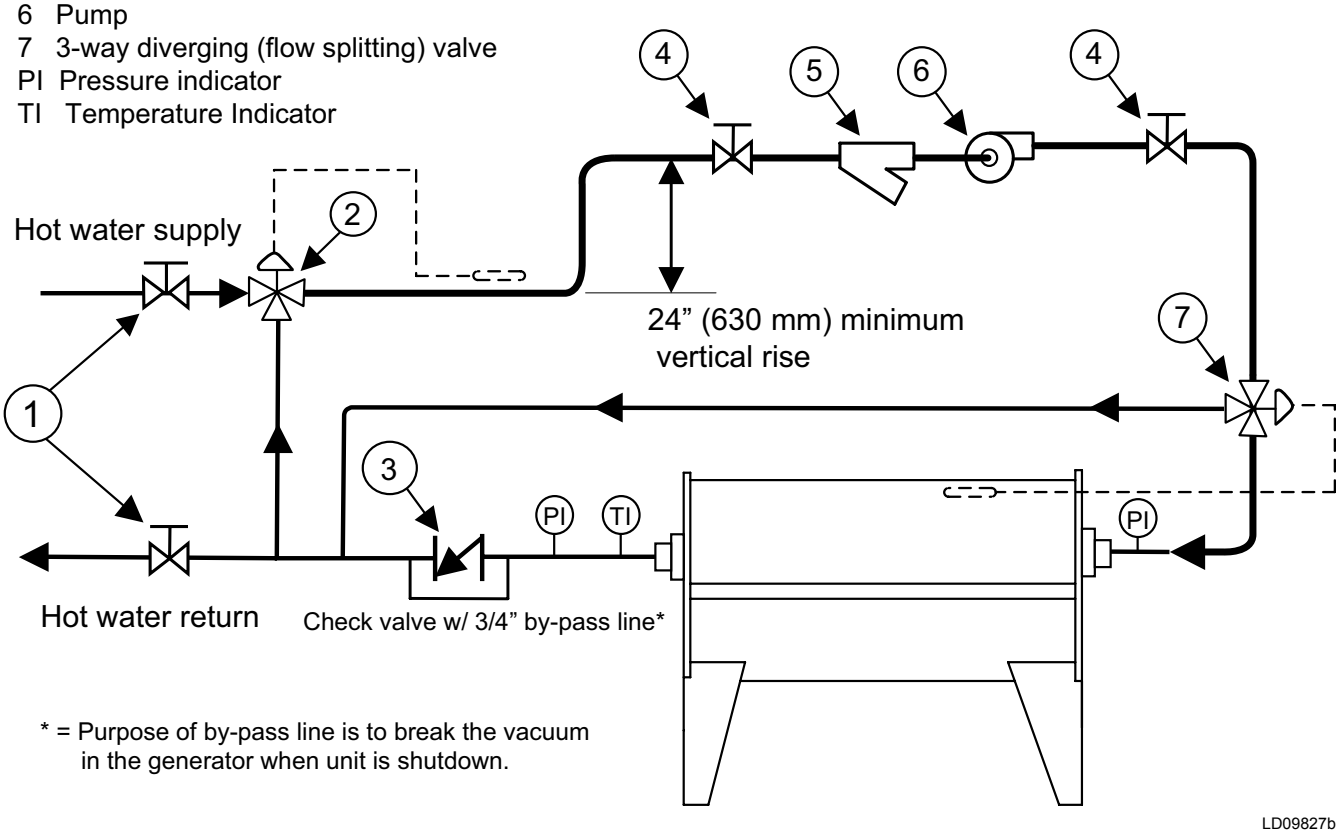
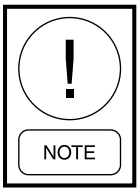


FIGURE 24 - TYPICAL 3-WAY CONVERGING VALVE ARRANGEMENT (TEMPERATURE ABOVE 266°F)

Valve Wiring

The valve control harness is supplied by the factory and will be coiled up on the generator inlet end of the unit. This harness will connect to unit-mounted junction box 3 (JB3) and terminate in the valve actuator.



It is recommended that a trained Johnson Controls Service Technician complete the valve control wiring.

The Johnson Controls factory does not supply the power wiring to the control valve. The following is recommended, #18 AWG, AWG dia 0.049, UL or CSA (nom) 1620 with 16 strands, 600 volt rating, AWM/UL style 1015. Insulation with minimum temp rating 105°C, nominal thickness 2/64, color white for the wire #2 neutral wire, black for the other wires. These wires should be routed using 1/2" (12.7 mm) metallic flexible conduit and appropriate fittings at each end. The length is determined by how far the control valve will be located from the unit mounted JB3 junction box.

Check Valve

Upon unit shutdown, the hot water left remaining in the generator section will start to contract as it cools down. This may form a vacuum inside the generator tube bundle. A check valve installed on the leaving waterside of the generator will break this vacuum. The check valve may not be necessary if the control valve is located 24" (610 mm) above the generator connection. A 3/4" (19 mm) bypass line should be installed around the check valve.

Pressure and Temperature Indicators

Appropriate indicators should be installed before and after the generator bundle. This will allow the operator and service technician to determine and verify operating conditions of the unit.

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SECTION 10 - ELECTRICAL CONNECTIONS

ELECTRICAL CONNECTIONS

All field wiring must be in accordance with the National Electrical Code (NEC) as well as all other applicable state and local laws, codes and specifications. The wiring installer(s) must be a fully qualified and licensed individual(s) that is familiar with and operates within these codes.

Disconnect and lockout all electrical power to the unit before proceeding with any work. Failure to adhere to this could result in damage to the equipment, personal injury or even loss of life.

A packet of unit literature is located with every unit on the inside door of the micropanel. Among the items in this package you will find a unit wiring and sensor location diagram (refer to Form 155.21-W2). If for any reason this literature is not available, notify the local Johnson Controls Service office. Do not attempt to wire the unit without proper instruction.

Incoming three-phase power supply to the unit MUST be routed through a CUSTOMER SUPPLIED remote, FUSED disconnect switch. See the appendix in the back of this document for determining the size of fuses, unit amp requirements and all electrical ratings for the unit.

Unit Grounding

The unit must be grounded in accordance with NEC, table 250-95 and any other applicable codes. **Use only copper conductors for all unit wiring, do not use aluminum!** The power panel is furnished with ground lugs suitable for wire sizes between #14 to 1/0 AWG.

Incoming Power Wiring

Located in the unit mounted, power panel is a 100 amp, non-fused, service disconnect switch. The incoming power lines from the customer supplied, remote mounted, fused disconnect switch must be connected to terminals L1, L2 and L3 of this non-fused disconnect switch. Refer to *Figure 25 on page 49* for incoming 3-phase power wiring.

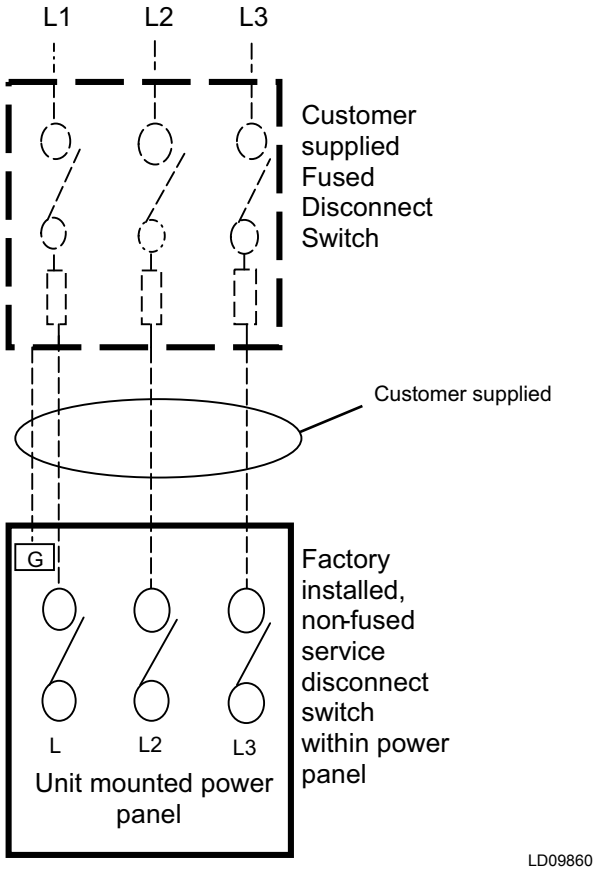


FIGURE 25 - INCOMING 3 PHASE POWER WIRING

The control center power (115V, 50/60 Hz, 10 amps, 1.0 KVA) is supplied through a factory mounted control power transformer (CPT) located in the power panel. If multiple conduits are used for the incoming three-phase power, they should contain an equal number of wires from each phase in each conduit to prevent overheating. Use copper conductors only for all unit wiring.

Power Factor Correction Capacitors

Are rarely used on absorption equipment due to their low power usage. However, when used they must be sized to meet NEC and all applicable codes.

Improperly sized or installed capacitors may result in equipment malfunction or damage and will not be covered under Johnson Controls warranty. .

Flow Switches

Refer to "System pump control" in the "Water Piping" section of this manual for important information on pump control.

The YORK YIA absorption chiller must monitor the flow of water through the various heat exchanger bundles in order to operate correctly. Therefore, flow switches or differential pressure control switches are required on the chilled water and tower (condenser) water flow circuits to determine if flow is established. The chilled water flow switch is a safety control. It must be connected to prevent operation of the unit whenever chilled water flow is stopped.

Flow Switch Wiring

With the introduction of the OptiView Control Panel, by default, thermal (analog) type flow switches are installed and wired into the control panel at the factory.

Digital type condenser and chilled liquid flow switches are optional and would be wired into the I/O board.

The contact rating for these devices must be able to meet 5 milliamperes at 115 volts A.C.

MISCELLANEOUS WIRING

This section covers wiring devices that may or may not be applicable to all units. To find out what applies to your unit, contact your local Johnson Controls office.

The below items are listed for reference purposes only. A qualified Johnson Controls service technician must accomplish all wiring to unit control and junction boxes (*refer to Form 155.21-W2*).

Each 115VAC field-connected inductive load i.e., relay coil, motor starter, etc. must have a transient suppressor wired in parallel with its coil, physically located at the coil. A bag of transient suppressors can be found inside the unit panel.

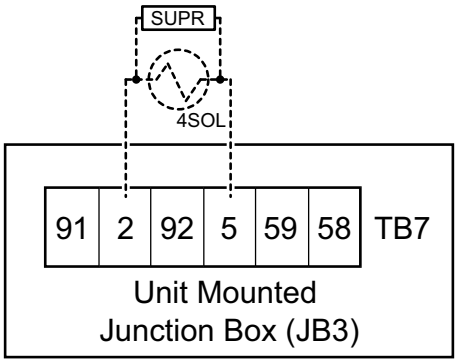
All wiring must be of copper and wired in accordance with all national, state and local codes.

– – – – – Customer supplied wiring

——— Factory supplied wiring

Automatic Steam Shut-off Valve (4SOL)

This device must not exceed 1 amp holding and 10 amps inrush for 115VAC field supplied and installed steam shut-off valve.

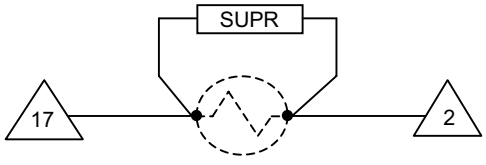


Note: Terminals 5 & 2 are located on terminal board 7 (TB7) in remote unit mounted junction box 3 (JB3).

FIGURE 26 - AUTOMATIC STEAM SHUT-OFF VALVE

Steam Condensate Drain Valve (6SOL)

If applicable, this valve is shipped loose for field installation. Wiring will be supplied by factory and connected to unit. Connection at valve to be completed by qualified technician.



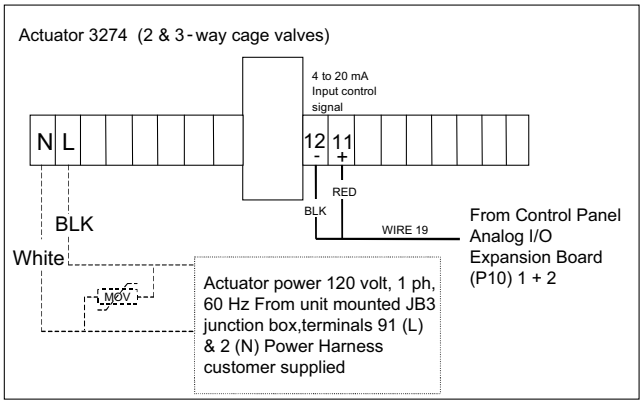
Note: Terminals 17 & 2 are located on the digital input board, TB3.

FIGURE 27 - STEAM CONDENSATE DRAIN VALVE

Control Valve Connections

The following control valve connections are illustrated for power wiring purposes only. A qualified Johnson Controls service technician must complete control signal wiring.

For the power wiring, Johnson Controls recommends the following: #18 AWG, AWG dia 0.049, UL or CSA (nom) 1620 with 16 strands, 600 volt rating, AWM/ UL style 1015. Insulation with minimum temp rating 105°C, nominal thickness 2/64, color white for the wire #2 because it will be the neutral and black for the other wires. These wires should be routed using ½" metallic flexible conduit and appropriate fittings at each end. The length of this wire can be measured from the unit mounted junction box (JB3) to the valve.



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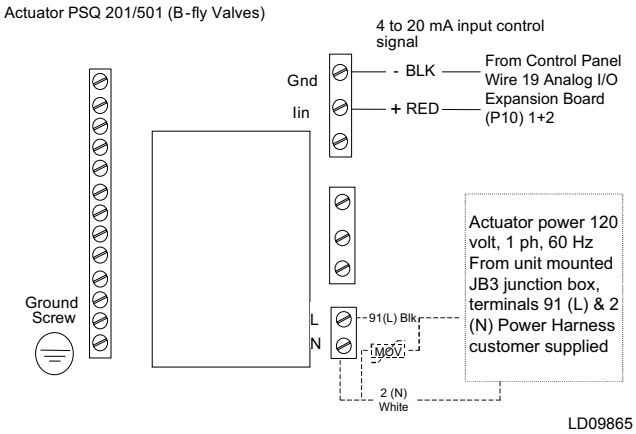

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FIGURE 28 - CONTROL VALVE CONNECTIONS

System Pump Control Wiring

For Johnson Controls's recommendation on pump control, refer to the "Unit Water Piping" section in this document. The customer must supply all wiring. Contact rating is 5 amps resistive at 250 volts A.C. & 30 volts D.C., 2 amps inductive (0.4 PF) at 250 volts A.C. & 30 volts D.C.

Each 115VAC field-connected inductive load i.e., relay coil, motor starter, etc. must have a transient suppressor wired in parallel with its coil, physically located at the coil. A bag of transient suppressors can be found inside the unit panel.

The wiring requirements for the control panel to control the pumps are below.

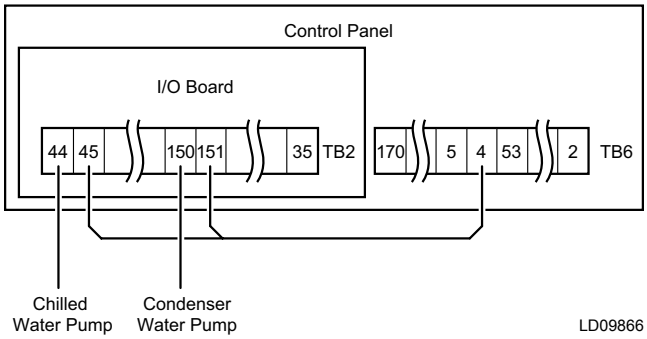

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FIGURE 29 - SYSTEM PUMP CONNECTIONS

NOTE

For further details on the following wiring connections (refer to Johnson Controls manual 155.21-W1).

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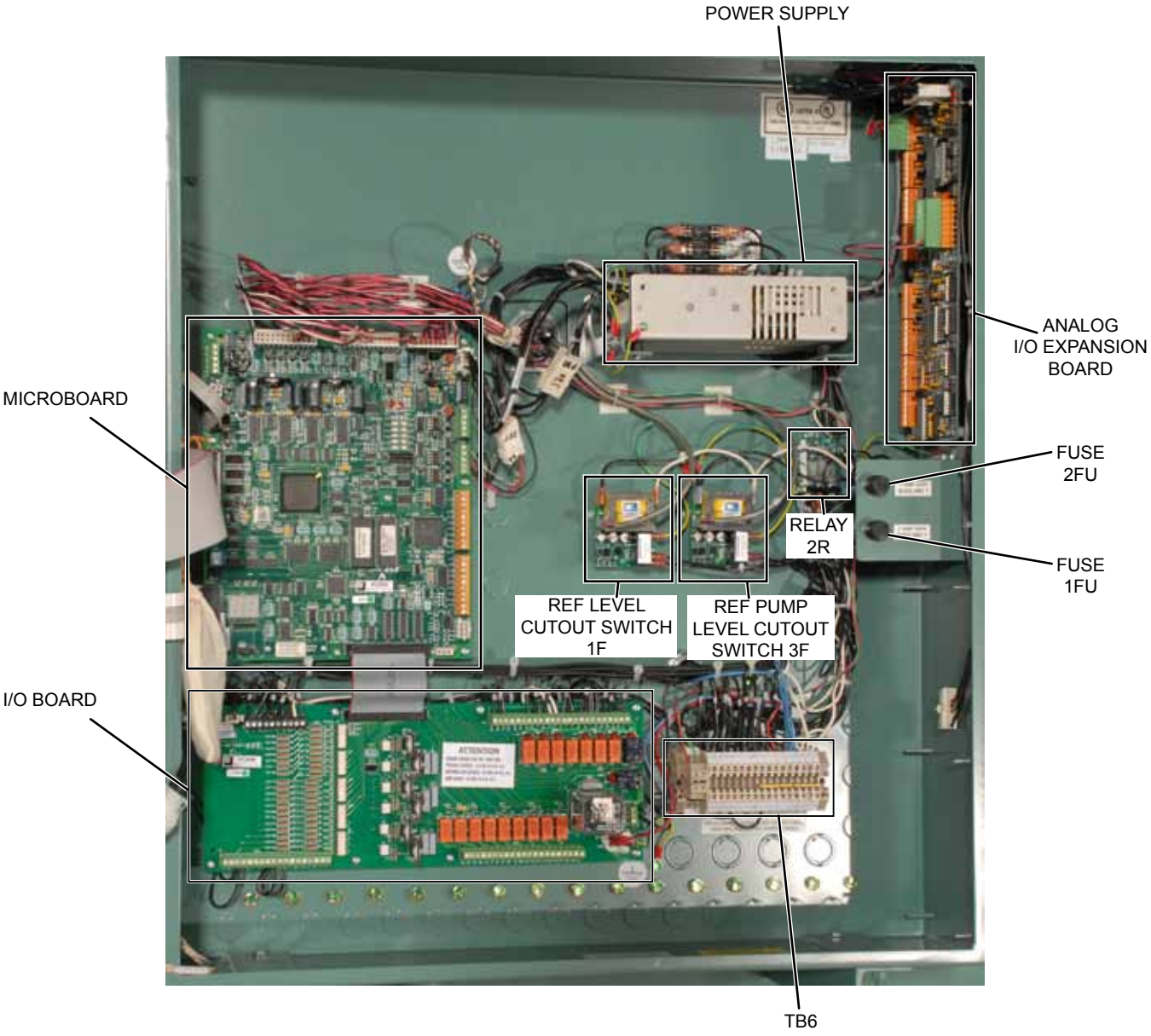

* TB7 is located in JB3 (remote unit mounted Junction box)

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FIGURE 30 - YORK YIA OPTIVIEW CONTROL CENTER COMPONENT LOCATIONS

SECTION 11 - PROTECTION FROM CRYSTALLIZATION

PROTECTION FROM CRYSTALLIZATION DURING POWER FAILURES

In the event of a power failure, an absorption chiller is susceptible to crystallization as it cools down. Because of this, there are certain techniques that can be applied to the chiller to help avoid crystallization. Listed below are some of these techniques.

Eliminating Heat Input

This is especially important on steam-fired units. During a power failure, steam from the boiler will continue to flow to the chiller for an undetermined amount of time. If not stopped, the steam will continue to boil the water out of the solution in the generator, pushing the solution's concentration closer to the crystallization area on the PTX chart.

Johnson Controls factory can provide one of two methods to reduce Heat Input, depending on the type of steam valve selected for the chillers application.

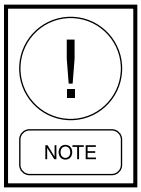
1. Johnson Controls will provide a fail-closed steam valve. The fail-closed steam valve has an internal spring, which will close the valve upon power failure. Fail-closed steam valves are only available in the cage-type design from the factory.
2. If the chiller has been selected for a butterfly-type control valve, Johnson Controls will supply a steam condensate drain solenoid valve. This NC valve will close upon power failure to keep the steam condensate from exiting the generator section.

The above options are not available for hot water fired units. Normally, during a power failure the hot water pump will lose power as well, stopping the flow of hot water to the unit.

Automatic Shut-off Valve

Another method of stopping the heat into a steam machine is to install an automatic shut-off valve in the steam inlet line to the chiller's generator bundle.

The automatic shut-off valve is not supplied by the factory and must be purchased and installed by the customer or the installing contractor.



See the Inlet Steam Piping section of this document for details for piping and selection of this valve.

Basically, the customer supplied shut-off valve will remain open when current is applied to terminals 2 and 5 on terminal board 7, which is located in unit-mounted junction box 3. Upon loss of current, this NC valve will shut to assure zero steam flow into the chiller. This valve works in conjunction with the condensate drain solenoid valve, if the unit is so equipped.

Uninterruptible Power Supply (UPS)

This device is a special factory option available at time of order submittal. A relay in the control panel will command the control valve to close using the UPS for power in the event that AC power is lost to the chiller.

If the unit has a factory supplied UPS, certain start-up, operation and maintenance procedures will be in effect. Please contact your local Johnson Controls service office for more details.

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SECTION 12 - INSULATION

INSULATION

Insulation on a single-stage absorption chiller can offer many benefits, such as: Elimination of condensation on cold surfaces (this is especially true in warm, humid environments); protects personnel working on or around the absorption equipment from the high temperature surfaces; prevents or prolongs the unit from crystallizing during a power failure.

Some areas of the chiller, such as small diameter solution piping will cool quicker than larger thermal mass areas such as the generator. By insulating these critical areas, the heat in the solution may be retained long enough for the power to be restored to the chiller before crystallization happens.

Hot Surface Insulation

Johnson Controls recommends using 2" (51 mm) thick, 3-pound density fiberglass insulation. The insulation may be covered with metallic jacketing or sealed with thermal mastic compound if desired. The main surfaces to receive this type of insulation are: solution-to-solution heat exchanger, piping between the solution-to-solution heat exchanger and generator, generator heads, and the steam/hot water piping. See *Appendix A*, at the end of this document for detailed illustrations on which surfaces get cold insulation. As an option, the upper shell may be insulated to limit the amount of heat gain to the equipment room.

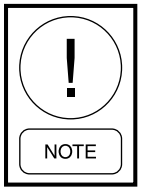
Glued insulation pins may be used for installing the fiberglass insulation to the hot areas of the unit. A high-temperature epoxy adhesive is available from various supply houses for this purpose. **DO NOT USE WELD PINS!**

Never weld to the unit shell or use weld pins for applying insulation. This action could penetrate the shell exterior and may jeopardize the integrity of the chiller. If in question contact the local Johnson Controls service office.

Cold Surface Insulation

Johnson Controls recommends using 3/4" (19 mm), closed-cell foam insulation. Cold surfaces to be insulated are evaporator shell and heads, refrigerant pump, evaporator refrigerant outlet box, miscellaneous piping between and around the refrigerant pump, and piping to the evaporator sprays.

The surface of the cold insulation must be sealed vapor tight to keep the glue intact and prevent sweating and mildew from forming underneath the insulation. All seams must also be sealed or covered with tape.

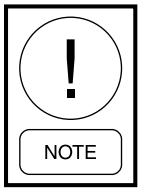


See Appendix A, detailed schematics on which surfaces get cold side insulation.

Insulation Tips

Not adhering to the following statements may either void unit warranty, or cause damage the chiller.

Never insulate the unit's pump motors. The motor housings have air holes, for ventilation and cooling purposes. Blocking these holes will cause premature motor failure.

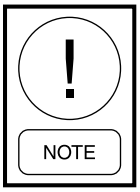


Do not apply any insulation to the unit until the unit has been completely started up and confirmed to be leak free.

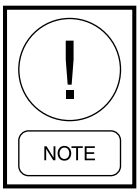
When insulating the unit, do not cover any sight glasses, hand valves, or water head bolts or nuts. These areas must be accessible for service and operation personnel. If insulation is desired in these areas, do not glue the insulation to the surface, in that way it can be easily removed for servicing the unit.

Factory Applied Chiller Insulation

As a special option, chiller refrigerant- side (anti-sweat) insulation can be furnished and installed at the factory if so desired. This option must be taken advantage of at the time of the original chiller order.

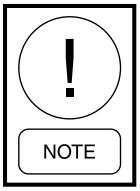


The factory supplied, refrigerant-side insulation option must be given consideration before ordering. This is due to the fact that additional field supplied and installed chiller insulation is a must after the unit is commissioned. Furthermore, factory installed insulation, due to it's vulnerable nature, is prone to damage during shipping, rigging and installation process.



Johnson Controls will not be responsible for damaged insulation due to negligence in shipping, rigging or installation of the chiller.

Specific applications and economic concerns may control the decision to have insulation applied at the factory. Evaporator water boxes and the customer's chilled water lines must be insulated in the field to keep condensation from dripping onto machine room equipment and floors. Usually, when this insulation is applied, the insulation contractor will also insulate the necessary components and piping on the chiller.



Refrigerant-side (anti-sweat) insulation is not offered as a field retrofit or an aftermarket product.

If the factory applied anti-sweat insulation option is ordered, the following chiller components will be insulation with closed-cell foam insulation from the factory.

- Evaporator spill box.
- Refrigerant pump suction line.
- Refrigerant pump housing.
- Refrigerant pump discharge line.
- Refrigerant spray header.
- Unloading solenoid (3SOL) line.
- Anti-freeze line.
- Intersection of Evaporator/Absorber shell (both sides). NOT THE COMPLETE SHELL.

TABLE 3 - EVAPORATOR SHELL APPROXIMATE INSULATION SIZES ENGLISH (METRIC)

MODEL UNIT	INSULATION WIDTH (CM)	SQ. FT. (SQ. METERS)
1A1	10" (26)	17 (1.58)
1A2	10" (26)	20 (1.85)
2A3	10" (26)	24 (2.23)
2A4	10" (26)	27 (2.5)
2B1	12" (31)	28 (2.6)
3B2	12" (31)	32 (3.0)
3B3	12" (31)	36 (3.34)
4B4	12" (31)	40 (3.72)
4C1	14" (36)	38 (3.53)
5C2	14" (36)	42 (3.9)
5C3	14" (36)	47 (4.37)
6C4	14" (36)	53 (4.92)
7D1	16" (41)	48 (4.46)
7D2	16" (41)	54 (5.02)
8D3	16" (41)	60 (5.57)
8E1	18" (46)	60 (5.57)
9E2	18" (46)	68 (6.32)
10E3	18" (51)	75 (7.0)
12F1	18" (51)	75 (7.0)
13F2	18" (51)	84 (7.8)
14F3	18" (51)	92 (8.55)

INSULATION

TABLE 4 - APPROXIMATE INSULATION FOR HOT AND COLD SURFACES – ENGLISH (METRIC)

MODEL YIA	COLD SURFACES			HOT SURFACES		
	EVAP HEADS & END SHEETS SQ. FT. (M2)	REFRIG OUTLET BOX & PUMP SQ. FT. (M2)	REFRIG SUCTION & DISCHARGE LINES - TUBULAR INSULATION DIA. IN/ L IN FT (CM/LIN. M)	UPPER SHELL SQ. FT. (M2)	GENERATOR HEADS SQ. FT. (M2)	SOLUTION-TO-SOLUTION HEAT EXCH. SQ. FT. (M2)
1A1	16 (1.5)	16 (1.5)	2/11, 4/4 (5/3.4, 10/1.2)	70 (6.5)	2 (0.2)	27 (2.5)
1A2	16 (1.5)	16 (1.5)	2/12,4/3 (5/3.7, 10/0.9)	70 (6.5)	2 (0.2)	32 (3.0)
2A3	16 (1.5)	16 (1.5)	2/12, 4/3 (5/3.7, 10/0.9)	81 (7.5)	2 (0.2)	38 (3.5)
2A4	16 (1.5)	16 (1.5)	2/12, 4/3 (5/4.0, 10/0.9)	93 (8.6)	2 (0.2)	43 (4.0)
2B1	19 (1.8)	17 (1.6)	2/9, 2-½ /4, 4/4 (5/2.7, 6.5/1.2, 10/1.2)	95 (8.8)	3 (0.3)	44 (4.0)
3B2	19 (1.8)	17 (1.6)	2/10, 2-½ /4, 4/4 (5/3.0, 6.5/1.2, 10/1.2)	110 (10.2)	3 (0.3)	49 (4.6)
3B3	19 (1.8)	17 (1.6)	2/11, 2-½ /4, 4/4 (5/3.4, 6.5/1.2, 10/1.2)	125 (11.6)	3 (0.3)	55 (5.1)
4B4	19 (1.8)	17 (1.6)	2/12, 2-½ /4, 4/4 (5/3.7, 6.5/1.2, 10/1.2)	136 (12.6)	3 (0.3)	63 (5.9)
4C1	26 (2.4)	18 (1.7)	2-½ / 11, 3/4, 4/6 (6.5/3.4, 7.5/1.2, 10/1.8)	132 (12.2)	4 (0.4)	51 (4.7)
5C2	26 (2.4)	18 (1.7)	2/12, 3/4, 4/6 (5/3.7, 7.5/1.2, 10/1.8)	148 (13.7)	4 (0.4)	59 (5.5)
5C3	26 (2.4)	18 (1.7)	2-½ /13, 3/4, 4/6 (6.5/4.0, 7.5/1.2, 10/1.8)	165 (12.3)	4 (0.4)	60 (5.6)
6C4	26 (2.4)	18 (1.7)	2-½ /14, 3/4, 4/6 (6.5/4.3, 7.5/1.2, 10/1.8)	185 (17.1)	4 (0.4)	61 (5.7)
7D1	39 (3.6)	31 (2.9)	3/17 (7.5/5.2, 10/1.8)	180 (16.7)	7 (0.7)	62 (5.8)
7D2	39 (3.6)	31 (2.9)	3/18, 4/6 (7.5/5.5, 10/1.8)	200 (18.6)	7 (0.7)	69 (6.4)
8D3	39 (3.6)	31 (2.9)	3/19, 4/6 (7.5/5.8, 10/1.8)	225 (21.0)	7 (0.7)	76 (7.0)
8E1	55 (5.1)	43 (4.0)	3/22, 4/8 (7.5/6.7, 10/2.4)	225 (21.0)	8 (0.7)	76 (7.0)
9E2	55 (5.1)	43 (4.0)	3/24, 4/8 (7.5/7.3, 10/2.4)	255 (21.0)	8 (0.7)	85 (7.9)
10E3	55 (5.1)	43 (4.0)	3/24, 4/8 (7.5/7.3, 10/2.4)	285 (26.5)	8 (0.7)	97 (9.0)
12F1	67 (6.2)	44 (4.1)	3/21, 4/28, 6/6 (7.5/6.4, 10/8.5, 15/2)	290 (27.0)	10 (0.9)	95 (8.8)
13F2	67 (6.2)	44 (4.1)	3/23, 4/28, 6/6 (7.5/7.0, 10/8.5, 15/2)	320 (29.8)	10 (0.9)	90 (8.3)
14F3	67 (6.2)	44 (4.1)	3/24, 4/28, 6/6 (7.5/7.3, 10/8.5, 15/2)	355 (33.0)	10 (0.9)	100 (9.3)

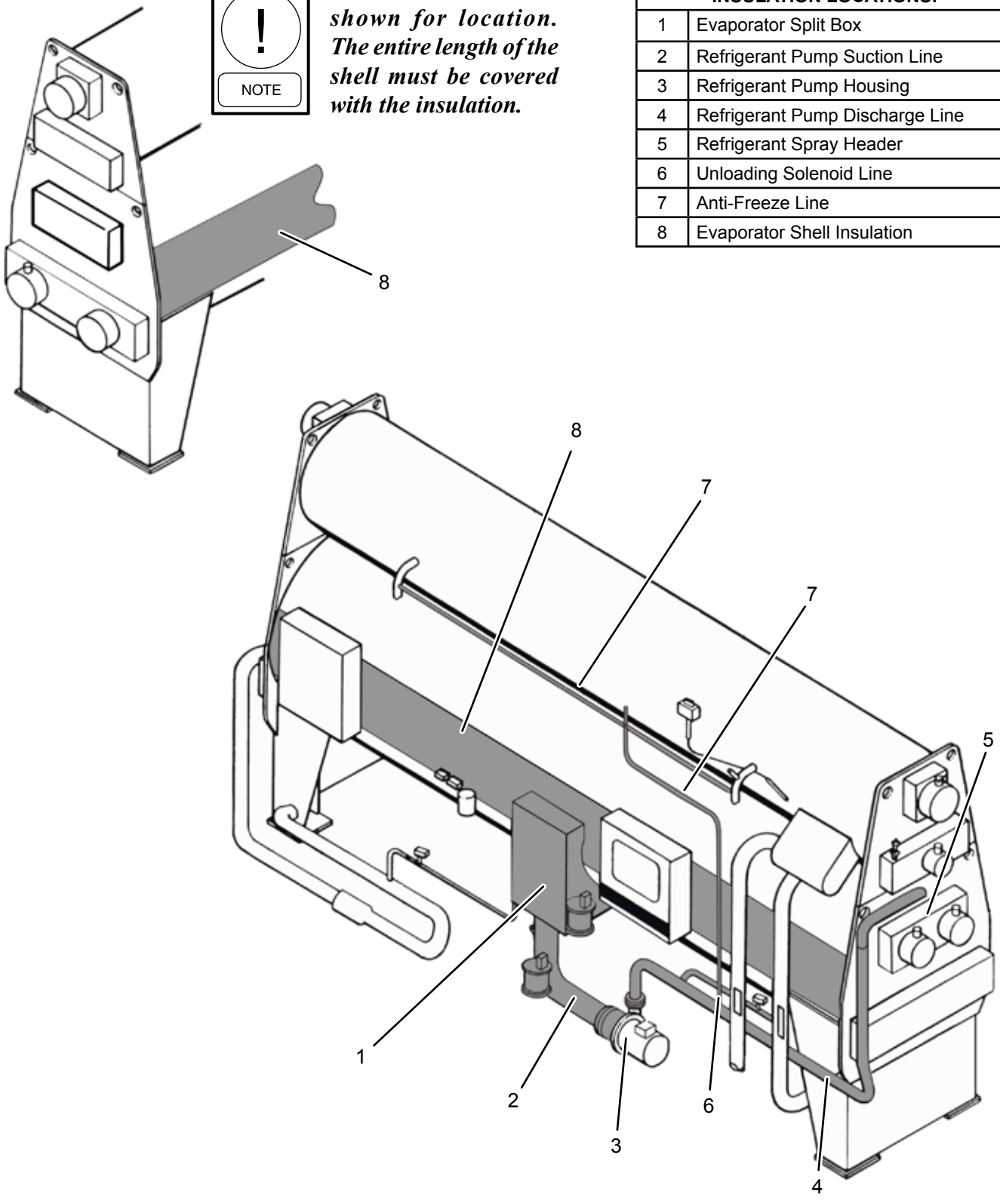
NOTES: 1. Evaporator shell insulation is only required if evaporator shell surface sweats.
2. Some of the cold surface insulation may be purchased as an extra option from the factory.

REFRIGERANT SIDE INSULATION (FACTORY SUPPLIED OPTION)

NOTE

Partial insulation shown for location. The entire length of the shell must be covered with the insulation.

INSULATION LOCATIONS:	
1	Evaporator Split Box
2	Refrigerant Pump Suction Line
3	Refrigerant Pump Housing
4	Refrigerant Pump Discharge Line
5	Refrigerant Spray Header
6	Unloading Solenoid Line
7	Anti-Freeze Line
8	Evaporator Shell Insulation



NOTE:
Shaded areas are the locations of the insulation.

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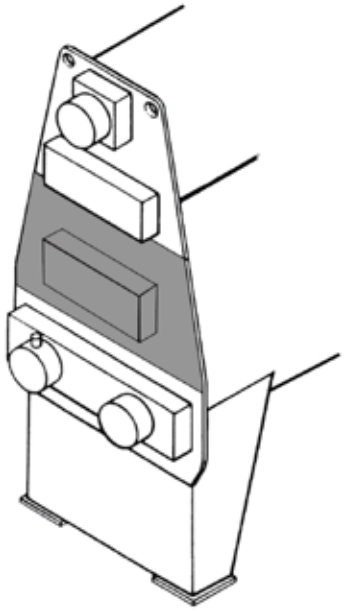
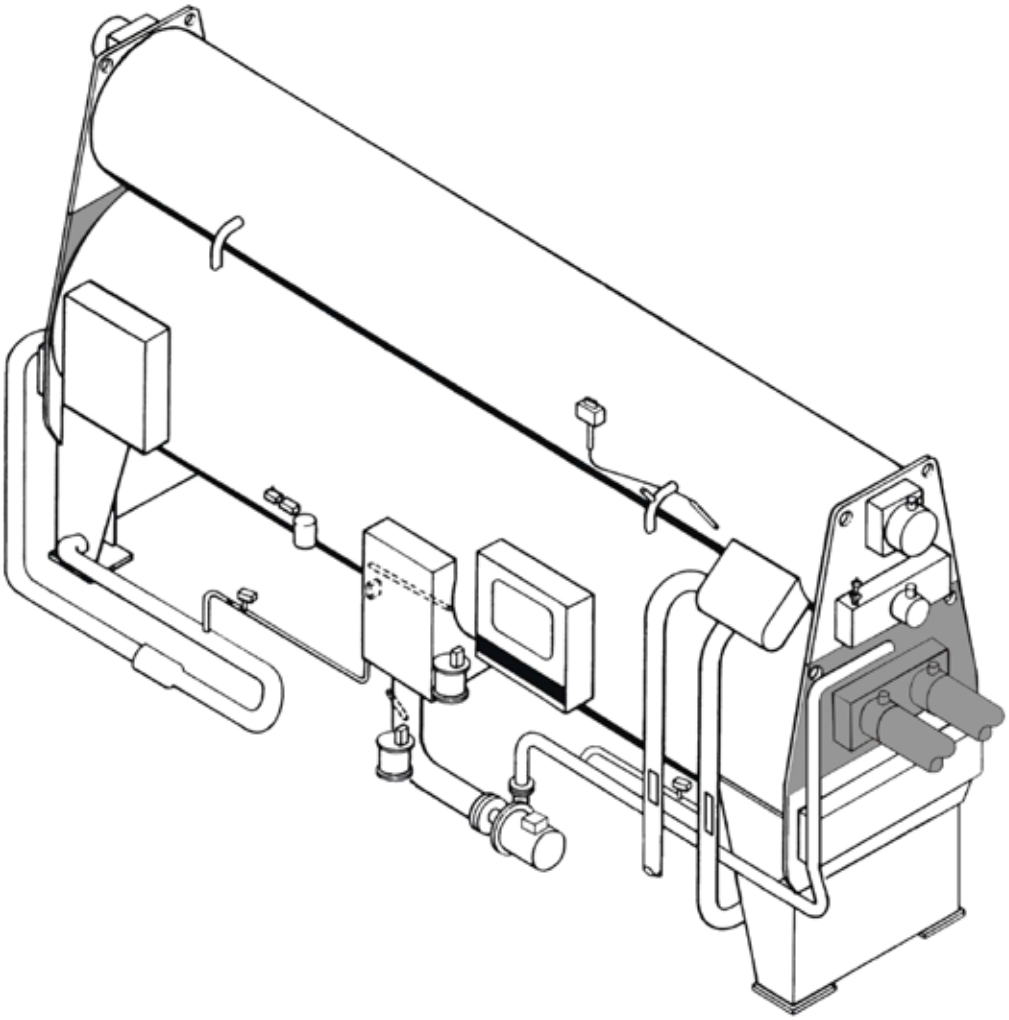
FIGURE 31 - REFRIGERANT SIDE INSULATION (FACTORY SUPPLIED OPTION)

COLD SIDE INSULATION (FIELD SUPPLIED AND INSTALLED)





NOTE

Cold side insulation must be applied in addition to the refrigerant side insulation as shown.

NOTE:
Shaded areas are the locations of the insulation.

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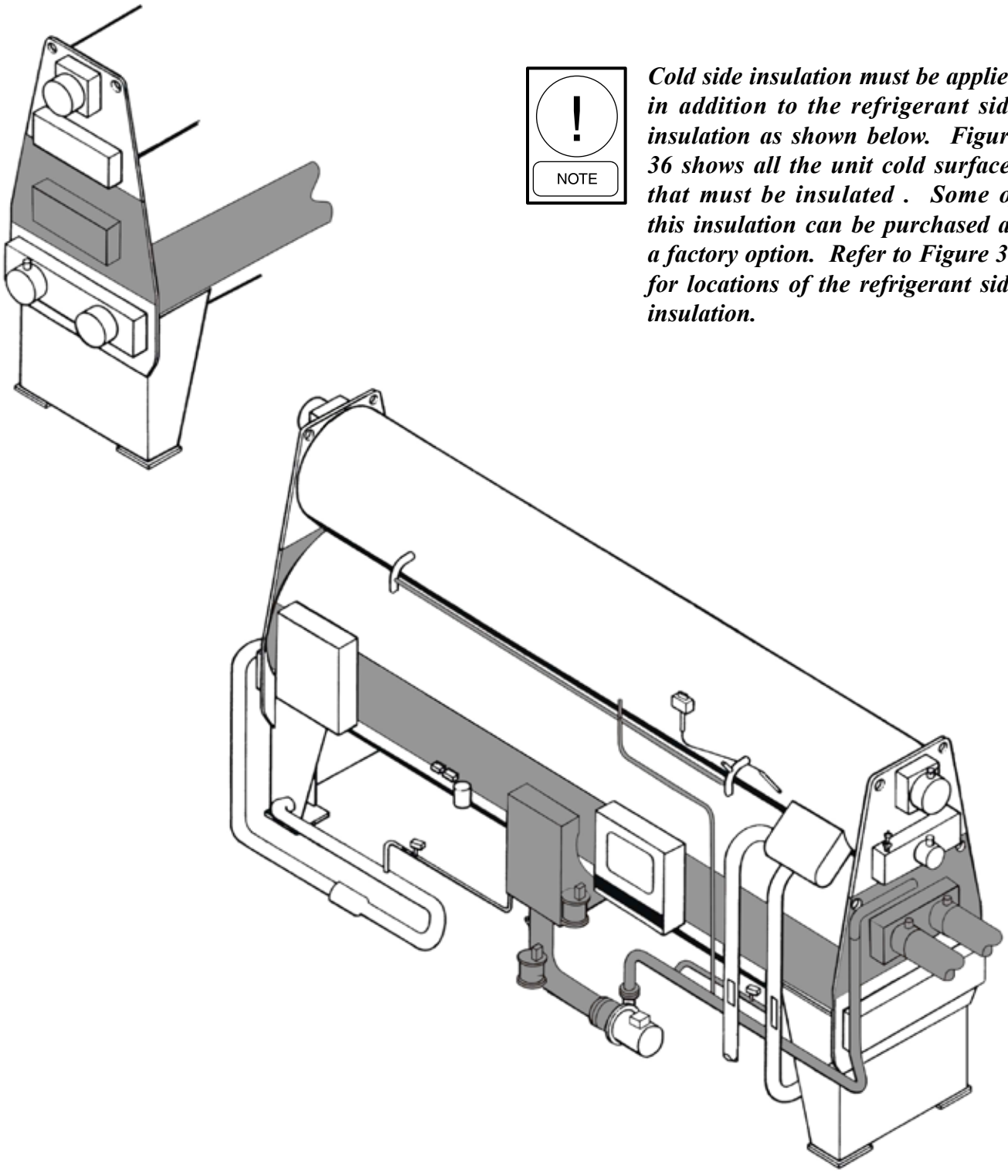
FIGURE 32 - COLD SIDE INSULATION (FIELD SUPPLIED AND INSTALLED)

REFRIGERANT SIDE AND COLD SIDE INSULATION



NOTE

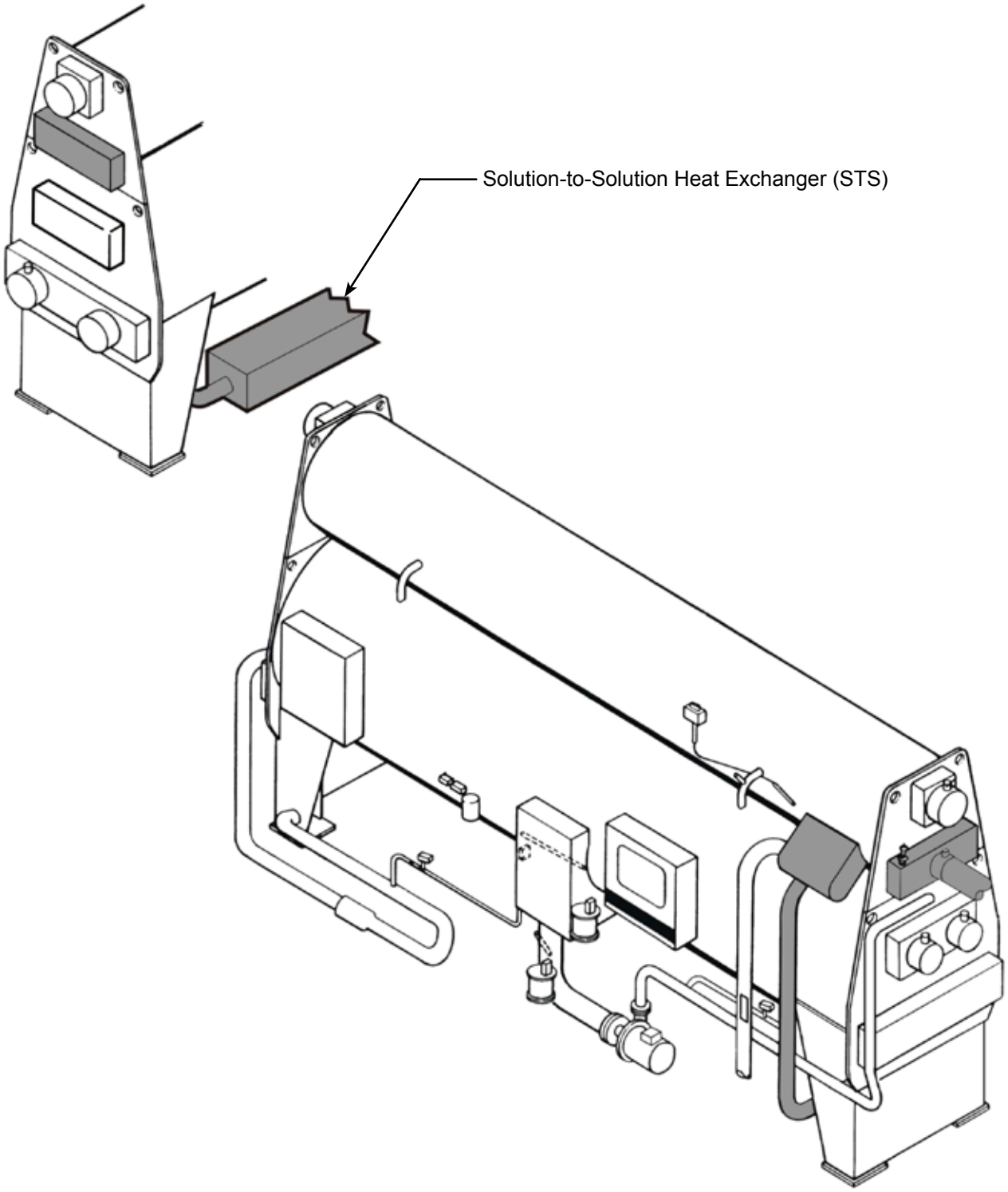
Cold side insulation must be applied in addition to the refrigerant side insulation as shown below. Figure 36 shows all the unit cold surfaces that must be insulated . Some of this insulation can be purchased as a factory option. Refer to Figure 33 for locations of the refrigerant side insulation.

NOTE:
Shaded areas are the locations of the insulation.

LD10078

FIGURE 33 - REFRIGERANT SIDE AND COLD SIDE INSULATION

HOT SURFACES INSULATION (FIELD SUPPLIED AND INSTALLED)



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NOTE:
Shaded areas are the locations of the insulation.

FIGURE 34 - HOT SURFACES INSULATION (FIELD SUPPLIED)

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APPENDIX A

MAJOR COMPONENT LOCATION

FIGURE 35 - MAJOR COMPONENT LOCATIONS FOR YORK YIA CHILLERS

A

UNIT WEIGHTS

TABLE 5 - UNIT WEIGHTS ENGLISH (METRIC)

MODEL	OPERATING WEIGHT[2] LBS (KG)	SHIPPING WEIGHT[3] LBS (KG)	RIGGING WEIGHT LBS (KG)	SOLUTION WEIGHT LBS (KG)	REFRIGERANT WEIGHT (LBS)	WATER WEIGHT IN ABS/COND/ EVAP/GEN LBS (KG)	TOP SHELL WEIGHT LBS (KG)	BOTTOM SHELL WEIGHT LBS (KG)
1A1	11,298 (5,124)	8,758 (3,972)	8,558 (3,881)	1,501 (681)	167 (76)	856 (388)	2,190 (993)	6,568 (2,979)
1A2	12,657 (5,741)	9,629 (4,367)	9,529 (4,322)	1,782 (808)	250 (114)	976 (443)	2,407 (1,092)	7,222 (3,275)
2A3	13,959 (6,331)	10,618 (4,816)	10,418 (4,725)	1,916 (869)	284 (129)	1,120 (508)	2,655 (1,204)	7,964 (3,612)
2A4	15,399 (6,984)	11,492 (5,212)	11,292 (5,121)	2,318 (1,052)	317 (144)	1,248 (566)	2,873 (1,303)	8,619 (3,909)
2B1	17,651 (8,006)	13,124 (5,952)	13,024 (5,907)	2,600 (1,179)	400 (182)	1,496 (679)	3,281 (1,488)	9,843 (4,464)
3B2	19,709 (8,939)	14,514 (6,583)	14,314 (6,492)	3,002 (1,362)	434 (197)	1,728 (784)	3,629 (1,646)	10,886 (4,937)
3B3	21,572 (9,784)	15,879 (7,202)	15,679 (7,111)	3,270 (1,482)	484 (219)	1,904 (864)	3,970 (1,801)	11,909 (5,402)
4B4	23,574 (10,692)	17,243 (7,821)	17,143 (7,775)	3,685 (1,672)	534 (242)	2,072 (940)	4,311 (1,955)	12,932 (5,866)
4C1	24,778 (11,239)	18,041 (8,183)	17,741 (8,047)	3,819 (1,732)	434 (197)	2,432 (1,103)	4,510 (2,046)	13,531 (6,137)
5C2	27,549 (12,496)	19,735 (8,951)	19,435 (8,815)	4,502 (2,042)	475 (216)	2,784 (1,263)	4,934 (2,238)	14,801 (6,713)
5C3	29,841 (13,535)	21,283 (9,683)	20,983 (9,517)	4,918 (2,231)	542 (246)	3,040 (1,379)	5,321 (2,421)	15,962 (7,262)
6C4	32,564 (14,770)	22,918 (10,395)	22,618 (10,259)	5,601 (2,541)	642 (291)	3,336 (1,513)	5,730 (2,599)	17,189 (7,796)
7D1	38,262 (17,355)	28,063 (12,729)	27,763 (12,593)	5,601 (2,541)	734 (333)	3,792 (1,720)	7,016 (3,182)	21,047 (9,547)
7D2	42,818 (19,421)	31,492 (14,284)	31,192 (14,148)	6,285 (2,851)	826 (375)	4,136 (1,876)	7,873 (3,571)	23,619 (10,713)
8D3	47,431 (21,514)	34,904 (15,832)	34,604 (15,696)	6,968 (3,161)	926 (420)	4,544 (2,061)	8,726 (3,958)	26,178 (11,874)
8E1	53,402 (24,222)	38,076 (17,270)	37,676 (17,089)	8,603 (3,902)	1,076 (488)	5,544 (2,515)	9,519 (4,318)	28,557 (12,953)
9E2	60,053 (27,239)	42,360 (19,214)	41,960 (19,032)	10,238 (4,644)	1,235 (560)	6,104 (2,769)	10,590 (4,804)	31,770 (14,411)
10E3	66,184 (30,020)	47,344 (21,474)	46,944 (21,293)	16,653 (4,832)	1,401 (636)	6,656 (3,019)	11,836 (5,369)	35,508 (16,106)
12F1	75,491 (34,242)	See note 4	43,066[1] (19,534)	12,288 (5,574)	1,351 (613)	7,936 (3,600)	13,442 (6,097)	40,325 (18,290)
13F2	82,330 (37,344)	See note 4	46,618[1] (21,145)	13,789 (,6255)	1,502 (681)	8,656 (3,926)	14,555 (6,602)	43,664 (19,805)
14F3	88,583 (40,180)	See note 4	48,970[1] (22,212)	15,276 (6,929)	1,702 (772)	9,352 (4,242)	15,518 (7,039)	46,553 (21,116)

NOTES:

[1] Bottom shell only. (Largest Rigging Component.)

[2] Operating weight = shipping weight + weight of refrigerant and solution + weight of chilled, tower and hot water in the tubes, less packaging materials.

[3] Shipping weight = Top & bottom shell weight packaging included.

[4] Top shell & bottom shell shipping separately. (Weight includes packaging)

SHELL AND TUBE VOLUMES

TABLE 6 - SHELL AND TUBE VOLUMES

Chiller Shell And Tube Volumes												
Unit Model	SHELL SIDE				Tube Side							
	Gen / Cond		Abs / Evap		Absorber		Evaporator		Generator		Condenser	
	Gallons	Liters	Gallons	Liters	Gallons	Liters	Gallons	Liters	Gallons	Liters	Gallons	Liters
1A1	175	662	543	2,055	45	170	32	121	14	53	16	61
1A2	211	799	653	2,472	52	197	36	136	16	61	18	68
2A3	249	943	764	2,892	58	220	40	151	17	64	25	95
2A4	277	1,049	875	3,312	64	242	45	170	19	72	28	106
2B1	361	1,366	1,006	3,808	81	307	55	208	23	87	28	106
3B2	405	1,533	1,152	4,361	90	341	61	231	25	95	40	151
3B3	456	1,726	1,298	4,913	99	375	67	254	28	106	44	167
4B4	508	1,923	1,444	5,466	108	409	73	276	30	114	48	182
4C1	587	2,222	1,516	5,739	130	492	88	333	37	140	49	185
5C2	646	2,445	1,701	6,439	143	541	96	363	41	155	68	257
5C3	719	2,722	1,899	7,188	156	591	105	397	44	167	75	284
6C4	810	3,066	2,136	8,085	171	647	115	435	49	185	82	310
7D1	904	3,422	2,690	10,182	193	731	134	507	56	212	91	344
7D2	1,004	3,800	2,992	11,326	210	795	146	553	61	231	100	379
8D3	1,130	4,277	3,371	12,760	232	878	160	606	66	250	110	416
8E1	1,264	4,785	3,756	14,218	278	1,052	192	727	82	310	141	534
9E2	1,423	5,386	4,230	16,012	306	1,158	211	799	90	341	156	591
10E3	1,582	5,988	4,705	17,810	334	1,264	230	871	97	367	171	647
12F1	1,911	7,234	5,137	19,445	395	1,495	269	1018	124	469	204	772
13F2	2,125	8,044	5,730	21,690	431	1,631	293	1109	135	511	223	844
14F3	2,340	8,858	6,311	23,889	467	1,768	315	1192	145	549	242	916

ELECTRICAL DATA

TABLE 7 - ELECTRICAL RATINGS

Model	Voltage Code	Voltage (V-Ph-Hz)	Wire Ampacity (amps)	Non-Fused Disconnect Switch (amps)	Max Dual Element Fuse amperage (customer supplied)	Solution Pump	Refrigerant Pump	Purge Pump	Control Panel (amps)	Total unit KW	Unit total Amps
1A1	-17	200/208-3-60	35.2	100	45	12.5	12.5	2.1	20	5.9	32.10
	-28	230-3-60	33.5	100	45	12.0	12.0	2.2	20	5.9	30.50
	-50	380-3-50	18.3	100	20	6.5	6.5	1.1	20	5.9	16.70
	-50	400-3-50	17.7	100	20	6.3	6.3	1.1	20	5.9	16.15
	-46	460-3-60	16.8	100	20	6.0	6.0	1.1	20	5.9	15.30
	-57	575-3-60	13.7	100	15	4.9	4.9	1.0	20	5.9	12.50
1A2	-17	200/208-3-60	35.2	100	45	12.5	12.5	2.1	20	5.9	32.10
	-28	230-3-60	33.5	100	45	12.0	12.0	2.2	20	5.9	30.50
	-50	380-3-50	18.3	100	20	6.5	6.5	1.1	20	5.9	16.70
	-50	400-3-50	17.7	100	20	6.3	6.3	1.1	20	5.9	16.15
	-46	460-3-60	16.8	100	20	6.0	6.0	1.1	20	5.9	15.30
	-57	575-3-60	13.7	100	15	4.9	4.9	1.0	20	5.9	12.50
2A3	-17	200/208-3-60	35.2	100	45	12.5	12.5	2.1	20	5.9	32.10
	-28	230-3-60	33.5	100	45	12.0	12.0	2.2	20	5.9	30.50
	-50	380-3-50	18.3	100	20	6.5	6.5	1.1	20	5.9	16.70
	-50	400-3-50	17.7	100	20	6.3	6.3	1.1	20	5.9	16.15
	-46	460-3-60	16.8	100	20	6.0	6.0	1.1	20	5.9	15.30
	-57	575-3-60	13.7	100	15	4.9	4.9	1.0	20	5.9	12.50
2A4	-17	200/208-3-60	35.2	100	45	12.5	12.5	2.1	20	5.9	32.10
	-28	230-3-60	33.5	100	45	12.0	12.0	2.2	20	5.9	30.50
	-50	380-3-50	18.3	100	20	6.5	6.5	1.1	20	5.9	16.70
	-50	400-3-50	17.7	100	20	6.3	6.3	1.1	20	5.9	16.15
	-46	460-3-60	16.8	100	20	6.0	6.0	1.1	20	5.9	15.30
	-57	575-3-60	13.7	100	15	4.9	4.9	1.0	20	5.9	12.50
2B1	-17	200/208-3-60	35.2	100	45	12.5	12.5	2.1	20	5.9	32.10
	-28	230-3-60	33.5	100	45	12.0	12.0	2.2	20	5.9	30.50
	-50	380-3-50	18.3	100	20	6.5	6.5	1.1	20	5.9	16.70
	-50	400-3-50	17.7	100	20	6.3	6.3	1.1	20	5.9	16.15
	-46	460-3-60	16.8	100	20	6.0	6.0	1.1	20	5.9	15.30
	-57	575-3-60	13.7	100	15	4.9	4.9	1.0	20	5.9	12.50
3B2	-17	200/208-3-60	44.6	100	60	20.0	12.5	2.1	20	7.3	39.60
	-28	230-3-60	42.3	100	60	19.0	12.0	2.2	20	7.3	37.50
	-50	380-3-50	18.3	100	20	6.5	6.5	1.1	20	7.3	16.70
	-50	400-3-50	17.7	100	20	6.3	6.3	1.1	20	7.3	16.15
	-46	460-3-60	21.2	100	30	9.5	6.0	1.1	20	7.3	18.80
	-57	575-3-60	17.4	100	25	7.8	4.9	1.0	20	7.3	15.40

ELECTRICAL DATA (CONT'D)

TABLE 7 - ELECTRICAL RATINGS (CONT'D)

Model	Voltage Code	Voltage (V-Ph-Hz)	Wire Ampacity (amps)	Non-Fused Disconnect Switch (amps)	Max Dual Element Fuse amperage (customer supplied)	Solution Pump	Refrigerant Pump	Purge Pump	Control Panel (amps)	Total unit KW	Unit total Amps
3B3	-17	200/208-3-60	44.6	100	60	20.0	12.5	2.1	20	7.3	39.60
	-28	230-3-60	42.3	100	60	19.0	12.0	2.2	20	7.3	37.50
	-50	380-3-50	22.1	100	30	9.5	6.5	1.1	20	7.3	19.70
	-50	400-3-50	22.9	100	30	10.4	6.3	1.1	20	7.3	20.25
	-46	460-3-60	21.2	100	30	9.5	6.0	1.1	20	7.3	18.80
	-57	575-3-60	17.4	100	25	7.8	4.9	1.0	20	7.3	15.40
4B4	-17	200/208-3-60	44.6	100	60	20.0	12.5	2.1	20	7.3	39.60
	-28	230-3-60	42.3	100	60	19.0	12.0	2.2	20	7.3	37.50
	-50	380-3-50	22.1	100	30	9.5	6.5	1.1	20	7.3	19.70
	-50	400-3-50	22.9	100	30	10.4	6.3	1.1	20	7.3	20.25
	-46	460-3-60	21.2	100	30	9.5	6.0	1.1	20	7.3	18.80
	-57	575-3-60	17.4	100	25	7.8	4.9	1.0	20	7.3	15.40
4C1	-17	200/208-3-60	44.6	100	60	20.0	12.5	2.1	20	7.3	39.60
	-28	230-3-60	42.3	100	60	19.0	12.0	2.2	20	7.3	37.50
	-50	380-3-50	22.1	100	30	9.5	6.5	1.1	20	7.3	19.70
	-50	400-3-50	22.9	100	30	10.4	6.3	1.1	20	7.3	20.25
	-46	460-3-60	21.2	100	30	9.5	6.0	1.1	20	7.3	18.80
	-57	575-3-60	17.4	100	25	7.8	4.9	1.0	20	7.3	15.40
5C2	-17	200/208-3-60	44.6	100	60	20.0	12.5	2.1	20	7.3	39.60
	-28	230-3-60	42.3	100	60	19.0	12.0	2.2	20	7.3	37.50
	-50	380-3-50	22.1	100	30	9.5	6.5	1.1	20	7.3	21.20
	-50	400-3-50	22.9	100	30	10.4	6.3	1.1	20	7.3	20.55
	-46	460-3-60	21.2	100	30	9.5	6.0	1.1	20	7.3	18.80
	-57	575-3-60	17.4	100	25	7.8	4.9	1.0	20	7.3	15.40
5C3	-17	200/208-3-60	44.6	100	60	20.0	12.5	2.1	20	7.3	39.60
	-28	230-3-60	42.3	100	60	19.0	12.0	2.2	20	7.3	37.50
	-50	380-3-50	22.1	100	30	9.5	6.5	1.1	20	7.3	21.20
	-50	400-3-50	22.9	100	30	10.4	6.3	1.1	20	7.3	20.55
	-46	460-3-60	21.2	100	30	9.5	6.0	1.1	20	7.3	18.80
	-57	575-3-60	17.4	100	25	7.8	4.9	1.0	20	7.3	15.40
6C4	-17	200/208-3-60	44.6	100	60	20.0	12.5	2.1	20	7.3	39.60
	-28	230-3-60	42.3	100	60	19.0	12.0	2.2	20	7.3	37.50
	-50	380-3-50	27.7	100	40	14.0	6.5	1.1	20	7.3	24.20
	-50	400-3-50	27.7	100	40	14.3	6.3	1.1	20	7.3	24.15
	-46	460-3-60	21.2	100	30	9.5	6.0	1.1	20	9.2	18.80
	-57	575-3-60	17.4	100	25	7.8	4.9	1.0	20	9.2	15.40

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ELECTRICAL DATA (CONT'D)

TABLE 7 - ELECTRICAL RATINGS (CONT'D)

Model	Voltage Code	Voltage (V-Ph-Hz)	Wire Ampacity (amps)	Non-Fused Disconnect Switch (amps)	Max Dual Element Fuse amperage (customer supplied)	Solution Pump	Refrigerant Pump	Purge Pump	Control Panel (amps)	Total unit KW	Unit total Amps
7D1	-17	200/208-3-60	44.6	100	60	20.0	12.5	2.1	20	7.3	39.60
	-28	230-3-60	42.3	100	60	19.0	12.0	2.2	20	7.3	37.50
	-50	380-3-50	27.7	100	40	14.0	6.5	1.1	20	7.3	24.20
	-50	400-3-50	27.7	100	40	14.3	6.3	1.1	20	7.3	24.15
	-46	460-3-60	21.2	100	30	9.5	6.0	1.1	20	9.2	18.80
	-57	575-3-60	17.4	100	25	7.8	4.9	1.0	20	9.2	15.40
7D2	-17	200/208-3-60	60.9	100	90	33.0	12.5	2.1	20	9.2	52.60
	-28	230-3-60	56.0	100	80	30.0	12.0	2.2	20	9.2	48.50
	-50	380-3-50	27.7	100	40	14.0	6.5	1.1	20	9.2	24.20
	-50	400-3-50	27.7	100	40	14.3	6.3	1.1	20	9.2	24.15
	-46	460-3-60	28.1	100	40	15.0	6.0	1.1	20	9.2	24.30
	-57	575-3-60	22.6	100	30	12.0	4.9	1.0	20	9.2	19.60
8D3	-17	200/208-3-60	60.9	100	90	33.0	12.5	2.1	20	9.2	52.60
	-28	230-3-60	56.0	100	80	30.0	12.0	2.2	20	9.2	48.50
	-50	380-3-50	27.7	100	40	14.0	6.5	1.1	20	9.2	24.20
	-50	400-3-50	27.7	100	40	14.3	6.3	1.1	20	9.2	24.15
	-46	460-3-60	28.1	100	40	15.0	6.0	1.1	20	9.2	24.30
	-57	575-3-60	22.6	100	30	12.0	4.9	1.0	20	9.2	19.60
8E1	-17	200/208-3-60	60.9	100	90	33.0	12.5	2.1	20	9.2	52.60
	-28	230-3-60	56.0	100	80	30.0	12.0	2.2	20	9.2	48.50
	-50	380-3-50	30.7	100	40	14.0	9.5	1.1	20	9.2	27.20
	-50	400-3-50	31.8	100	45	14.3	10.4	1.1	20	9.2	28.25
	-46	460-3-60	28.1	100	40	15.0	6.0	1.1	20	10.7	24.30
	-57	575-3-60	22.6	100	30	12.0	4.9	1.0	20	10.7	19.60
9E2	-17	200/208-3-60	79.0	100	110	40.7	21.0	2.1	20	10.7	68.80
	-28	230-3-60	71.5	100	100	36.8	19.0	2.2	20	10.7	62.30
	-50	380-3-50	35.2	100	45	14.0	14.0	1.1	20	10.7	31.70
	-50	400-3-50	35.7	100	50	14.3	14.3	1.1	20	12.6	32.15
	-46	460-3-60	35.8	100	50	18.4	9.5	1.1	20	12.6	31.20
	-57	575-3-60	29.3	100	40	15.0	7.8	1.0	20	12.6	25.50
10E3	-17	200/208-3-60	91.0	100	125	40.7	33.0	2.1	20	12.6	80.80
	-28	230-3-60	82.5	100	110	36.8	30.0	2.2	20	12.6	73.30
	-50	380-3-50	35.2	100	45	14.0	14.0	1.1	20	12.6	31.70
	-50	400-3-50	35.7	100	50	14.3	14.3	1.1	20	14.4	32.15
	-46	460-3-60	41.3	100	50	18.4	15.0	1.1	20	12.6	36.70
	-57	575-3-60	33.5	100	45	15.0	12.0	1.0	20	12.6	29.70

ELECTRICAL DATA (CONT'D)

TABLE 7 - ELECTRICAL RATINGS (CONT'D)

Model	Voltage Code	Voltage (V-Ph-Hz)	Wire Ampacity (amps)	Non-Fused Disconnect Switch (amps)	Max Dual Element Fuse amperage (customer supplied)	Solution Pump	Refrigerant Pump	Purge Pump	Control Panel (amps)	Total unit KW	Unit total Amps
12F1	-17	200/208-3-60	81.4	100	110	33.0	33.0	2.1	20	12.6	73.10
	-28	230-3-60	74.0	100	100	30.0	30.0	2.2	20	12.6	66.50
	-50	380-3-50	35.2	100	45	14.0	14.0	1.1	20	12.6	31.70
	-50	400-3-50	35.7	100	50	14.3	14.3	1.1	20	12.6	32.15
	-46	460-3-60	37.1	100	50	15.0	15.0	1.1	20	12.6	33.30
	-57	575-3-60	29.7	100	40	12.0	12.0	1.0	20	12.6	26.70
13F2	-17	200/208-3-60	91.0	100	125	40.7	33.0	2.1	20	12.6	80.80
	-28	230-3-60	82.5	100	110	36.8	30.0	2.2	20	12.6	73.30
	-50	380-3-50	35.2	100	45	14.0	14.0	1.1	20	12.6	31.70
	-50	400-3-50	35.7	100	50	14.3	14.3	1.1	20	14.4	32.15
	-46	460-3-60	41.3	100	50	18.4	15.0	1.1	20	12.6	36.70
	-57	575-3-60	33.5	100	45	15.0	12.0	1.0	20	12.6	29.70
14F3	-17	200/208-3-60	91.0	100	125	40.7	33.0	2.1	20	12.6	80.80
	-28	230-3-60	83.2	100	110	36.8	30.0	2.2	20	12.6	74.00
	-50	380-3-50	35.2	100	45	14.0	14.0	1.1	20	12.6	31.70
	-50	400-3-50	35.7	100	50	14.3	14.3	1.1	20	14.4	32.15
	-46	460-3-60	41.3	100	50	18.4	15.0	1.1	20	12.6	36.70
	-57	575-3-60	33.5	100	45	15.0	12.0	1.0	20	12.6	29.70

UNIT CHARGE QUANTITIES

TABLE 8 - UNIT CHARGE QUANTITIES ENGLISH (METRIC)

Model Unit	Nominal Tonnage	Solution Charge[4]					Refrigerant Charge			Unit Alcohol Charge
		Charge Shipped			Unit Charge[3]		Charge Shipped		Unit Charge[3]	
		Drums[1]	Pounds (kgs)	Gallons (liters)	Pounds (kgs)	Gallons (liters)	Drums[3]	Gallons (liters)	Gallons (liters)	Quarts
1A1	120	4	1,608 (729)	120 (454)	1,501 (681)	112 (424)	1	55 (208)	20 (76)	1-1/2
1A2	155	5	2,010 (912)	150 (567)	1,782 (808)	133 (503)	1	55 (208)	30 (113)	1-1/2
2A3	172	5	2,010 (912)	150 (567)	1,916 (869)	143 (541)	1	55 (208)	34 (129)	1-1/2
2A4	205	6	2,412 (1,094)	180 (681)	2,318 (1,051)	173 (655)	1	55 (208)	38 (144)	1-1/2
2B1	235	7	2,814 (1,276)	210 (795)	2,600 (1,179)	194 (734)	1	55 (208)	48 (182)	2
3B2	273	8	3,216 (1,459)	240 (908)	3,002 (1,362)	224 (848)	1	55 (208)	52 (197)	2
3B3	311	9	3,216 (1,459)	270 (1,022)	3,270 (1,483)	244 (923)	2	110 (416)	58 (219)	2
4B4	334	10	3,618 (1,641)	300 (1,135)	3,685 (1,671)	275 (1,041)	2	110 (416)	64 (242)	2
4C1	363	10	4,020 (1,823)	300 (1,135)	3,819 (1,732)	285 (1,079)	1	55 (208)	52 (197)	3
5C2	410	12	4,422 (2,006)	360 (1,363)	4,502 (2,042)	336 (1,272)	2	110 (416)	57 (216)	3
5C3	446	13	4,824 (2,188)	390 (1,746)	4,918 (2,230)	367 (1,389)	2	110 (416)	65 (246)	3
6C4	518	14	5,628 (2,553)	420 (1,589)	5,601 (2,540)	418 (1,582)	2	110 (416)	77 (291)	3
7D1	565	14	5,628 (2,553)	420 (1,589)	5,601 (2,540)	418 (1,582)	2	110 (416)	88 (333)	4
7D2	617	16	6,432 (2,917)	480 (1,817)	6,285 (2,851)	469 (1,775)	2	110 (416)	99 (375)	4
8D3	704	18	6,834 (3,100)	540 (2,044)	6,968 (3,160)	520 (1,968)	3	165 (624)	111 (420)	4
8E1	794	22	8,442 (3,829)	660 (2,498)	8,603 (3,902)	642 (2,430)	3	165 (624)	129 (488)	5
9E2	908	26	9,648 (4,376)	780 (2,952)	10,238 (4,644)	764 (2,892)	3	165 (624)	148 (560)	5
10E3	960	27	10,452 (4,741)	810 (3,066)	10,653 (4,832)	795 (3,009)	3	220 (833)	168 (636)	5
12F1	1148	31	12,060 (5,470)	930 (3,520)	12,288 (5,574)	917 (3,471)	3	165 (624)	162 (613)	6
13F2	1235	35	13,668 (6,200)	1,050 (3,974)	13,789 (6,254)	1,029 (3,895)	4	220 (833)	180 (681)	6
14F3	1377	38	15,276 (6,929)	1,140 (4,315)	15,276 (6,929)	1,140 (4,315)	4	220 (833)	204 (772)	6

NOTES:

[1] Solution drums are 30 gallon capacity.

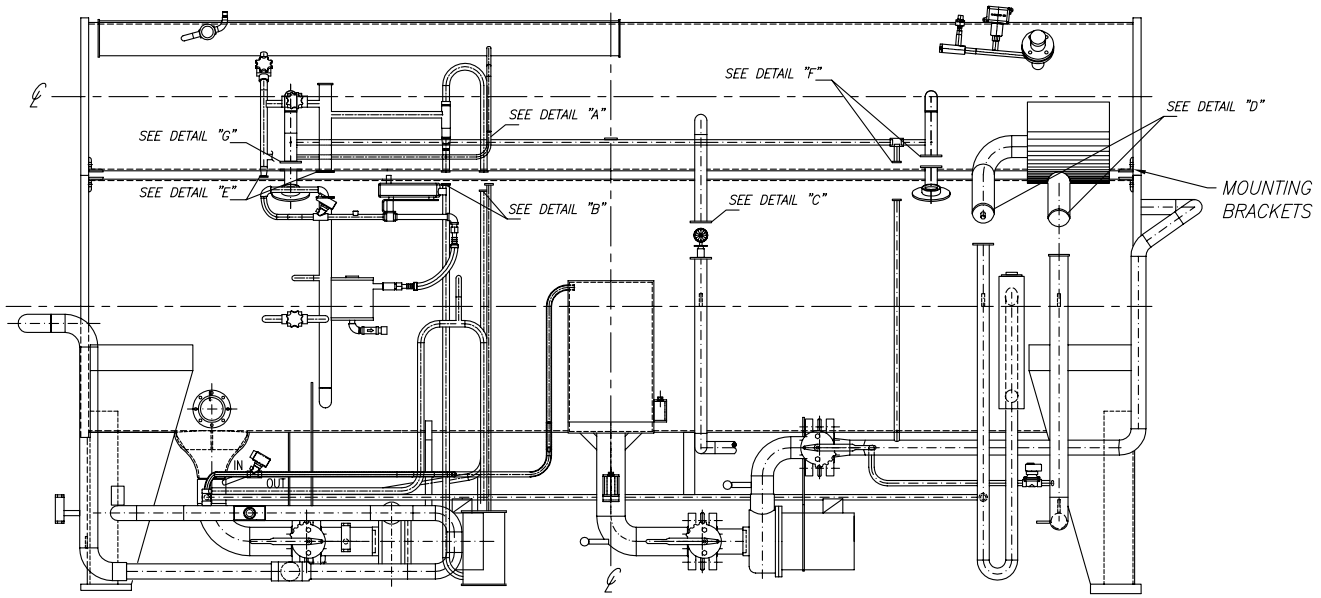
[2] Refrigerate drums are 55 gallon capacity.

[3] Charges for unit charge are TYPICAL. Final trimming of solution and refrigerant may require more or less from the start-up amount.

[4] Solution quantities are based on Advaguard 750 at 53% base concentration.

[5] 1 gallon of water = 8.334 lbs.

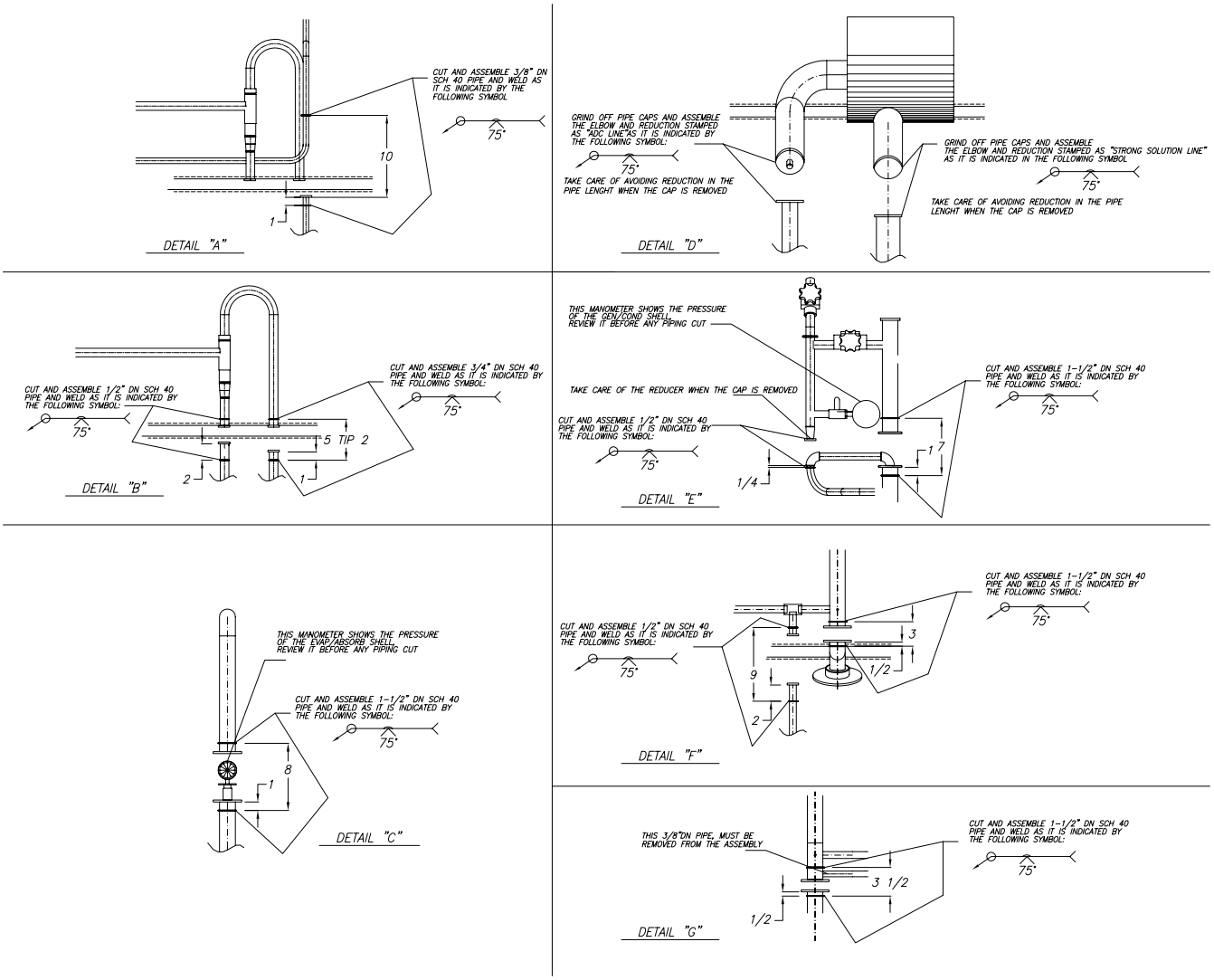
[6] Do not use this Table for mix match units. Refer to 155.16-M3.1 (LS01).



NOTES:
1. - Installation instructions and product drawings must be referred to when field re-assembly is made.
2. - Bevel both sides of all joints as it is indicated in the welding symbols.
3. - The following pieces are shipped loose:
    1 - Reduction and elbow assembly marked as "ADC Line"
    1 - Reduction and elbow assembly marked as "Concentration Solution Line""
    2 - 10" x 1-1/2"ND SCH40 Pipe -
        066R11530-000 for 1A1, 1A2, 2A3, or 2A4
    3 - 10" x 1/2"ND SCH40 Pipe -
        066R11526-000 for 1A1, 1A2, 2A3, or 2A4
    1 - 10" x 3/4"ND SCH40 Pipe -
        075R06790-000 for 1A1, 1A2, 2A3, or 2A4
    1 - 7" x 1-1/2"ND SCH40 Pipe - 066R12499-000 for 1A1 or 1A2
    2 - 7" x 1-1/2"ND SCH40 Pipe - 066R12499-000 for 1A1 or 1A2
    1 - 18" x 3/8"ND SCH40 Pipe -
        075R06848-000 for 1A1, 1A2, 2A3, or 2A4
    1 - Kit of bolts (021-01518-000) and nuts (021-14232-000) installed in brackets to joins the shells
4. - Review manometer shown in details "C" and "D" before making any cuts on the piping.

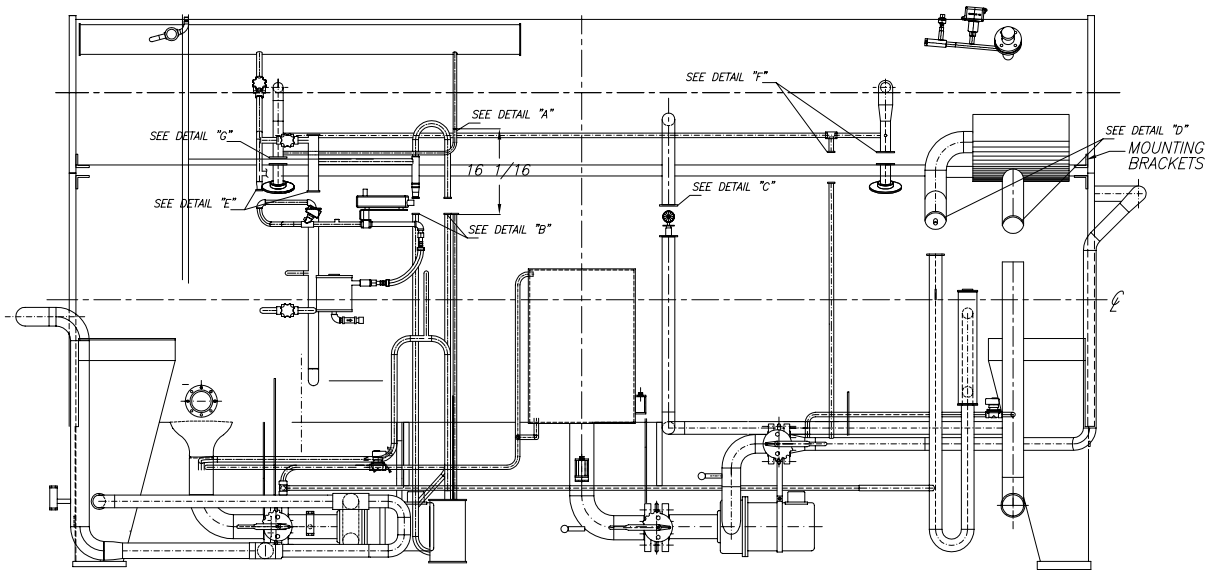
LD14546

FIGURE 36 - UNIT ASSEMBLY FOR MODELS 1A1 THRU 2A4



LD14546

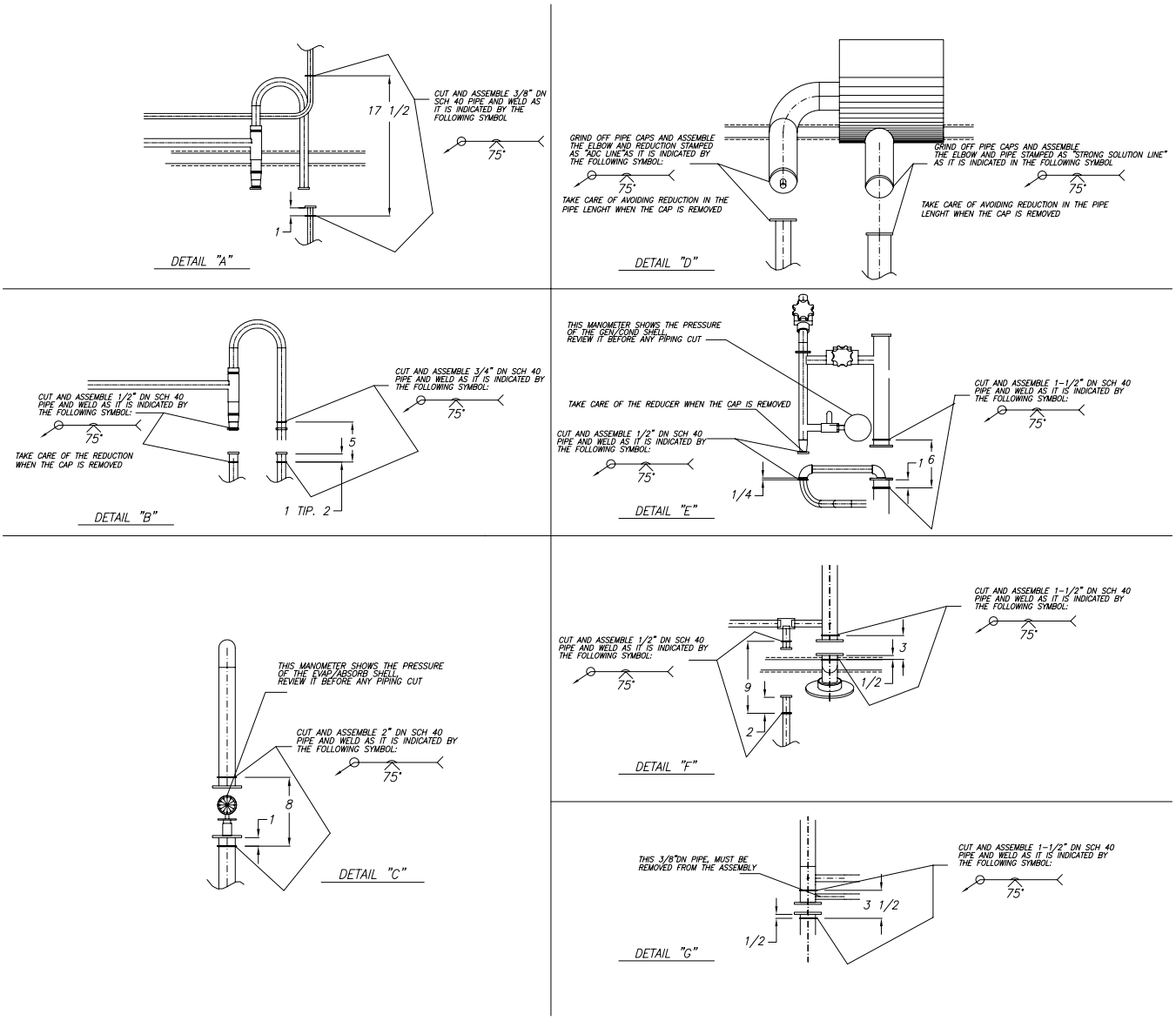
FIGURE 36 - UNIT ASSEMBLY FOR MODELS 1A1 THRU 2A4 (CONT'D)



NOTES:
1. - Installation instructions and product drawings must be referred to when field re-assembly is made.
2. - Bevel both sides of all joints as it is indicated in the welding symbols.
3. - The following pieces are shipped loose:
   1 - Reduction and elbow assembly marked as "ADC Line"
   1 - Reduction and elbow assembly marked as "Concentration Solution Line""
   2 - 10" x 1-1/2" ND SCH40 Pipe - 066R11530-000
   4 - 10" x 1/2" ND SCH40 Pipe - 066R11526-000
   1 - 10" x 3/4" ND SCH40 Pipe - 075R06790-000
   1 - 10" x 2"ND SCH40 Pipe - 066R12537-000
   2 - 7" x 1-1/2"ND SCH40 Pipe - 066R12499-000
   1 - 18" x 3/8"ND SCH40 Pipe - 075R06848-000
   1 - Kit of bolts (021-01598-000) and nuts (021-11154-000) installed in brackets to joins the shells
4. - Review manometer shown in details "C" and "D" before making any cuts on the piping.

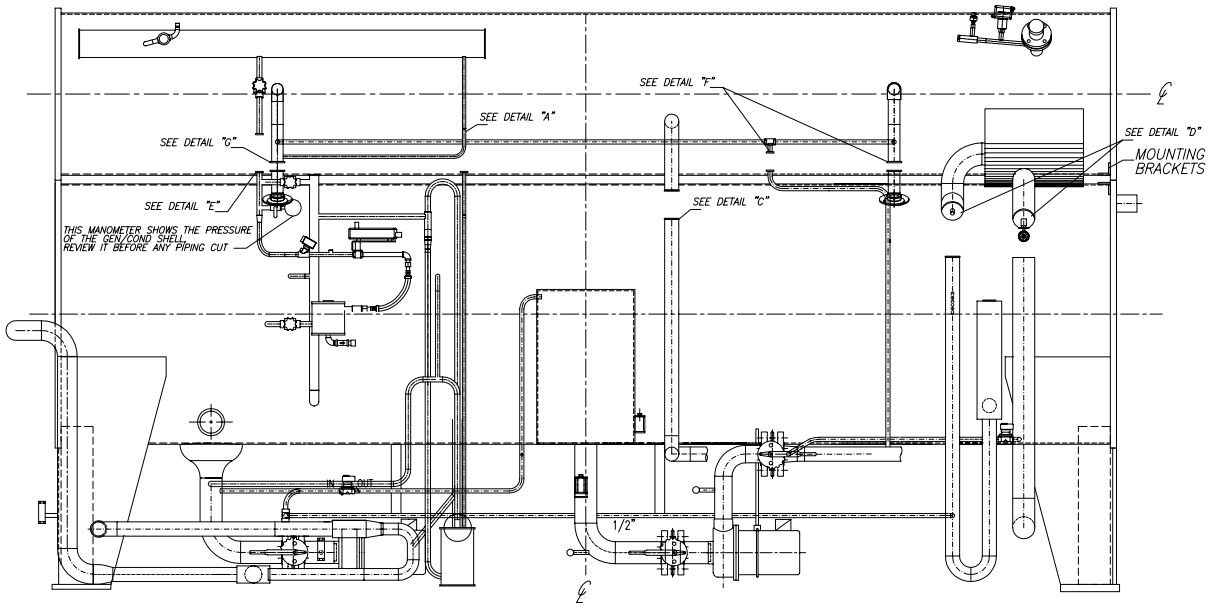
LD14547

FIGURE 37 - UNIT ASSEMBLY FOR MODELS 2B1 THRU 4B4



LD14547

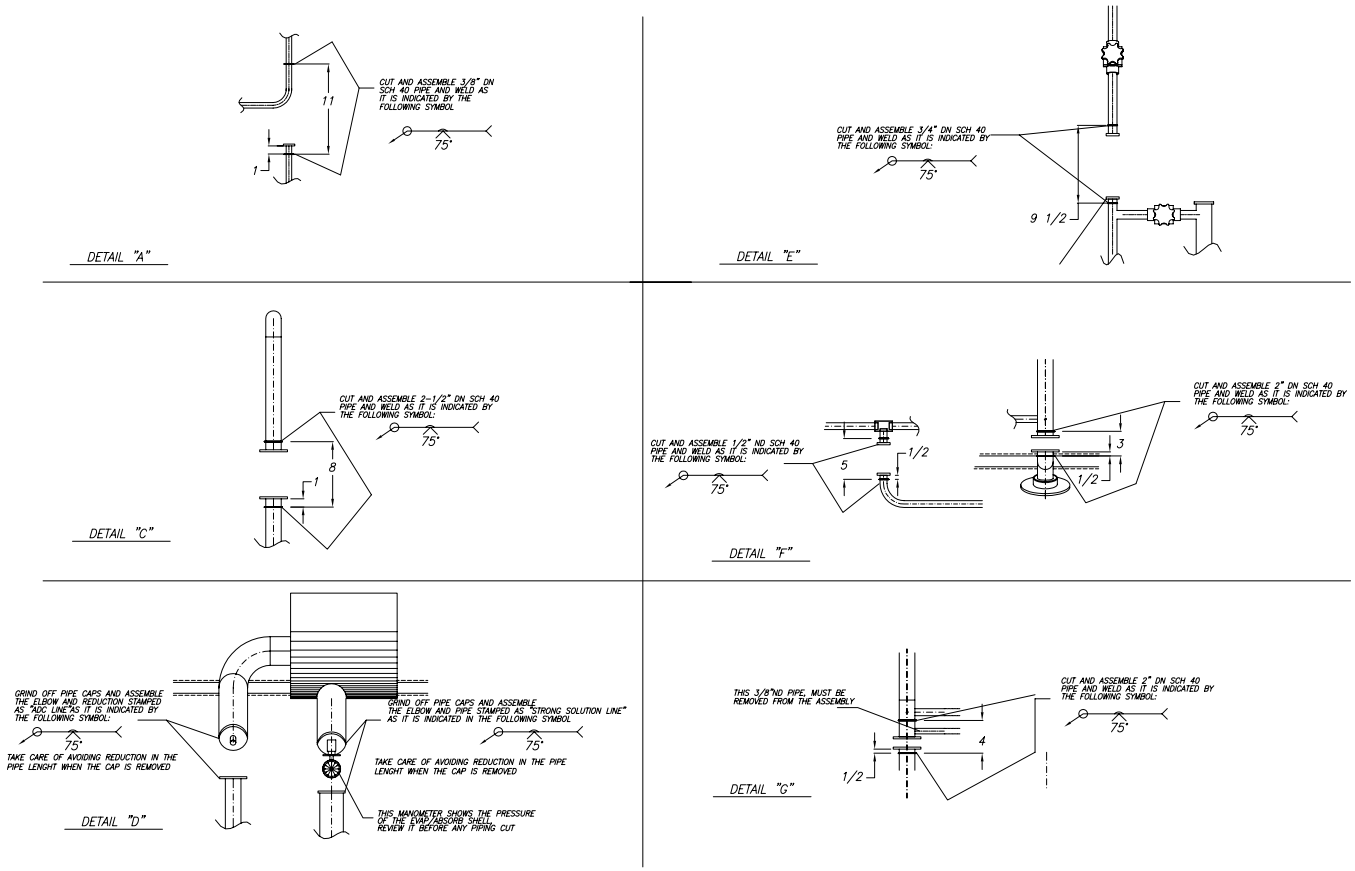
FIGURE 37 - UNIT ASSEMBLY FOR MODELS 2B1 THRU 4B4 (CONT'D)



NOTES:
1. - Installation instructions and product drawings must be referred to when field re-assembly is made.
2. - Bevel both sides of all joints as it is indicated in the welding symbols.
3. - The following pieces are shipped loose:
   1 - Reduction and elbow assembly marked as "ADC Line"
   1 - Reduction and elbow assembly marked as "Concentration Solution Line""
   2 - 10" x 2-1/2"ND SCH40 Pipe - 066R11545-000
   4 - 10" x 1/2"ND SCH40 Pipe - 066R11526-000
   1 - 10" x 3/4"ND SCH40 Pipe - 075R06790-000
   1 - 5" x 4"ND SCH40 Pipe - 066R12613-000
   2 - 7" x 2"ND SCH40 Pipe - 066R12500-000
   1 - 18" x 3/8"ND SCH40 Pipe - 075R06848-000
   1 - Kit of bolts (021-01598-000) and nuts (021-11154-000) installed in brackets to joins the shells
4. - Review manometer shown in details "C" and "D" before making any cuts on the piping.

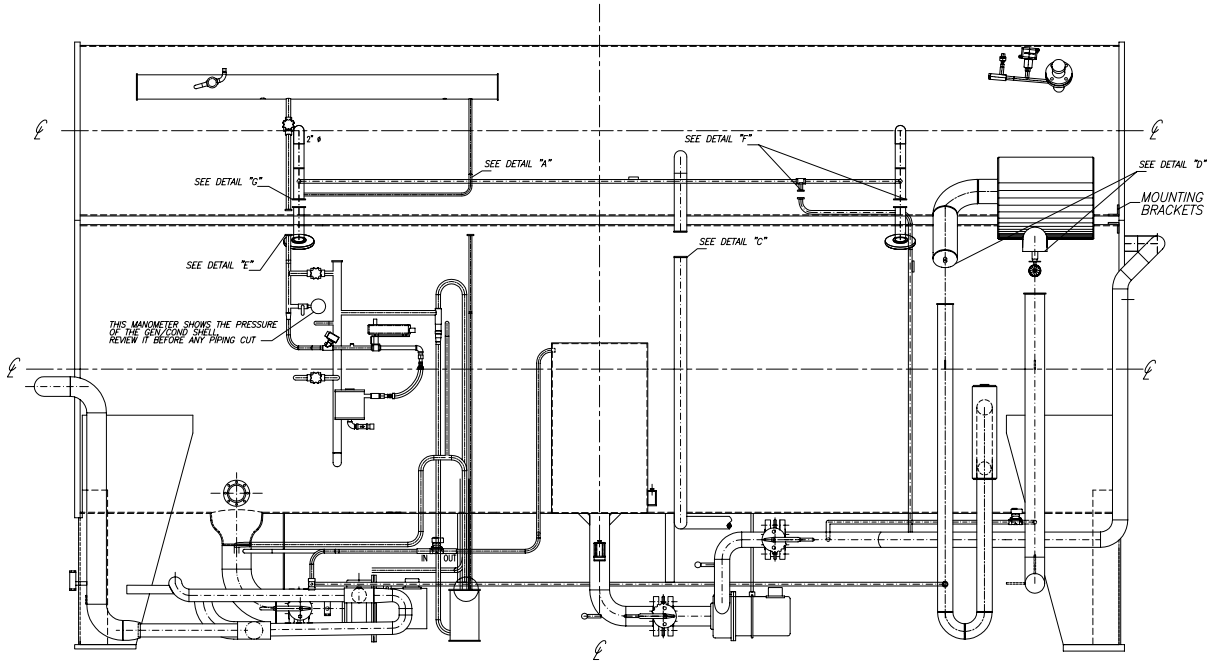
LD14548

FIGURE 38 - UNIT ASSEMBLY FOR MODELS 4C1 THRU 6C4



LD14548

FIGURE 38 - UNIT ASSEMBLY FOR MODELS 4C1 THRU 6C4 (CONT'D)

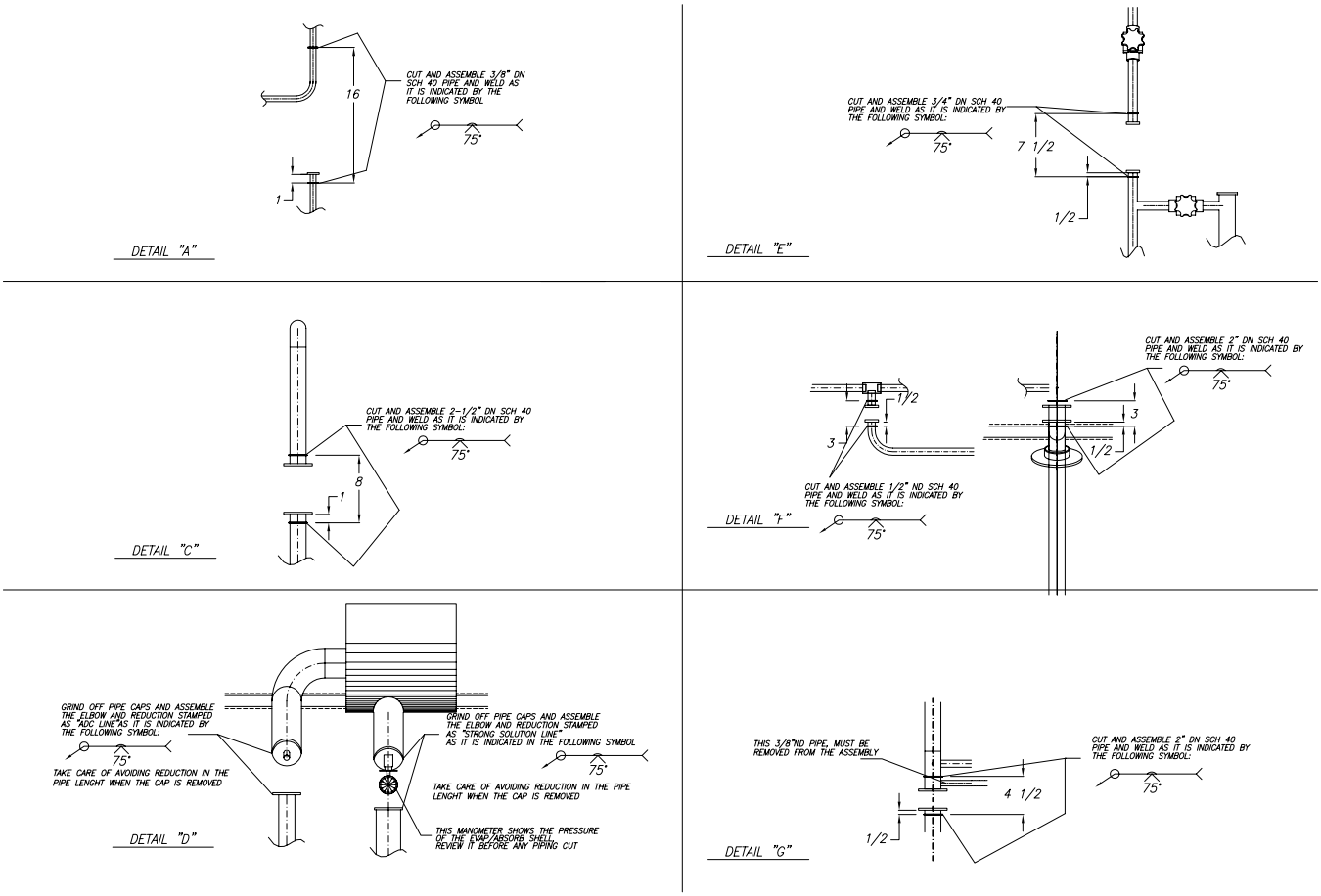


A

NOTES:
1. - Installation instructions and product drawings must be referred to when field re-assembly is made.
2. - Bevel both sides of all joints as it is indicated in the welding symbols.
3. - The following pieces are shipped loose:
   1 - Reduction and elbow assembly marked as "ADC Line"
   1 - Reduction and elbow assembly marked as "Concentration Solution Line""
   2 - 10" x 2-1/2"ND SCH40 Pipe - 066R11545-000
   1 - 10" x 1/2"ND SCH40 Pipe - 066R11526-000
   1 - 10" x 3/4"ND SCH40 Pipe - 075R06790-000
   2 - 7" x 2"ND SCH40 Pipe - 066R12500-000
   1 - 18" x 3/8"ND SCH40 Pipe - 075R06848-000
   1 - Kit of bolts (021-02097-000) and nuts (021-00504-000) installed in brackets to joins the shells
4. - Review manometer shown in details "C" and "D" before making any cuts on the piping.

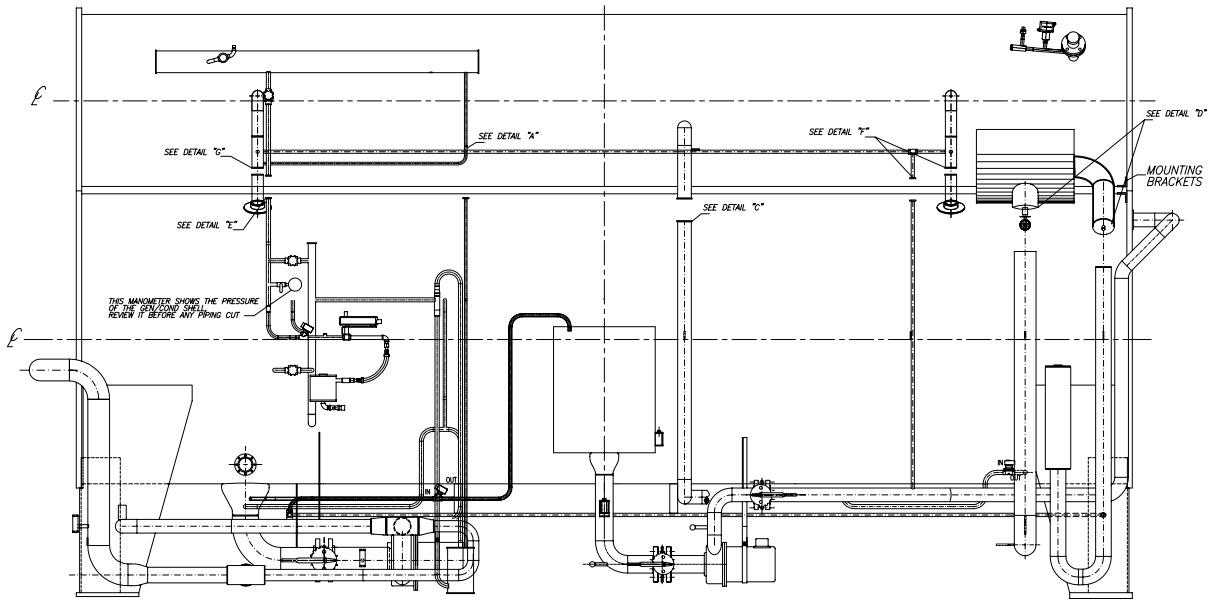
LD14549

FIGURE 39 - UNIT ASSEMBLY FOR MODELS 7D1 THRU 8D3



LD14549

FIGURE 39 - UNIT ASSEMBLY FOR MODELS 7D1 THRU 8D3 (CONT'D)

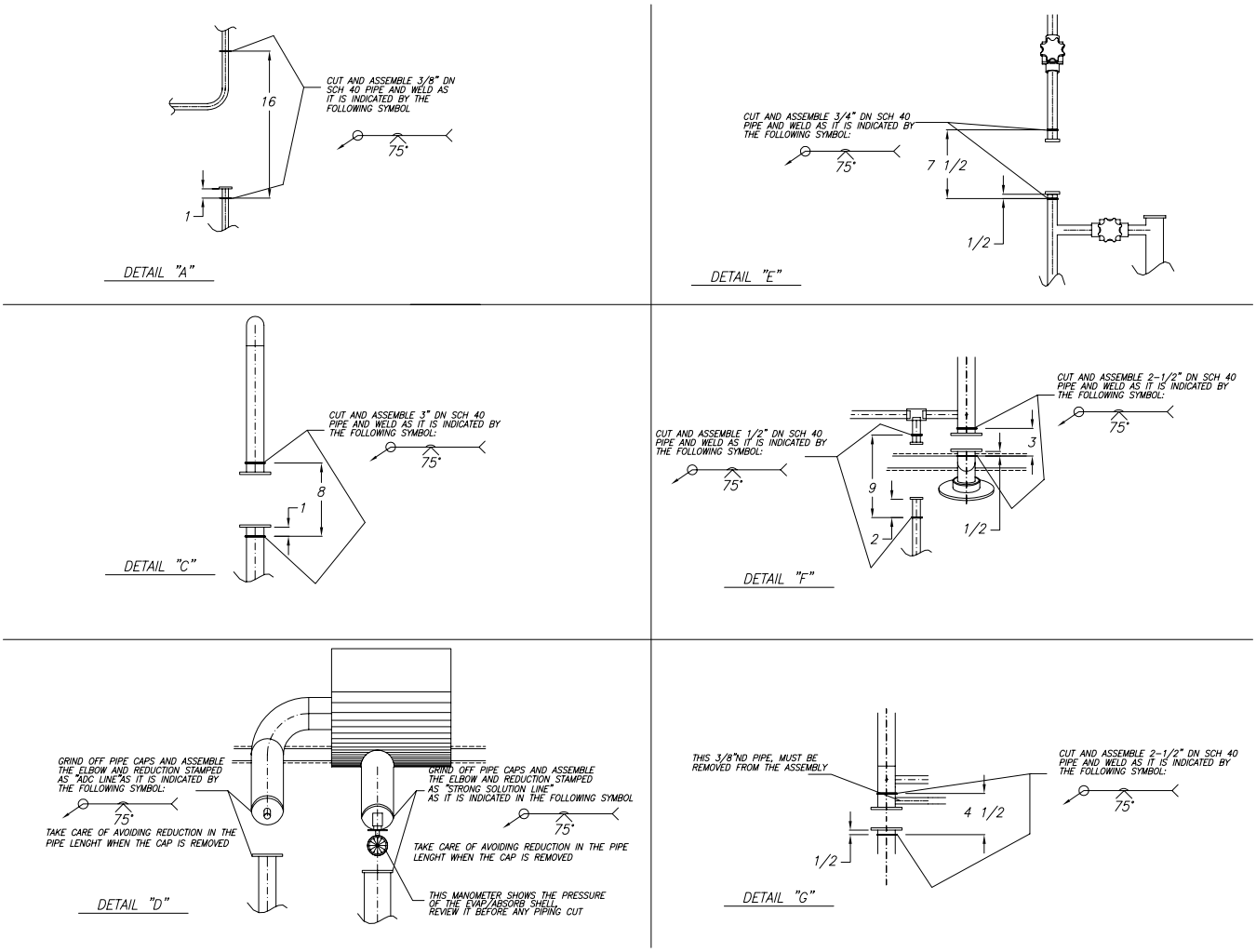


A

NOTES:
1. - Installation instructions and product drawings must be referred to when field re-assembly is made.
2. - Bevel both sides of all joints as it is indicated in the welding symbols.
3. - The following pieces are shipped loose:
   1 - Reduction and elbow assembly marked as "ADC Line"
   1 - Reduction and elbow assembly marked as "Concentration Solution Line""
   1 - 10" x 3"ND SCH40 Pipe - 066R11527-000
   1 - 10" x 1/2"ND SCH40 Pipe - 066R11526-000
   1 - 10" x 3/4"ND SCH40 Pipe - 075R06790-000
   2 - 8" x 2-1/2"ND SCH40 Pipe - 067-82917-000
   1 - 18" x 3/8"ND SCH40 Pipe - 075R06848-000
   1 - Kit of bolts (021-02097-000) and nuts (021-00504-000) installed in brackets to joins the shells
4. - Review manometer shown in details "C" and "D" before making any cuts on the piping.

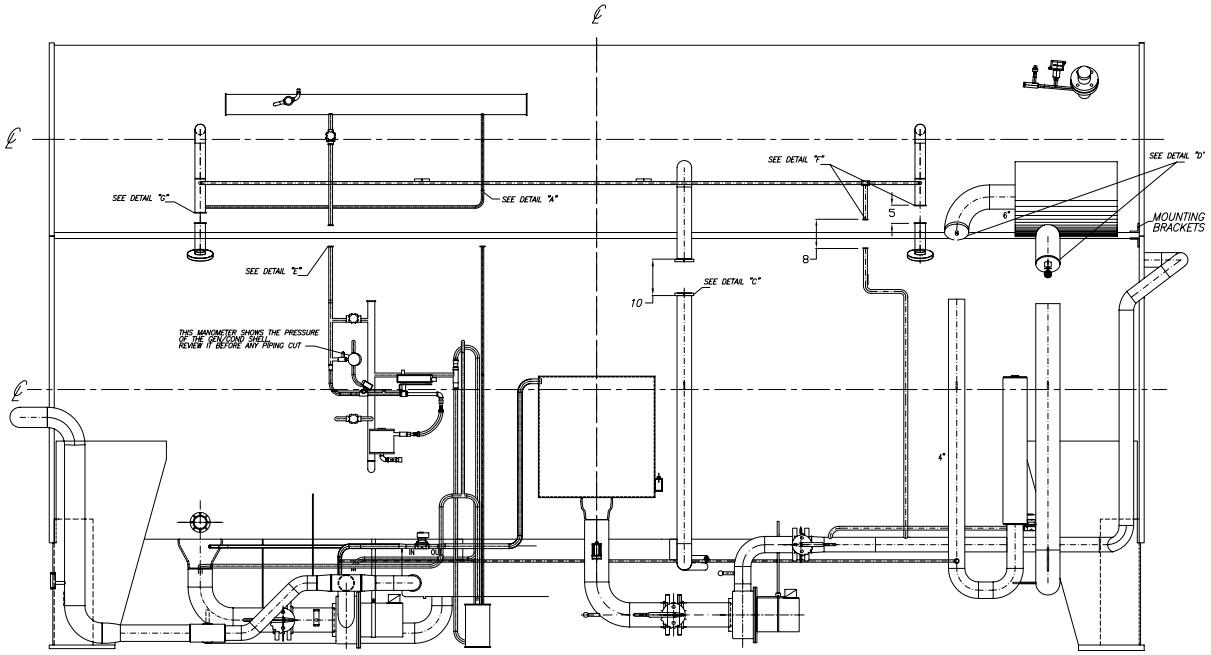
LD14550

FIGURE 40 - UNIT ASSEMBLY FOR MODELS 8E1 THRU 10E3



LD14550

FIGURE 40 - UNIT ASSEMBLY FOR MODELS 8E1 THRU 10E3 (CONT'D)

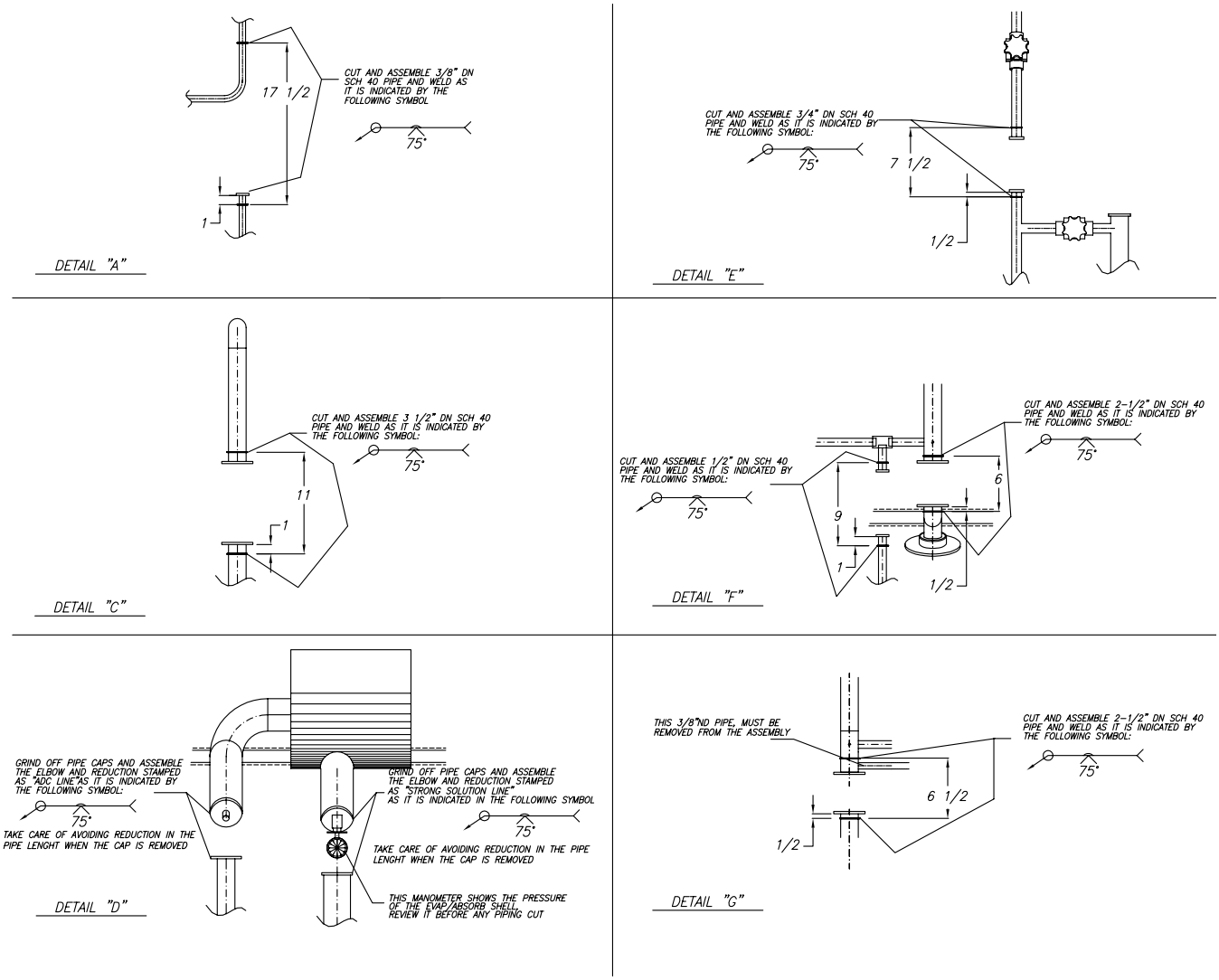


NOTES:

1. - Installation instructions and product drawings must be referred to when field re-assembly is made.
2. - Bevel both sides of all joints as it is indicated in the welding symbols.
3. - The following pieces are shipped loose:
   - 1 - Reduction and elbow assembly marked as "ADC Line"
   - 1 - Reduction and elbow assembly marked as "Concentration Solution Line""
   - 1 - 10" x 3-1/2"ND SCH40 Pipe - 067-78356-000
   - 1 - 10" x 1/2"ND SCH40 Pipe - 066R11526-000
   - 1 - 10" x 3/4"ND SCH40 Pipe - 075R06790-000
   - 2 - 8" x 2-1/2"ND SCH40 Pipe - 067-82917-000
   - 1 - 18" x 3/8"ND SCH40 Pipe - 075R06848-000
   - 1 - Kit of bolts (021-02097-000) and nuts (021-00504-000) installed in brackets to joins the shells
4. - Review manometer shown in details "C" and "D" before making any cuts on the piping.

LD14551

FIGURE 41 - UNIT ASSEMBLY FOR MODELS 12F1 THRU 14F3



LD14551

FIGURE 41 - UNIT ASSEMBLY FOR MODELS 12F1 THRU 14F3 (CONT'D)

The following factors can be used to convert from English to the most common SI Metric values.

TABLE 9 - SI METRIC CONVERSION

MEASUREMENT	MULTIPLY ENGLISH UNIT	BY FACTOR	TO OBTAIN METRIC UNIT
Capacity	Tons Refrigerant Effect (ton)	3.516	Kilowatts (kW)
Power	Horsepower	0.7457	Kilowatts (kW)
Flow Rate	Gallons / Minute (gpm)	0.0631	Liters / Second (l/s)
Length	Feet (ft)	0.3048	Meters (m)
	Inches (in)	25.4	Millimeters (mm)
Weight	Pounds (lbs)	0.4538	Kilograms (kg)
Velocity	Feet / Second (fps)	0.3048	Meters / Second (m/s)
Pressure Drop	Feet of Water (ft)	2.989	Kilopascals (kPa)
	Pounds / Square Inch (psi)	6.895	Kilopascals (kPa)

TEMPERATURE

To convert degrees Fahrenheit (°F) to degrees Celsius (°C), subtract 32° and multiply by 5/9 or 0.5556.

Example: (45.0°F - 32°) x 0.5556 = 27.2°C

To convert a temperature range (i.e., a range of 10°F) from Fahrenheit to Celsius, multiply by 5/9 or 0.5556.

Example: 10.0°F range x 0.5556 = 5.6 °C range

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