DIVERSIFIED HEAT TRANSFER, INC.

Installation, Operation, and Maintenance Manual

SuperTherm (VS Series)

Indirect Fired, Semi-Instantaneous, Steam and Boiler Water Heater

(Vertically Built, Steam to Water with Electronic or Pneumatic Controls)

This manual applies to the following models:

- SuperTherm VS06_S2A
- SuperTherm VS08_S2A
- SuperTherm VS010_S2A
- SuperTherm VS012_S2A
- SuperTherm VS06_D2A
- SuperTherm VS08_D2A
- SuperTherm VS010_D2A
- SuperTherm VS012_D2A

DHT SUPERTHERM WATER HEATER

CONTRACTOR / FACILITY INFORMATION

NOTE: This user manual must always accompany the specific unit as recorded below:

Model #: _____

Serial #: _____

Install Date: _____

Latest Update: 09/05/2018

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SECTION 1: GENERAL INFORMATION

1.1 INTRODUCTION

The purpose of this manual is to provide an installation, operation and maintenance procedural guide for the VS Series of SuperTherm water heaters, which includes the following four models:

- SuperTherm VS06_2A
- SuperTherm VS08_2A
- SuperTherm VS010_2A
- SuperTherm VS012_2A

These are all vertically configured and use steam to heat domestic water.

1.2 DESCRIPTION

The Diversified Heat Transfer SuperTherm series of semi-instantaneous water heaters are the engineered solutions for facility owners/managers who need high recovery capacity in a small space. They are constructed of stainless steel pipe and other non-ferrous materials to ensure long leak-free operation. Designed for continuous high-peak loads, the DHT SuperTherm units are ideal for high-demand applications, such as hospitals and dormitories etc.

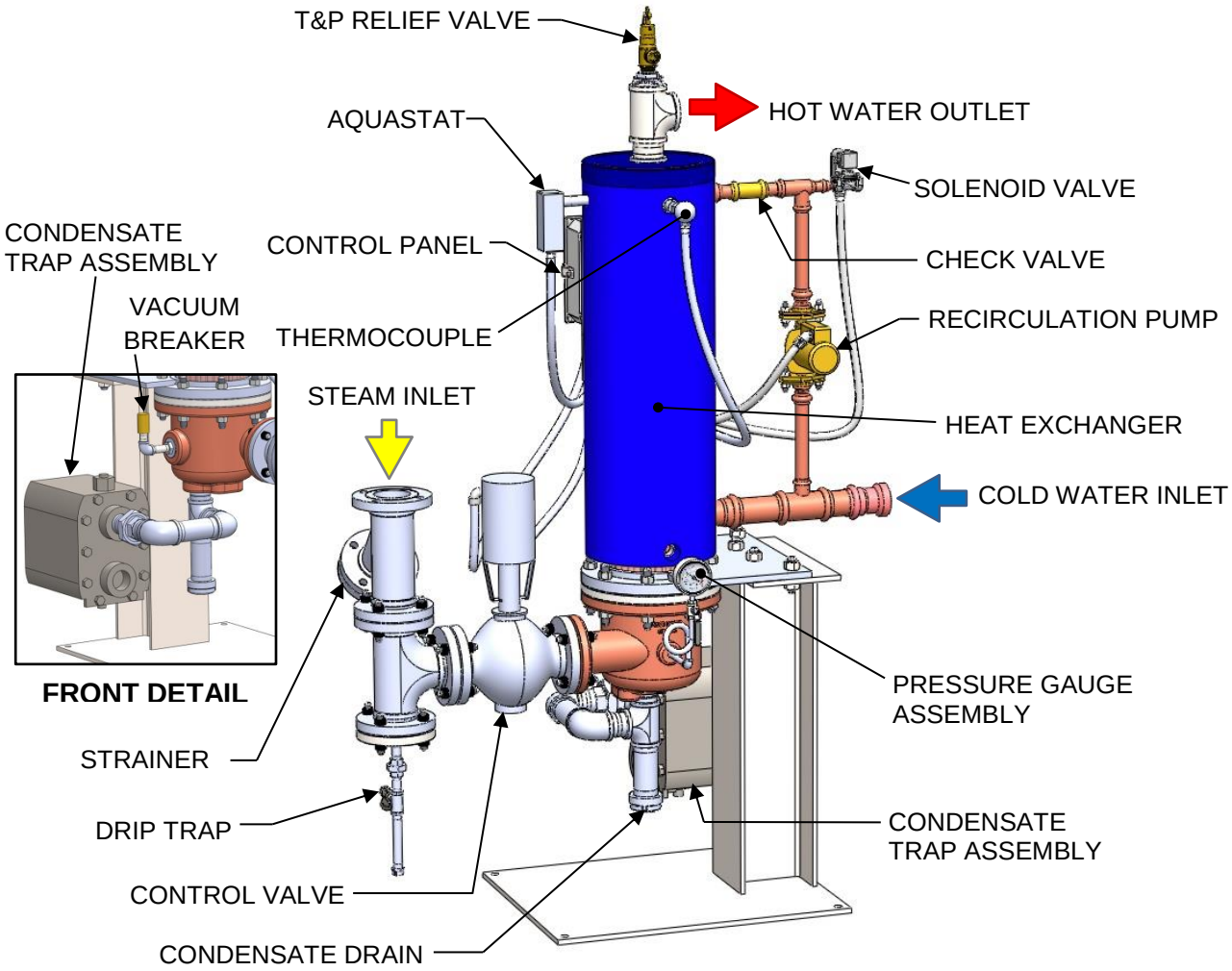


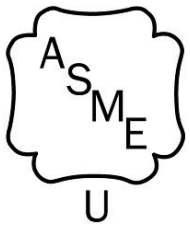
FIG 1.2: SuperTherm VS Series (Vertical/Steam) Component and Function Diagram

Units are engineered using steam, boiler water or HTHW as the heating medium. Semi-instantaneous operation provides high output by channeling the incoming cold water directly over the heat exchanger tubes in a controlled manner to maximize the heat transfer rates compared to conventional stratified heat exchanger convection systems. Velocity of water and pressure drop are controlled by changing water flow directly across the heat exchanger, which increases heat transfer and inhibits scale formation.

Perfect for mechanical rooms where space is limited, the water heating systems feature vertical configurations so they require less than four square feet of floor space. Plus, the tube bundle can be removed straight downward from the bottom of the unit to eliminate the need for overhead space or extra clearances for service or maintenance.

1.3 FEATURES

- Compact design to fit in small mechanical rooms and standard doorways
- Complete packaged system with components engineered to specific application requirements
- Energy efficient
- High recovery
- Stainless alloy construction
- ASME Code Tested & Stamped



1.4 APPLICATIONS

SuperTherm units are used in wide range of domestic water heating applications including either new construction or replacement of existing units. Most common application examples include:

- Apartment complexes
- Prisons/Correctional facilities
- Hospitals/medical centers/nursing homes
- Hotels/casinos/entertainment
- Schools/colleges/universities/dormitories
- Government buildings
- Commercial office buildings
- Factories/industrial facilities
- Fitness centers/health clubs etc.

NOTE:
Contact your DHT sales representative or DHT factory in case any applications related information is required.

1.5 ENERGY SOURCES

DHT SuperTherm Hot Water Heaters are engineered and manufactured to use one the following energy sources to produce domestic hot water:

- Steam
- Boiler Water
- High Temperature Hot Water (HTHW)

**This manual includes information for steam to water units with electronic controls and pneumatic controls. Refer to separate manual if require hot water as the heating medium or different control options.*

1.6 DESIGN CONDITIONS

DHT has design, engineering and manufacturing capabilities to produce products to satisfy wide range of our customer requirements.

DHT standard design conditions for SuperTherm units are:

	Shell Side	Tube Side
Design Pressure, PSIG	**150**	**150**
Design Temperature, °F	**210**	**300**

NOTE:
Consult the design specifications for the unit or the name plate attached to the unit and a tag on T & P Relief valve for maximum pressure for the unit.

1.7 CONSTRUCTION

All DHT SuperTherm units are designed and manufactured from superior materials of highest quality. Each unit meets or exceeds requirements of ASME Section VIII, Div.1 Code and TEMA standards. All DHT Units are registered with the National Board of Boiler and Pressure Vessels Inspectors and are U-stamped.

Heat exchangers: U-tube heat exchangers (TEMA BEU type) are manufactured with stainless steel tubesheet, stainless steel shell and cast iron or fabricated carbon steel head. Tubes are copper, CU-NI 90/10 or stainless steel depending on tube design temperature. If it is required the units can be built using double wall leak protective tubing and double tubesheet. Double wall tubes are available in copper or CU-NI 90/10 and steam or tube side tubesheet is carbon steel. Shell or water side tubesheet is stainless steel.

Controls and trim: DHT SuperTherm units can be equipped with electronically or pneumatically activated control valves. DHT SuperTherm units are equipped with a control panel with graphical LCD display, easy adjustable set points, and set points for double safety alarm system, if it is required a data port for a communication with Building Management System. When applicable the SuperThem units are equipped with double solenoid safety system.

Standard package also includes ASME Temperature and Pressure Relief valve and recirculating water line with circulator.

Steam fired units are equipped with condensate line: F & T steam trap, steam inlet strainer and drip leg with thermodynamic steam trap.

Insulation and Jacketing: All standard DHT SuperTherm units contain fiber glass insulation between the heat exchanger and jacket. The jackets are constructed of PVC as standard.

1.8 SAFETY

1.8.1 Operating Precautions

In order to achieve maximum performance from the unit, the precautions and procedures described below must be strictly followed:

- The unit should be installed, operated, and serviced in accordance with the information only in this manual.
- The unit should be installed according to designs prepared by qualified facility engineers, including those of a structural, mechanical, electrical, or other applicable disciplines.
- The unit should not be operated or serviced until a safety training program has been established by the customer.
- The unit should only be operated and serviced by qualified technical personnel in accordance with all applicable codes, laws, and regulations.
- The unit must be used according to the specification given to DHT.
- Pressure and temperatures should not exceed limits indicated on DHT name plate attached to the unit.
- For initial startup refer to all instructions in **Section 3.1: Startup Procedures**.
- The heating and heated fluids should be free from any debris.
- The unit should operate only with fluid that it was designed for.
- Prevent evaporation of fluid on the shell side. Steam or vapor should only flow through the tubes.
- The system should be designed to prevent the unit from encountering pressure shocks.
- All strainers installed on the unit should be periodically cleaned as per DHT maintenance schedule. (See Recommended Inspections Time Interval).
- Refer to **Section 2.7: Electrical Connections** for proper grounding of the unit.

1.8.2 Storage and Transportation

The units should be stored in a clean place away from corrosive environment or weather elements (e.g. rain, snow) preferably indoors and maintained between 32°F to 110°F ambient operating temperature. During transportation, ensure that they are not exposed to mechanical damage. Units should not be exposed to too cold or hot temperature limits specified by DHT.

1.8.3 Safety Features

The customer is responsible for maintainance of the safety features of the SuperTherm water heater such as guards, safety labels, safety controls, interlocks and lockout devices.

1.8.4 Safety Notation

In this manual there will be four levels of important note types as regards those accompanying the text of this document. Note headers will appear as shown and described below:

NOTE:
Important information, but not associated with safety practices.

CAUTION!
Indicates potential safety concerns, possible material damage, and unsafe practices that may lead to damage to property, injury or death.

WARNING!
Indicates a potential health hazard that *MAY* lead to injury or death.

DANGER!
Indicates an immediate health hazard that *WILL* lead to injury or death.

1.8.5 Proper Training

Proper training is the best protection against accidents. Operating and service personnel must be thoroughly familiar with the basic construction and operation of the SuperTherm semi-instantaneous water heater, and all applicable safety precautions. If any of the provisions of this manual are not fully and completely understood, contact DHT technical service for advice and information. Please have the serial number of the unit available. The serial number is located on the name plate attached to the front of the unit below the control panel.

1.8.6 Safety Precautions

DANGER!

- ***WATER TEMPERATURES OVER 125ºF CAN CAUSE SEVERE BURNS INSTANTLY OR DEATH FROM SCALDS.***

- **Children, disabled, and elderly are at the highest risk of being scalded.**
- **See instruction manual before setting temperature at water heater.**
- **Feel water before bathing or showering.**
- **Temperature limiting valves are available. Contact DHT technical support at 800-221-1522 for more information.**

WARNING!

- Fluids under pressure may cause injury to personnel or damage to equipment when released. Be sure to shut off all incoming and outgoing water shutoff valves. Carefully decrease all trapped pressures to zero before performing maintenance.
- Before attempting to perform any maintenance on the unit, shut off all electrical power to the unit from an exterior switch.
- Electrical voltages up to 120 VAC may be used in this equipment, therefore the front panel door on the unit's power box must be closed at all times, except during maintenance and servicing.
- A three-pole switch must be installed on the electrical supply line of the unit. The switch must be installed in an easily accessible position to quickly and safely disconnect electrical service. Do not affix switch to any part of the water heater itself.

CAUTION!

DO NOT use this water heater if any part has been under water. Call a qualified technician to inspect and replace any part that has been under water.

SECTION 2: INSTALLATION INSTRUCTIONS

CAUTION!

In order to maintain the warranty on the SuperTherm water heater, the startup must be completed within six (6) months of shipment, and the start-up report must be furnished to DHT within thirty (30) days of the startup. The warranty may be found in Section 7, and the Startup and Installation forms can be found in Section 6.5.

WARNING!

- INSTALLER MUST COMPLY WITH STARTUP AND INSTALLATION INSTRUCTIONS TO AVOID A DANGEROUS SITUATION.
- Startup and installation forms MUST be submitted to a DHT representative or risk loss of coverage under warranty.
- The inspection log must be maintained and up-to-date and kept in close proximity to the SuperTherm unit for inspection of DHT personnel.

NOTE:
The startup must be performed by DHT factory personnel or a factory authorized representative.

2.1 RECEIVING, HANDLING, AND STORAGE

2.1.1 Examining the Unit

SuperTherm water heaters are thoroughly inspected and tested prior to shipment. Upon receipt of the SuperTherm water heater, please carefully inspect the entire unit and its components for any damages during shipping. If any evidence of damage is detected that could affect the safe operation of the unit, contact DHT or the authorized sales representative to report the damage and to receive instructions on how to proceed.

After the inspection has been done, we advise that all pressure and control components be checked to assure that they meet design specifications, the name plate and the specification tags. In case of any discrepancy, contact DHT or an authorized sales representative, before proceeding with the installation.

2.1.2 Compliance with Codes

The SuperTherm semi-instantaneous water heater is constructed and stamped in accordance with ASME Boiler and Pressure Vessel Code, Section VIII – Division 1. Other codes or approvals which apply will be labeled on the SuperTherm water heater.

The SuperTherm water heater installation must only be performed by technically qualified persons. The installation must conform to all national, state or provincial and local code requirements established by the authorities having jurisdiction as well as specific instructions in this manual. Authorities having jurisdiction should be consulted before installations are made.

2.2 SITE PREPARATION

- A firm and level foundation is required (6 to 8 inches concrete pad recommended)
- Secure the SuperTherm water heater to the building floor or mounting pad. For attachment to the foundation, use the four holes in the base.

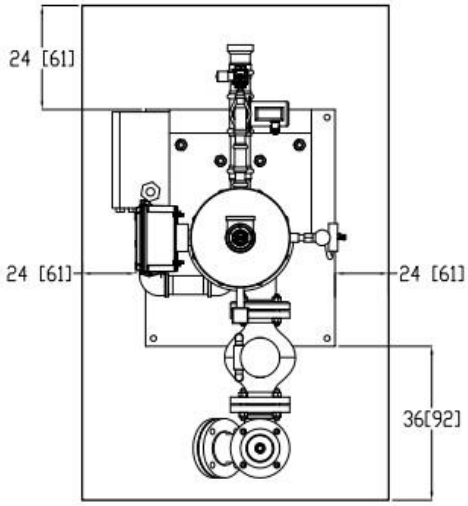
> **NOTE:**
> Seismic anchorage information is available upon request. Contact your DHT sales representative for more information.

- The SuperTherm water heater is top-heavy and proper rigging techniques should be followed while moving heavy equipment to avoid injury.
- The SuperTherm water heater must be plumb and level to function properly.
- The SuperTherm water heater should be placed with at least 10" headroom above it to permit removal of the relief valve.
- All SuperTherm steam water heaters should be placed to permit gravity flow of condensate to the condensate return system (see Sec. 2.6.1.3).

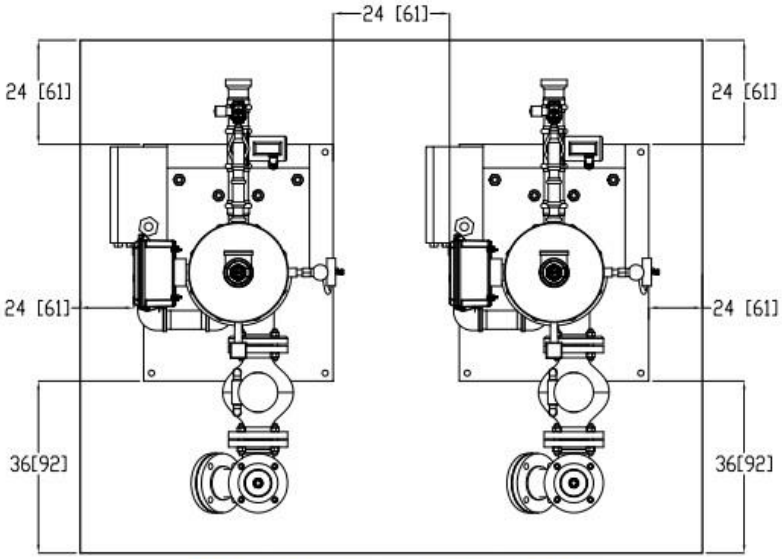
2.3 INSTALLATION CLEARANCES AND UNIT DIMENSIONS

The SuperTherm minimum acceptable clearances are shown in Figure 2-1 and dimensions are shown in Figure 2-2. The minimum clearance dimensions are indicated in the drawings. However, if Local Building Codes require additional clearances, these codes shall supersede these requirements.

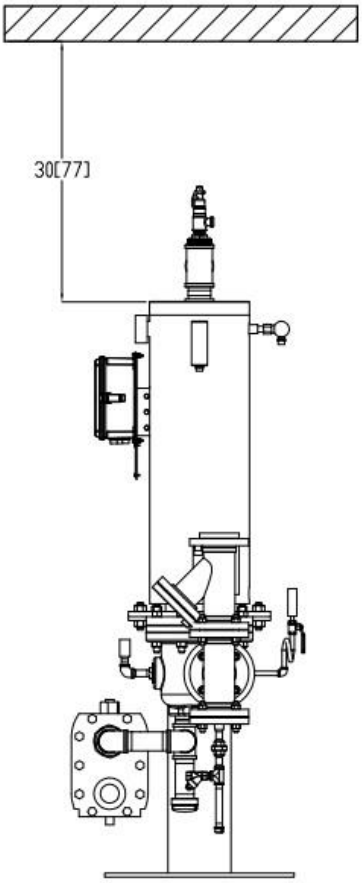
All steam piping, water piping and electrical conduit or cable must be arranged so that they do not interfere with the removal of any panels, or inhibit service or maintenance of the unit.



SINGLE UNIT INSTALLATION



MULTIPLE UNITS INSTALLATION



ELEVATION VIEW

NOTES:
1. ALL DIMENSIONS SHOWN ARE IN INCHES [CENTIMETERS].
2. 54[138] MIN. SERVICE CLEARANCE IS REQUIRED ON TOP OF HEAT EXCHANGER SHELL COVER IF RELIEF VALVE AND TEE ARE NOT TO BE DISASSEMBLED IN THE FIELD DURING SERVICE.
3. THIS DRAWING SHOWS MINIMUM RECOMMENDED SERVICE CLEARANCE DIMENSIONS.
4. REFER TO WATER HEATER DIMENSIONAL DRAWING TO REVIEW OTHER DIMENSIONS.
5. DHT RESERVES THE RIGHT TO MODIFY THE DIMENSIONS WITHOUT PRIOR NOTICE.
6. ALSO CONSULT LOCAL CODES AND AUTHORITIES.

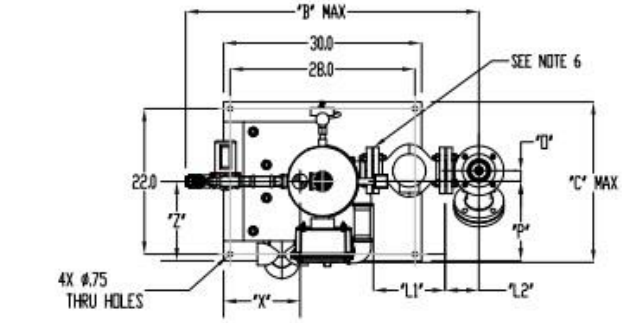
FIG 2-1: SUPERTHERM INSTALLATION CLEARANCE DRAWING

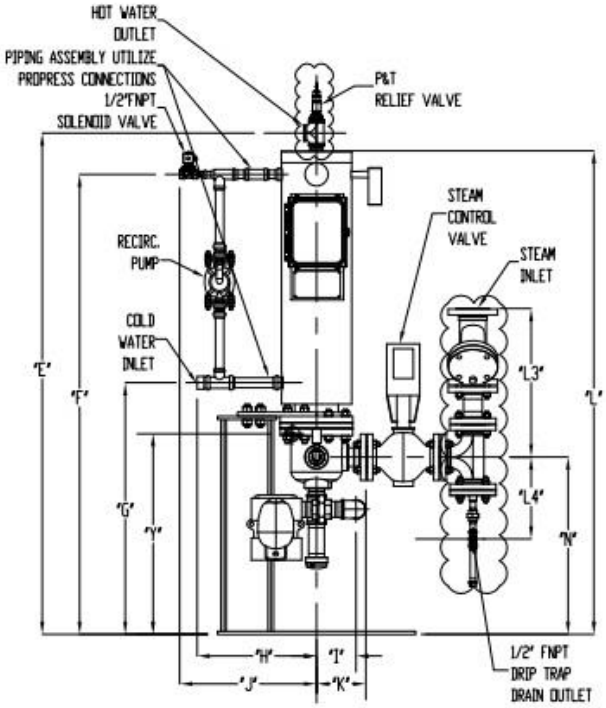
UNIT MODEL	"A" MAX	"B" MAX	"C" MAX	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"	"L"	"M"	"N"	"O"	"P"	"Q"
VS06_2	84.0	50.0	24.3	79.9	75.8	69.6	38.0	18.1	6.0	20.8	7.5	73.1	18.9	26.8	1.6	12.0	11.0
VS08_2	88.0	56.0	25.3	83.0	77.5	69.5	38.0	24.5	6.0	21.8	9.1	73.3	17.2	25.8	2.5	12.0	11.4
VS010_2	91.0	62.0	26.3	85.5	78.1	68.9	38.0	28.3	6.0	25.5	9.9	73.5	15.2	25.3	2.8	12.0	11.4
VS012_2	97.0	70.0	27.3	89.0	79.2	68.4	38.0	31.3	6.0	29.2	11.5	73.7	12.0	23.7	3.0	12.0	11.5

CONTROL VALVE SIZE	"L1"	"L2"	"L3"	"L4"	Y-STRAINER SIZE
1" FNPT	7.9	1.8	8.2	8.2	1-1/2" FNPT
1-1/4" FNPT	9.3	1.9	10.4	8.6	2" FNPT
1-1/2" FNPT	9.8	2.0	10.0	8.7	2" FNPT
2" FNPT	12.3	2.3	10.3	9.0	2" FNPT
2" FNPT	12.3	2.6	13.1	9.3	2-1/2" FNPT
2-1/2" FLG	10.9	5.1	15.8	12.1	2-1/2" FLG
2-1/2" FLG	10.9	5.1	18.8	12.1	3" FLG
3" FLG	11.8	5.6	17.3	12.7	3" FLG
4" FLG	13.9	6.6	20.5-21.6	13.7	4" FLG
5" FLG	15.8	7.7	24.0-25.1	14.6	5" FLG

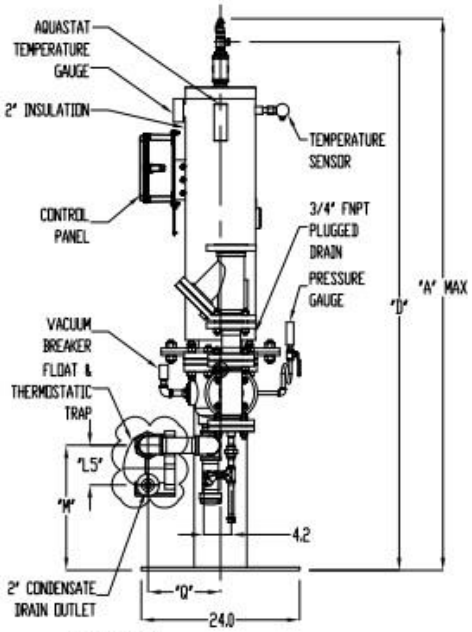
CENTER OF GRAVITY*			
UNIT MODEL	"X"	"Y"	"Z"
VS06_2	11.6	30.3	11.9
VS08_2	13.6	32.1	11.9
VS010_2	14.3	34.7	11.9
VS012_2	15.4	36.9	11.9

CONDENSATE TRAP	"L5"
MPART-A-TR1-0003	3.0
MPART-A-TR1-0009	3.0
MPART-A-TR1-0005	6.6
MPART-A-TR1-0008	6.6
MPART-A-TR1-0006	6.0
MPART-A-TR1-0010	6.0
MPART-A-TR1-0001	6.0
MPART-A-TR1-0015	6.0
MPART-A-TR1-0016	6.0
MPART-A-TR1-0013	6.0





STEAM INLET HEADER CONNECTION SIZE: _____



NOTES:
1. ALL DIMENSIONS ARE SHOWN IN INCHES.
2. COMPONENTS SHOWN IN CLOUDS ARE SHIPPED WITH UNIT IN SUB-ASSEMBLIES FOR FIELD INSTALLATION.
3. DHT RESERVES THE RIGHT TO MODIFY DIMENSIONS WITHOUT PRIOR NOTICE.
4. DO NOT COMPLETE FIELD PIPING UNTIL UNIT IS PROPERLY INSTALLED. ACTUAL DIMENSIONS MAY VARY DUE TO MANUFACTURING TOLERANCES. FABRICATION ACCEPTS NO LIABILITY DUE TO DIMENSION VARIATION.
5. RELIEF VALVE, SOLENOID VALVE AND CONDENSATE OUTLET PIPED TO DRAIN BY CONTRACTOR. CONDENSATE DRAIN BY GRAVITY. REFER TO INSTALLATION AND PIPING DRAWING FOR MORE DETAILS.
6. ADDITIONAL REDUCER/INCREASER MAY BE REQUIRED TO MATCH CONNECTION SIZES.
7. COLD WATER INLET/RECICULATION PIPING ASSEMBLY UTILIZE PROPRESS CONNECTIONS.
8. *CENTER OF GRAVITY IS SHOWN WITHOUT STEAM INLET PIPING, CONTROL VALVE AND CONDENSATE DRAIN PIPING.

UNIT MODEL: _____

OPERATIONAL CONDITIONS	WATER	STEAM
FLUID QUANTITY	GPM	LB/HR
FLUID TEMPERATURE (IN/OUT)	°F	°F
HEAT EXCHANGED (OPTIONAL)		BTU/HR

RELIEF VALVES SET AT____°F & ____PSI

"CONSULT FACTORY IF WATER/SHELL SIDE OPERATING PRESSURE IS HIGHER THAN 150 PSIG/210°F."

MATERIALS OF CONSTRUCTION	
SHELL	316/L S.S.
TUBE	COPPER, 0.625" O.D. x 0.049" WALL
HEAD	UPPER - 304/L S.S. & LOWER - CAST IRON
TUBESHEET	304/L S.S.

HEAT EXCHANGER DESIGN SPEC.	SHELL SIDE	TUBE SIDE
FLUID TYPE	WATER	STEAM
DESIGN PRESSURE (PSIG)	200	150
TEST PRESSURE (PSIG)	260	300
DESIGN TEMP. (°F)	210	350
ASME B&PV CODE SEC VIII DIV-1 = U STAMP		

UNIT MODEL	CONNECTION SIZES			
	SHELL (WATER) SIDE		TUBE (STEAM) SIDE-HEAT EXCHANGER	
	INLET	OUTLET	STEAM INLET	CONDENSATE OUTLET
VS06_2	1.5" FNPT	1.5" FNPT	2.5" FNPT - 150#	2" FNPT
VS08_2	2.5" FNPT	2.5" FNPT	3" FLG - 150#ANSI	2" FNPT
VS010_2	3" FNPT	3" FNPT	4" FLG - 150#ANSI	2" FNPT
VS012_2	4" FNPT	4" FNPT	5" FLG - 150#ANSI	2" FNPT

DIVERSIFIED HEAT TRANSFER, INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522 FAX: (855) 221-2400

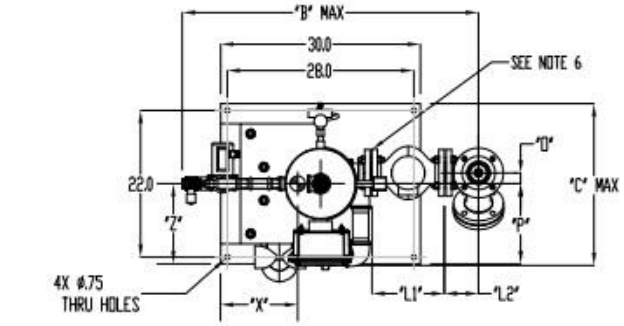
VS SUPERTHERM WATER HEATER W/ ELECTRIC VALVE (UP TO 25 PSIG) DIMENSIONAL DRAWING

	NAME	DATE	DWG#	REV
DRAWN BY	LY	10/25/2017	S-20	E
CHECKED BY	SS	10/25/2017	SHEET 1 OF 1	

FIG 2-2a: SUPERTHERM SINGLE WALL DIMENSIONAL DRAWING

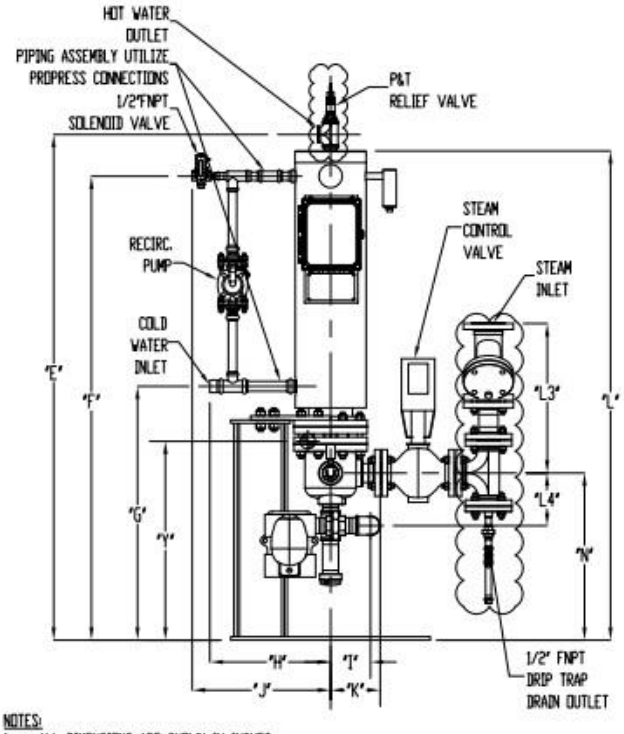
UNIT MODEL	"A" MAX	"B" MAX	"C" MAX	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"	"L"	"M"	"N"	"O"	"P"	"Q"
VS06_2	84.0	50.0	24.3	79.9	75.8	69.6	38.0	18.1	6.0	20.8	7.5	73.3	17.2	25.1	1.6	12.0	11.0
VS08_2	88.0	56.0	25.3	83.0	77.5	69.5	38.0	24.5	6.0	21.8	9.1	73.4	15.3	23.9	2.5	12.0	11.4
VS010_2	91.0	62.0	26.3	85.5	78.1	68.9	38.0	28.3	6.0	25.5	9.9	73.5	13.2	23.3	2.8	12.0	11.4
VS012_2	97.0	70.0	27.3	89.0	79.2	68.4	37.9	31.3	6.0	29.2	11.5	73.7	9.8	21.5	3.0	12.0	11.5

CONTROL VALVE SIZE	"L1"	"L2"	"L3"	"L4"	Y-STRAINER SIZE
1" FNPT	7.9	1.8	8.2	8.2	1-1/2" FNPT
1-1/4" FNPT	9.3	1.9	10.4	8.6	2" FNPT
1-1/2" FNPT	9.8	2.0	10.0	8.7	2" FNPT
2" FNPT	12.3	2.3	10.3	9.0	2" FNPT
2" FNPT	12.3	2.6	13.1	9.3	2-1/2" FNPT
2-1/2" FLG	10.9	5.1	15.8	12.1	2-1/2" FLG
2-1/2" FLG	10.9	5.1	18.8	12.1	3" FLG
3" FLG	11.8	5.6	17.3	12.7	3" FLG
4" FLG	13.9	6.6	20.5-21.6	13.7	4" FLG
5" FLG	15.8	7.7	24.0-25.1	14.6	5" FLG

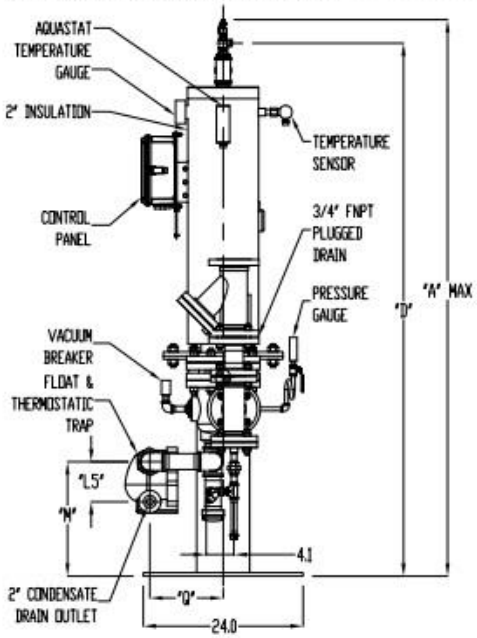


CENTER OF GRAVITY*			
UNIT MODEL	"X"	"Y"	"Z"
VS06_2	11.8	30.2	11.9
VS08_2	13.8	31.5	11.9
VS010_2	14.6	33.9	11.9
VS012_2	15.8	35.7	11.9

CONDENSATE TRAP	"L5"
MPART-A-TR1-0003	3.0
MPART-A-TR1-0009	3.0
MPART-A-TR1-0005	6.6
MPART-A-TR1-0008	6.6
MPART-A-TR1-0006	6.0
MPART-A-TR1-0010	6.0
MPART-A-TR1-0001	6.0
MPART-A-TR1-0015	6.0
MPART-A-TR1-0016	6.0
MPART-A-TR1-0013	6.0



STEAM INLET HEADER CONNECTION SIZE: _____



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5. RELIEF VALVE, SOLENOID VALVE AND CONDENSATE OUTLET PIPED TO DRAIN BY CONTRACTOR. CONDENSATE DRAIN BY GRAVITY. REFER TO INSTALLATION AND PIPING DRAWING FOR MORE DETAILS.
6. ADDITIONAL REDUCER/INCREASER MAY BE REQUIRED TO MATCH CONNECTION SIZES.
7. COLD WATER INLET/RECICULATION PIPING ASSEMBLY UTILIZE PROPRESS CONNECTIONS.
8. *CENTER OF GRAVITY IS SHOWN WITHOUT STEAM INLET PIPING, CONTROL VALVE AND CONDENSATE DRAIN PIPING.

UNIT MODEL: _____

OPERATIONAL CONDITIONS	WATER	STEAM
FLUID QUANTITY	GPM	LB/HR
FLUID TEMPERATURE (IN/OUT)	°F	°F
HEAT EXCHANGED (OPTIONAL)		BTU/HR

RELIEF VALVES SET AT____°F & ____PSI

"CONSULT FACTORY IF WATER/SHELL SIDE OPERATING PRESSURE IS HIGHER THAN 150 PSIG/210°F."

MATERIALS OF CONSTRUCTION	
SHELL	316/L S.S.
TUBE	COPPER, OUTER 0.750"OD/INNER 0.625"OD x 0.040" WALL
HEAD	UPPER - 304/L S.S. & LOWER - CAST IRON
TUBESHEET	304/L S.S. UPPER & CARBON STEEL LOWER

HEAT EXCHANGER DESIGN SPEC.	SHELL SIDE	TUBE SIDE
FLUID TYPE	WATER	STEAM
DESIGN PRESSURE (PSIG)	200	150
TEST PRESSURE (PSIG)	260	300
DESIGN TEMP. (°F)	210	300
ASME B&PV CODE SEC VIII DIV-1 = U STAMP		

UNIT MODEL	CONNECTION SIZES			
	SHELL (WATER) SIDE		TUBE (STEAM) SIDE-HEAT EXCHANGER	
	INLET	OUTLET	STEAM INLET	CONDENSATE OUTLET
VS06_2	1.5" FNPT	1.5" FNPT	2.5" FNPT - 150#	2" FNPT
VS08_2	2.5" FNPT	2.5" FNPT	3" FLG - 150#ANSI	2" FNPT
VS010_2	3" FNPT	3" FNPT	4" FLG - 150#ANSI	2" FNPT
VS012_2	4" FNPT	4" FNPT	5" FLG - 150#ANSI	2" FNPT

DIVERSIFIED HEAT TRANSFER, INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522 FAX: (855) 221-2400

VS DW SUPERTHERM WATER HEATER W/ ELECTRIC VALVE (UP TO 25 PSIG) DIMENSIONAL DRAWING

	NAME	DATE	DWG#	REV
DRAWN BY	SS	04/03/2018	S-22	B
CHECKED BY	DA	04/06/2018	SHEET 1 OF 1	

FIG 2-2b: SUPERTHERM DOUBLE WALL DIMENSIONAL DRAWING

2.4 PLACEMENT

The unit should be mounted to the suitable floor, concrete pads or structural construction, following DHT guidelines, applicable architectural and local code requirements to assure the safe operation of the unit.

NOTES:

1. Proper rigging techniques should be followed while moving heavy equipment.
2. Maintain proper levels in order for the unit to function properly and follow clearance, dimensional and applicable piping drawings.

CAUTION!

Refer to **Section 2.6 Piping Installation and Unit Connections** for **condensate drain piping instructions**. SuperTherm units must be installed to permit condensate drain freely by gravity.

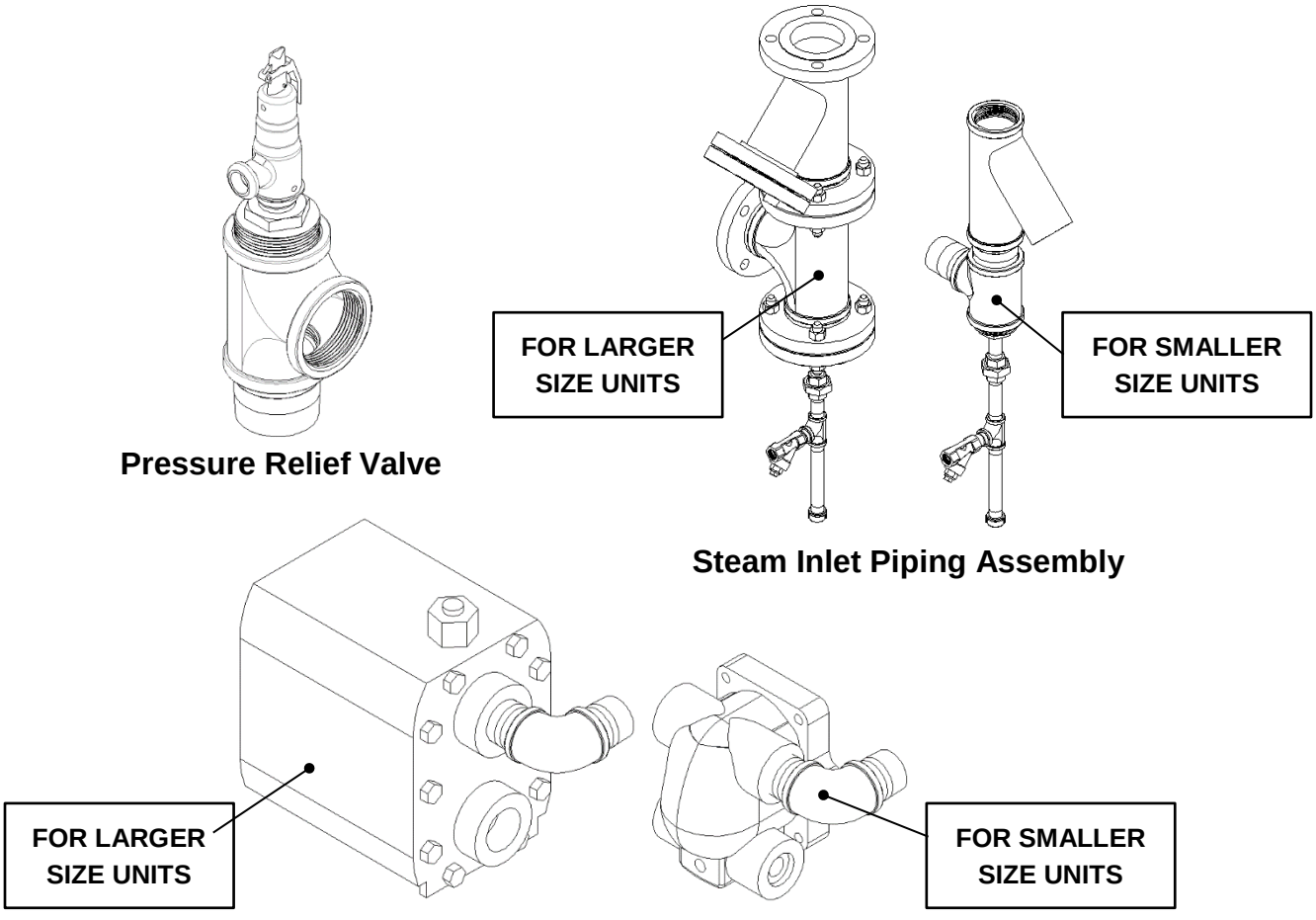
2.5 LOOSE PART INSTALLATION INSTRUCTIONS

The pressure relief valve, steam inlet piping assembly, and condensate trap assembly are included with the SuperTherm water heater, and must first be assembled to the unit before the piping and electrical installation procedures are performed. See Figure 2-3.

NOTE:

1. Pictures shown may look different than actual component depending upon their size. Refer to the latest dimensional drawings to ensure connection details and orientations are up-to-date before proceeding.
2. Under no circumstances should any personnel manually trip the ASME P&T relief valve for any purposes. Otherwise, the warranty will be nullified if it is.

The following sub-assemblies are packed separately within the unit's shipping container for field installation. Installation instructions follow.



Pressure Relief Valve

Steam Inlet Piping Assembly

Condensate Trap Assembly

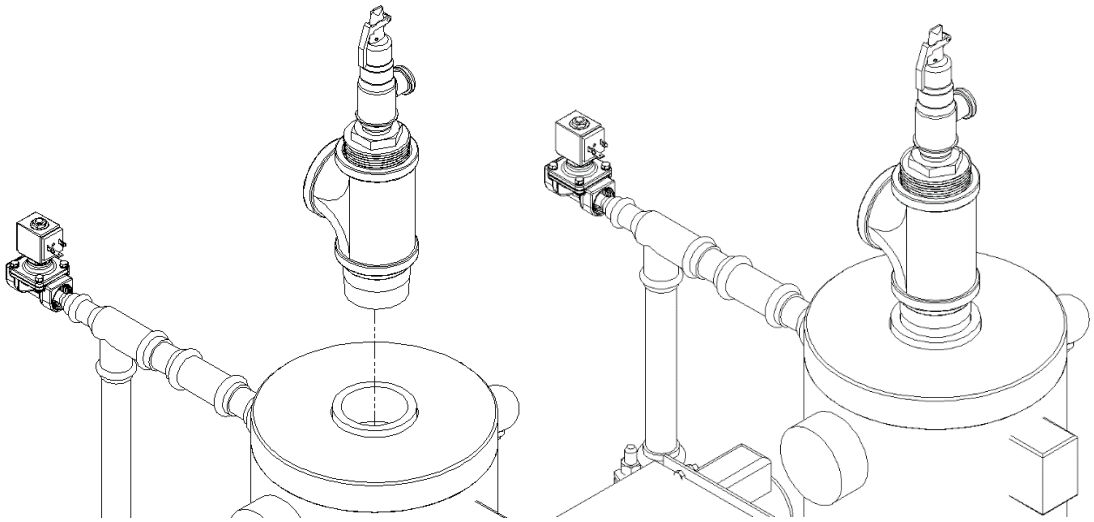
FIG 2-3: FACTORY SUPPLIED LOOSE PART ILLUSTRATIONS

➢ COMPONENT INSTALLATION AND PIPING INSTRUCTIONS

Locate and install the SuperTherm heater in the mechanical room as described in Section 2.3 (Site Preparation) according to local codes. Perform Parts 1 to 3 of the instructions below to install the factory supplied component parts.

2.5.1 PART 1: DHW Outlet Pressure Relief Valve Installation

1. Locate the temperature and pressure relief valve sub-assembly for the DHW outlet. See Figure 2-4.
2. After installation of the SuperTherm unit in the mechanical room, carefully make the DHW outlet assembly connection on top of the unit as shown in following pictures:



Before Installation **After Installation**

FIG 2-4: DWH OUTLET PRESSURE RELIEF VALVE INSTALLATION DIAGRAM

3. A suitable pipe joint compound for potable water should be used on the threaded connections. Any excess compound should be wiped off.
4. Tighten until sealed and facing proper orientation/direction.

NOTE:
Under no circumstances should any personnel manually trip the ASME P&T relief valve for any purposes. Otherwise, the warranty will be nullified if it is.

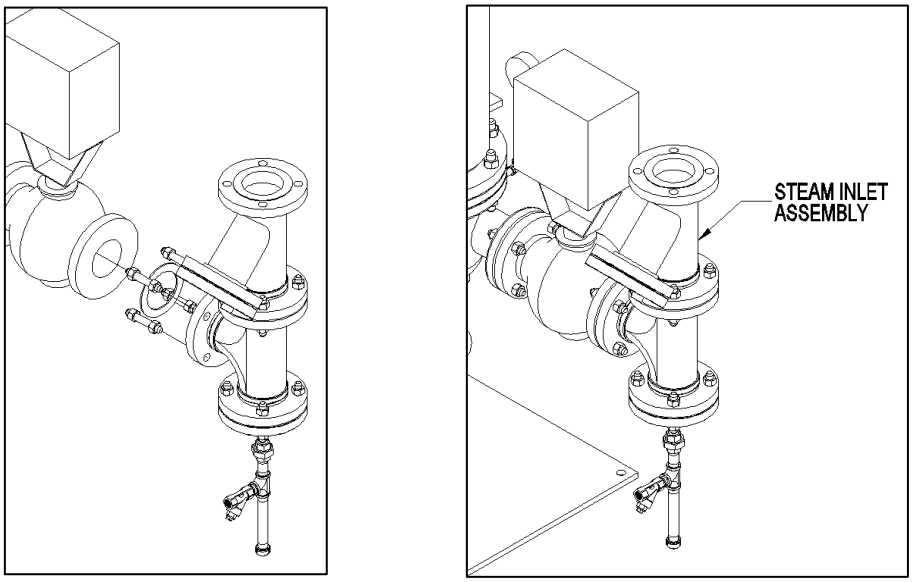
2.5.2 PART 2: Steam Inlet Piping Assembly Installation

1) After the DHW Outlet Assembly is installed per the last instruction, locate the Steam Inlet sub-assembly, as shown in Figure 2-5, and install as described below:

NOTE: It is available in both flange and union connections, depending on the size. Up to two inches (2") is available for union connections and larger sizes are available in flanged connections.

2) Provide appropriate support below for the steam inlet piping assembly. Unit is not designed to support the weight of this steam inlet piping assembly.

3) Install steam inlet sub-assembly on the control valve of the unit as shown in following pictures:



Before Installation **After Installation**

FIG 2-5: STEAM INLET PIPING ASSEMBLY INSTALLATION DIAGRAM

For Thread Connections: a suitable pipe joint compound should be used on the threaded connections. Any excess compound should then be wiped off.

For Flange Connections: required appropriate studs, nuts and gasket are also packed separately.

4) Tighten until sealed and facing proper orientation/direction.

2.5.3 PART 3: Condensate Trap Connection Instructions

After the Steam Inlet Piping Assembly is installed per the last instruction, locate the condensate trap assembly, as shown in Figure 2-6, and install as described below:

5) Provide appropriate support below the condensate trap. Unit is not designed to support the weight of the condensate trap outlet assembly.

6) Install it on the condensate outlet piping union of the unit as shown in following pictures:

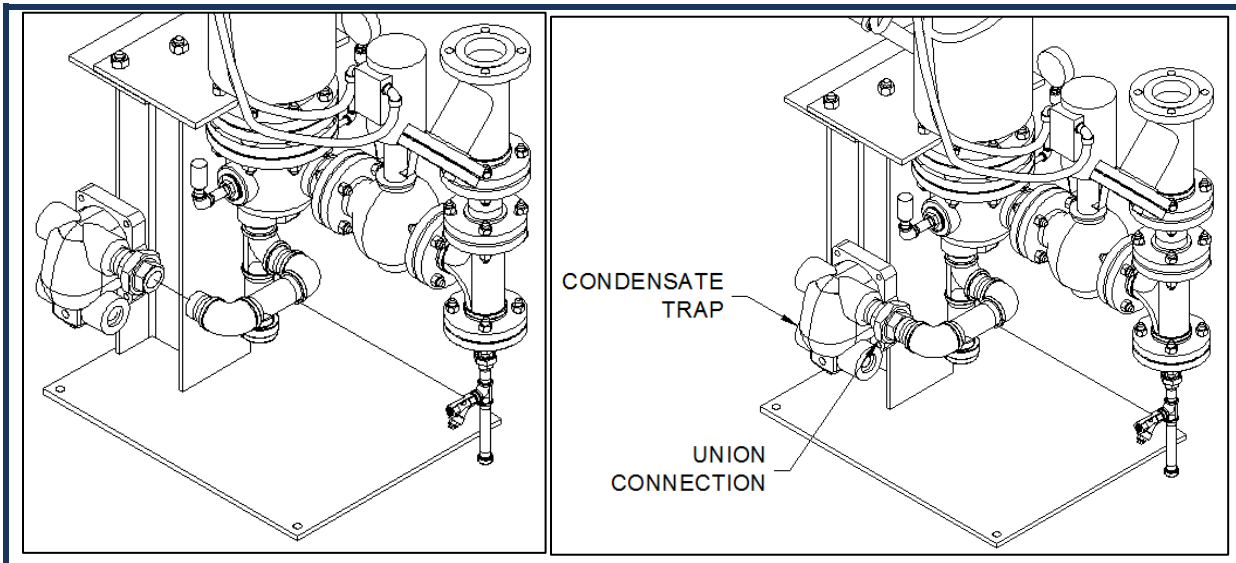


FIG 2-6: CONDENSATE TRAP MAINTENANCE DIAGRAM

7) A suitable pipe joint compound should be used on the threaded connections. Any excess compound should be wiped off.
8) Tighten until sealed and facing proper orientation/direction.
9) Refer to Section 2.6 and piping installation drawing(s) for additional installation and piping details.
10) Check to make sure there is no leakage around all these joints upon startup of unit.

2.6 PIPING INSTALLATION AND UNIT CONNECTIONS

SuperTherm units can be installed in various domestic water applications within the rated temperature and pressure conditions. Refer to Section 6.3 for appropriate Piping and Installation drawing per application requirements (single, multiple units and with or without storage tanks) before making piping connections. CAD drawings are also available on DHT website for layout specification. If any special application help is needed, please call your local DHT representative or DHT factory for specific application information.

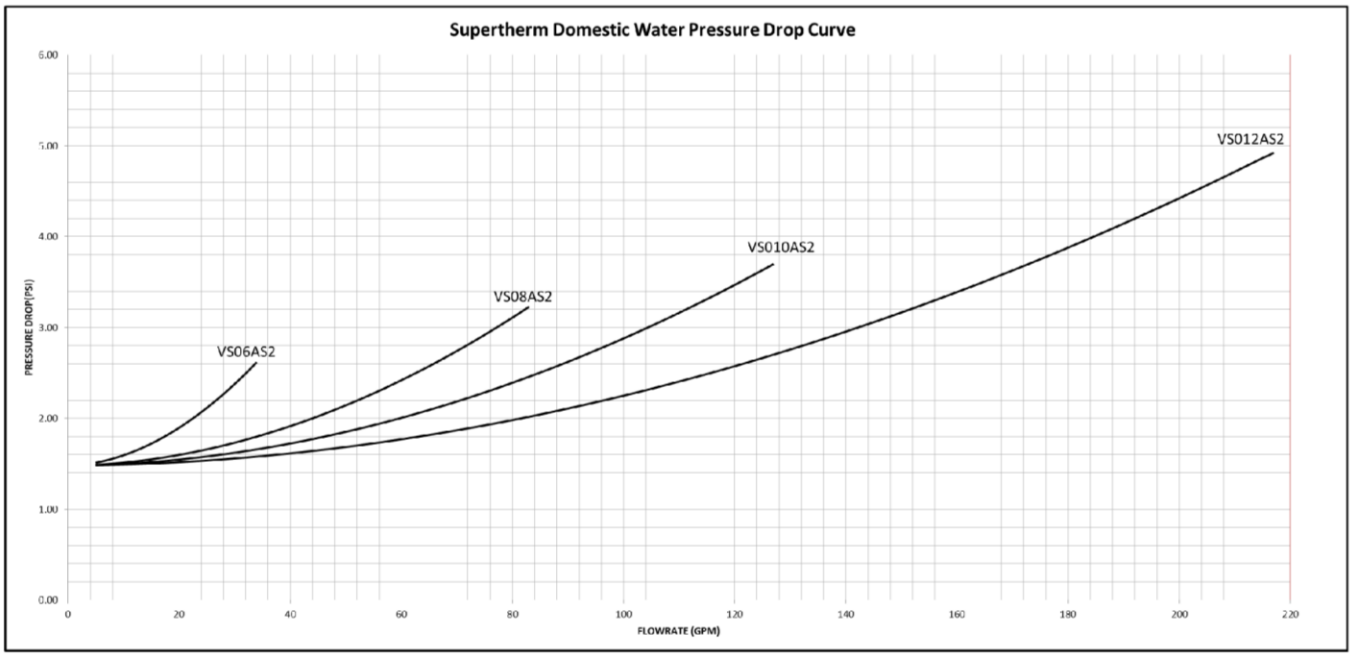
NOTE:
Also consult local codes and authorities in addition to DHT typical Piping and Installation drawings.

- **Domestic water piping:** the exact location of cold water inlet and hot water outlet ports of the unit, as well as pipe diameters and thread/flange size, can be determined for the drawing supplied with the unit. Properly sized water lines should be connected to the unit. A manual shutoff valve should be installed on the inlet water source as an isolation device. All piping and fittings should be clean and free of debris. It is important that the piping systems are balanced when two or more units are in parallel in order to achieve the combined capacity and proper temperature control. Refer to typical Piping and Installation Drawings in Section 6.3. Most up to date drawings are available at www.dhtnet.com.

NOTE:
Building recirculation piping shall be properly sized to provide sufficient capacity to dissipate residual heat within the tube bundle of the water heaters during the periods of low demand.

Refer to the following charts in order to determine the domestic water side pressure drop through the unit:

TABLE 2: WATER PRESSURE DROP CURVE CHART (Single Wall)



Formulas for pressure drop:

VS06AS2: Pressure Drop (PSI) $= 0.0009m^2 + 0.0033m + 1.4724\ (5 \leq m \leq 34)$
VS08AS2: Pressure Drop (PSI) $= 0.0002m^2 + 0.0016m + 1.4735\ (5 \leq m \leq 83)$
VS010AS2: Pressure Drop (PSI) $= 0.0001m^2 + 0.0011m + 1.475\ (5 \leq m \leq 127)$
VS012AS2: Pressure Drop (PSI) $= 0.00007m^2 + 0.0007m + 1.4757\ (5 \leq m \leq 218)$
m – Domestic Water Flowrate (GPM)

- **Steam inlet piping:** Steam inlet piping to be sized per given steam pressure, steam volume and supply line pressure drop to deliver correct volume of steam at sufficient pressure to the control valve.

CAUTION!
Steam, boiler water, or high temperature water can present a very dangerous situation because of the high pressures and temperatures. Follow all mandatory and recommended procedures and safety rules to avoid any hazardous situation.

Make sure that a shutoff valve is installed up stream in the steam line and works properly. It is recommended to install pressure gauge between shut off valve and strainer on the steam inlet assembly. All valves on the source line should be closed during the installation process. Connect the energy source to the piping leading to the control valve. Determine the exact location of the inlet connections and piping size using the drawing of the unit. Refer to typical Piping and Installation Drawings in Section 6.3.

- **Main Condensate and drip trap drain piping:** Determine exact location and size of the condensate port shown on the drawings and connect condensate piping to the port and to

the system following all applicable codes and rules to avoid creating the excessive back pressure to the unit. Shutoff valve and check valve should be installed on the condensate drain line to allow the unit to be isolated from the system.

CAUTION!

The condensate drain piping must be arranged to permit condensate to drain freely by gravity from the unit. Failure to do so can cause improper water temperature control, damage to heat exchanger (premature tube bundle failure) and drainage components.

Do not attempt to lift the condensate above the condensate outlet of the trap without a condensate pump. A pumping steam trap may be substituted if condensate drain by gravity is not feasible after referring to manufacturer's instructions.

- **Drain discharge piping:** All DHT SuperTherm units are equipped with pressure and temperature relief valves, over temperature solenoid valve and heat exchanger shell drain. They should be piped directly to a safe drain according to appropriate plumbing codes as explained in Piping and Installation drawings in Section 6.3.

WARNING!

Make sure that the pressure & temperature relief valve, solenoid valve and condensate traps are piped to a proper drain per instructions and codes. Scalding injury and/or water damage can occur from either the manual lifting of the lever or the normal operation of the valve if it is not piped to a proper drain. Ensure that the piping is of the proper material and rating for the temperature and pressure of the system and that it is secured to prevent possible injury. If the valve fails to flow water or reseat, consult the factory.

2.7 ELECTRICAL CONNECTIONS

All field wiring connections for power and controls are in the control box on the front of the SuperTherm water heater. The wiring label is attached to the inside front door of the control box. An external electrical disconnect (not supplied with the water heater) with adequate overload protection is required. The water heater must be grounded in accordance with national, state or provincial, and local codes.

Connect the system to the correct voltage. The SuperTherm water heater requires 120V AC, 10Amp service with ground (H, N, G) supplied from a suitable circuit breaker (rated for 15Amps) or fused disconnect. The circulation pump has a 120V constant speed fractional HP motor that operates continuously when the power to the unit is on.

Refer to Section 6.4 for standard electrical wiring drawings/schematics.

CAUTION!

All electrical wiring must be in accordance with all local, state and national codes that apply. Do not exceed the rated current of the D.C. power supply (100MA) or the form 'C' relay outputs (5A/240VAC resistive).

WARNING!

Hazardous voltages are present within the enclosure. Installation or service should only be carried out by trained personnel.

CAUTION!

Do not operate the pump without water in the unit! Do not turn on power before filling with water! Failure to do so can cause damage to the pump.

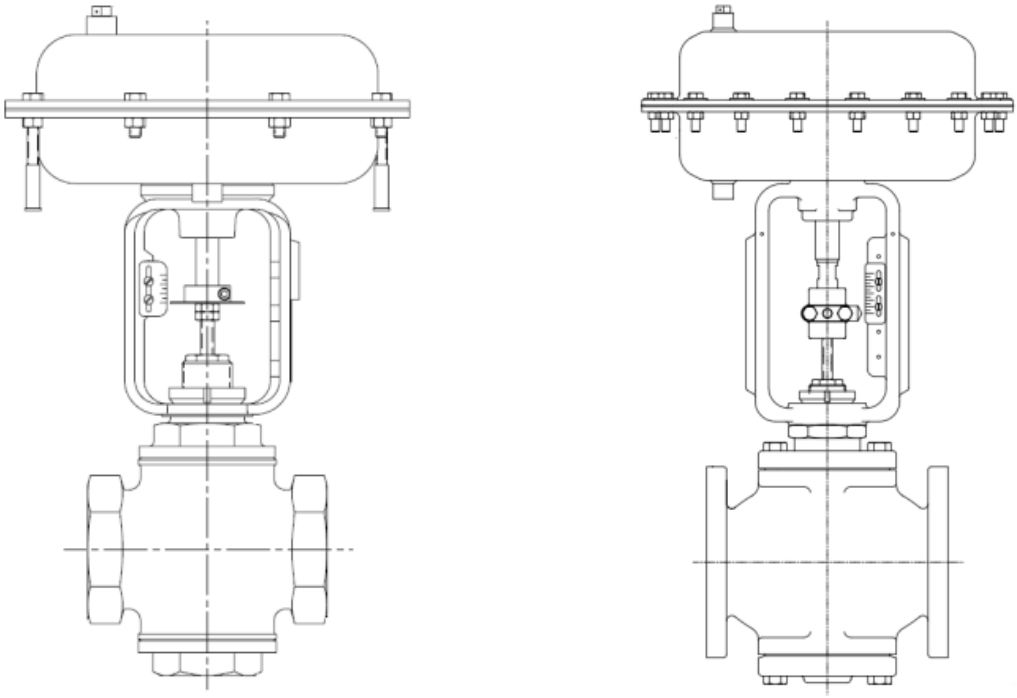
2.8 PNEUMATIC DEVICES INSTALLATION

DHT SuperTherm units can be equipped with pneumatically activated control valves. In most cases they require instrument air with pressure ranges from 15 to 30 psi. Consult the supplied drawings and specific installation and operation manuals for each component to determine the requirements for that component.

NOTES:

1) Assure that the pneumatic feed has been shut down, and air pressure bled from the system by acceptable methods, before attempting any connections.

2) For all pneumatic connections, the use and/ or type of joint compound or sealer on the joint should be determined by referring to local codes, accepted practices, or the requirements of the installing contractor.



Up to 2" Connection **Flanged Connection**

FIG 2-7: PNEUMATIC VALVES (2" and FLANGED) DIAGRAM

Normally closed, 2-way, pneumatically activated actuators and globe control valves are available in NPT connections up to 2 inches size and flanged connections for larger sizes as shown in above pictures. Follow good piping practices and refer to codes and standards in addition to information supplied by DHT. Supply air should be connected to ports or terminals as indicated on the control valve. Final tuning may be required under the actual operating conditions. Refer to section **4.19 Control Valve Technical Information** or supplied pneumatic control valve installation and operations manual before making field piping connections and operating the valve.

2.9 WATER QUALITY

- Before piping the unit into the system, the system must be thoroughly flushed to remove sediment, flux, filings and other foreign matter. The heat exchanger can be damaged by build-up of corrosion due to sediment.
- The manufacturer cannot be held responsible for any damage caused by incorrect use of additives in the system.
- Mineral buildup in the heat exchanger reduces heat transfer, overheats the heat exchanger, and causes failure. Leaks in the heater or piping must be repaired at once. Leakage of steam, boiler water or HTHW into domestic water side is unsafe and needs to be repaired immediately.
- Air elimination is extremely important from the domestic hot water system. Ensure proper air vents are installed in the piping systems that are prone to trap air pockets.
- Consider using water hammer arrestors or an expansion tank to dampen the spikes in water pressure since water hammering can lead to premature failure of the tube bundle and baffles.
- **Hardness** – Water hardness contributes to the formation of scaling, which impacts the performance of the heater exchanger and may lead to premature tube bundle failures. Water hardness should not exceed 6 grains per gallon or 100 ppm. Water softening may be required if it exceeds these levels.
- **Artificial Softness** – Do NOT use artificially softened water since artificial softening agents generally use salt, which causes corrosion of the heat exchanger and piping components. Do NOT use deionized water.
- **Chloride** – Elevated chloride levels in water accelerate corrosion of the heat exchanger and piping system materials. Concentrations of chlorides in system water should be less than 100 ppm.
- **pH –** The pH must always be between 6.5 to 9.5 however it is recommended to keep it higher than 6.8 for copper materials.

NOTES:

2. CuNi or stainless steel materials can handle wider range of water quality levels as compared to copper. Please consult DHT factory if water quality levels exceeds these limits.
3. Consult DHT factory before using SuperTherm units for any other non-standard applications.

SECTION 3: OPERATION AND CONTROLS

3.1 INTRODUCTION

This chapter provides information and instructions for following topics:

- SuperTherm functional description
- Preparation of unit for operation.
- Unit startup procedure instructions
- Unit shutdown procedure instructions
- Controller startup settings

3.2 SUPERTHERM FUNCTIONAL DESCRIPTION

DHT's SuperTherm units are engineered using steam, boiler water or HTHW as the heating medium. Heat exchanger U-tube bundle is either available in single or double wall configuration depending upon customer requirement. Heating fluid is on the tube side and the domestic water is on the shell side. Semi-instantaneous operation provides high output by channeling the incoming cold water directly over the heat exchanger tubes in a controlled manner to maximize the heat transfer rates compared to conventional stratified heat exchanger convection systems. Velocity of water and pressure drop are controlled by changing water flow directly across the heat exchanger, which increases heat transfer and inhibits scale formation. Domestic hot water temperature is maintained by using either electronic or pneumatic controls.

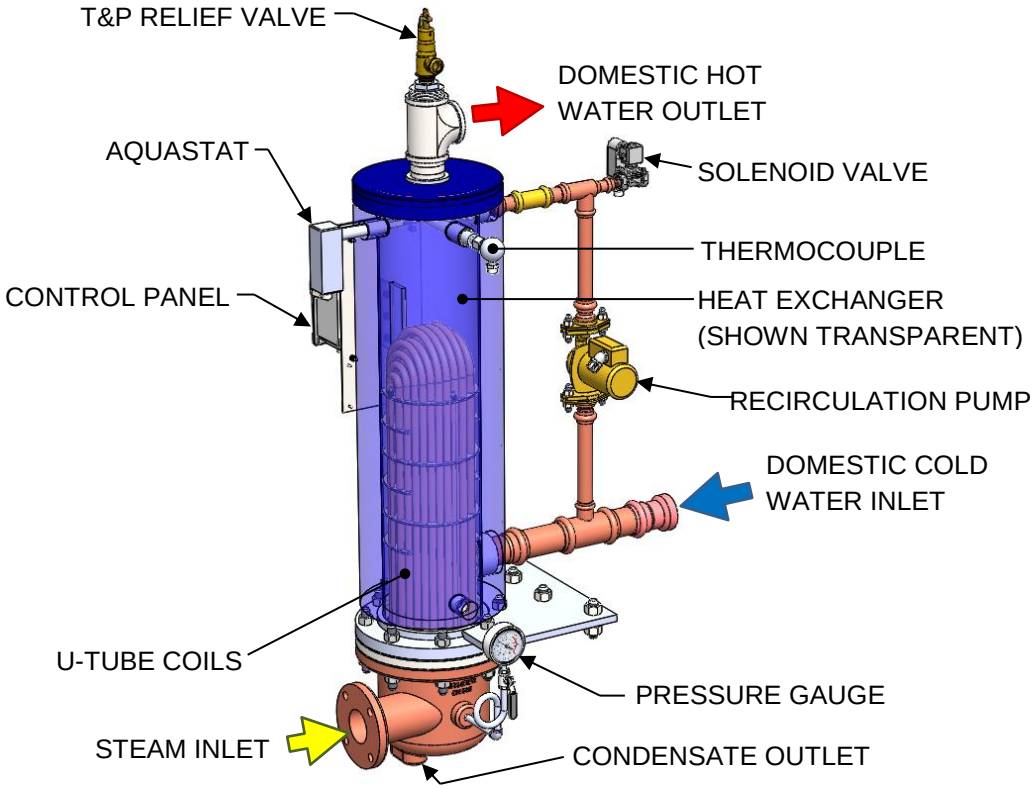


FIG 3-1: SUPERTHERM HEAT EXCHANGER FUNCTIONAL DIAGRAM
(Heat Exchanger Shell is Transparent to Show U-Tube Coils)

Cold domestic water enters the heat exchanger through the cold water inlet connection (as shown in Figure 3-2). It is distributed over the tubes in the heat exchanger shell and flows upwards. It is heated by steam, boiler water or HTHW circulating inside the heat exchanger tube bundle. Heated domestic water then exits the heat exchanger from the hot water outlet connection on top of the unit. Unit also includes a constant speed recirculation pump which continuously circulates the heated domestic water through the heat exchanger shell to ensure there is always hot water present in case of demand. Domestic hot water supply temperature is maintained by either electronic or pneumatically operated control valve.

Steam, boiler water or HTHW enters the heat exchanger coils through the control valve which is modulated by the 4-20 mA output from the controller depending upon the reading from the temperature sensor on the outlet of the heat exchanger. Unit employs closed loop feedback control system to maintain target temperature set point in tight range. Steam rises through the first pass, then enters the second pass of the U-tube bundle on top and then exits through the outlet connection on the bottom head as shown. Flow rate of heating medium is modulated to maintain the desired set point in varying load conditions.

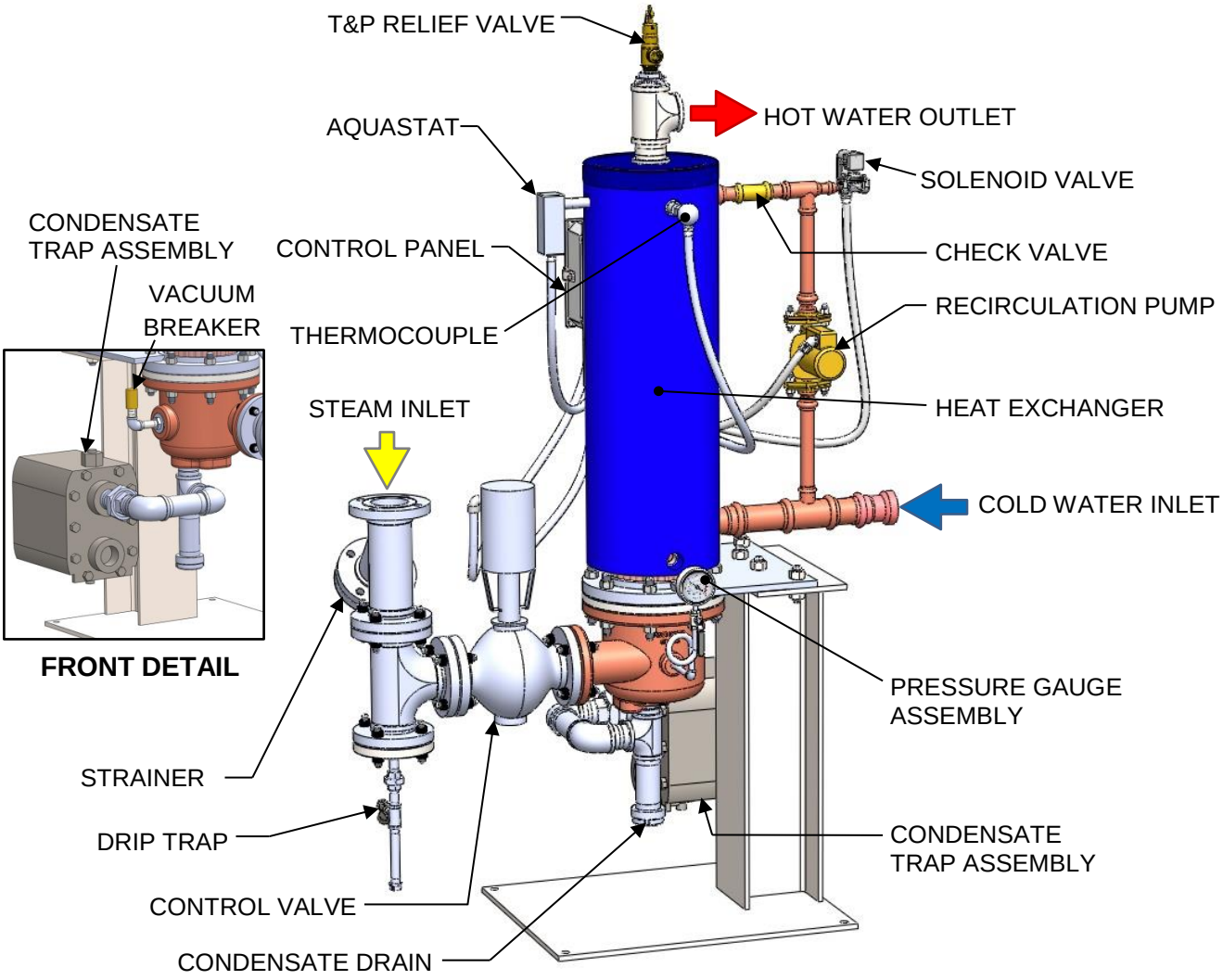
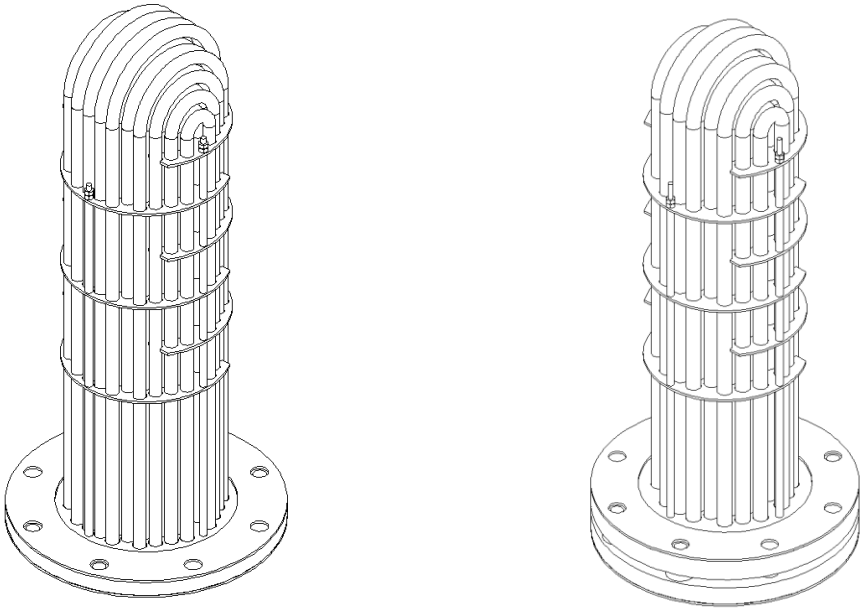


FIG 3-2: SUPERTHERM WATER HEATER COMPONENT DIAGRAM

Tube Bundle Options: SuperTherm units are available in either single or double wall U-Tube bundle construction depending upon customer requirement (see Figure 3-3). Double wall construction has inner and outer walls separated by air gap between them. Steam or boiler water flows through the inner walls and any condensate or water leaking through the inner walls is collected within the air gap which is vented to atmosphere for leak detection. Similarly, if the domestic water leaks through the outer walls, it is collected within the air gap between the tubes and is vented to atmosphere for leak detection.



SINGLE WALL
U-TUBE BUNDLE

DOUBLE WALL
U-TUBE BUNDLE

FIG 3-3: SINGLE AND DOUBLE WALL U-TUBE ILLUSTRATIONS

Double Wall Construction and Protection Performance:

- Prevents cross-contamination.
- Easy inspections and low maintenance.
- Fully visible, 360° vented leak detection between tubesheets as shown.
- Bolting and gaskets for potable water and heating medium are completely independent.
- Individual tube access for easy maintenance.
- Used to upgrade present single-wall tube bundles.
- Double wall U-tube coils construction is available in either Copper or Cu-NI materials.

DHT SuperTherm water heaters tube bundle double wall construction meets Uniform Plumbing Code requirements for heating potable water. The heat transfer surface is 5/8” O.D. inner wall and ¾” O.D. outer wall. Both inside and outside surfaces are smooth with no fins or surface irregularities that promote scale formation or corrosion attack. Double-wall tubing has a similar overall heating conductivity as a single wall tube of equivalent wall thickness. Each tube has multiple parallel and continuous vent paths. See Figure 3-4.

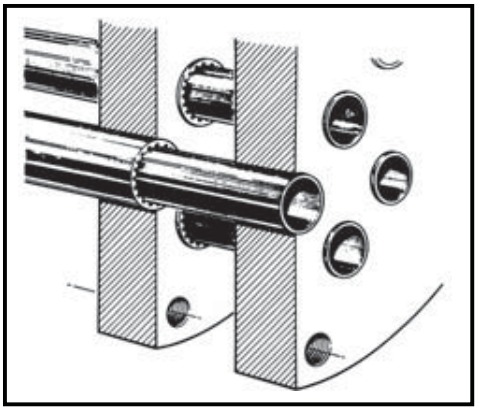


FIG 3-4: U-TUBE DOUBLE WALL CONSTRUCTION DETAIL ILLUSTRATION

Tube failure can be caused by corrosion, erosion, and vibration, and can result in the contamination of the domestic water system to be contaminated by a heating medium such as steam, hydronic water, glycol solution, etc. There is no practical way to have the heating medium sterile or free from harmful treatment compounds or corrosion by-products. A low pressure heating medium circuit does not ensure contamination protection of indirect, single-wall water heaters. Whether they are shell and tube, shell and coil, plate and frame, or any other type, all consist of relatively thin wall heat transfer surface separating the heating medium from the domestic water system. Therefore, the potential for cross contamination is real and in some instances contamination has occurred. Several states and cities are now insisting on double-wall vented construction in all indirect type domestic water heaters. Plumbing codes have also been re-written to include double-wall protection. DHT has developed the most practical, “state-of-the-art” double tube wall heaters to preclude any possibility of contaminating the domestic water system.

Safety Controls: Automatic over-temperature limit switch is included which will cut off all electricity supply to the unit and shall close the normally closed control valve during over temperature condition. Power supply is restored if unit goes back to normal operation.

Unit includes primary and secondary alarms functionality in the safety controls. Red light shall turn on when the hot water temperature reaches the primary alarm setting and then alarm starts sounding. In the next step, power supply to the normally closed control valve is interrupted causing it to close. If the water temperature continues to rise, it turns the secondary alarm on, which then opens the dump solenoid valve to release high temperature hot water to safe drain in order to protect the unit. When the unit goes back to normal operating temperature conditions, green light turns on but the siren continue until owner manually presses the switch to turn it off. Power to the control valve is restored and solenoid valve closes. Controls also include aquastat safety over the control panel system if it in case it malfunctions.

In case of pneumatic controls, air shutoff solenoid valve shutoff/interrupt air supply to the normally closed control valve causing it to close. Air supply to control valve is restored if unit goes back to normal operation.

3.3 PREPARATION OF UNIT FOR OPERATION

It is important to make sure that the unit is installed and all piping and electrical connections are made per instructions in Chapter 2. Also make sure that the connecting piping has been cleaned out before starting up the unit.

3.4 UNIT STARTUP PROCEDURES

Follow the instructions below to start up the SuperTherm unit:

➢ UNIT STARTUP PROCEDURE INSTRUCTIONS

1) Assure that all manual shutoff valves on steam, boiler water/high temperature hot water, domestic water and pneumatic lines are closed.

2) Slowly open the manual shutoff valve on the feed water inlet line, checking to assure that there are no leaks at the valve or any joints.

3) Adjust the operating temperature control to the desired temperature. Refer to Section 3.5 for the exact location of the control and detailed adjusting procedure.

4) Adjust the high temperature limit per actual operating conditions. It is normally factory set at 160°F considering 140°F operating supply water temperature.

5) Open the steam condensate return valve or steam/boiler water high temperature water return valve.

6) Slowly open the manual shutoff valves on the power source inlet.

NOTE:
This procedure is similar for both boiler water and high temperature water energy sources.

CAUTION!
Steam, boiler water, and high temperature water present situations that can be very dangerous because of the high temperatures and pressures. Use common sense and follow all accepted and recommended procedures when performing installation, operation, and maintenance procedures, to avoid possible injury or death.

7) If no leaks are found, slowly continue to open the manual shutoff valves on the power source inlet.

8) As the unit is initially heating the water, carefully re-inspect the water/steam inlet, the water outlet, power source inlet (steam, boiler water, or high temperature water), and condensate return lines and joints for signs of leakage.

9) As unit approaches the desired operating temperature, check that the temperature inside the unit is within the desired range. If necessary, readjust the temperature control valve. See the Submittal documents and the temperature control valve component manual, included with the unit, for the exact location of the valve and detailed adjusting procedures.

10) After the unit has reached operating temperature, re-inspect all joints for signs of leakage. In addition, check all gauges and controls to verify that the clean steam and energy source pressures are within design specification. (Cont.)

11) The unit is now ready for normal operation. Proceed to Section 3.6 for setting the

temperature and other initial startup parameters using the controller.

3.5 UNIT SHUTDOWN PROCEDURES

All maintenance procedures require the water heater to be properly shutdown. Follow the instructions below in order to shut down the SuperTherm unit:

➢ UNIT SHUTDOWN PROCEDURE INSTRUCTIONS

1. Close all valves in the energy source inlet line (steam, boiler water or high temperature water).
2. Turn off all power to the electric control, if so equipped.
3. Turn off the pneumatic (instrument air) source. Only applicable for pneumatic controls.
4. When possible, relieve the pressure from energy source line (steam, boiler water, or high temperature water), between the shutoff valve and the unit.
5. Wait 5 minutes or until dial thermometer starts dropping. Close all remaining valves in the system in this order.
    a) Hot water outlet line.
    b) Cold water inlet line; and
    c) Condensate return line (or boiler/high temperature water return line).
6. After the system has cooled, drain the unit by opening the heat exchanger drain valve and holding the pressure relief valve in the open position. This will prevent the formation of a vacuum and increase the drainage flow.
7. Proceed with the required maintenance or repairs.
8. After performing the required maintenance or repairs, return the unit to operation by following the described above startup procedures in Section 3.3.

3.6 CONTROLLER INTRODUCTION

The DHT Series 700 Water Heater Controller is a microprocessor based, state of the art, device offering unmatched performance and full user configurability for water heating applications.

The 700 Series is used with a type ‘K’ thermocouple sensor.

Process indication is displayed in alpha/numeric format on the controller’s two line, backlit LCD display along with the current status of the unit’s relay outputs. Six digital LED indicator lights (3 red and 3 green) provided for alarm and status indication.

All aspects of the unit are user configurable through the ‘plain English’ menus and combinations of the 3 user data key push buttons.

MODBUS RTU®: RS485Network allows multiple units to be connected together for distributed applications, remote monitoring SCADA applications (optional).

Optional Building automation communication gateway available for connections with Bacnet MS/TP, or Bacnet/IP

Menu based programming, all parameters and setpoints are user configurable via menu prompts and user keys. The preconfigured screens and 'pull down' sub menus with English prompts assures rapid setup and commissioning.

3.7 CONTROLLER STARTUP

FIG 3-5: SUPERTHERM CONTROLLER MODULE PHOTO

Upon power up, the opening screen shows the model number and the current revision level (Figure 3-6), then defaults to the display shown in Figure 3-7.

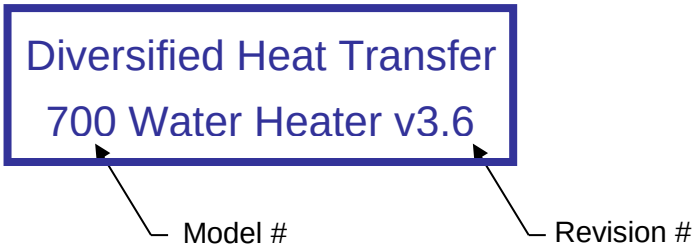


FIG 3-6: OPENING SCREEN DISPLAY

> **NOTE:**
> The numbers shown in this section are for information purposes only. User has to manually insert the numbers depending upon required application operating conditions following the programming sequence in Section 3.7.

FIG 3-7: DEFAULT DISPLAY AFTER STARTUP

To program the controller for operation, follow the instructions in the following sections.

3.8 PROGRAMMING THE SEQUENCE

➢ ENTERING THE PASSWORD

1. To begin the programming sequence, press the ❋ button and the 'ENTER PASSWORD' screen appears:

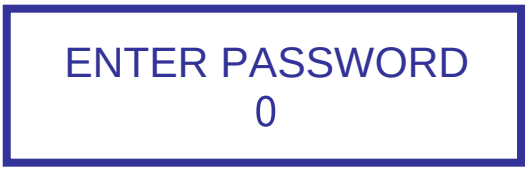


FIG 3-8: PASSWORD ENTRY

2. Use the ↑ ↓ buttons to enter the access password, press the ❋ button to enter the password, and then proceed to step 3.

> **NOTE:**
> Use default password "**0**" to move to next steps.

➢ SETPOINTS MENU

3. Use the ↑ ↓ buttons to cycle through the menu choices and navigate to the 'SETPOINTS' menu, as shown:

FIG 3-9: SETPOINTS MENU

4. Press ❋ to access the 'PRIMARY ALARM **ON** AT' Menu.
5. Use the ↑ ↓ buttons to change the 'PRIMARY ALARM **ON** AT' setpoint value. Press ❋ to save and advance to the 'PRIMARY ALARM **OFF** AT' setpoint value as shown:

FIG 3-10: PRIMARY ALARM ON SETTING

6. Use the ↑ ↓ buttons to change the 'PRIMARY 'ALARM OFF AT' setpoint value. Press ❋ to save and advance to the 'SECONDARY ALARM' set points menus.

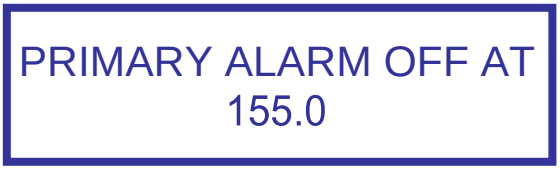


FIG 3-11: PRIMARY ALARM OFF MENU

7. Use the ↑ ↓ buttons to change the 'SECONDARY ALARM **ON** AT' setpoint value. Press ❋ to save and advance to the 'SECONDARY ALARM **OFF** AT' setpoint value.

FIG 3-12: SECONDARY ALARM ON MENU

8. Use the ↑ ↓ buttons to change the 'SECONDARY ALARM **OFF** AT' setpoint value.

FIG 3-13: SECONDARY ALARM OFF SETTING

HINT: Holding down the ✱ key for three (3) seconds will display the previous screen.

➢ VALVE OUTPUT MENU

9. Press ❋ to save and advance to the 'VALVE OUTPUT' Menu using ↑ ↓ buttons.

FIG 3-14: VALVE OUTPUT MENU

10. Press ✱ to view or adjust the current 'SETPOINT' using ↑ ↓ buttons.

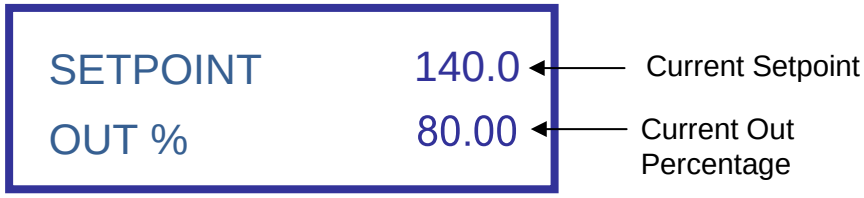


FIG 3-15: SETPOINT SETTING

11. Press ✱ to view or adjust 'GAIN' setting using ↑ ↓ buttons.

FIG 3-16: GAIN SETTING

NOTE:

- The 'GAIN" setting increases or decreases the speed of response to a load change.
- Factory settings are typically 4.5. If the system is overshooting, lower the gain to 4.4, 4.3 or 4.2.

12. Press ✱ to view or adjust the 'INTEGRAL' setting using ↑ ↓ buttons.

FIG 3-17: INTEGRAL SETTING

NOTE:

- 'INTEGRAL' mode permits the controller to return to setpoint after a load change. **Make small adjustments, from 1.0 to .9, .8, .7, or .6**. This will make the system calculate its current position at a faster rate.
- The bottom line (OUT %) shows the live output percentage to the valve. This appears on all of the valve output screens.

13. Press ✱ to view and adjust the 'MAXIMUM' and 'OUTPUT %' using ↑ ↓ buttons.

FIG 3-18: MAXIMUM AND OUTPUT % SETTINGS

NOTE:

- Maximum output allowed can be limited to limit cycling.
- When starting up, begin with an output setting of 50% to 60%.

14. Press ✱ to view the 'MANUAL/AUTO' menu items. Press ↑ ↓ to select AUTO (automatic) or MANUAL Operation.

CAUTION!

Always leave in the AUTO (Automatic) setting.

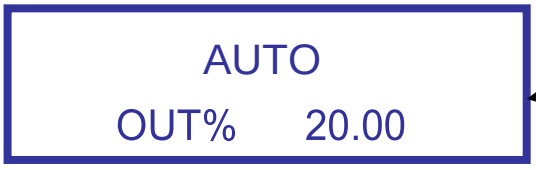


FIG 3-19: AUTO SETTING

FIG 3-20: MANUAL SETTING

15. Use the ↑↓ buttons to increase or decrease the 'OUT %' (output).

FIG 3-21: MANUAL OUTPUT % MANUAL SELECT SETTING

NOTE:
Not recommended to use manual positioning when unit is in operation.

➢ DIAGNOSTICS MENU

16. Press ↑ or ↓ buttons to navigate to the 'DIAGNOSTICS' MENU'.

FIG 3-22: DIAGNOSTICS MENU

17. Press ✱ to view the 'DIAGNOSTICS' screen as shown below.

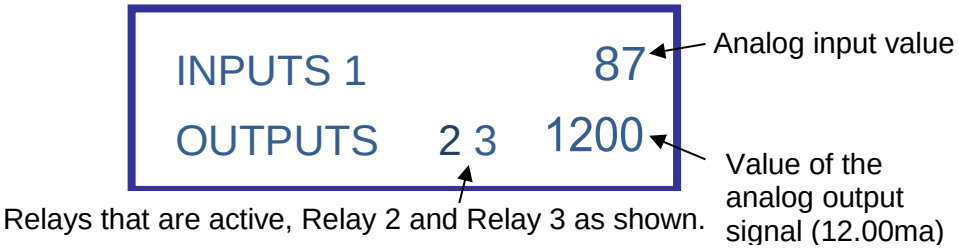


FIG 3-23: DIAGNOSTIC DISPLAY

NOTE:
The bottom line shows the live output (OUT %) to the valve. This appears on all of the valve output screens.

SECTION 4: MAINTENANCE

This section covers the service and maintenance actions for SuperTherm VS water heaters and provides step by step instructions for the inspection and replacement of critical parts and components.

Any questions concerning maintenance procedures should be directed to DHT support at 1-800-221-1522. Please be prepared with model and serial numbers of the unit and heat exchanger coils prior to contacting DHT.

CAUTION!

All service on the SuperTherm water heater must be performed by trained and experienced technicians from appropriate service agencies.

NOTE:

Taking the unit offline is required for many of the maintenance procedures in this section, so all technicians performing maintenance should be familiar with the procedures necessary for unit shutdown (Section 3.5) and unit startup (Section 3.4).

Carefully examine any component(s) directly connected or linked to the part(s) being replaced before maintenance procedures are started. Consider them for replacement at same time if any of the associated component(s) show signs of wear or improper operation.

4.1 CIRCULATING PUMP MAINTENANCE

To evenly heat the water in a DHT SuperTherm water heater a circulating pump is used. The following instructions describe the procedure to allow testing the pump, and it's replacement should it be required.

➢ CIRCULATING PUMP INSPECTION & REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 5 of the shutdown procedure in Section 3.2 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Test the pump according to manufacturer's instructions supplied with the test unit. If found to be defective or worn, replace the pump per the following steps:

   a) After assuring that the power has been turned off, disconnect the electric leads to the circulating pump.

   b) Drain the shell by removing the plug on the shell drain connection as shown in Figure 4-1B, item 17.

   c) After breaking the flanged joint between the pump and the inlet and outlet piping, remove the pump.

   d) Follow recommendations by the pump manufacturer to reconnect the pump to the inlet and outlet piping.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

   e) Reconnect electric leads to the pump according to the unit's manufacturer's wiring diagram.

   f) Follow the startup procedure in Section 3.1 to return the unit to operation. Check for signs of leakage at all connections.

4.2 POWER CONNECTION REWIRING

If any of the power connections must be rewired at the electrically activated controls or junction boxes, follow the steps listed below.

➢ POWER CONNECTION REWIRING INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 5 of the shutdown procedure in Section 3.2 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Ensure that electrical power has power has been turned off, then disconnect and rewire the electrical connection as required.
3) Turn the power on to check that the component that has been rewired is functioning properly.
4) Follow the startup procedure in Section 3.1 to return the unit to operation.

4.3 PNEUMATIC (INSTRUMENT AIR) CONNECTIONS REFITTING

If any of the pneumatic (instrument air) connections must be refit at the pneumatically activated controls, follow the steps listed below. Instrument air, at pressures as high as 150 psi, can be required for pneumatically activated controls. Air pressure at this level can pose a very dangerous situation. Assure that the air source has been shut down and that the line pressure has been bled before breaking any pneumatic connection.

➢ PNEUMATIC CONNECTIONS REFITTING INSTRUCTIONS

1) Before performing ANY maintenance procedure, follow Steps 1 through 6 of the shutdown procedure in Section 3.2 to take the unit off-line.
2) After assuring the air source has been turned off, break and redo the pneumatic connections in questions.
3) Turn the air supply on and check that the component that has been reconnected is functioning properly.
4) Follow the startup procedure in Section 3.1 to return the unit to operation.

4.4 HEAT EXCHANGER COIL & GASKET MAINTENANCE

The "U-Bend" heat exchanger coil is the heart of DHT Water Heaters. Every two years this coil should be removed from the unit and inspected for wear or damage. There is one (1) gasket located between the coil tube face and the flange welded to the shell/tank, and one (1) gasket with a divider so that it will fit between the tubesheet and the head.

➢ HX COIL/GASKET INSPECTION/REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow the steps for the shutdown procedure in Section 3.2 to take the unit off-line.

WARNING!

- Boiler steam and high temperature water can be **very dangerous**, and can lead to possible injury or death if caution is not exercised. Use all recommended procedures in this manual, as well as general safety and acceptable practices when performing any of these maintenance procedures.
- TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Shut OFF the energy source, water inlet, and outlet, condensate/water return line; and make sure that the pressure has been bled from both the water line and energy source systems; that the shell/tank has been completely drained; and that the steam, water, all components, and surface have cooled.

3) Using care, break the joint between the coil head of the heat exchanger and the small line leading to the energy source pressure gauge.

4) Using care, break the connections between heat exchanger coil head and the energy source inlet and outlet lines.

NOTE: If you are required to make the necessary break at a second location and to rotate the lines to allow heat exchanger coil clearance, ensure the action does not damage the in-line components.

5) Remove the studs and nuts that secure the heat exchanger coil head to the shell, and remove all studs from the unit.

6) Carefully separate the heat exchanger coil head from the mounting flange and remove the coil assembly from the tank.

7) Be careful, as residual steam condensate (or boiler or high temperature water) can leak out from the coil after it is removed, and this could present a scalding danger.

8) There may still be residual steam condensate (or boiler / high temperature eater) in the coil that can run out during removal of the coil from the tank. If sufficient time has not been allowed for cooling, this residual condensate/ water could resent a danger of injury.

9) Inspect the heat exchanger coil for buildup of scale and evidence of leakage. If there is no leakage, use care and clean the excess scale from the coils to prepare the heat exchanger coil for re-installation. If leakage is found between the water in the tank and the coils, either repair or replace the heat exchanger coil with a new one.

10) Completely remove the old gaskets, then entirely clean the mating surfaces. Install one of two new gaskets between the coil tube face and the flange welded to the tank, and the gasket (with a divider) between the tubesheet and the head.

11) Insert the heat exchanger coil carefully into the tank, oriented with the divider in the head properly lined up with the coil.

12) Assure that the heat exchanger unit is aligned properly, then clamp the flanges together, and follow the torque procedures below:

NOTE: Studs used to secure the heat exchanger in DHT Water Heaters are A193 B7 grade.

a) Lubricate the stud threads and the nut faces with a suitable lubricant.

b) Insert the studs through the flanges, then start and finger tighten the nuts.

c) Number all bolts so that torqueing requirements can be followed.

NOTE: Refer to Section 4.19 for drawing location and part number information of studs and nuts. Reference the applicable drawing for the unit model being serviced.

d) Apply torque in fifty percent (50%) increments of the final torque value around 140-150 FT-LBS until sealed before proceeding to the next step.

e) Tighten bolts in the applicable sequential order (0°-180°, 90°-270°, 45°-225°, 135°-315°) at each step until final target torque is reached.

f) Use rotational tightening until all bolts are stable at final torque level. Two (2) complete times around is usually required.

13) Reconnect the steam/ energy source inlet to the heat exchanger coil. If these lines have been broken at a secondary location for coil removal, ensure these connections are also tightened.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

14) Reconnect the small line leading to the energy source pressure gauge.

15) Follow the startup procedure in Section 3.1 to return the unit to operation. Check for signs of leakage at all connections.

4.5 INLET, OUTLET, AND CONDENSATE / WATER RETURN LINE AND MANUAL SHUTOFF VALVES REPLACEMENT

If any of the inlet, outlet, return lines, or shutoff valves are damaged and must be replaced, follow the steps outlined below.

➢ INLET, OUTLET, AND CONDENSATE/WATER RETURN LINE AND MANUAL SHUTOFF VALVES REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 5 of the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Ensure that electrical power has power has been turned off, then disconnect and rewire the electrical connection as required.
3) Turn the power on to check that the component that has been rewired is functioning properly.
4) Follow the startup procedure instructions in Sec. 3.1 of this manual to return the unit to operation.

CAUTION!
It is NOT advised to replace the inlet, outlet, condensate / water return line, and shutoff valves without a complete shutdown of the unit**.** In the absence of a complete shutdown and removal of electrical power, failure of a manual shutoff valve during the maintenance procedure could result in a dangerous situation.

5) Shut OFF the energy source, condensate/water return line, feed water inlet and outlet; and ensure that both the water lines and energy source systems have been bled of pressure. Ensure that the shell/tank has been drained completely and that all surfaces and components have cooled.
6) Use care and break the joint between the line or valve to be replaced and the unit.
7) Remove the valve or section of line to be replaced.
8) Replace the damaged valve or section of line.
9) Reconnect the valve or line to the unit.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

10) Perform the startup procedure, as described in Section 3.1, to put the unit back online. Check for evidence of leakage at all connections.

4.6 PRESSURE GAUGE (ENERGY SOURCE) REPLACEMENT

If the pressure gauge for the energy source does not function correctly and must be replaced, follow the procedures outlined below.

➢ PRESSURE GAUGE (ENERGY SOURCE) REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 7 of the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Carefully disconnect the small line connecting the pressure gauge with the heat exchanger coil head from both the head and the gauge.
3) Remove the gauge from its mounting.
4) Mount the new gauge.
5) Reconnect the small line to both the heat exchanger coil head and the gauge.
6) Follow recommendations contained in the manufacturer's documentation, local codes, or accepted contractor practices as to the use and/or type of joint compound or sealer at the connections.
7) Follow the startup procedures to put the unit back on-line. Carefully check all connections for any sign of leakage.

4.7 PRESSURE OR T&P RELIEF VALVE (SHELL/TANK) REPLACEMENT

If the water pressure or T&P relief valve mounted on the tank is not functioning correctly and must be replaced, follow the procedures outlined below.

➢ PRESSURE RELIEF VALVE (SHELL/TANK) REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow the shutdown procedure in Section 3.5 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Carefully disconnect the drain line from the relief valve to the drain.
3) Unscrew and remove the relief valve from its mounting location on top of the unit.
4) Install the new relief valve in place. Tighten until sealed and facing proper orientation.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

5) Reconnect the drain line from the relief valve to the drain per local codes.
6) If any were disconnected, reconnect all electric and pneumatic lines and restore power and instrument air to the system.
7) Reference the manufacturer's documentation for the relief that was supplied with your unit for additional installation / setup instructions.
8) Follow the startup procedures to put the unit back on-line. Carefully check all connections for any sign of leakage.

4.8 SOLENOID SAFETY SYSTEM INSPECTION & REPLACEMENT

The solenoid safety system acts as a fail-safe for DHT SuperTherm water heaters. The system requires power to operate, therefore in the case of a power failure, the system will totally shutdown the unit. If it is mandatory that the unit remain in operation during power failures, it should be wired into the buildings' emergency power system. **Before this is done, it is the duty of the installer/operator to check local codes and requirements to assure that this is an acceptable configuration.**

When power is supplied to the solenoid safety system, the system allows the electrically operated controls to supply energy to the unit. A semi-annual inspection is recommended, but manufacturer's recommendations should be followed for frequency of inspection, testing, and maintenance. If it is necessary to replace a malfunctioning system, follow the instructions below.

NOTE: Location of the solenoid safety system may vary from unit to unit. Refer to the drawing supplied with the submittal for the exact location and configuration of the solenoid safety system in your unit.

➢ SOLENOID SAFETY SYSTEM INSPECTION & REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 7 of the shutdown procedure in Section 3.2 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Carefully disconnect the line connecting the solenoid safety system to the control panel.
3) Carefully disconnect electric leads from the solenoid valve safety system.
4) If the system is pneumatically activated, turn off the instrument air source and disconnect the pneumatic lines from the solenoid safety system. Also disconnect any electric lines connecting pneumatic control valve in this case (similar to step 2 and 3 above).
5) Remove the solenoid safety system from its mounting.
6) Mount the new safety system.
7) Reconnect the line from the control panel to the solenoid valve safety system on both sides.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

8) Reconnect the small line from the energy source control valve to the safety system.
9) If any were disconnected, reconnect all electric and pneumatic lines and restore power and instrument air to the system.
10) Reference the manufacturer's documentation for the safety system that was supplied with your unit for additional installation / setup instructions.
11) Follow the startup procedure in Section 3.1 to return the unit to operation. Check for signs of leakage at all connections.

4.9 STRAINERS INSPECTION AND REPLACEMENT

The strainers are installed upstream of the energy source shutoff valve for both the coil and the main traps. These strainers must be flushed periodically (approximately every three (3) to six (6) months) to prevent the buildup of any sediment.

➢ STRAINERS INSPECTION AND REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 7 of the shutdown procedure in Section 3.2 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Location of the strainers may differ between units. Refer to the drawing that accompanies the Submittal sheet for the exact location.

3) Break the line connections on the INLET side of both strainers, then break the line connection on the OUTLET side of the strainers.

4) Remove and inspect the strainers for wear or damage.

5) Clean out any sediment found in the strainers. Replace the strainers if cleaning does not adequately restore function.

6) Replace the strainers in the system, back-in-line.

7) Reinstall the inlet and outlet lines to both strainers following the manufacturer's recommendations, while adhering to local codes, as well as proper safety and accepted practices.

8) Follow the startup procedure in Section 3.1 to return the unit to operation. Check for signs of leakage at all connections.

4.10 TEMPERATURE CONTROL VALVE INSPECTION & REPLACEMENT

The temperature control valve is installed upstream of the heat exchanger coil and ***must be interlocked*** with the high temperature cut off solenoid. The manufacturer documentation included with the unit gives specifics for operation and maintenance of the control valve. The location of the temperature control valve and it's interlocks with other components can be found in the drawing accompanying the submittal sheet for the unit, and should be referred to before performing this maintenance procedure.

➢ TEMPERATURE CONTROL VALVE INSPECTION & REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 7 of the shutdown procedure in Section 3.2 to take the unit off-line.

WARNING!

- Boiler steam and high temperature water can be **very dangerous**, and can lead to possible injury or death if caution is not exercised. Use all recommended procedures in this manual, as well as general safety and acceptable practices when performing any of these maintenance procedures.
- TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) Assure that the energy source, condensate/ water return line, water inlet and outlet have been shut off; that the pressure has been bled from both the steam and energy source systems; that the shell/tank has been completely drained; and that all components and surfaces have cooled.
3) For electrically activated control valve, turn off the power and disconnect the leads to the valve.
4) For pneumatically activated control valve, turn off the instrument air source, bleed the pressure from the line, and disconnect the lines to the valve.
5) Break the joints between the pressure control valve and feed water valve, solenoid safety unit, and auxiliary trap line.
6) Break the connections between the energy source inlet line and the heat exchanger coil.

NOTE: If you are required to make the necessary break at a second location and to rotate the lines to allow heat exchanger coil clearance, ensure the action does not damage the in-line components.

7) Remove the control valve from the system.
8) Follow the supplied manufacturer instructions for inspecting the valve. If found to be malfunctioning, replace the valve.
9) Reinstall the control valve by reconnecting it to the heat exchanger coil outlet line and the energy source inlet line. Reconnect the small line from the shell/ tank outlet line to the safety system.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

10) Place the valve in the same orientation as it was when removed and tighten the connections. If lines were also broken in a secondary location, ensure those connections are also tightened
11) Reconnect the solenoid safety unit and the auxiliary trap line to the control valve.
12) Follow the startup procedure in Section 3.1 to return the unit to operation. Check for signs of leakage at all connections.

4.11 TEMPERATURE CONTROLLER

The temperature controller is a digital solid-state device, which requires no periodic maintenance.
Occasional physical checks of the unit should be carried out for physical and mechanical security of mounting, terminal blocks, and electrical wiring.

4.12 TRAPS (MAIN & AUXILIARY) REPLACEMENT (STEAM SYSTEMS ONLY)

On units that use a steam energy source, the main and auxiliary traps are installed upstream of the condensate shutoff valve. The flow of condensate is controlled by the rise and fall of a float in the body of the trap. To replace a malfunctioning condensate trap, follow the instructions below.

➢ TRAPS (MAIN & AUXILIARY) REPLACEMENT INSTRUCTIONS

1) Before performing this maintenance procedure, follow Steps 1 through 7 of the shutdown procedure in Section 3.2 to take the unit off-line.

WARNING!
TURN OFF/DISCONNECT ALL ELECTRIC POWER BEFORE ATTEMPTING ANY MAINTENANCE PROCEDURE.

2) The trap location may differ between units. Refer to the drawing that accompanies the Submittal sheet for the exact location of the trap.
3) Break the joint on the INLET side of both traps, then break the joint on the OUTLET side of both traps.
4) Remove and inspect the traps for wear or damage.
5) Replace traps if they are malfunctioning.
6) Install the traps back in the system, in-line.
7) Reconnect the all inlet and outlet lines to both traps.

NOTE: Use and type of joint sealer should be determined from local codes or the specifications of the installing contractor.

8) Follow the startup procedure in Section 3.1 to return the unit to operation. Check for signs

of leakage at all connections.

4.13 CLEANING OF HEAT EXCHANGERS AND TANKS

Heat exchangers and tanks are cleansed by flushing the units with fluids which do not react with materials of the units. Dirt deposited in heat exchanger/tank will result in an increase in Pressure drop, lower temperature difference in the heated medium or a higher exit temperature on heating medium side. It is recommended to clean heat exchangers and tanks twice a year.

4.14 DISASSEMBLY AND REASSEMBLY

This heat exchanger is designed to function in various domestic water heating applications. It is required to disassemble and reassemble the heat exchanger after checking for tube leaks or regular cleaning etc. DHT units are designed to easily remove the tube bundle from bottom of the unit when installed at their location. It requires tooling including wrenches, torque wrenches and sealing compounds etc.

CAUTION!
Proper caution must be taken during disassembly and reassembly of the heat exchanger in order to prevent any damage to the components and/or injury.

4.15 REPLACEABLE PARTS LIST

The following is a list of parts that are generally replaceable, by trained/certified personnel, on DHT, Inc., Water Heaters. Replaceable parts may vary to some degree, depending on model and specific design configuration. Refer to the original design specifications or contact DHT, Inc. with any questions regarding replaceable parts.

Please have the unit's model and serial number available when contacting DHT, Inc.

NOTE: Replaceable parts may vary depending on design specification of the unit.

- Control Valve
- Gaskets
- Heat Exchanger Tube Bundle
- Pressure Gauge
- Thermometer
- T&P Relief Valve
- Solenoid Valve
- Auxiliary Trap
- Main Condensate Trap
- PID Controller
- Recirculation Pump
- Thermocouple
- Aquastat
- Vacuum Breaker

NOTE:
Refer to **Section 4.18 Parts and Accessories** for complete list and part number information.

4.16 RECOMMENDED SPARE PARTS:

TABLE 4-3: RECOMMENDED SPARE PARTS

REFERENCE	ITEM NO.	QUANTITY PER UNIT	PART NAME
FIG. 4-1A	6	1	GASKET
FIG. 4-1A	7	1	GASKET W/ RIB
FIG. 4-1D	20a	1	PRESSURE GAUGE
FIG. 4-1C	19	1	BIMETAL THERMOMETER
FIG. 4-1C	18	1	THERMOCOUPLE
FIG. 4-1B	12	1	AQUASTAT
FIG. 4-1B	14	1	SOLENOID VALVE
FIG. 4-1D	21a	1	VACUUM BREAKER
FIG. 4-2	26 & 27	SEE TABLE 4-10	GASKETS

For the replacement heat exchanger tube bundle model number, refer to the nameplate mounted on the jacket of the unit.

4.17 ORDERING INFORMATION

All replacement parts for DHT SuperTherm units can be ordered directly from your local authorized sales representative/agent. Visit Rep Locator page on DHT website if needed to find your local sales rep contact information.

NOTE:
If sales representative is not available, please contact DHT Sales.

Please include the model and serial number of the unit for which the parts are being ordered. If ordering by phone, please have this information readily available. All orders must be submitted via PO and sent to sales@dhtnet.com.

4.18 INSPECTION SCHEDULE

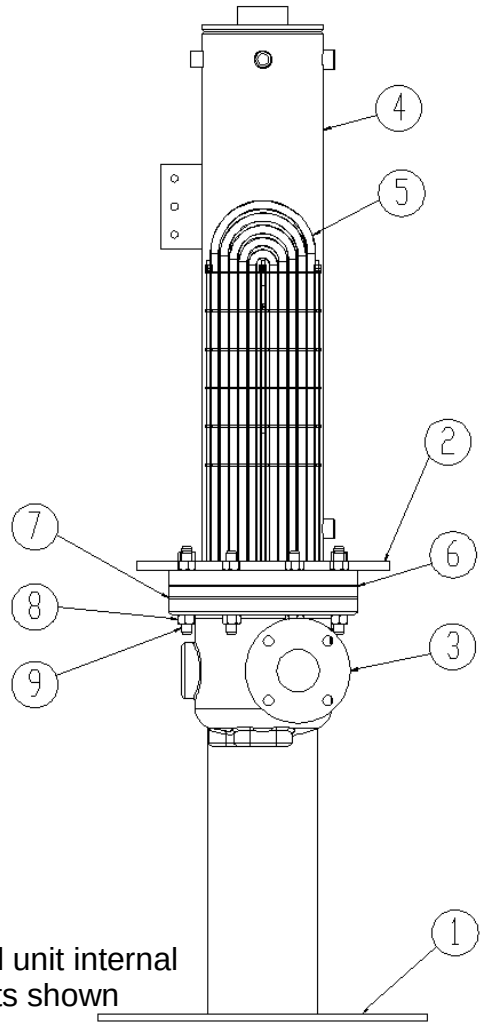
Table 4-4, below, summarizes the recommended time intervals for inspection of the water heater, components, inlet and outlet water and energy source lines (steam, boiler water, or high temperature water), and power connections.

TABLE 4-4: RECOMMENDED INSPECTIONS TIME INTERVAL TABLE

TO BE INSPECTED	PER MANUFACTURE SPECS.	WEEKLY	MONTHLY	3 MONTHS	6 MONTHS	1 YEAR
Recirculation Pump	X					
Control Valve	X					
Temperature & Pressure Gauges				X		
Heat Exchanger tube bundle & Gaskets			X			
Inlet, Outlet & Return Connections				X		
Pneumatic Connections				X		
Power & Ground Connections				X		
Relief Valves	X					
Isolation Valves		X				
Solenoid & Aquastat Safety System				X		
Strainers				X		
Traps- Main & Auxiliary					X	
PID Controller & Thermocouple					X	
Vacuum Breaker			X			

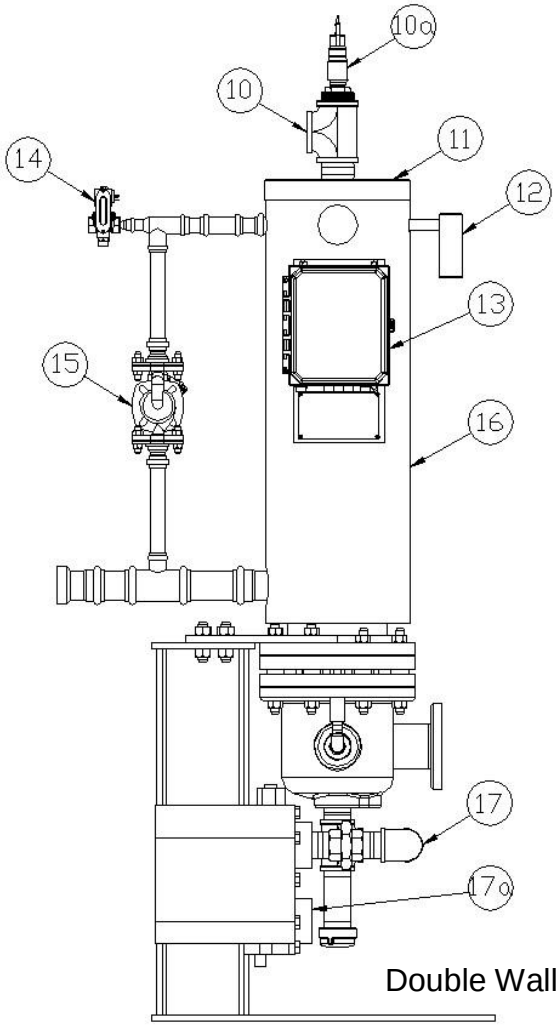
NOTE:
It is mandatory to keep maintenance/inspections log near the unit following DHT IOM and applicable federal, state, and local regulations. Failing to do so will void DHT warranty.

4.19 PARTS AND ACCESSORIES



Single Wall unit internal components shown

Drawing "A"



Double Wall unit shown

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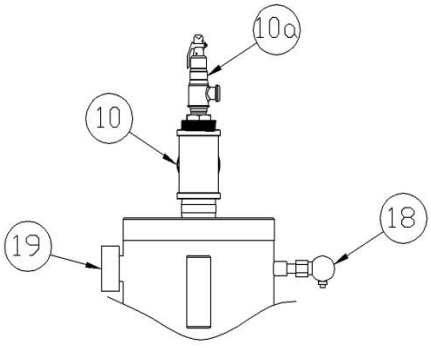

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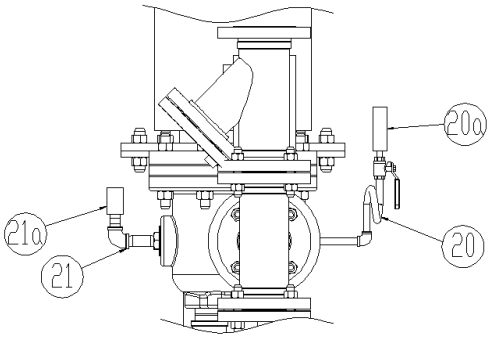


Drawing "D"

FIG 4-1: SUPERTHERM PARTS DRAWINGS

TABLE 4-5: VS06AS2A AND VS06AD2A SUPERTHERM PARTS

ITEM NO.	PART NO.	QUANTITY	PART NAME
1	10013	1	BASE SKID
2	10012-1	1	TOP PLATE
3	MCST-8-0001	1	BONNET HEAD
4	040002-001-1	1	SHELL ASSEMBLY
5	040001-001-1	1	TUBE BUNDLE ASSEMBLY (VS06AS2A UNIT ONLY)
	040001-005-1		TUBE BUNDLE ASSEMBLY (VS06AD2A UNIT ONLY)
6	10006-1	1	GASKET
7	10007-1	1	GASKET W/ RIB
8	MHRD-01A-0002	16	HEX NUT 3/4"-10 - UNC 2B
	MHRD-01A-0001	8	HEX NUT 7/8”-9 - UNC 2B (W/ TOP PLATE AND BASE SKID)
9	MHRD-15-0073	4	STUD – 3/4"-10 X 6” LG - UNC 2A (W/ SHELL & TOP PLATE - FOR VS06AS2A UNIT ONLY)
	MHRD-15-0072	4	STUD – 3/4"-10 X 5” LG - UNC 2A (W/ SHELL - FOR VS06AS2A UNIT ONLY)
	MHRD-15-0074	4	STUD – 3/4"-10 X 7” LG – UNC 2A (W/ SHELL - FOR VS06AD2A UNIT ONLY)
	MHRD-15-0085	4	STUD – 3/4"-10 X 7.5” LG – UNC 2A (W/ SHELL & TOP PLATE - FOR VS06AD2A UNIT ONLY)
	MHRD-15-0101	4	STUD – 7/8”-9 X 3.5” LG - UNC 2A (W/ TOP PLATE AND BASE SKID)
10	SEE TABLE 4-10 FOR PART NUMBER DETAILS		
11	10017-1	1	INSULATION CAP
12	MELE-04-0001	1	AQUASTAT
13	MELE-01-0003	1	CONTROL PANEL
14	MPART-C-SV-0001	1	SOLENOID VALVE
15	MELE-09-0008	1	RECIRCULATION PUMP
16	10016-1	1	INSULATION JACKET
17	SEE TABLE 4-9 FOR PART NUMBER DETAILS		
18	MELE-06-0001	1	THERMOCOUPLE
19	MPART-C-TGA-0001	1	BIMETAL THERMOMETER
20	080001-001-1	1	PRESSURE GAUGE ASSEMBLY KIT
20a	MPART-E-PGA-0002	1	PRESSURE GAUGE ONLY
21	080002-001-1	1	VACUUM BREAKER ASSEMBLY KIT
21a	MPART-E-VB-0001	1	VACUUM BREAKER ONLY

TABLE 4-6: VS08AS2A AND VS08AD2A SUPERTHERM PARTS

ITEM NO.	PART NO.	QUANTITY	DESCRIPTION
1	10013	1	BASE SKID
2	10012-2	1	TOP PLATE
3	MCST-8-0002	1	BONNET HEAD
4	040002-002-1	1	SHELL ASSEMBLY
5	040001-002-1	1	TUBE BUNDLE ASSEMBLY (VS08AS2A UNIT ONLY)
	040001-006-1		TUBE BUNDLE ASSEMBLY (VS08AD2A UNIT ONLY)
6	10006-2	1	GASKET
7	10007-2	1	GASKET W/ RIB
8	MHRD-01A-0002	16	HEX NUT 3/4"-10 - UNC 2B
	MHRD-01A-0001	8	HEX NUT 7/8”-9 - UNC 2B (W/ TOP PLATE AND BASE SKID)

TABLE 4-6: VS08AS2A AND VS08AD2A SUPERTHERM PARTS

ITEM NO.	PART NO.	QUANTITY	DESCRIPTION
9	MHRD-15-0073	8	STUD – 3/4"-10 X 6" LG - UNC 2A (VS08AS2A UNIT ONLY)
	MHRD-15-0085	4	STUD – 3/4"-10 X 7.5" LG – UNC 2A (VS08AD2A UNIT ONLY)
	MHRD-15-0075	4	STUD – 3/4"-10 X 8" LG – UNC 2A (VS08AD2A UNIT ONLY)
	MHRD-15-0101	4	STUD – 7/8"-9 X 3.5" LG - UNC 2A (W/ TOP PLATE AND BASE SKID)
10	SEE TABLE 4-10 FOR PART NUMBER DETAILS		
11	10017-2	1	INSULATION CAP
12	MELE-04-0001	1	AQUASTAT
13	MELE-01-0003	1	CONTROL PANEL
14	MPART-C-SV-0001	1	SOLENOID VALVE
15	MELE-09-0008	1	RECIRCULATION PUMP
16	10016-2	1	INSULATION JACKET
17	SEE TABLE 4-9 FOR PART NUMBER DETAILS		
18	MELE-06-0001	1	THERMOCOUPLE
19	MPART-C-TGA-0001	1	BIMETAL THERMOMETER
20	080001-001-1	1	PRESSURE GAUGE ASSEMBLY KIT
20a	MPART-E-PGA-0002	1	PRESSURE GAUGE ONLY
21	080002-001-1	1	VACUUM BREAKER ASSEMBLY KIT
21a	MPART-E-VB-0001	1	VACUUM BREAKER ONLY

TABLE 4-7: VS010AS2A AND VS010AD2A SUPERTHERM PARTS

ITEM NO.	PART NO.	QUANTITY	PART NAME
1	10013	1	BASE SKID
2	10012-3	1	TOP PLATE
3	MCST-8-0003	1	BONNET HEAD
4	040002-003-1	1	SHELL ASSEMBLY
5	040001-003-1	1	TUBE BUNDLE ASSEMBLY (VS10AS2A UNIT ONLY)
	040001-007-1		TUBE BUNDLE ASSEMBLY (VS10AD2A UNIT ONLY)
6	10006-3	1	GASKET
7	10007-3	1	GASKET W/ RIB
8	MHRD-01A-0001	32	HEX NUT 7/8"-9 - UNC 2B
9	MHRD-15-0094	12	STUD – 7/8"-9 X 7" LG - UNC 2A (VS10AS2A ONLY)
	MHRD-15-0096	6	STUD – 7/8"-9 X 9" LG - UNC 2A (VS10AD2A ONLY)
	MHRD-15-0106	6	STUD – 7/8"-9 X 8.5" LG - UNC 2A (VS10AD2A ONLY)
	MHRD-15-0101	4	STUD – 7/8"-9 X 3.5" LG - UNC 2A (W/ TOP PLATE AND BASE SKID)
10	SEE TABLE 4-10 FOR PART NUMBER DETAILS		
11	10017-3	1	INSULATION CAP
12	MELE-04-0001	1	AQUASTAT
13	MELE-01-0003	1	CONTROL PANEL
14	MPART-C-SV-0001	1	SOLENOID VALVE
15	MELE-09-0007	1	RECIRCULATION PUMP
16	10016-3	1	INSULATION JACKET
17	SEE TABLE 4-9 FOR PART NUMBER DETAILS		
18	MELE-06-0001	1	THERMOCOUPLE
19	MPART-C-TGA-0001	1	BIMETAL THERMOMETER

TABLE 4-7: VS010AS2A AND VS010AD2A SUPERTHERM PARTS

ITEM NO.	PART NO.	QUANTITY	PART NAME
20	080001-001-1	1	PRESSURE GAUGE ASSEMBLY KIT
20a	MPART-E-PGA-0002	1	PRESSURE GAUGE ONLY
21	080002-001-1	1	VACUUM BREAKER ASSEMBLY KIT
21a	MPART-E-VB-0001	1	VACUUM BREAKER ONLY

TABLE 4-8: VS012AS2A AND VS012AD2A SUPERTHERM PARTS

ITEM NO.	PART NO.	QUANTITY	PART NAME
1	10013	1	BASE SKID
2	10012-4	1	TOP PLATE
3	MCST-8-0004	1	BONNET HEAD
4	040002-004-1	1	SHELL ASSEMBLY
5	040001-004-1	1	TUBE BUNDLE ASSEMBLY (VS12AS2A UNIT ONLY)
	040001-008-1		TUBE BUNDLE ASSEMBLY (VS12AD2A UNIT ONLY)
6	10006-4	1	GASKET
7	10007-4	1	GASKET W/ RIB
8	MHRD-01A-0001	32	HEX NUT 7/8”-9 - UNC 2B
9	MHRD-15-0094	12	STUD – 7/8”-9 X 7” LG - UNC 2A (VS12AS2A ONLY)
	MHRD-15-0096	12	STUD – 7/8”-9 X 9” LG - UNC 2A (VS12AD2A ONLY)
	MHRD-15-0101	4	STUD – 7/8”-9 X 3.5” LG - UNC 2A (W/ TOP PLATE AND BASE SKID)
10	SEE TABLE 4-10 FOR PART NUMBER DETAILS		
11	10017-4	1	INSULATION CAP
12	MELE-04-0001	1	AQUASTAT
13	MELE-01-0003	1	CONTROL PANEL
14	MPART-C-SV-0001	1	SOLENOID VALVE
15	MELE-09-0012	1	RECIRCULATION PUMP
16	10016-4	1	INSULATION JACKET
17	SEE TABLE 4-9 FOR PART NUMBER DETAILS		
18	MELE-06-0001	1	THERMOCOUPLE
19	MPART-C-TGA-0001	1	BIMETAL THERMOMETER
20	080001-002-1	1	PRESSURE GAUGE ASSEMBLY KIT
20a	MPART-E-PGA-0002	1	PRESSURE GAUGE ONLY
21	080002-001-1	1	VACUUM BREAKER ASSEMBLY KIT
21a	MPART-E-VB-0001	1	VACUUM BREAKER ONLY

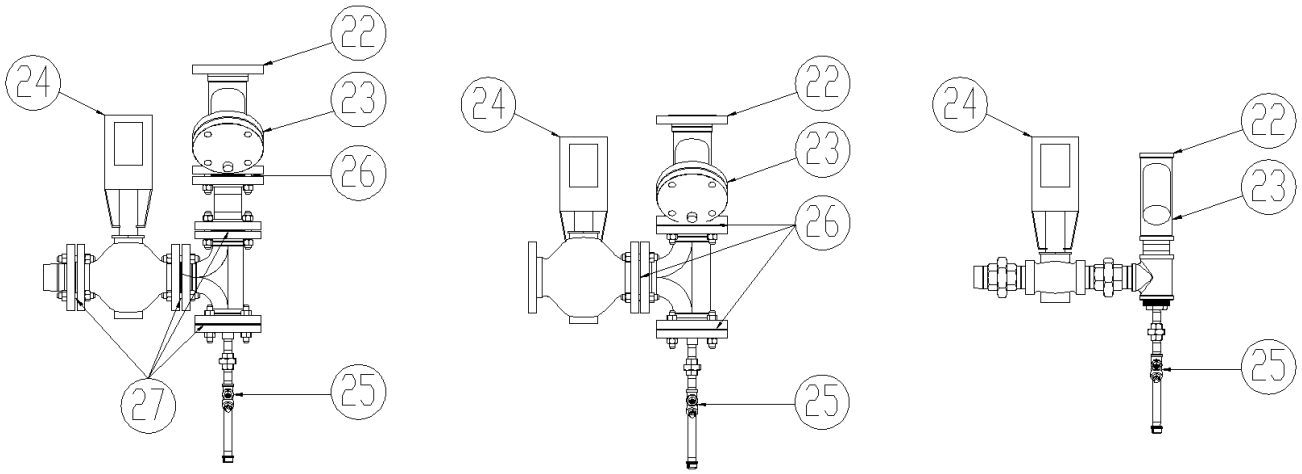
TABLE 4-9: SUPERTHERM CONDENSATE DRAIN ASSEMBLY PARTS

SUPERTHERM CONDENSATE DRAIN ASSEMBLY KIT			CONDENSATE TRAP ONLY (ITEM # 17a)	
ITEM NO.	PART NO.	QUANTITY	PART NO.	QUANTITY
17	060004-001-1	1	MPART-A-TR1-0003	1
	060004-001-2	1	MPART-A-TR1-0009	1
	060004-001-3	1	MPART-A-TR1-0016	1
	060004-001-4	1	MPART-A-TR1-0015	1
	060004-001-5	1	MPART-A-TR1-0005	1
	060004-001-6	1	MPART-A-TR1-0008	1
	060004-001-7	1	MPART-A-TR1-0013	1
	060004-001-8	1	MPART-A-TR1-0006	1
	060004-002-1	1	MPART-A-TR1-0010	1

TABLE 4-10: SUPERTHERM DHW OUTLET ASSEMBLY PARTS

SUPERTHERM DHW ASSEMBLY KIT			T&P RELIEF VALVE ONLY (ITEM # 10a)	
ITEM NO.	PART NO.	QUANTITY	PART NO.	QUANTITY
10	060003-001-1	1	MPART-E-RV1-0002	1
	060003-002-1	1	MPART-E-RV1-0002	1
	060003-002-2	1	MPART-E-RV1-0003	1
	060003-002-3	1	MPART-E-RV1-0005	1
	060003-002-4	1	MPART-E-RV1-0004	1
	060003-003-1	1	MPART-E-RV1-0005	1
	060003-003-2	1	MPART-E-RV1-0004	1
	060003-003-3	1	MPART-E-RV1-0001	1
	060003-004-1	1	MPART-E-RV1-0004	1
	060003-004-2	1	MPART-E-RV1-0001	1
	060003-005-1	1	MPART-E-RV1-0001 & MPART-E-RV1-0002	1 EACH
	060003-005-2	1	MPART-E-RV1-0001 & MPART-E-RV1-0005	1 EACH

4.20 STEAM INLET KIT PART NUMBERS:



Reducing Type Flanged **Straight Flanged Type** **Threaded Type**

FIG 4-1: STEAM INLET PARTS DIAGRAM

TABLE 4-11: STEAM INLET KIT PART NUMBERS

ITEM NO.	22	23	24	25	26	27
PART NAME	STEAM INLET ASSY KIT	STRAINER	CONTROL VALVE	DRIP TRAP	GASKET	GASKET
PART NO. (QUANTITY)	060002-001-1 THRU 2 (1)	MPART-A-Y-0002 (1)	SEE TABLE 4-12 FOR CONTROL VALVE PART NUMBER DETAILS (1)	MPART-F-TR2-0001 (1)	-	-
	060002-002-1 THRU 4 (1)	MPART-A-Y-0002 (1)			-	-
	060002-003-1 THRU 4 (1)	MPART-A-Y-0002 (1)			-	-
	060002-004-1 THRU 4 (1)	MPART-A-Y-0006 (1)			-	-
	060002-005-1 THRU 6 (1)	MPART-A-Y-0011 (1)			10011-1 (3)	-
	060002-006-1 THRU 6 (1)	MPART-A-Y-0007 (1)			10011-7 (1)	10011-1 (3)
	060002-007-1 THRU 15 (1)	MPART-A-Y-0007 (1)			10011-2 (3)	-
	060002-008-1 THRU 15 (1)	MPART-A-Y-0001 (1)			10011-9 (1)	10011-2 (3)
	060002-009-1 THRU 8 (1)	MPART-A-Y-0001 (1)			10011-3 (3)	-
	060002-010-1 THRU 9 (1)	MPART-A-Y-0009 (1)			10011-11 (1)	10011-3 (3)
	060002-011-1 THRU 9 (1)	MPART-A-Y-0009 (1)			10011-4 (3)	-

TABLE 4-12: CONTROL VALVE PART NUMBERS

ITEM NO.	SIZE (INCHES)	ELECTRONIC CONTROL VALVE ONLY	PNEUMATIC CONTROL VALVE ONLY
24	1-1/4	MPART-E-V1-0011	MPART-E-V2-0006
	1-1/2	MPART-E-V1-0012	MPART-E-V2-0005
	2	MPART-E-V1-0001	MPART-E-V2-0004
	2-1/2	MPART-A-V1-0003	MPART-A-V2-0003/ MPART-A-V2-0013
	3	MPART-A-V1-0004/ MPART-A-V1-0014	MPART-A-V2-0002/ MPART-A-V2-0014/ MPART-A-V2-0015
	4	MPART-A-V1-0005	MPART-A-V2-0001/ MPART-A-V2-0016
	5	MPART-A-V1-0002	MPART-A-V2-0011/ MPART-A-V2-0012

NOTE:
Control valve part number varies for certain sizes with respect to the valve and/or actuator types.

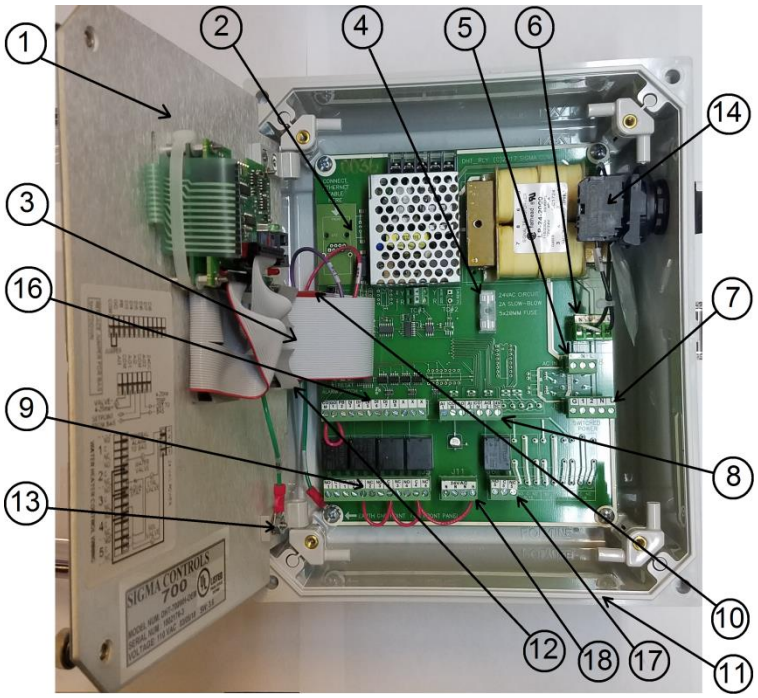
TABLE 4-13: HEAD TO CONTROL VALVE CONNECTION GASKET PART NUMBERS

ITEM NO.	PART NUMBER	DESCRIPTION
NOT SHOWN	10011-5	3” X 1.5” REDUCING FLANGE GASKET
	10011-6	3” x 2” REDUCING FLANGE GASKET
	10011-1	2.5” FLANGE GASKET
	10011-7	3” X 2.5” REDUCING FLANGE GASKET
	10011-8	4” X 2.5” REDUCING FLANGE GASKET
	10011-2	3” FLANGE GASKET
	10011-9	4” X 3” REDUCING FLANGE GASKET
	10011-10	5” X 3” REDUCING FLANGE GASKET
	10011-3	4” FLANGE GASKET
	10011-11	5” X 4” REDUCING FLANGE GASKET
	10011-4	5” FLANGE GASKET

4.21 CONTROL BOX PARTS

TABLE 4-14: CONTROL PANEL PART NUMBERS

ITEM	PART NO.	QTY.	DESCRIPTION
1	700-OEM-CPU-SUBASSM	1	ENTIRE CPU, MEMBRANE SW & FRONT DOOR
2	700-OEM-RLY-SUBASSM	1	RELAY PCB WITH TRANSFORMER, ALL HEADERS AND 5 RELAYS
3	700-OEM-CAB44-SUBASSM	1	44 PIN CABLE SUB ASSEMBLY 20 & 14 PIN CONNS AND FOLDS
4	700-OEM-FUSE-2A	1	FUSE CERAMIC 2A 250VAC 5X20MM
5	700-OEM-TB-J8	1	GREEN TERMINAL BLOCK 3 POSITION POWER
6	700-OEM-TB-PS	1	GREEN TERMINAL BLOCK 4 POSITION POWER SWITCH
7	700-OEM-TB-J9	1	GREEN TERMINAL BLOCK 5 POSITION PUMP
8	700-OEM-TB-J4	1	GREEN TERMINAL BLOCK 7 POSITION ANALOGS
9	700-OEM-TB-J5	1	GREEN TERMINAL BLOCK 12 POSITION RELAYS
10	700-OEM-HORN	1	SOUND ALARM
11	700-OEM- DHT-ENC	1	CONTROL BOX ENCLOSURE WITH CLEAR LID AND CUTOUTS
12	700-OEM- CAB-CLIP	1	FLAT GRAY PVC CABLE CLIP
13	700-OEM-DOOR-SCR	4	PHILLIPS ROUND HEAD SCREW 18-8SS, 6-32 THRD, 5/8” LONG
14	700-OEM-22M-SW	1	22MM POWER SWITCH ASSM WITH ROTARY SW & CONTACT BLOCK
15	700-OEM-DHT-MEM	1	FRONT COVER MEMBRANE SWITCH
16	700-OEM-TB-J3	1	GREEN TERMINAL BLOCK 12 POSITION DIGITAL INPUTS
17	700-OEM-TB-J6	1	GREEN TERMINAL BLOCK 3 POSITION RELAY 5
18	700-OEM-TB-J11	1	GREEN TERMINAL BLOCK 4 POSITION 24VAC



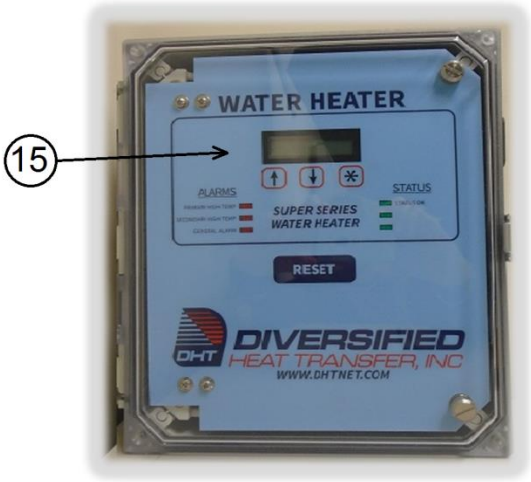


TABLE 4-15: BAS COMMUNICATION GATEWAY PART NUMBERS

ITEM NO.	PART NO.	QUANTITY	PART NAME
NOT SHOWN	MELE-17-0001	1	FPC-N34 PROTONODE
	MELE-17-0002	1	FPC-N35 PROTONODE

4.22 CONTROL VALVE TECHNICAL INFORMATION

Click on the following links in order to download the Control Valves documentation which is required for startup and maintenance:

4.22.1 Siemens Electronic Control Valves:

Actuator: Click here to download the Installation Instructions.

1/2 to 2-Inch Valve, Two-Way, and Actuator Assembly Selection: Click here to download the Technical Bulletin.

2-1/2 to 6-Inch Valve, Two-Way, and Actuator Assembly Selection: Click here to download the Technical Bulletin.

4.22.2 RTK Electronic Control Valves:

ST5113 Actuator: Click here to download the IOM.

Electric 5200-7010 series Control Valves: Click here to download the specs.

Electric 5300-7010 series Control Valves: Click here to download the specs.

Electric 5300-AR-7010 series Control Valves: Click here to download the specs.

Electric 6150-7010 (6151-5) series Control Valves: Click here to download the specs.

Steam Loop Pressure Regulation & Safety Shutoff: Click here to download the brochure.

NOTE:
Consult factory for technical support regarding RTK series valves.

4.22.3 Warren Pneumatic Control Valves:

2800 Series 1/2 to 2-Inch Valve Control Valve: Click here to download the IOM Instructions.

2900 Series 2-1/2 to 10-Inch Valve Control Valve: Click here to download the IOM Instructions.

NOTE:
Electronic version of this manual can be found on DHT's website that contains online link to these documents. Consult factory or your authorized sales representative for technical support regarding these valves in case of any question

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SECTION 5: TROUBLESHOOTING

Following table shows issues that a DHT SuperTherm unit may encounter during its operation, and the procedures to remedy those problems. The left-hand column lists the symptoms. The remaining columns are suggested procedures or "remedies" that should be followed to identify and correct the problem.

SYMPTOM	PROBABLE CAUSE(S)	REMEDY
Water heater is not able to maintain the required temperature at the rated capacity.	1. Inlet steam/energy source pressure is too low.	1. Check the steam/energy source pressure gauge. Adjust the inlet pressure to meet the design requirements if the reading is low. If there is a restriction in the primary energy source line, the gauge reading will drop drastically when the heat exchanger calls for full energy, even though the pressure seems to be normal during light demand. If the incoming energy source pressure is correct, its pressure gauge reading should reach design pressure as the hot water supply temperature approaches set point.
	2. Inlet steam/energy source pressure control valve is not opening properly.	2. See the adjustment and testing instructions contained in the supplied Installation/Operations Manual for the specific temperature control value installed on the unit. Replace the valve is necessary. Refer to Section 4.19 Control Valve Technical Information if hard copy is not available.
	3. The condensate drain/water return piping has not been installed properly to allow the condensate drain freely (by gravity)/water return circulation; the condensate drain/water return line is restricted; or the condensate/water return check valve is leaking or has failed.	3. Rearrange the condensate drain/water return piping and inspect the valve for proper drainage. Also check to make sure there is no restriction in the condensate drain/water return line. Replace the check valve if it is leaking or has failed. Inspect F&T trap and drip line. If condensate drain/water return line is restricted due to trap, contact the local DHT representative for the required trap size. Also inspect vacuum breaker for any malfunctioning.
	4. The water heater temperature control system/valve is not operating properly.	4. See the adjustment and testing instructions contained in Section 3.6 for the specific temperature control system installed on the unit. Also, check to ensure that the thermocouple is installed and functioning correctly. Repair or replace it if needed. Replace the control valve and/or actuator if necessary.
	5. There is a leakage in the heat exchanger coil.	5. Shut off the primary energy source to unit and break connection in the condensate/water return line to verify the presence of leakage. Steam condensate or boiler / high temperature water will drain from the coil in the beginning, but the flow should stop after a short

		period of time. It the flow continues and water is leaking from shell into the coil; disassemble, inspect, repair (if possible), or replace the heat exchanger coil and reassemble the unit.
	6. The heat exchanger coil is heavily scaled or damaged.	6. Call DHT or your authorized representative, for instructions on repair or replacement. Refer to the nameplate for the model and serial numbers of the unit and heat exchanger coil. Include these numbers in all correspondence.
	7. Water heater and control valve being used at higher than rated design capacity.	7. Call DHT or your authorized representative. Refer to the nameplate for the model and serial numbers of the unit and heat exchanger coil. Include these numbers in all correspondence.
	8. Recirculating pump malfunctions/failed.	8. Recirculation piping temperature should be same as the hot water outlet temperature when recirculation pump is operating properly. Check the power supply or repair/ replace the pump if needed.
DHW supply temperature is too high	1. The water heater temperature control system/valve is not operating properly.	1. See the adjustment and testing instructions contained in Section 3.6 for the specific temperature control system installed on the unit. Also, check to ensure that the thermocouple is installed and functioning correctly. Repair or replace it if needed. Replace the control valve and/or actuator if necessary. Refer to **Section 4.19 Control Valve Technical Information** if hard copy is not available.
	2. The temperature controller or thermometer indicates wrong value.	2. Inspect and replace the temperature controller, thermocouple and/or thermometer if any of them not functioning properly.
	3. Incoming water is preheated too much.	3. Maintain incoming cold water at least 10°F below the hot water supply temperature.
DHW supply outlet temperature fluctuates significantly	1. Inlet steam/energy source control valve does not open/close properly.	1. See the adjustment and testing instructions contained in the supplied manual for the specific temperature control valve installed on the unit. Replace the control valve and/or actuator if necessary. Refer to **Section 4.19 Control Valve Technical Information** if hard copy is not available.
	2. Inlet steam/energy source pressure is too low.	2. Check the steam/energy source pressure gauge. Adjust the inlet pressure to meet the design requirements if the reading is low. If there is any restriction in the steam/energy source line, the gauge reading will drop extremely when the heat exchanger calls for full energy, even though the pressure seems to be normal during light demand. If the incoming energy source pressure is correct, its pressure gauge reading should reach design pressure as the pressure in the heat exchanger as hot water supply temperature

		approaches set point.
	3. Water heater and control valve being used at higher than rated design capacity.	3. Call DHT or your authorized representative. Refer to the nameplate for the model and serial numbers of the unit and heat exchanger coil. Include these numbers in all correspondence.
	4. There is a water leakage in the heat exchanger coil.	4. Shut off the primary energy source to unit and break connection in the condensate/water return line to verify the presence of leakage. Steam condensate or boiler / high temperature water will drain from the coil in the beginning, but the flow should stop after a short period of time. It the flow continues and water is leaking from shell into the coil; disassemble, inspect, repair (if possible), or replace the heat exchanger coil and reassemble the unit.
	5. The condensate drain/water return piping has not been installed properly to allow the condensate drain freely (by gravity)/water return circulation; the condensate drain/water return line is restricted; or the condensate/water return check valve is leaking or has failed.	5. Rearrange the condensate drain/water return piping and inspect the valve for proper drainage. Also check to make sure there is no restriction in the condensate drain/water return line. Replace the check valve if it is leaking or has failed. Inspect F&T trap and drip line. If condensate drain/water return line is restricted due to trap, contact the local DHT representative for the required trap size. Also inspect vacuum breaker for any malfunctioning.
	6. Recirculating pump malfunctions/ failed.	6. Recirculation piping temperature should be same as the hot water outlet temperature when recirculation pump is operating properly. Check the power supply or repair/ replace the pump if needed. Also check building recirculation pump aquastat settings if being used.
	7. Ground wiring connection is loose or disconnect.	7. Check the ground connection to make sure it is not loose which can cause electrical nuisance for temperature control (building stray voltage).
	8. The water heater temperature control system is not operating properly	8. Refer to the PID settings adjustment and testing instructions contained in Section 3.6 for the specific temperature control system installed on the unit. Also, check to ensure that the thermocouple is installed and functioning correctly. Repair or replace it if needed.
Excessive or insufficient condensate (steam, boiler water, or high temperature hot water) being	1. The condensate drain/water return piping has not been installed properly to allow the condensate drain freely (by gravity)/water return circulation; the condensate drain/water return line is restricted; or the condensate/water return check valve is leaking or has failed.	1. Rearrange the condensate drain/water return piping and inspect the valve for proper drainage. Also check to make sure there is no restriction in the condensate drain/water return line. Replace the check valve if it is leaking or has failed. Inspect F&T trap and drip line. If condensate drain/water return line is restricted due to trap, contact the local DHT representative for the required trap size. Also inspect vacuum breaker for any malfunctioning.

returned from the unit.	2. There is a water leakage in the heat exchanger coils.	2. Shut off the primary energy source to unit and break connection in the condensate/water return line to verify the presence of leakage. Steam condensate or boiler / high temperature water will drain from the coil in the beginning, but the flow should stop after a short period of time. It the flow continues and water is leaking from shell into the coil; disassemble, inspect, repair (if possible), or replace the heat exchanger coil and reassemble the unit.
Steam is discharged into the condensate drain	1. The heat exchanger coil is heavily scaled or damaged. 2. Undersized or faulty condensate trap(s).	1. Call DHT or your authorized representative, for instructions on repair or replacement. Refer to the nameplate for the model and serial numbers of the unit and heat exchanger coil. Include these numbers in all correspondence. 2. Contact the local DHT representative for the required trap size if it is faulty.
Temperature and Pressure or pressure only relief valve “pops”.	1. Inlet steam/energy source control valve does not close properly. 2. Incoming water is preheated too much. 3. Improperly sized or disconnected expansion tank in closed loop piping system. 4. Inadequate water hammer arrestors. 5. System/incoming water pressure is too high. 6. Relief valve is faulty. 7. Aquastat /over temperature settings in PID controller or solenoid valve not properly set or defective.	1. See the adjustment and testing instructions contained in Section 3.6 for the specific temperature control system installed on the unit. Also, check to ensure that the thermocouple is installed and functioning correctly. Repair or replace it if needed. Replace the control valve if necessary. Refer to **Section 4.19 Control Valve Technical Information** if hard copy is not available. 2. Maintain incoming cold water at least 10°F below the hot water supply temperature. 3. Install the properly sized expansion tank in the closed loop piping system as shown in Installation and Piping drawings in Section 6.3. 4. In order to avoid any shock waves, install water hammer arrestors/shock absorbers in the hot and cold water systems as needed. 5. Bring the system water pressure below the relief valve setting. 6. Inspect and adjust or replace the relief valve if it has failed. Contact DHT representative for replacement. 7. Check and readjust as necessary. Replace the defective parts as necessary. Refer to adjustment instructions contained in Section 3.6.
Water heater shuts down at or	1. Over temperature limit settings not properly set or defective.	1. Refer to adjustment instructions contained in Section 3.6. Replace the defective parts as necessary.

too close to (above or below) the design outlet water temperature.		
A loud banging in the Water heater, primary piping, or condensate / water return piping (not to be confused with a normal clicking noise made during operation).	1. The condensate drain/water return piping has not been installed properly to allow the condensate drain freely (by gravity)/water return circulation; the condensate drain/water return line is restricted; or the condensate/water return check valve is leaking or has failed. 2. Primary/inlet steam line is not properly trapped (steam as energy source only). 3. Vacuum breaker is faulty. 4. Improperly sized or disconnected expansion tank in closed loop piping system. 5. Inadequate water hammer arrestors.	1. Rearrange the condensate drain/water return piping and inspect the valve for proper drainage. Also check to make sure there is no restriction in the condensate drain/water return line. Replace the check valve if it is leaking or has failed. Inspect F&T trap and drip line. If condensate drain/water return line is restricted due to trap, contact the local DHT representative for the required trap size. Also inspect vacuum breaker for any malfunctioning. 2. Reconfigure the primary/inlet steam line to allow main and auxiliary (drip) traps to function properly. 3. Check and replace the vacuum breaker if faulty. 4. Install the properly sized expansion tank in the closed loop piping system as shown in Installation and Piping drawings in Section 6.3. 5. In order to avoid any shock waves, install water hammer arrestors/shock absorbers in the hot and cold water systems as needed. Also check for any trapped air in the domestic water system.
Over-temperature sound alarm occurs frequently.	1. Automatic over temperature settings not properly set or defective parts.	1. Check and readjust the over-temperature setting as necessary. Refer to adjustment instructions contained in Section 3.6. Replace the defective parts or thermocouple if defective.
Unable to clear Over-temperature sound alarm condition	1. Automatic over temperature settings not properly set or defective parts. 2. Defective thermocouple. 3. Over-temperature solenoid valve leaks/open. 4. Recirculating pump malfunctions/failed. Flow is stagnant through the heat exchanger.	1. Check and readjust the over-temperature setting as necessary. Refer to adjustment instructions contained in Section 3.6. Replace the defective parts. 2. Replace the thermocouple if shorted. 3. Readjust or replace the solenoid valve if defective. 4. Check to make sure pump is functioning properly. Also, check for any blockage in the piping to ensure proper flow through heat exchanger.
Solenoid Valve does not open and DHW supply	1. Solenoid valve is defective or disconnected.	1. Check to make sure solenoid valve wiring is done correctly and not loose. Also, check to make sure voltage is present. Replace the solenoid valve if defective.

temperature is higher than the secondary alarm limit.	2. Automatic over temperature settings not properly set, loose wiring or defective parts.	2. Check and readjust the over-temperature setting as necessary. Refer to adjustment instructions contained in Section 3.6. Replace the defective parts.
Controller unit 'Locks Up'	1. Controller 'Locks Up'	1. Recycle power to the unit by removing AC power, waiting 10 seconds and reconnecting power. **DANGER!** **This should be done by using the user provided circuit breaker or fuse, not by removing the power wires at the terminal block. Serious injury or death can occur if contact is made with the incoming AC power.**
Controller display remains at zero or shows no change	1. Display remains at zero or shows no change but the process is changing.	1. Recycle power to the unit by removing AC power, waiting 10 seconds and reconnecting power. If the problem persists, contact the local DHT representative.
Entire System is OFF	2. External 120V AC power disconnected or ON/OFF switch on control panel failed/OFF.	2. Check to make sure external circuit breaker is ON and there is power supply available. Replace the ON/OFF switch on the control panel if faulty.

NOTE:
Use of non-DHT thermocouple on unit may lead to temperature controls issues. See 4.19 for DHT thermocouple part number details.

SECTION 6: TECHNICAL DRAWINGS & FORMS

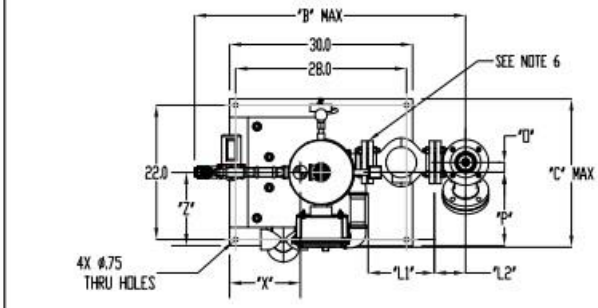
6.1 DIMENSIONAL DRAWINGS

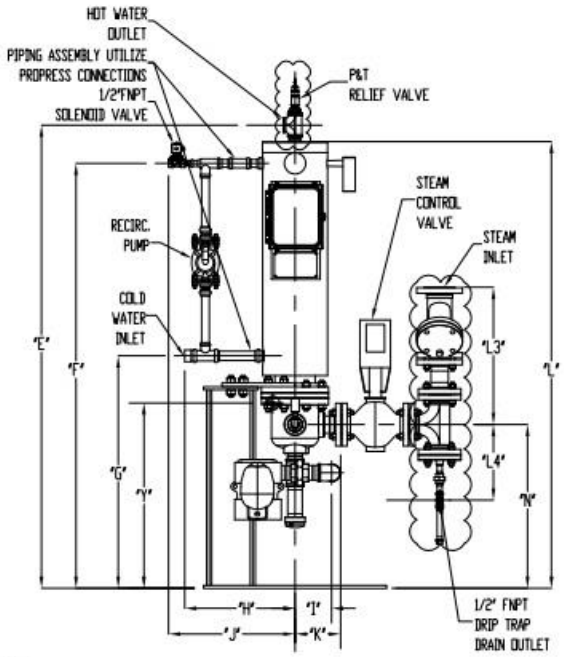
UNIT MODEL	"A" MAX	"B" MAX	"C" MAX	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"	"L"	"M"	"N"	"O"	"P"	"Q"
VS06_2	84.0	50.0	24.3	79.9	75.8	69.6	38.0	18.1	6.0	20.8	7.5	73.1	18.9	26.8	1.6	12.0	11.0
VS08_2	88.0	56.0	25.3	83.0	77.5	69.5	38.0	24.5	6.0	21.8	9.1	73.3	17.2	25.8	2.5	12.0	11.4
VS010_2	91.0	62.0	26.3	85.5	78.1	68.9	38.0	28.3	6.0	25.5	9.9	73.5	15.2	25.3	2.8	12.0	11.4
VS012_2	97.0	70.0	27.3	89.0	79.2	68.4	38.0	31.3	6.0	29.2	11.5	73.7	12.0	23.7	3.0	12.0	11.5

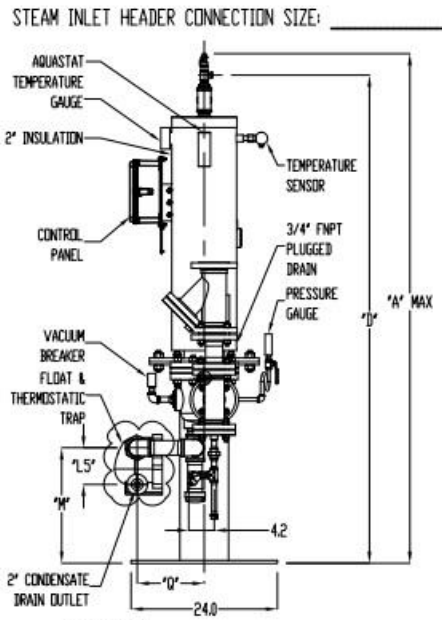
CONTROL VALVE SIZE	"L1"	"L2"	"L3"	"L4"	Y-STRAINER SIZE
1" FNPT	7.9	1.8	8.2	8.2	1-1/2" FNPT
1-1/4" FNPT	9.3	1.9	10.4	8.6	2" FNPT
1-1/2" FNPT	9.8	2.0	10.0	8.7	2" FNPT
2" FNPT	12.3	2.3	10.3	9.0	2" FNPT
2" FNPT	12.3	2.6	13.1	9.3	2-1/2" FNPT
2-1/2" FLG	10.9	5.1	15.8	12.1	2-1/2" FLG
2-1/2" FLG	10.9	5.1	18.8	12.1	3" FLG
3" FLG	11.8	5.6	17.3	12.7	3" FLG
4" FLG	13.9	6.6	20.5-21.6	13.7	4" FLG
5" FLG	15.8	7.7	24.0-25.1	14.6	5" FLG

CENTER OF GRAVITY*			
UNIT MODEL	"X"	"Y"	"Z"
VS06_2	11.6	30.3	11.9
VS08_2	13.6	32.1	11.9
VS010_2	14.3	34.7	11.9
VS012_2	15.4	36.9	11.9

CONDENSATE TRAP	"L5"
MPART-A-TR1-0003	3.0
MPART-A-TR1-0009	3.0
MPART-A-TR1-0005	6.6
MPART-A-TR1-0008	6.6
MPART-A-TR1-0006	6.0
MPART-A-TR1-0010	6.0
MPART-A-TR1-0001	6.0
MPART-A-TR1-0015	6.0
MPART-A-TR1-0016	6.0
MPART-A-TR1-0013	6.0







NOTES:
1. ALL DIMENSIONS ARE SHOWN IN INCHES.
2. COMPONENTS SHOWN IN CLOUDS ARE SHIPPED WITH UNIT IN SUB-ASSEMBLIES FOR FIELD INSTALLATION.
3. DHT RESERVES THE RIGHT TO MODIFY DIMENSIONS WITHOUT PRIOR NOTICE.
4. DO NOT COMPLETE FIELD PIPING UNTIL UNIT IS PROPERLY INSTALLED. ACTUAL DIMENSIONS MAY VARY DUE TO MANUFACTURING TOLERANCES. FABRICATION ACCEPTS NO LIABILITY DUE TO DIMENSION VARIATION.
5. RELIEF VALVE, SOLENOID VALVE AND CONDENSATE OUTLET PIPED TO DRAIN BY CONTRACTOR. CONDENSATE DRAIN BY GRAVITY. REFER TO INSTALLATION AND PIPING DRAWING FOR MORE DETAILS.
6. ADDITIONAL REDUCER/INCREASER MAY BE REQUIRED TO MATCH CONNECTION SIZES.
7. COLD WATER INLET/RECICULATION PIPING ASSEMBLY UTILIZE PROPRESS CONNECTIONS.
8. *CENTER OF GRAVITY IS SHOWN WITHOUT STEAM INLET PIPING, CONTROL VALVE AND CONDENSATE DRAIN PIPING.

UNIT MODEL: _____

OPERATIONAL CONDITIONS	WATER	STEAM
FLUID QUANTITY	GPM	LB/HR
FLUID TEMPERATURE (IN/OUT)	°F	°F
HEAT EXCHANGED (OPTIONAL)		BTU/HR

RELIEF VALVES SET AT____°F & ____PSI

"CONSULT FACTORY IF WATER/STEAM SIDE OPERATING PRESSURE IS HIGHER THAN 150 PSIG/210°F."

MATERIALS OF CONSTRUCTION	
SHELL	316/L S.S.
TUBE	COPPER, 0.625" O.D. x 0.049" WALL
HEAD	UPPER - 304/L S.S. & LOWER - CAST IRON
TUBESHEET	304/L S.S.

HEAT EXCHANGER DESIGN SPEC.	SHELL SIDE	TUBE SIDE
FLUID TYPE	WATER	STEAM
DESIGN PRESSURE (PSIG)	200	150
TEST PRESSURE (PSIG)	260	300
DESIGN TEMP. (°F)	210	350
ASME B&PV CODE SEC VIII DIV-1 : U STAMP		

UNIT MODEL	CONNECTION SIZES			
	SHELL (WATER) SIDE		TUBE (STEAM) SIDE-HEAT EXCHANGER	
	INLET	OUTLET	STEAM INLET	CONDENSATE OUTLET
VS06_2	1.5" FNPT	1.5" FNPT	2.5" FNPT - 150#	2" FNPT
VS08_2	2.5" FNPT	2.5" FNPT	3" FLG - 150#ANSI	2" FNPT
VS010_2	3" FNPT	3" FNPT	4" FLG - 150#ANSI	2" FNPT
VS012_2	4" FNPT	4" FNPT	5" FLG - 150#ANSI	2" FNPT

DIVERSIFIED HEAT TRANSFER, INC.
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PHONE: (800) 221-1522 FAX: (855) 221-2400

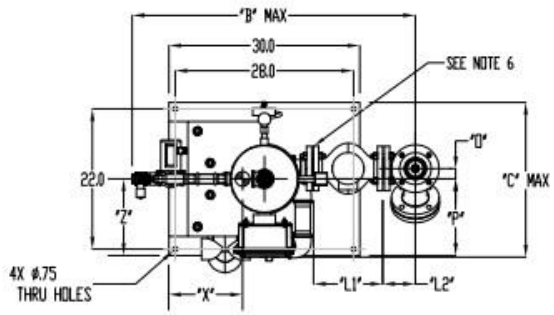
VS SUPERTHERM WATER HEATER W/ ELECTRIC VALVE (UP TO 25 PSIG) DIMENSIONAL DRAWING

	NAME	DATE	DWG#	REV
DRAWN BY	LY	10/25/2017	S-20	E
CHECKED BY	SS	10/25/2017	SHEET 1 OF 1	

SUPERTHERM SINGLE WALL DIMENSIONAL DRAWING

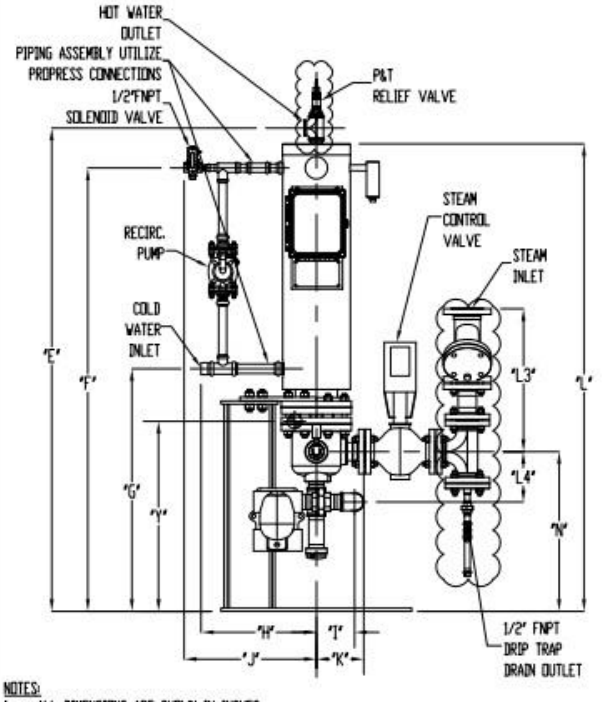
UNIT MODEL	"A" MAX	"B" MAX	"C" MAX	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"	"L"	"M"	"N"	"O"	"P"	"Q"
VS06_2	84.0	50.0	24.3	79.9	75.8	69.6	38.0	18.1	6.0	20.8	7.5	73.3	17.2	25.1	1.6	12.0	11.0
VS08_2	88.0	56.0	25.3	83.0	77.5	69.5	38.0	24.5	6.0	21.8	9.1	73.4	15.3	23.9	2.5	12.0	11.4
VS010_2	91.0	62.0	26.3	85.5	78.1	68.9	38.0	28.3	6.0	25.5	9.9	73.5	13.2	23.3	2.8	12.0	11.4
VS012_2	97.0	70.0	27.3	89.0	79.2	68.4	37.9	31.3	6.0	29.2	11.5	73.7	9.8	21.5	3.0	12.0	11.5

CONTROL VALVE SIZE	"L1"	"L2"	"L3"	"L4"	Y-STRAINER SIZE
1" FNPT	7.9	1.8	8.2	8.2	1-1/2" FNPT
1-1/4" FNPT	9.3	1.9	10.4	8.6	2" FNPT
1-1/2" FNPT	9.8	2.0	10.0	8.7	2" FNPT
2" FNPT	12.3	2.3	10.3	9.0	2" FNPT
2" FNPT	12.3	2.6	13.1	9.3	2-1/2" FNPT
2-1/2" FLG	10.9	5.1	15.8	12.1	2-1/2" FLG
2-1/2" FLG	10.9	5.1	18.8	12.1	3" FLG
3" FLG	11.8	5.6	17.3	12.7	3" FLG
4" FLG	13.9	6.6	20.5-21.6	13.7	4" FLG
5" FLG	15.8	7.7	24.0-25.1	14.6	5" FLG

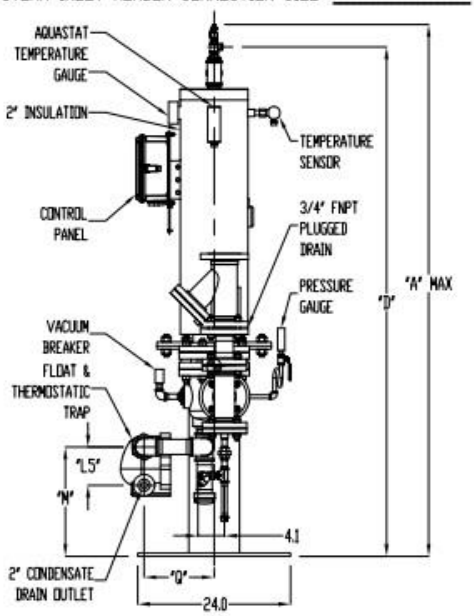


CENTER OF GRAVITY*			
UNIT MODEL	"X"	"Y"	"Z"
VS06_2	11.8	30.2	11.9
VS08_2	13.8	31.5	11.9
VS010_2	14.6	33.9	11.9
VS012_2	15.8	35.7	11.9

CONDENSATE TRAP	"L5"
MPART-A-TR1-0003	3.0
MPART-A-TR1-0009	3.0
MPART-A-TR1-0005	6.6
MPART-A-TR1-0008	6.6
MPART-A-TR1-0006	6.0
MPART-A-TR1-0010	6.0
MPART-A-TR1-0001	6.0
MPART-A-TR1-0015	6.0
MPART-A-TR1-0016	6.0
MPART-A-TR1-0013	6.0



STEAM INLET HEADER CONNECTION SIZE: _____



NOTES:
1. ALL DIMENSIONS ARE SHOWN IN INCHES.
2. COMPONENTS SHOWN IN CLOUDS ARE SHIPPED WITH UNIT IN SUB-ASSEMBLIES FOR FIELD INSTALLATION.
3. DHT RESERVES THE RIGHT TO MODIFY DIMENSIONS WITHOUT PRIOR NOTICE.
4. DO NOT COMPLETE FIELD PIPING UNTIL UNIT IS PROPERLY INSTALLED. ACTUAL DIMENSIONS MAY VARY DUE TO MANUFACTURING TOLERANCES. FABRICATION ACCEPTS NO LIABILITY DUE TO DIMENSION VARIATION.
5. RELIEF VALVE, SOLENOID VALVE AND CONDENSATE OUTLET PIPED TO DRAIN BY CONTRACTOR. CONDENSATE DRAIN BY GRAVITY. REFER TO INSTALLATION AND PIPING DRAWING FOR MORE DETAILS.
6. ADDITIONAL REDUCER/INCREASER MAY BE REQUIRED TO MATCH CONNECTION SIZES.
7. COLD WATER INLET/RECICULATION PIPING ASSEMBLY UTILIZE PROPRESS CONNECTIONS.
8. *CENTER OF GRAVITY IS SHOWN WITHOUT STEAM INLET PIPING, CONTROL VALVE AND CONDENSATE DRAIN PIPING.

UNIT MODEL: _____

OPERATIONAL CONDITIONS	WATER	STEAM
FLUID QUANTITY	GPM	LB/HR
FLUID TEMPERATURE (IN/OUT)	°F	°F
HEAT EXCHANGED (OPTIONAL)		BTU/HR

RELIEF VALVES SET AT____°F & ____PSI

"CONSULT FACTORY IF WATER/SHELL SIDE OPERATING PRESSURE IS HIGHER THAN 150 PSIG/210°F."

MATERIALS OF CONSTRUCTION	
SHELL	316/L S.S.
TUBE	COPPER, OUTER 0.750"OD/INNER 0.625"OD x 0.040" WALL
HEAD	UPPER - 304/L S.S. & LOWER - CAST IRON
TUBESHEET	304/L S.S. UPPER & CARBON STEEL LOWER

HEAT EXCHANGER DESIGN SPEC.	SHELL SIDE	TUBE SIDE
FLUID TYPE	WATER	STEAM
DESIGN PRESSURE (PSIG)	200	150
TEST PRESSURE (PSIG)	260	300
DESIGN TEMP. (°F)	210	300
ASME B&PV CODE SEC VIII DIV-1 : U STAMP		

UNIT MODEL	CONNECTION SIZES			
	SHELL (WATER) SIDE		TUBE (STEAM) SIDE-HEAT EXCHANGER	
	INLET	OUTLET	STEAM INLET	CONDENSATE OUTLET
VS06_2	1.5" FNPT	1.5" FNPT	2.5" FNPT - 150#	2" FNPT
VS08_2	2.5" FNPT	2.5" FNPT	3" FLG - 150#ANSI	2" FNPT
VS010_2	3" FNPT	3" FNPT	4" FLG - 150#ANSI	2" FNPT
VS012_2	4" FNPT	4" FNPT	5" FLG - 150#ANSI	2" FNPT

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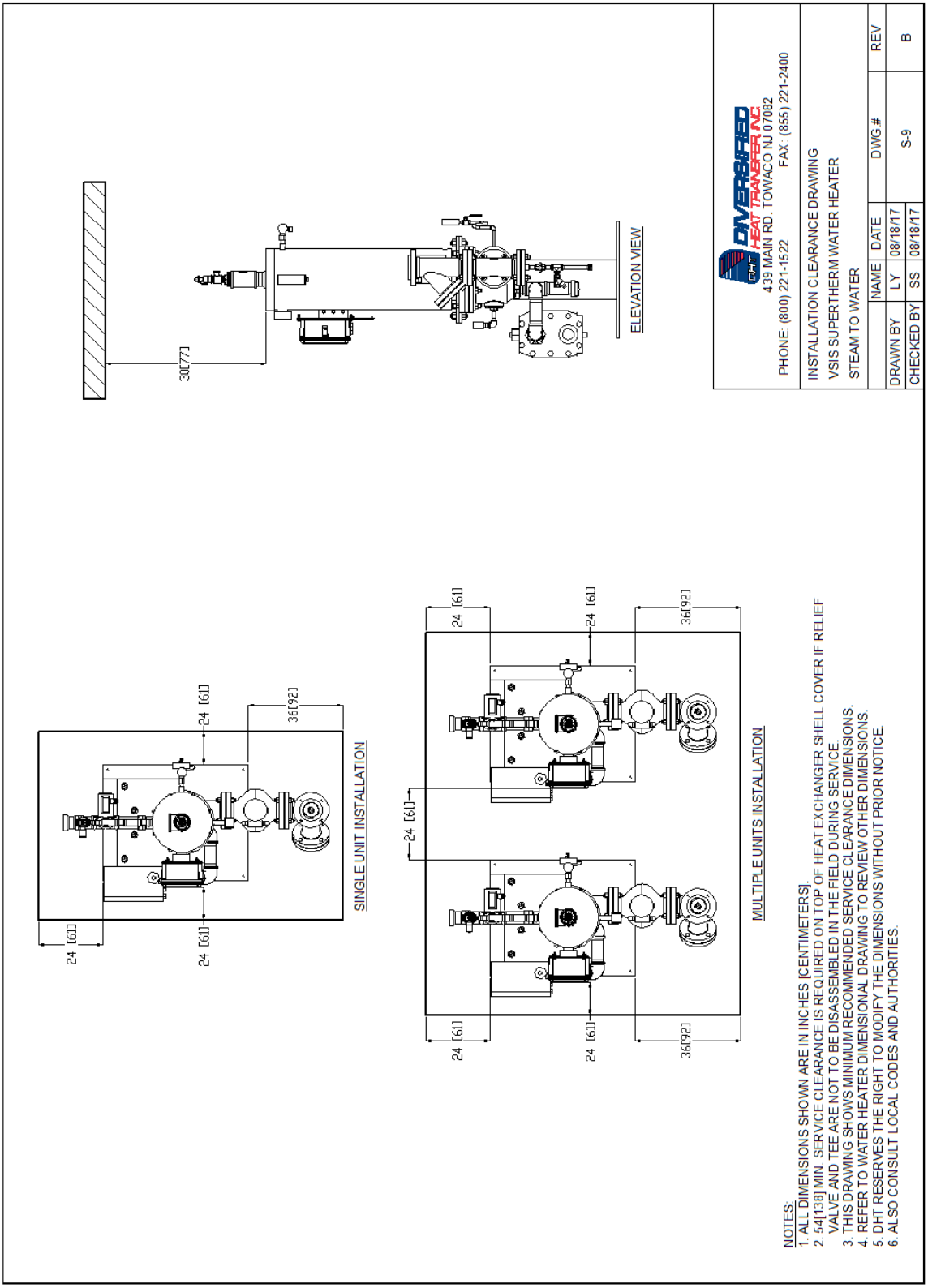
VS DW SUPERTHERM WATER HEATER W/ ELECTRIC VALVE (UP TO 25 PSIG) DIMENSIONAL DRAWING

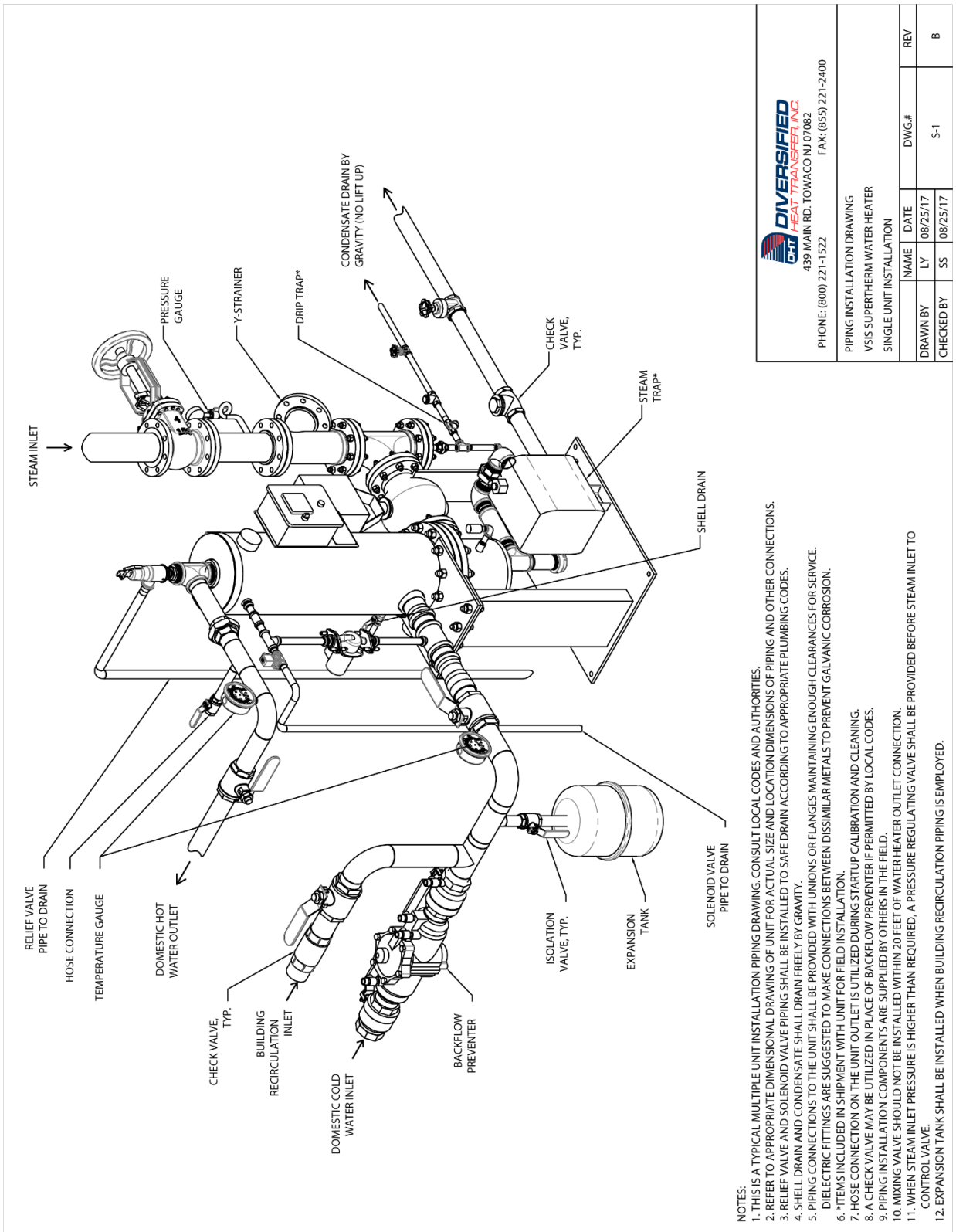
	NAME	DATE	DWG#	REV
DRAWN BY	SS	04/03/2018	S-22	B
CHECKED BY	DA	04/06/2018	SHEET 1 OF 1	

SUPERTHERM DOUBLE WALL DIMENSIONAL DRAWING

6.2 CLEARANCE DRAWINGS



6.3 PIPING AND INSTALLATION DRAWINGS



NOTES:
1. THIS IS A TYPICAL MULTIPLE UNIT INSTALLATION PIPING DRAWING. CONSULT LOCAL CODES AND AUTHORITIES.
2. REFER TO APPROPRIATE DIMENSIONAL DRAWING OF UNIT FOR ACTUAL SIZE AND LOCATION DIMENSIONS OF PIPING AND OTHER CONNECTIONS.
3. RELIEF VALVE AND SOLENOID VALVE PIPING SHALL BE INSTALLED TO SAFE DRAIN ACCORDING TO APPROPRIATE PLUMBING CODES.
4. SHELL DRAIN AND CONDENSATE SHALL DRAIN FREELY BY GRAVITY.
5. PIPING CONNECTIONS TO THE UNIT SHALL BE PROVIDED WITH UNIONS OR FLANGES MAINTAINING ENOUGH CLEARANCES FOR SERVICE. DIELECTRIC FITTINGS ARE SUGGESTED TO MAKE CONNECTIONS BETWEEN DISSIMILAR METALS TO PREVENT GALVANIC CORROSION.
6. *ITEMS INCLUDED IN SHIPMENT WITH UNIT FOR FIELD INSTALLATION.
7. HOSE CONNECTION ON THE UNIT OUTLET IS UTILIZED DURING STARTUP CALIBRATION AND CLEANING.
8. A CHECK VALVE MAY BE UTILIZED IN PLACE OF BACKFLOW PREVENTER IF PERMITTED BY LOCAL CODES.
9. PIPING INSTALLATION COMPONENTS ARE SUPPLIED BY OTHERS IN THE FIELD.
10. MIXING VALVE SHOULD NOT BE INSTALLED WITHIN 20 FEET OF WATER HEATER OUTLET CONNECTION.
11. WHEN STEAM INLET PRESSURE IS HIGHER THAN REQUIRED, A PRESSURE REGULATING VALVE SHALL BE PROVIDED BEFORE STEAM INLET TO CONTROL VALVE.
12. EXPANSION TANK SHALL BE INSTALLED WHEN BUILDING RECIRCULATION PIPING IS EMPLOYED.

DIVERSIFIED HEAT TRANSFER, INC.
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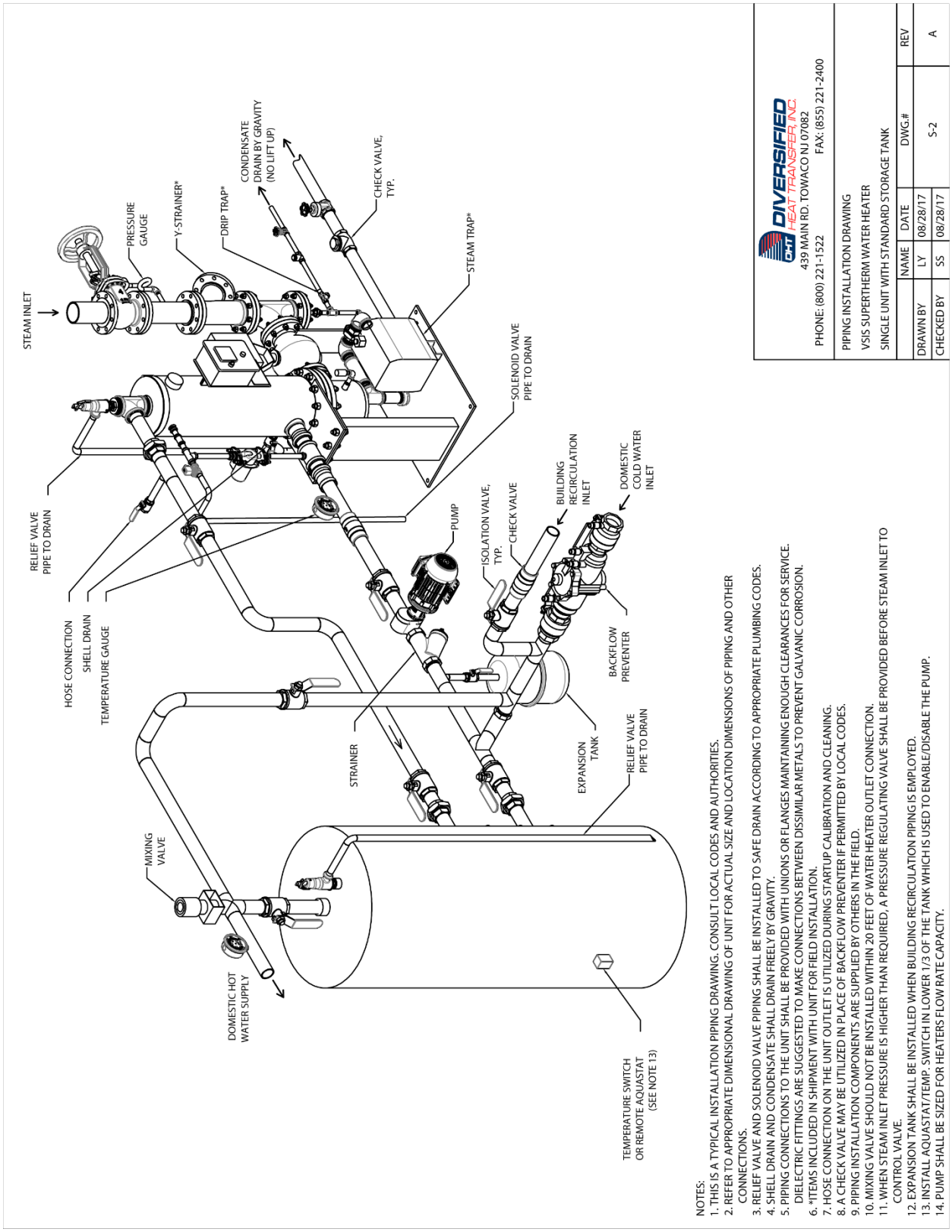
PHONE: (800) 221-1522 FAX: (855) 221-2400

PIPING INSTALLATION DRAWING
VSIS SUPERTHERM WATER HEATER
SINGLE UNIT INSTALLATION

	NAME	DATE	DWG.#	REV
DRAWN BY	LY	08/25/17	S-1	B
CHECKED BY	SS	08/25/17		

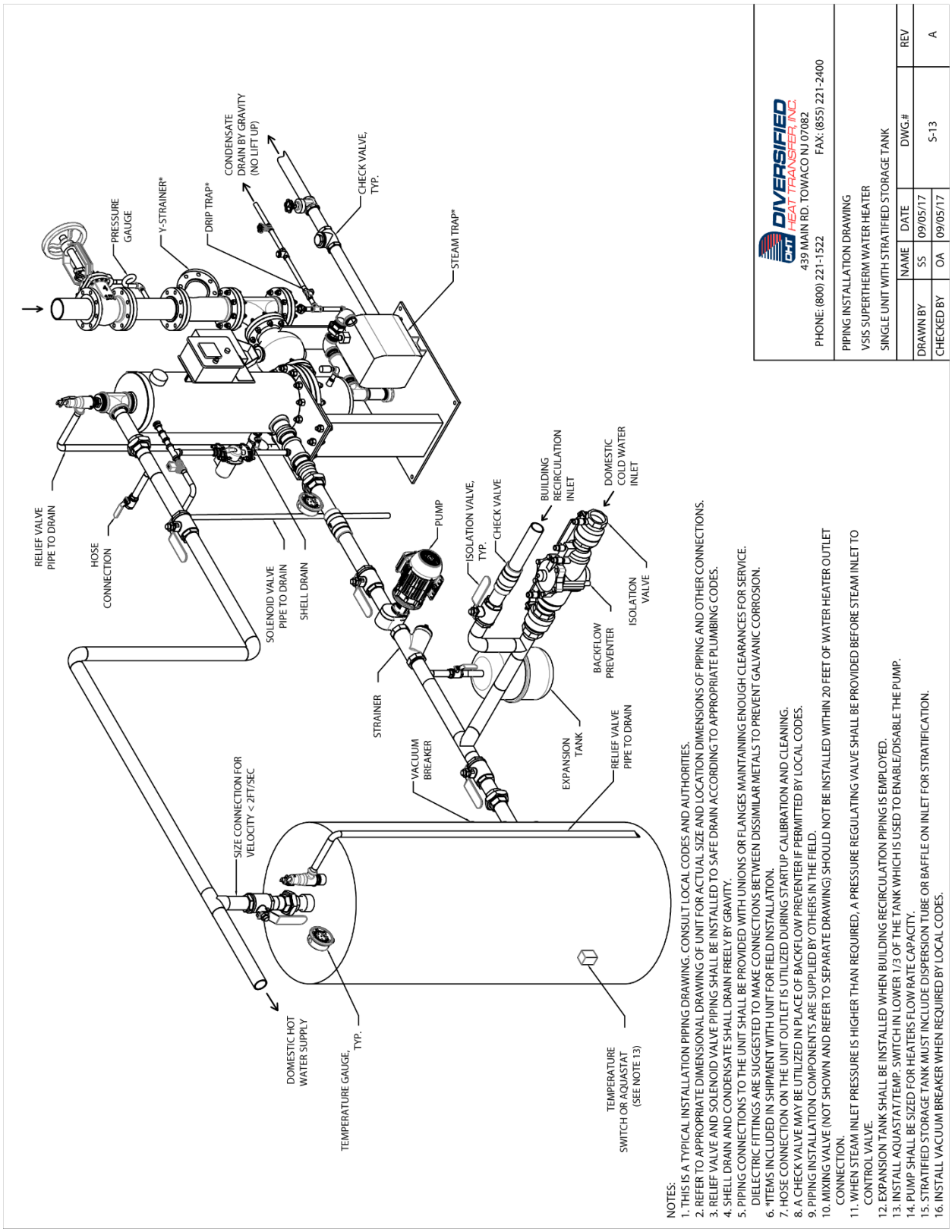


NOTES:
1. THIS IS A TYPICAL INSTALLATION PIPING DRAWING. CONSULT LOCAL CODES AND AUTHORITIES.
2. REFER TO APPROPRIATE DIMENSIONAL DRAWING OF UNIT FOR ACTUAL SIZE AND LOCATION DIMENSIONS OF PIPING AND OTHER CONNECTIONS.
3. RELIEF VALVE AND SOLENOID VALVE PIPING SHALL BE INSTALLED TO SAFE DRAIN ACCORDING TO APPROPRIATE PLUMBING CODES.
4. SHELL DRAIN AND CONDENSATE SHALL DRAIN FREELY BY GRAVITY.
5. PIPING CONNECTIONS TO THE UNIT SHALL BE PROVIDED WITH UNIONS OR FLANGES MAINTAINING ENOUGH CLEARANCES FOR SERVICE. DIELECTRIC FITTINGS ARE SUGGESTED TO MAKE CONNECTIONS BETWEEN DISSIMILAR METALS TO PREVENT GALVANIC CORROSION.
6. *ITEMS INCLUDED IN SHIPMENT WITH UNIT FOR FIELD INSTALLATION.
7. HOSE CONNECTION ON THE UNIT OUTLET IS UTILIZED DURING STARTUP CALIBRATION AND CLEANING.
8. A CHECK VALVE MAY BE UTILIZED IN PLACE OF BACKFLOW PREVENTER IF PERMITTED BY LOCAL CODES.
9. PIPING INSTALLATION COMPONENTS ARE SUPPLIED BY OTHERS IN THE FIELD.
10. MIXING VALVE SHOULD NOT BE INSTALLED WITHIN 20 FEET OF WATER HEATER OUTLET CONNECTION.
11. WHEN STEAM INLET PRESSURE IS HIGHER THAN REQUIRED, A PRESSURE REGULATING VALVE SHALL BE PROVIDED BEFORE STEAM INLET TO CONTROL VALVE.
12. EXPANSION TANK SHALL BE INSTALLED WHEN BUILDING RECIRCULATION PIPING IS EMPLOYED.
13. INSTALL AQUASTAT/TEMP. SWITCH IN LOWER 1/3 OF THE TANK WHICH IS USED TO ENABLE/DISABLE THE PUMP.
14. PUMP SHALL BE SIZED FOR HEATERS FLOW RATE CAPACITY.

DIVERSIFIED HEAT TRANSFER, INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522 FAX: (855) 221-2400

PIPING INSTALLATION DRAWING
VSIS SUPERTHERM WATER HEATER
SINGLE UNIT WITH STANDARD STORAGE TANK

	NAME	DATE	DWG.#	REV
DRAWN BY	LY	08/28/17	S-2	A
CHECKED BY	SS	08/28/17		



NOTES:
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2. REFER TO APPROPRIATE DIMENSIONAL DRAWING OF UNIT FOR ACTUAL SIZE AND LOCATION DIMENSIONS OF PIPING AND OTHER CONNECTIONS.
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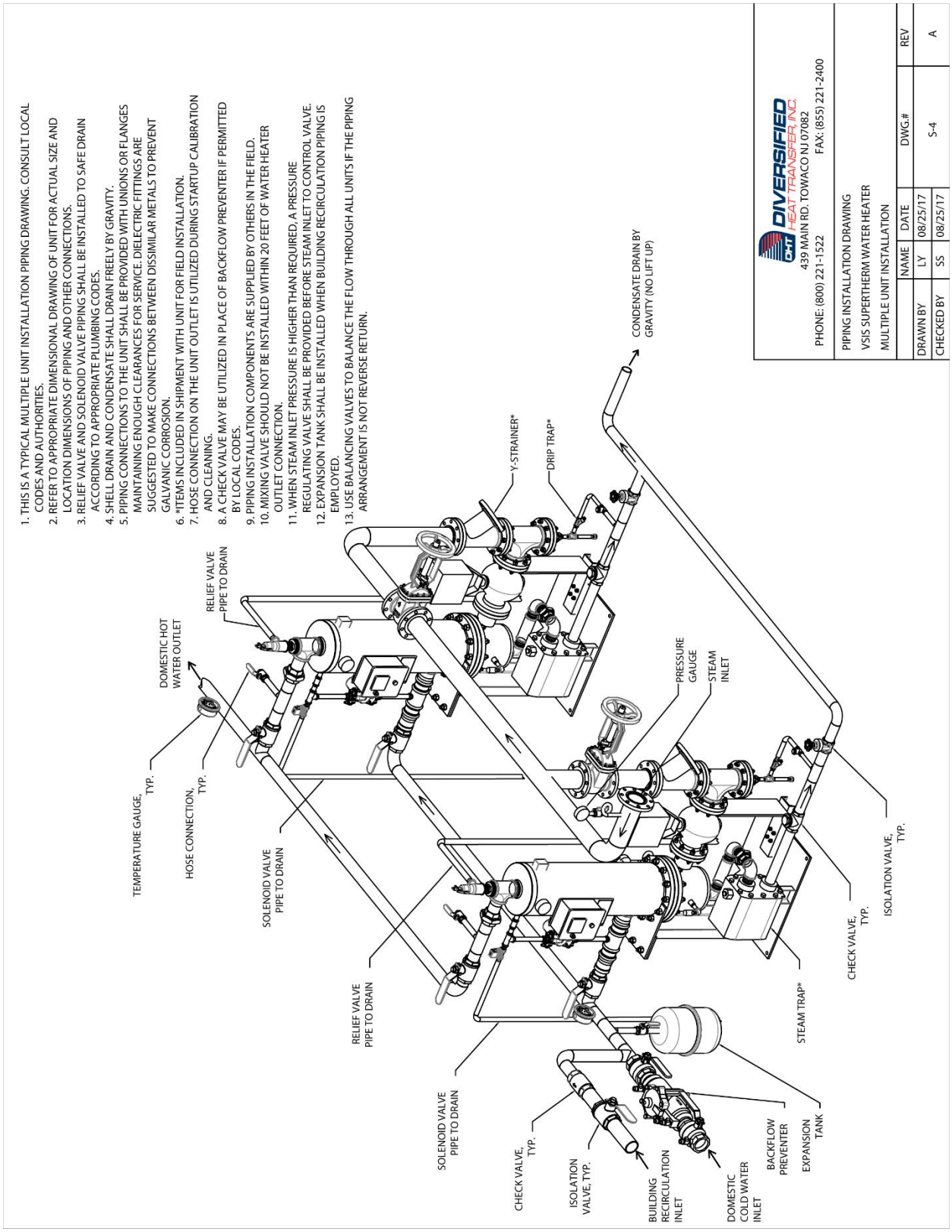
13. INSTALL AQUASTAT/TEMP. SWITCH IN LOWER 1/3 OF THE TANK WHICH IS USED TO ENABLE/DISABLE THE PUMP.
14. PUMP SHALL BE SIZED FOR HEATERS FLOW RATE CAPACITY.
15. STRATIFIED STORAGE TANK MUST INCLUDE DISPERSION TUBE OR BAFFLE ON INLET FOR STRATIFICATION.
16. INSTALL VACUUM BREAKER WHEN REQUIRED BY LOCAL CODES.

DIVERSIFIED HEAT TRANSFER, INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522 FAX: (855) 221-2400

PIPING INSTALLATION DRAWING
VSIS SUPERTHERM WATER HEATER
SINGLE UNIT WITH STRATIFIED STORAGE TANK

	NAME	DATE	DWG.#	REV
DRAWN BY	SS	09/05/17	S-13	A
CHECKED BY	OA	09/05/17		


1. THIS IS A TYPICAL MULTIPLE UNIT INSTALLATION PIPING DRAWING. CONSULT LOCAL CODES AND AUTHORITIES.
2. REFER TO APPROPRIATE DIMENSIONAL DRAWING OF UNIT FOR ACTUAL SIZE AND LOCATION DIMENSIONS OF PIPING AND OTHER CONNECTIONS.
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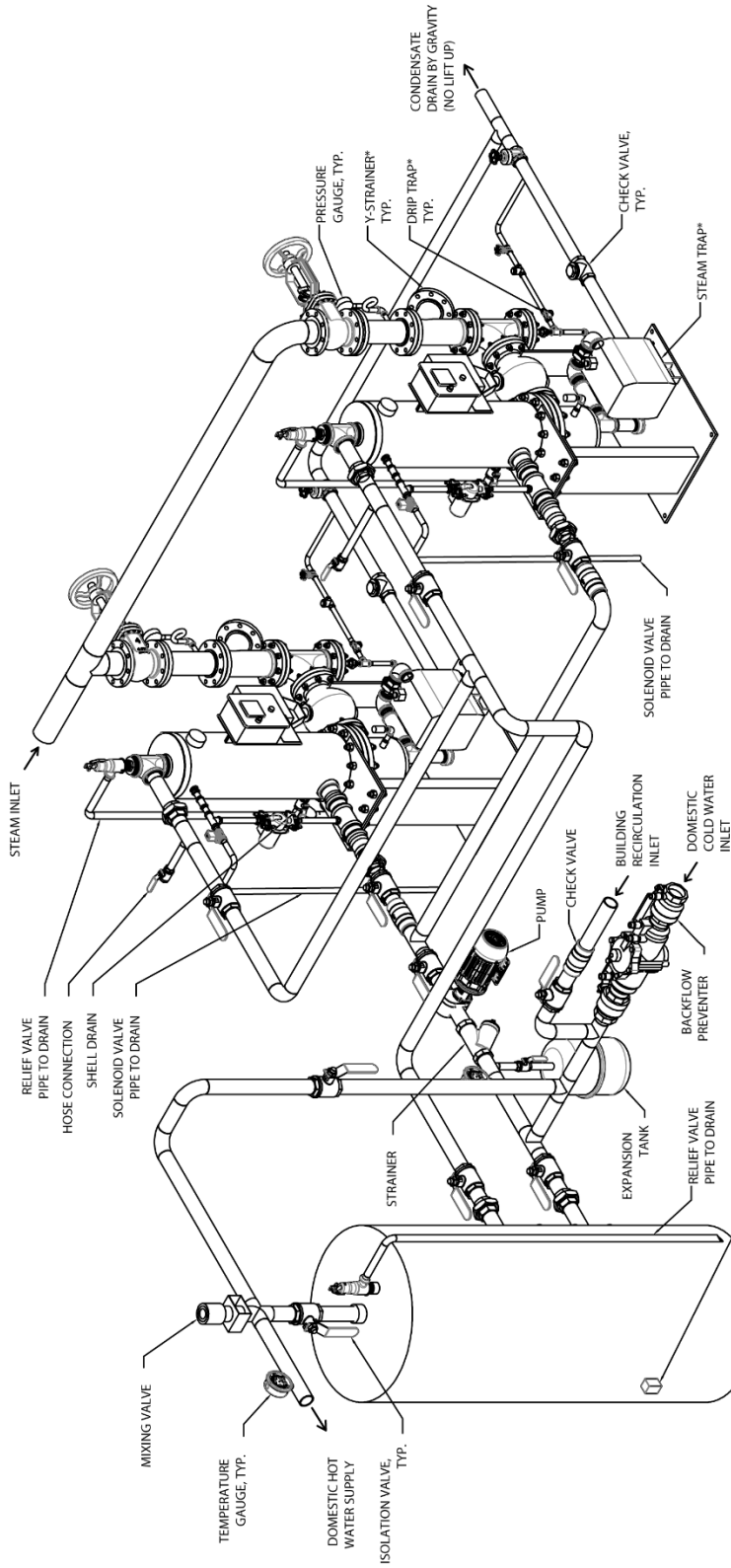
12. EXPANSION TANK SHALL BE INSTALLED WHEN BUILDING RECIRCULATION PIPING IS EMPLOYED.
13. USE BALANCING VALVES TO BALANCE THE FLOW THROUGH ALL UNITS IF THE PIPING ARRANGEMENT IS NOT REVERSE RETURN.
DIVERSIFIED HEAT TRANSFER, INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522 FAX: (855) 221-2400
PIPING INSTALLATION DRAWING
VSIS SUPERTHERM WATER HEATER
MULTIPLE UNIT INSTALLATION
NAME DATE DWG.# REV
DRAWN BY LY 08/25/17 S-4 A
CHECKED BY SS 08/25/17
CONDENSATE DRAIN BY GRAVITY (NO LIFT UP)
Y-STRAINER*
DRIP TRAP*
RELIEF VALVE PIPE TO DRAIN
DOMESTIC HOT WATER OUTLET
PRESSURE GAUGE
STEAM INLET
TEMPERATURE GAUGE, TYP.
HOSE CONNECTION, TYP.
SOLENOID VALVE PIPE TO DRAIN
CHECK VALVE, TYP.
ISOLATION VALVE, TYP.
RELIEF VALVE PIPE TO DRAIN
STEAM TRAP*
SOLENOID VALVE PIPE TO DRAIN
CHECK VALVE, TYP.
ISOLATION VALVE, TYP.
BUILDING RECIRCULATION INLET
DOMESTIC COLD WATER INLET
BACKFLOW PREVENTER
EXPANSION TANK



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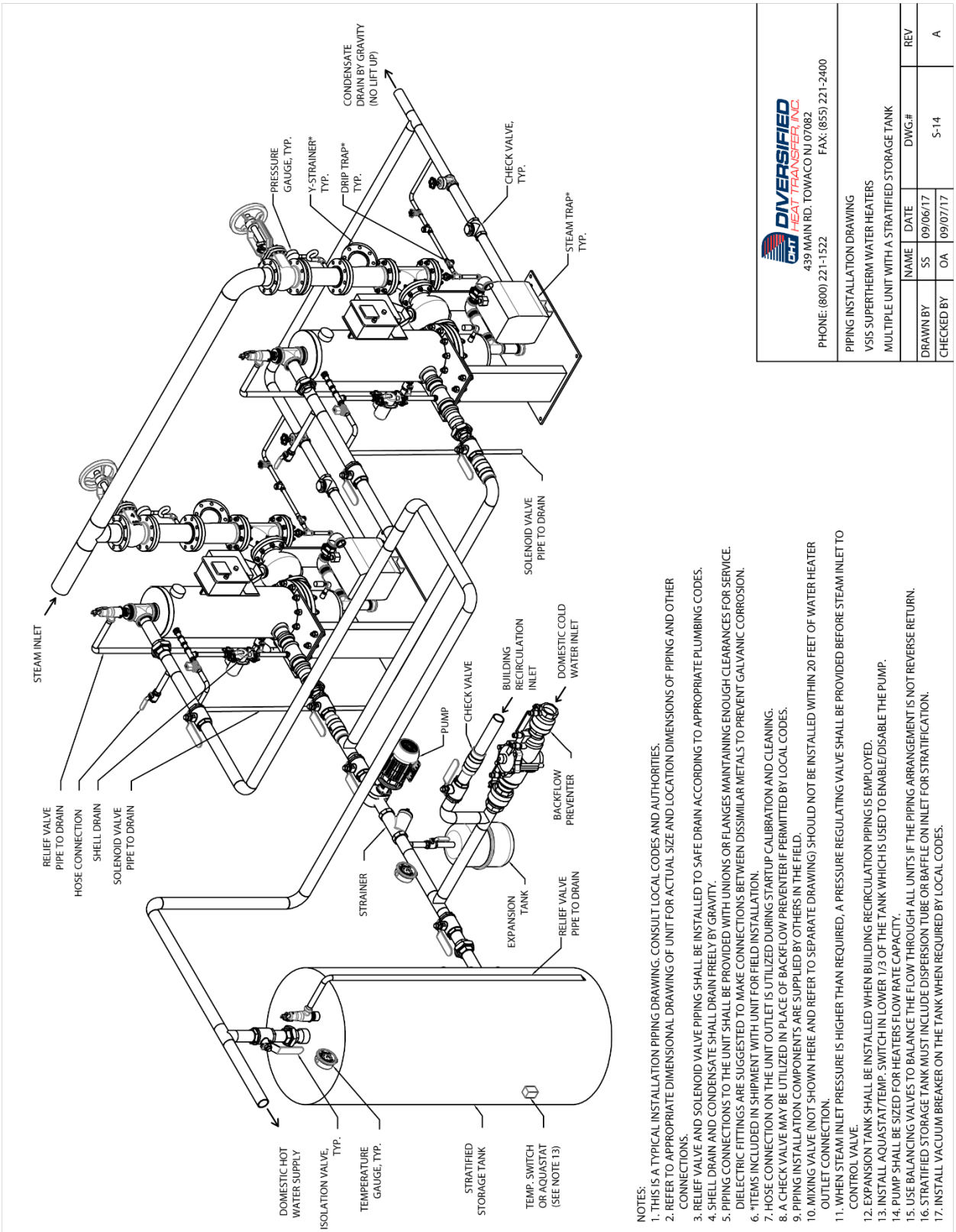
13. INSTALL AQUASTAT/TEMP. SWITCH IN LOWER 1/3 OF THE TANK WHICH IS USED TO ENABLE/DISABLE THE PUMP.
14. PUMP SHALL BE SIZED FOR HEATERS FLOW RATE CAPACITY.
15. USE BALANCING VALVES TO BALANCE THE FLOW THROUGH ALL UNITS IF THE PIPING ARRANGEMENT IS NOT REVERSE RETURN.

DIVERSIFIED HEAT TRANSFER, INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522 FAX: (855) 221-2400

PIPING INSTALLATION DRAWING
VSIS SUPERTHERM WATER HEATER
MULTIPLE UNIT WITH A STANDARD STORAGE TANK

	NAME	DATE	DWG.#	REV
DRAWN BY	LY	08/31/17	S-12	A
CHECKED BY	SS	09/01/17		



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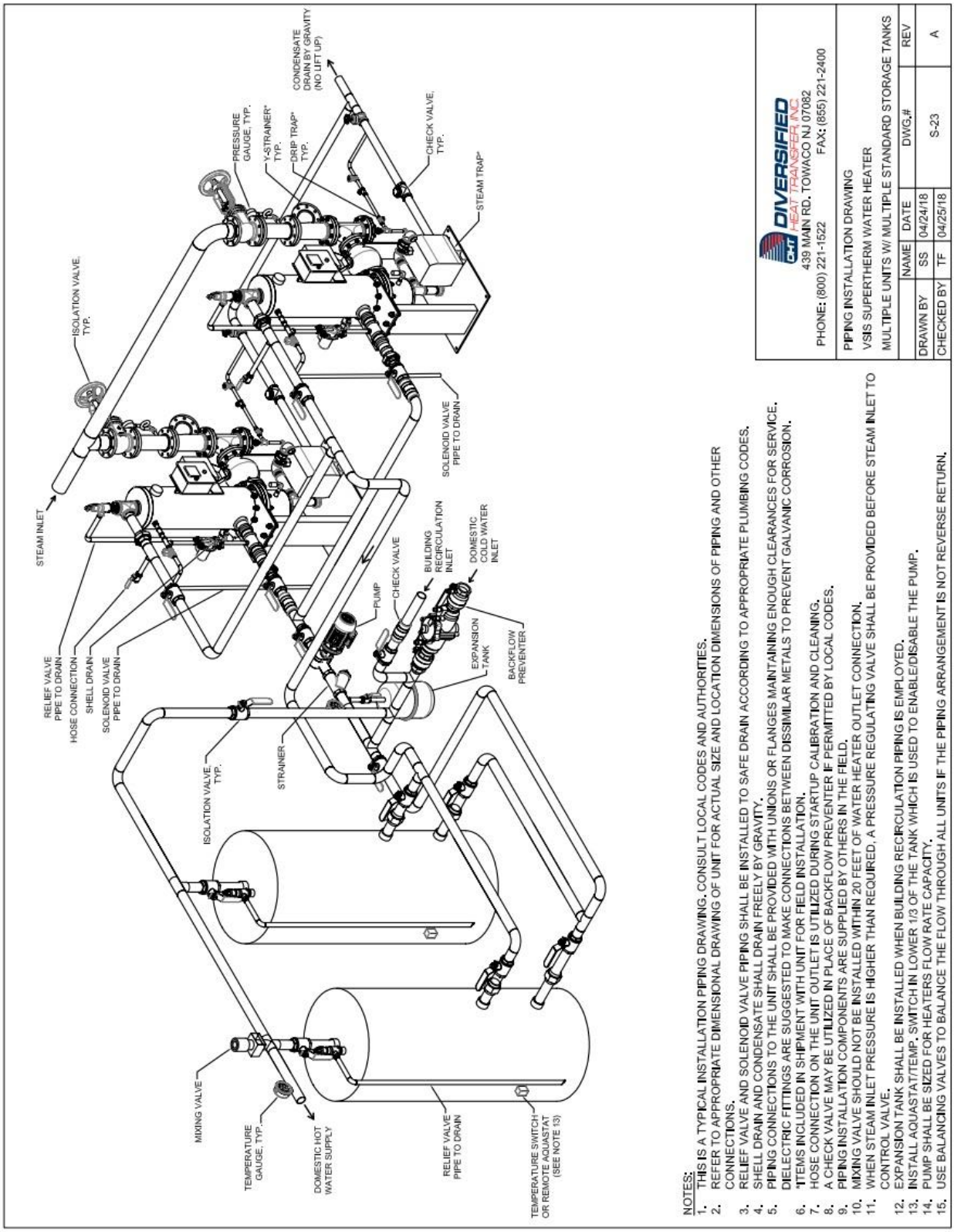
16. STRATIFIED STORAGE TANK MUST INCLUDE DISPERSION TUBE OR BAFFLE ON INLET FOR STRATIFICATION.
17. INSTALL VACUUM BREAKER ON THE TANK WHEN REQUIRED BY LOCAL CODES.

DIVERSIFIED DHT HEAT TRANSFER, INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522 FAX: (855) 221-2400

PIPING INSTALLATION DRAWING
VSIS SUPERTHERM WATER HEATERS
MULTIPLE UNIT WITH A STRATIFIED STORAGE TANK

	NAME	DATE	DWG.#	REV
DRAWN BY	SS	09/06/17	S-14	A
CHECKED BY	OA	09/07/17		



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10. MIXING VALVE SHOULD NOT BE INSTALLED WITHIN 20 FEET OF WATER HEATER OUTLET CONNECTION.
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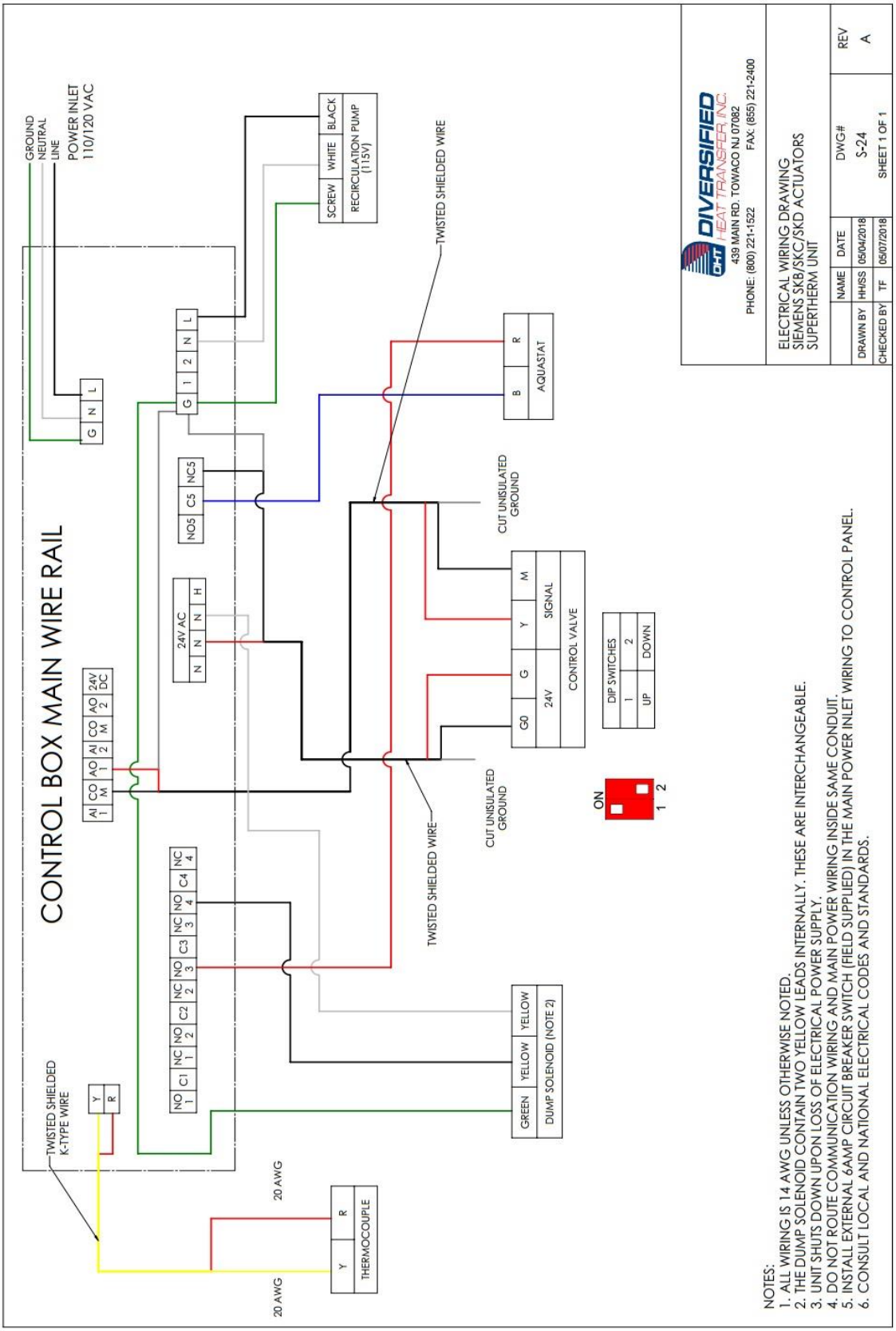
13. INSTALL AQUASTAT/TEMP. SWITCH IN LOWER 1/3 OF THE TANK WHICH IS USED TO ENABLE/DISABLE THE PUMP.
14. PUMP SHALL BE SIZED FOR HEATERS FLOW RATE CAPACITY.
15. USE BALANCING VALVES TO BALANCE THE FLOW THROUGH ALL UNITS IF THE PIPING ARRANGEMENT IS NOT REVERSE RETURN.

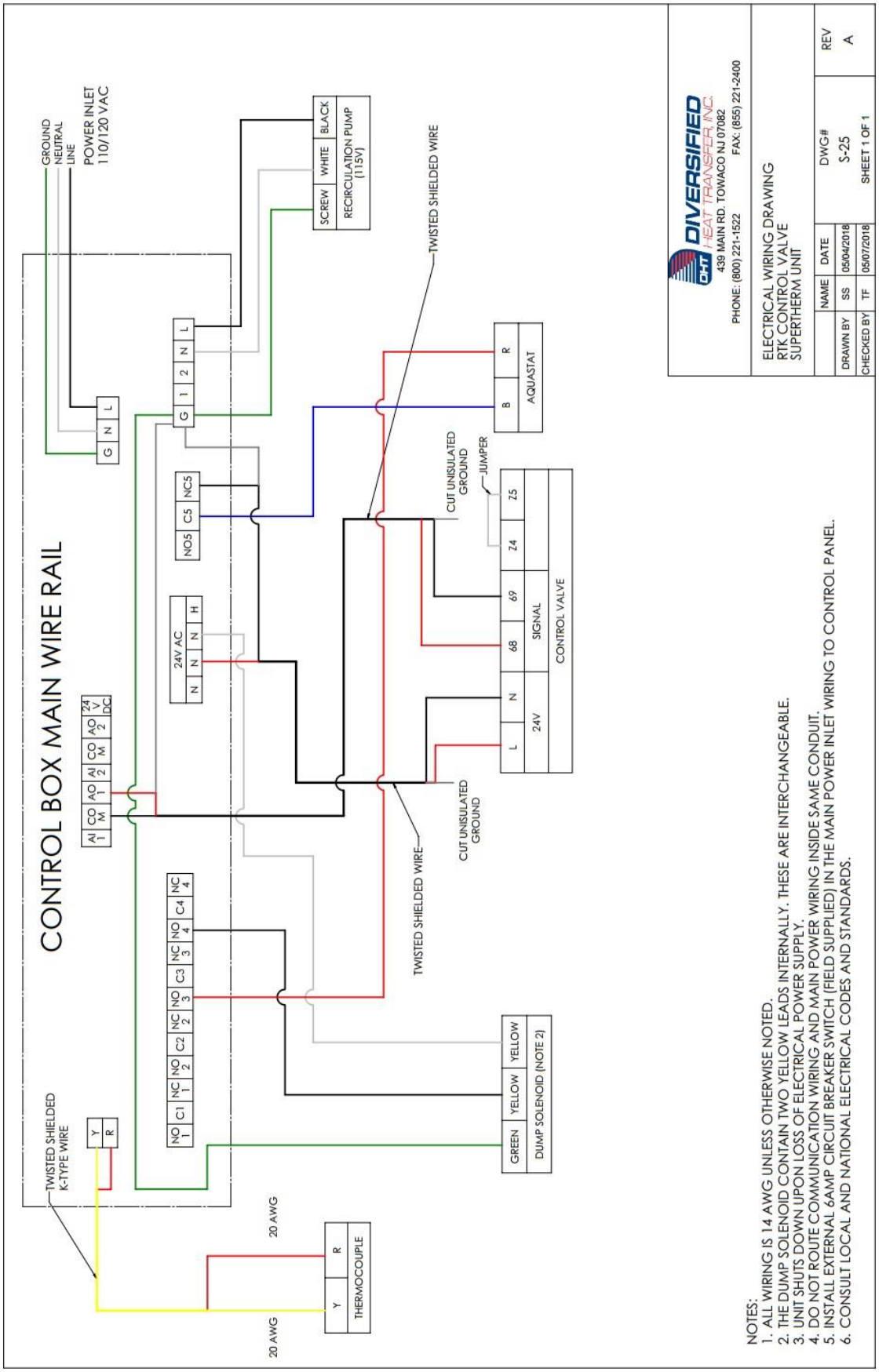
DIVERSIFIED HEAT TRANSFER, INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522 FAX: (855) 221-2400

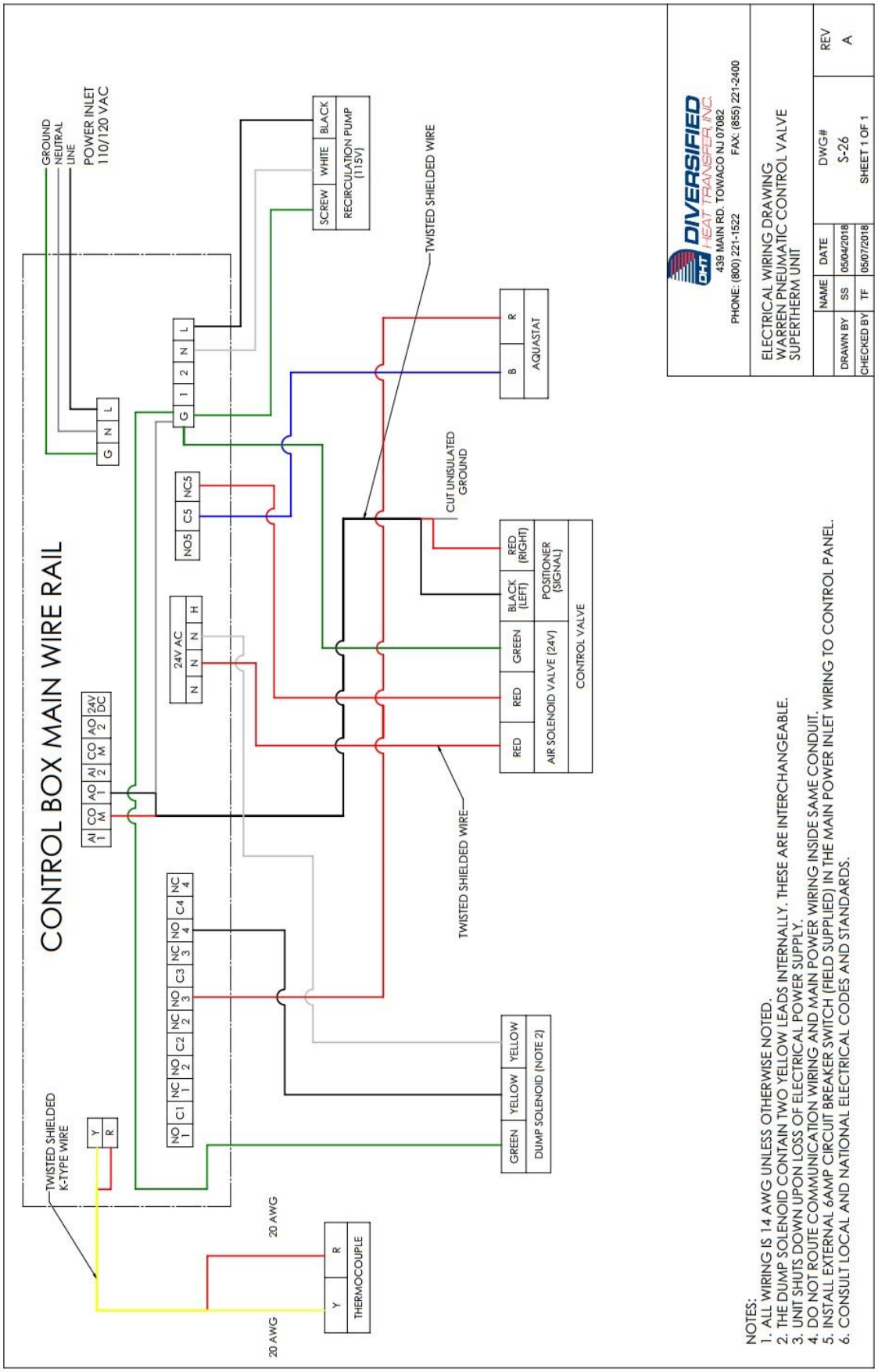
PIPING INSTALLATION DRAWING
VSIS SUPERTHERM WATER HEATER
MULTIPLE UNITS W/ MULTIPLE STANDARD STORAGE TANKS

	NAME	DATE	DWG.#	REV
DRAWN BY	SS	04/24/18	S-23	A
CHECKED BY	TF	04/25/18		

6.4 ELECTRICAL WIRING DIAGRAMS/SCHEMATICS




CONTROL BOX MAIN WIRE RAIL
GROUND
NEUTRAL
LINE
POWER INLET
110/120 VAC
SCREW
WHITE
BLACK
RECIRCULATION PUMP
(115V)
TWISTED SHIELDED WIRE
AQUASTAT
CUT UNINSULATED
GROUND
JUMPER
24V AC
SIGNAL
CONTROL VALVE
TWISTED SHIELDED
K-TYPE WIRE
DUMP SOLENOID (NOTE 2)
GREEN
YELLOW
THERMOCOUPLE
20 AWG
DIVERSIFIED
HEAT TRANSFER, INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522
FAX: (855) 221-2400
ELECTRICAL WIRING DRAWING
RTK CONTROL VALVE
SUPERTHERM UNIT
DRAWN BY
CHECKED BY
NAME
DATE
DWG#
S-25
REV
A
SHEET 1 OF 1
NOTES:
1. ALL WIRING IS 14 AWG UNLESS OTHERWISE NOTED.
2. THE DUMP SOLENOID CONTAIN TWO YELLOW LEADS INTERNALLY. THESE ARE INTERCHANGEABLE.
3. UNIT SHUTS DOWN UPON LOSS OF ELECTRICAL POWER SUPPLY.
4. DO NOT ROUTE COMMUNICATION WIRING AND MAIN POWER WIRING INSIDE SAME CONDUIT.
5. INSTALL EXTERNAL 6AMP CIRCUIT BREAKER SWITCH (FIELD SUPPLIED) IN THE MAIN POWER INLET WIRING TO CONTROL PANEL.
6. CONSULT LOCAL AND NATIONAL ELECTRICAL CODES AND STANDARDS.


CONTROL BOX MAIN WIRE RAIL
GROUND
NEUTRAL
LINE
POWER INLET
110/120 VAC
G N L
G 1 2 N L
SCREW
WHITE
BLACK
RECIRCULATION PUMP (115V)
TWISTED SHIELDED WIRE
B
R
AQUASTAT
CUT UNINSULATED GROUND
NO5 C5 NC5
24V AC
N N N H
RED (RIGHT)
BLACK (LEFT)
GREEN
RED
POSITIONER (SIGNAL)
AIR SOLENOID VALVE (24V)
CONTROL VALVE
TWISTED SHIELDED WIRE
AI 1 CO M1 AO 1 AI 2 CO M2 AO 2 24V DC
NO 1 C1 NC 1 NO 2 C2 NC 2 NO 3 C3 NC 3 NO 4 C4 NC 4
TWISTED SHIELDED K-TYPE WIRE
Y R
GREEN
YELLOW
YELLOW
DUMP SOLENOID (NOTE 2)
20 AWG
20 AWG
Y R
THERMOCOUPLE
DIVERSIFIED HEAT TRANSFER, INC.
439 MAIN RD. TOWACO NJ 07082
PHONE: (800) 221-1522 FAX: (855) 221-2400
ELECTRICAL WIRING DRAWING
WARREN PNEUMATIC CONTROL VALVE
SUPERTHERM UNIT
NAME DATE
DRAWN BY SS 05/04/2018
CHECKED BY TF 05/07/2018
DWG# S-26
SHEET 1 OF 1
REV A
NOTES:
1. ALL WIRING IS 14 AWG UNLESS OTHERWISE NOTED.
2. THE DUMP SOLENOID CONTAIN TWO YELLOW LEADS INTERNALLY. THESE ARE INTERCHANGEABLE.
3. UNIT SHUTS DOWN UPON LOSS OF ELECTRICAL POWER SUPPLY.
4. DO NOT ROUTE COMMUNICATION WIRING AND MAIN POWER WIRING INSIDE SAME CONDUIT.
5. INSTALL EXTERNAL 6AMP CIRCUIT BREAKER SWITCH (FIELD SUPPLIED) IN THE MAIN POWER INLET WIRING TO CONTROL PANEL.
6. CONSULT LOCAL AND NATIONAL ELECTRICAL CODES AND STANDARDS.

6.5 FORMS AND RECORDS

6.5.1 DHT Water Heater Controller Programming Record Sheet

DHT Water Heater Controller Programming Record Sheet

MODEL NUMBER:_____ SERIAL NUMBER: _____

VERSION:_____ PASSWORD: _____

SETPOINTS **SETPOINT**

PRIMARY ALARM ON AT _____

PRIMARY ALARM OFF AT _____

SECONDARY ALARM ON AT _____

SECONDARY ALARM OFF AT _____

PASSWORD:_____

INPUT FILTER _____

UNIT TEXT _____

SCALING

DECIMAL POINT _____

ANALOG INPUT LOW _____

ANALOG INPUT HIGH _____

6.5.2 SuperTherm Installation Form

DIVERSIFIED HEAT TRANSFER, INC

SUPERTHERM INSTALLATION FORM

Please complete **ONE (1)** form for each SITE at which **DHT SUPERTHERM** units are installed and return it to DHT for warranty validation within 30 days of start-up. After completion, e-mail this form to: WARRANTY@DHTNET.COM or fax to 718-386-7809.

Completed by: _____ Date: _____

UNIT AND LOCATION

Installation Name: _____ Technician: _____

Street Address: _____ Company: _____

City, State, Zip: _____ Phone #: _____

DHT Sales Rep: _____ Email: _____

EQUIPMENT CLASSIFICATION

Choose the unit type and enter the serial number for each unit. Add additional in ADDITIONAL NOTES if needed.

☐ VTSI (TANK) SERIES- Steam		☐ VTSIW (TANK) SERIES- WATER		☐ VSI (VERTICAL) SERIES- STEAM		☐ VSI (VERTICAL) SERIES- WATER	
☐ Single Wall	☐ Double Wall	☐ Single Wall	☐ Double Wall	☐ Single Wall	☐ Double Wall	☐ Single Wall	☐ Double Wall

GENERAL INSTALLATION

1. Does the installation meet DHT recommended clearances? ☐ YES ☐ NO
2. Does condensate gravity drain? ☐ YES ☐ NO
3. Is there any lift in the condensate piping? ☐ YES ☐ NO
4. Does condensate drain to a receiver? ☐ YES ☐ NO
5. Is the relief valve piped to drain or within 12" of floor? ☐ YES ☐ NO
6. Is the unit's drain piped to the floor or a drain? ☐ YES ☐ NO
7. Is a recirculation system used to maintain system water temperature? ☐ YES ☐ NO
8. If yes, what is the recirculation pump capacity in GPM? _____ GPM
9. Is heat trace used to maintain system water temperatures? ☐ YES ☐ NO
10. What is the outlet water temperature set point? _____ °F
11. What is the high limit temperature switch setting? _____ °F
12. For a multiple unit installation, does the system utilize one or more of the following balancing methods?
    - Reverse Return Piping ☐ YES ☐ NO
    - Balancing Valves ☐ YES ☐ NO
    - Current Feed Manifolds ☐ YES ☐ NO

SUPERTHERM Installation Form Page 1 of 4

FOR HEATERS USING A STORAGE TANK

1. Storage tank is: ☐ Stratified ☐ Accumulator
2. Does the tank have ☐ Baffle ☐ Dispersion Tube
3. What is the storage tanks volume? _____ Gallons
4. What is the heater outlet temperature? _____ °F
5. Position of aquastat: ☐ Upper 1/3 ☐ Middle 1/3 ☐ Lower 1/3 ☐ No aquastat
6. What is the aquastat temperature setting? _____ °F
7. Does the aquastat control the pump between the tank & heater? ☐ YES ☐ NO
8. Is a throttling valve installed between the pump and heater? ☐ YES ☐ NO
9. Is there a bypass loop around the pump? ☐ YES ☐ NO
10. What is the capacity of pump between the tank and heater? _____ GPM

WATER HEATER INSTALLATION

1. Are isolation valves installed in the inlet piping? ☐ YES ☐ NO
2. Are isolation valves installed in the outlet piping? ☐ YES ☐ NO
3. Is a hose bib installed in the outlet piping? ☐ YES ☐ NO
4. Are check valves installed in the cold water inlet? ☐ YES ☐ NO
5. Are check valves installed in the recirculation line? ☐ YES ☐ NO
6. Building recirculation is piped to: ☐ Inlet Side of Heater ☐ None
7. Record distance of building connections (ft)_____ & cold water feed _____ to the bank of unit (s)
8. What are the maximum/ minimum design flow rates through the unit? Max _____ GPM Min _____ GPM
   a. Were the maximum/ minimum flow rates verified? ☐ YES ☐ NO
9. What is the design system flow rate? _____ GPM
10. What is the design plant delta T? _____ °F

VALVE INFORMATION

1. What is the inlet steam pressure to the valve? _____ PSI
2. Has the boiler water flow been balanced between the units? ☐ YES ☐ NO
3. Type of valve:
   ☐ Pneumatic ☐ Self- Contained ☐ Electric
   ☐ Other (specify model/ manufacturer) _____

SUPERTHERM Installation Form Page 2 of 4

CONTROL BOX CONFIGURATION

Please indicate if any changes have been made to the Factory Settings.

Factory Settings	Factory Value	Field Value (Changes)
Primary Alarm On	160°F	
Primary Alarm Off	155°F	
Secondary Alarm On	170°F	
Secondary Alarm Off	165°F	
Setpoint	140°F	
Gain	4.5	
Integral	1	
Derivative	0.00	
Dead Band	0.00	

Factory Settings	Factory Value	Field Value (Changes)
Valve Open	50%	
Auto	NA	
Filter	1.00	
PID	Reverse	
Scale	32F-4mA 212F-20mA	
Pump	working	
Aqua Stat	180°F	

SUMMARY

1. Are all the units installed in accordance with DHT guidelines & industry best practices? ☐ YES ☐ NO

A. If no, please describe the issues.

B. Who has been contacted? Please provide name & Number for each person contacted. (Check all that apply)

☐ DHT Engineer: _____ ☐ General Contractor: _____
☐ Mechanical Contractor: _____ ☐ Building Owner: _____
☐ Design Engineer: _____ ☐ Plumber: _____
☐ Controls Engineer: _____ ☐ Electrician: _____

2. Is there any conflicts between the Installation & the Engineer' s Specification or Design Plans? ☐ YES ☐ NO

A. If no, please describe the issues.

B. Who has been contacted? Please provide name & Number for each person contacted. (Check all that apply)

☐ DHT Engineer: _____ ☐ General Contractor: _____
☐ Mechanical Contractor: _____ ☐ Building Owner: _____
☐ Design Engineer: _____ ☐ Plumber: _____
☐ Controls Engineer: _____ ☐ Electrician: _____

3. Are there any conflicts or physical restrictions that will prevent the boiler plant from receiving proper preventative maintenance in the future? ☐ YES ☐ NO

A. If no, please describe the issues.

B. Who has been contacted? Please provide name & Number for each person contacted. (Check all that apply)

☐ DHT Engineer: _____ ☐ General Contractor: _____

☐ Mechanical Contractor: _____ ☐ Building Owner: _____

☐ Design Engineer: _____ ☐ Plumber: _____

☐ Controls Engineer: _____ ☐ Electrician: _____

4. Please outline any exceptions that have granted by a DHT Engineer for this installation if necessary.

OTHER NOTES:

DHT INTERNAL APPROVAL

DHT Engineer Sign-off: _____ Date: _____

SUPERTHERM Installation Form Page 4 of 4

6.5.3 SuperTherm Startup Form

DIVERSIFIED HEAT TRANSFER, INC

SUPERTHERM START-UP FORM

Please complete ONE (1) form for each UNIT at the site and return to DHT for warranty validation within 30 days of start-up. After completion, e-mail this form to WARRANTY@DHTNET.COM or fax to 718-386-7809.

Completed by: _____ Date: _____

UNIT AND LOCATION

Installation Name: _____ Technician: _____

Street Address: _____ Company: _____

City, State, Zip: _____ Phone #: _____

DHT Sales Rep: _____ Email: _____

Unit Serial #: _____

EQUIPMENT CLASSIFICATION

Choose the unit type and enter the serial number for each unit. Add additional in ADDITIONAL NOTES if needed.

☐ VTSI (TANK) SERIES- STEAM ☐ Single Wall ☐ Double Wall Model #: _____

☐ VTSIW (TANK) SERIES- WATER ☐ Single Wall ☐ Double Wall Model #: _____

☐ VSI (VERTICAL) SERIES- STEAM ☐ Single Wall ☐ Double Wall Model #: _____

☐ VSI (VERTICAL) SERIES- WATER ☐ Single Wall ☐ Double Wall Model #: _____

CONTROL BOX CONFIGURATION

Please indicate if any changes have been made to the Factory Settings.

Factory Settings	Factory Value	Field Value (Changes)
Primary Alarm On	160°F	
Primary Alarm Off	155°F	
Secondary Alarm On	170°F	
Secondary Alarm Off	165°F	
Setpoint	140°F	
Gain	4.5	
Integral	1	
Derivative	0.00	
Dead Band	0.00	

Factory Settings	Factory Value	Field Value (Changes)
Valve Open	50%	
Auto	NA	
Filter	1.00	
PID	Reverse	
Scale	32F-4mA 212F-20mA	
Pump	working	
Aqua Stat	180°F	

SUPERTHERM Start-up Form Page 1 of 2

ADDITIONAL NOTES:

DHT INTERNAL APPROVAL

DHT Engineer Sign-off: _____ Date: _____

DHT Notes:

SUPERTHERM Start-up Form Page 2 of 2

SECTION 7: WARRANTY

SUPERTHERM WATER HEATER PRODUCT SPECIFIC LIMITED WARRANTY

Subject to the terms and conditions herein and the Terms and Conditions of Sale (as defined herein), Diversified Heat Transfer, Inc. (DHT) ("Seller") provides to the purchaser of the product ("Buyer") a non-prorated warranty for the following components of the SuperTherm Water Heater. The SuperTherm Water Heater must be operated in accordance with the conditions stated herein, against the indicated failures. The SuperTherm Warranty commences on the date of shipment or if a start-up report is furnished to Seller, on the start-up date shown on the report furnished to Seller (the "Warranty Period"). The startup must be completed within six (6) months of shipment, and the start-up report must be furnished to Seller within thirty (30) days of the startup.

- **TUBE BUNDLE** shall carry a non-prorated (5) year warranty against failure due to thermal shock, mechanical failure, manufacturing or material defect. The tube bundle shall not be warranted from failure due to scaling, liming, corrosion, or erosion due to water or installation conditions.
- **SHELL** shall carry a non-prorated (10) year warranty.
- **ALL OTHER COMPONENTS** shall carry a non-prorated (1) year warranty.

CONDITIONS OF WARRANTY:

This Specific Product Limited Warranty is transferrable to the owner that utilizes the product(s) purchased hereunder for its intended use at the original installation site (the "Original Owner"). This Specific Product Limited Warranty is non-transferable to anyone who subsequently receives or purchases products from the Original Owner. If the Original Owner did not purchase the product directly from Seller, the Original Owner should contact the reseller from whom it purchased the product for a copy of the Terms and Conditions of Sale which can be also found on www.dhtnet.com.

Seller's obligations under this Specific Limited Warranty is limited to modify, repair, or exchange the defective item which after examination shall, to Seller's own satisfaction be determined to have been defective at the time it was shipped. In the event that a replacement is provided by Seller, the defective item will become the property of Seller. Any claims relating to this product shall be limited to the list price of the product at the time of sale. Transportation to Seller's facility or other designated facility for repairs of any products or party alleged defective shall, in all events, be at Buyer's sole risk and cost.

This warranty applies only if the Seller receives, within the Warranty Period, an immediate written notice, providing a detailed description of all claimed defects, upon discovery of such defects together with proof of purchase (invoice or Order Acknowledgment) and a copy of the start-up report for the affected product (Attention: Diversified Heat Transfer, Inc., 439 Main Rd. Rte 202, Towaco, NJ).

Seller may seek reimbursement of any costs incurred by Seller where the product is found to be in good working order, or when it has been determined that this Specific Product Limited Warranty does not apply as per the exclusions set forth below. The remedies available to Buyer set forth herein are exclusive remedies, and all other remedies, statutory or otherwise, including but not limited to the right of legal action, are waived by Buyer. Buyer shall indemnify and hold Seller harmless against, any claim due to any injury or death to any person or damage to any property resulting in whole or in part from any modification or alteration Buyer makes to any product sold hereunder.

EXCLUSIONS:
To the full extent permitted by law, Seller shall have no liability for and the warranties do not cover:

A. Any product which has been altered or repaired by other than Seller's personnel;
B. Deterioration or failure of any product due to
    a. abrasion, corrosion, erosion or fouling,
    b. misuse,
    c. modification not authorized by Seller in writing
    d. improper installation, lack of or improper maintenance or operation;

C. Equipment not furnished by Seller, either mounted or unmounted, or when contracted for by a party or parties other than Seller to be installed or handled;

D. The suitability of any product for any particular application;

E. The design or operation of owner's plant or equipment or of any facility or system of which any product may be made a part;

F. Any damage to the product due to abrasion, erosion, corrosion, deterioration, abnormal temperatures or the influence of foreign matter or energy;

G. The performance of any product under conditions varying materially from those under which such product is usually tested under industry standards at the time of shipment;

H. Leakage or other malfunction caused by:

   a. defective installations in general and specifically, any installation which is made

      i. in violation of applicable state or local plumbing, housing or building codes or
      ii. contrary to the written instructions furnished with the product,

   b. adverse local conditions in general and, specifically, sediment or lime precipitation in the tubes, headers and/or shells or corrosive elements in the water, heating medium or atmosphere, or

   c. misuse in general and, specifically, operation and maintenance contrary to the written instructions furnished with the unit, disconnection, alteration or addition of components or apparatus, not approved by Seller, operation with heating media, fuels or settings other than those set forth on the rating plate or accidental or exterior damage;

I. Discoloration or rusty water caused by piping, fittings, valves, pumps or other sources outside of the SuperTherm Water Heater;

J. INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, SUCH AS LOSS OF THE USE OF PRODUCTS, FACILITIES OR PRODUCTION, INCONVENIENCE, LOSS OF TIME OR LABOR EXPENSE INVOLVED IN REPAIRING OR REPLACING THE ALLEGED DEFECTIVE PRODUCT;

K. Damage to surrounding area or property caused by leakage or malfunction;

L. Costs associated with the replacement and/or repair of the unit including: any freight, shipping or delivery charges, any removal, installation or reinstallation charges, any material and/or permits required for installation, reinstallation or repair, charges to return the SuperTherm Water Heater or components;

M. Any claim due to any injury or death to any person or damage to any property resulting in whole or in part from any modification or alteration Buyer makes to any product sold hereunder; and

N. Design defects where Seller has complied with Buyer's design specifications.

No salesman or other representative of the seller has any authority to expand warranties beyond the face of the said warranty and purchaser shall not rely on any oral statement except as stated in the said warranty. An Officer of the Seller must do any modifications to this warranty in writing.

WARRANTY CLAIMS:
Warranty claims should be presented through prompt telephone notification to DHT at toll-free 1-800-221-1522 or email to warranty@dhtnet.com. In order to process a warranty claim a formal purchase order number is required prior to shipment of any warranty item. In addition, the returned item must include a Returned Goods Authorization (RGA) label, attached to the shipping carton, which identifies the item's return address, register number and factory authorized RGA number.

This warranty applies only to units sold to customers in North America. All other geographical areas carry a standard warranty of 18 months from date of shipment or 12 months from startup, whichever comes first.

-END-

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Change Log:

Date	Description	Changed By
03/16/2018	Initial release	CH/SS/DP
05/14/2018	Rev 2 Changes: • Revised SuperTherm single wall dimensional drawing. • Added SuperTherm double wall dimensional drawing. • Changed images and drawings per heat exchanger design changes. • Revised electrical wiring drawings. • Small size control panel. • Changed torque spec • Updated latest installation and piping drawings • Changed part numbers	SS
09/05/2018	Rev 3 Changes: • Changed water quality Section 2.9 pH limits. • Updated piping and installation drawings Section 6. • Updated heat exchanger construction and controls Section 1.7. • Updated SuperTherm unit model numbers. • Updated part numbers in Section 4.19. • Revised Dimensional Drawings	SS