

Project Name: Press Hotel, Portland, Maine

Architect: Archetype Architects
48 Union Wharf
Portland, Maine 04101

Contractor: Wright Ryan Construction, Inc.
10 Danforth Street
Portland, Maine 04101

Subcontractor: Warren Mechanical, Inc.
P.O. Box 149
Westbrook, Maine 04098-0149

Supplier: Power & Process, Inc.
P.O. Box 7056
Prospect, Ct. 06712

Manufacturer: Patterson-Kelley Mach

Section: 15000 VE Water Heating System

Contractor Review

Architect's Review

MACH[®] Boiler

SUBMITTAL DATA:

DATE: 2/27/2014
PROJECT: Press Hotel
LOCATION: 119 Exchange Street, Portland, ME
ENGINEER: Crabtree Engineering – Memphis, TN
DESCRIPTION: (3) MACH C-1050, (1) MACH CM-300W
CONTRACTOR: Warren Mechanical, Inc.
REF. #: PO# PH5460-07

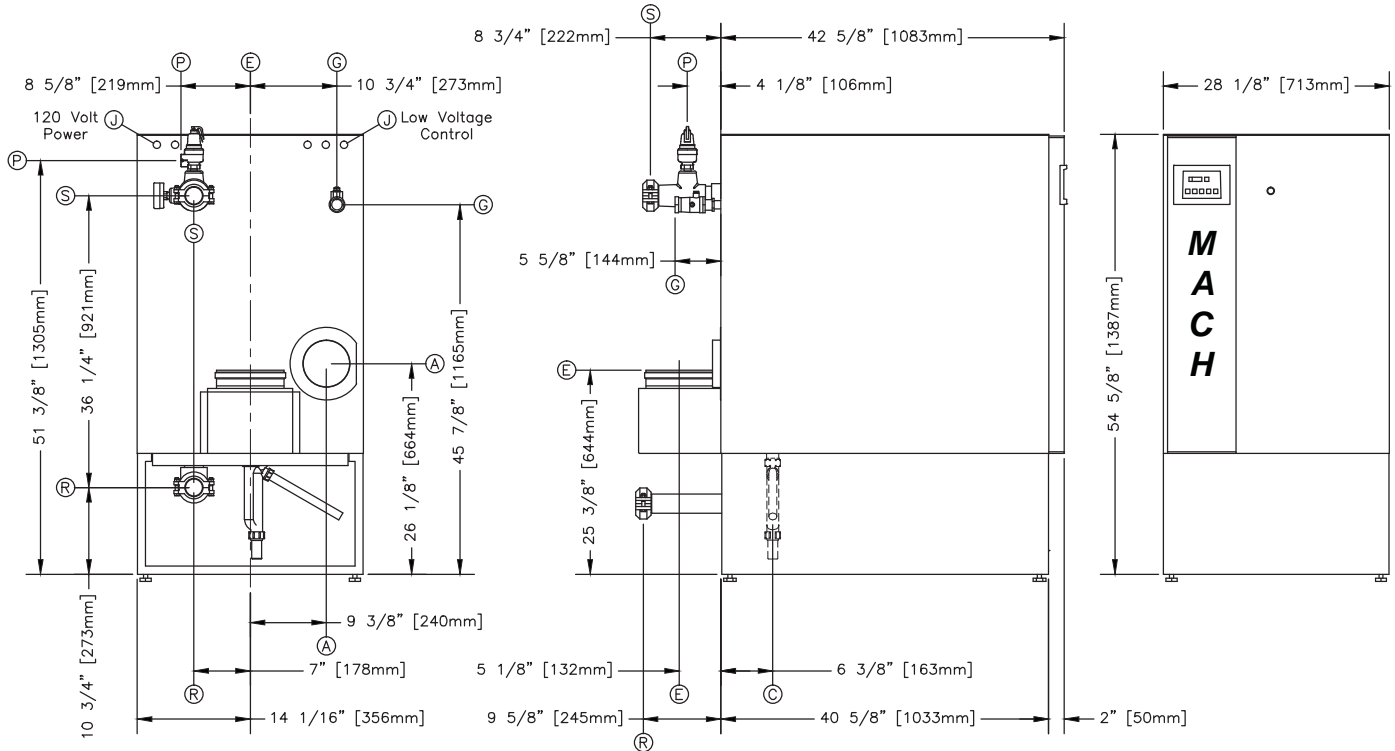
- Original Submittal
 Re-Submittal
 For Record Only

ADDITIONAL NOTES:

SUBMITTED BY: Power & Process, Inc.
33 Great Hill Road
Naugatuck, CT 06770
Chuck Tufo

MACH® Model C-1050

ENVI® Control



Service Clearances:
 24" [610mm] Above
 36" [914mm] Front

The MACH® Boiler requires category II venting (condensing-negative pressure) or category IV venting (condensing-positive pressure) as defined in ANSI Z223.1/NFPA 54/CSA-B.149 Latest Edition. Harsco Industrial, Patterson-Kelley reserves the right to make changes at any time without notification.

BOILER CONNECTIONS:	
(A) Combustion Air Inlet	6" dia stub
(C) Condensate Drain	3/4"
(E) Exhaust Vent	200mm ID (8"nom ID)
(G) Main Gas Connection	1" NPT-F
(J) Wiring Junction Boxes	as marked
(P) Pressure Relief Valve	see list for selection
(R) Boiler Water Return, Victaulic® clamp	2" pipe, grooved
(S) Boiler Water Supply, Victaulic® clamp	2" pipe, grooved

Victaulic is a registered trademark of Victaulic Company, Easton, PA, USA

BOILER CONTROLS: ASME CSD-1 is standard.	
Complies with GE GAP (IRI) guidelines GAP.4.1.0 and GAP.4.1.3.	
Complies with FM Global 6-4/12-69 Section 1.0	
Main Gas Train: see gas train submittal	
Integrated Boiler Control, ENVI® Series	
Operating Thermostat, 70°-195°F (21°-91°C)	
High Limit Thermostat, Manual Reset, 100-200°F (38°-93°C)	
High Exhaust Pressure Switch	
LWCO, Probe Type, Manual Reset	
Air Switch, Differential Pressure Type	
Combustion Blower, Variable Speed, 300 watt (0.4 hp)	

PROJECT: Press Hotel
 LOCATION: 19 Exchange Street, Portland, ME
 CUSTOMER: Warren Mechanical, Inc. - Westbrook, ME
 PO# PH5460-07
 ENGINEER: Crabtree Engineering - Memphis, TN

C.S.A. CERTIFIED RATINGS AND CAPACITIES	
Fuel	<input checked="" type="checkbox"/> Natural Gas(NG) <input type="checkbox"/> Propane(LP)
Input, BTU/hr	1,050,000
Output, BTU/hr	987,000
Boiler HP:	29.5
Maximum Inlet Gas Pressure:	14" w.c.
Minimum Inlet Gas Pressure:	3.5" w.c.

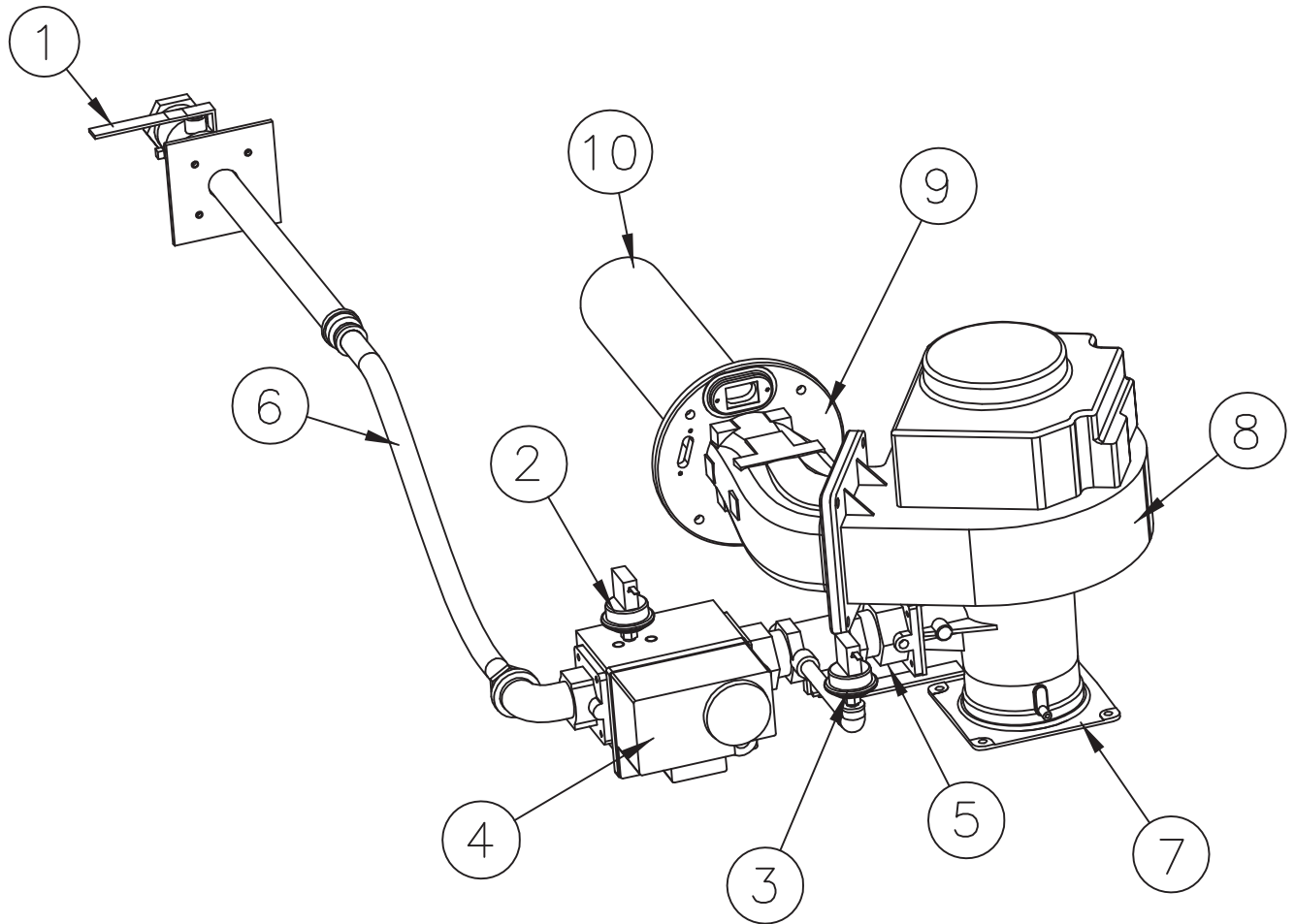
Electrical Requirements	120v, 1ph, 60hz
Total Operating Amps	less than 5 amps
Operating Weight	780 lbs.
Water Content	7.3 gallons

A.S.M.E. Section IV Design Data	
Maximum Pressure	80 psig
Maximum Allowable Temperature	200°F
Maximum Operating Temperature	194°F
Heated Wet Surface Area:	25.69 sq.ft.
Flow rate @ 20°F ΔT	100 GPM
Flow rate @ 40°F ΔT	50 GPM

Pressure Relief Valve	Press/Temp Gauge
<input checked="" type="checkbox"/> 80 PSIG 3/4" x 1" (standard)	0-240psi/30-240°F
<input type="checkbox"/> 30 PSIG 1"	0-100psi/30-240°F
<input type="checkbox"/> 50 PSIG 3/4" x 1"	0-100psi/30-240°F
<input type="checkbox"/> 60 PSIG 3/4"	0-100psi/30-240°F
<input type="checkbox"/> 75 PSIG 3/4" x 1"	0-240psi/30-240°F

HARSCO
INDUSTRIAL
Patterson-Kelley

P-K MACH[®] Model C-750 / C900 / C1050 Gas Train



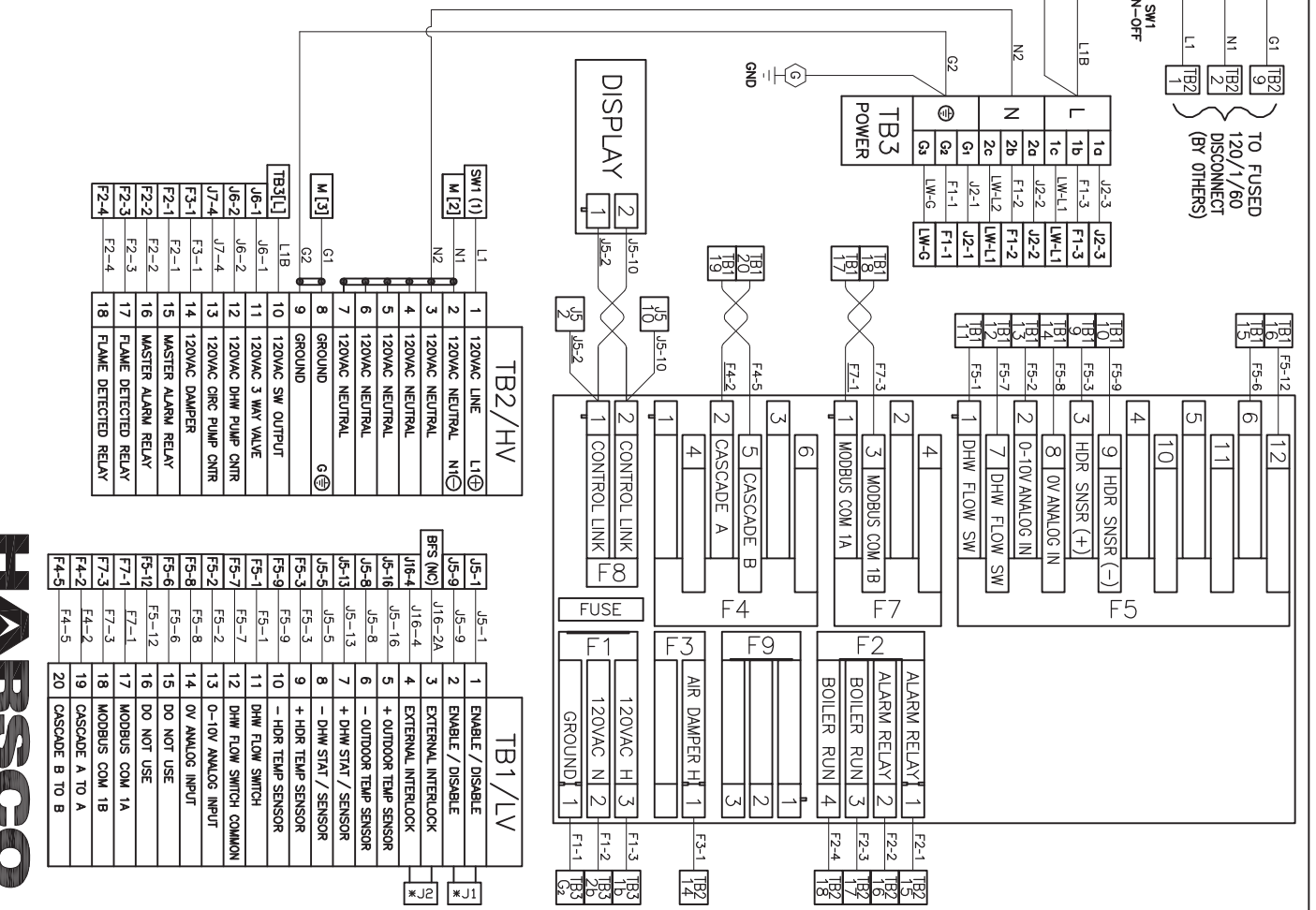
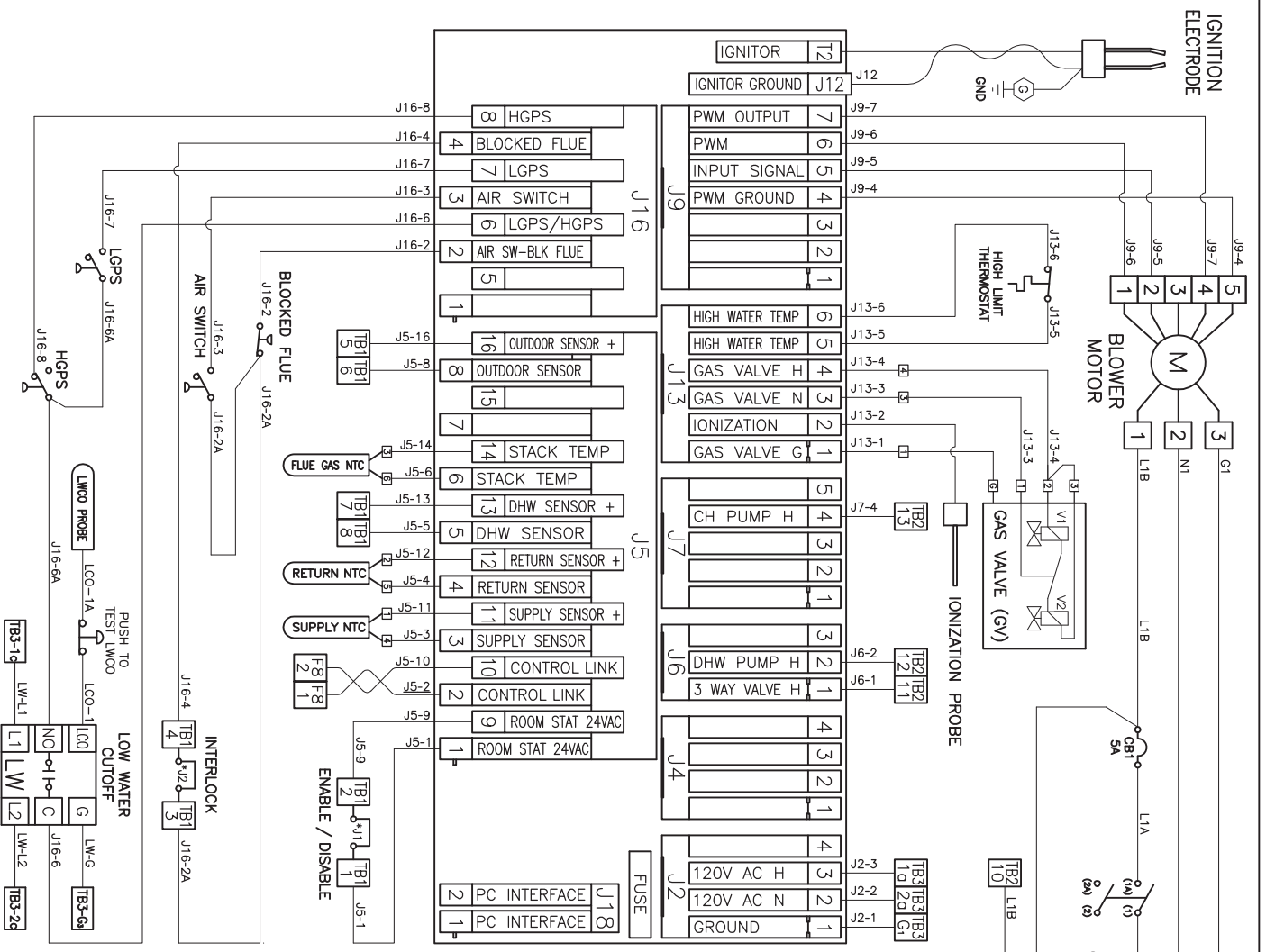
GAS TRAIN COMPONENTS	
1.	Main Gas Shut-Off Cock
2.	Low Gas Pressure Switch
3.	High Gas Pressure Switch
4.	Gas Safety Shut-Off / Control Valve
5.	Gas Manifold Shut-Off Valve
6.	Flex Hose With Gas Valve Adaptor
7.	Venturi
8.	Premix Combustion Blower
9.	Burner Hood
10.	Burner

PROJECT: Press Hotel
 LOCATION: 19 Exchange Street, Portland, ME
 CUSTOMER: Warren Mechanical, Inc. - Westbrook, ME
 PO# PH5460-07
 ENGINEER: Crabtree Engineering - Memphis, TN



Patterson-Kelley

Harsco
 East Stroudsburg, PA 18301
 570-476-7261
 www.pkboilers.com



IF ANY OF THE ORIGINAL WIRE SUPPLIED WITH THIS BOILER MUST BE REPLACED, IT MUST BE REPLACED WITH THE SAME UL WIRE TYPE.

MACH® C-750/C-900/C-1050
ENVI® Control

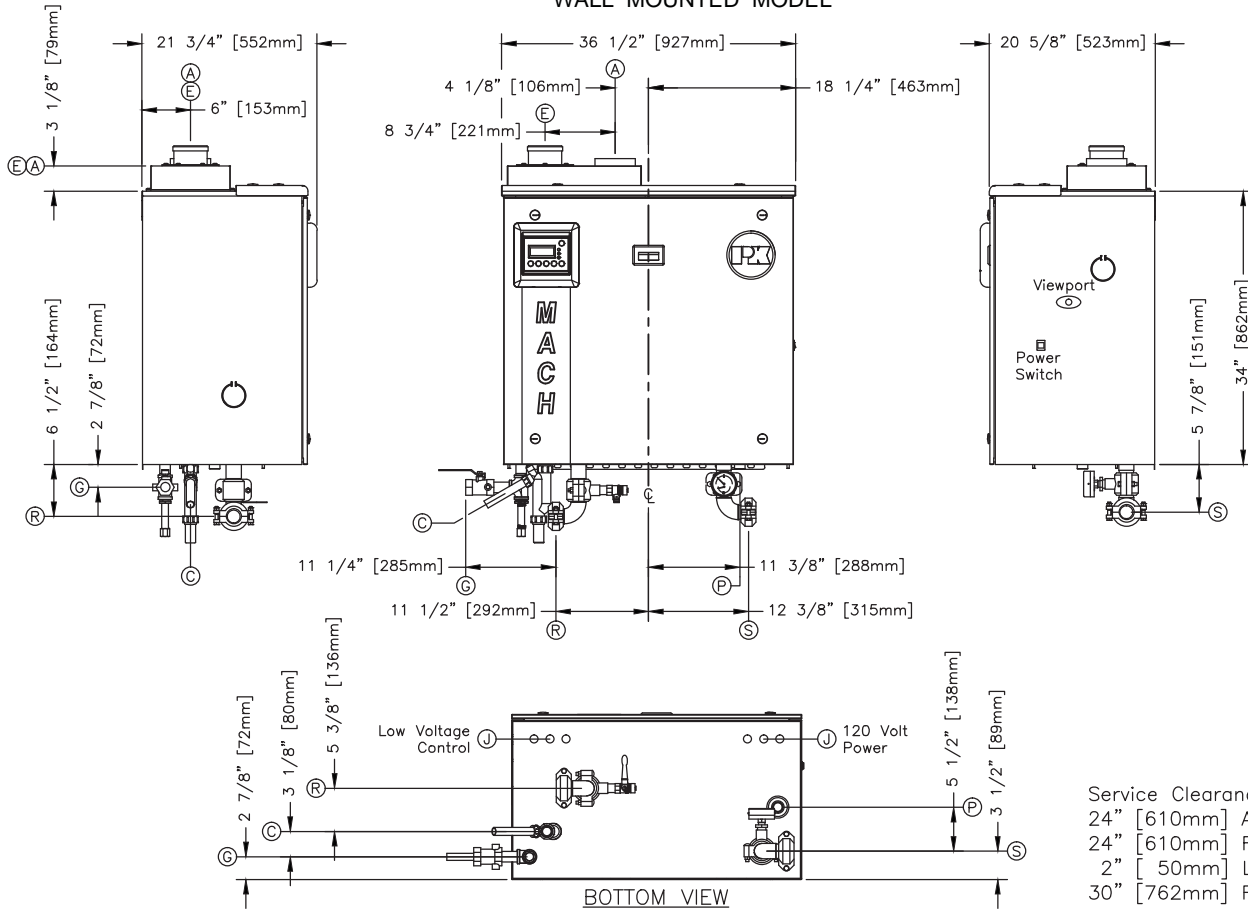
2620000300
REV. 0.7

HARSCO
INDUSTRIAL

Patterson-Kelley
East Stroudsburg, PA 18301
570-476-7261
www.harscochk.com

MACH® Model CM-300

WALL MOUNTED MODEL



Service Clearances:
 24" [610mm] Above
 24" [610mm] Right Side
 2" [50mm] Left Side
 30" [762mm] Front

The MACH® Boiler requires category IV venting (condensing-positive pressure) as defined in ANSI Z223.1/NFPA 54/CSA-B.149 Latest Edition. Harsco Industrial, Patterson-Kelley reserves the right to make changes at any time without notification.

BOILER CONNECTIONS:	
(A) Combustion Air Inlet	5" dia stub
(C) Condensate Drain	3/4"
(E) Exhaust Vent	4"
(G) Main Gas Connection	1" NPT-F
(J) Wiring Junction Boxes	as marked
(P) Pressure Relief Valve	see list for selection
(R) Boiler Water Return, Victaulic clamp	1 1/2" pipe, grooved
(S) Boiler Water Supply, Victaulic clamp	1 1/2" pipe, grooved

Victaulic is a registered trademark of Victaulic Company, Easton, PA, USA

BOILER CONTROLS: ASME CSD-1 is standard. Complies with GE GAP (IRI) guidelines GAP.4.1.0 and GAP.4.1.3. Complies with FM Global 6-4/12-69 Section 1.0	
Main Gas Train: see gas train submittal	
Integrated Boiler Control, ENVI® Series	
Operating Thermostat, 70°-195°F (21°-91°C)	
High Limit Thermostat, Manual Reset, 100-200°F (38°-93°C)	
High Exhaust Pressure Switch	
LWCO, Probe Type, Manual Reset	
Air Switch, Differential Pressure Type	
Combustion Blower, Variable Speed, 300 watt (0.4 hp)	

PROJECT: Press Hotel
 LOCATION: 19 Exchange Street, Portland, ME
 CUSTOMER: Warren Mechanical, Inc. - Westbrook, ME
 PO# PH5460-07
 ENGINEER: Crabtree Engineering - Memphis, TN

C.S.A. CERTIFIED RATINGS AND CAPACITIES		
Fuel	<input checked="" type="checkbox"/> Natural Gas(NG)	<input type="checkbox"/> Propane(LP)
Input, BTU/hr	300,000	
Output, BTU/hr	280,500	
Boiler HP:	8.3	
Maximum Inlet Gas Pressure:	14" w.c.	
Minimum Inlet Gas Pressure:	3.5" w.c.	

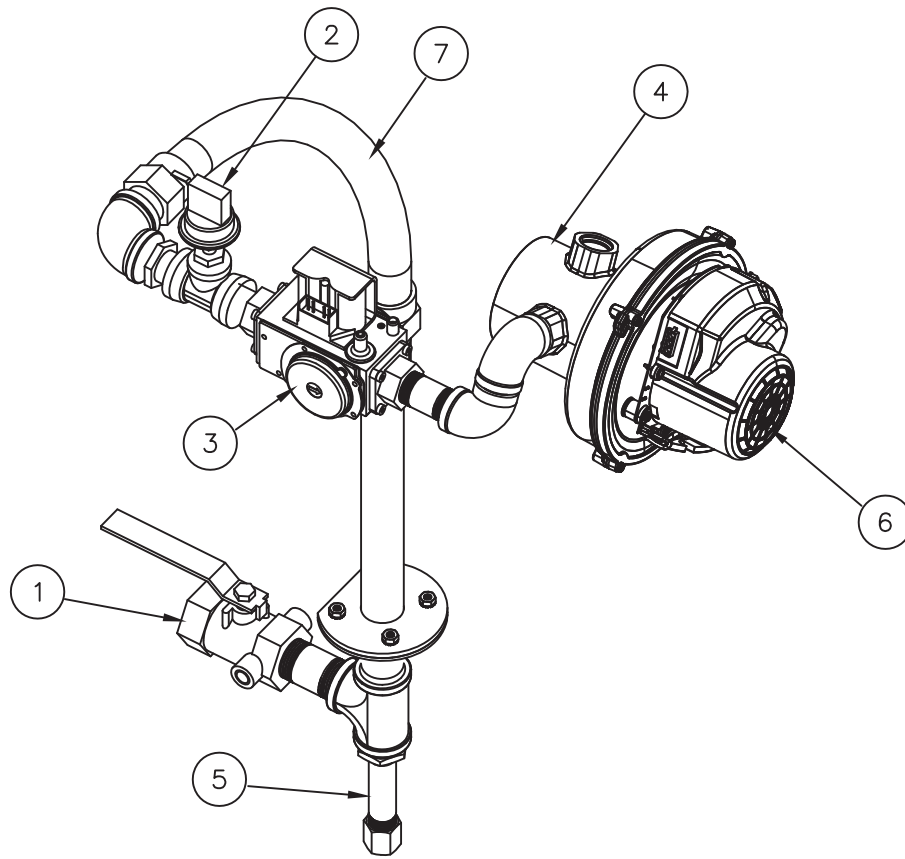
Electrical Requirements	120v, 1ph, 60hz
Total Operating Amps	less than 8 amps
Operating Weight	290 lbs.
Water Content	1.21 gallons

A.S.M.E. Section IV Design Data	
Maximum Pressure	80 psig
Maximum Temperature	250°F
Heated Wet Surface Area:	12.29 sq.ft.
Flow rate @ 20°F ΔT	28 GPM
Flow rate @ 40°F ΔT	14 GPM

Pressure Relief Valve/Press-Temp Gauge		
Standard:	80 PSIG 3/4" x 1"	0-240psi/30-240°F
Optional relief valves: (available for field installation)		
<input type="checkbox"/>	30 PSIG 3/4" x 1"	0-100psi/30-240°F
<input type="checkbox"/>	50 PSIG 3/4" x 1"	0-100psi/30-240°F
<input type="checkbox"/>	60 PSIG 3/4" x 1"	0-100psi/30-240°F
<input type="checkbox"/>	75 PSIG 3/4" x 1"	0-240psi/30-240°F

HARSCO
INDUSTRIAL
Patterson-Kelley

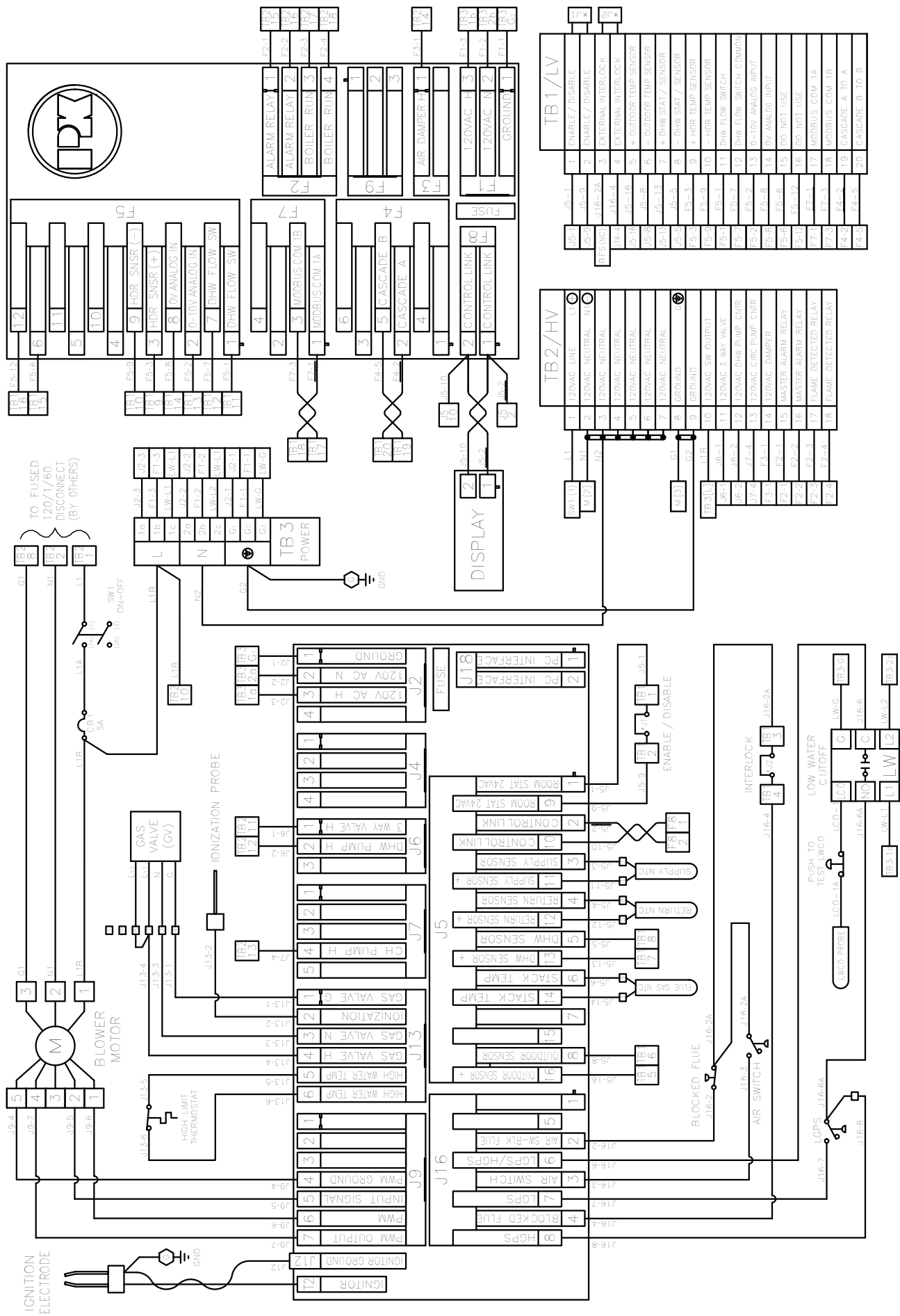
MACH[®] Model CM-300 Gas Train



GAS TRAIN COMPONENTS	
1	Main Gas Shut-Off Cock
2	Low Gas Pressure Switch
3	Gas Shut-Off / Control Valve
4	Air / Gas Manifold
5	Drip Leg
6	Blower
7	Flex Hose with Gas valve Adaptors

PROJECT: Press Hotel
LOCATION: 19 Exchange Street, Portland, ME
CUSTOMER: Warren Mechanical, Inc. - Westbrook, ME
PO# PH5460-07
ENGINEER: Crabtree Engineering - Memphis, TN

HARSCO
INDUSTRIAL
Patterson-Kelley





- Cascade sequencing
- Text-based display
- Outdoor air reset
- Pump exercising
- BMS integration
- MODBUS® protocol
- Domestic hot water prioritization
- Hybrid system integration

Harsco's ENVI® control is an on-board control system that does it all - temperature control, flame safeguard, firing rate control, blocked flue protection, outdoor air reset, freeze protection, cascade sequencing and more.

The user friendly text-based display is easy to program. Step through various menus at the touch of a button. Menu descriptions, boiler status and errors are displayed in plain English.

With its built-in cascade function, the ENVI® control allows you to sequence up to 24 boilers. Run times are equally distributed across each unit in the system with boiler start rotation.

Use MODBUS® RS-485 protocol or 10 VDC analog to communicate with building management systems. A protocol converter for BACnet, LonWorks®, and Metasys® N2 are optionally available.

Standard on Harsco's MACH® and MODU-FIRE® Forced Draft boilers, the ENVI® control makes it easy to create high efficiency hybrid systems at a fraction of the cost.



Optional protocol converter for BACnet, LonWorks®, Metasys® N2



User friendly interface

ENVI® Control

- Text-based display
- Cascade sequence up to 24 boilers
- MODBUS® RS-485 protocol
- Optional protocol converter for BACnet, LonWorks® and Metasys® N2
- Standard control system for MACH® and MODU-FIRE® Forced Draft boilers

MODBUS® is a registered trademark of Schneider Automation Inc.

LonWorks® is a registered trademark of Echelon Corporation.

Metasys® is a registered trademark of Johnson Controls, Inc.

PROJECT: Press Hotel
 LOCATION: 19 Exchange Street, Portland, ME
 CUSTOMER: Warren Mechanical, Inc. - Westbrook, ME
 PO# PH5460-07
 ENGINEER: Crabtree Engineering - Memphis, TN



ENVI[®] Control

Smart Control, Simplified Design

Designed to maximize efficiency, the ENVI[®] control monitors and modulates the combustion and ignition of the boiler to maintain the desired outlet temperature. This flexible control can run a single boiler or a master/member network of up to 24 boilers. The lead/lag setup and boiler start rotation ensures run times are equally distributed across each unit in the system, extending the life of the boilers.

The ENVI[®] control is an on-board control system, eliminating the need for external control panels and reducing ancillary component costs. It is the standard control system for Harsco MACH[®] and MODU-FIRE Forced Draft boilers. This allows control of both condensing and non-condensing boilers in a hybrid system for maximum efficiency at minimum cost.

Comfort Heat

Choose from several comfort heat modes to maintain the setpoint at the outlet of a single boiler or to maintain a header setpoint for a network of boilers.

Outdoor Air Reset

Automatically adjust the setpoint based on a user defined outdoor air reset curve.

Night Setback

Automatically lower the setpoint when the building is unoccupied, such as at night or weekends and holidays.

Domestic Hot Water

Use the same boiler or sequence of boilers to deliver domestic hot water as a priority, including systems with storage or a plate and frame heat exchanger system.

MODBUS[®] is a registered trademark of Schneider Automation Inc.

LonWorks[®] is a registered trademark of Echelon Corporation

Metasys[®] is a registered trademark of Johnson Controls, Inc.

BMS Interface

Communicate with Building Management Systems using MODBUS[®] RS-485 protocol or 0-10 VDC analog input. BACnet, LonWorks[®] and Metasys[®] N2 systems can also be supported with an optional protocol converter.

Alarm Status

Individually annunciated limit switches make troubleshooting quicker and easier. Alarm descriptions are in plain English and include information about the status of the boiler when the alarm occurred.



The descriptions and technical data in this brochure are subject to change without notice. Contact your local Harsco Industrial Patterson-Kelley representative for the most up-to-date information and product application support.

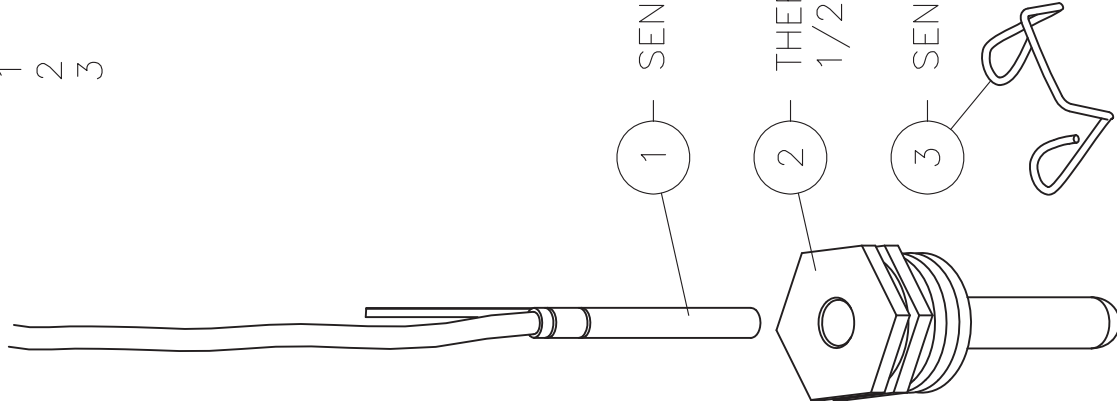
Harsco Industrial
Patterson-Kelley
www.harscopk.com

100 Burson Street
East Stroudsburg, PA
18301

Phone 570.476.7261
Toll Free 877.728.5351
Fax 570.476.7247

ITEM NO	QUANTITY / UM	PART NUMBER	DESCRIPTION
---------	---------------	-------------	-------------

1	1.00 EA	2630000247	SNSR,NTC,D6x45MM,12K3%,#TSK10B7
2	1.00 EA	2630000248	THERMOWELL,1/2"NPT,8TW4550
3	1.00 EA	2630000250	CLIP,THERMOWELL,8TZ4550



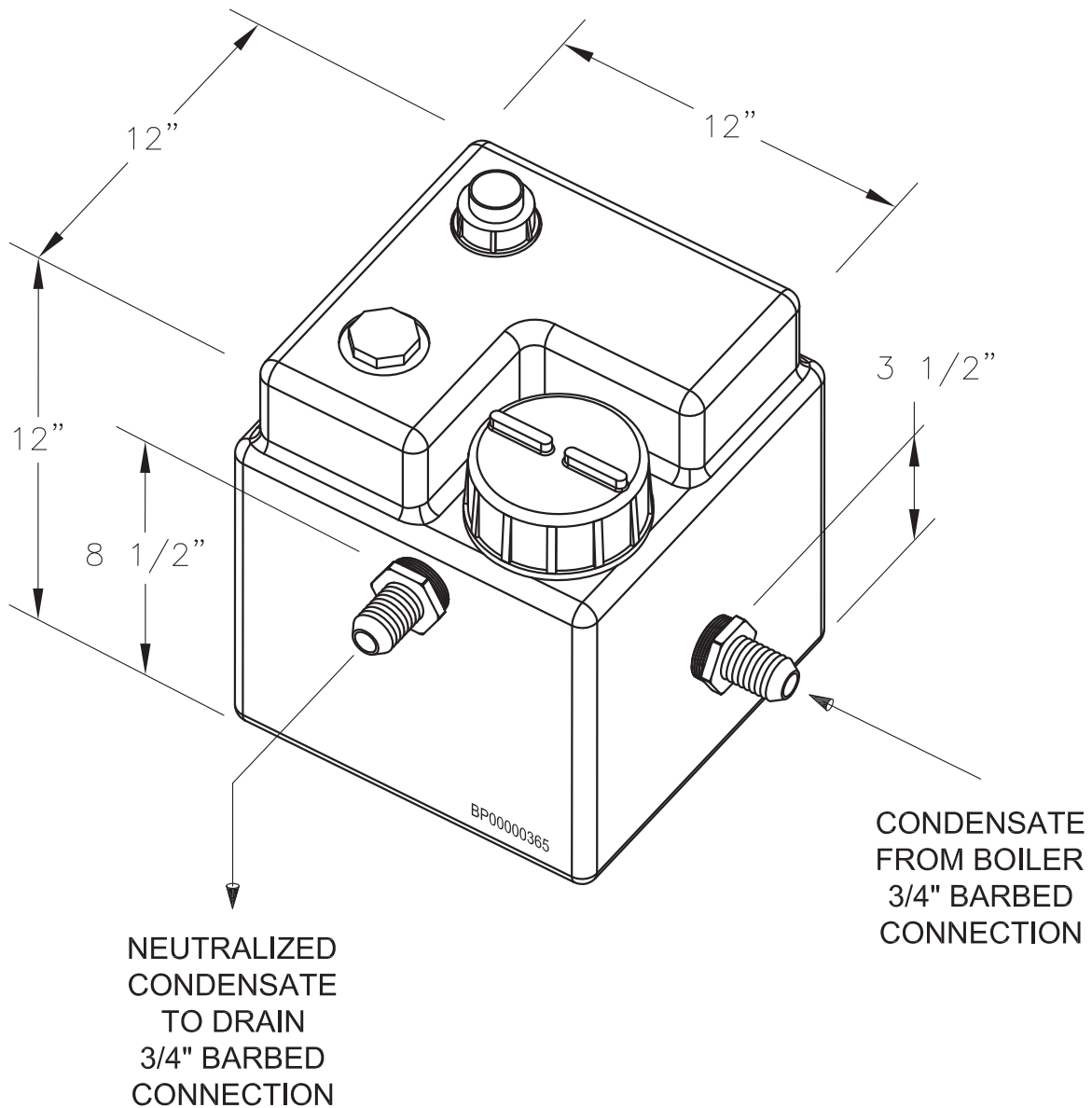
1 — SENSOR HAS 10'-0" OF CABLE ATTACHED

2 — THERMOWELL IS BRASS AND COPPER CONSTRUCTION, 7/8" HEX, 1/2" MNPT THREAD, WELL IS 5/16" DIAMETER x 1 1/2" PROJECTION.

3 — SENSOR RETAINING CLIP

TITLE		KIT,HDR_SENSOR,ENVI	
<p>HARSCO INDUSTRIAL Patterson-Kelley East Stroudsburg, PA 18301 877-728-5351 www.harscopk.com</p>		<p>THIS DRAWING, INFORMATION AND THE SUBJECT MATTER THEREOF, ARE THE SOLE AND EXCLUSIVE PROPERTY OF HARSCO INDUSTRIAL, PATTERSON-KELLEY, EAST STROUDSBURG, PA, 18301 USA IT MAY BE REPRODUCED BY THE PURCHASER OF THIS EQUIPMENT FOR THEIR INTERNAL USE ONLY. IT CANNOT BE DISTRIBUTED TO ANY OTHER FIRM OR PARTY WITHOUT WRITTEN CONSENT FROM OUR COMPANY.</p>	
BY	DATE	REFERENCE NUMBER	REV
JS	11-20-09		
DRAWN	FILE SIZE	DRAWING NUMBER	
CHECKED		BP00000279	
APPROVED			
BY	CHECK	DATE	
REV	DESCRIPTION		

CONDENSATE NEUTRALIZATION TANK



NEUTRALIZATION MATERIAL IS INCLUDED
INSIDE THE POLYETHYLENE ENCLOSURE

CLAMPS ARE ALSO INCLUDED TO ATTACH
HOSE TO INLET AND DRAIN CONNECTIONS

PROJECT: Press Hotel
LOCATION: 19 Exchange Street, Portland, ME
CUSTOMER: Warren Mechanical, Inc. - Westbrook, ME
PO# PH5460-07
ENGINEER: Crabtree Engineering - Memphis, TN

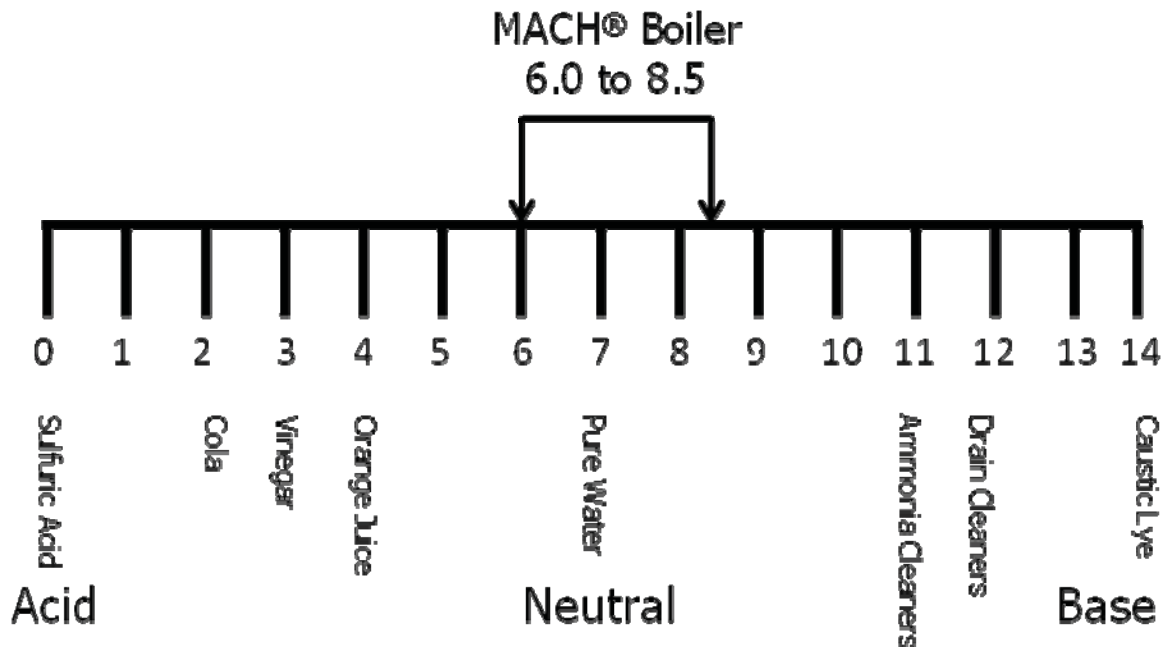
HARSCO
INDUSTRIAL
Patterson-Kelley

MACH[®] BOILER – pH Levels

The MACH[®] boiler utilizes an aluminum heat exchanger that requires a very specific pH range for the hydronic fluid (water – water/glycol). The pH is a measure of the acid content of the water. The MACH[®] boiler requires that the pH be between 6.0 and 8.5.

The pH Scale ranges from 0 (acid) to 7 (neutral) to 14 (base). The pH scale is logarithmic, meaning that the difference between each pH unit is a factor of **10**.

Example: **a pH of 9.5 is 10 times more alkaline than a pH of 8.5**
a pH of 4 is 10 times more acidic than a pH of 5



A sample of boiler water or boiler water/glycol should be tested. The sample should read between 6.0 and 8.5 to be correct for a MACH[®] boiler. Samples that read above or below the specification are outside of the allowable operating range and may cause damage to the boiler. It has been found that water with the pH greater than 8.5 can have negative effects on the aluminum and may cause premature boiler failure.

The use of pH paper (or litmus paper) to test the hydronic fluid (water) is highly suspect. This paper degrades with age and is only accurate to +/- 2 pH units. It is not considered acceptable as a test

Bulletin: M-101

Date: 7/20/10

Supersedes: M-101 4/1/05

TECHNICAL DATA

HARSCO
INDUSTRIAL
Patterson-Kelley

method by Harsco Industrial Patterson-Kelley. The best and easiest way to measure pH is to use a pH meter.

The pH of the hydronic fluid (water) should be measured using a pH meter. Harsco Industrial Patterson-Kelley recommends the use of a calibrated pH meter as the best method for measurement. A pH meter is an inexpensive investment that will give readings to +/- 0.1 pH. Acceptable pH meters are available from a variety of companies including Omega at 1-888-826-6342 (PHH-3X-KIT for \$60) or Fisher Scientific at 1-800-766-7000 (PH-testr1-kit for \$85), or www.professionalequipment.com (ExStik PH100 for \$90).

All pH meters need to be calibrated for accurate use. Standard pH solutions or powders are inexpensive (less than \$10) for pH 4, 7, and 10 or included with a kit. It is recommended that the pH meter be calibrated by placing in a solution of pH = 7, and then a solution of pH = 10. Please read the instructions because every meter has a slightly different calibration process, or knobs to adjust.

PROJECT: Press Hotel
LOCATION: 19 Exchange Street, Portland, ME
CUSTOMER: Warren Mechanical, Inc. - Westbrook, ME
PO# PH5460-07
ENGINEER: Crabtree Engineering - Memphis, TN

SUPPLEMENT B - MACH® WATER CHEMISTRY

The MACH® boiler uses an aluminum alloy that will withstand the acidic condensate (pH ~ 3.0 to 5.0) formed when firing natural or LP gas under conditions which cause the flue gas to condense on the fire side of the heat exchanger. However, the alloy is not resistant to highly alkaline (pH >9.0) environments, so care must be exercised to assure that the water inside the heat exchanger remains in the neutral range (pH ~ 6.0 – 8.5). Other metals, such as steel, cast iron or copper that are commonly found in hydronic heating systems are reactive in neutral to acidic environments so water chemistry must include buffers and protectants that prevent corrosion of these metals. In response to these needs, many chemical treatment manufacturers have devised *multi-metal* treatments that protect aluminum, steel, iron and copper based metals.

The manufacturer of the chemical treatment system must certify that the treatment is intended for use in hydronic systems that include cast aluminum boilers. Additionally, the manufacturer should guarantee that the treatment system, when used in accordance with the manufacturer's instructions, will not damage the boiler, piping, pumps, and terminal units and associated components of the hydronic system.

The water quality requirements for the MACH® Boiler are as follows:

- The pH must be between 6.0 and 8.5.
- The total hardness must be less than 200 ppm
- The chloride must be less than 150 ppm
- Total solids must be less than 1000 ppm
- Other contaminants should be less than 1 ppm
- Conductivity must be less than 3000 μ S

The hydronic heating system must be a closed loop system. Free oxygen, in particular, can cause the formation iron oxides (rust). Electrolytic action in the presence of oxygen causes the formation of magnetite in un-inhibited water. When sludge (formed when calcium compounds, primarily CaCO₃, are heated) is mixed with magnetite and rust, a very hard scale will form. This scale significantly reduces system efficiencies and shortens the life expectancy of the heating system. Thus, it is important to maintain a tight system to limit the introduction of fresh water make up, which contains dissolved oxygen, minerals and other potential contaminants. A general rule of thumb for any closed hydronic heating system is to limit makeup water to no more than 5% of the total volume per year.

Flushing, Cleaning and Treating the System

Before cleaning the system, the boiler must be isolated from the piping system to prevent introduction of sludge and other contaminants into the boiler. Under no circumstances should the hydronic system be flushed while the boiler is attached to the system. Debris or corrosion products may accumulate in the boiler and plug the heat exchanger. The boiler must be disconnected from the system and a bypass installed so that the chemical cleaning solution does not circulate through the boiler.

1. Thoroughly flush the system to remove as many contaminants as possible.
2. Fill the system with water, add the cleaning chemicals and circulate as per the chemical supplier's instructions.
3. Drain and flush the system thoroughly until the water becomes tap water clear.
4. Add the Multi-Metal protector/scale inhibitor to the system following the chemical supplier's instructions.
5. To be sure that the boiler is not air-bound, open the pressure-relief valve located at the rear of the boiler. Leave the relief valve open until a steady flow of water is observed. Close the valve and finish filling the system.

For systems requiring freeze protection, only virgin glycol should be used. The virgin glycol must be treated with an inhibitor compatible with the chemical treatment system chosen. Note that glycol has a limited useful life and must be changed periodically.

Before commissioning, a sample of the system water and the make-up water should be analyzed to assure the proper mixture of water, chemical treatment and (if applicable) glycol. This analysis can be made by your local water treatment firm, or by one of the manufacturers listed below. The water chemistry should be adjusted as recommended in the analysis results. Thereafter, the system water should be analyzed at the start of the heating season for boilers operated for comfort heat only or twice annually for boilers that are operated year round.

There are many suppliers of chemical treatments that are acceptable for use in multi-metal hydronic systems. The Association of Water Technologies maintains a listing of manufacturers and water treatment firms and professionals for reference. This listing can be found on the internet at www.awt.org, click on the "Find a Water Treater" button.

The following companies have certified their water treatment systems as safe for use with multi-metal hydronic systems that include aluminum boilers. These manufacturers provide treatments to chemical service companies, through either direct sales or wholesalers. Further information is available by contacting one of the individuals listed below:

Fernox

Hydronic Agencies Ltd.
Sean Leonard
Edmonton, AB, CANADA
Phone: (780) 452-8661
Toll Free: (877) FERNOX4U
(877-337-6694)
Fax: (780) 488-2304
Email: sales@hydronicagencies.com
www.hydronicagencies.com

Fernox USA

Cookson Electronics
Brian Conrad
Altoona PA
Phone: (814) 946-1611
Toll Free (800) 289-3797
Fax: (814) 944-8094
Email:
fernox_americas@cooksonelectronics.com
www.fernox.com

H-O-H Water Technology, Inc.

Steve Sadowski
Greendale, WI
Phone: (414) 421-2070,
Toll Free: (800) 944-9746
Fax: (414) 421-2077
Email:
ssadowski@hohwatertechnology.com
www.hohwatertechnology.com

Rhomar Water Management, Inc.

Dwight Hedgepeth
Springfield, MO
Phone: (417) 862-2600,
Toll Free: (800) 543-5975
Fax: (417) 862-6410
Email: peggy@rhomarwater.com
www.rhomarwater.com

Sentinel Performance Solutions Ltd.

Marathon Distributors
Rich Ronchka
Mississauga ON Canada
Toll Free: (888) 602-5360
www.sentinel-solutions.net/en/

Sentinel Performance Solutions Ltd.

Douglas Products and Packaging
Liberty, MO
Toll Free: (877) 567-2560
Email:
customerservice@douglasproducts.com
www.douglasproducts.com

PROJECT: Press Hotel LOCATION: 19 Exchange Street, Portland, ME CUSTOMER: Warren Mechanical, Inc. - Westbrook, ME PO# PH5460-07 ENGINEER: Crabtree Engineering - Memphis, TN

Multi-Metal Systems Water Quality Standards

HARSCO Industrial, Patterson-Kelley boilers are designed to be incorporated into any multi-metal hydronic heating system. All multi-metal hydronic systems require that attention be paid to water treatment. The chemical additives for any multi-metal system must be specifically formulated for use with all the various metals used in that system.

Any closed, hydronic heating systems should include a meter, to monitor water addition to the recirculating loop, and a filter, pursuant to ASHRAE Standard 189.1 and the AWT Handbook. Water added to a closed hydronic system should not exceed more than 10% of the system volume per year and meter readings should be recorded, at least monthly, to ensure system losses are minimized and corrective actions shall be taken when needed.

Treatment programs for multi-metal systems should meet or exceed the following generally accepted best practices water quality guidelines:

1. Proper cleaning and surface preparation must be completed prior to system start-up.
2. pH must be maintained in a range that is appropriate for the metals contained in the system (see chart below).
3. Total Alkalinity between 100-500 ppm as CaCO₃.
4. Filtration as per industry best practices.
5. Total suspended solids below 10 ppm.
6. Corrosion inhibiting compounds to protect metals at or below:
 - a. Aluminum <0.25 MPY
 - b. Copper <0.1 MPY, soluble copper <0.25 ppm
 - c. Steel <3.0 MPY

According to ASTM D 2688
7. Addition of strong acids is not recommended.

Prior to initiating any treatment program, a water sample of the proposed fill water should be sampled for analysis. Once filled and bled of air, a pH neutral, industrial cleaner for use in multi-metal systems should be used to clean the entire hydronic system. Samples of the system water with cleaner should be taken and analyzed to ensure proper cleaner strength. Once cleaned, the system should be flushed with fresh (fill) water until the system water is within 100 micro Siemens in conductivity of the fresh water. When flushing is complete, a treatment program that is designed for use in that multi-metal system, after consideration of the metals it contains, must be used. Treatment programs should also comply with the standard water quality guidelines listed above.

Multi-Metal Systems with Aluminum	Multi-Metal Systems with Stainless Steel	Multi-Metal Systems with Copper
Proper surface cleaning required	Proper surface cleaning required	Proper surface cleaning required.
pH maintained between 6.0-8.5*	pH maintained between 6.6-8.5**	pH range may vary ***
Total Alkalinity 100-500 ppm as CaCO ₃	Total Alkalinity 100-500 ppm as CaCO ₃	Total Alkalinity 100-500 ppm as CaCO ₃
Best Practices Filtration	Best Practices Filtration	Best Practices Filtration
Suspended solids below 10 ppm	Suspended solids below 10 ppm	Suspended solids below 10 ppm
Corrosion rates below: 0.1 MPY copper 3.0 MPY steel 0.25 MPY aluminum	Corrosion rates below: 0.1 MPY copper 3.0 MPY steel 0.1 MPY sst ^	Corrosion rates below: 0.1 MPY copper 3.0 MPY steel Max. MPY other metals
Addition of strong acid not recommended	Addition of strong acids not recommended	Addition of strong acids not recommended
<i>When freeze protection is required, automotive grade glycols are not recommended and decomposition products should be monitored and maintained below concentrations that present corrosive conditions. For existing boiler water systems, additional requirements and operational conditions may be required to mitigate pre-existing conditions.</i>		
<p>* Other system components may have more restrictive ranges.</p> <p>** Per ACV [Belgium] Heat Exchanger Manufacturers</p> <p>*** Copper has a broad range of acceptable pH and the other metallic components may require a tighter range</p> <p>^ Per ASHRAE/AIA Presentation # 6017 2012 Winter Conference</p>		

Bulletin: M-102

Date: 01/11/2011

Supersedes: N/A

TECHNICAL DATA



MACH[®] CONDENSING BOILER COMBUSTION DATA

Size	Units	C300	C450	C750	C900	C1050	C1500	C2000	C2500	C3000	C4000
Input	MBtu/hr	300	450	750	900	1,050	1,500	2,000	2,500	3,000	4,000
Output	MBtu/hr	276	414	713	846	987	1,440	1,920	2,375	2,850	3,800
Output	BHP	8.2	12.4	21.3	25.3	29.5	43.0	57.3	70.9	85.1	113.5
Fuel Rate	cfh	291	437	728	874	1,019	1,456	1,942	2,427	2,913	3,883
Air Requirement	SCFM	63	94	157	189	220	315	420	524	629	839
Flue Gas Flow	ACFM	83	124	207	248	290	414	552	690	828	1,104
Flue Gas Flow	fps	15.8	15.2	17.6	11.9	13.8	12.6	16.9	21.1	25.3	33.7
Emmission:											
Dry Flue Gas Flow	pph	265	397	662	794	927	1,324	1,765	2,206	2,647	3,529
Wet Flue Gas Flow	pph	296	445	741	889	1,037	1,482	1,976	2,470	2,964	3,952
CO ₂	pph	36	53	89	107	124	178	237	206	247	329
CO	ppm	67	67	64	64	64	19	19	21	23	33
NO _x	ppm	7	7	6	9	9	14	14	9.2	7.2	7.2

MACH[®] Boiler LIMITED WARRANTY



LIMITED WARRANTY

Subject to the terms and conditions herein, Harsco Industrial, Patterson-Kelley, Seller, warrants to the original owner at the original installation site that products manufactured by Seller will be free from defects in materials and workmanship for a period of one (1) year from date of start up (the "Warranty Period"), provided that start up is completed within six months from the date of shipment. The heat exchanger and burner will be warranted for a period of five (5) years and a ten (10) year warranty against failure due to thermal shock from the date of shipment (the "Warranty Period").

REMEDY

The sole remedy of this warranty is expressly limited to the repair or replacement of any part found to be defective under conditions of normal use within the Warranty Period. Installation is not included.

WARRANTY

The owner must notify the original installer of the Product and Seller (Attention: Harsco Industrial, Patterson-Kelley, 100 Burson Street, East Stroudsburg, PA 18301), in writing, within the Warranty Period, providing a detailed description of all claimed defects. Transportation to the factory or other designated facility for repairs of any products or items alleged defective shall, in all events, be the responsibility and at the cost of the owner.

EXCLUSIONS

Seller shall have no liability for and this warranty does not cover:

- 1) 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.
- 2) The performance of any Product under conditions varying materially from those under which such Product is usually tested under industry standards at of the time of shipment
- 3) Any damage to the Product due to abrasion, erosion, deterioration, abnormal temperatures or the influence of foreign matter or energy.
- 4) 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.
- 5) The suitability of any Product for any particular application.
- 6) Any failure resulting from misuse, modification not authorized by Seller in writing, improper installation or lack of or improper maintenance.
- 7) Equipment furnished by the owner, either mounted or unmounted, or when contracted for by the owner to be installed or handled.
- 8) Leakage or other malfunction caused by:
 - i) Defective installations in general and specifically, any installation which is made:
 - (a) In violation of applicable state or local plumbing housing or building codes,
 - (b) Contrary to the written instructions furnished with the unit
 - ii) Adverse local conditions in general and, specifically, sediment or lime precipitation in the tubes and/or headers or corrosive elements in the atmosphere.
 - iii) 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 fuels or settings other than those set forth on the rating plate or accidental or exterior damage.
- 9) Production of noise, odors, discoloration or rusty water.
- 10) Damage to surrounding area or property caused by leakage or malfunction.
- 11) 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 boiler and or components. Seller's liability under this warranty shall not in any case exceed the amount paid for the Product found to be defective.

THIRD-PARTY WARRANTIES

For goods or components not manufactured by Seller, the warranty obligations of Seller shall, in all respects, conform and be limited to one (1) year from the date of shipment.

SEVERABILITY

To the extent that any provision of this warranty would be void or prohibited under applicable law, such provisions shall be limited in effect to the minimum extent necessary to render the remaining provisions hereof enforceable.

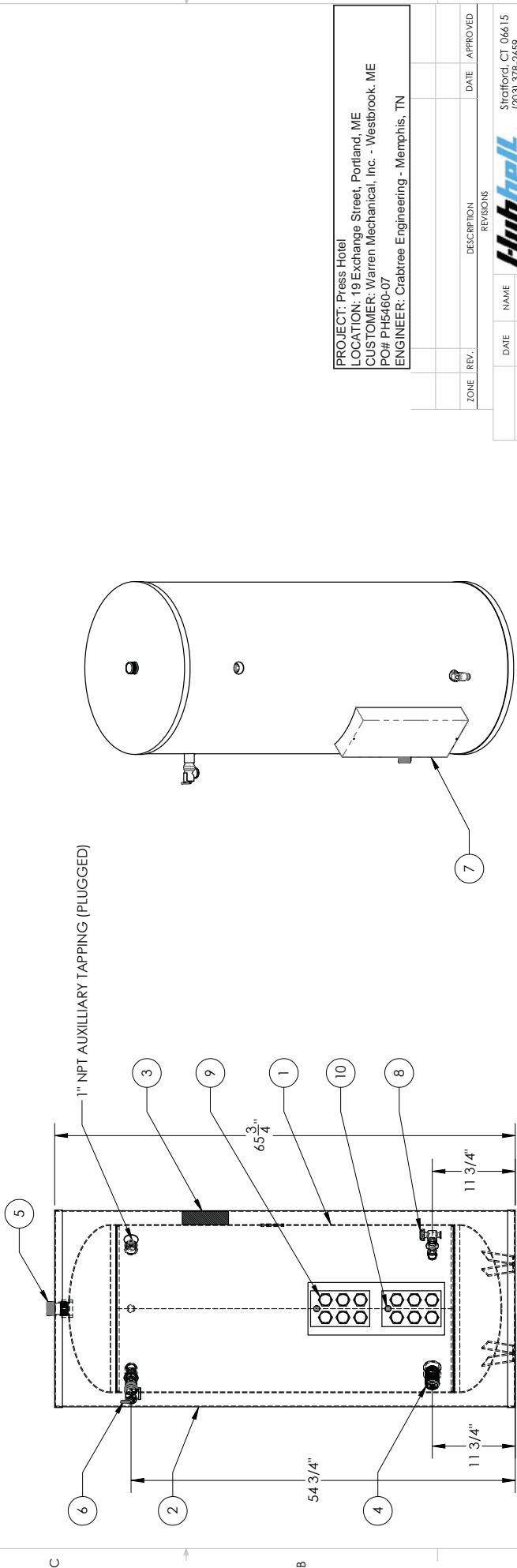
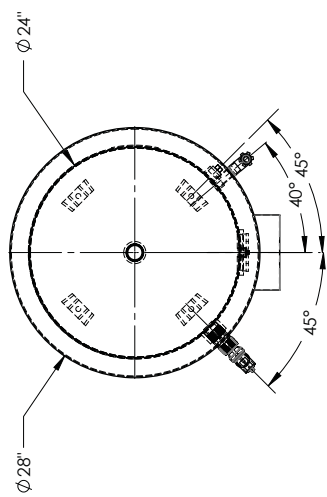
NO OTHER WARRANTIES

Seller makes no implied warranty of merchantability or fitness for a particular purpose or other warranties with respect to any products or services except as expressly set forth in this limited warranty.

PROJECT: Press Hotel LOCATION: 19 Exchange Street, Portland, ME CUSTOMER: Warren Mechanical, Inc. - Westbrook. ME PO# PH5460-07 ENGINEER: Crabtree Engineering - Memphis, TN

1 2 3 4 5 6 7 8

ITEM	QTY	DESCRIPTION	SIZE	MATERIAL	PART NO.
1	1	HYDRASTONE CEMENT LINED TANK	120 GAL.	STEEL	
2	1	PROTECTIVE OUTER JACKET		PLASTIC	
3	1	INSULATION	2" THICK	POLYURETHANE	
4	1	COLD WATER INLET	1-1/2" NPT	BRONZE	
5	1	HOT WATER OUTLET	1-1/2" NPT	BRASS	
6	1	T&P RELIEF VALVE - 150 PSI, 210°F	1" NPT	BRONZE	40XL-7 1 150LB
7	1	ACCESS COVER	3 X 8.5" X 21"	STEEL	
8	1	DRAIN VALVE	3/4" GHT	BRONZE	
9	12	HEX "J" PLUG	1-1/2 UNF	BRASS	
10	2	PIPE PLUG	3/4 UNF	BRASS	



COVER REMOVED IN THIS VIEW

PROJECT: Press Hotel
 LOCATION: 19 Exchange Street, Portland, ME
 CUSTOMER: Warren Mechanical, Inc. - Westbrook, ME
 PO# PH6460-07
 ENGINEER: Crabtree Engineering - Memphis, TN

ZONE	REV.	DESCRIPTION	DATE	APPROVED

Hubbell™
 Stratford, CT 06615
 (203) 376-2657
The Electric Heater Company
 Customer: POWER & PROCESS INC.
 Description: SEA120SL
 120 GALLON STORAGE TANK

DATE	NAME	DWG. NO.	REV
02/24/14	DWW	B	14-58483

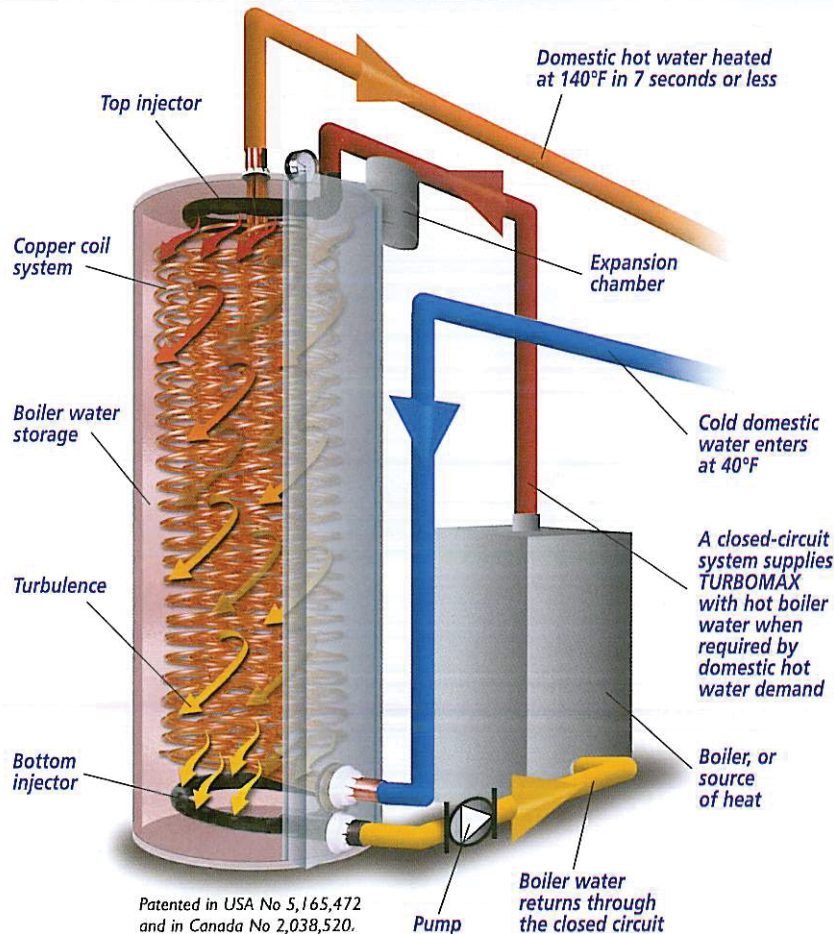
SCALE: 1:14 FSCM: 19857 SHEET 1 OF 1

PROPRIETARY AND CONFIDENTIAL
 THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF THE ELECTRIC HEATER COMPANY. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF THE ELECTRIC HEATER COMPANY IS PROHIBITED.

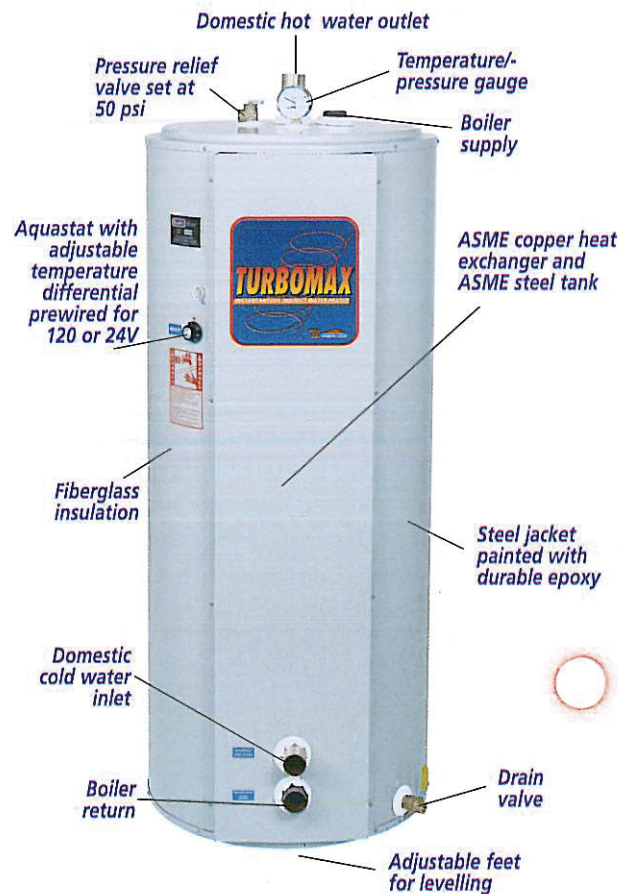
- NOTES:
 1. TANK ALL WELDED STEEL CONSTRUCTION CEMENT LINED TO 5/8" MINIMUM THICKNESS AFTER FABRICATION AND TEST.
 2. TANK DESIGNED FOR WORKING PRESSURE OF 150 PSI, 225 PSI TEST ASME CONSTRUCTION AND STAMPED SECTION IV.
 3. PIECE NUMBER 6 T&P RELIEF VALVE (150 PSI, 210°F), TO BE SHIPPED LOOSE.
 4. BRASS HEX HEAD PLUGS INSERTED INTO ALL ELEMENT AND UNUSED PROBE TAPPINGS

1 2 3 4 5 6 7 8

TURBOMAX® 109A / 65A



Standard Equipment



TURBOMAX® 109A

Domestic hot water produced per hour in U.S. gallons†							
Net BTUH	kW	First hour			Continuous		
		110°F	140°F	180°F	110°F	140°F	180°F
400 000	117	798	527	362	687	483	346
500 000	146	970	647	449	859	603	436
600 000	176	1142	668	535	1031	724	516
700 000	205	1314	889		1202	845	
800 000	234	1485	1009		1374	965	
900 000	264	1657			1546		

TURBOMAX® 65A

Domestic hot water produced per hour in U.S. gallons†							
Net BTUH	kW	First hour			Continuous		
		110°F	140°F	180°F	110°F	140°F	180°F
200 000	59	411	268	182	344	241	173
250 000	73	496	329	225	429	302	216
300 000	88	582	389	268	515	362	260
350 000	103	668	449		601	422	
400 000	117	754	510		687	483	
450 000	132	840	570		773	543	
500 000	146	926			859		

† Based on ASHRAE (D.O.E.) test method performed by CRIQ. Domestic cold water at 40°F and boiler water at 180°F

Specifications

Standby loss <1/2°F per hour
Heat Transfer Efficiency = 99%
Output Temperature up to 200°F
Tube max. allowed ASME = 200 PSI at 210F T-109A working pressure 150 PSI at 210F T-65A
Shell max. allowed ASME = 200 PSI at 210F T-109A working pressure 150 PSI at 210F T-65A

Dimensions

Model	Tank volume	Heat transfer area (sq. ft.)	Utility connection	Boiler connection	Hgt.	Diam.	Shipping weight
TURBOMAX 109A	110 US gal.	58.9 ft ²	2 1/2" Sweat M	2" NPTM	74"	29"	755 lbs
TURBOMAX 65A	67 US gal.	32.7 ft ²	2" Sweat M	1 1/2" NPTM	67"	24"	425 lbs



Copyright © 2010 Thermo 2000 Inc. All rights reserved. TURBOMAX is a trademark of Thermo 2000 Inc. Thermo 2000 Inc. reserves the right to modify at any time and without notice colors, components, materials, specifications or models described in or shown in this brochure.

Visit our website at
www.thermo2000.com



1-888-854-1111
www.thermo2000.com

THERMO 2000 INC.
500, 9th Avenue
Richmond, (Qc) Cnd JOB 2HO
Tel.: (819) 826-5613
Fax: (819) 826-6370
Email: info@thermo2000.com

PROJECT: Press Hotel
LOCATION: 19 Exchange Street, Portland, ME
CUSTOMER: Warren Mechanical, Inc. - Westbrook, ME
PO# PH5460-07
ENGINEER: Crabtree Engineering - Memphis, TN