2018

Consolidated Version 1

CWT HEATER
OPERATOR'S MANUAL

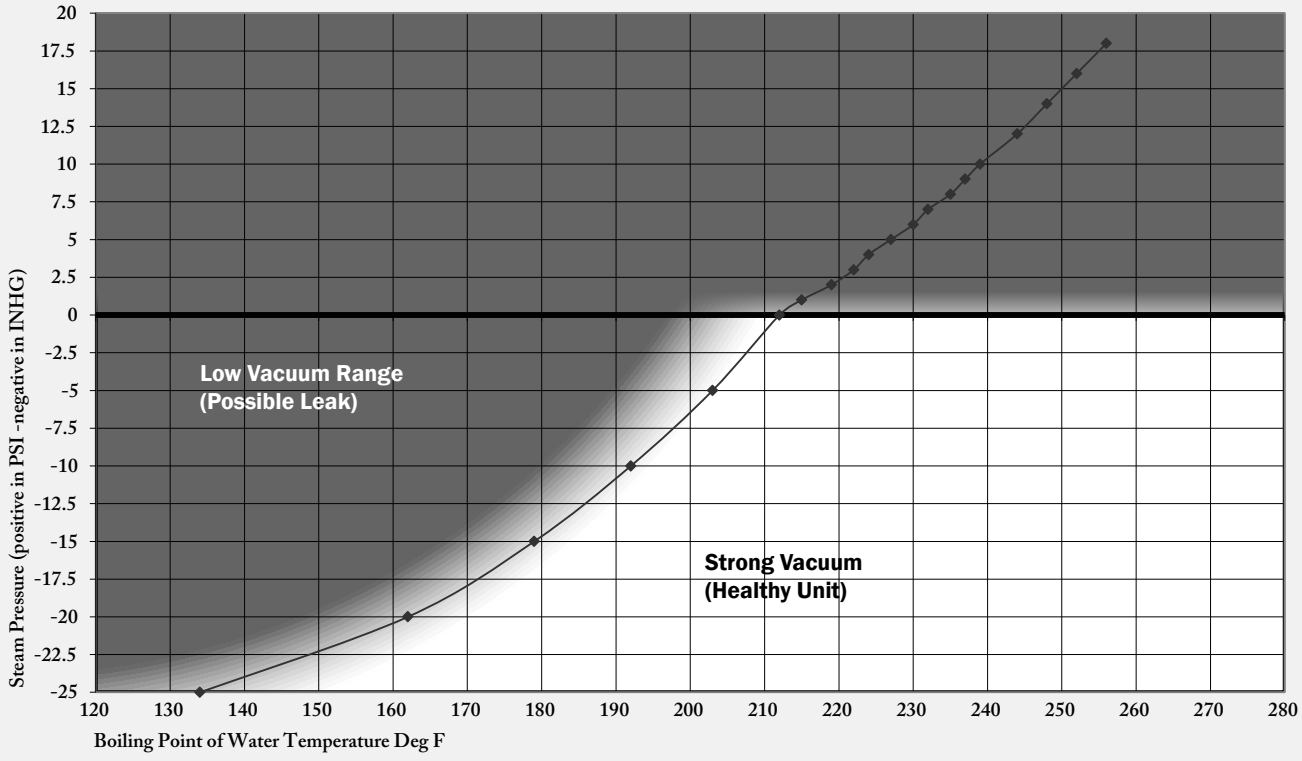
COLD WEATHER
TECHNOLOGIES

TECVALCO

Boiling Point of Water at various Pressures - Gauge Pressure

(Vacuum and Positive Pressure)

To use this chart correlate the steam temperature gauge vs. the vacuum gauge reading.



TECVALCO

COLD WEATHER TECHNOLOGIES

For service scan the QR code, or call **(780) 875-2530**

WARNING:
If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbour's phone. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

CWT (Cold Weather Technologies)
is an indirect-heater product line of
Tecvalco Ltd.
Niagara Falls, Ontario CANADA
Toll Free: 1 (866) 317-0131 | www.tecvalco.com

MODEL NUMBER: _____

SERIAL NUMBER: _____

IMPORTANT NOTES:

1) The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code, ANSI Z223.1/NFPA 54 *and/or* CAN/CSA B149.1, Natural Gas and Propane Installation Code.

2) Where required by the authority having jurisdiction, the installation must conform to the Standard for Controls and Safety Devices for Automatically Fire Boilers, ANSI/ASME CSD-1.

3) The CWT unit shall only be installed outdoors and such that there are no combustibles or any combustible construction within three feet (3') of boiler, vent stack, and steam piping. Boiler unit must not be installed on combustible surface.

4) The equipment shall be installed in accordance with the current Installation Code for Gas Burning Appliances and Equipment, and applicable State Regulations for the class; which should be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.

5) The boiler and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of ½ psi (3.5 kPa). The boiler must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ psi (3.5 kPa).

6) The boiler shall be installed such that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation and service.

7) Provisions for combustion and ventilation air in accordance with the section "Air for Combustion and Ventilation," of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or Clause 8.2, 8.3 or 8.4 of Natural Gas and Propane Installation Code, CAN/CSA B149.1, or applicable provisions of the local building codes.

8) This boiler is not connected /serviced as a common venting system.

9) Vent clearances will be for the Authority having Jurisdiction to determine the correct dimensions for their site clearances.

10) ANSI Z21.13/CSA 4.9 requires a sediment trap to be installed upstream of the fuel train. End users will need to make accommodation for a sediment trap in your piping upstream of fuel train.

11) ***On units suppled with the optional fuel train assembly,*** *the optional manual main shutoff valve is located before the Fisher HSR regulator on the fuel train.*

CAUTION: Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

All wiring indicated within this manual shall be done in accordance with the NEC "National Electrical Code" for US applications.

Verify proper operation after servicing.

This manual and the instructions outlined within apply to all CWT Heater Models ranging from DLH-70 to DLH-4620

Foreword

Thank you for purchasing a Cold Weather Technologies (CWT) Dry Line Heater (DLH). The following manual has been simplified to give both technical and non-technical owners and operators a detailed and thorough understanding of CWT Heater operation. Detailed installation diagrams and pictures can also be found inside this manual. These diagrams will serve you well as a reference for the unit and its materials.

Please note: *it is essential that all wiring and piping be installed in accordance with this manual*

The boilers supplied with the CWT Heaters are designed, manufactured and registered as ASME Section IV Low Pressure Boilers. The control systems are designed and installed in accordance with ASME CSD-1. Local regulations may vary for installation, design and operator certification requirements. *Please review and comply with all local codes and regulations.*

The boiler is designed to operate on natural gas. *However, please ensure the gas on which the boiler will operate is the same as that specified on the boiler model and rating plate.*

Some components in the Instrumentation might have been changed or replaced due to market availability at the time when this manual was prepared. However, a changed component does not affect the overall capability of the CWT Natural Gas Heater. With proper care and regular maintenance, the heater should provide years of trouble–free service. Please take a few moments and read through the manual carefully. Keep the manual in a safe place where it can be easily located if needed.

We welcome any suggestions from customers to help improve this product line. Please feel free to call Tecvalco.

The CWT boiler and its components are designed, fabricated, tested and inspected in accordance to the laws, codes, statutes and regulations for use in Canada. *The end user is responsible for ensuring that CWT boiler complies with all Federal, Municipal, Provincial, State and Local laws, Codes, Statutes and Regulations prior to installation of the unit, and application of permits, licenses, certificates and authorizations thereof.*

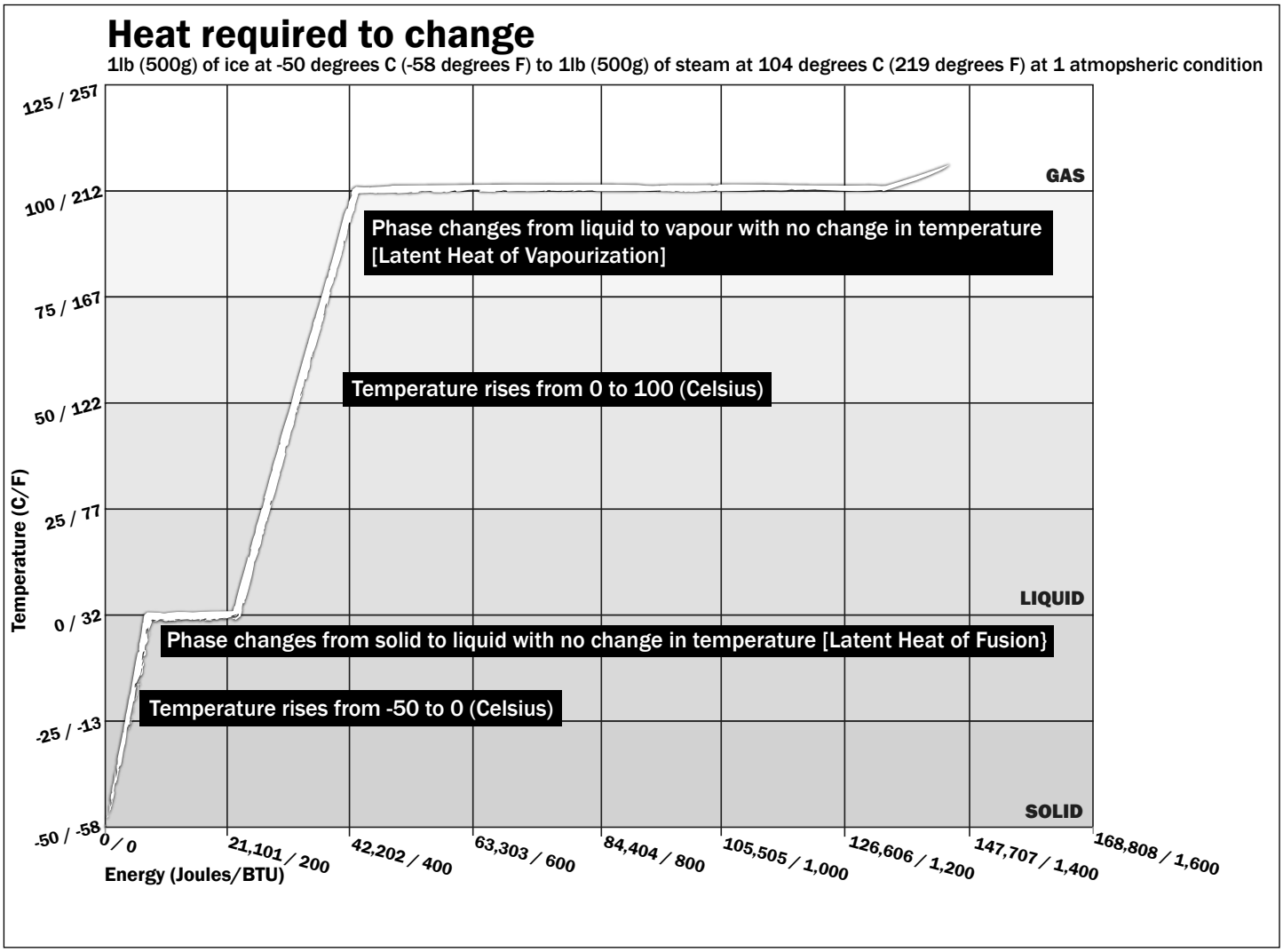
Warning: *This manual must be read in its entirety before installation of this product. Installation must be performed by a qualified technician and adhere to the safety standards. Failure to do so may result in personnel injury or property damage.*

Table of Contents

SECTION A CONTENTS

1. Introduction

The CWT Indirect Line Heater, a product of Tecvalco Ltd., has been developed for the purpose of process heating in the natural gas and oil industries. In contrast to conventional water bath heaters, the CWT system utilizes a Heat-Driven Loop (HDL) to allow for the use of lower pressure steam as the heating medium. This system removes the need for keeping a large volume of water/glycol solution at a high temperature to meet the demand when required. The HDL system utilizes a CWT boiler initially pulled under vacuum to provide low grade steam instantly upon demand. The vacuum results in the steam being created at low temperatures which results in the instant response. The steam is then directed to a condensing can (vessel) where it surrounds a process coil carrying the medium requiring heat. Upon condensing on the exterior of the process coil, the latent heat of vapourization is transferred to the process. Upon giving up this latent heat, the steam turns back to liquid (condensate) with no necessary drop in temperature, then drains by gravity back to the boiler where it is again turned to steam and the cycle repeats. This process, as configured in the CWT system, requires no pumps or electricity to function and is a completely closed loop. Given that the entire process typically operates under vacuum, corrosion is virtually non-existent, resulting in decreased maintenance and increased system life.



(Figure 1.1)

The latent heat exchanged from the steam as it condenses into liquid water to the natural gas inside the high-pressure coil is the key to heat exchange in HDL system. A glycol/water solution is used in all HDL systems for freeze protection and corrosion inhibition along with minimum oxidation.

2. Site preparation and delivery

2.1 Prior to receiving the boiler

In preparation for the receipt of the boiler the following should be performed:

2.1.1 Tecvalco requires that the heater be levelled on a stable foundation or base. This should be completed prior to the arrival of the heater.

Note: *Please follow all local jurisdictions and codes to design a proper foundation. In addition, the equipment shall be installed in accordance with those installation regulations in force in the local area where the installation is to be made. These shall be carefully followed in all cases. Authorities having jurisdiction should be consulted before installations are made.*

If the foundation or base is not level it will prevent efficient gravity drainage of condensate to the boiler, possibly interrupting the process. An unstable foundation or base will create stress on piping which can result in a loss of vacuum. This will reduce the efficiency and effectiveness of the process.

2.1.2 A thermowell MUST be installed in the piping within six feet downstream of the control point and this thermowell will receive the probe for the process temperature control. **It is the end user's responsibility to select and notify Tecvalco of the appropriate thermowells prior to shipping the heating boiler (see section 3.1 for thermowell sizings)**. The thermowell must be in contact with the flow of gas to operate the system properly.

2.1.3 The CWT heater fuel supply operates on an inlet fuel pressure of 0.5 psi (14" W.C.) or less, depending on the size of the heater. Regulating and fuel supply metering equipment up to the fuel train to provide the required fuel gas pressure is the sole responsibility of the end user. It is also the end user's responsibility to ensure that an adequate fuel supply is available.

2.2 Upon receiving the boiler

The CWT heater is typically shipped completely charged with heat transfer fluid and on vacuum - depending on size of the heater.

2.2.1 Document any damages upon receipt with the transport company and notify Tecvalco immediately.

2.2.2 Unload the heater using lift points (lugs on the skid) and place. The offload lift should be carried out as per the lifting diagram supplied by Tecvalco and at all times during the lift, the heater must be level.

2.2.3 The shipping crate will contain:

(a.) an operating manual,
(b.) a checklist of parts, and
(c.) the required parts for installation.

3. Installation procedures

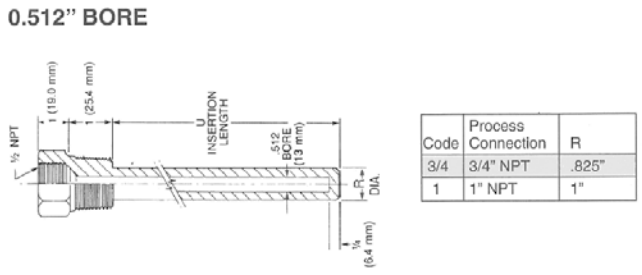
3.1 Place thermowells in downstream process piping just past the desired control point. The line temperature probe is typically placed immediately after the last pressure regulation in the facility. **Place thermowells as close as possible to meter station**. The probe requires a thermowell with an internal bore of minimum .512 inches (13mm). Tecvalco can supply the appropriate thermowell upon request. Length will depend on pipe size and collar used on pipe. This information will be required in order to send proper length.

NOTE: *It is suggested that a physical barrier be inserted within this conduit between the unit and the thermowell installed in the high-pressure gas line.*

Use the following table to select the appropriate thermowell, and notify Tecvalco of the part number.

CWT Part Numbers	Description
THR-SS-.75-.5-4-.512	3/4″ NPS x 1/2″ x 2.5″ U Length x .512 Bore
THR-SS-.75-.5-5-.512	3/4″ NPS x 1/2″ x 3.5″ U Length x .512 Bore
THR-SS-.75-.5-6-.512	3/4″ NPS x 1/2″ x 4.5″ U Length x .512 Bore
THR-SS-.75-.5-8-.512	3/4″ NPS x 1/2″ x 6.5″ U Length x .512 Bore
THR-SS-.75-.5-9-.512	3/4″ NPS x 1/2″ x 7.5″ U Length x .512 Bore
THR-SS-1-.5-2-.512	1″ NPS x 1/2″ x 1″ U Length x .512 Bore
THR-SS-1-.5-4-.512	1″ NPS x 1/2″ x 2.5″ U Length x .512 Bore
THR-SS-1-.5-5-.512	1″ NPS x 1/2″ x 3.5″ U Length x .512 Bore
THR-SS-1-.5-6-.512	1″ NPS x 1/2″ x 4.5″ U Length x .512 Bore

- It is suggested the tip of the thermowell be in the middle of the pipe, or beyond in smaller pipes.
- Please ensure that proper components and procedures are used for the pressure piping.
- It is suggested that appropriate thermally conductive heat transfer compound be used.



Code	Process Connection	R
3/4	3/4" NPT	.825"
1	1" NPT	1"

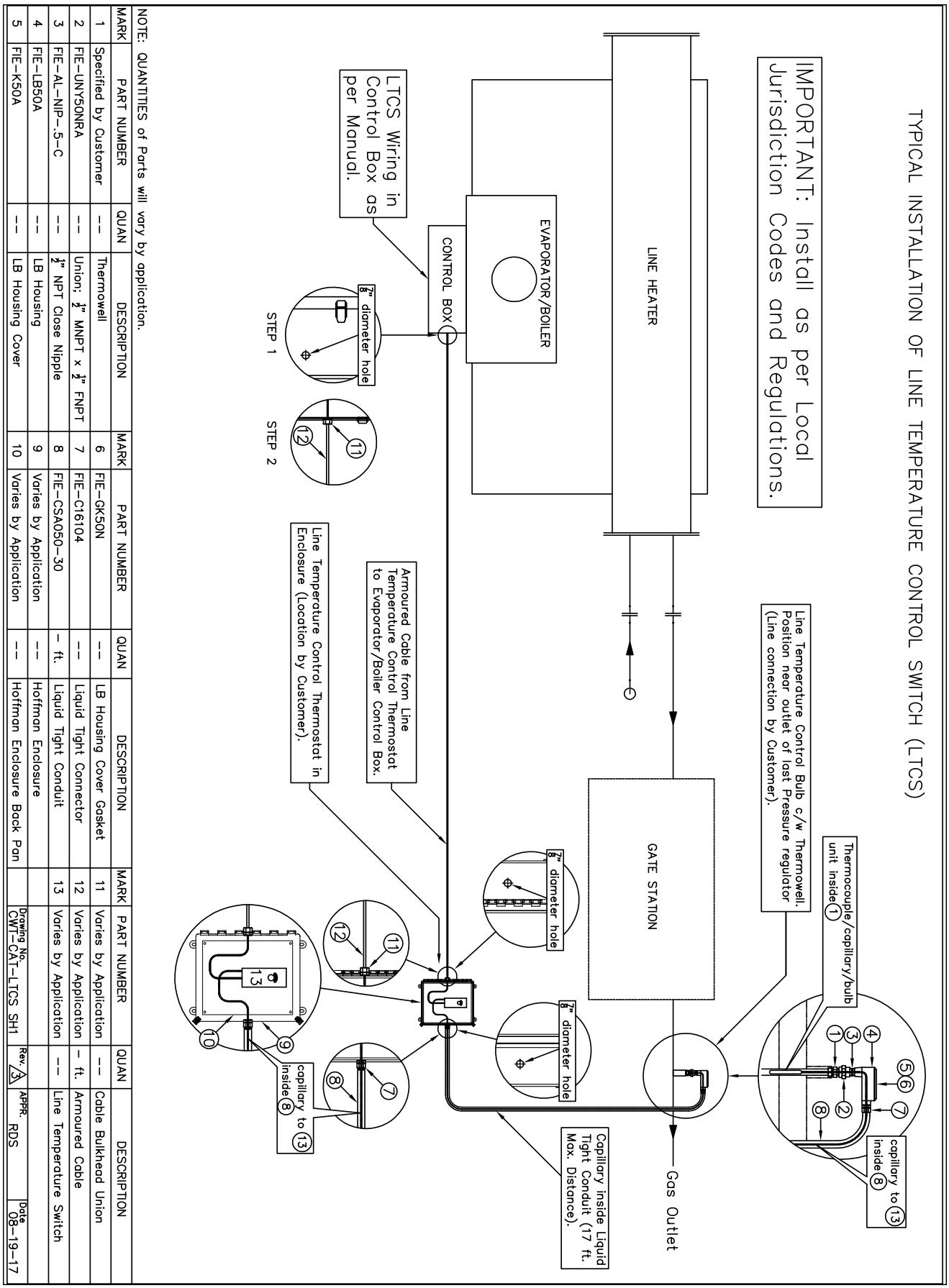
NOTE: *All customers should select components and materials based upon applicable engineering standards.*

ONE THERMOWELL PER HEATER

Heater size (BTU in 1000's)	Number of thermowells
70	1
140	1
385	1
770 (single)	1
770 (2-385)	2
1155 (1-385, 1-770)	2
1155 (3-385)	3
1540 (2-770)	2
2310 (3-770)	3
3080 (4-770)	4
3850 (5-770)	5
4620 (6-770)	6

Figure 3.1.1

Note: One thermowell per boiler.

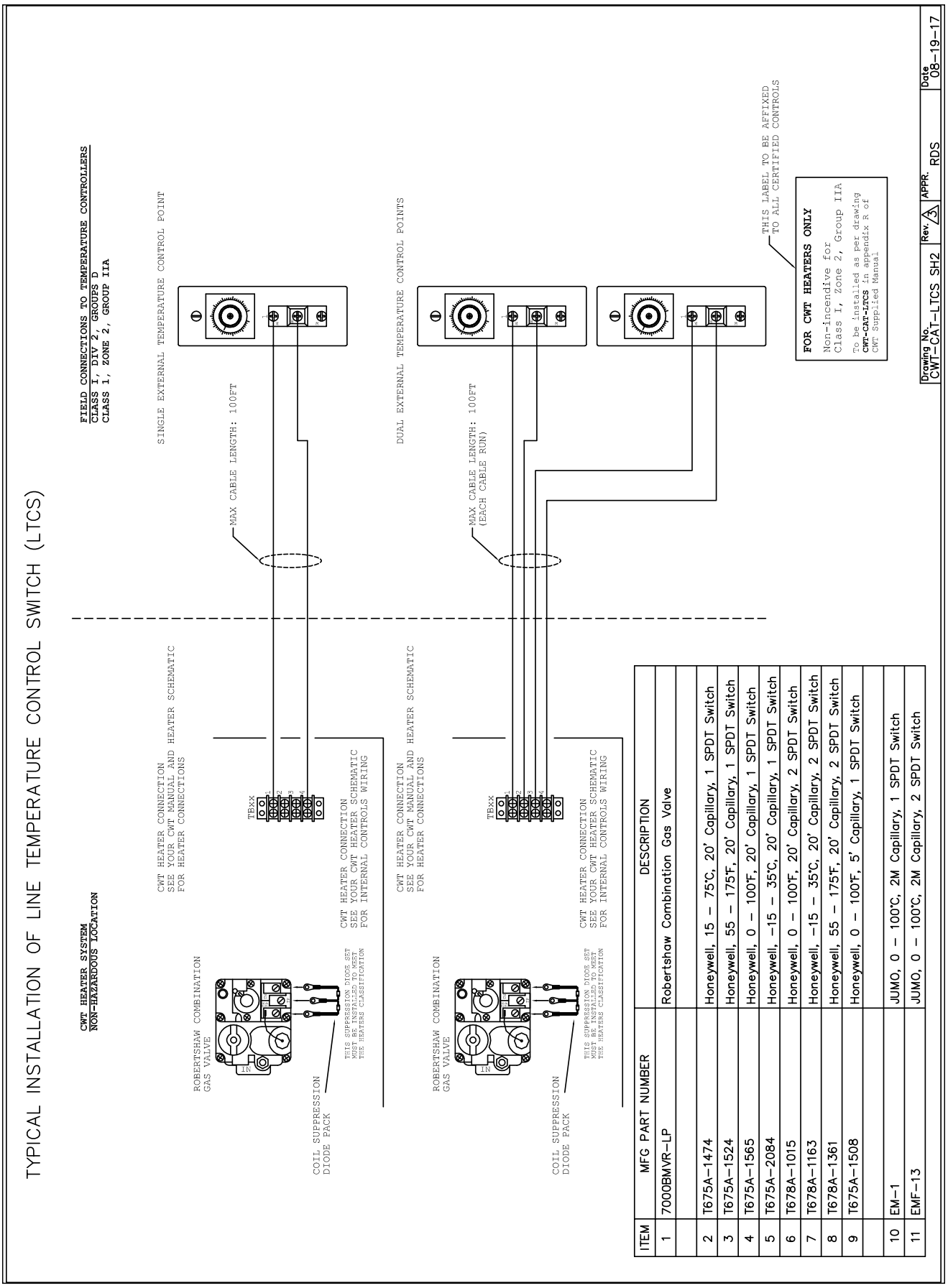


NOTE: QUANTITIES of Parts will vary by application.

MARK	PART NUMBER	QUAN	DESCRIPTION
1	Specified by Customer	--	Thermowell
2	FIE-UNY50NRA	--	Union; 1½" MNPT x 1½" FNPT
3	FIE-AL-NIP-.5-C	--	1½" NPT Close Nipple
4	FIE-LB50A	--	LB Housing
5	FIE-K50A	--	LB Housing Cover
6	FIE-GK50N	--	LB Housing Cover Gasket
7	FIE-C16104	--	Liquid Tight Connector
8	FIE-CSA050-30	- ft.	Liquid Tight Conduit
9	Varies by Application	--	Hoffman Enclosure
10	Varies by Application	--	Hoffman Enclosure Back Pan
11	Varies by Application	--	Cable Bulkhead Union
12	Varies by Application	- ft.	Armoured Cable
13	Varies by Application	--	Line Temperature Switch

Drawing No. CWT-CAT-LTCS SH1	Rev. 3
APPR. RDS	Date 08-19-17

Figure 3.1.2



ITEM	MFG PART NUMBER	DESCRIPTION
1	7000BMVR-LP	Robertshaw Combination Gas Valve
2	T675A-1474	Honeywell, 15 – 75°C, 20' Capillary, 1 SPDT Switch
3	T675A-1524	Honeywell, 55 – 175°F, 20' Capillary, 1 SPDT Switch
4	T675A-1565	Honeywell, 0 – 100°F, 20' Capillary, 1 SPDT Switch
5	T675A-2084	Honeywell, –15 – 35°C, 20' Capillary, 1 SPDT Switch
6	T678A-1015	Honeywell, 0 – 100°F, 20' Capillary, 2 SPDT Switch
7	T678A-1163	Honeywell, –15 – 35°C, 20' Capillary, 2 SPDT Switch
8	T678A-1361	Honeywell, 55 – 175°F, 20' Capillary, 2 SPDT Switch
9	T675A-1508	Honeywell, 0 – 100°F, 5' Capillary, 1 SPDT Switch
10	EM-1	JUMO, 0 – 100°C, 2M Capillary, 1 SPDT Switch
11	EMF-13	JUMO, 0 – 100°C, 2M Capillary, 2 SPDT Switch

Figure 3.1.3

3.2 Connect the fuel supply line to the fuel train on the boiler. Be sure to check local codes. The CWT boiler operates on an inlet fuel pressure of 0.5 psi (34.37 kPa) (14" W.C.) or less.

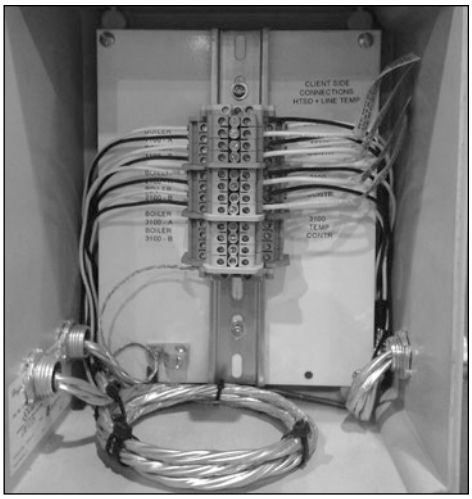


Figure 3.3

3.3 To install the line temperature control switch, refer to figure 3.1.2.

3.4 If supplied with a boiler unit having multiple boilers, run cable from line temperature controller to skid-mounted junction box and connect to internal terminal strip.

3.5 Place B-Vent exhaust stack on boiler (**see section 4.1.29** for images of the stack, and Appendixes at the back of the manual):

- Remove stack shipping cover and gasket. Be sure to save the cover/blind gasket on the stack, as it is to be reused for the stack.
- Place rain cap on exhaust stack section (use screws).
- Place exhaust stack sections together if necessary (use screws).
- Place exhaust stack on boiler using the shipping cover gasket between the flange and stack section (lifting equipment may be required).
- Use the bolts removed from the shipping cover to secure the stack to the boiler. (Note: 70k and 140k boilers do not require bolts to secure the stack sections).

3.6 Pressure gauges to be placed in valves located on coil (See figure 3.6)

(Figure 3.6)

3.7 When completed all parts from crate should be used.

3.7.1 ***Note:*** *Tecvalco highly recommends insulating gas piping from heater coil outlet, up to the pipe where the downstream thermo-probe be installed.*

3.7.2 Ready for pre-start up, start-up and run procedure (section 5)
Note: *Please confirm all connections are tight and sealed.*

3.8 Vent stack installation

Vent Installations shall be in accordance with "Venting of Equipment" of the National Fuel Gas Code, ANSI Z223.1/NFPA 54, or "Venting Systems and Air supply for Appliances" of the Natural Gas and Propane Installation Code, CAN/B 149.1, or applicable provisions of the local building codes. **Type of Vent**: **"B" Gas Vent**. For stack assembly limitations, please look at Appendix E to H.

a. Slide the vent stack assembly into the stack support bracket. Lock stack in place and secure with self-tapping screws.
b. Safely climb on a step ladder and place the stack support bracket onto the stack flange located on top of the boiler.
c. Use 1/2 inch Grade 5 bolts and nuts provided to securely atach the vent stack.

3.9 Nameplate information

C ETL US LISTED
Intertek
4009346

CERTIFIED/CERTIFIEE

CANADA & U.S.A

LE CANADA ET LES ETATS-UNIS

FOR OUTDOOR INSTALLATION ONLY - BOILER CATEGORY I

INSTALLATION À L'EXTÉRIEUR UNIQUEMENT - CHAUDIÈRE DE CATÉGORIE

MANUFACTURE DATE/DATE DE FABRICATION :

MODEL/MODELE :

ORIFICE :

SERIAL NO/N° DE SÉRIE :

SPECIFICATIONS/SPECIFICATIONS : NATURAL GAS/GAZ NATUREL

MIN. INLET GAS PRESSURE/PRESSION ENTRÉE MIN. ("WC/PO H2O) : 14

MIN. MANIFOLD PRESSURE/PRESSION RAMPE MIN. ("WC/PO H20) : 3.5

MINIMUM INPUT/ENTRÉE MIN (BTU/HR) :

MODEL/MODELE			ORIFICE		
	38	41	42	43	45
CWT 70	N/A	N/A	N/A	46000	N/A
CWT 140	N/A	N/A	N/A	90000	N/A
CWT 385	N/A	N/A	212000	200000	150000
CWT 770	540000	460000	N/A	430000	350000

MAX. INLET GAS PRESSURE/PRESSION ENTRÉE MAX. ("WC/PO H2O) : 14

MAX. MANIFOLD PRESSURE/PRESSION RAMPE MAX. ("WC/PO H20) :

MAXIMUM INPUT/ENTRÉE MAX (BTU/HR) :

MODEL/MODELE			ORIFICE		
	38	41	42	43	45
CWT 70	N/A	N/A	N/A	70000	N/A
CWT 140	N/A	N/A	N/A	140000	N/A
CWT 385	N/A	N/A	385000	350000	288000
CWT 770	770000	713000	N/A	615000	502000

MINIMUM RELIEF VALVE CAPACITY / CAPACITÉ MIN. VALVE DE DÉTENTE (Lb/H) : _____

ELECTRICAL SYSTEM: 750Mv dc - INTERNALLY GENERATED

CONFORMS TO ANSI Z21.13-2014, CERTIFIED TO CSA 4.9-2014

FOR INSTALLATION ON NON-COMBUSTIBLE FLOOR ONLY NO COMBUSTIBLE CONSTRUCTION ABOVE THE BOILER SURFACES OF THE DEVICE CAN GET HOT-USE APPROPRIATE CAUTION AND KEEP DEVICE 3 FT AWAY FROM ANY COMBUSTIBLE MATERIALS

SYSTÈM ÉLECTRIQUE: 750Mv dc - TENSION GÉNERÉE EN INTERNE

CONFORME À ANSI Z21.13-2014, HOMOLOGATION CSA 4.9-2014

INSTALLATION SUR SOLS NON COMBUSTIBLES UNIQUEMET. CONSTRUCTION COMBUSTILE INTERDITE AU-DESUS DE LA CHAUDIÈRE. LES SURFACES DE L' APPARIEL PEUVENT ÊTRE BRÛLANTES. ADOPTER LES PRÉCAUTIONS D'USAGE ET GARDER LES MATÉRIAUX COMBUSTIBLES À 3 pi (1 m) DE L'APPAREIL.

MANUFACTURED IN CANADA BY/FABRIQUE AU CANADA PAR

TECVALCO LTD, NORTH BATTLEFORD , SK, CANADA

The orifice size indicated on the nameplate corresponds to the firing rate in the table below.

This pressure is upstream of the Robertshaw gas valve.

Manifold is referring to the pressure at the burners, not the outlet of the Robertshaw.

NOTE:
Heaters should be clocked to deterine firing rate.
NEVER OVER-FIRE THE CWT.

4. Components, safeties, and controls

The CWT boiler is equipped with a number of safety systems that protect personnel and equipment. These systems function automatically without the need for constant supervision; however, some of the systems may require manual restart/start-up after a shut down. A thorough examination of the device should be performed to determine the cause of any shut down. **Activation of a safety shut down may be a signal that maintenance is needed for the device.** Contact Tecvalco if the cause of the shut down is unknown.

The controls on the CWT operate on the energy provided by the thermopiles located near the continuous pilot. The power provided passes through a circuit that contains the various switches, as illustrated in the following pages.

In general, safety and control is straight forward. Both circuits use normally closed switches, wired in series. If any switch opens, the circuit is broken, causing either the main burner to be turned off (in the case of the control circuit) or the pilot burner and in the main burner to be turned off (in the case of the safety circuit). The control circuit allows for automatic restart while the safety circuit requires a manual reset and relight of the pilot and burner.

Note: *Low-pressure boiler regulations may require testing or inspection of boilers and control systems. Please refer to all local and federal codes and regulations.*

4.1 BOILER SECTION

The firebox contains the burners, burner manifold, burner tray, ignitor/thermopile assembly, and the pilot and main fuel lines.

4.1.1

SWORDFISH BURNERS (BURNER MANIFOLD OR BURNER TRAY)

The burners are referred to as “swordfish burner”. Each burner is capable of a nominal capacity of 35,000 Btu/hr per burner, based on the table below for each size of CWT boiler system. They sit in slots in the burner tray and are equipped with a primary air adjuster.

Your new CWT, as shipped from the factory, comes installed with either a #43 orifice (70 and 140 models) or #45 orifice (386 and 770 models). This is to allow for proper tuning of the appliance for the specific application. Tuning should ALWAYS be performed by a properly-trained technician. NEVER OVER FIRE the CWT boiler or damage can occur and void the factory warranty.

	RATING (Btu/hr)					
	ORIFICE					Max manifold
	38	41	42	43	45	pressure
CWT 70	N/A	N/A	N/A	70000	N/A	7.0
CWT 140	N/A	N/A	N/A	140000	N/A	8.1
CWT 385	N/A	N/A	385000	350000	288000	9.5, 9.7, 11.5
CWT 770	770000	713000	N/A	615000	502000	6.2, 7.4, 6.9, 7.0

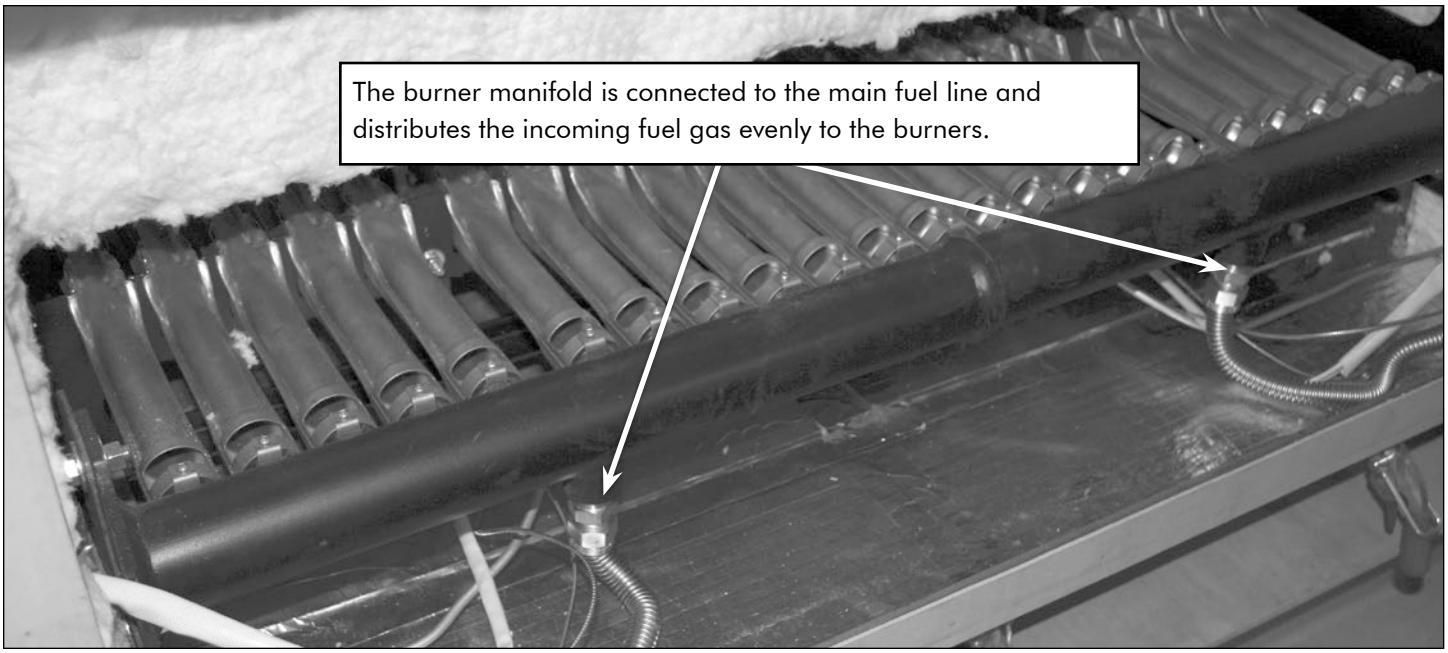


Figure 4.1.1 -
The burner tray for the CWT 770 heater, which contains 22 swordfish burners, one split manifold and four thermocouples on two pilot assemblies.

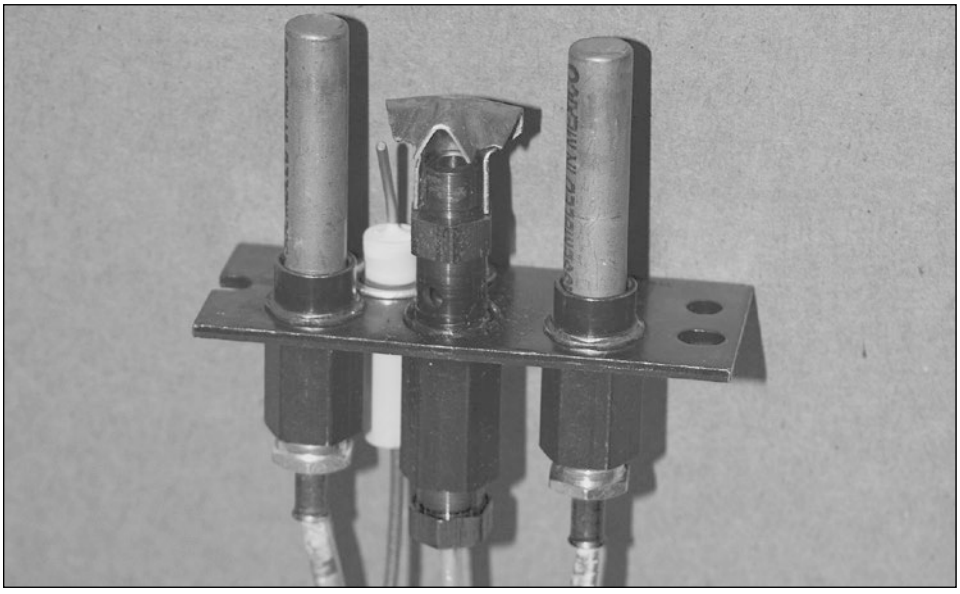
Each heater contains swordfish burners as follows:

- CWT 70 Heater = 2 swordfish burners
- CWT 140 Heater = 4 swordfish burners
- CWT 385 Heater = 11 swordfish burners
- CWT 770 Heater = 22 swordfish burners

4.1.2

PILOT AND THERMOPILE ASSEMBLY

The pilot and thermopile assembly consists of two 750 mV thermopiles, a pilot burner, and a sparker.

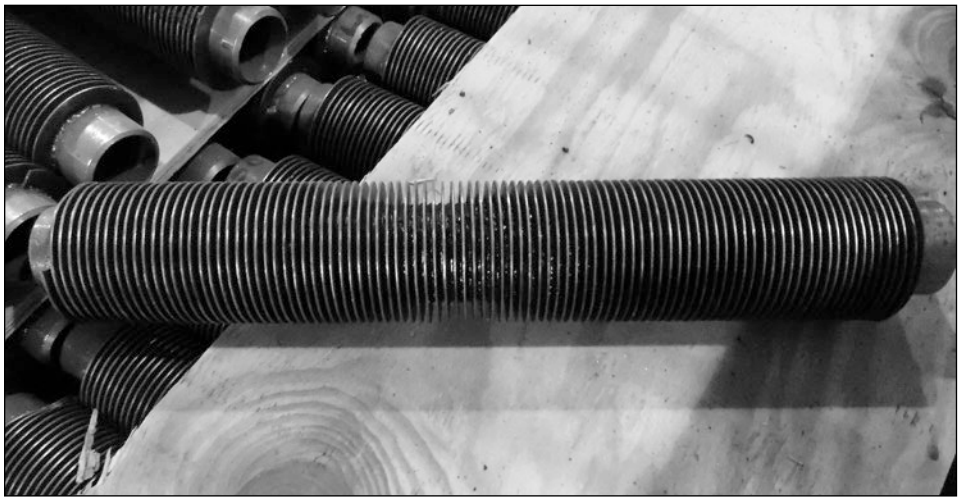


(Figure 4.1.2)

NOTE: *The pilot orifice must be stamped with the part number BL22N.*

4.1.3 The fintube assembly (primary heat exchanger)

The fintubes are located above the burners and span the width of the firebox. The flue gas passes through the fins and exits through the stack. As the heated flue gas passes through the fintubes, they heat the water-glycol mixture and cause the water to boil, generating steam.



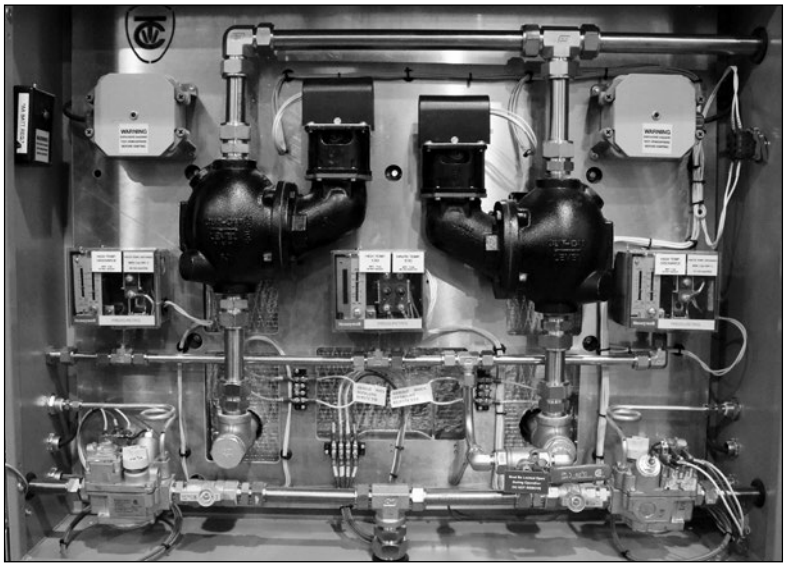
(Figure 4.1.3)

4.1.4 The control box

The control box is attached to the boiler and houses the various controls and safeties for the CWT heating unit which have been designed to meet the requirements of ASME CSD-1. They include the Robertshaw gas valve, the switches for steam pressures/temperatures, as well as the required safety switches.

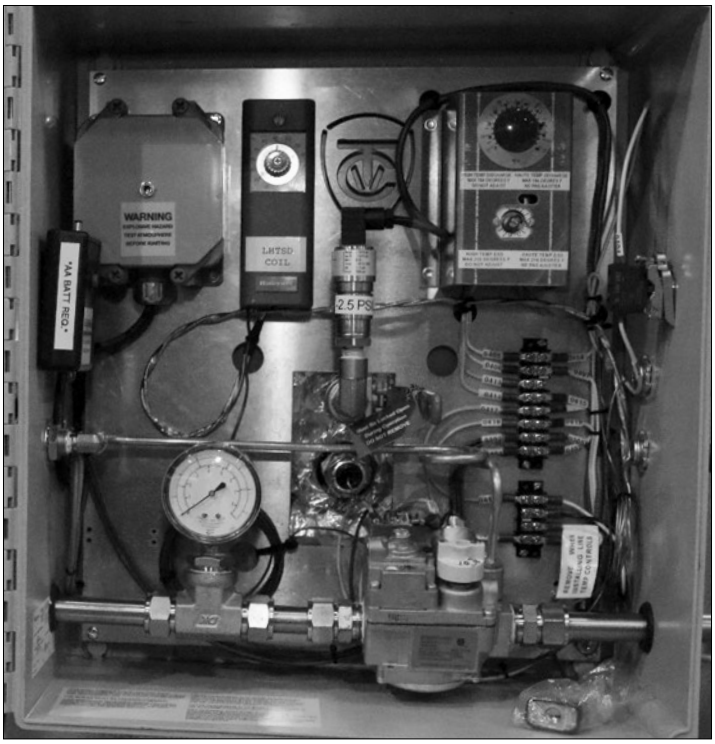
Also included are the ignition box and a pressure gauge to indicate main fuel line pressure downstream of the gas control valve. The gas line temperature control, while usually remote from the boiler, is also connected to the control box and system control logic. There are two control versions for the CWT boiler line; 1) standard low-pressure boiler control, 2) vacuum boiler control. Be sure to reference the proper figures, drawings, etc. for your style of control.

Please refer to figures 4.1.4.a through 4.1.4.e



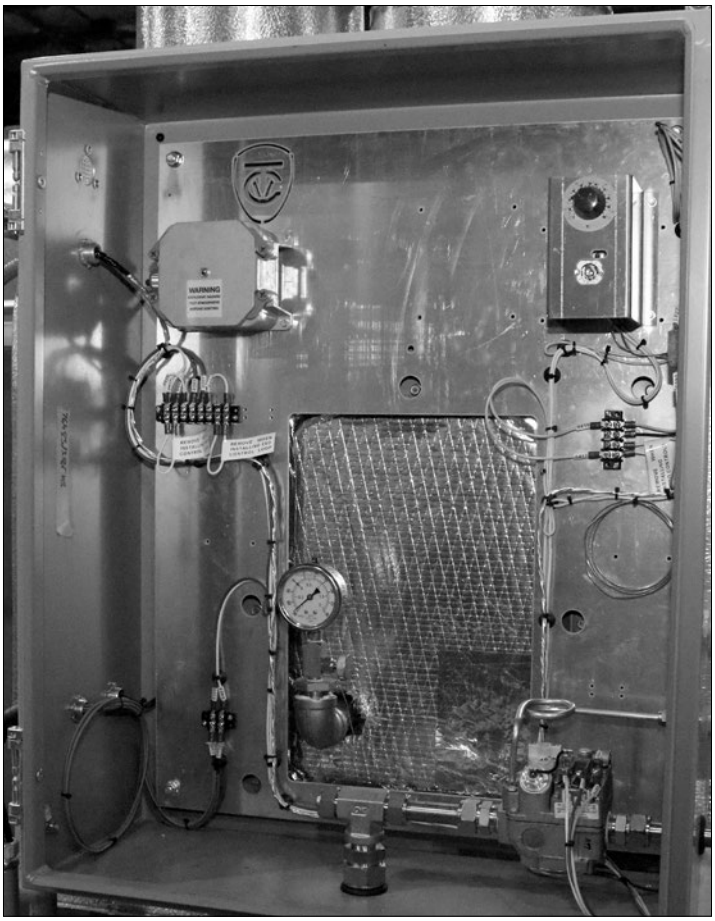
LEFT (Figure 4.1.4.a) - Control box for CWT 385 Standard Boiler.

ABOVE (Figure 4.1.4.b) - Control box for CWT 770 Standard Boiler.



(Figure 4.1.4.c)

Control box for a CWT70 Vacuum Boiler.



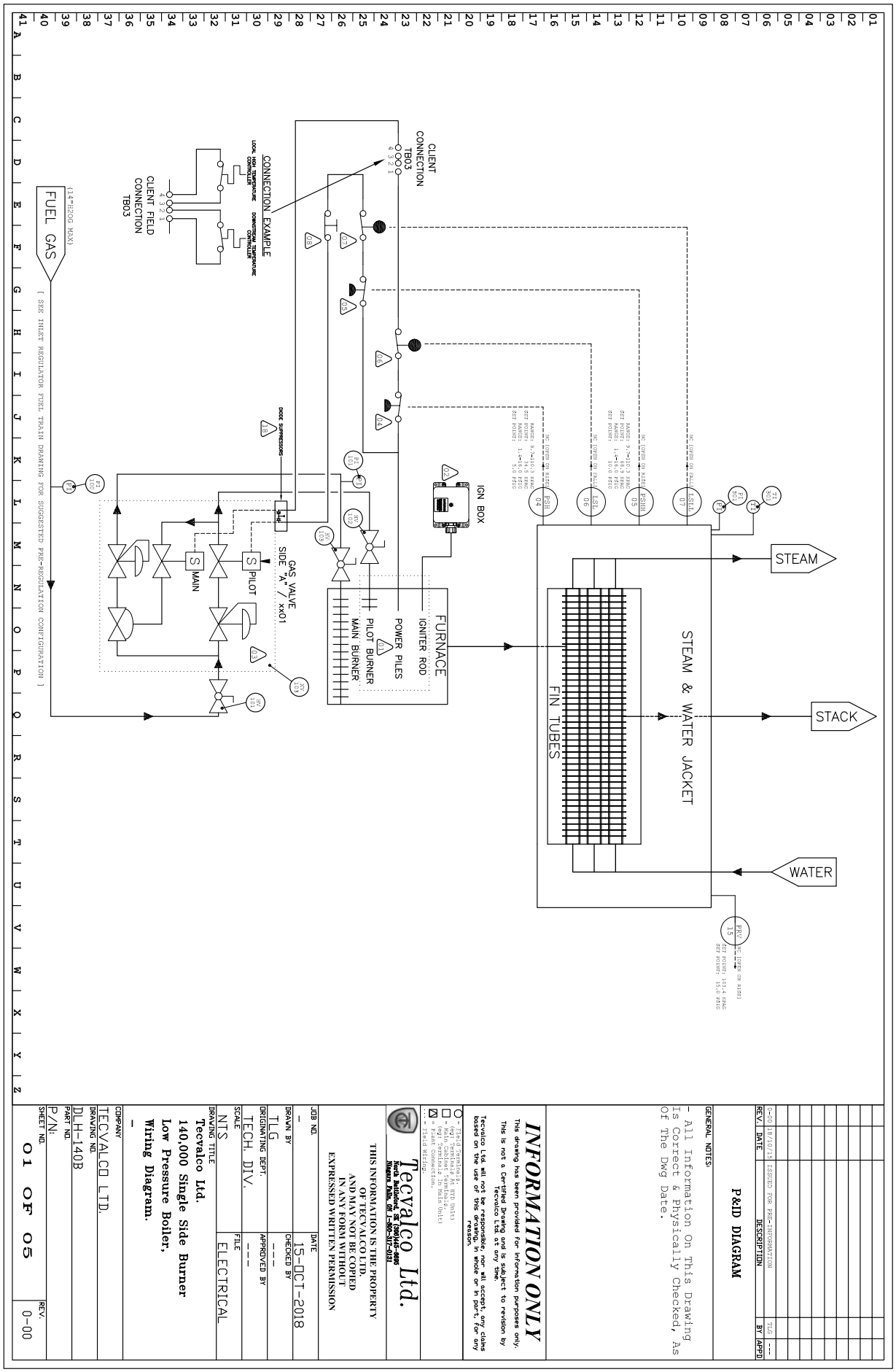
(Figure 4.1.4.d)

Control box for a CWT385 Vacuum Boiler.

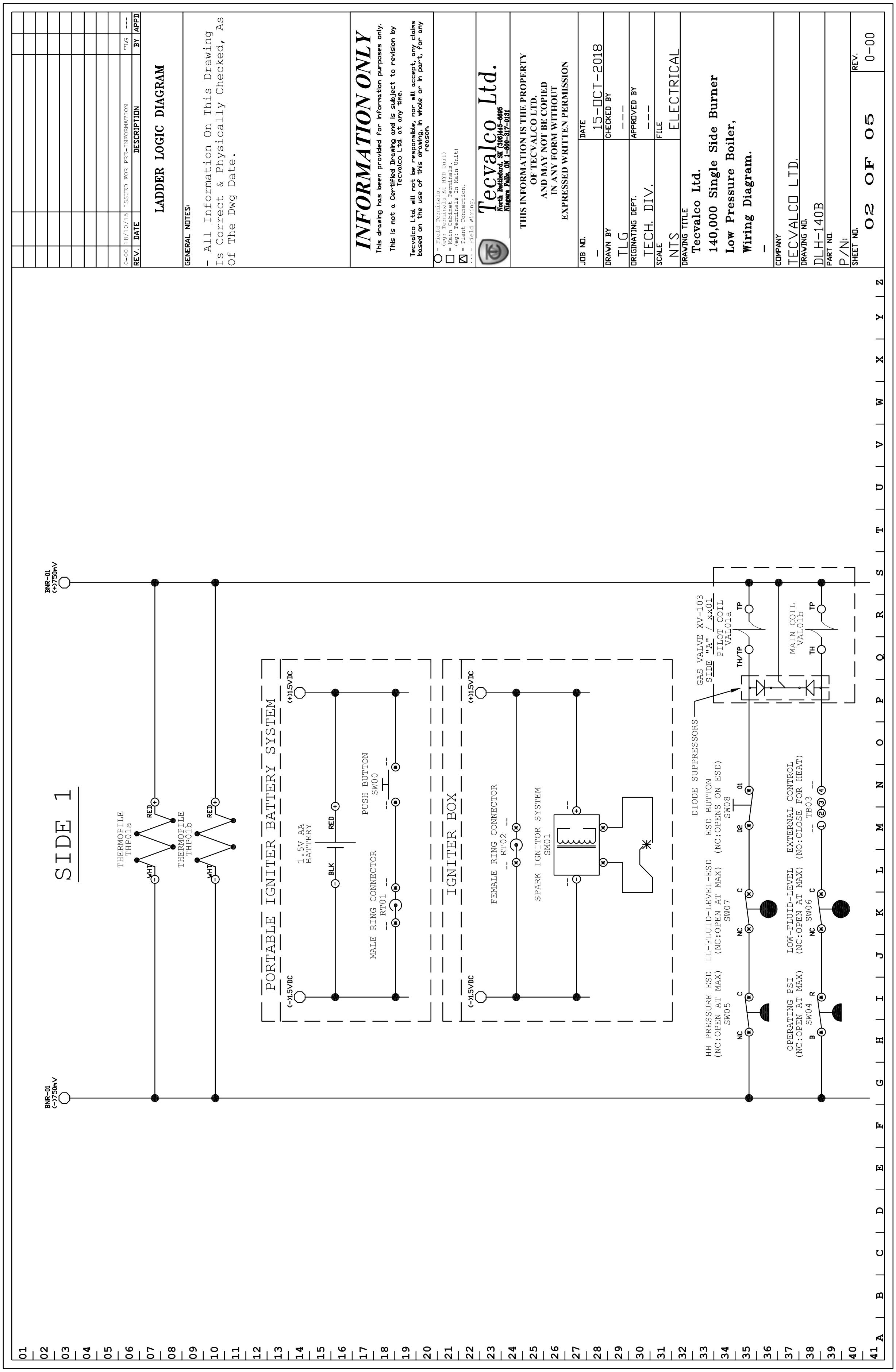
(Figure 4.1.4.e)

Control box for a CWT770 Vacuum Boiler.

4.1.5
WIRING
SCHEMATICS



(Figure 4.1.5a)


LADDER LOGIC DIAGRAM
0-00 18/10/15 ISSUED FOR PRE-INFORMATION TLG ---
REV. DATE DESCRIPTION BY APPD
GENERAL NOTES:
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JOB NO. -
DATE 15-OCT-2018
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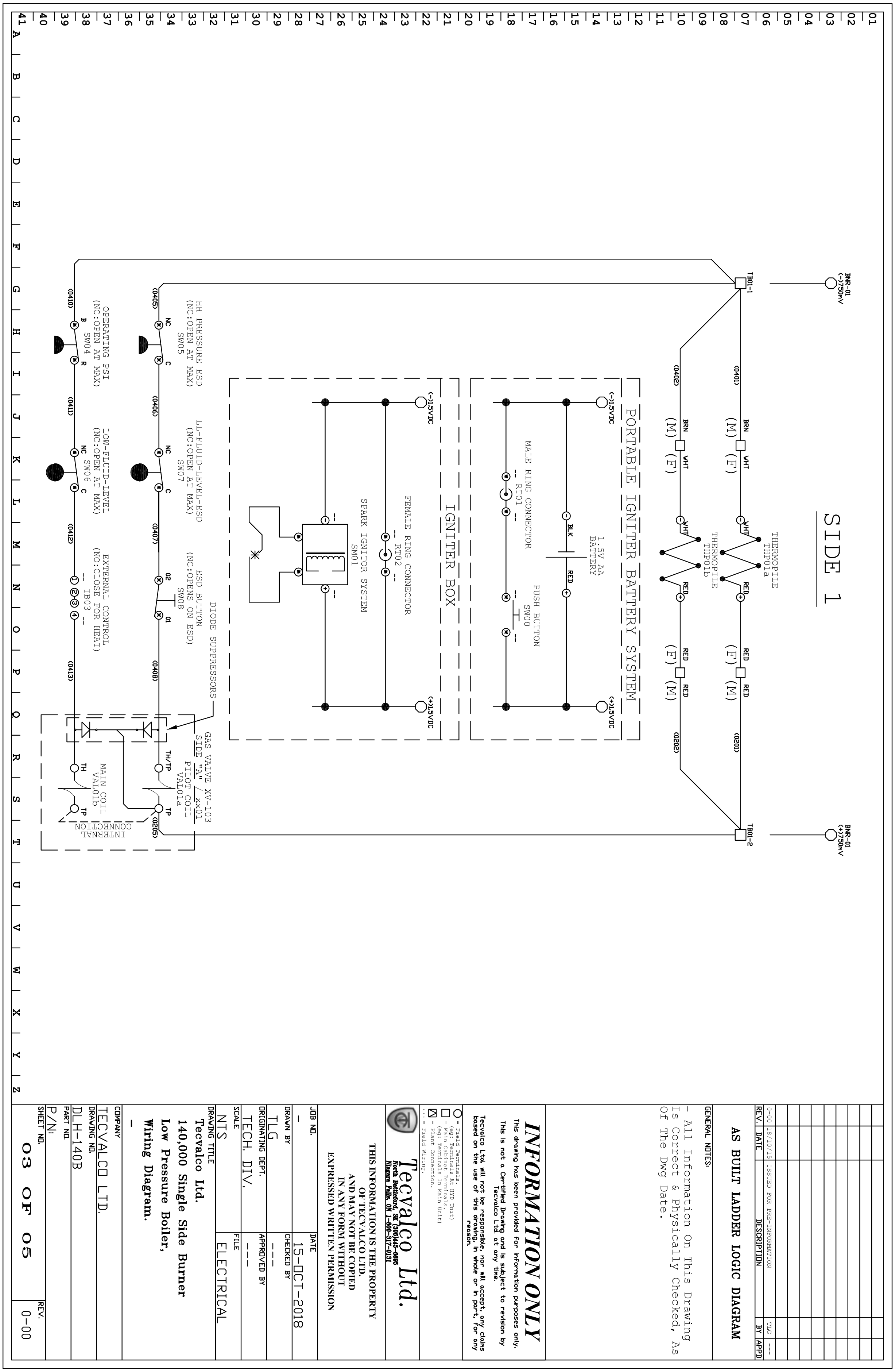
CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.
APPROVED BY ---
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE Tecvalco Ltd. 140,000 Single Side Burner Low Pressure Boiler, Wiring Diagram.
COMPANY TECVALCO LTD.
DRAWING NO. DLH-140B
PART NO. P/N:
SHEET NO. 02 OF 05
REV. 0-00
SIDE 1
BNR-01 (+)750mV
BNR-01 (-)750mV
THERMOPILE THP01a
THERMOPILE THP01b
PORTABLE IGNITER BATTERY SYSTEM
(+)1.5VDC
(-)1.5VDC
1.5V AA BATTERY
PUSH BUTTON SW00
MALE RING CONNECTOR RT01
IGNITER BOX
FEMALE RING CONNECTOR RT02
SPARK IGNITOR SYSTEM SM01
GAS VALVE XV-103 SIDE "A" / xx01
PILOT COIL VAL01a
MAIN COIL VAL01b
DIODE SUPPRESSORS
HH PRESSURE ESD (NC:OPEN AT MAX) SW05
LL-FLUID-LEVEL-ESD (NC:OPEN AT MAX) SW07
ESD BUTTON (NC:OPENS ON ESD) SW08
OPERATING PSI (NC:OPEN AT MAX) SW04
LOW-FLUID-LEVEL (NC:OPEN AT MAX) SW06
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) TB03

(Figure 4.1.5b)


SIDE 1
PORTABLE IGNITER BATTERY SYSTEM
IGNITER BOX
THERMOPILE THP01a
THERMOPILE THP01b
1.5V AA BATTERY
PUSH BUTTON SW00
MALE RING CONNECTOR -- RT01 --
FEMALE RING CONNECTOR -- RT02 --
SPARK IGNITOR SYSTEM SM01
HH PRESSURE ESD (NC:OPEN AT MAX) SW05
LL-FLUID-LEVEL-ESD (NC:OPEN AT MAX) SW07
ESD BUTTON (NC:OPENS ON ESD) SW08
OPERATING PSI (NC:OPEN AT MAX) SW04
LOW-FLUID-LEVEL (NC:OPEN AT MAX) SW06
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) -- TB03 --
DIODE SUPPRESSORS
GAS VALVE XV-103 SIDE "A" / x01
PILOT COIL VAL01a
MAIN COIL VAL01b
INTERNAL CONNECTION
AS BUILT LADDER LOGIC DIAGRAM
GENERAL NOTES:
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INFORMATION ONLY
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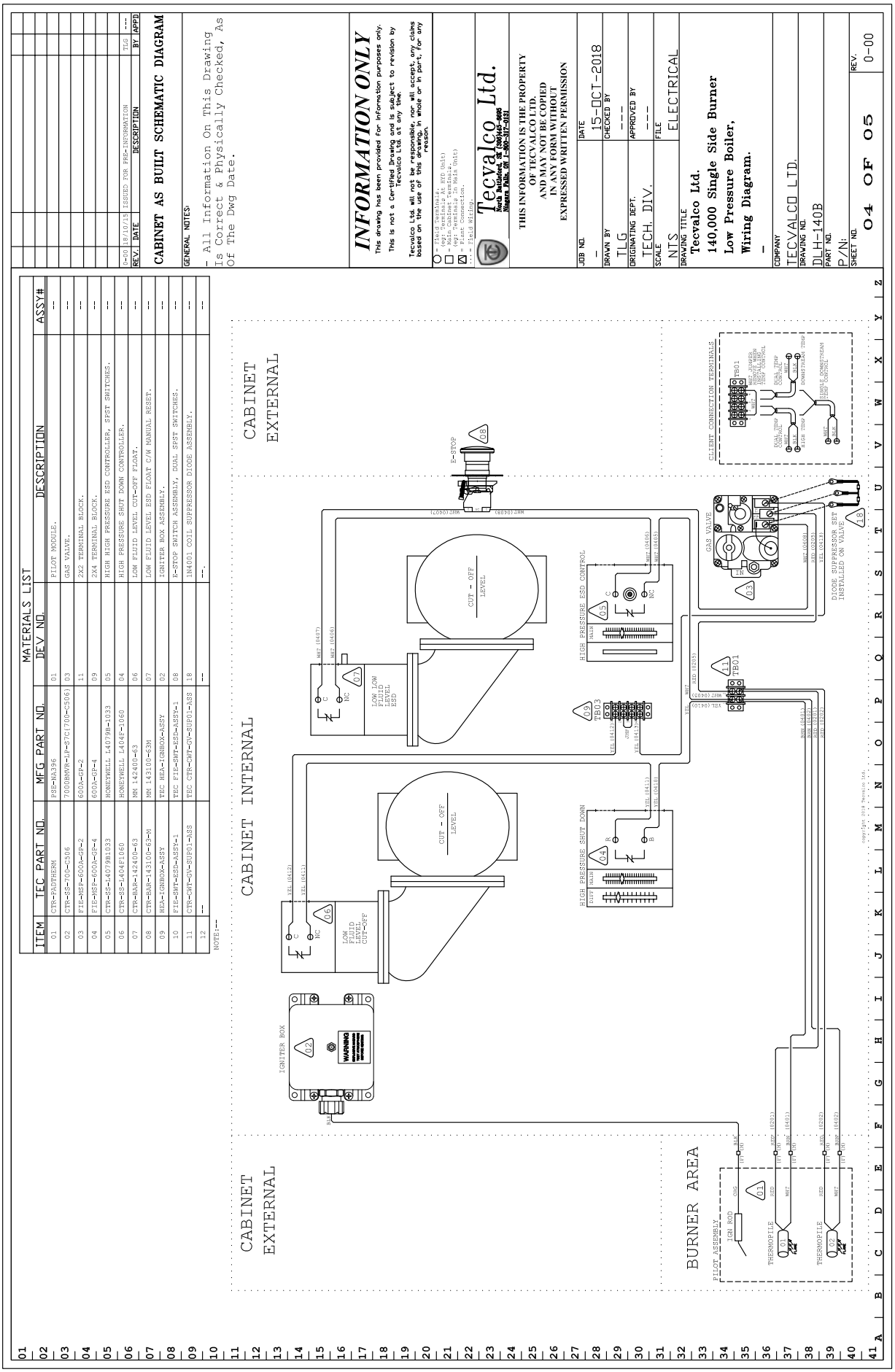
DRAWN BY TLG
DATE 15-OCT-2018
ORIGINATING DEPT. TECH. DIV.
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
140,000 Single Side Burner
Low Pressure Boiler,
Wiring Diagram.
COMPANY TECVALCO LTD.
DRAWING NO. DLH-140B
SHEET NO. 03 OF 05
REV. 0-00

(Figure 4.1.5c)


MATERIALS LIST
ITEM | TEC PART NO. | MFG PART NO. | DEV NO. | DESCRIPTION | ASSY#
01 | CTR-PSOTHERM | BSD-HA396 | 01 | PILOT MODULE. | --
02 | CTR-SSS-700-CS06 | 700UBMVR-LP-S7C1700-CS06 | 03 | GAS VALVE. | --
03 | FIE-MSB-600A-GP-2 | 600A-GP-2 | 11 | 2X2 TERMINAL BLOCK. | --
04 | FIE-MSP-600A-GP-4 | 600A-GP-4 | 09 | 2X4 TERMINAL BLOCK. | --
05 | CTR-SSS-L4079B1033 | HONEYWELL L4079B-1033 | 05 | HIGH HIGH PRESSURE ESD CONTROLLER, SPST SWITCHES. | --
06 | CTR-SSS-L404F1060 | HONEYWELL L404F-1060 | 04 | HIGH PRESSURE SHUT DOWN CONTROLLER. | --
07 | CTR-SSS-142401-63 | MM 142401-63 | 06 | LOW FLUID LEVEL CUT-OFF FLOAT. | --
08 | CTR-SSS-143101-63-M | MM 143101-63M | 07 | LOW FLUID LEVEL ESD FLOAT C/W MANUAL RESET. | --
09 | HEA-IGNBOX-ASSY | TEC HEA-IGNBOX-ASSY | 02 | IGNITER BOX ASSEMBLY. | --
10 | FIE-SWT-ESTS-ASSY-1 | TEC FIE-SWT-ESTS-ASSY-1 | 08 | E-STOP SWITCH ASSEMBLY, DUAL SPST SWITCHES. | --
11 | CTR-SWT-GV-S0P01-ASS | TEC CTR-SWT-GV-S0P01-ASS | 18 | 184001 COIL SUPPRESSOR DIODE ASSEMBLY. | --
12 | -- | | -- | -. | --
NOTE:-
CABINET EXTERNAL
CABINET INTERNAL
CABINET EXTERNAL
BURNER AREA
IGNITER BOX
WARNING
PILOT ASSEMBLY
IGN ROD
THERMOPILE
THERMOPILE
LOW FLUID LEVEL CUT-OFF
LOW LOW FLUID LEVEL ESD
CUT - OFF LEVEL
CUT - OFF LEVEL
HIGH PRESSURE SHUT DOWN
HIGH PRESSURE ESD CONTROL
GAS VALVE
E-STOP
CLIENT CONNECTION TERMINALS
TB01
DIODE SUPPRESSOR SET INSTALLED ON VALVE
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DATE 15-OCT-2018
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CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.
APPROVED BY ---
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
140,000 Single Side Burner
Low Pressure Boiler,
Wiring Diagram.
-
COMPANY TECVALCO LTD.
DRAWING NO. DLH-140B
PART NO.
P/N:
SHEET NO. 04 OF 05
REV. 0-00
REV. DATE DESCRIPTION BY (APPD)
1-00 18/10/15 ISSUED FOR PRE-INFORMATION TLG ---
CABINET AS BUILT SCHEMATIC DIAGRAM
GENERAL NOTES:
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(Figure 4.1.5d)

MATERIALS LIST

ITEM	TEC PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	DEV RANGE	DEV SET POINT	–
01				ELECTRICAL SECTION			
02	CTR-PADTHERM	PSE-NA396	01/-------/	ASSEMBLY BY PSE,CONTAINS 2: HONEYWELL,Q313A1402 POWER PILE.	-	-	-
03	CTR-SS-L4079B1033	L4079B-1033	05/PSHH-05/	HONEYWELL PRESSURE CONTROLLER, SINGLE SPST SWITCHES, MANUAL RESET.	(1.4/16 PSIG)[9.7/110.3 KPAG]	(10.0 PSIG)[68.9 KPAG]	-
04	CTR-SS-L404F1060	L404F-1060	04/ PSH-04/	HONEYWELL PRESSURE CONTROLLER, SINGLE SPST SWITCHES, AUTO RESET.	(1.4/16 PSIG)[9.7/110.3 KPAG]	(5.0 PSIG)[34.5 KPAG]	-
05	CTR-BAR-142400-63	MM 142400-63	06/ LSL-06/	MCDONALD MILLER LOW FLUID LEVEL CUT-OFF FLOAT (/W SPDT).	-	-	-
06	CTR-BAR-143100-63-M	MM 143100-63M	07/LSLL-07/	MCDONALD MILLER LOW FLUID LEVEL ESD FLOAT (/W SPDT), MANUAL RESET.	-	-	-
07	HEA-IGNBOX-ASSY	HEA-IGNBOX-ASSY	02/-------/	ASSEMBLY BY TECVALCO LTD.,CONTAINS 1: IGNITER MODULE.	-	-	-
08	FIE-SWT-ESD-ASSY-1	FIE-SWT-ESD-ASSY-1	08/-------/	TELEMECANIQUE SWITCH ASSEMBLY (ESD BUTTON,LABEL,BEZEL,1NC BLOCK).	-	-	-
09	CTR-CWT-GV-SUP01-ASS	CTR-CWT-GV-SUP01-ASS	18/-------/	ASSEMBLY BY TECVALCO LTD, 1N4001 COIL SUPPRESSOR DIODE ASSEMBLY.	-	-	-
10				GAS HEADER SECTION			
11	GAU-INCH-2.5-.25-0-15	LP2507L210	--/PI-100,101/	MILJOCO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
12	OR --->	208-00075-611.10	--/PI-100,101/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
13	OR --->	RPG-ES-LP1-254-15	--/PI-100,101/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
14	VAV-SS-FP-2000-.75	--	--/HV-101,103/	VALVE-TEK, 2000#, 3/4", 316-SS, BALL VALVE.	-	-	-
15	VAV-SS-FP-2000-.25	--	--/HV-102/	VALVE-TEK, 2000#, 1/4", 316-SS, BALL VALVE.	-	-	-
16	CTR-SS-700-C506	7000BMVR-LP-S7C[700-C506]	03/XV-103/	ROBERTSHAW, 7000MVR SERIES, LP GAS VALVE, MILLIVOLT APPLICATIONS.	-	-	-
17				STEAM SECTION			
18	GAU-3-9-50-500-S	54-35675-M33	--/ TI-301/	WIKA, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
19	OR --->	RTG-ES-B3B9-RR	--/ TI-301/	BUFFALO, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
20	GAU-2.5-25B-M30P-L	200-06030-233.53	--/ PI-301/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
21	OR --->	RPG-ESSEC201L-254CC	--/ PI-301/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
22	CTR-SP-PRV-13-202-08	13-202-B15	--/PRV-15 /	CONBRACO, 1" PRV, 15 PSIG (103 KPAG) @ 250°F (121°C).	(15 PSIG @ 230°F)[103 KPAG @ 110°C]	(15.0 PSIG)[103.4 KPAG]	-
23	--	--	--	--	-	-	-
24	--	--	--	--	-	-	-
25							
26							
27							
28							
29							
30							

BURNER SPECIFICATIONS

140,000 BTUH BURNER SYSTEM

MAXIMUM REGULATOR INLET PRESSURE: 14.0" H2Og

MAXIMUM BTU / HOUR: 140,000 btuh (#43)
MAXIMUM MANIFOLD PRESSURE: 8.1" H2Og
STD SETUP BTU / HOUR: 140,000 btuh (#43)
STD SETUP MANIFOLD PRESSURE: 8.1" H2Og

MAXIMUM BTU / HOUR PILOT: 1,200 btuh
MAXIMUM WORKING PRESSURE PILOT: 3.5" H2Og

MAIN BURNER ORIFICE SIZE: 0.082" (#43x4)
PILOT BURNER ORIFICE SIZE: 0.022"

NOTES:
1) All 1" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 3/4" Tubing: 304 SS, 0.035 Wall [SCH40].
1) All 3/8" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 1" Nipples: SCH XS, SA-106B.
3) All 3/4" Nipples: SCH XS, SA-106B.
4) All 3/8" Nipples: SCH XS, SA-106B.

LEGEND

STEAM JACKET MOUNTED INSTRUMENTS.	ELECTRICAL CONTROL INSTRUMENT TAGS.	GAS CONTROL SYSTEM TAGS.	EXTERNAL INPUTS OR OUTPUTS FROM SYSTEM.	CUSTOM HOUSING TO HOLD SPARK GENERATOR.	SPARK GENERATOR.	MALE OR FEMALE RING CONNECTOR.
LEVEL CONTROL, NC, OPEN ON DECREASE.	PRESSURE CONTROL, NC, OPEN ON INCREASE.	EXTERNAL CABLED CLIENT CONNECTION.	CONTROL AND OPERATOR SWITCHES.	SOLENOID CONTROL VALVE.	750MV POWER PILE GENERATOR.	BATTERY POWER CELLS.
MANUAL GAS CONTROL BALL VALVE.	PRESSURE CONTROL VALVE - REGULATOR.	PRESSURE SAFETY VALVE.	GAUGE - PRESSURE.	ROBERTSHAW - PRESS & HOLD PILOT VALVE.	ROBERTSHAW - MAIN GAS VALVE ACTUATOR.	ROBERTSHAW - MAIN GAS CONTROL VALVE.

REV.	DATE	DESCRIPTION	BY	APPD
0-00	18/10/15	ISSUED FOR PRE-INFORMATION	TLG	---

PARTS LIST / SETTINGS / LEGEND

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○ = Field Terminals. (eg: Terminals At HYD Unit)
□ = Main Cabinet Terminals. (eg: Terminals In Main Unit)
△ = Plant Connection.
---- = Field Wiring.

Tecvalco Ltd.
North Battleford, SK (306)445-0805
Niagara Falls, ON 1-800-317-0131

JOB NO. –	DATE 15-OCT-2018
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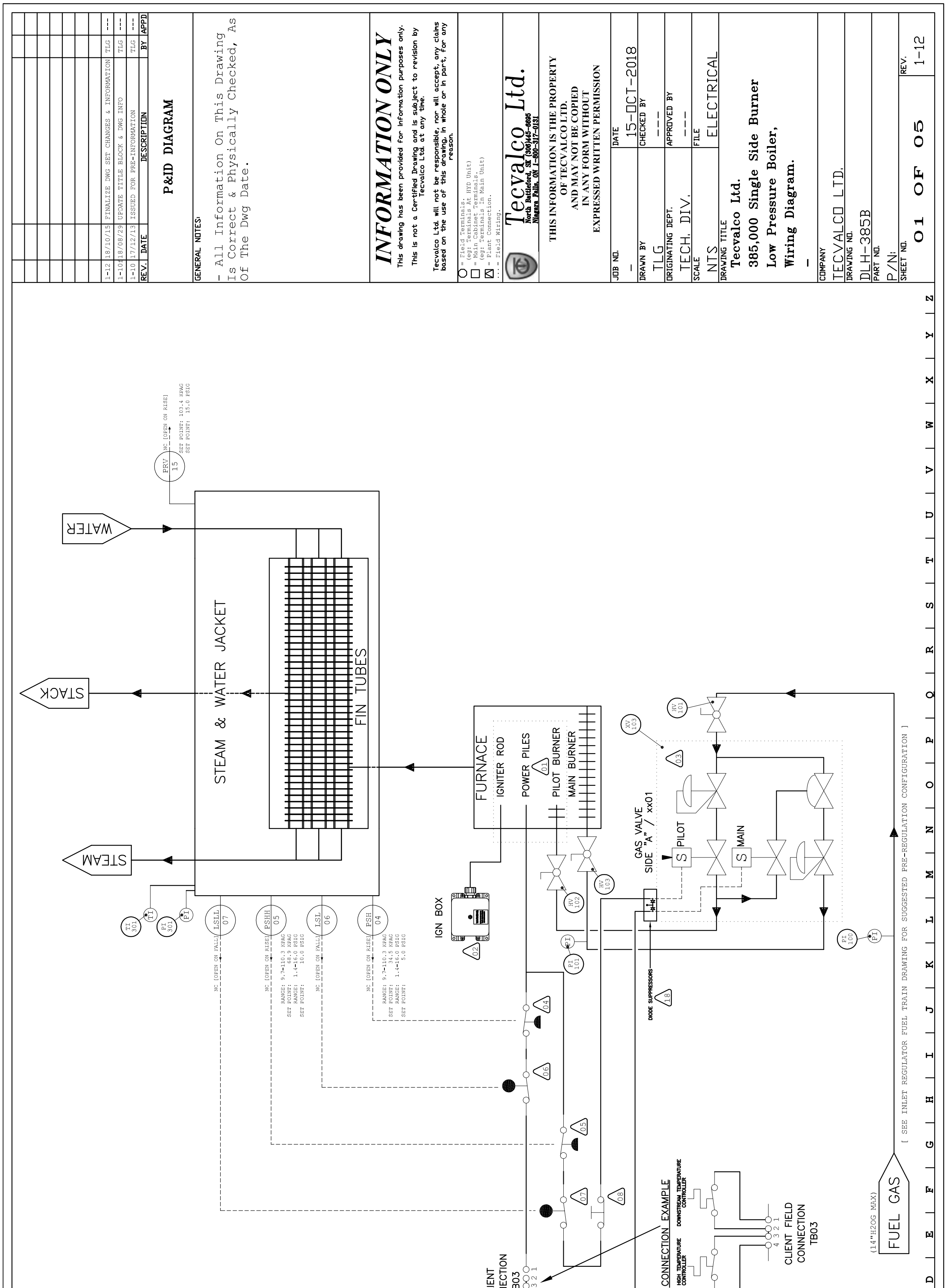
ORIGINATING DEPT. TECH. DIV.	APPROVED BY ---
SCALE NTS	FILE ELECTRICAL

DRAWING TITLE
Tecvalco Ltd.
140,000 Single Side Burner Low Pressure Boiler, Wiring Diagram.
–

COMPANY: TECVALCO LTD.
DRAWING NO.: DLH-140B
PART NO.: P/N:
SHEET NO.: 05 OF 05
REV.: 0-00

(Figure 4.1.5e)


STEAM & WATER JACKET
FIN TUBES
STACK
WATER
STEAM
FURNACE
IGNITER ROD
POWER PILES
PILOT BURNER
MAIN BURNER
IGN BOX
GAS VALVE SIDE "A" / xx01
PILOT
MAIN
DIODE SUPPRESSORS
FUEL GAS
(14"H2OG MAX)
[SEE INLET REGULATOR FUEL TRAIN DRAWING FOR SUGGESTED PRE-REGULATION CONFIGURATION]
CLIENT CONNECTION TB03
CONNECTION EXAMPLE
CLIENT FIELD CONNECTION TB03
P&ID DIAGRAM
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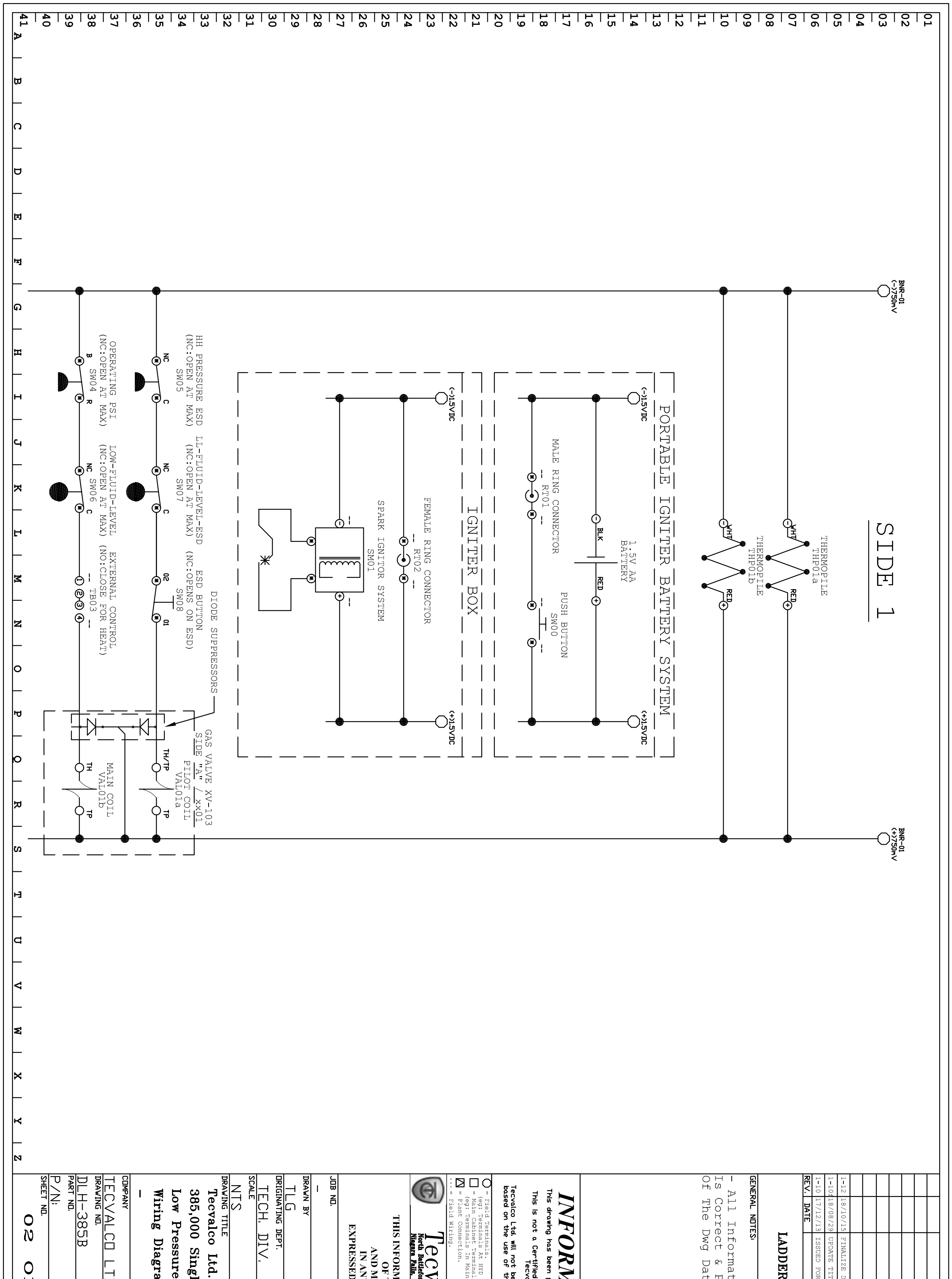
ORIGINATING DEPT. TECH. DIV.
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE Tecvalco Ltd. 385,000 Single Side Burner Low Pressure Boiler, Wiring Diagram.
COMPANY TECVALCO LTD.
DRAWING NO. DLH-385B
SHEET NO. 01 OF 05
REV. 1-12

(Figure 4.1.5f)


SIDE 1
THERMOPILE THP01a
THERMOPILE THP01b
PORTABLE IGNITER BATTERY SYSTEM
1.5V AA BATTERY
MALE RING CONNECTOR -- RT01 --
PUSH BUTTON SW00
IGNITER BOX
FEMALE RING CONNECTOR -- RT02 --
SPARK IGNITOR SYSTEM SM01
DIODE SUPPRESSORS
HH PRESSURE ESD (NC:OPEN AT MAX) SW05
LL-FLUID-LEVEL-ESD (NC:OPEN AT MAX) SW07
ESD BUTTON (NC:OPENS ON ESD) SW08
OPERATING PSI (NC:OPEN AT MAX) SW04
LOW-FLUID-LEVEL (NC:OPEN AT MAX) SW06
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) -- TB03 --
GAS VALVE XV-103 SIDE "A" / xx01
PILOT COIL VAL01a
MAIN COIL VAL01b
LADDER LOGIC DIAGRAM
GENERAL NOTES:
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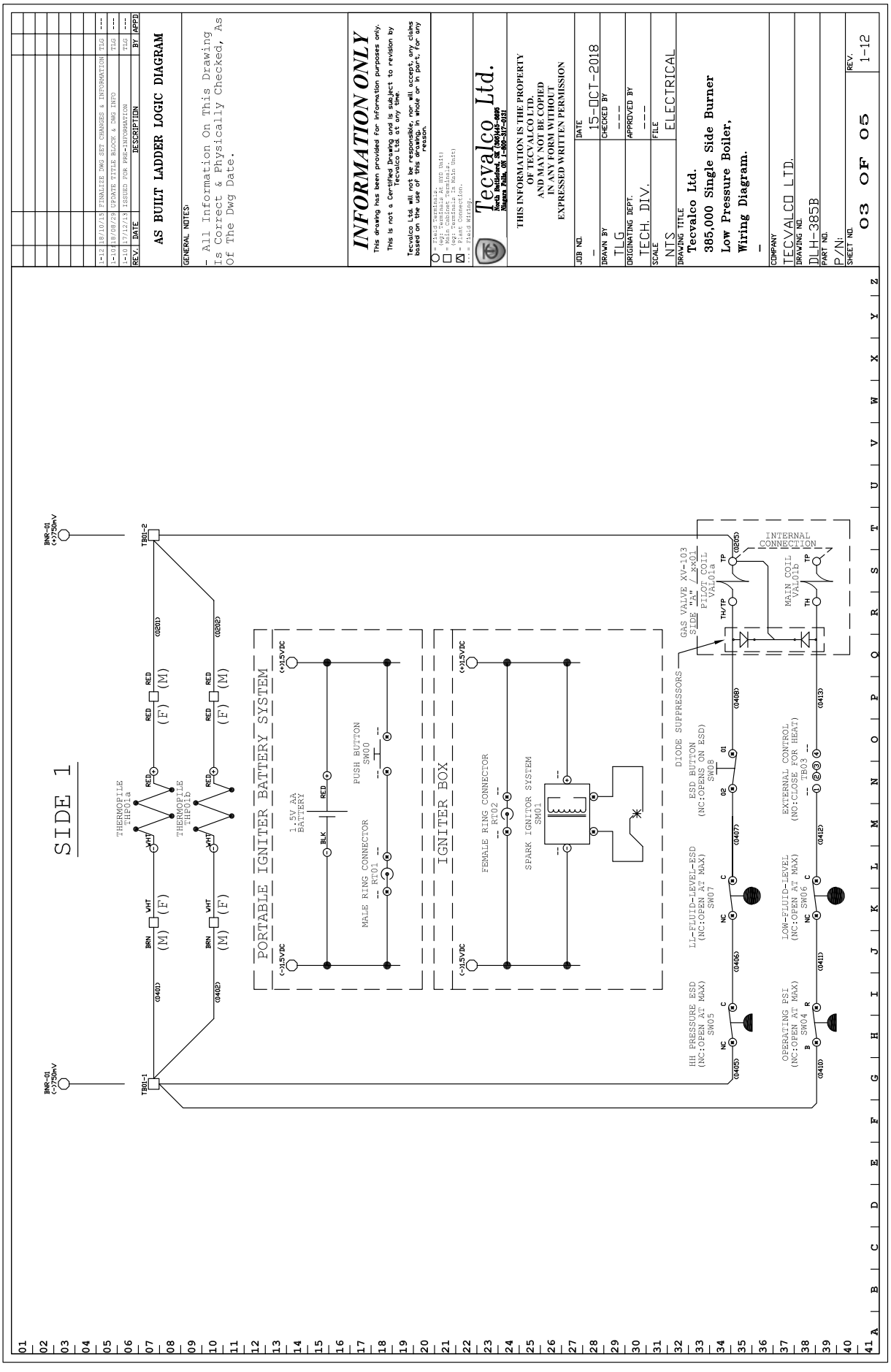
ORIGINATING DEPT. TECH. DIV.
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
385,000 Single Side Burner
Low Pressure Boiler,
Wiring Diagram.
COMPANY TECVALCO LTD.
DRAWING NO. DLH-385B
SHEET NO. 02 OF 05
REV. 1-12

(Figure 4.1.5g)


SIDE 1
PORTABLE IGNITER BATTERY SYSTEM
IGNITER BOX
1.5V AA BATTERY
MALE RING CONNECTOR
PUSH BUTTON SW00
FEMALE RING CONNECTOR
SPARK IGNITOR SYSTEM SW01
DIODE SUPPRESSORS
GAS VALVE XV-103
PILOT COIL VAL01a
MAIN COIL VAL01b
INTERNAL CONNECTION
ESD BUTTON (NC:OPENS ON ESD) SW08
LL-FLUID-LEVEL-ESD (NC:OPEN AT MAX) SW07
LOW-FLUID-LEVEL (NC:OPEN AT MAX) SW06
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) TB03
HH PRESSURE ESD (NC:OPEN AT MAX) SW05
OPERATING PSI (NC:OPEN AT MAX) SW04
THERMOPILE TH01a
THERMOPILE TH01b
AS BUILT LADDER LOGIC DIAGRAM
INFORMATION ONLY
Tecvalco Ltd.
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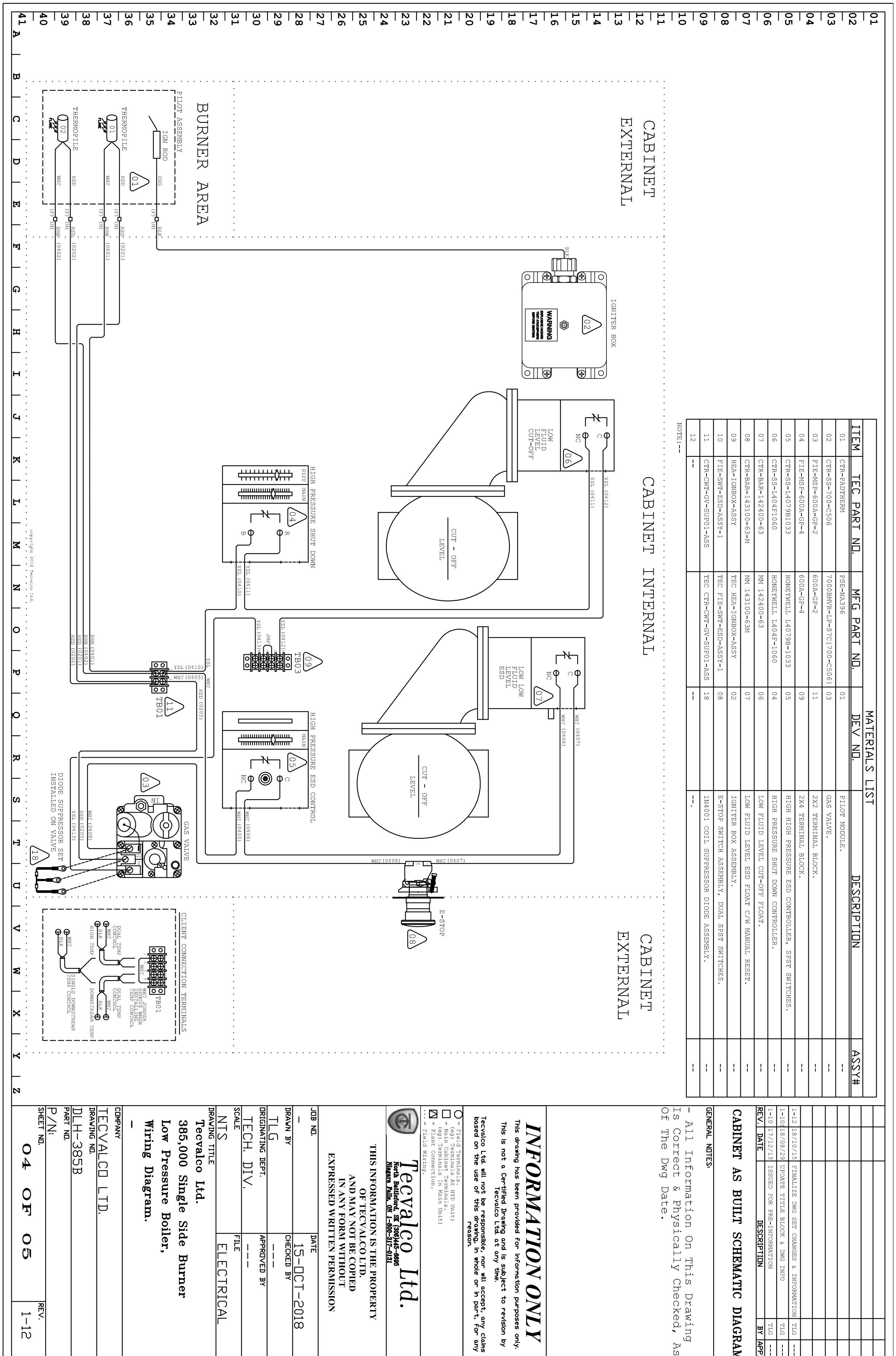
Tecvalco Ltd.
385,000 Single Side Burner
Low Pressure Boiler,
Wiring Diagram.
TECVALCO LTD.
DLH-385B
03 OF 05
1-12

(Figure 4.1.5h)



MATERIALS LIST

ITEM	TEC PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	ASSY#
01	CTR-PADTHERM	PSE-NA396	01	PILOT MODULE.	--
02	CTR-SS-700-C506	7000BMVR-LP-S7C(700-C506)	03	GAS VALVE.	--
03	FIE-MSP-600A-GP-2	600A-GP-2	11	2X2 TERMINAL BLOCK.	--
04	FIE-MSP-600A-GP-4	600A-GP-4	09	2X4 TERMINAL BLOCK.	--
05	CTR-SS-L4079B1033	HONEYWELL L4079B-1033	05	HIGH HIGH PRESSURE ESD CONTROLLER, SPST SWITCHES.	--
06	CTR-SS-L404F1060	HONEYWELL L404F-1060	04	HIGH PRESSURE SHUT DOWN CONTROLLER.	--
07	CTR-BAR-142400-63	MM 142400-63	06	LOW FLUID LEVEL CUT-OFF FLOAT.	--
08	CTR-BAR-143100-63-M	MM 143100-63M	07	LOW FLUID LEVEL ESD FLOAT C/W MANUAL RESET.	--
09	HEA-IGNBOX-ASSY	TEC HEA-IGNBOX-ASSY	02	IGNITER BOX ASSEMBLY.	--
10	FIE-SWT-ESD-ASSY-1	TEC FIE-SWT-ESD-ASSY-1	08	E-STOP SWITCH ASSEMBLY, DUAL SPST SWITCHES.	--
11	CTR-CWT-GV-SUP01-ASS	TEC CTR-CWT-GV-SUP01-ASS	18	1N4001 COIL SUPPRESSOR DIODE ASSEMBLY.	--
12	--		--	--.	--

NOTE:--

(Figure 4.1.5i)

MATERIALS LIST

ITEM	TEC PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	DEV RANGE	DEV SET POINT	-
01				ELECTRICAL SECTION			
02	CTR-PADTHERM	PSE-NA396	01/-------/	ASSEMBLY BY PSE,CONTAINS 2: HONEYWELL,Q313A1402 POWER PILE.	-	-	-
03	CTR-SS-L4079B1033	L4079B-1033	05/PSHH-05/	HONEYWELL PRESSURE CONTROLLER, SINGLE SPST SWITCHES, MANUAL RESET.	(1.4/16 PSIG)[9.7/110.3 KPAG]	(10.0 PSIG)[68.9 KPAG]	-
04	CTR-SS-L404F1060	L404F-1060	04/ PSH-04/	HONEYWELL PRESSURE CONTROLLER, SINGLE SPST SWITCHES, AUTO RESET.	(1.4/16 PSIG)[9.7/110.3 KPAG]	(5.0 PSIG)[34.5 KPAG]	-
05	CTR-BAR-142400-63	MM 142400-63	06/ LSL-06/	MCDONALD MILLER LOW FLUID LEVEL CUT-OFF FLOAT (/W SPDT).	-	-	-
06	CTR-BAR-143100-63-M	MM 143100-63M	07/LSLL-07/	MCDONALD MILLER LOW FLUID LEVEL ESD FLOAT (/W SPDT), MANUAL RESET.	-	-	-
07	HEA-IGNBOX-ASSY	HEA-IGNBOX-ASSY	02/-------/	ASSEMBLY BY TECVALCO LTD.,CONTAINS 1: IGNITER MODULE.	-	-	-
08	FIE-SWT-ESD-ASSY-1	FIE-SWT-ESD-ASSY-1	08/-------/	TELEMECANIQUE SWITCH ASSEMBLY (ESD BUTTON,LABEL,BEZEL,1NC BLOCK).	-	-	-
09	CTR-CWT-GV-SUP01-ASS	CTR-CWT-GV-SUP01-ASS	18/-------/	ASSEMBLY BY TECVALCO LTD, 1N4001 COIL SUPPRESSOR DIODE ASSEMBLY.	-	-	-
10				GAS HEADER SECTION			
11	GAU-INCH-2.5-.25-0-15	LP2507L210	--/PI-100,101/	MILJOCO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
12	OR --->	208-00075-611.10	--/PI-100,101/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
13	OR --->	RPG-ES-LP1-254-15	--/PI-100,101/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
14	VAV-SS-FP-2000-.75	--	--/HV-101,103/	VALVE-TEK, 2000#, 3/4", 316-SS, BALL VALVE.	-	-	-
15	VAV-SS-FP-2000-.25	--	--/HV-102/	VALVE-TEK, 2000#, 1/4", 316-SS, BALL VALVE.	-	-	-
16	CTR-SS-700-C506	7000BMVR-LP-S7C(700-C506)	03/XV-103/	ROBERTSHAW, 7000MVR SERIES, LP GAS VALVE, MILLIVOLT APPLICATIONS.	-	-	-
17				STEAM SECTION			
18	GAU-3-9-50-500-S	54-35675-M33	--/ TI-301/	WIKA, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
19	OR --->	RTG-ES-B3B9-RR	--/ TI-301/	BUFFALO, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
20	GAU-2.5-25B-M30P-L	200-06030-233.53	--/ PI-301/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
21	OR --->	RPG-ESSEC201L-254CC	--/ PI-301/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
22	CTR-SP-PRV-13-202-08	13-202-B15	--/PRV-15 /	CONBRACO, 1" PRV, 15 PSIG (103 KPAG) @ 250°F (121°C).	(15 PSIG @ 230°F)[103 KPAG @ 110°C]	(15.0 PSIG)[103.4 KPAG]	-
23	--	--	--	--	-	-	-
24	--	--	--	--	-	-	-
25							
26							
27							
28							
29							
30							

BURNER SPECIFICATIONS

385,000 BTUH BURNER SYSTEM

MAXIMUM REGULATOR INLET PRESSURE: 14.0" H2Og

MAXIMUM BTU / HOUR: 385,000 btuh (#42)
MAXIMUM MANIFOLD PRESSURE: 9.5" H2Og
STD SETUP BTU / HOUR: 288,000 btuh (#45)
STD SETUP MANIFOLD PRESSURE: 9.5" H2Og

MAXIMUM BTU / HOUR PILOT: 1,200 btuh
MAXIMUM WORKING PRESSURE PILOT: 3.5" H2Og

MAIN BURNER ORIFICE SIZE: 0.082" (#45x11)
PILOT BURNER ORIFICE SIZE: 0.022"

NOTES:
1) All 1" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 3/4" Tubing: 304 SS, 0.035 Wall [SCH40].
1) All 3/8" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 1" Nipples: SCH XS, SA-106B.
3) All 3/4" Nipples: SCH XS, SA-106B.
4) All 3/8" Nipples: SCH XS, SA-106B.

LEGEND

STEAM JACKET MOUNTED INSTRUMENTS.	ELECTRICAL CONTROL INSTRUMENT TAGS.	GAS CONTROL SYSTEM TAGS.	EXTERNAL INPUTS OR OUTPUTS FROM SYSTEM.	CUSTOM HOUSING TO HOLD SPARK GENERATOR.	SPARK GENERATOR.	MALE OR FEMALE RING CONNECTOR.
LEVEL CONTROL, NC, OPEN ON DECREASE.	PRESSURE CONTROL, NC, OPEN ON INCREASE.	EXTERNAL CABLED CLIENT CONNECTION.	CONTROL AND OPERATOR SWITCHES.	SOLENOID CONTROL VALVE.	750MV POWER PILE GENERATOR.	BATTERY POWER CELLS.
MANUAL GAS CONTROL BALL VALVE.	PRESSURE CONTROL VALVE - REGULATOR.	PRESSURE SAFETY VALVE.	GAUGE - PRESSURE.	ROBERTSHAW - PRESS & HOLD PILOT VALVE.	ROBERTSHAW - MAIN GAS VALVE ACTUATOR.	ROBERTSHAW - MAIN GAS CONTROL VALVE.

REV.	DATE	DESCRIPTION	BY	APPD
1-12	18/10/15	FINALIZE DWG SET CHANGES & INFORMATION	TLG	---
1-11	18/08/29	UPDATE TITLE BLOCK & DWG INFO	TLG	---
1-10	17/12/13	ISSUED FOR PRE-INFORMATION	TLG	---

PARTS LIST / SETTINGS / LEGEND

GENERAL NOTES:

- All Information On This Drawing Is Correct & Physically Checked, As Of The Dwg Date.

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○ = Field Terminals.
(eg: Terminals At HYD Unit)
□ = Main Cabinet Terminals.
(eg: Terminals In Main Unit)
△ = Plant Connection.
---- = Field Wiring.

Tecvalco Ltd.
North Battleford, SK (306)445-6805
Niagara Falls, ON 1-800-317-0151

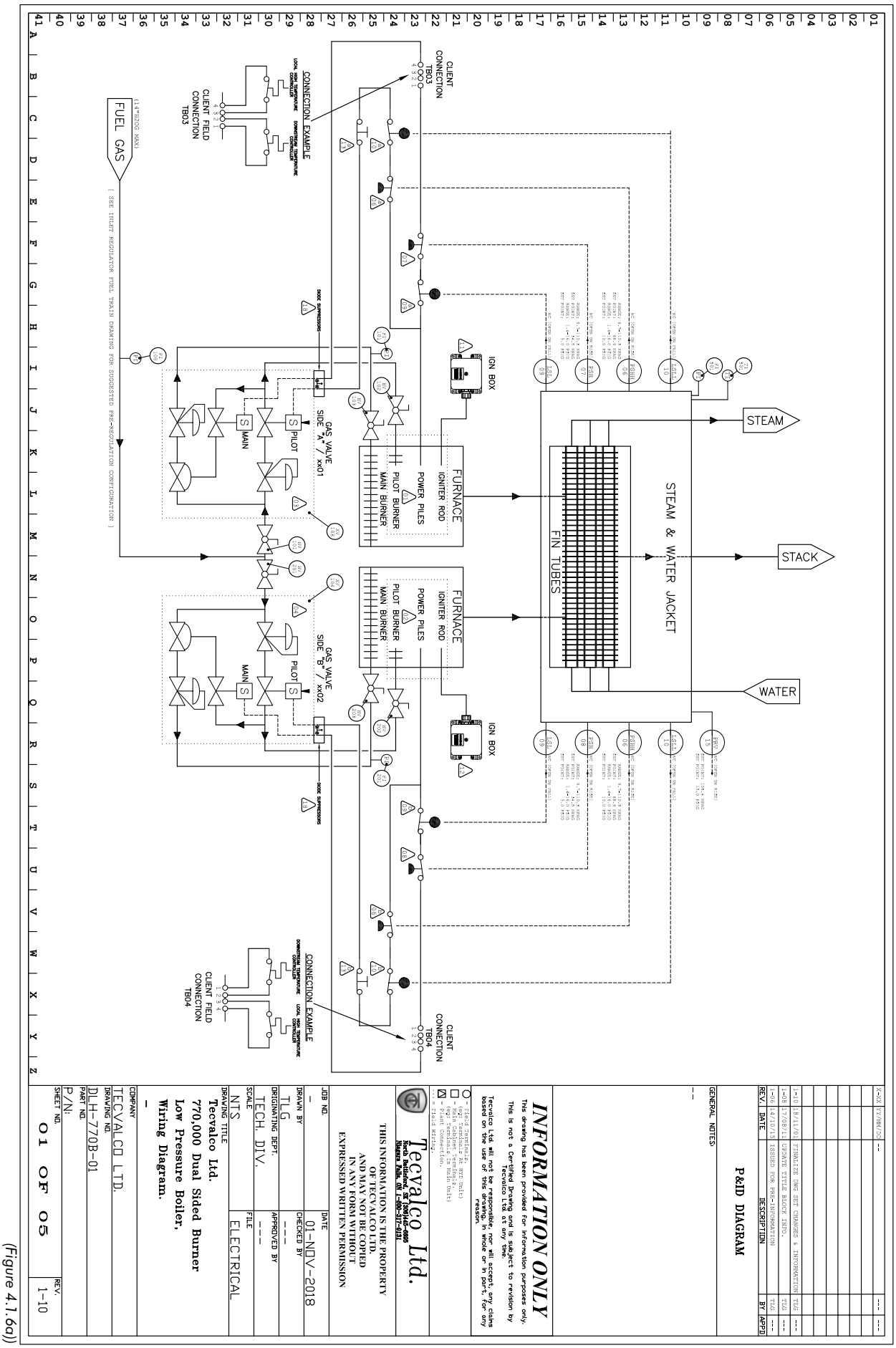
JOB NO. --	DATE 15-OCT-2018
DRAWN BY TLG	CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.	APPROVED BY ---
SCALE NTS	FILE ELECTRICAL

DRAWING TITLE
Tecvalco Ltd.
385,000 Single Side Burner
Low Pressure Boiler,
Wiring Diagram.
-

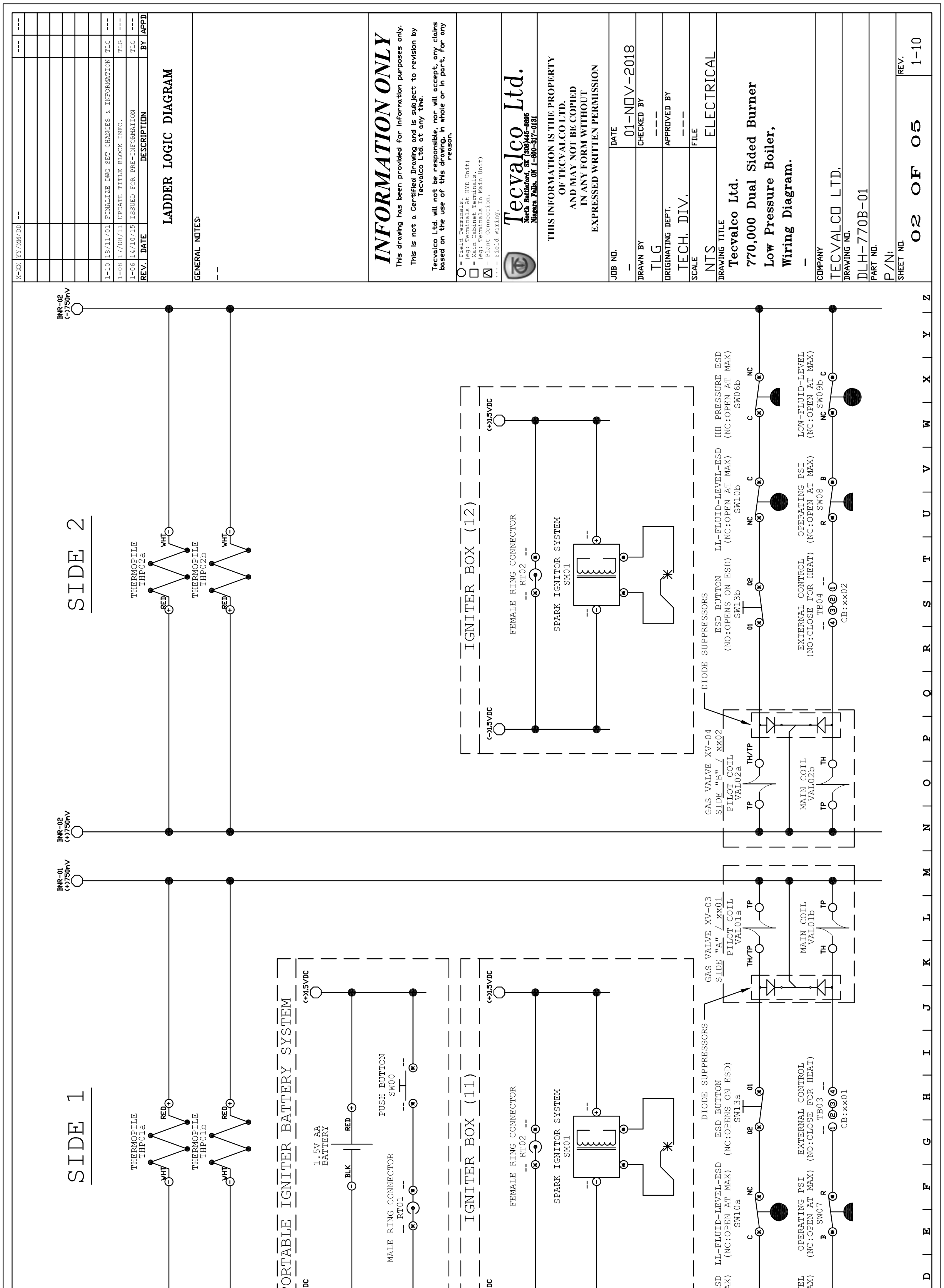
COMPANY: TECVALCO LTD.
DRAWING NO.: DLH-385B
PART NO.: P/N:
SHEET NO.: 05 OF 05
REV.: 1-12

(Figure 4.1.5j)

4.1.6
P&ID
DRAWINGS



(Figure 4.1.6a))


LADDER LOGIC DIAGRAM
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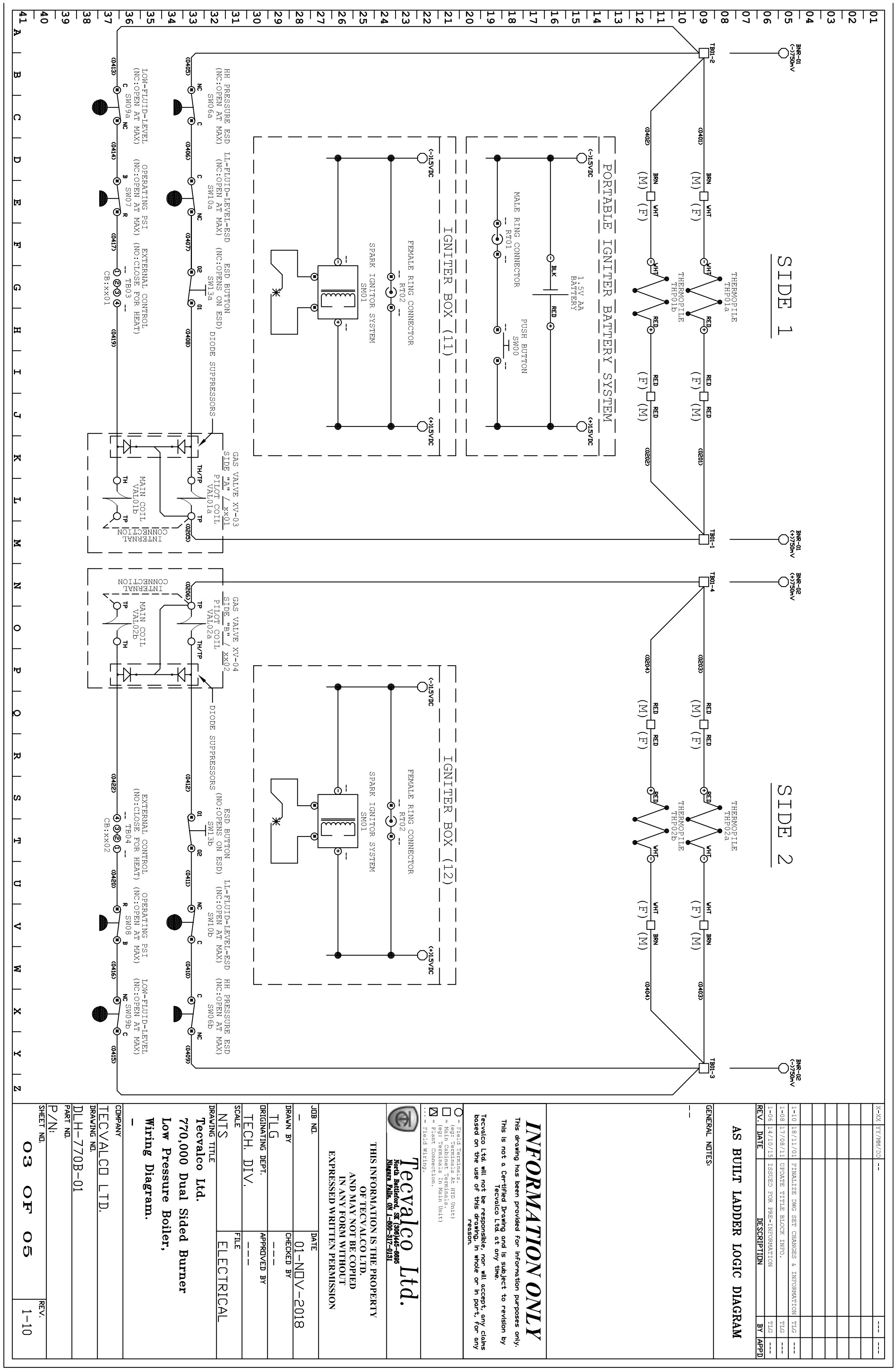
01-NOV-2018
TLG
TECH. DIV.
NTS
ELECTRICAL
Tecvalco Ltd.
770,000 Dual Sided Burner
Low Pressure Boiler,
Wiring Diagram.
TECVALCO LTD.
DLH-770B-01
02 OF 05
1-10
SIDE 1
SIDE 2
PORTABLE IGNITER BATTERY SYSTEM
IGNITER BOX (11)
IGNITER BOX (12)
THERMOPILE THP01a
THERMOPILE THP01b
THERMOPILE THP02a
THERMOPILE THP02b
SPARK IGNITOR SYSTEM SM01
FEMALE RING CONNECTOR RT02
MALE RING CONNECTOR RT01
PUSH BUTTON SW00
1.5V AA BATTERY
DIODE SUPPRESSORS
GAS VALVE XV-03 SIDE "A" / xx01
GAS VALVE XV-04 SIDE "B" / xx02
HH PRESSURE ESD (NC:OPEN AT MAX) SW06a
LL-FLUID-LEVEL-ESD (NC:OPEN AT MAX) SW10a
ESD BUTTON (NC:OPENS ON ESD) SW13a
LOW-FLUID-LEVEL (NC:OPEN AT MAX) SW09a
OPERATING PSI (NC:OPEN AT MAX) SW07
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) TB03
CB:xx01
CB:xx02

(Figure 4.1.6b)

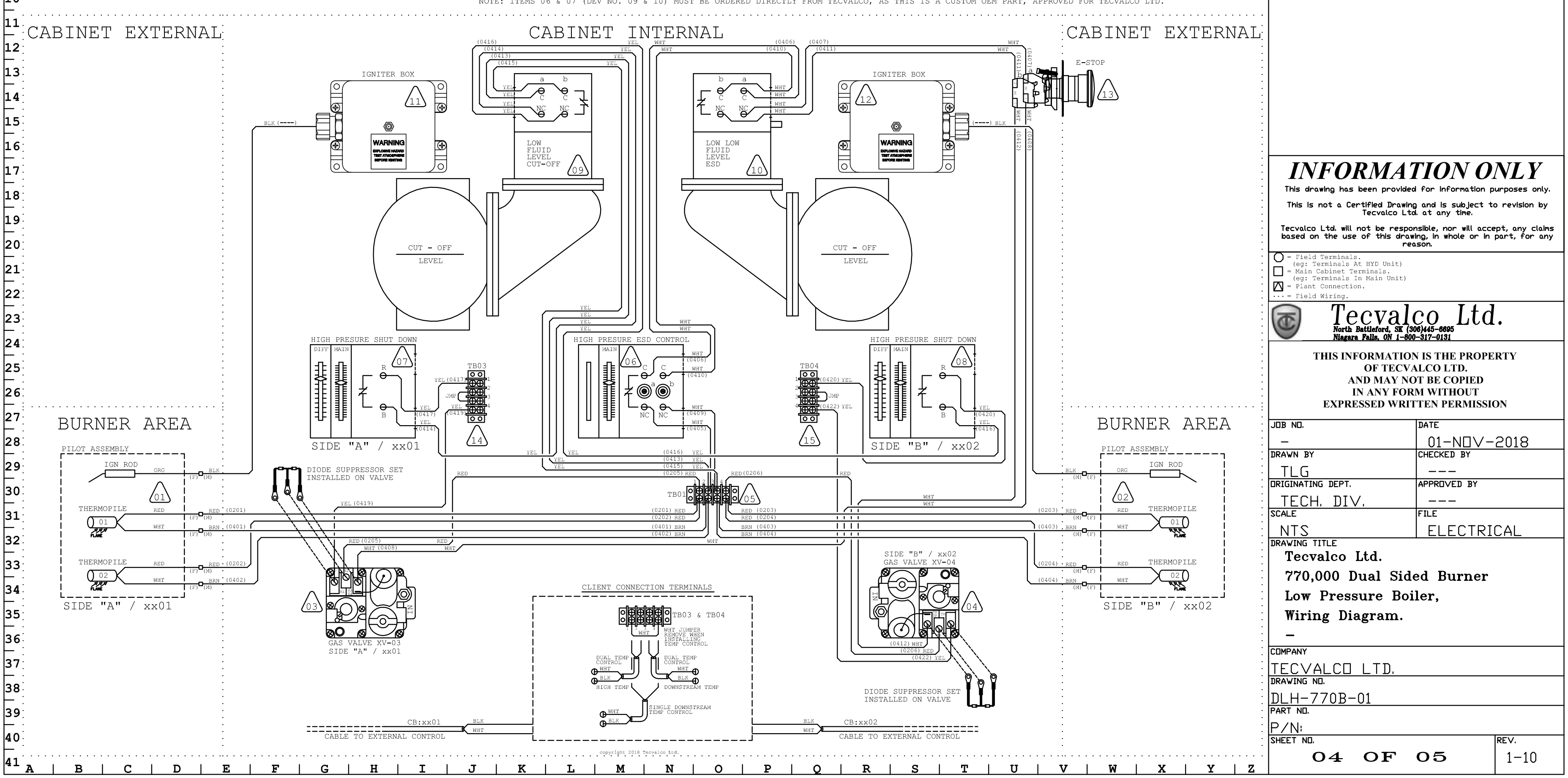

SIDE 1
SIDE 2
PORTABLE IGNITER BATTERY SYSTEM
IGNITER BOX (11)
IGNITER BOX (12)
AS BUILT LADDER LOGIC DIAGRAM
INFORMATION ONLY
Tecvalco Ltd.
770,000 Dual Sided Burner
Low Pressure Boiler,
Wiring Diagram.
DLH-770B-01
03 OF 05

(Figure 4.1.6c)

MATERIALS LIST

ITEM	TEC PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	ASSY#
01	CTR-PADTHERM	PSE-NA396	01 & 02	PILOT MODULE.	--
02	CTR-SS-700-C506	7000BMVR-LP-S7C(700-C506)	03 & 04	GAS VALVE.	--
03	FIE-MSP-600A-GP-4	600A-GP-4	05	2X4 TERMINAL BLOCK.	--
04	CTR-SS-L4079A1035	HONEYWELL L4079A-1035	06	HIGH HIGH PRESSURE ESD CONTROLLER, DUAL SPST SWITCHES.	--
05	CTR-SS-L404F1060	HONEYWELL L404F-1060	07 & 08	HIGH PRESSURE SHUT DOWN CONTROLLER.	--
06	CTR-BAR-142400-63-DPDT	MM 142400-63	09	LOW FLUID LEVEL CUT-OFF FLOAT (/W DPDT).	--
07	CTR-BAR-143100-63-M-DPDT	MM 143100-63M	10	LOW FLUID LEVEL ESD FLOAT (/W DPDT) C/W MANUAL RESET.	--
08	HEA-IGNBOX-ASSY	TEC HEA-IGNBOX-ASSY	11 & 12	IGNITER BOX ASSEMBLY.	--
09	FIE-SWT-ESD-ASSY-2	TEC FIE-SWT-ESD-ASSY-2	13	E-STOP SWITCH ASSEMBLY, DUAL SPST SWITCHES.	--
10	--	--	--	--.	--
11	--	--	--	--.	--
12					

NOTE: ITEMS 06 & 07 (DEV NO. 09 & 10) MUST BE ORDERED DIRECTLY FROM TECVALCO, AS THIS IS A CUSTOM OEM PART, APPROVED FOR TECVALCO LTD.


CABINET EXTERNAL
CABINET INTERNAL
CABINET EXTERNAL
IGNITER BOX
E-STOP
LOW FLUID LEVEL CUT-OFF
LOW LOW FLUID LEVEL ESD
CUT - OFF LEVEL
HIGH PRESURE SHUT DOWN
HIGH PRESURE ESD CONTROL
SIDE "A" / xx01
SIDE "B" / xx02
TB03
TB04
TB01
BURNER AREA
PILOT ASSEMBLY
IGN ROD
THERMOPILE
DIODE SUPPRESSOR SET INSTALLED ON VALVE
GAS VALVE XV-03 SIDE "A" / xx01
SIDE "B" / xx02 GAS VALVE XV-04
CLIENT CONNECTION TERMINALS
TB03 & TB04
WHT JUMPER REMOVE WHEN INSTALLING TEMP CONTROL
DUAL TEMP CONTROL
HIGH TEMP
DOWNSTREAM TEMP
SINGLE DOWNSTREAM TEMP CONTROL
CB:xx01
CB:xx02
CABLE TO EXTERNAL CONTROL
1-10 18/11/01 FINALIZE DWG SET CHANGES & INFORMATION TLG
1-08 17/08/11 UPDATE TITLE BLOCK INFO. TLG
1-06 14/10/15 ISSUED FOR PRE-INFORMATION TLG
REV. DATE DESCRIPTION BY APPD
CABINET AS BUILT SCHEMATIC DIAGRAM
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= Main Cabinet Terminals. (eg: Terminals In Main Unit)
= Plant Connection.
= Field Wiring.
Tecvalco Ltd.
North Battleford, SK (306)445-6695
Niagara Falls, ON 1-800-317-0131
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DATE 01-NOV-2018
DRAWN BY TLG
CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.
APPROVED BY ---
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
770,000 Dual Sided Burner
Low Pressure Boiler,
Wiring Diagram.
COMPANY TECVALCO LTD.
DRAWING NO. DLH-770B-01
PART NO. P/N:
SHEET NO. 04 OF 05
REV. 1-10

(Figure 4.1.6d)

MATERIALS LIST

ITEM	TEC PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	DEV RANGE	DEV SET POINT	–
01				ELECTRICAL SECTION			
02	CTR-PADTHERM	PSE-NA396	01/-------/	ASSEMBLY BY PSE,CONTAINS 2: HONEYWELL,Q313A1402 POWER PILE.	-	-	-
03	CTR-PADTHERM	PSE-NA396	02/-------/	ASSEMBLY BY PSE,CONTAINS 2: HONEYWELL,Q313A1402 POWER PILE.	-	-	-
04	CTR-SS-L4079A1035	L4079A-1035	06/PSHH-06/	HONEYWELL PRESSURE CONTROLLER, DUAL SPST SWITCHES, MANUAL RESET.	(1.4/16 PSIG)[9.7/110.3 KPAG]	(10.0 PSIG)[68.9 KPAG]	-
05	CTR-SS-L404F1060	L404F-1060	07/ PSH-07/	HONEYWELL PRESSURE CONTROLLER, SINGLE SPST SWITCHES, AUTO RESET.	(1.4/16 PSIG)[9.7/110.3 KPAG]	(5.0 PSIG)[34.5 KPAG]	-
06	CTR-SS-L404F1060	L404F-1060	08/ PSH-08/	HONEYWELL PRESSURE CONTROLLER, SINGLE SPST SWITCHES, AUTO RESET.	(1.4/16 PSIG)[9.7/110.3 KPAG]	(5.0 PSIG)[34.5 KPAG]	-
07	CTR-BAR-142400-63-DPDT	MM 142400-63	09/ LSL-09/	MCDONALD MILLER LOW FLUID LEVEL CUT-OFF FLOAT (/W DPDT).	-	-	-
08	CTR-BAR-143100-63-M-DPDT	MM 143100-63M	10/LSLL-10/	MCDONALD MILLER LOW FLUID LEVEL ESD FLOAT (/W DPDT), MANUAL RESET.	-	-	-
09	HEA-IGNBOX-ASSY	HEA-IGNBOX-ASSY	11/-------/	ASSEMBLY BY TECVALCO LTD.,CONTAINS 1: IGNITER MODULE.	-	-	-
10	HEA-IGNBOX-ASSY	HEA-IGNBOX-ASSY	12/-------/	ASSEMBLY BY TECVALCO LTD.,CONTAINS 1: IGNITER MODULE.	-	-	-
11	FIE-SWT-ESD-ASSY-2	FIE-SWT-ESD-ASSY-2	13/-------/	TELEMECANIQUE SWITCH ASSEMBLY (ESD BUTTON,LABEL,BEZEL,2NC BLOCKS).	-	-	-
12				GAS HEADER SECTION			
13	GAU-INCH-2.5-.25-0-15	LP2507L210	--/PI-100,101,201/	MILJOCO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
14	OR --->	208-00075-611.10	--/PI-100,101,201/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
15	OR --->	RPG-ES-LP1-254-15	--/PI-100,101,201/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
16	VAV-SS-FP-2000-.75	--	--/HV-101,201,103,203/	VALVE-TEK, 2000#, 3/4", 316-SS, BALL VALVE.	-	-	-
17	VAV-SS-FP-2000-.25	--	--/HV-102,202/	VALVE-TEK, 2000#, 1/4", 316-SS, BALL VALVE.	-	-	-
18	CTR-SS-700-C506	7000BMVR-LP-S7C(700-C506)	03/XV-03/	ROBERTSHAW, 7000MVR SERIES, LP GAS VALVE, MILLIVOLT APPLICATIONS.	-	-	-
19	CTR-SS-700-C506	7000BMVR-LP-S7C(700-C506)	04/XV-04/	ROBERTSHAW, 7000MVR SERIES, LP GAS VALVE, MILLIVOLT APPLICATIONS.	-	-	-
20				STEAM SECTION			
21	GAU-3-9-50-500-S	54-35675-M33	--/ TI-301/	WIKA, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
22	OR --->	RTG-ES-83B9-RR	--/ TI-301/	BUFFALO, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
23	GAU-2.5-25B-M30P-L	200-06030-233.53	--/ PI-301/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
24	OR --->	RPG-ESSEC201L-254CC	--/ PI-301/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
25	CTR-SP-PRV-13-213-08	13-213-B15Q	--/PRV-15 /	CONBRACO, 1-1/4" X 1-1/2" PRV, 15 PSIG (103 KPAG) @ 250°F (121°C).	(15 PSIG @ 230°F)[103 KPAG @ 110°C]	(15.0 PSIG)[103.4 KPAG]	-
26	--	--	--	--	-	-	-
27							
28							
29							
30							

BURNER SPECIFICATIONS

770,000 BTUH BURNER SYSTEM (2 X 385,000 BTUH)

MAXIMUM REGULATOR INLET PRESSURE: 14.0" H2Og

MAXIMUM BTU / HOUR: 770,000 btuh (#38)
MAXIMUM MANIFOLD PRESSURE: 6.9" H2Og
STD SETUP BTU / HOUR: 502,000 btuh (#45)
STD SETUP MANIFOLD PRESSURE: 6.9" H2Og

MAXIMUM BTU / HOUR PILOT: 1,200 btuh
MAXIMUM WORKING PRESSURE PILOT: 3.5" H2Og

MAIN BURNER ORIFICE SIZE: 0.0820" (#45x22)
PILOT BURNER ORIFICE SIZE: 0.0220"

NOTES:
1) All 1" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 3/4" Tubing: 304 SS, 0.035 Wall [SCH40].
1) All 3/8" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 1" Nipples: SCH XS, SA-106B.
3) All 3/4" Nipples: SCH XS, SA-106B.
4) All 3/8" Nipples: SCH XS, SA-106B.

LEGEND

STEAM JACKET MOUNTED INSTRUMENTS.	ELECTRICAL CONTROL INSTRUMENT TAGS.	GAS CONTROL SYSTEM TAGS.	EXTERNAL INPUTS OR OUTPUTS FROM SYSTEM.	CUSTOM HOUSING TO HOLD SPARK GENERATOR.	SPARK GENERATOR.	MALE OR FEMALE RING CONNECTOR.
LEVEL CONTROL, NC, OPEN ON DECREASE.	PRESSURE CONTROL, NC, OPEN ON INCREASE.	EXTERNAL CABLED CLIENT CONNECTION.	PUSH BUTTON MOMENTARY SWITCH, NO CONTACTS.	SOLENOID CONTROL VALVE.	750MV POWER PILE GENERATOR.	BATTERY POWER CELLS.
MANUAL GAS CONTROL BALL VALVE.	PRESSURE CONTROL VALVE - REGULATOR.	PRESSURE SAFETY VALVE.	GAUGE - PRESSURE.	ROBERTSHAW - PRESS & HOLD PILOT VALVE.	ROBERTSHAW - MAIN GAS VALVE ACTUATOR.	ROBERTSHAW - MAIN GAS CONTROL VALVE.

REV.	DATE	DESCRIPTION	BY	APPD
X-XX	YY/MM/DD	--	---	---
1-10	18/11/01	FINALIZE DWG SET CHANGES & INFORMATION	TLG	---
1-08	17/08/11	UPDATE TITLE BLOCK INFO.	TLG	---
1-06	14/10/15	ISSUED FOR PRE-INFORMATION	TLG	---

PARTS LIST / SETTINGS / LEGEND

GENERAL NOTES:
--

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○ - Field Terminals. (eg: Terminals At HYD Unit)
□ - Main Cabinet Terminals. (eg: Terminals In Main Unit)
⍁ - Plant Connection.
- - - Field Wiring.

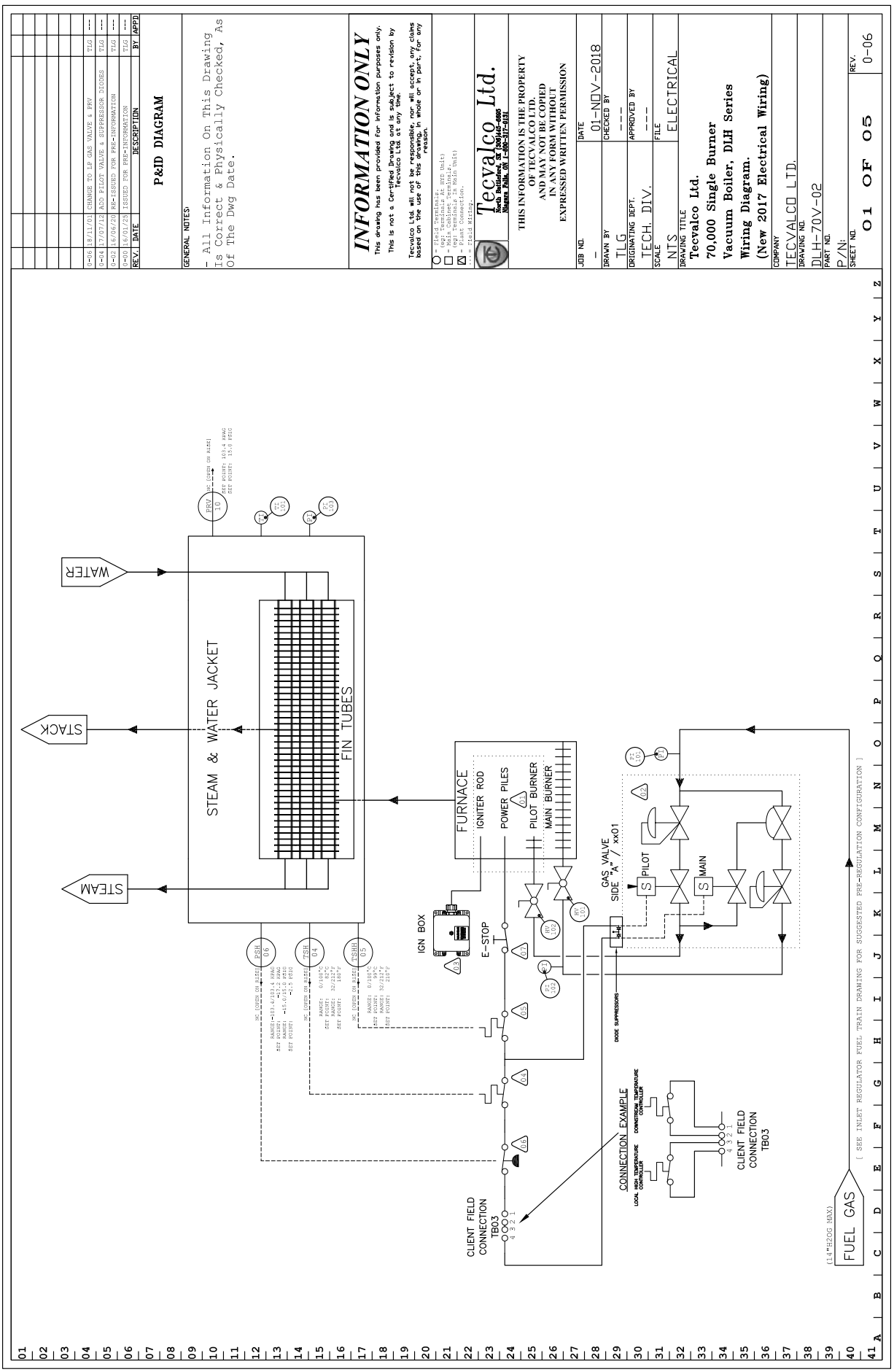
Tecvalco Ltd.
North Battleford, SK (306)445-8695
Niagara Falls, ON 1-800-317-0131

JOB NO. –	DATE 01-NOV-2018
DRAWN BY TLG	CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.	APPROVED BY ---
SCALE NTS	FILE ELECTRICAL

DRAWING TITLE
Tecvalco Ltd.
770,000 Dual Sided Burner
Low Pressure Boiler,
Wiring Diagram.
–

COMPANY: TECVALCO LTD.
DRAWING NO.: DLH-770B-01
PART NO.: P/N:
SHEET NO.: 05 OF 05
REV.: 1-10

(Figure 4.1.6e)


P&ID DIAGRAM
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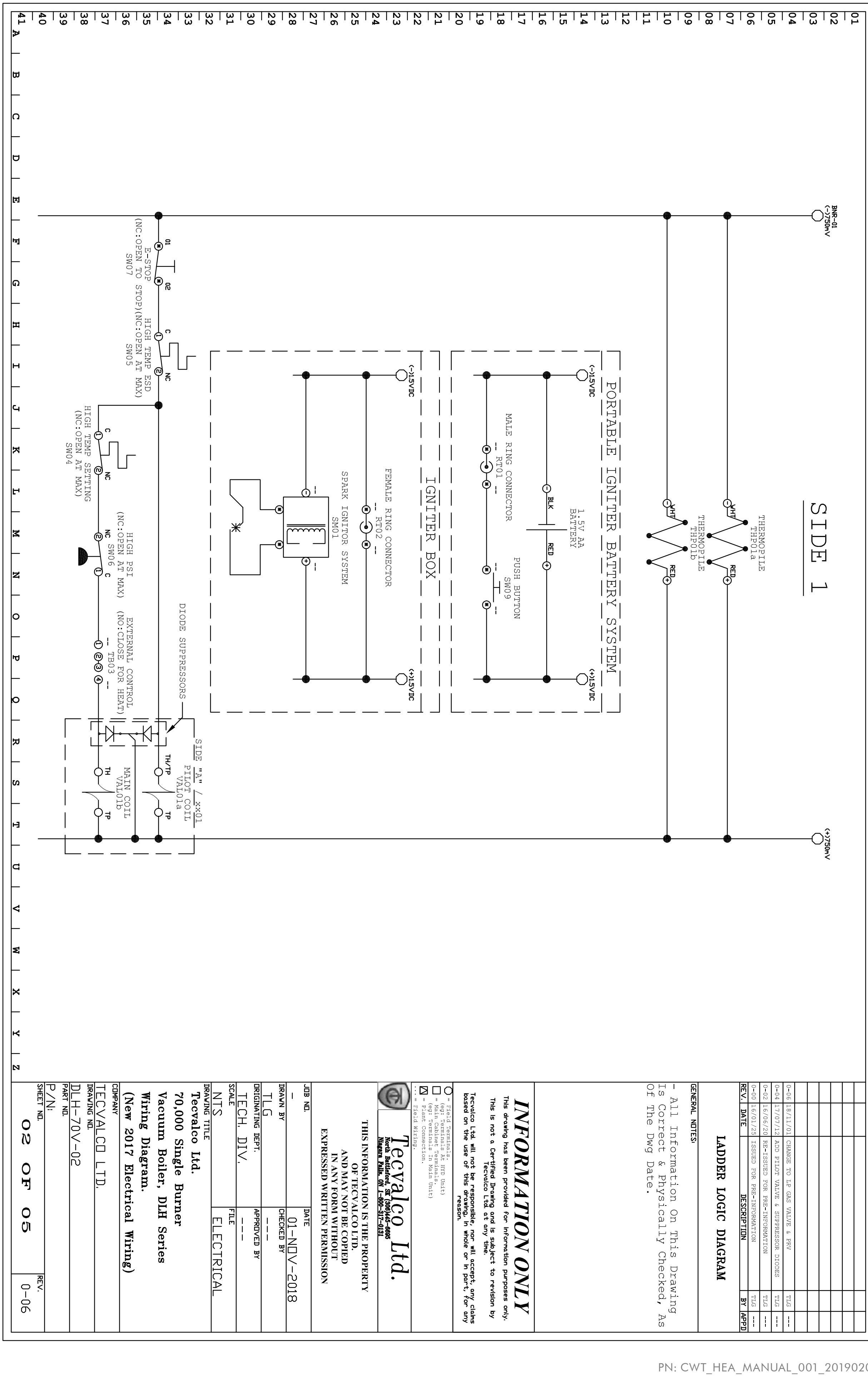
DATE 01-NOV-2018
DRAWN BY TLG
CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.
APPROVED BY ---
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
70,000 Single Burner
Vacuum Boiler, DLH Series
Wiring Diagram.
(New 2017 Electrical Wiring)
COMPANY TECVALCO LTD.
DRAWING NO. DLH-70V-02
PART NO. P/N:
SHEET NO. 01 OF 05
REV. 0-06
WATER
STACK
STEAM
STEAM & WATER JACKET
FIN TUBES
FURNACE
IGNITER ROD
POWER PILES
PILOT BURNER
MAIN BURNER
IGN BOX
E-STOP
GAS VALVE SIDE "A" / xx01
PILOT
MAIN
DIODE SUPPRESSORS
CONNECTION EXAMPLE
CLIENT FIELD CONNECTION TB03
FUEL GAS
[SEE INLET REGULATOR FUEL TRAIN DRAWING FOR SUGGESTED PRE-REGULATION CONFIGURATION]

(Figure 4.1.6f)


SIDE 1
PORTABLE IGNITER BATTERY SYSTEM
IGNITER BOX
THERMOPILE THP01a
THERMOPILE THP01b
1.5V AA BATTERY
PUSH BUTTON SW09
MALE RING CONNECTOR RT01
FEMALE RING CONNECTOR RT02
SPARK IGNITOR SYSTEM SM01
E-STOP (NC:OPEN TO STOP) SW07
HIGH TEMP ESD (NC:OPEN AT MAX) SW05
HIGH TEMP SETTING (NC:OPEN AT MAX) SW04
HIGH PSI (NC:OPEN AT MAX) SW06
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) TB03
DIODE SUPPRESSORS
SIDE "A" / xx01 PILOT COIL VAL01a
MAIN COIL VAL01b
LADDER LOGIC DIAGRAM
GENERAL NOTES:
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INFORMATION ONLY
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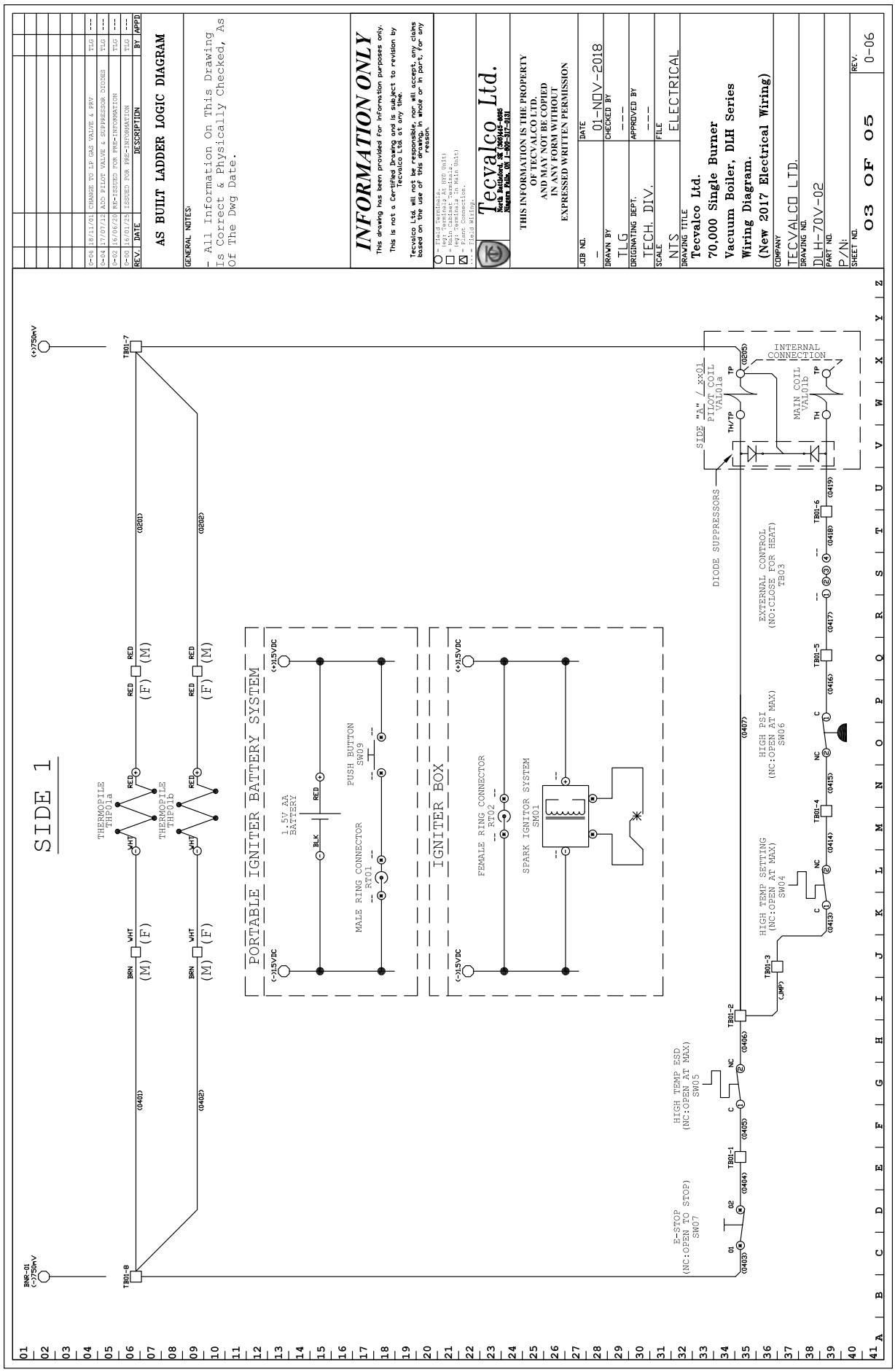
DATE 01-NOV-2018
DRAWN BY TLG
ORIGINATING DEPT. TECH. DIV.
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
70,000 Single Burner
Vacuum Boiler, DLH Series
Wiring Diagram.
(New 2017 Electrical Wiring)
COMPANY TECVALCO LTD.
DRAWING NO. DLH-70V-02
SHEET NO. 02 OF 05
REV. 0-06

(Figure 4.1.6g)


SIDE 1
PORTABLE IGNITER BATTERY SYSTEM
IGNITER BOX
THERMOPILE THP01a
THERMOPILE THP01b
1.5V AA BATTERY
PUSH BUTTON SW09
MALE RING CONNECTOR -- RIG1 --
FEMALE RING CONNECTOR -- RIG2 --
SPARK IGNITOR SYSTEM SM01
E-STOP (NC:OPEN TO STOP) SW07
HIGH TEMP ESD (NC:OPEN At MAX) SW05
HIGH TEMP SETTING (NC:OPEN AT MAX) SW04
HIGH PSI (NC:OPEN AT MAX) SW06
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) TB03
DIODE SUPPRESSORS
SIDE "A" / z:x01 PILOT COIL VAL01a
MAIN COIL VAL01b
INTERNAL CONNECTION
AS BUILT LADDER LOGIC DIAGRAM
INFORMATION ONLY
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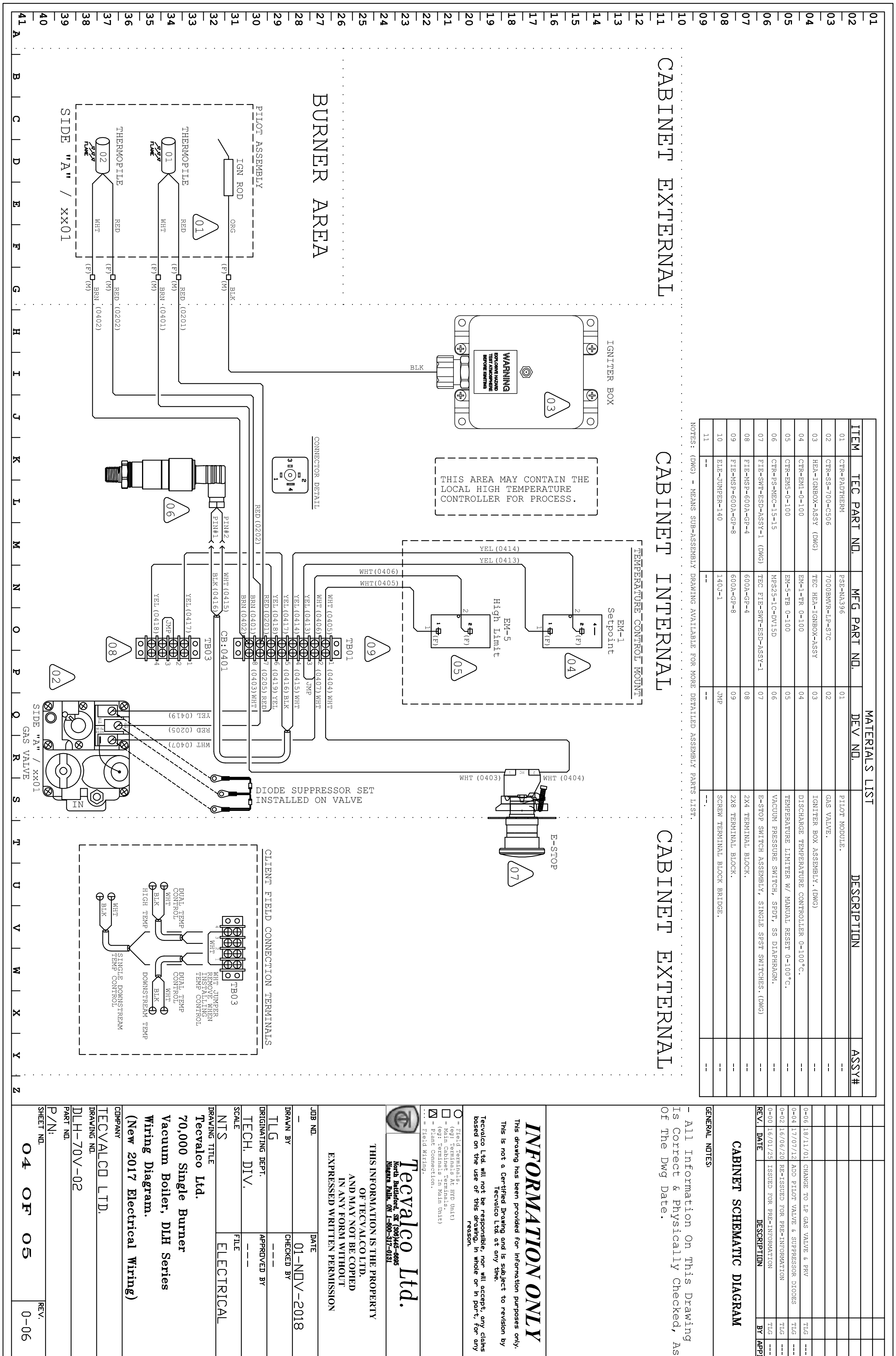
Tecvalco Ltd.
Tecvalco Ltd.
70,000 Single Burner
Vacuum Boiler, DLH Series
Wiring Diagram.
(New 2017 Electrical Wiring)
TECVALCO LTD.
DLH-70V-02
03 OF 05
0-06

(Figure 4.1.6h)


CABINET EXTERNAL
BURNER AREA
PILOT ASSEMBLY
IGN ROD
THERMOPILE
SIDE "A" / xx01
IGNITER BOX
WARNING
THIS AREA MAY CONTAIN THE LOCAL HIGH TEMPERATURE CONTROLLER FOR PROCESS.
CONNECTOR DETAIL
CABINET INTERNAL
TEMPERATURE CONTROL MOUNT
EM-1 Setpoint
EM-5 High Limit
TB01
TB03
CB:0401
SIDE "A" / xx01 GAS VALVE
DIODE SUPPRESSOR SET INSTALLED ON VALVE
E-STOP
CLIENT FIELD CONNECTION TERMINALS
DUAL TEMP CONTROL
HIGH TEMP
DOWNSTREAM TEMP
SINGLE DOWNSTREAM TEMP CONTROL
WHT JUMPER REMOVE WHEN INSTALLING TEMP CONTROL
CABINET EXTERNAL
MATERIALS LIST
ITEM | TEC PART NO. | MFG PART NO. | DEV NO. | DESCRIPTION | ASSY#
01 | CTR-PADTHERM | PSE-NA396 | 01 | PILOT MODULE. | --
02 | CTR-SS-700-C506 | 7000BMVR-LP-S7C | 02 | GAS VALVE. | --
03 | HEA-IGNBOX-ASSY (DWG) | TEC HEA-IGNBOX-ASSY | 03 | IGNITER BOX ASSEMBLY.(DWG) | --
04 | CTR-EM1-0-100 | EM-1-TR 0-100 | 04 | DISCHARGE TEMPERATURE CONTROLLER 0-100°C. | --
05 | CTR-EM5-0-100 | EM-5-TB 0-100 | 05 | TEMPERATURE LIMITER W/ MANUAL RESET 0-100°C. | --
06 | CTR-PS-MEC-15-15 | MPS25-1C-DV15D | 06 | VACUUM PRESSURE SWITCH, SPDT, SS DIAPHRAGM. | --
07 | FIE-SWT-ESD-ASSY-1 (DWG) | TEC FIE-SWT-ESD-ASSY-1 | 07 | E-STOP SWITCH ASSEMBLY, SINGLE SPST SWITCHES.(DWG) | --
08 | FIE-MSP-600A-GP-4 | 600A-GP-4 | 08 | 2X4 TERMINAL BLOCK. | --
09 | FIE-MSP-600A-GP-8 | 600A-GP-8 | 09 | 2X8 TERMINAL BLOCK. | --
10 | ELE-JUMPER-140 | 140J-1 | JMP | SCREW TERMINAL BLOCK BRIDGE. | --
NOTES: (DWG) - MEANS SUB-ASSEMBLY DRAWING AVAILABLE FOR MORE DETAILED ASSEMBLY PARTS LIST.
CABINET SCHEMATIC DIAGRAM
REV. | DATE | DESCRIPTION | BY | APPD
0-06 | 18/11/01 | CHANGE TO LP GAS VALVE & PRV | TLG | --
0-04 | 17/07/12 | ADD PILOT VALVE & SUPPRESSOR DIODES | TLG | --
0-02 | 16/06/20 | RE-ISSUED FOR PRE-INFORMATION | TLG | --
0-00 | 16/01/25 | ISSUED FOR PRE-INFORMATION | TLG | --
GENERAL NOTES:
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JOB NO. -
DATE 01-NOV-2018
DRAWN BY TLG
CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.
APPROVED BY ---
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
70,000 Single Burner
Vacuum Boiler, DLH Series
Wiring Diagram.
(New 2017 Electrical Wiring)
COMPANY TECVALCO LTD.
DRAWING NO. DLH-70V-02
PART NO. P/N:
SHEET NO. 04 OF 05
REV. 0-06

(Figure 4.1.6i)

MATERIALS LIST

ITEM	GRIT PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	DEV RANGE	DEV SET POINT	MAX
01				ELECTRICAL SECTION			
02	CTR-PADTHERM	PSE-NA396	01/-------/	ASSEMBLY BY PSE,CONTAINS 2: HONEYWELL,Q313A1402 POWER PILE.	0MV/750MV	-	-
03	HEA-IGNBOX-ASSY	HEA-IGNBOX-ASSY	03/-------/	ASSEMBLY BY TECVALCO LTD,CONTAINS 1: IGNITER MODULE.	-	-	-
04	CTR-EM5-0-100	EM-5-TB 0-100	05/TSHH-05/	JUMO,HIGH TEMPERATURE LIMITER / SWITCH,C/W MANUAL RESET.	(32°F/212°F)[0.0°C/100.0°C]	(210°F)[99.0°C]	-
05	CTR-EM1-0-100	EM-1-TR 0-100	04/ TSH-04/	JUMO,DISCHARGE TEMPERATURE CONTROLLER / SWITCH.	(32°F/212°F)[0.0°C/100.0°C]	(180°F)[82.2°C]	-
06	CTR-PS-MEC-15-15	MPS25-1C-DV15D	06/ PSH-06/	PROSENSE PRESSURE SWITCH, SPDT, WITH 316L SS DIAPHRAGM.	(-15.0/15.0PSIG)[-103.4/103.4KPAG]	(-2.5 PSIG)[-17.2 KPAG]	-
07	FIE-SWT-ESD-ASSY-1	--	07/-------/	TELEMECANIQUE SWITCH ASSEMBLY (ESD BUTTON,LABEL,BEZEL,1NC BLOCK).	-	-	-
08				GAS HEADER SECTION			
09	GAU-INCH-2.5-.25-0-15	LP2507L210	--/ PI-101,102/	MILJOCO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
10	OR --->	208-00075-611.10	--/ PI-101,102/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
11	OR --->	RPG-ES-LP1-254-15	--/ PI-101,102/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
12	VAV-SS-FP-2000-.75	--	--/ HV-101/	VALVE-TEK, 2000#, 3/4", 316-SS, BALL VALVE.	-	-	-
13	VAV-SS-FP-2000-.25	--	--/ HV-102/	VALVE-TEK, 2000#, 1/4", 316-SS, BALL VALVE.	-	-	-
14	CTR-SS-700-C506	7000BMVR-LP-S7C(700-C506)	02/-------/	ROBERTSHAW, 7000BMVR SERIES, LP GAS VALVE, MILLIVOLT APPLICATIONS.	-	-	-
15				STEAM SECTION			
16	GAU-3-9-50-500-S	54-35675-M33	--/ TI-101/	WIKA, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
17	OR --->	RTG-ES-B3B9-RR	--/ TI-101/	BUFFALO, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
18	GAU-2.5-25B-M30P-L	200-06030-233.53	--/ PI-103/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
19	OR --->	RPG-ESSEC201L-254CC	--/ PI-103/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
20	CTR-SP-PRV-13-213-08	13-213-B15Q	--/PRE-10 /	CONBRACO, 1-1/4" X 1-1/2" PRV, 15 PSIG (103 KPAG) @ 250°F (121°C).	(15 PSIG @ 230°F)[103 KPAG @ 110°C]	(15.0 PSIG)[103.4 KPAG]	-
21	--	--	--	--	-	-	-
22							
23							-
24							
25							
26							
27							
28							
29							
30							

BURNER SPECIFICATIONS

70,000 BTUH BURNER SYSTEM

MAXIMUM REGULATOR INLET PRESSURE: 14.0" H2Og

MAXIMUM BTU / HOUR: 70,000 btuh (#43)
MAXIMUM MANIFOLD PRESSURE: 7.0" H2Og
STD SETUP BTU / HOUR: 70,000 btuh (#43)
STD SETUP MANIFOLD PRESSURE: 7.0" H2Og

MAXIMUM BTU / HOUR PILOT: 1,200 btuh
MAXIMUM WORKING PRESSURE PILOT: 3.5" H2Og

MAIN BURNER ORIFICE SIZE: 0.0890" (#43x2)
PILOT BURNER ORIFICE SIZE: 0.0220"

NOTES:
1) All 1" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 3/4" Tubing: 304 SS, 0.035 Wall [SCH40].
1) All 3/8" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 1" Nipples: SCH XS, SA-106B.
3) All 3/4" Nipples: SCH XS, SA-106B.
4) All 3/8" Nipples: SCH XS, SA-106B.

LEGEND

STEAM JACKET MOUNTED INSTRUMENTS.	ELECTRICAL CONTROL INSTRUMENT TAGS.	GAS CONTROL SYSTEM TAGS.	EXTERNAL INPUTS OR OUTPUTS FROM SYSTEM.	CUSTOM HOUSING TO HOLD SPARK GENERATOR.	SPARK GENERATOR.	MALE OR FEMALE RING CONNECTOR.
TEMPERATURE CONTROL, NC, OPEN ON INCREASE.	PRESSURE CONTROL, NC, OPEN ON INCREASE.	EXTERNAL CABLED CLIENT CONNECTION.	CONTROL AND OPERATOR SWITCHES.	SOLENOID CONTROL VALVE.	750MV POWER PILE GENERATOR.	BATTERY POWER CELLS.
MANUAL GAS CONTROL BALL VALVE.	PRESSURE CONTROL VALVE - REGULATOR.	PRESSURE RELIEF VALVE.	GAUGE - PRESSURE.	ROBERTSHAW - PRESS & HOLD PILOT VALVE.	ROBERTSHAW - MAIN GAS VALVE ACTUATOR.	ROBERTSHAW - MAIN GAS CONTROL VALVE.

REV.	DATE	DESCRIPTION	BY	APPD
0-06	18/11/01	CHANGE TO LP GAS VALVE & PRV	TLG	---
0-04	17/07/12	ADD PILOT VALVE & SUPPRESSOR DIODES	TLG	---
0-02	16/06/20	RE-ISSUED FOR PRE-INFORMATION	TLG	---
0-00	16/01/25	ISSUED FOR PRE-INFORMATION	TLG	---

PARTS LIST / SETTINGS / LEGEND

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○ = Field Terminals. (eg: Terminals At HYD Unit)
□ = Main Cabinet Terminals. (eg: Terminals In Main Unit)
△ = Plant Connection.
--- = Field Wiring.

Tecvalco Ltd.
North Battleford, SK (306)445-8895
Niagara Falls, ON 1-866-317-0131

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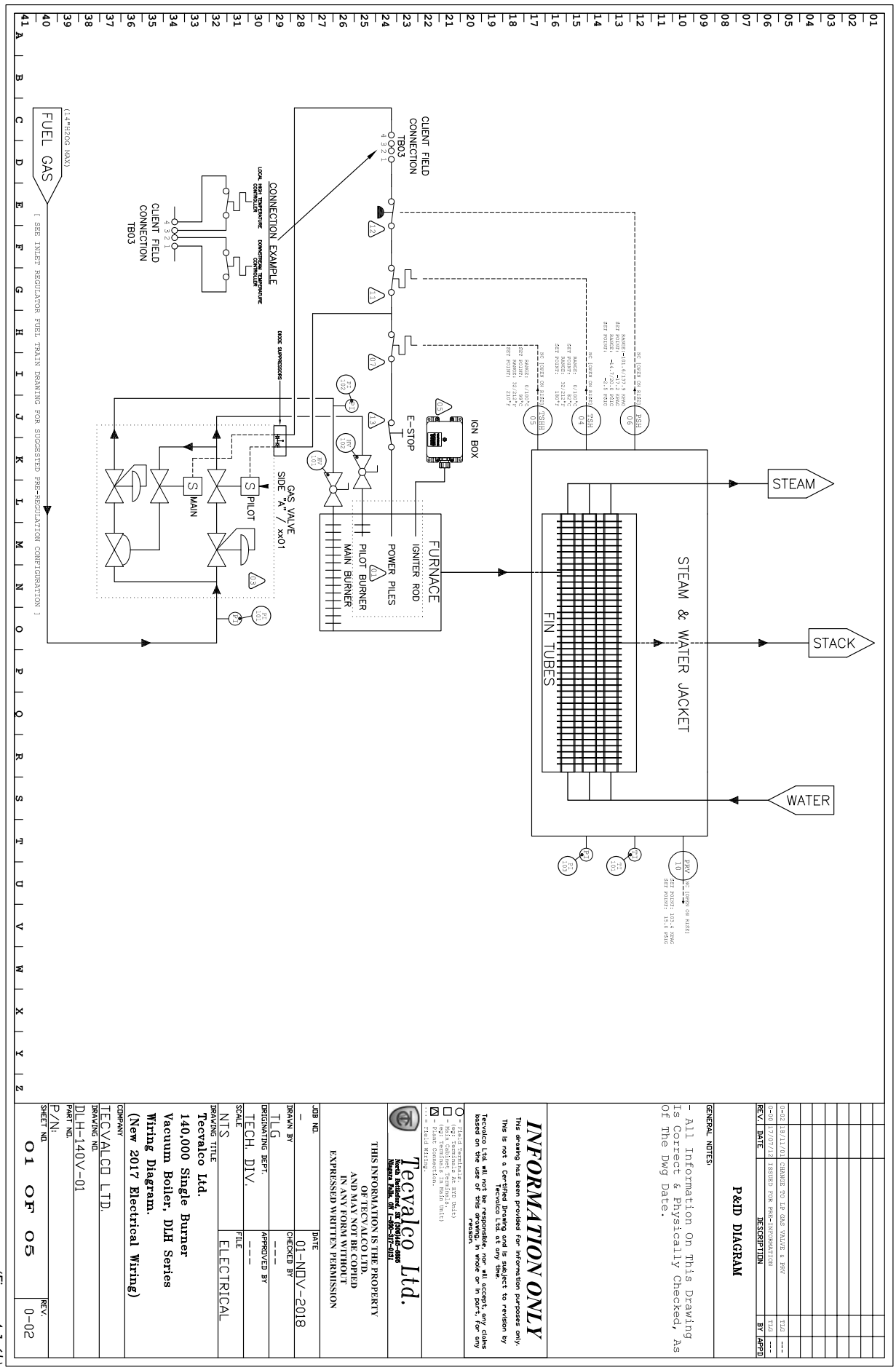
ORIGINATING DEPT. TECH. DIV.	APPROVED BY ---
SCALE NTS	FILE ELECTRICAL

DRAWING TITLE
Tecvalco Ltd.
70,000 Single Burner
Vacuum Boiler, DLH Series
Wiring Diagram.
(New 2017 Electrical Wiring)

COMPANY: TECVALCO LTD.
DRAWING NO.: DLH-70V-02
PART NO.: P/N:
SHEET NO.: 05 OF 05
REV.: 0-06

(Figure 4.1.6j)


STEAM
STACK
WATER
STEAM & WATER JACKET
FIN TUBES
FURNACE
IGNITER ROD
POWER PILES
PILOT BURNER
MAIN BURNER
E-STOP
IGN BOX
CLIENT FIELD CONNECTION TB03
CONNECTION EXAMPLE
LOCAL HIGH TEMPERATURE CONTROLLER
DOWNSTREAM TEMPERATURE CONTROLLER
CLIENT FIELD CONNECTION TB03
DIODE SUPPRESSORS
GAS VALVE SIDE "A" / xx01
MAIN
PILOT
FUEL GAS
(SEE INLET REGULATOR FUEL TRAIN DRAWING FOR SUGGESTED PRE-REGULATION CONFIGURATION)
P&ID DIAGRAM
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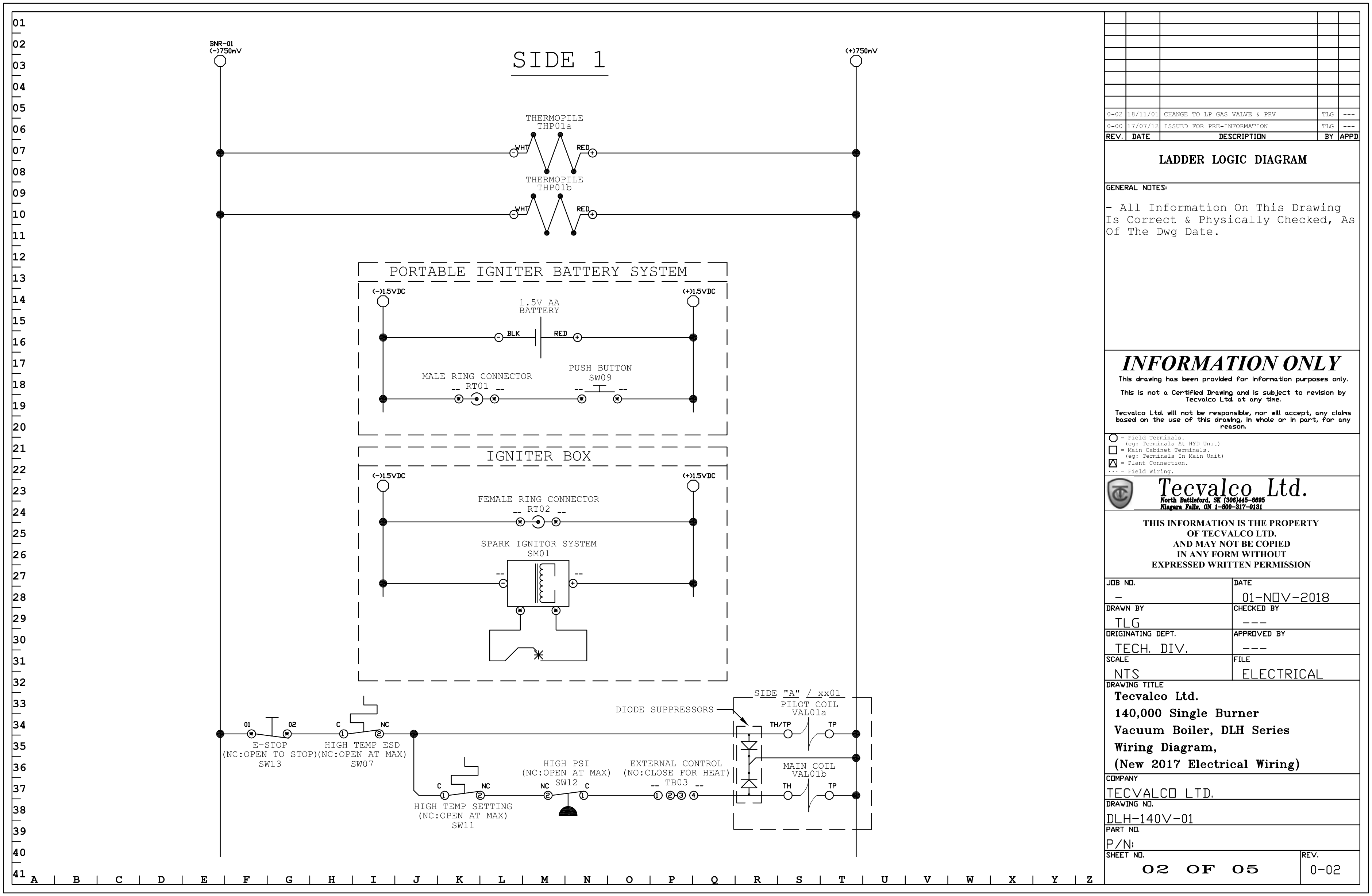
Tecvalco Ltd.
Tecvalco Ltd.
140,000 Single Burner
Vacuum Boiler, DLH Series
Wiring Diagram.
(New 2017 Electrical Wiring)
TECVALCO LTD.
DLH-140V-01
P/N:
01 OF 05
0-02

(Figure 4.1.6k)


SIDE 1
BNR-01 (-)750mV
(+)750mV
THERMOPILE THP01a
THERMOPILE THP01b
WHT
RED
PORTABLE IGNITER BATTERY SYSTEM
(-)1.5VDC
(+)1.5VDC
1.5V AA BATTERY
BLK
MALE RING CONNECTOR RT01
PUSH BUTTON SW09
IGNITER BOX
FEMALE RING CONNECTOR RT02
SPARK IGNITOR SYSTEM SM01
E-STOP (NC:OPEN TO STOP) SW13
HIGH TEMP ESD (NC:OPEN AT MAX) SW07
HIGH TEMP SETTING (NC:OPEN AT MAX) SW11
HIGH PSI (NC:OPEN AT MAX) SW12
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) TB03
DIODE SUPPRESSORS
SIDE "A" / xx01
PILOT COIL VAL01a
MAIN COIL VAL01b
TH/TP
TP
TH
0-02 | 18/11/01 | CHANGE TO LP GAS VALVE & PRV | TLG | ---
0-00 | 17/07/12 | ISSUED FOR PRE-INFORMATION | TLG | ---
REV. | DATE | DESCRIPTION | BY | APPD
LADDER LOGIC DIAGRAM
GENERAL NOTES:
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= Field Terminals. (eg: Terminals At HYD Unit)
= Main Cabinet Terminals. (eg: Terminals In Main Unit)
= Plant Connection.
= Field Wiring.
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Niagara Falls, ON 1-800-317-0131
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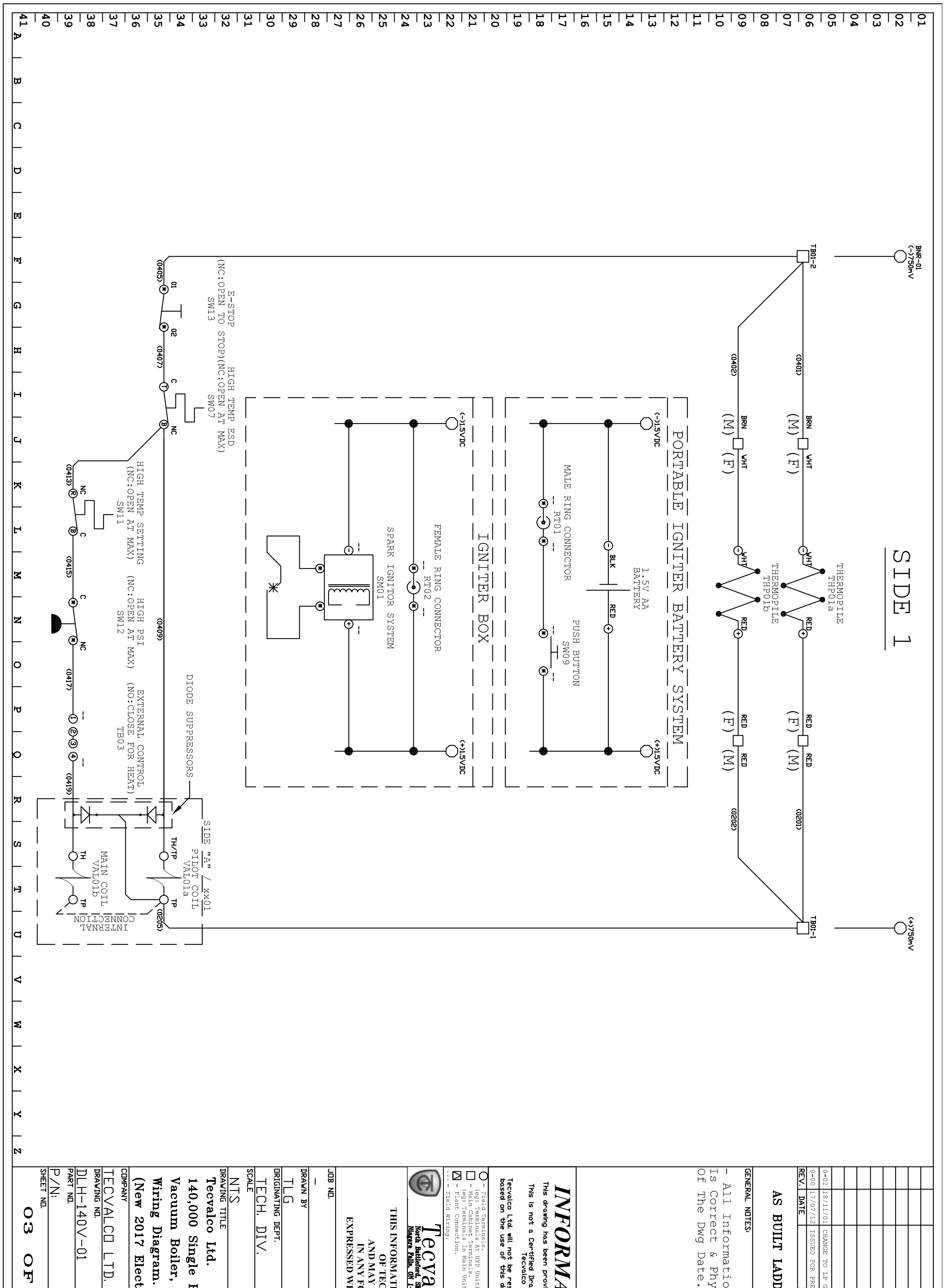
DATE 01-NOV-2018
DRAWN BY TLG
CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.
APPROVED BY ---
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
140,000 Single Burner
Vacuum Boiler, DLH Series
Wiring Diagram,
(New 2017 Electrical Wiring)
COMPANY TECVALCO LTD.
DRAWING NO. DLH-140V-01
PART NO. P/N:
SHEET NO. 02 OF 05
REV. 0-02

(Figure 4.1.6l)


SIDE 1
PORTABLE IGNITER BATTERY SYSTEM
IGNITER BOX
THERMOPILE THP01a
THERMOPILE THP01b
1.5V AA BATTERY
PUSH BUTTON SW09
MALE RING CONNECTOR RT01
FEMALE RING CONNECTOR RT02
SPARK IGNITOR SYSTEM SM01
E-STOP (NC:OPEN TO STOP) SW13
HIGH TEMP ESD (NC:OPEN AT MAX) SW07
HIGH TEMP SETTING (NC:OPEN AT MAX) SW11
HIGH PSI (NC:OPEN AT MAX) SW12
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) TB03
DIODE SUPPRESSORS
PILOT COIL VAL01a
MAIN COIL VAL01b
INTERNAL CONNECTION
AS BUILT LADDER LOGIC DIAGRAM
GENERAL NOTES:
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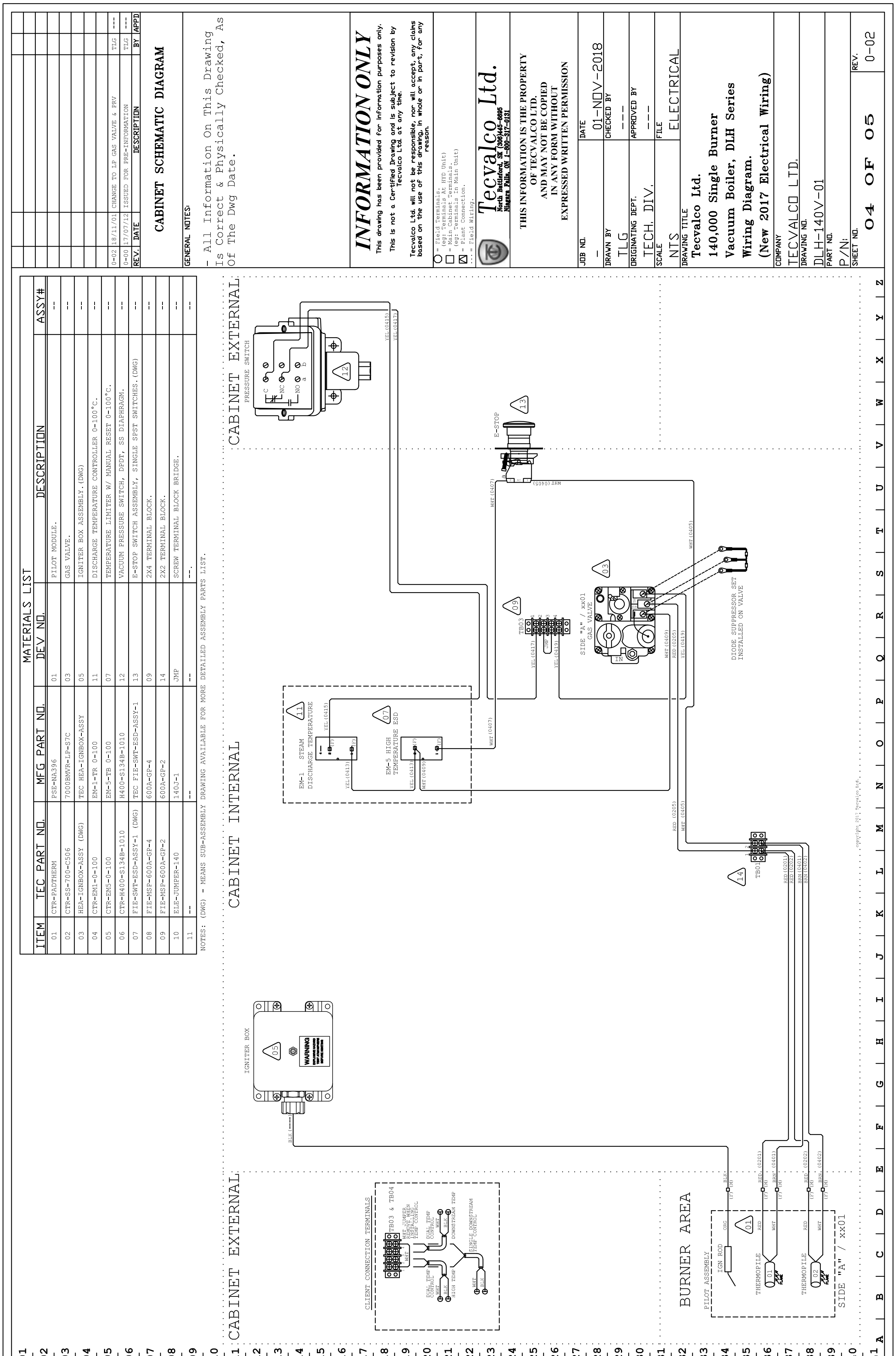
DRAWING TITLE
Tecvalco Ltd.
140,000 Single Burner
Vacuum Boiler, DLH Series
Wiring Diagram.
(New 2017 Electrical Wiring)
DATE 01-NOV-2018
DRAWN BY TLG
ORIGINATING DEPT. TECH. DIV.
SCALE NTS
FILE ELECTRICAL
COMPANY TECVALCO LTD.
DRAWING NO. DLH-140V-01
SHEET NO. 03 OF 05
REV. 0-02

(Figure 4.1.6m)


CABINET EXTERNAL
CABINET INTERNAL
CABINET EXTERNAL
BURNER AREA
IGNITER BOX
PRESSURE SWITCH
E-STOP
EM-1 STEAM DISCHARGE TEMPERATURE
EM-5 HIGH TEMPERATURE ESD
SIDE "A" / xx01 GAS VALVE
DIODE SUPPRESSOR SET INSTALLED ON VALVE
CLIENT CONNECTION TERMINALS
TB03 & TB04
PILOT ASSEMBLY
IGN ROD
THERMOPILE
SIDE "A" / xx01
CABINET SCHEMATIC DIAGRAM
GENERAL NOTES:
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Tecvalco Ltd.
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0-02 18/11/01 CHANGE TO LP GAS VALVE & PRV TLG
0-00 17/07/12 ISSUED FOR PRE-INFORMATION TLG
DATE 01-NOV-2018
DRAWN BY TLG
ORIGINATING DEPT. TECH. DIV.
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE Tecvalco Ltd. 140,000 Single Burner Vacuum Boiler, DLH Series Wiring Diagram. (New 2017 Electrical Wiring)
COMPANY TECVALCO LTD.
DRAWING NO. DLH-140V-01
SHEET NO. 04 OF 05
REV. 0-02

MATERIALS LIST

ITEM	TEC PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	ASSY#
01	CTR-PADTHERM	PSE-NA396	01	PILOT MODULE.	--
02	CTR-SS-700-C506	7000BMVR-LP-S7C	03	GAS VALVE.	--
03	HEA-IGNBOX-ASSY (DWG)	TEC HEA-IGNBOX-ASSY	05	IGNITER BOX ASSEMBLY.(DWG)	--
04	CTR-EM1-0-100	EM-1-TR 0-100	11	DISCHARGE TEMPERATURE CONTROLLER 0-100°C.	--
05	CTR-EM5-0-100	EM-5-TB 0-100	07	TEMPERATURE LIMITER W/ MANUAL RESET 0-100°C.	--
06	CTR-H400-S134B-1010	H400-S134B-1010	12	VACUUM PRESSURE SWITCH, DPDT, SS DIAPHRAGM.	--
07	FIE-SWT-ESD-ASSY-1 (DWG)	TEC FIE-SWT-ESD-ASSY-1	13	E-STOP SWITCH ASSEMBLY, SINGLE SPST SWITCHES.(DWG)	--
08	FIE-MSP-600A-GP-4	600A-GP-4	09	2X4 TERMINAL BLOCK.	--
09	FIE-MSP-600A-GP-2	600A-GP-2	14	2X2 TERMINAL BLOCK.	--
10	ELE-JUMPER-140	140J-1	JMP	SCREW TERMINAL BLOCK BRIDGE.	--
11	--	--	--	--.	--

NOTES: (DWG) - MEANS SUB-ASSEMBLY DRAWING AVAILABLE FOR MORE DETAILED ASSEMBLY PARTS LIST.

(Figure 4.1.6n)

MATERIALS LIST

ITEM	TEC PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	DEV RANGE	DEV SET POINT	–
01				ELECTRICAL SECTION			
02	CTR-PADTHERM	PSE-NA396	01/-------/	ASSEMBLY BY PSE, CONTAINS 2: HONEYWELL, Q313A1402 POWER PILE.	0MV/750MV	-	-
03	HEA-IGNBOX-ASSY	HEA-IGNBOX-ASSY	05/-------/	ASSEMBLY BY TECVALCO LTD, CONTAINS 1: IGNITER MODULE.	-	-	-
04	CTR-EM-S-0-100	EM-S-TB 0-100	07/TSHH-07/	JUMO, HIGH TEMPERATURE LIMITER / SWITCH, C/W MANUAL RESET.	(32°F/212°F)[0.0°C/100.0°C]	(210°F)[99.0°C]	-
05	CTR-EM-1-0-100	EM-1-TR 0-100	11/ TSH-11/	JUMO, DISCHARGE TEMPERATURE CONTROLLER / SWITCH.	(32°F/212°F)[0.0°C/100.0°C]	(180°F)[82.2°C]	-
06	CTR-H400-S134B-1010	H400-S134B-1010	12/ PSH-12/	UNITED ELECTRIC, PRESSURE SWITCH, DPDT, WITH 316L SS DIAPHRAGM.	(-14.7/20.0PSIG)[-101.6/137.9KPAG]	(-2.5 PSIG)[-17.2 KPAG]	-
07	FIE-SWT-ESD-ASSY-1	--	13/-------/	TELEMECANIQUE SWITCH ASSEMBLY (ESD BUTTON,LABEL,BEZEL,1NC BLOCK).	-	-	-
08				GAS HEADER SECTION			
09	GAU-INCH-2.5-.25-0-15	LP2507L210	--/ PI-101,102/	MILJOCO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
10	OR --->	208-00075-611.10	--/ PI-101,102/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
11	OR --->	RPG-ES-LP1-254-15	--/ PI-101,102/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
12	VAV-SS-FP-2000-.75	--	--/ HV-101/	VALVE-TEK, 2000#, 3/4", 316-SS, BALL VALVE.	-	-	-
13	VAV-SS-FP-2000-.25	--	--/ HV-102/	VALVE-TEK, 2000#, 1/4", 316-SS, BALL VALVE.	-	-	-
14	CTR-SS-700-C506	7000BMVR-LP-S7C[700-C506]	03/-------/	ROBERTSHAW, 7000BMVR SERIES, LP GAS VALVE, MILLIVOLT APPLICATIONS.	-	-	-
15				STEAM SECTION			
16	GAU-3-9-50-500-S	54-35675-M33	--/ TI-101/	WIKA, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
17	OR --->	RTG-ES-B3B9-RR	--/ TI-101/	BUFFALO, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
18	GAU-2.5-25B-M30P-L	200-06030-233.53	--/ PI-103/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
19	OR --->	RPG-ESSEC201L-254CC	--/ PI-103/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
20	CTR-SP-PRV-13-202-08	13-202-B15	--/PRE-10 /	CONBRACO, 1" PRV, 15 PSIG (103 KPAG) @ 250°F (121°C).	(15 PSIG @ 230°F)[103 KPAG @ 110°C]	(15.0 PSIG)[103.4 KPAG]	-
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BURNER SPECIFICATIONS

140,000 BTUH BURNER SYSTEM

MAXIMUM REGULATOR INLET PRESSURE: 14.0" H2Og

MAXIMUM BTU / HOUR: 140,000 btuh (#43)
MAXIMUM MANIFOLD PRESSURE: 8.1" H2Og
STD SETUP BTU / HOUR: 140,000 btuh (#43)
STD SETUP MANIFOLD PRESSURE: 8.1" H2Og

MAXIMUM BTU / HOUR PILOT: 1,200 btuh
MAXIMUM WORKING PRESSURE PILOT: 3.5" H2Og

MAIN BURNER ORIFICE SIZE: 0.0890" (#43x4)
PILOT BURNER ORIFICE SIZE: 0.0220"

NOTES:
1) All 1" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 3/4" Tubing: 304 SS, 0.035 Wall [SCH40].
1) All 3/8" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 1" Nipples: SCH XS, SA-106B.
3) All 3/4" Nipples: SCH XS, SA-106B.
4) All 3/8" Nipples: SCH XS, SA-106B.

LEGEND

STEAM JACKET MOUNTED INSTRUMENTS.	ELECTRICAL CONTROL INSTRUMENT TAGS.	GAS CONTROL SYSTEM TAGS.	EXTERNAL INPUTS OR OUTPUTS FROM SYSTEM.	CUSTOM HOUSING TO HOLD SPARK GENERATOR.	SPARK GENERATOR.	MALE OR FEMALE RING CONNECTOR.
TEMPERATURE CONTROL, NC, OPEN ON INCREASE.	PRESSURE CONTROL, NC, OPEN ON INCREASE.	EXTERNAL CABLED CLIENT CONNECTION.	CONTROL AND OPERATOR SWITCHES.	SOLENOID CONTROL VALVE.	750MV POWER PILE GENERATOR.	BATTERY POWER CELLS.
MANUAL GAS CONTROL BALL VALVE.	PRESSURE CONTROL VALVE - REGULATOR.	PRESSURE RELIEF VALVE.	GAUGE - PRESSURE.	ROBERTSHAW - PRESS & HOLD PILOT VALVE.	ROBERTSHAW - MAIN GAS VALVE ACTUATOR.	ROBERTSHAW - MAIN GAS CONTROL VALVE.

REV.	DATE	DESCRIPTION	BY	APPD
0-02	18/11/01	CHANGE TO LP GAS VALVE & PRV	TLG	---
0-00	17/07/12	ISSUED FOR PRE-INFORMATION	TLG	---

PARTS LIST / SETTINGS / LEGEND

GENERAL NOTES:

- All Information On This Drawing Is Correct & Physically Checked, As Of The Dwg Date.

INFORMATION ONLY

This drawing has been provided for information purposes only.

This is not a Certified Drawing and is subject to revision by Tecvalco Ltd. at any time.

Tecvalco Ltd. will not be responsible, nor will accept, any claims based on the use of this drawing, in whole or in part, for any reason.

○ = Field Terminals. (eg: Terminals At HYD Unit)
□ = Main Cabinet Terminals. (eg: Terminals In Main Unit)
⊠ = Plant Connection.
--- = Field Wiring.

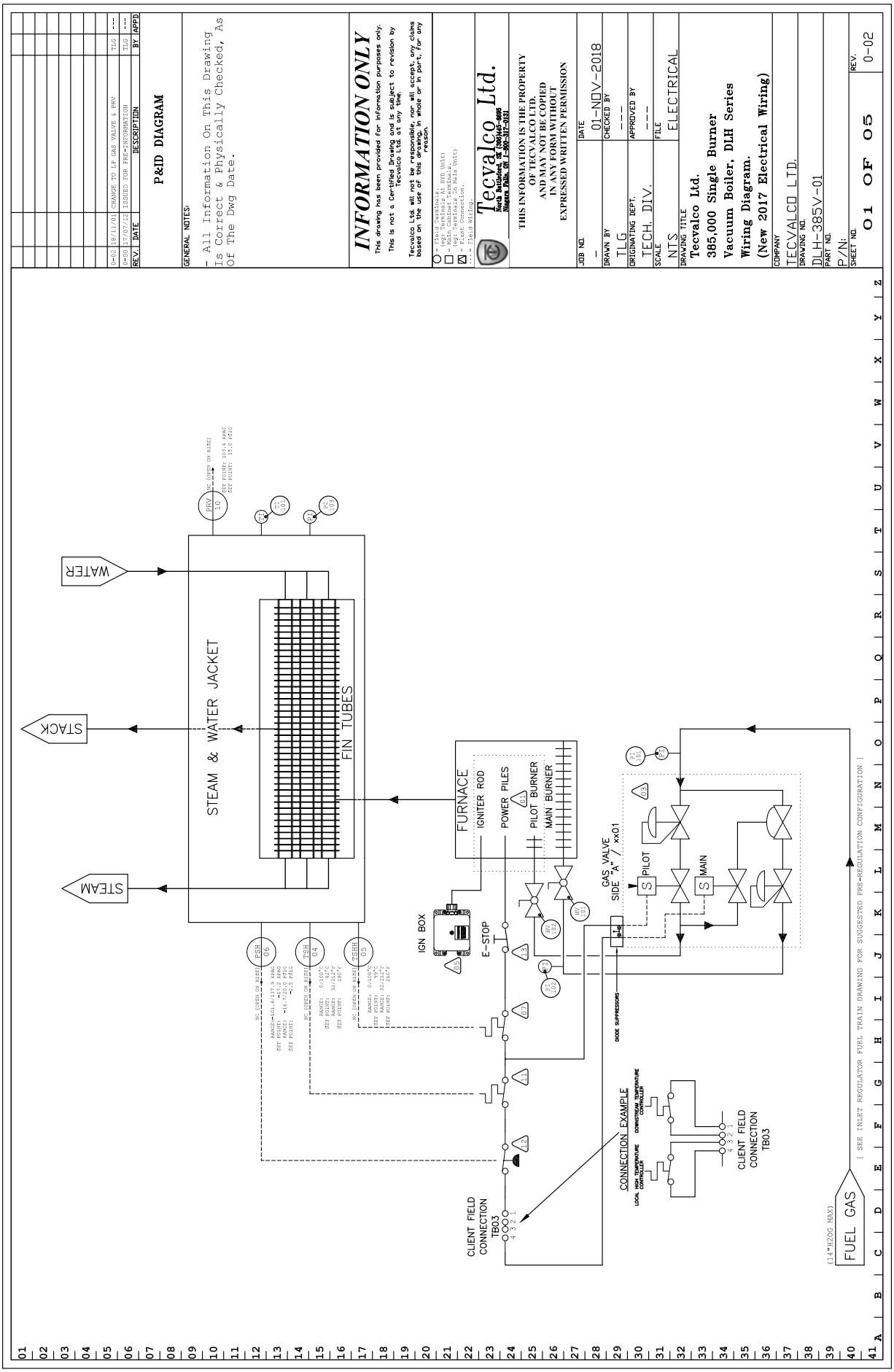
Tecvalco Ltd.
North Battleford, SK (306)445-8695
Niagara Falls, ON 1-800-317-0131

JOB NO. –	DATE 01-NOV-2018
DRAWN BY TLG	CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.	APPROVED BY ---
SCALE NTS	FILE ELECTRICAL

DRAWING TITLE
Tecvalco Ltd.
140,000 Single Burner Vacuum Boiler, DLH Series Wiring Diagram.
(New 2017 Electrical Wiring)

COMPANY: TECVALCO LTD.
DRAWING NO.: DLH-140V-01
PART NO.: P/N:
SHEET NO.: 05 OF 05
REV.: 0-02

(Figure 4.1.6o)


P&ID DIAGRAM
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Niagara Falls, ON. 1-800-317-0191
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DATE 01-NOV-2018
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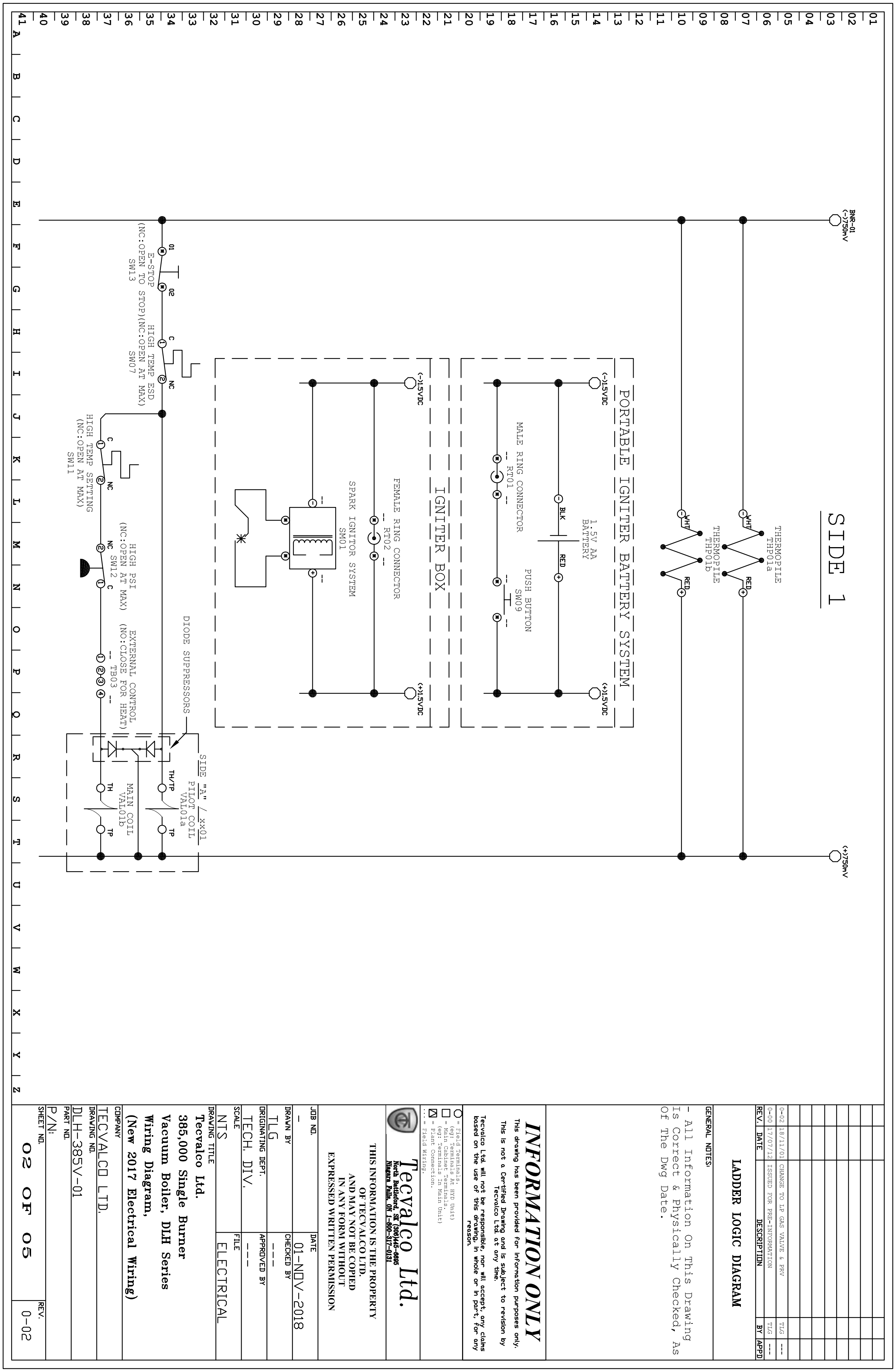
ORIGINATING DEPT. TECH. DIV.
APPROVED BY ---
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
385,000 Single Burner
Vacuum Boiler, DLH Series
Wiring Diagram.
(New 2017 Electrical Wiring)
COMPANY TECVALCO LTD.
DRAWING NO. DLH-385V-01
PART NO. P/N:
SHEET NO. 01 OF 05
REV. 0-02
REV. DATE DESCRIPTION BY APPD
0-02 18/11/01 CHANGE TO SP GAS VALVE & PRV TLG ---
0-00 17/07/24 ISSUED FOR PRE-INFORMATION TLG ---
WATER
STACK
STEAM
STEAM & WATER JACKET
FIN TUBES
FURNACE
IGNITER ROD
POWER PILES
PILOT BURNER
MAIN BURNER
IGN BOX
E-STOP
GAS VALVE SIDE 'A' / xx01
PILOT
MAIN
DIODE SUPPRESSORS
CONNECTION EXAMPLE
CLIENT FIELD CONNECTION TB03
FUEL GAS
[SEE INLET REGULATOR FUEL TRAIN DRAWING FOR SUGGESTED PRE-REGULATION CONFIGURATION]

(Figure 4.1.6p)


SIDE 1
PORTABLE IGNITER BATTERY SYSTEM
IGNITER BOX
BNR-01
(-)750mV
(+)750mV
THERMOPILE
THP01a
THP01b
1.5V AA
BATTERY
PUSH BUTTON
SW09
MALE RING CONNECTOR
RT01
FEMALE RING CONNECTOR
RT02
SPARK IGNITOR SYSTEM
SM01
(-)1.5VDC
(+)1.5VDC
E-STOP
(NC:OPEN TO STOP)
SW13
HIGH TEMP ESD
(NC:OPEN AT MAX)
SW07
HIGH TEMP SETTING
(NC:OPEN AT MAX)
SW11
HIGH PSI
(NC:OPEN AT MAX)
SW12
EXTERNAL CONTROL
(NO:CLOSE FOR HEAT)
TB03
DIODE SUPPRESSORS
SIDE "A" / x01
PILOT COIL
VAL01a
MAIN COIL
VAL01b
LADDER LOGIC DIAGRAM
REV. DATE DESCRIPTION BY APPD
0-02 18/11/01 CHANGE TO LP GAS VALVE & PRV TLG ---
0-00 17/07/12 ISSUED FOR PRE-INFORMATION TLG ---
GENERAL NOTES:
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INFORMATION ONLY
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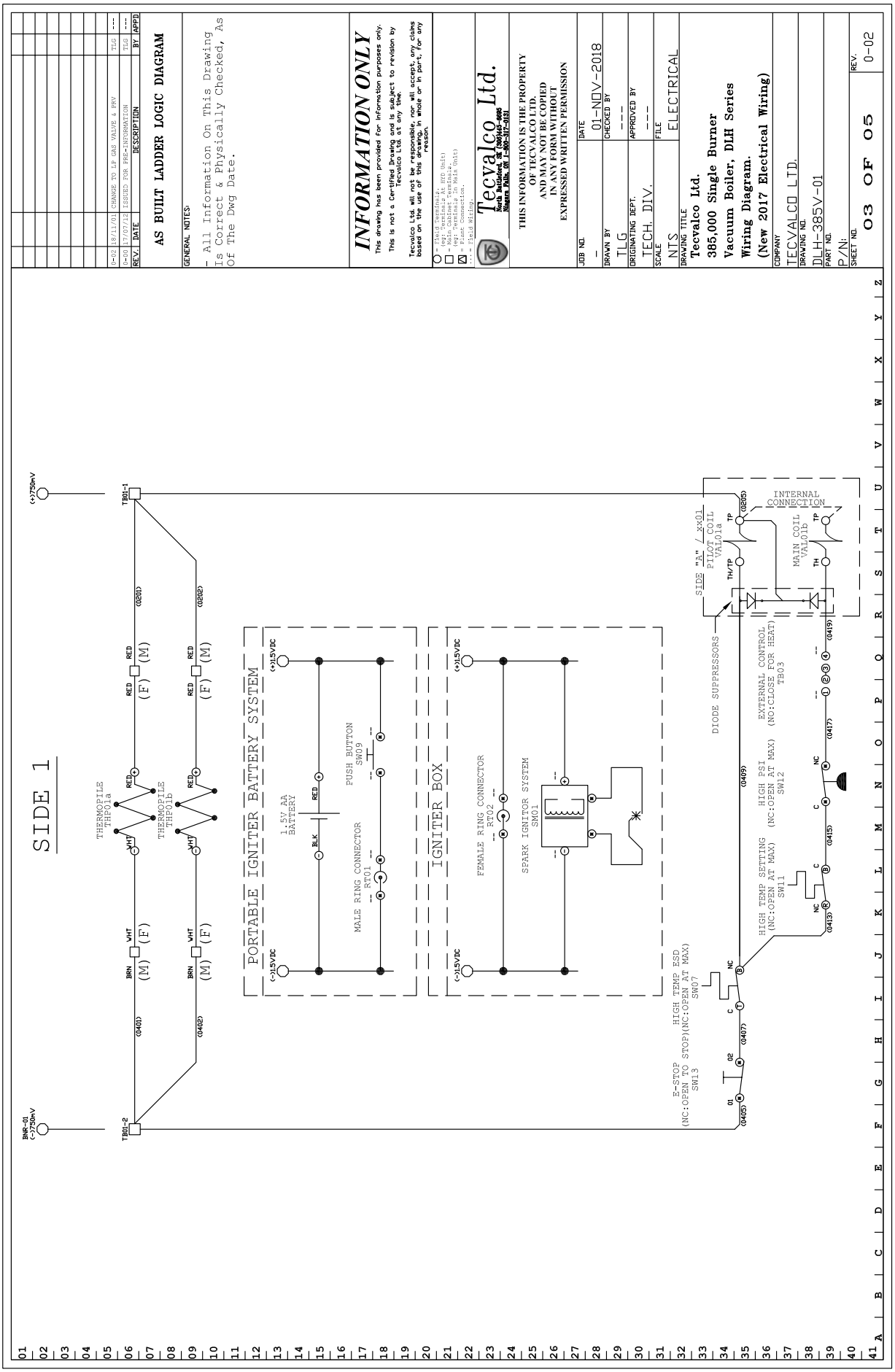
Tecvalco Ltd.
THIS INFORMATION IS THE PROPERTY OF TECVALCO LTD. AND MAY NOT BE COPIED IN ANY FORM WITHOUT EXPRESSED WRITTEN PERMISSION
JOB NO.
DATE
01-NOV-2018
DRAWN BY
TLG
CHECKED BY

ORIGINATING DEPT.
TECH. DIV.
APPROVED BY

SCALE
NTS
FILE
ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
385,000 Single Burner Vacuum Boiler, DLH Series Wiring Diagram,
(New 2017 Electrical Wiring)
COMPANY
TECVALCO LTD.
DRAWING NO.
DLH-385V-01
PART NO.
P/N:
SHEET NO.
02 OF 05
REV.
0-02

(Figure 4.1.6a)


SIDE 1
PORTABLE IGNITER BATTERY SYSTEM
IGNITER BOX
THERMOPILE TH901a
THERMOPILE TH901b
1.5V AA BATTERY
PUSH BUTTON SW09
MALE RING CONNECTOR -- RT01 --
FEMALE RING CONNECTOR -- RT02 --
SPARK IGNITOR SYSTEM SN01
E-STOP (NC:OPEN TO STOP) SW13
HIGH TEMP ESD (NC:OPEN AT MAX) SW07
HIGH TEMP SETTING (NC:OPEN AT MAX) SW11
HIGH PSI (NC:OPEN AT MAX) SW12
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) TB03
DIODE SUPPRESSORS
SIDE "A" / 2x01
PILOT COIL VA101a
MAIN COIL VA101b
INTERNAL CONNECTION
AS BUILT LADDER LOGIC DIAGRAM
GENERAL NOTES:
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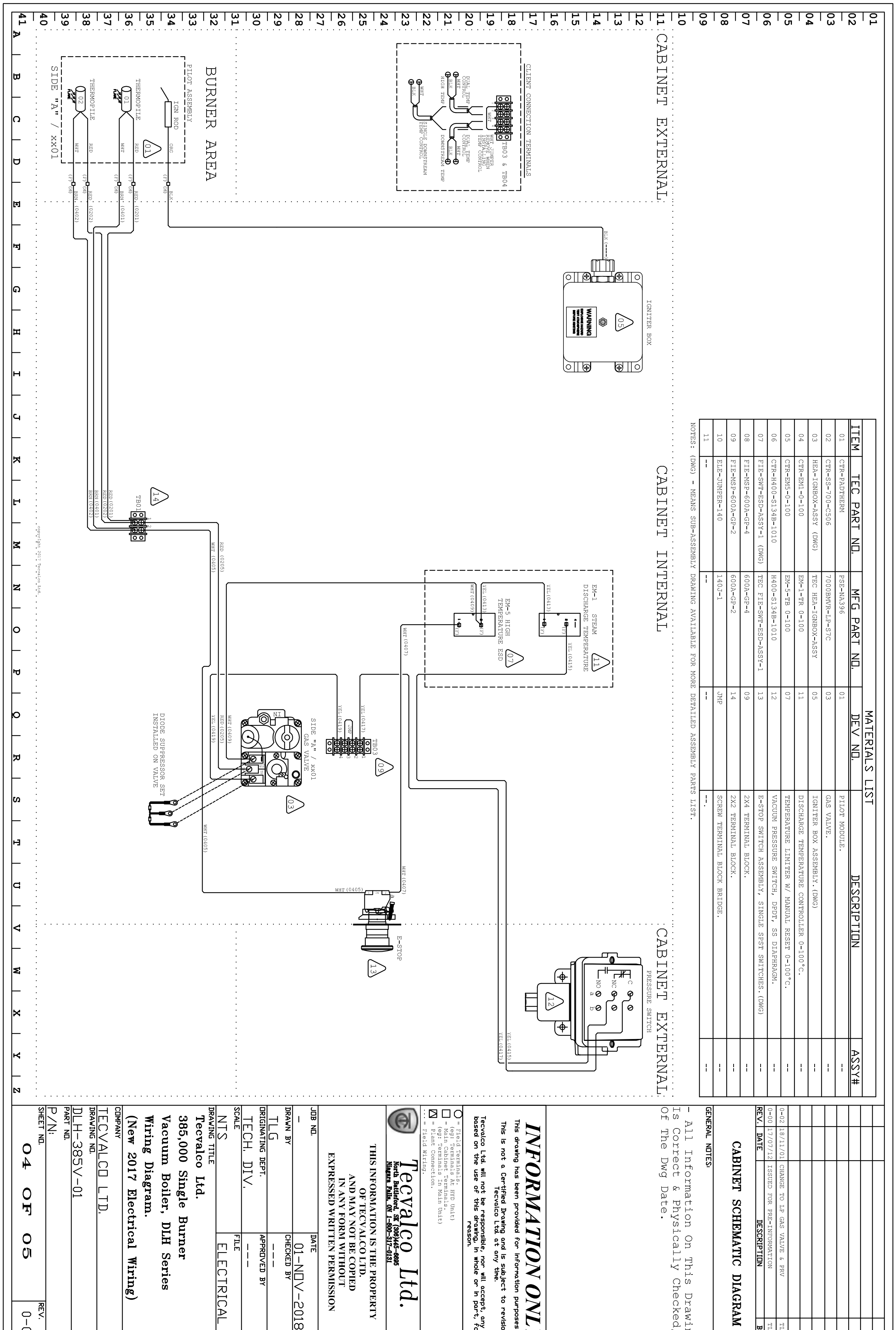
JOB NO. –
DATE 01-NOV-2018
DRAWN BY TLG
CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.
APPROVED BY ---
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
385,000 Single Burner
Vacuum Boiler, DLH Series
Wiring Diagram.
(New 2017 Electrical Wiring)
COMPANY
TECVALCO LTD.
DRAWING NO.
DLH-385V-01
PART NO.
P/N:
SHEET NO.
03 OF 05
REV.
0-02
REV. DATE DESCRIPTION BY (APPD)
0-02 18/11/01 CHANGE TO LP GAS VALVE & PRV TLG ---
0-00 17/07/12 ISSUED FOR PRE-INFORMATION TLG ---

(Figure 4.1.6r)



MATERIALS LIST

ITEM	TEC PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	ASSY#
01	CTR-PADTHERM	PSE-NA396	01	PILOT MODULE.	--
02	CTR-SS-700-C506	7000BMVR-LP-S7C	03	GAS VALVE.	--
03	HEA-IGNBOX-ASSY (DWG)	TEC HEA-IGNBOX-ASSY	05	IGNITER BOX ASSEMBLY.(DWG)	--
04	CTR-EM1-0-100	EM-1-TR 0-100	11	DISCHARGE TEMPERATURE CONTROLLER 0-100°C.	--
05	CTR-EM5-0-100	EM-5-TB 0-100	07	TEMPERATURE LIMITER W/ MANUAL RESET 0-100°C.	--
06	CTR-H400-S134B-1010	H400-S134B-1010	12	VACUUM PRESSURE SWITCH, DPDT, SS DIAPHRAGM.	--
07	FIE-SWT-ESD-ASSY-1 (DWG)	TEC FIE-SWT-ESD-ASSY-1	13	E-STOP SWITCH ASSEMBLY, SINGLE SPST SWITCHES.(DWG)	--
08	FIE-MSP-600A-GP-4	600A-GP-4	09	2X4 TERMINAL BLOCK.	--
09	FIE-MSP-600A-GP-2	600A-GP-2	14	2X2 TERMINAL BLOCK.	--
10	ELE-JUMPER-140	140J-1	JMP	SCREW TERMINAL BLOCK BRIDGE.	--
11	--	--	--	--.	--

NOTES: (DWG) - MEANS SUB-ASSEMBLY DRAWING AVAILABLE FOR MORE DETAILED ASSEMBLY PARTS LIST.

(Figure 4.1.6s)

MATERIALS LIST

ITEM	TEC PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	DEV RANGE	DEV SET POINT	–
01				ELECTRICAL SECTION			
02	CTR-PADTHERM	PSE-NA396	01/-------/	ASSEMBLY BY PSE, CONTAINS 2: HONEYWELL, Q313A1402 POWER PILE.	0MV/750MV	-	-
03	HEA-IGNBOX-ASSY	HEA-IGNBOX-ASSY	05/-------/	ASSEMBLY BY TECVALCO LTD, CONTAINS 1: IGNITER MODULE.	-	-	-
04	CTR-EM-5-0-100	EM-5-TB 0-100	07/TSHH-07/	JUMO, HIGH TEMPERATURE LIMITER / SWITCH, C/W MANUAL RESET.	(32°F/212°F)[0.0°C/100.0°C]	(210°F)[99.0°C]	-
05	CTR-EM-1-0-100	EM-1-TR 0-100	11/ TSH-11/	JUMO, DISCHARGE TEMPERATURE CONTROLLER / SWITCH.	(32°F/212°F)[0.0°C/100.0°C]	(180°F)[82.2°C]	-
06	CTR-H400-S134B-1010	H400-S134B-1010	12/ PSH-12/	UNITED ELECTRIC, PRESSURE SWITCH, DPDT, WITH 316L SS DIAPHRAGM.	(-14.7/20.0PSIG)[-101.6/137.9KPAG]	(-2.5 PSIG)[-17.2 KPAG]	-
07	FIE-SWT-ESD-ASSY-1	--	13/-------/	TELEMECANIQUE SWITCH ASSEMBLY (ESD BUTTON,LABEL,BEZEL,1NC BLOCK).	-	-	-
08				GAS HEADER SECTION			
09	GAU-INCH-2.5-.25-0-15	LP2507L210	--/ PI-101,102/	MILJOCO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
10	OR --->	208-00075-611.10	--/ PI-101,102/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
11	OR --->	RPG-ES-LP1-254-15	--/ PI-101,102/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
12	VAV-SS-FP-2000-.75	--	--/ HV-101/	VALVE-TEK, 2000#, 3/4", 316-SS, BALL VALVE.	-	-	-
13	VAV-SS-FP-2000-.25	--	--/ HV-102/	VALVE-TEK, 2000#, 1/4", 316-SS, BALL VALVE.	-	-	-
14	CTR-SS-700-C506	7000BMVR-LP-S7C[700-C506]	03/-------/	ROBERTSHAW, 7000BMVR SERIES, LP GAS VALVE, MILLIVOLT APPLICATIONS.	-	-	-
15				STEAM SECTION			
16	GAU-3-9-50-500-S	54-35675-M33	--/ TI-101/	WIKA, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
17	OR --->	RTG-ES-B3B9-RR	--/ TI-101/	BUFFALO, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
18	GAU-2.5-25B-M30P-L	200-06030-233.53	--/ PI-103/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
19	OR --->	RPG-ESSEC201L-254CC	--/ PI-103/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
20	CTR-SP-PRV-13-202-08	13-202-B15	--/PRE-10 /	CONBRACO, 1" PRV, 15 PSIG (103 KPAG) @ 250°F (121°C).	(15 PSIG @ 230°F)[103 KPAG @ 110°C]	(15.0 PSIG)[103.4 KPAG]	-
21	--	--	--	--	-	-	-
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BURNER SPECIFICATIONS

385,000 BTUH BURNER SYSTEM

MAXIMUM REGULATOR INLET PRESSURE: 14.0" H2Og

MAXIMUM BTU / HOUR: 385,000 btuh (#42)
MAXIMUM MANIFOLD PRESSURE: 9.5" H2Og
STD SETUP BTU / HOUR: 288,000 btuh (#45)
STD SETUP MANIFOLD PRESSURE: 9.5" H2Og

MAXIMUM BTU / HOUR PILOT: 1,200 btuh
MAXIMUM WORKING PRESSURE PILOT: 3.5" H2Og

MAIN BURNER ORIFICE SIZE: 0.0820" (#45x11)
PILOT BURNER ORIFICE SIZE: 0.0220"

NOTES:
1) All 1" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 3/4" Tubing: 304 SS, 0.035 Wall [SCH40].
1) All 3/8" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 1" Nipples: SCH XS, SA-106B.
3) All 3/4" Nipples: SCH XS, SA-106B.
4) All 3/8" Nipples: SCH XS, SA-106B.

LEGEND

STEAM JACKET MOUNTED INSTRUMENTS.	ELECTRICAL CONTROL INSTRUMENT TAGS.	GAS CONTROL SYSTEM TAGS.	EXTERNAL INPUTS OR OUTPUTS FROM SYSTEM.	CUSTOM HOUSING TO HOLD SPARK GENERATOR.	SPARK GENERATOR.	MALE OR FEMALE RING CONNECTOR.
TEMPERATURE CONTROL, NC, OPEN ON INCREASE.	PRESSURE CONTROL, NC, OPEN ON INCREASE.	EXTERNAL CABLED CLIENT CONNECTION.	CONTROL AND OPERATOR SWITCHES.	SOLENOID CONTROL VALVE.	750MV POWER PILE GENERATOR.	BATTERY POWER CELLS.
MANUAL GAS CONTROL BALL VALVE.	PRESSURE CONTROL VALVE - REGULATOR.	PRESSURE RELIEF VALVE.	GAUGE - PRESSURE.	ROBERTSHAW - PRESS & HOLD PILOT VALVE.	ROBERTSHAW - MAIN GAS VALVE ACTUATOR.	ROBERTSHAW - MAIN GAS CONTROL VALVE.

REV.	DATE	DESCRIPTION	BY	APPD
0-02	18/11/01	CHANGE TO LP GAS VALVE & PRV	TLG	---
0-00	17/07/12	ISSUED FOR PRE-INFORMATION	TLG	---

PARTS LIST / SETTINGS / LEGEND

GENERAL NOTES:

- All Information On This Drawing Is Correct & Physically Checked, As Of The Dwg Date.

INFORMATION ONLY

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○ = Field Terminals.
(eg: Terminals At HYD Unit)
□ = Main Cabinet Terminals.
(eg: Terminals In Main Unit)
△ = Plant Connection.
---- = Field Wiring.

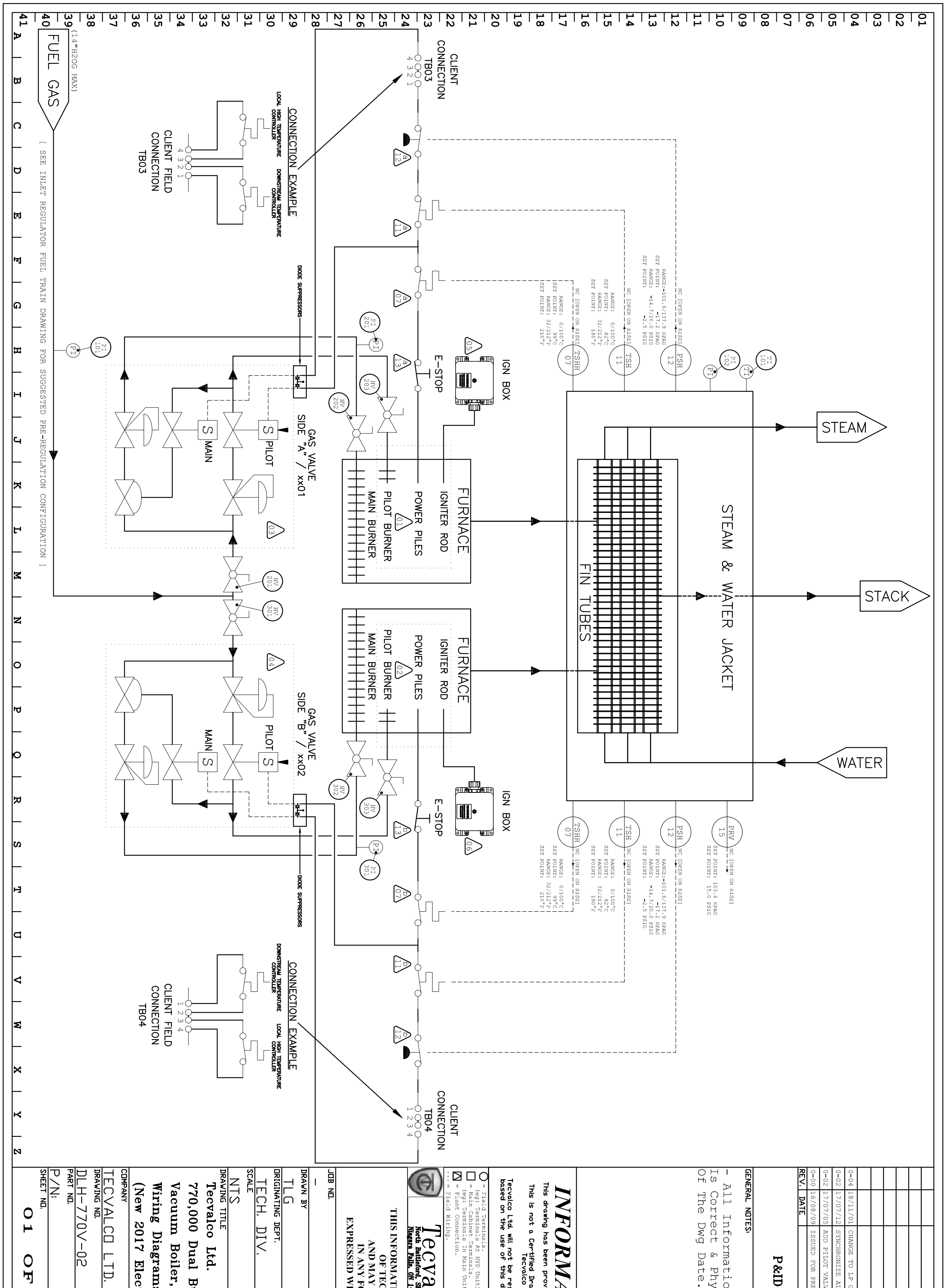
Tecvalco Ltd.
North Battleford, SK (306)445-6695
Niagara Falls, ON 1-800-317-0131

JOB NO. –	DATE 01-NOV-2018
DRAWN BY TLG	CHECKED BY ---
ORIGINATING DEPT. TECH. DIV.	APPROVED BY ---
SCALE NTS	FILE ELECTRICAL

DRAWING TITLE
Tecvalco Ltd.
385,000 Single Burner Vacuum Boiler, DLH Series Wiring Diagram.
(New 2017 Electrical Wiring)

COMPANY: TECVALCO LTD.
DRAWING NO.: DLH-385V-01
PART NO.: P/N:
SHEET NO.: 05 OF 05
REV.: 0-02

(Figure 4.1.6t)


FUEL GAS
STEAM
STACK
WATER
STEAM & WATER JACKET
FIN TUBES
FURNACE
IGNITER ROD
POWER PILES
PILOT BURNER
MAIN BURNER
IGN BOX
E-STOP
GAS VALVE SIDE "A" / xx01
GAS VALVE SIDE "B" / xx02
CLIENT CONNECTION TB03
CLIENT CONNECTION TB04
CONNECTION EXAMPLE
CLIENT FIELD CONNECTION TB03
CLIENT FIELD CONNECTION TB04
DIODE SUPPRESSORS
[SEE INLET REGULATOR FUEL TRAIN DRAWING FOR SUGGESTED PRE-REGULATION CONFIGURATION]
P&ID DIAGRAM
GENERAL NOTES:
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INFORMATION ONLY
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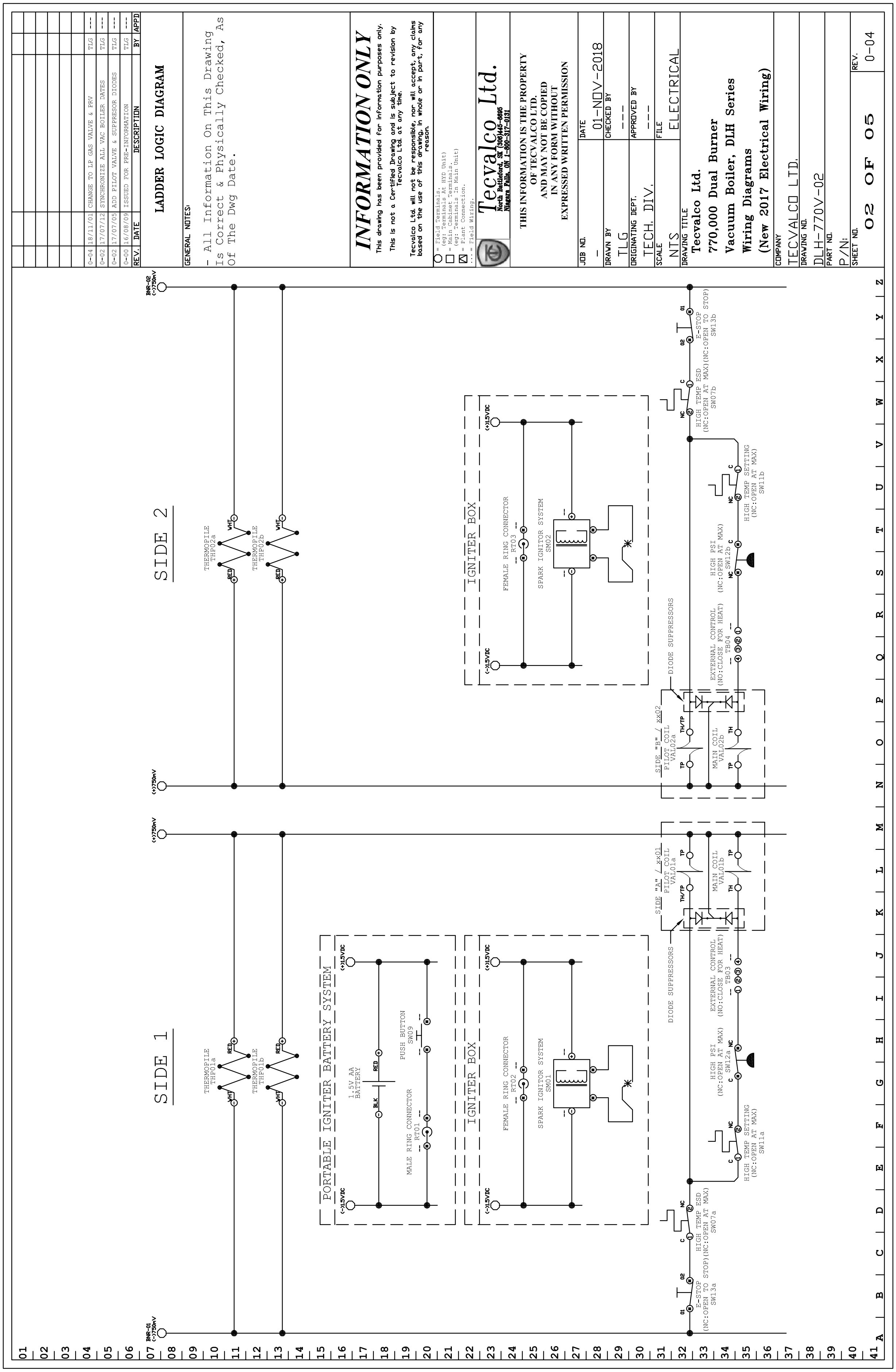
DATE 01-NOV-2018
ORIGINATING DEPT. TECH. DIV.
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
770,000 Dual Burner
Vacuum Boiler, DLH Series
Wiring Diagrams
(New 2017 Electrical Wiring)
COMPANY TECVALCO LTD.
DRAWING NO. DLH-770V-02
SHEET NO. 01 OF 05
REV. 0-04

(Figure 4.1.6u)


LADDER LOGIC DIAGRAM
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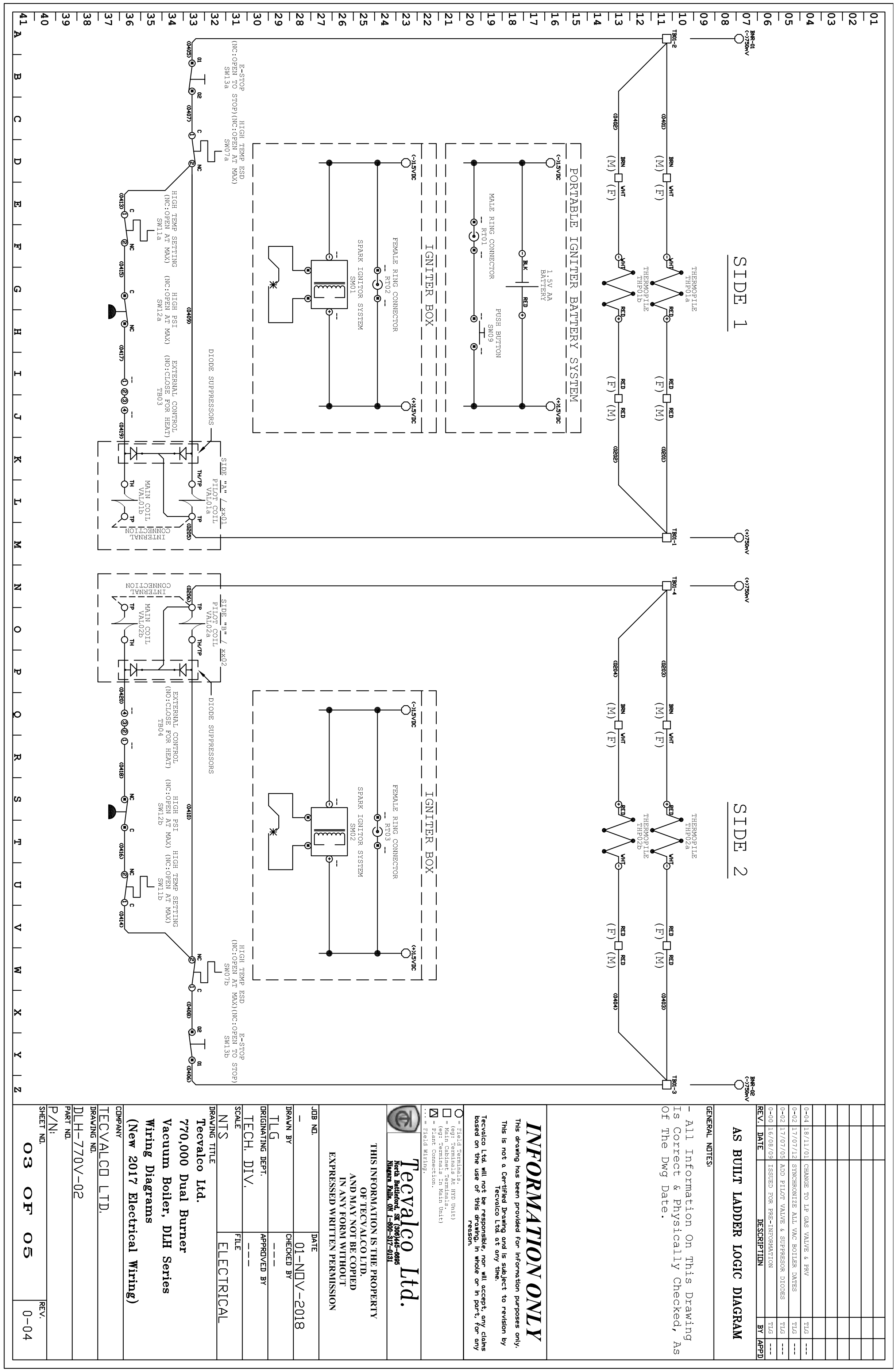
Tecvalco Ltd.
770,000 Dual Burner
Vacuum Boiler, DLH Series
Wiring Diagrams
(New 2017 Electrical Wiring)
COMPANY TECVALCO LTD.
DRAWING NO. DLH-770V-02
SHEET NO. 02 OF 05
REV. 0-04
SIDE 1
SIDE 2
THERMOPILE THP01a
THERMOPILE THP01b
THERMOPILE THP02a
THERMOPILE THP02b
PORTABLE IGNITER BATTERY SYSTEM
1.5V AA BATTERY
PUSH BUTTON SW09
MALE RING CONNECTOR RT01
IGNITER BOX
FEMALE RING CONNECTOR RT02
FEMALE RING CONNECTOR RT03
SPARK IGNITOR SYSTEM SM01
SPARK IGNITOR SYSTEM SM02
DIODE SUPPRESSORS
E-STOP
HIGH TEMP ESD
HIGH TEMP SETTING
HIGH PSI
EXTERNAL CONTROL (NO:CLOSE FOR HEAT)
PILOT COIL
MAIN COIL

(Figure 4.1.6v)


SIDE 1
SIDE 2
PORTABLE IGNITER BATTERY SYSTEM
IGNITER BOX
THERMOPILE THP01a
THERMOPILE THP01b
THERMOPILE THP02a
THERMOPILE THP02b
1.5V AA BATTERY
PUSH BUTTON SW09
MALE RING CONNECTOR RT01
FEMALE RING CONNECTOR RT02
FEMALE RING CONNECTOR RT03
SPARK IGNITOR SYSTEM SM01
SPARK IGNITOR SYSTEM SM02
E-STOP (NC:OPEN TO STOP) SW13a
E-STOP (NC:OPEN TO STOP) SW13b
HIGH TEMP ESD (NC:OPEN AT MAX) SW07a
HIGH TEMP ESD (NC:OPEN AT MAX) SW07b
HIGH TEMP SETTING (NC:OPEN AT MAX) SW11a
HIGH TEMP SETTING (NC:OPEN AT MAX) SW11b
HIGH PSI (NC:OPEN AT MAX) SW12a
HIGH PSI (NC:OPEN AT MAX) SW12b
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) TB03
EXTERNAL CONTROL (NO:CLOSE FOR HEAT) TB04
DIODE SUPPRESSORS
SIDE "A" / xx01 PILOT COIL VAL01a
MAIN COIL VAL01b
SIDE "B" / xx02 PILOT COIL VAL02a
MAIN COIL VAL02b
INTERNAL CONNECTION
AS BUILT LADDER LOGIC DIAGRAM
REV. DATE DESCRIPTION BY APP'D
0-04 18/11/01 CHANGE TO LP GAS VALVE & PRV TLG
0-02 17/07/12 SYNCHRONIZE ALL VAC BOILER DATES TLG
0-02 17/07/05 ADD PILOT VALVE & SUPPRESOR DIODES TLG
0-00 16/08/09 ISSUED FOR PRE-INFORMATION TLG
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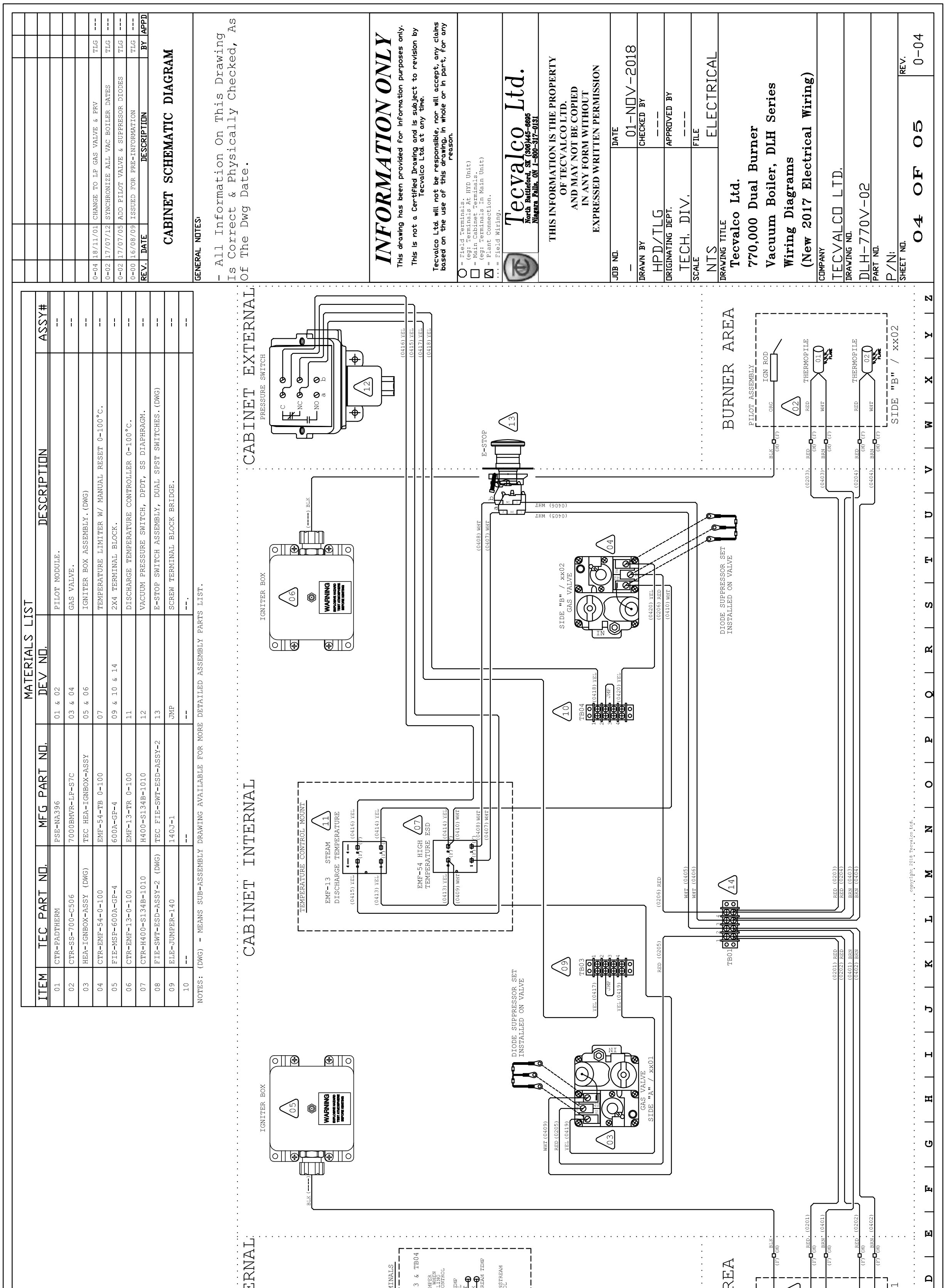
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
770,000 Dual Burner
Vacuum Boiler, DLH Series
Wiring Diagrams
(New 2017 Electrical Wiring)
COMPANY TECVALCO LTD.
DRAWING NO. DLH-770V-02
PART NO.
P/N:
SHEET NO. 03 OF 05
REV. 0-04

(Figure 4.1.6w)


MATERIALS LIST
ITEM | TEC PART NO. | MFG PART NO. | DEV NO. | DESCRIPTION | ASSY#
01 | CTR-PADTHERM | PSE-NA396 | 01 & 02 | PILOT MODULE. | --
02 | CTR-SS-700-C506 | 7000BMVR-LP-S7C | 03 & 04 | GAS VALVE. | --
03 | HEA-IGNBOX-ASSY (DWG) | TEC HEA-IGNBOX-ASSY | 05 & 06 | IGNITER BOX ASSEMBLY.(DWG) | --
04 | CTR-EMF-54-0-100 | EMF-54-TB 0-100 | 07 | TEMPERATURE LIMITER W/ MANUAL RESET 0-100°C. | --
05 | FIE-MSP-600A-GP-4 | 600A-GP-4 | 09 & 10 & 14 | 2X4 TERMINAL BLOCK. | --
06 | CTR-EMF-13-0-100 | EMF-13-TR 0-100 | 11 | DISCHARGE TEMPERATURE CONTROLLER 0-100°C. | --
07 | CTR-H400-S134B-1010 | H400-S134B-1010 | 12 | VACUUM PRESSURE SWITCH, DPDT, SS DIAPHRAGM. | --
08 | FIE-SWT-ESD-ASSY-2 (DWG) | TEC FIE-SWT-ESD-ASSY-2 | 13 | E-STOP SWITCH ASSEMBLY, DUAL SPST SWITCHES.(DWG) | --
09 | ELE-JUMPER-140 | 140J-1 | JMP | SCREW TERMINAL BLOCK BRIDGE. | --
10 | -- | -- | -- | -- | --
NOTES: (DWG) - MEANS SUB-ASSEMBLY DRAWING AVAILABLE FOR MORE DETAILED ASSEMBLY PARTS LIST.
CABINET EXTERNAL
CABINET INTERNAL
BURNER AREA
SIDE "A" / xx01
SIDE "B" / xx02
PILOT ASSEMBLY
IGN ROD
THERMOPILE
IGNITER BOX
WARNING
GAS VALVE SIDE "A" / xx01
GAS VALVE SIDE "B" / xx02
DIODE SUPPRESSOR SET INSTALLED ON VALVE
PRESSURE SWITCH
E-STOP
TEMPERATURE CONTROL MOUNT
EMF-13 STEAM DISCHARGE TEMPERATURE
EMF-54 HIGH TEMPERATURE ESD
CLIENT CONNECTION TERMINALS
TB03 & TB04
DUAL TEMP CONTROL
HIGH TEMP
DOWNSTREAM TEMP
SINGLE DOWNSTREAM TEMP CONTROL
TB01
TB03
TB04
REV. | DATE | DESCRIPTION | BY | APPD
0-04 | 18/11/01 | CHANGE TO LP GAS VALVE & PRV | TLG | ---
0-02 | 17/07/12 | SYNCHRONIZE ALL VAC BOILER DATES | TLG | ---
0-02 | 17/07/05 | ADD PILOT VALVE & SUPPRESSOR DIODES | TLG | ---
0-00 | 16/08/09 | ISSUED FOR PRE-INFORMATION | TLG | ---
CABINET SCHEMATIC DIAGRAM
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○ - Field Terminals. (eg: Terminals At HYD Unit)
□ - Main Cabinet Terminals. (eg: Terminals In Main Unit)
⊠ - Plant Connection.
- - - Field Wiring.
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ORIGINATING DEPT. TECH. DIV.
APPROVED BY ---
SCALE NTS
FILE ELECTRICAL
DRAWING TITLE
Tecvalco Ltd.
770,000 Dual Burner
Vacuum Boiler, DLH Series
Wiring Diagrams
(New 2017 Electrical Wiring)
COMPANY TECVALCO LTD.
DRAWING NO. DLH-770V-02
PART NO. P/N:
SHEET NO. 04 OF 05
REV. 0-04

(Figure 4.1.6x)

MATERIALS LIST

ITEM	TEC PART NO.	MFG PART NO.	DEV NO.	DESCRIPTION	DEV RANGE	DEV SET POINT	–
01				ELECTRICAL SECTION			
02	CTR-PADTHERM	PSE-NA396	01/-------/	ASSEMBLY BY PSE, CONTAINS 2: HONEYWELL, Q313A1402 POWER PILE.	0MV/750MV	-	-
03	CTR-PADTHERM	PSE-NA396	02/-------/	ASSEMBLY BY PSE, CONTAINS 2: HONEYWELL, Q313A1402 POWER PILE.	0MV/750MV	-	-
04	HEA-IGNBOX-ASSY	HEA-IGNBOX-ASSY	05/-------/	ASSEMBLY BY TECVALCO LTD, CONTAINS 1: IGNITER MODULE.	-	-	-
05	HEA-IGNBOX-ASSY	HEA-IGNBOX-ASSY	06/-------/	ASSEMBLY BY TECVALCO LTD, CONTAINS 1: IGNITER MODULE.	-	-	-
06	CTR-EMF-54-0-100	EMF-54-TB 0-100	07/TSHH-07/	JUMO, HIGH TEMPERATURE LIMITER / SWITCH, C/W MANUAL RESET.	(32°F/212°F)[0.0°C/100.0°C]	(210°F)[99.0°C]	-
07	CTR-EMF-13-0-100	EMF-13-TR 0-100	11/ TSH-11/	JUMO, DISCHARGE TEMPERATURE CONTROLLER / SWITCH.	(32°F/212°F)[0.0°C/100.0°C]	(180°F)[82.2°C]	-
08	CTR-H400-S134B-1010	H400-S134B-1010	12/ PSH-12/	UNITED ELECTRIC, PRESSURE SWITCH, DPDT, WITH 316L SS DIAPHRAGM.	(-14.7/20.0PSIG)[-101.6/137.9KPAG]	(-2.5 PSIG)[-17.2 KPAG]	-
09	FIE-SWT-ESD-ASSY-2	--	13/-------/	TELEMECANIQUE SWITCH ASSEMBLY (ESD BUTTON,LABEL,BEZEL,2NC BLOCK).	-	-	-
10				GAS HEADER SECTION			
11	GAU-INCH-2.5-.25-0-15	LP2507L210	--/PI-101,201,301/	MILJOCO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
12	OR --->	208-00075-611.10	--/PI-101,201,301/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
13	OR --->	RPG-ES-LP1-254-15	--/PI-101,201,301/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, 0-15" H2OG.	(0.0"/15" H2OG)[0.0/3.7 KPAG]	-	-
14	VAV-SS-FP-2000-.75	--	--/HV-201,301,202,302/	VALVE-TEK, 2000#, 3/4", 316-SS, BALL VALVE.	-	-	-
15	VAV-SS-FP-2000-.25	--	--/HV-203,303/	VALVE-TEK, 2000#, 1/4", 316-SS, BALL VALVE.	-	-	-
16	CTR-SS-700-C506	7000BMVR-LP-S7C(700-C506)	03/-------/	ROBERTSHAW, 7000MVR SERIES, LP GAS VALVE, MILLIVOLT APPLICATIONS.	-	-	-
17	CTR-SS-700-C506	7000BMVR-LP-S7C(700-C506)	04/-------/	ROBERTSHAW, 7000MVR SERIES, LP GAS VALVE, MILLIVOLT APPLICATIONS.	-	-	-
18				STEAM SECTION			
19	GAU-3-9-50-500-S	54-35675-M33	--/ TI-101/	WIKA, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
20	OR --->	RTG-ES-B3B9-RR	--/ TI-101/	BUFFALO, 3.0" FACE, 9" LG STEM, 1/2" NPT, 50-550°F.	(50°F/550°F)[10.0°C/288.0°C]	-	-
21	GAU-2.5-25B-M30P-L	200-06030-233.53	--/ PI-102/	WIKA, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
22	OR --->	RPG-ESSEC201L-254CC	--/ PI-102/	BUFFALO, 2.5" FACE, 1/4" NPT PROCESS CONNECTION, -30"HG/+30PSIG.	(-14.7/30.0PSIG)[-101.6/206.8KPAG]	-	-
23	CTR-SP-PRV-13-213-08	13-213-B15Q	--/PRE-15 /	CONBRACO, 1-1/4" X 1-1/2" PRV, 15 PSIG (103 KPAG) @ 250°F (121°C).	(15 PSIG @ 230°F)[103 KPAG @ 110°C]	(15.0 PSIG)[103.4 KPAG]	-
24	--	--	--	--	-	-	-
25							
26							
27							
28							
29							
30							

BURNER SPECIFICATIONS

770,000 BTUH BURNER SYSTEM (2 X 385,000 BTUH)

MAXIMUM REGULATOR INLET PRESSURE: 14.0" H2Og

MAXIMUM BTU / HOUR: 770,000 btuh (#38)
MAXIMUM MANIFOLD PRESSURE: 6.9" H2Og
STD SETUP BTU / HOUR: 502,000 btuh (#45)
STD SETUP MANIFOLD PRESSURE: 6.9" H2Og

MAXIMUM BTU / HOUR PILOT: 1,200 btuh
MAXIMUM WORKING PRESSURE PILOT: 3.5" H2Og

MAIN BURNER ORIFICE SIZE: 0.0820" (#45x22)
PILOT BURNER ORIFICE SIZE: 0.0220"

NOTES:
1) All 1" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 3/4" Tubing: 304 SS, 0.035 Wall [SCH40].
1) All 3/8" Tubing: 304 SS, 0.035 Wall [SCH40].
2) All 1" Nipples: SCH XS, SA-106B.
3) All 3/4" Nipples: SCH XS, SA-106B.
4) All 3/8" Nipples: SCH XS, SA-106B.

LEGEND

STEAM JACKET MOUNTED INSTRUMENTS.	ELECTRICAL CONTROL INSTRUMENT TAGS.	GAS CONTROL SYSTEM TAGS.	EXTERNAL INPUTS OR OUTPUTS FROM SYSTEM.	CUSTOM HOUSING TO HOLD SPARK GENERATOR.	SPARK GENERATOR.	MALE OR FEMALE RING CONNECTOR.
TEMPERATURE CONTROL, NC, OPEN ON INCREASE.	PRESSURE CONTROL, NC, OPEN ON INCREASE.	EXTERNAL CABLED CLIENT CONNECTION.	CONTROL AND OPERATOR SWITCHES.	SOLENOID CONTROL VALVE.	750MV POWER PILE GENERATOR.	BATTERY POWER CELLS.
MANUAL GAS CONTROL BALL VALVE.	PRESSURE CONTROL VALVE - REGULATOR.	PRESSURE RELIEF VALVE.	GAUGE - PRESSURE.	ROBERTSHAW - PRESS & HOLD PILOT VALVE.	ROBERTSHAW - MAIN GAS VALVE ACTUATOR.	ROBERTSHAW - MAIN GAS CONTROL VALVE.

REV.	DATE	DESCRIPTION	BY	APPD
0-04	18/11/01	CHANGE TO LP GAS VALVE & PRV	TLG	---
0-02	17/07/12	SYNCHRONIZE ALL VAC BOILER DATES	TLG	---
0-02	17/07/05	ADD PILOT VALVE & SUPPRESOR DIODES	TLG	---
0-00	16/08/09	ISSUED FOR PRE-INFORMATION	TLG	---

PARTS LIST / SETTINGS / LEGEND

GENERAL NOTES:

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□ = Main Cabinet Terminals. (eg: Terminals In Main Unit)
▨ = Plant Connection.
--- = Field Wiring.

Tecvalco Ltd.
North Battleford, SK (306)445-6695
Niagara Falls, ON 1-800-317-0131

JOB NO. –	DATE 01-NOV-2018
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ORIGINATING DEPT. TECH. DIV.	APPROVED BY ---
SCALE NTS	FILE ELECTRICAL

DRAWING TITLE
Tecvalco Ltd.
770,000 Dual Burner
Vacuum Boiler, DLH Series
Wiring Diagrams
(New 2017 Electrical Wiring)

COMPANY: TECVALCO LTD.
DRAWING NO.: DLH-770V-02
PART NO.: P/N:
SHEET NO.: 05 OF 05
REV.: 0-04

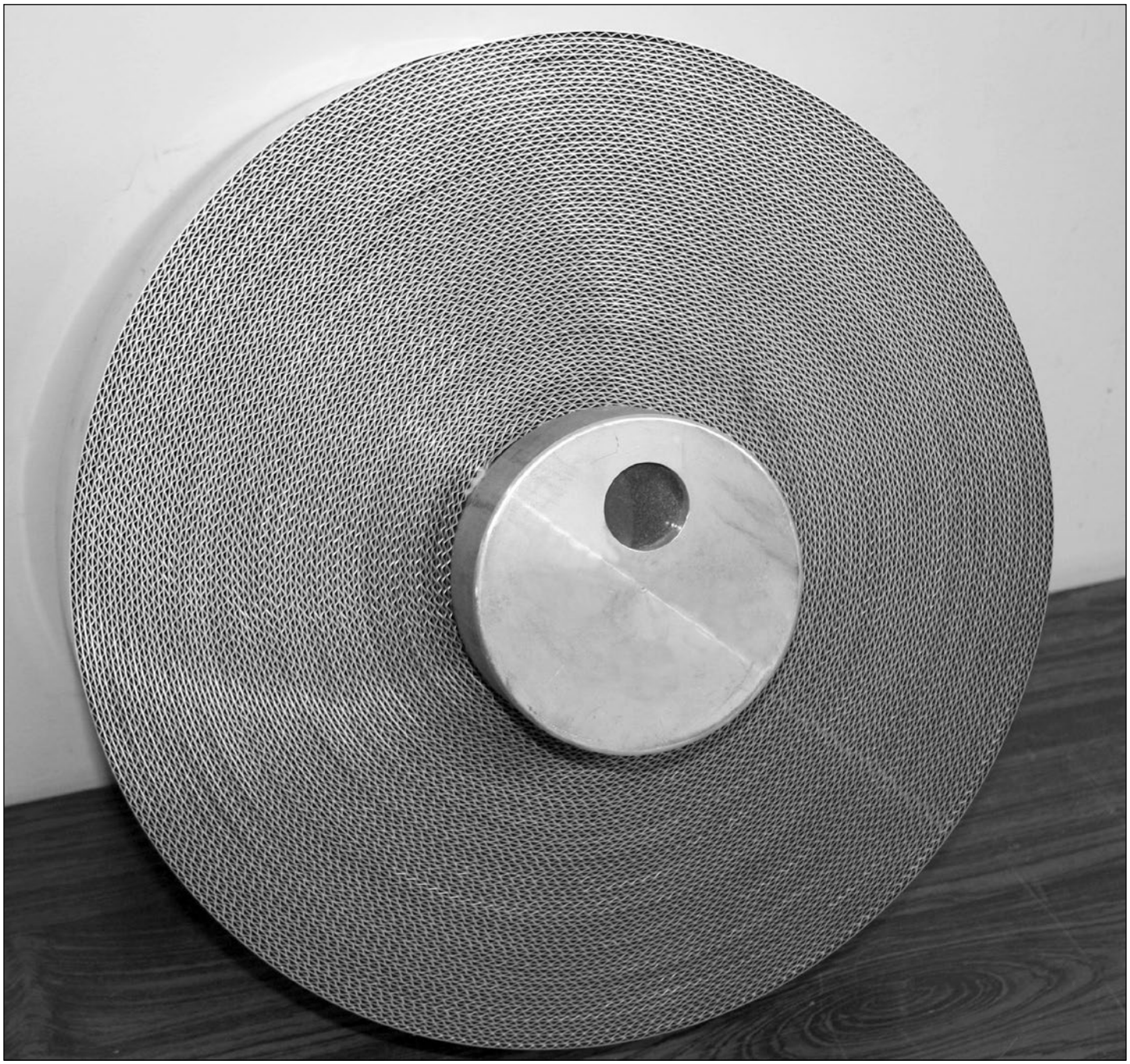
(Figure 4.1.6y)

4.1.7

FLAME OR FLASHBACK ARRESTORS

It is a simple device, which quenches the flame from escaping to the outside of the burner housing. **Ensure you are following local codes and regulations in the use and cleaning of a flame arrestor.**

Our flame arrestors are tested to ISO 16852.



(Figure 4.1.7)

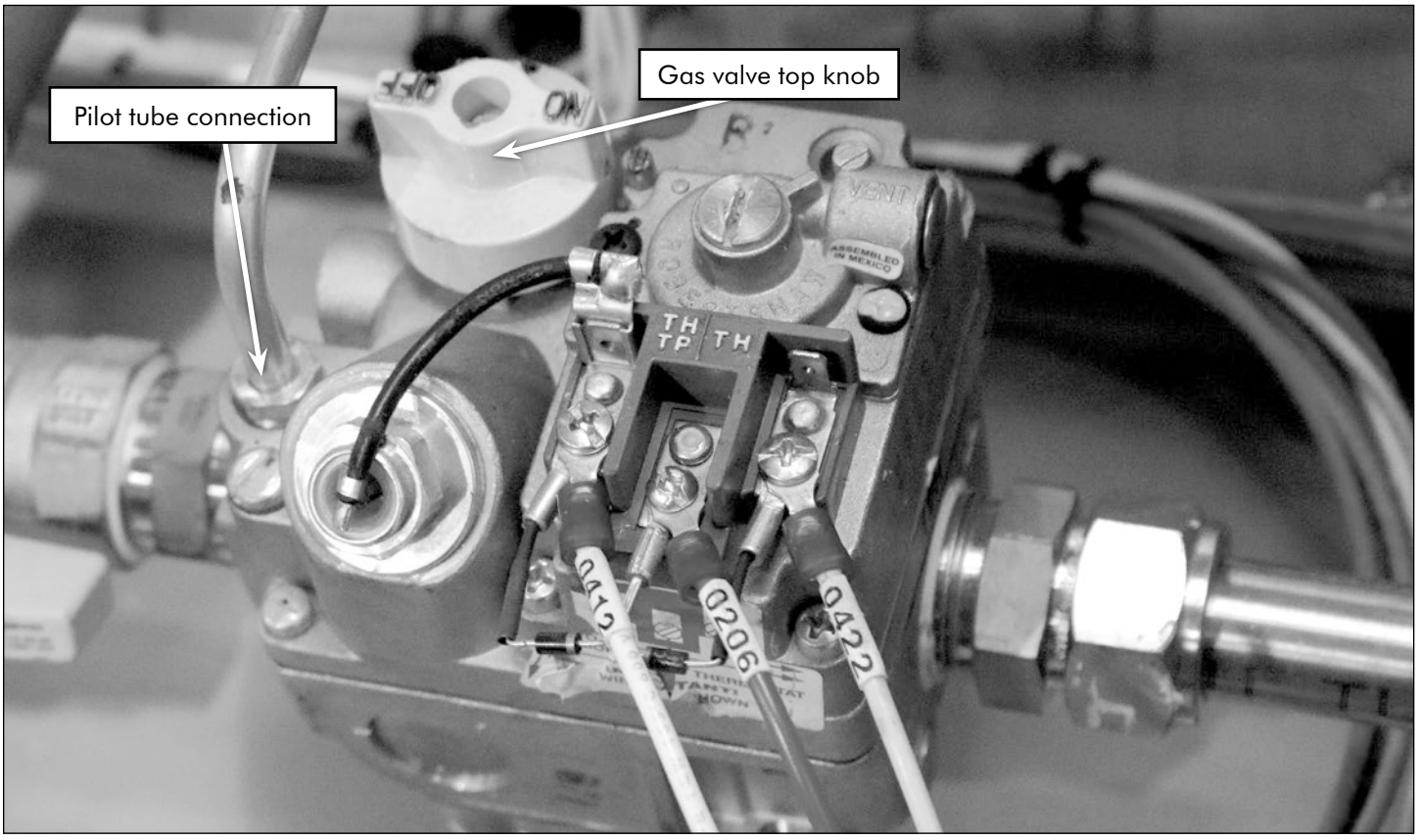
4.1.8

ROBERTSHAW GAS VALVE

The Robertshaw gas valve is the primary fuel control on the boiler. The electrical current generated by the thermopiles in the continuous pilot powers the valve. The valve has three settings: off, pilot, and on. When the valve is in the on position it will respond to the controls in the circuit and the unit will operate.

The Robertshaw gas valve is supplied with a fully adjustable fuel gas regulator. The pressure setting must be set for the max process load of the station and no higher than the max manifold pressure of the corresponding orifice installed in the unit.

WARNING: *The Robertshaw gas valve is not intended for operation at higher than 14.0" W.C. (.5 psi) supply gas pressure. Exposure to higher supply pressure may cause damage and could result in fire.*



(Figure 4.1.8)

NOTE: *Please refer to Technical Manual section for detailed product information.*

4.1.9

LOW FLUID LEVEL SWITCH (STANDARD BOILER CONTROL ONLY)

If the fluid level in the heater falls below this level switch setting, the unit will open circuits to the main burner gas supplies. The operator should inspect the heater to determine possible cause of fluid loss. This will not require manual relighting of the heater. If fluid needs to be replenished, or the heater requires repair, it must be turned off prior to servicing, which will require a manual relight upon completion.

(Figure 4.1.9)

4.1.10

LOW-LOW FLUID LEVEL SWITCH WITH ESD (STANDARD BOILER CONTROL ONLY)

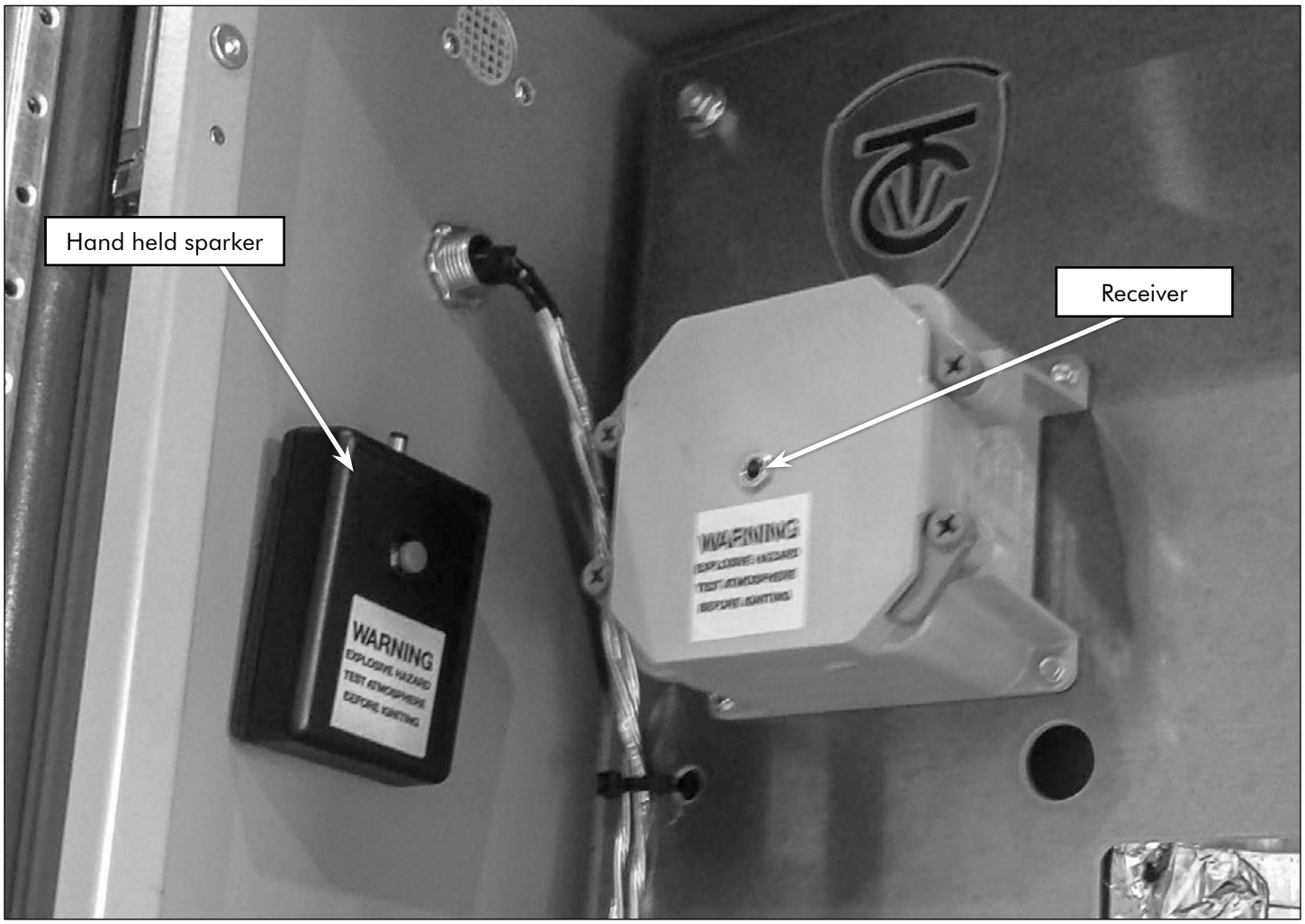
If the fluid level in the heater falls below this level switch setting, the unit will open circuits to the pilot and main burner gas supplies shutting down both the pilot and main gas. The operator should inspect the heater to determine possible cause of fluid loss. This will require a manual reset of the switch and manual relighting of the heater. If fluid needs to be replenished, or the heater requires repair, it must be turned off prior to servicing, which will require a manual relight upon completion.

(Figure 4.1.10)

4.1.11
IGNITOR BOX AND HAND-HELD SPARKER

The ignition box assembly is mounted within the control panel and consists of a receiver and a separate hand-held sparker. Inside the sparker is an AA battery.

***NOTE**: Before lighting the heater, it is mandatory to first test the atmosphere for combustible gases around the unit.*



(Figure 4.1.11)

***NOTE:** Lighting the CWT unit using the hand-held igniter is the only time that the system is capable of producing a spark to light gases and is not CL1 Zone 2 "Non-Incendive" certified. The atmosphere around the control cabinet must be tested or checked prior to lighting the unit for personal safety.*

4.1.12

PRESSURE SAFETY VALVE (RELIEF VALVE) - (STANDARD BOILER CONTROL ONLY)

Overheating and/or over-pressuring the system will release fluid from the heater and will lead to decreased efficiency. If fluid is seen in the collection barrel, review the heater for any issues and repair as needed. It may be necessary to remove and replace fluid in the heater.

(Figure 4.1.12)

(Figure 4.1.13a) Burst disk.

4.1.13

BURST DISK AND BURST DISK HOLDER (VACUUM BOILER CONTROL ONLY)

The CWT Vacuum Boiler is designed to operate below -2.5 psig. If the pressure in the boiler reaches 7.1 psig the rupture disk will fail and the pressure will be released. The rupture disk is located above the fluid level in the unit so most of what will be released will be steam. The small amount of glycol that would be carried along will be collected in the containment system.

Note: For the new graphite gaskets 3M High Strength 90 Spray Adhesive must be used on all bonding surfaces. Avoid contact with disc.

There are a few different styles of rupture discs used in the past on CWT Line Heaters. The most current one is shown in figure 4.1.13a and 4.1.13b.

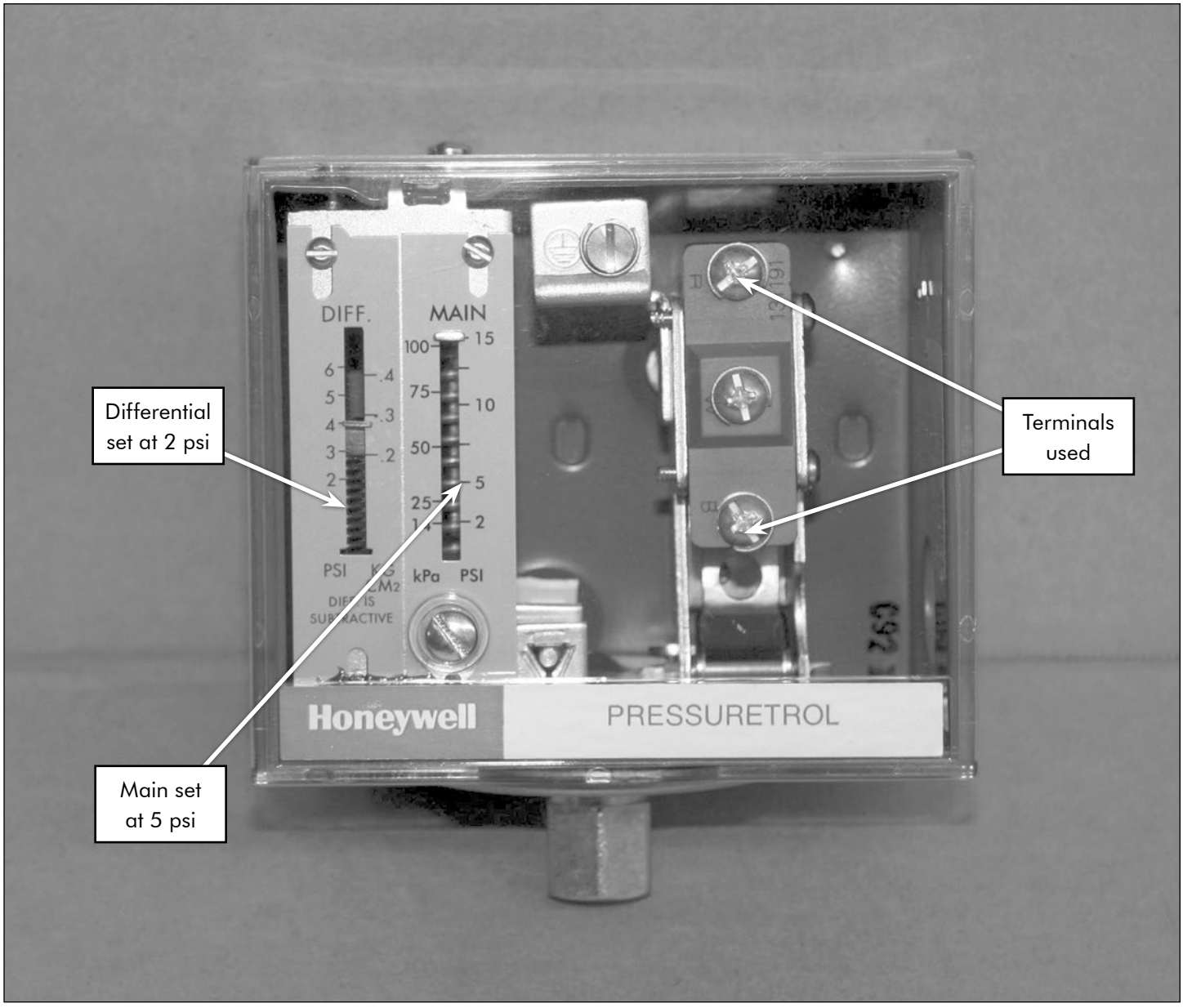
Older style rupture discs can be changed out to the new graphite rupture disc with minor alterations to the old style disc holder and piping.

(Figure 4.1.13b) Burst disk with holders.

4.1.14

OPERATING STEAM PRESSURE SWITCH (STANDARD BOILER CONTROL ONLY)

If the steam pressure in the heater exceeds 5 psi, the unit will open circuits to the main burner gas supplies, leaving the pilot burning. As the steam cools, decreasing the pressure to below 5 psi the main burner will be allowed to relight automatically.

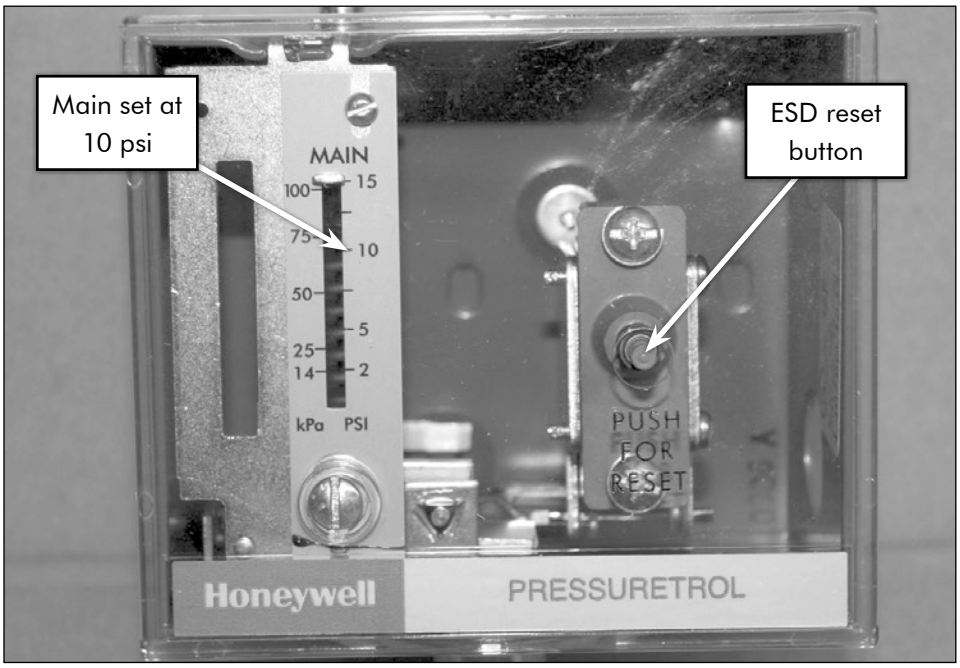


(Figure 4.1.14)

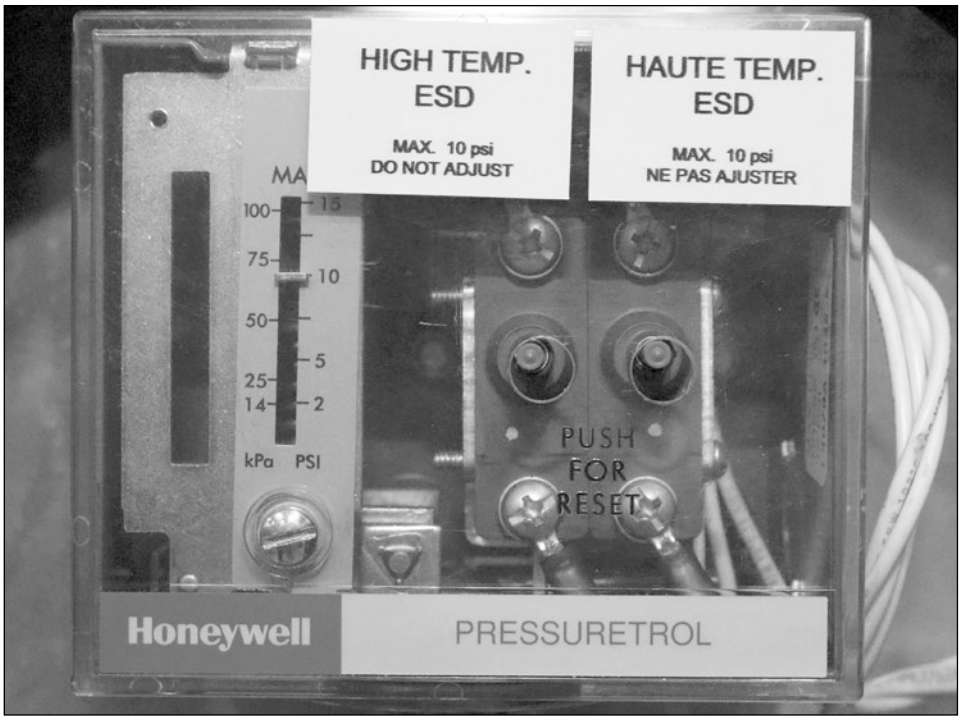
4.1.15

HIGH-HIGH STEAM PRESSURE SWITCH WITH ESD (STANDARD BOILER CONTROL ONLY)

If the steam pressure in the heater exceeds 10 psi, the unit will open circuits to the pilot and main burner gas supplies causing both the main flame and pilot to extinguish. The operator must inspect the heater to determine the cause of the excess pressure. A manual resetting of the ESD switch will be required prior to relighting heater.



(Figure 4.1.15a) - High-high steam pressure swith for 385 boiler



(Figure 4.1.15b) - High-high steam pressure swith for 770 boiler

4.1.16

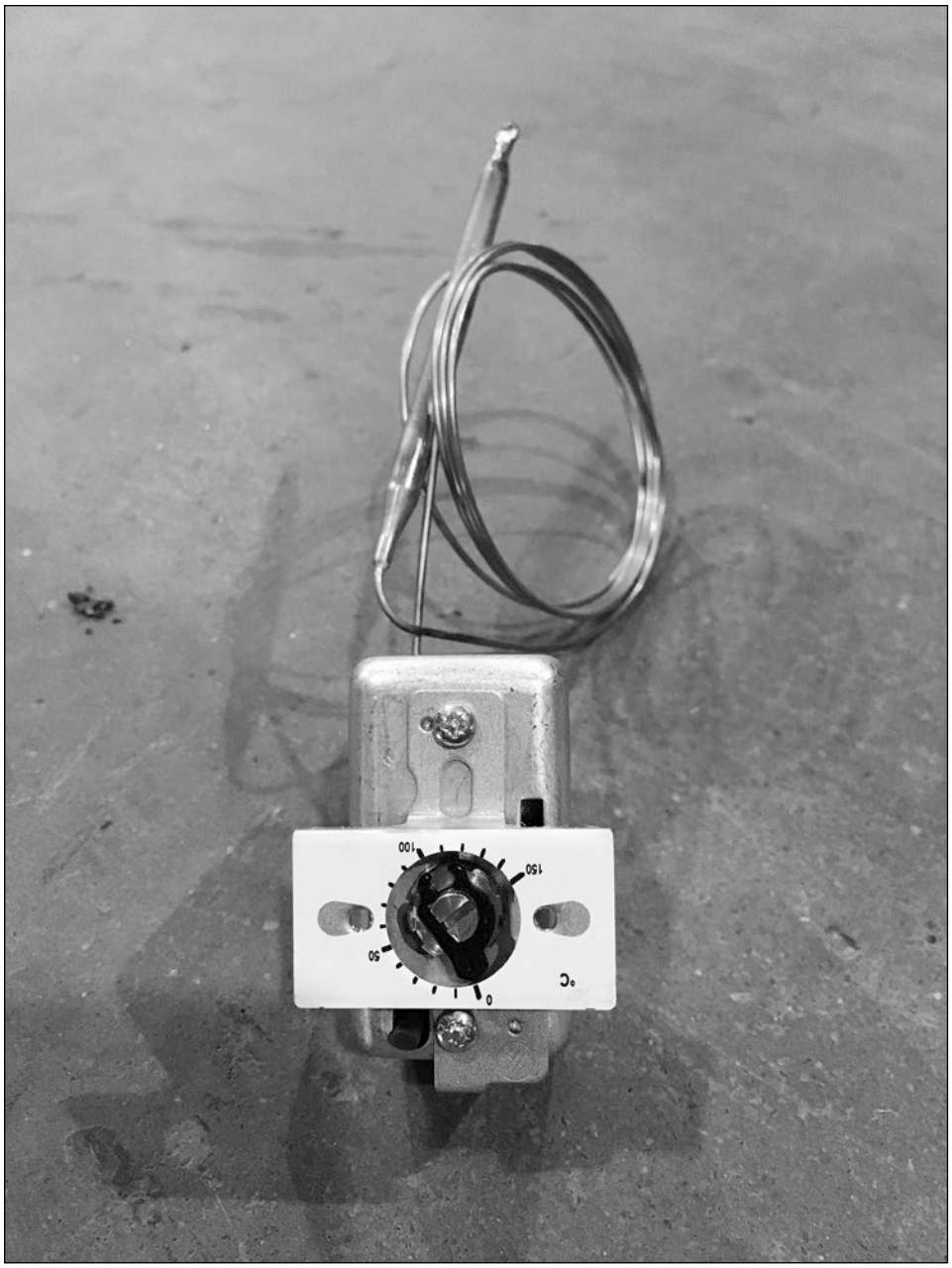
DISCHARGE TEMPERATURE SWITCH (VACUUM BOILER CONTROL ONLY)

This switch is factory set at 180°F, but can be set as high as 195°F. If the steam discharge temperature exceeds the set point of the discharge temperature switch, the unit will open the main gas valve, leaving the pilot burning. When the steam cools down enough below its deadband the switch closes again and allows the unit to fire again.

(Figure 4.1.16a)

4.1.17
HIGH TEMPERATURE ESD SWITCH
(VACUUM BOILER CONTROL ONLY)

The ESD switch is set at 210°F. When the glycol temperature rises above this set point, the contacts open and shuts down both main and pilot burners. A manual reset of the ESD will be required prior to re-firing the heater.



(Figure 4.1.17)

4.1.18
VACUUM PRESSURE SWITCH
(VACUUM BOILER CONTROL ONLY)

The vacuum pressure switch is set at -2.5 psig vacuum. If the steam pressure exceeds this set point the switch opens shutting down the main burner but leaving the pilot on. This will NOT require manual reset.

(Figure 4.1.18)

4.1.19

TEMPERATURE CONTROL (LINE TEMPERATURE CONTROL)

The line temperature control monitors the temperature of the process in the downstream piping. It is generally set between 0°C (32°F) and 5°C (41°F) in natural gas distribution applications. If the gas temperature in the downstream gas piping falls below this set point, the switch will close allowing gas to flow to the main burner and generating steam for heat transfer.

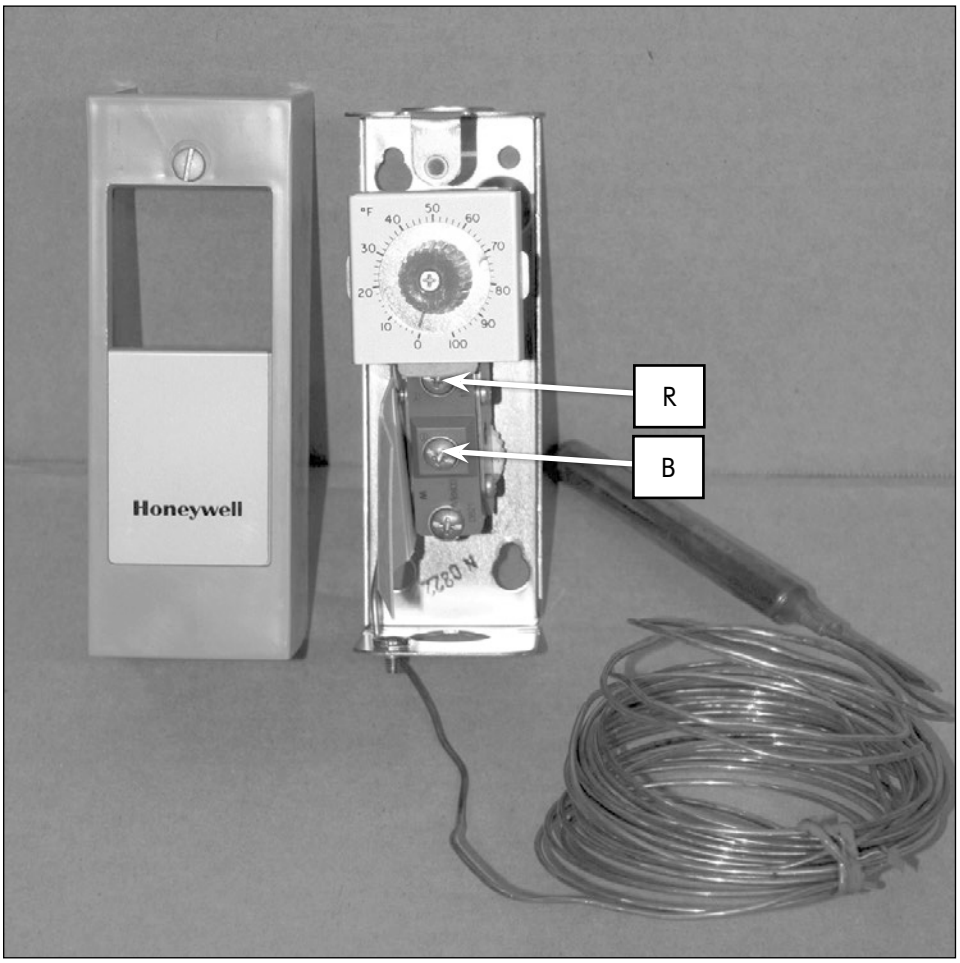
Once the heated gas passing the line temp controller has exceeded its set point, the contacts will open which stops the gas flowing to the main burners. If low or zero gas flow situations exist, the gas temperature control will be from the High Temperature Shutdown (HTSD) temp controller on the outlet of the high pressure coil. The temperature set point on the HTSD probe must then be increased to account for the pressure drop through the gate station. (As a general rule, a 100 Psi / 689.4 kPa drop in pressure will result in drop of 7°F (-13.9°C) of temperature).

NOTE: *Please refer to technical manual section for detailed product information.*

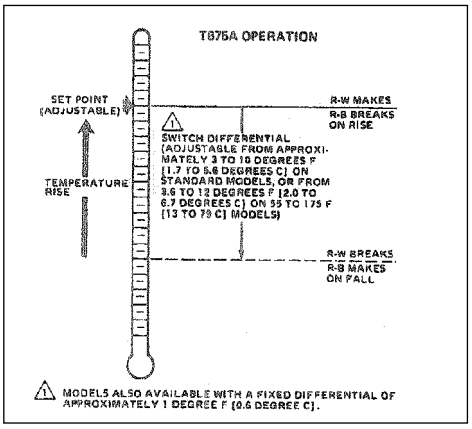
4.1.20a

70 / 140 / 385 BOILER LINE TEMPERATURE CONTROLLER (T675A SWITCH)

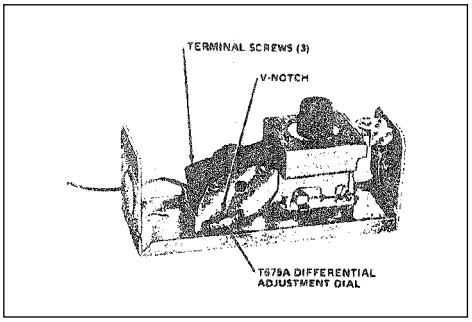
As the temperature of the controlled medium falls below the set point less differential, the T675A switch makes terminals R to B and energizes a normally closed solenoid valve to provide heat. Figure 4.1.15a.1 shows the operation of the T675A. Figure 4.1.15a.2 shows the location of the adjustment dial on models with an adjustable differential.



(Figure 4.1.20a.3)



(Figure 4.1.20a.1)



(Figure 4.1.20a.2)

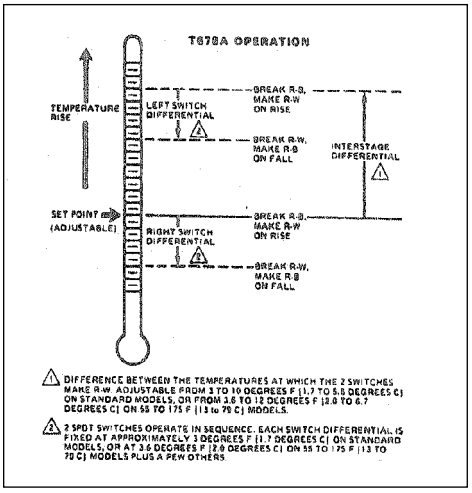
4.1.20b

770 BOILER LINE TEMPERATURE CONTROLLER (T678A SWITCH)

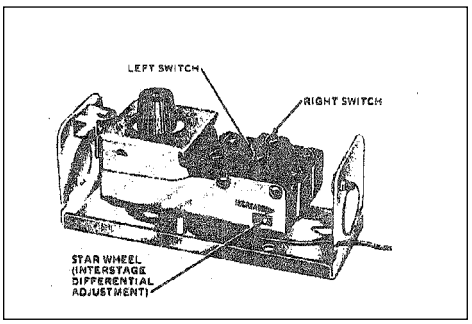
When the temperature at the sensing element rises above the set point of the controller, the switch on the right breaks R to W. Should the temperature continue to rise through the preselected interstage differential of the controller, the switch on the left will break R to W.

Conversely, on a temperature fall, the switch on the left closes R to B, providing first step switching. If the temperature continues to fall, the switch on the right makes R to B to provide sequencing of equipment.

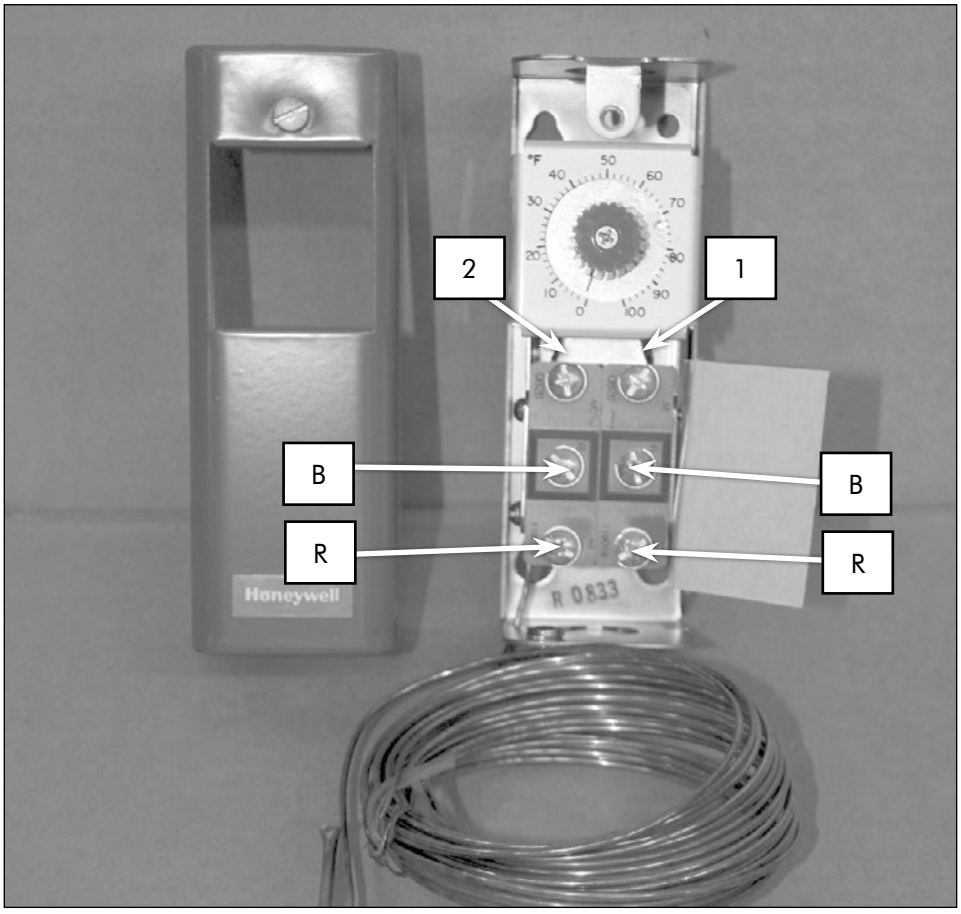
The T678A temperature controller has an adjustable interstage differential. The set point adjustment knob determines the temperature at which the right switch operates. The left switch can be adjusted to operate from 3 to 10 degrees F (1.7 to 5.6 degrees C) (or 3.6 to 12 degrees F (2.0 to 6.7 degrees C) on some models) above the point of operation of the right switch. An illustration depicting the operation of the T678A is shown in figure 4.1.15b.1. The interstage differential is adjusted by turning the star wheel with a narrow screwdriver instered into the rectangular hole in the chasis (figure 4.1.15b.2).



(Figure 4.1.20b.1)



(Figure 4.1.20b.2)



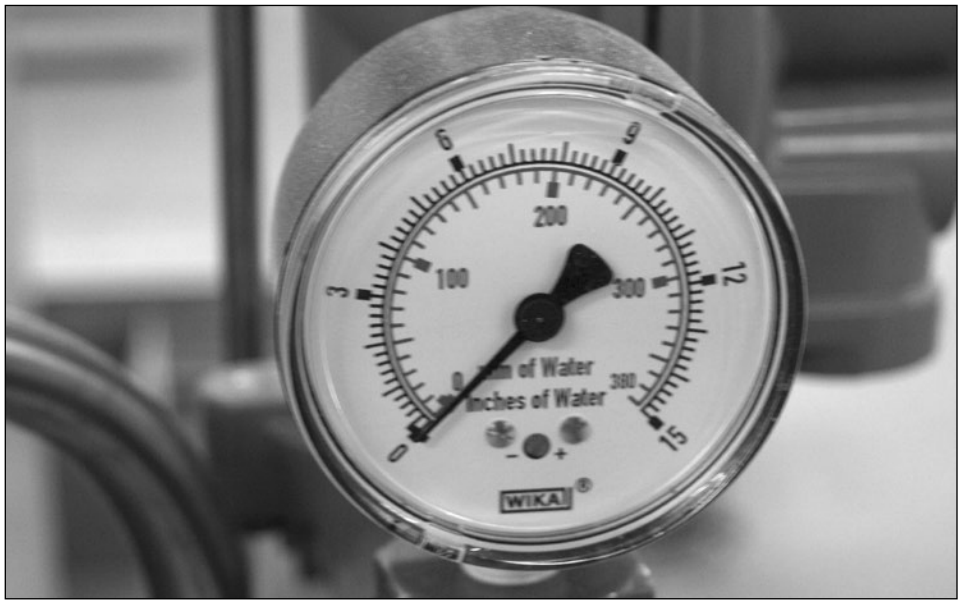
(Figure 4.1.20b.3)

4.1.21
FUEL PRESSURE GAUGE IWC
(INCHES OF WATER COLUMN)

Pressure measurements in inches of water column

1 psi = 27.68 inches of water column, so 0.45 psi would be 27.68 * 0.45 = 12.5 inches of water column

WARNING: *The Robertshaw gas valve is not intended for operation at higher than 14.0" W.C. (.5 psi) supply gas pressure. Exposure to higher supply pressure may cause damage and could result in fire.*



(Figure 4.1.21)

4.1.22
FUEL TRAIN (OPTIONAL)

Customers have the choice to set up their own fuel train or purchase the fuel train directly from Tecvalco.

NOTE: The fuel train is not a part of the certified appliance, and as such should always be installed according to local codes.

4.1.23

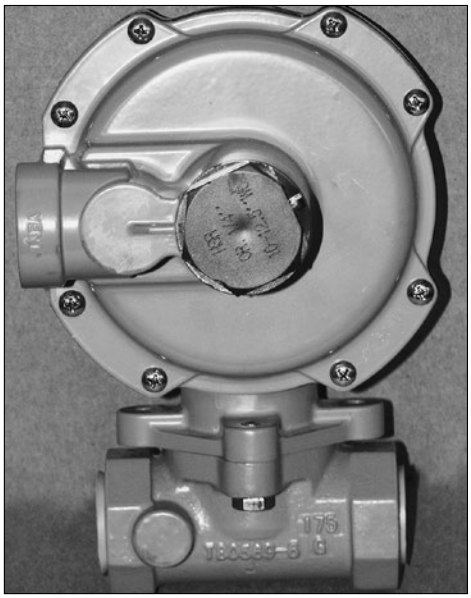
FISHER HSR REGULATOR (OPTIONAL EQUIPMENT)

Pressure to the Robershaw gas control valve. The maximum inlet pressure to the HSR is 20 psi due to the .5" orifice installed within the unit. **Vent as per local codes**.

The following table is using a HSR with .5 inch orifice. Required inlet pressures to the HSR and standard cubic feet per hour for each boiler assembly:

BOILER SIZE	INLET PRESSURE	REQUIRED SCFH
70	1 psig	100
140	1 psig	200
385	5 psig	400
770 (Single)	5 psig	800
770 (2-385)	5 psig	800
1155 (3-385)	5 psig	1200
1.54 (2-770)	5 psig	1600
2.3 (3-770)	5 psig	2400
3.1 (4-770)	5 psig	3200
3.85 (5-77)	5 psig	4000
4.6 (6-770)	5 psig	4800

(Table 4.1.23)

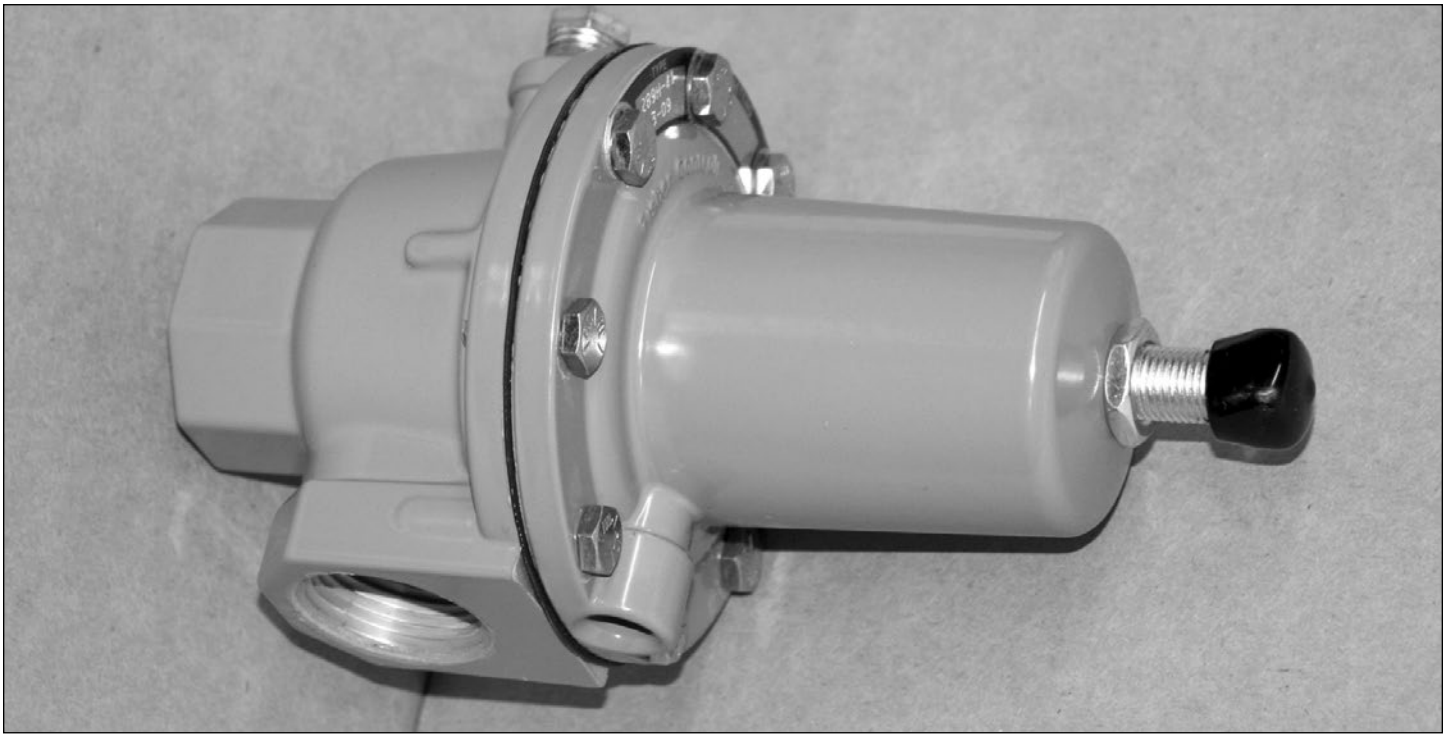


(Figure 4.1.23)

4.1.24

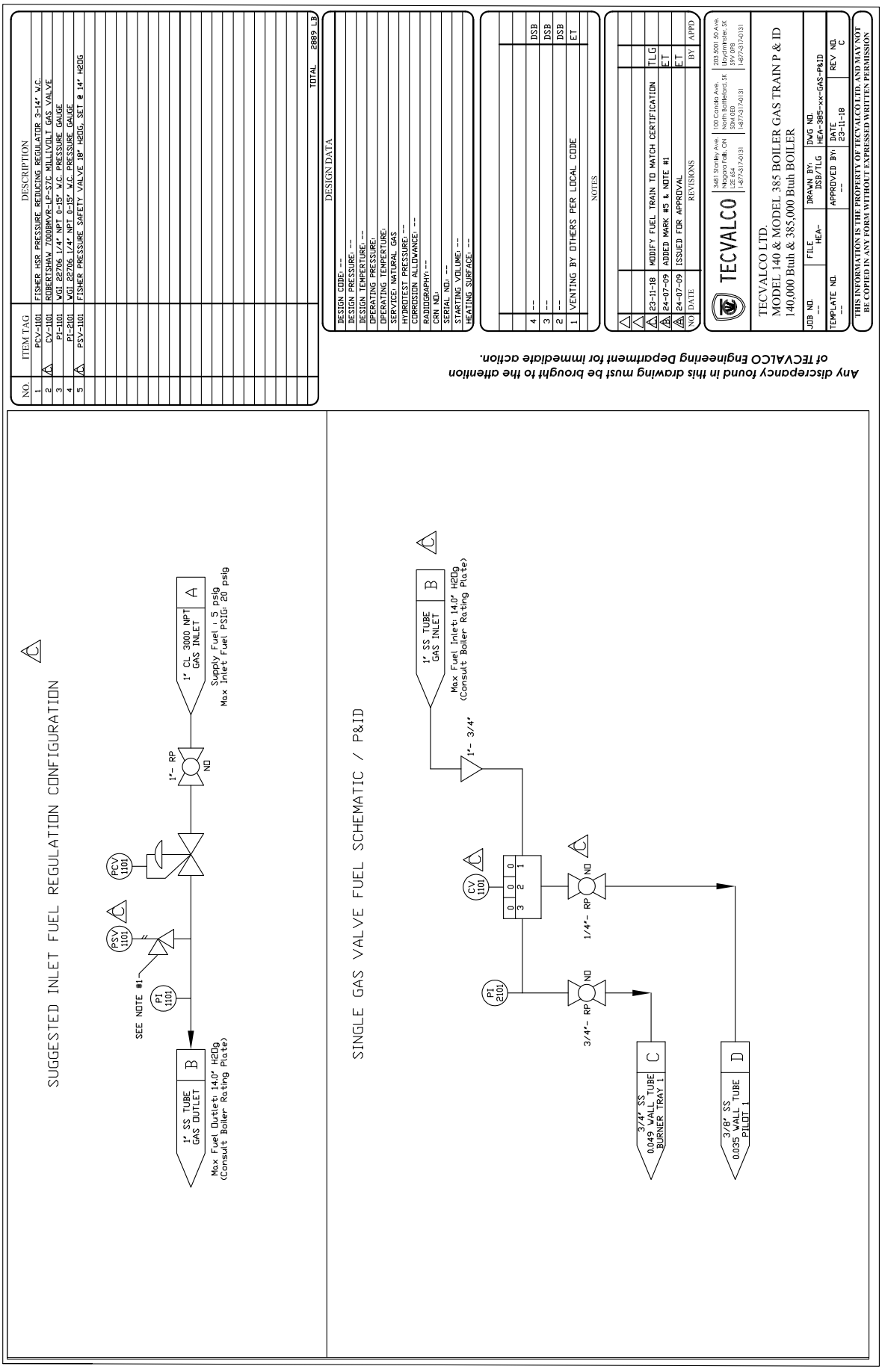
EMERSON 289L RELIEF VALVE (OPTIONAL EQUIPMENT)

This valve is set to relieve excess gas measurement at 14 inches water column. **Vent as per local codes**.



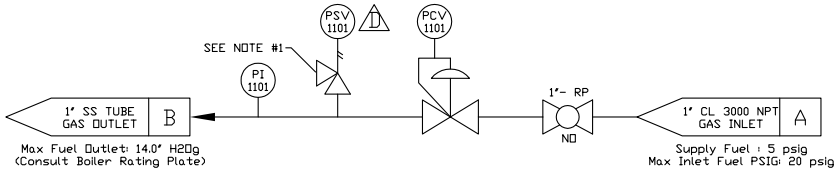
(Figure 4.1.24)

4.1.25 70 / 140 / 385 FUEL TRAIN DRAWINGS

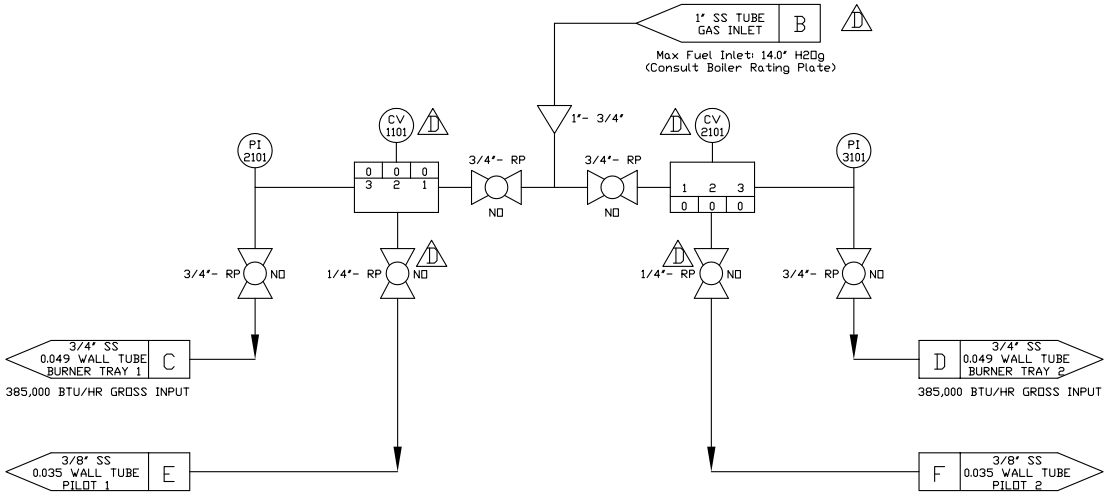


Fuel gas assembly drawings can be found in the Appendix

SUGGESTED INLET FUEL REGULATION CONFIGURATION



DUAL GAS VALVE FUEL SCHEMATIC / P&ID



NO.	ITEM TAG	DESCRIPTION
1	PCV-1101	FISHER HSR PRESSURE REDUCING REGULATOR 3-14" W.C.
2	CV-1101	ROBERTSHAW 7000BMVR-LP-S7C MILLIVOLT GAS VALVE
3	CV-2101	ROBERTSHAW 7000BMVR-LP-S7C MILLIVOLT GAS VALVE
4	PI-1101	WGI 22706 1/4" NPT 0-15" W.C. PRESSURE GAUGE
5	PI-2101	WGI 22706 1/4" NPT 0-15" W.C. PRESSURE GAUGE
6	PI-3101	WGI 22706 1/4" NPT 0-15" W.C. PRESSURE GAUGE
7	PSV-1101	FISHER PRESSURE SAFETY VALVE 18" H2OG, SET @ 14" H2OG
		TOTAL 2889 LB

DESIGN DATA
DESIGN CODE: --
DESIGN PRESSURE: --
DESIGN TEMPERTURE: --
OPERATING PRESSURE:
OPERATING TEMPERTURE:
SERVICE: NATURAL GAS
HYDROTEST PRESSURE: --
CORROSION ALLOWANCE: --
RADIOGRAPHY: --
CRN NO.:
SERIAL NO.: --
STARTING VOLUME: --
HEATING SURFACE: --

4	--	
3	Unable to find original, dwg redone.	TLG
2	Ref. Dwg. HEA-770-2-CTLBOX for complete BOM	BAN
1	VENTING BY OTHERS PER LOCAL CODE	ET

NOTES

NO	DATE	REVISIONS	BY	APPD
5	23-11-18	MODIFY FUEL TRAIN TO MATCH CERTIFICATION	TLG	
4	10-14-09	ADDED 3/4" Valves Upstream of CV-1101/2101	BAN	BAN
3	24-07-09	ADDED MARK #7 & NOTE #1	ET	
2	24-07-09	ISSUED FOR APPROVAL	ET	

TECVALCO
3481 Stanley Ave., Niagara Falls, ON L2E 6S4 1-877-317-0131
100 Canola Ave., North Battleford, SK S0M 0E0 1-877-317-0131
203-5001 50 Ave., Lloydminster, SK S9V 0P8 1-877-317-0131

TECVALCO LTD.
HEA-770-GAS-P&ID (GAS TRAIN P & ID)
770,000 Btuh BOILER

JOB NO.	FILE	DRAWN BY:	DWG NO.
--	HEA-	TLG	HEA-770-GAS-P&ID
TEMPLATE NO. --		APPROVED BY: --	DATE 23-11-18 / REV NO. D

Any discrepancy found in this drawing must be brought to the attention of TECVALCO Engineering Department for immediate action.

4.1.26
PRESSURE VACUUM GAUGE

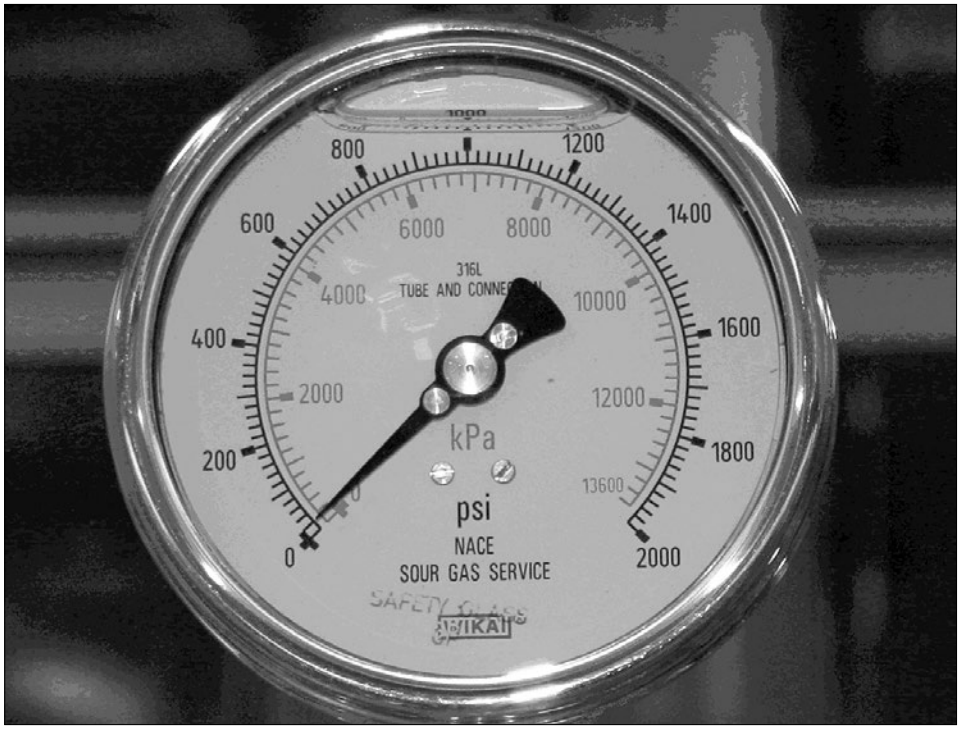
The vacuum gauge indicates the strength of vacuum. When the unit has a steam temperature of less than 140 degrees Fahrenheit, the gauge should be in the range of –22 to –24 inches HG.

Note: *Heat transfer efficiency will increase with high vacuum.*

(Figure 4.1.26)

4.1.27
HIGH PRESSURE COIL GAUGE

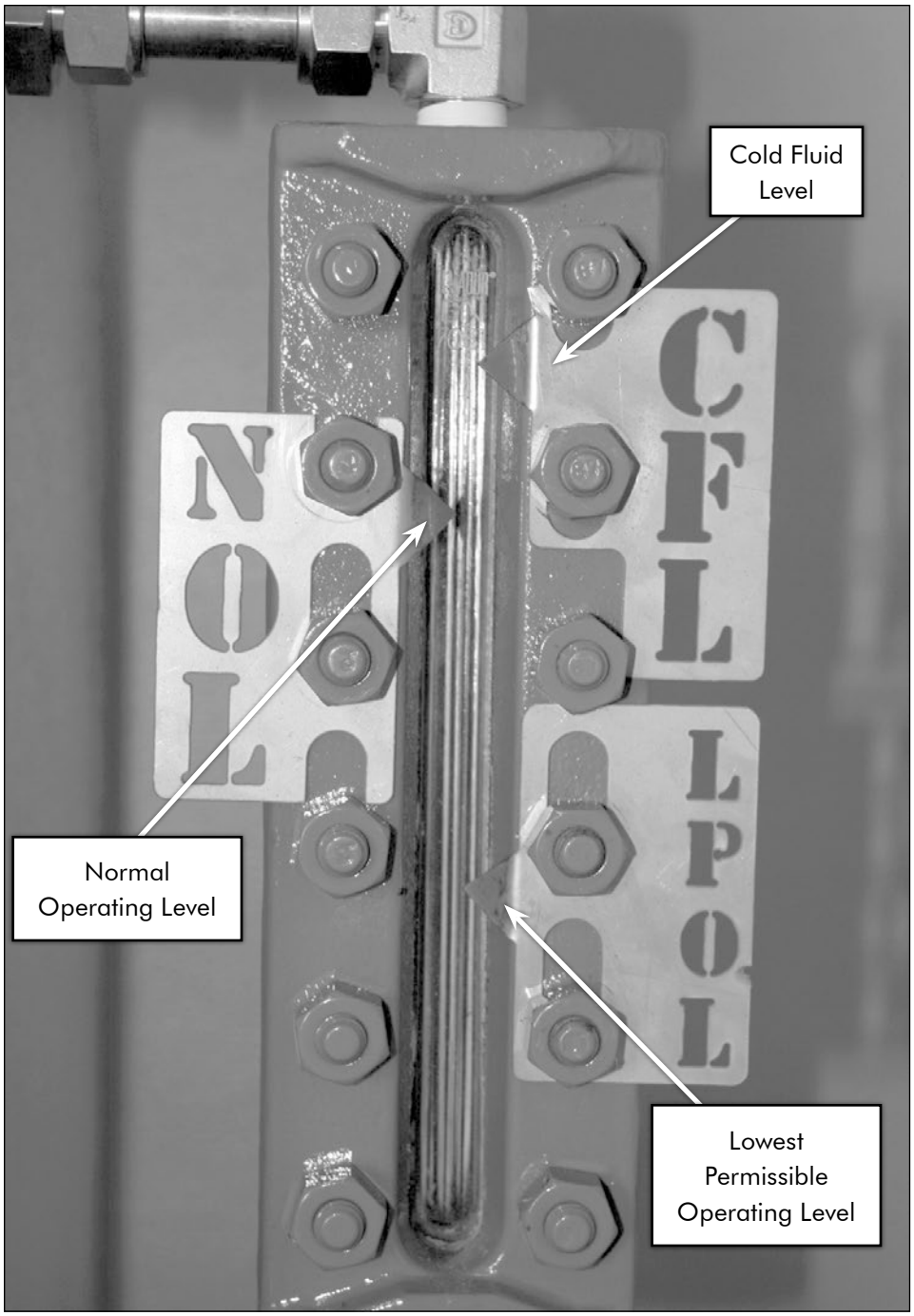
Picture of pressure gauge to the right is the standard liquid-filled pressure gauge CWT uses on inlet and outlet of high pressure coils to determine the gas pressure.



(Figure 4.1.27)

4.1.28
LIQUID LEVEL GAUGE

Pictured here is the liquid level gauge, which indicates the availability of the heat transfer fluid in the system. It is normal for the fluid level to fluctuate in between the CFL and LPOL during operation (not included on the 70k model).



(Figure 4.1.28)

4.1.29
EXHAUST VENT

The exhaust stack cap supplied with the CWT heater is a residential, B-Vent style stack cap. They come in six (6) inch, eight (8) inch, or twelve (12) inch, depending on the boiler model.

The six inch stack has a high-wind stack cap with bird screen, while the eight (8) and twelve (12) inch stacks are both equipped with the bird screen.

Stacks are to be cleaned out (blown out) periodically as part of the routine maintenance. B-vent stacks are double-walled galvalume and can dent very easily. Proper care when installing the vent stack should be taken to prevent damage.

Refer to the Appendix assembly details.

5" B-vent for 70,000 BTU boiler

6" B-vent for 140,000 BTU boiler

8" B-vent for 385,000 BTU boiler

12" B-vent for 770,00 BTU boiler

4.1.30
EMERGENCY SHUTDOWN DEVICE

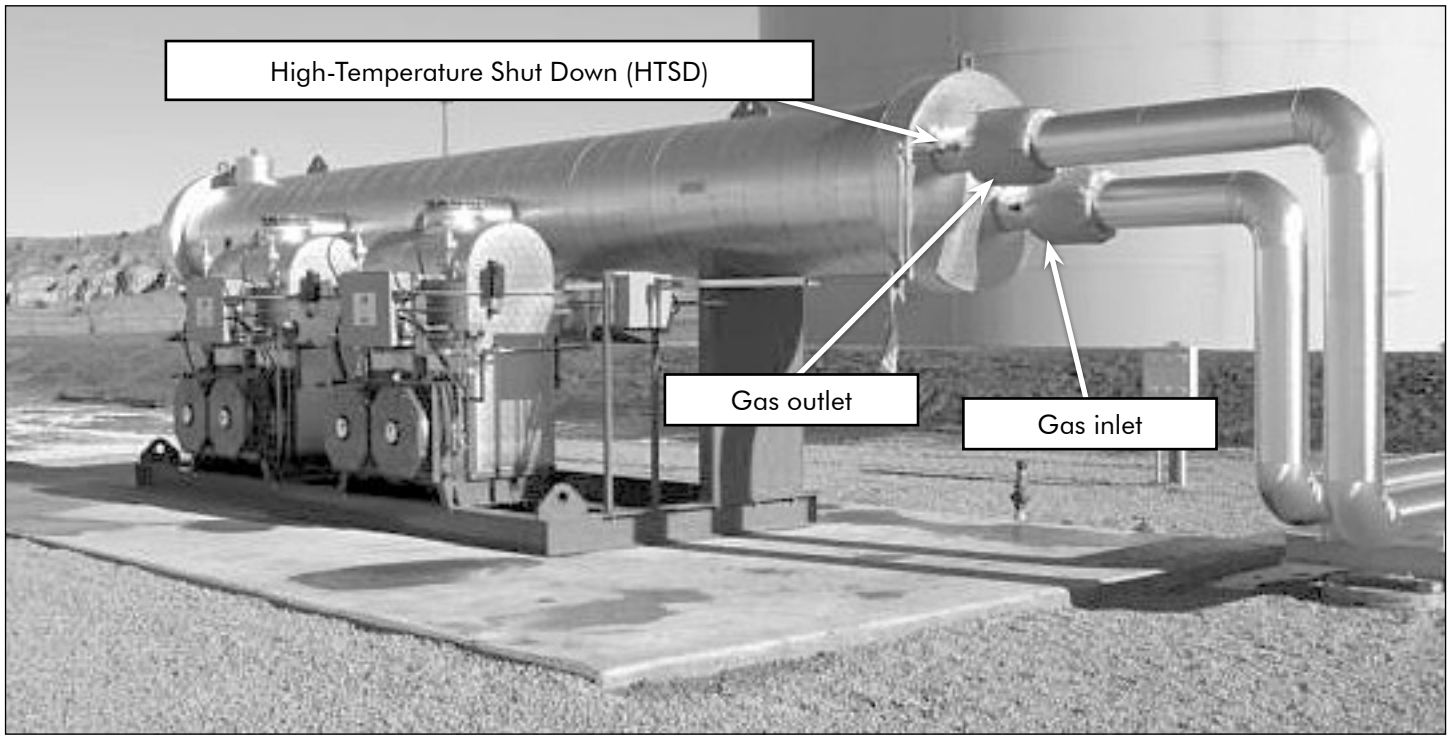
Pushing the emergency shutdown button will remove power from the control system. This will extinguish the main flame as well as the pilot.

To reset, turn the mushroom button clockwise. After this, a manual reignition will be required.

(Figure 4.1.30

4.2
CONDENSER SECTION (HEAT EXCHANGER) (NATURAL GAS HEATER APPLICATIONS ONLY)

The condenser or heat exchanger is the part of the CWT heater where the steam condenses on the pressure coil that contains the cold gas. When the steam contacts the process pipe it releases latent heat, condensing back to water. The water drains to the boiler section by gravity. **The inlet and outlet of the high-pressure piping is not defined, either flow direction will result in an acceptable heat exchange. The HTSD must be installed on the outlet side of the high pressure coil.**



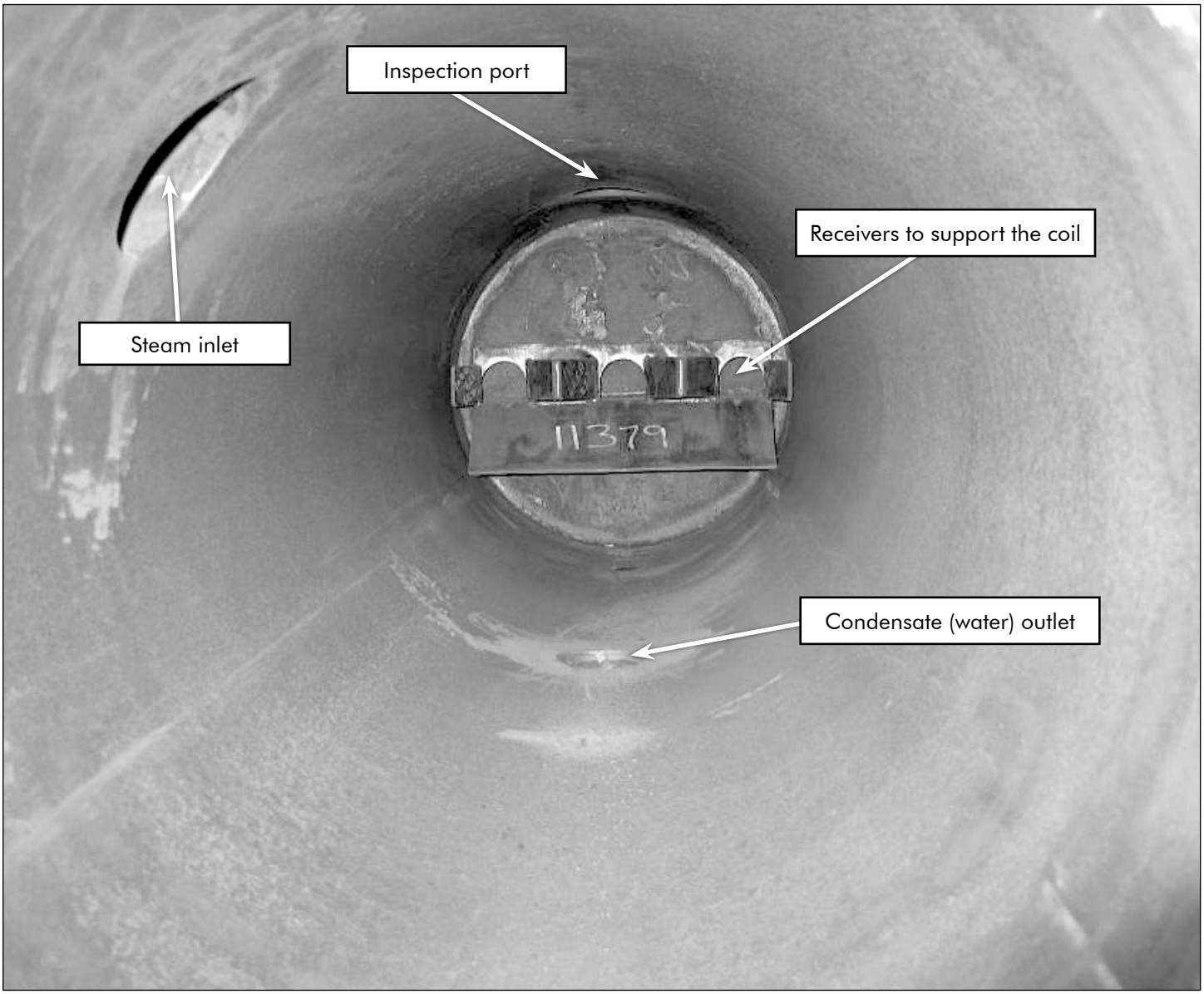
(Figure 4.2)

4.2.1

THE HEAT EXCHANGER CAN

The condenser/heat exchanger can contains the pressure coil and provides the vessel in which the steam is allowed to condense on the coil.

Inside the condenser can (photo below) the receivers at the far end support the coil.

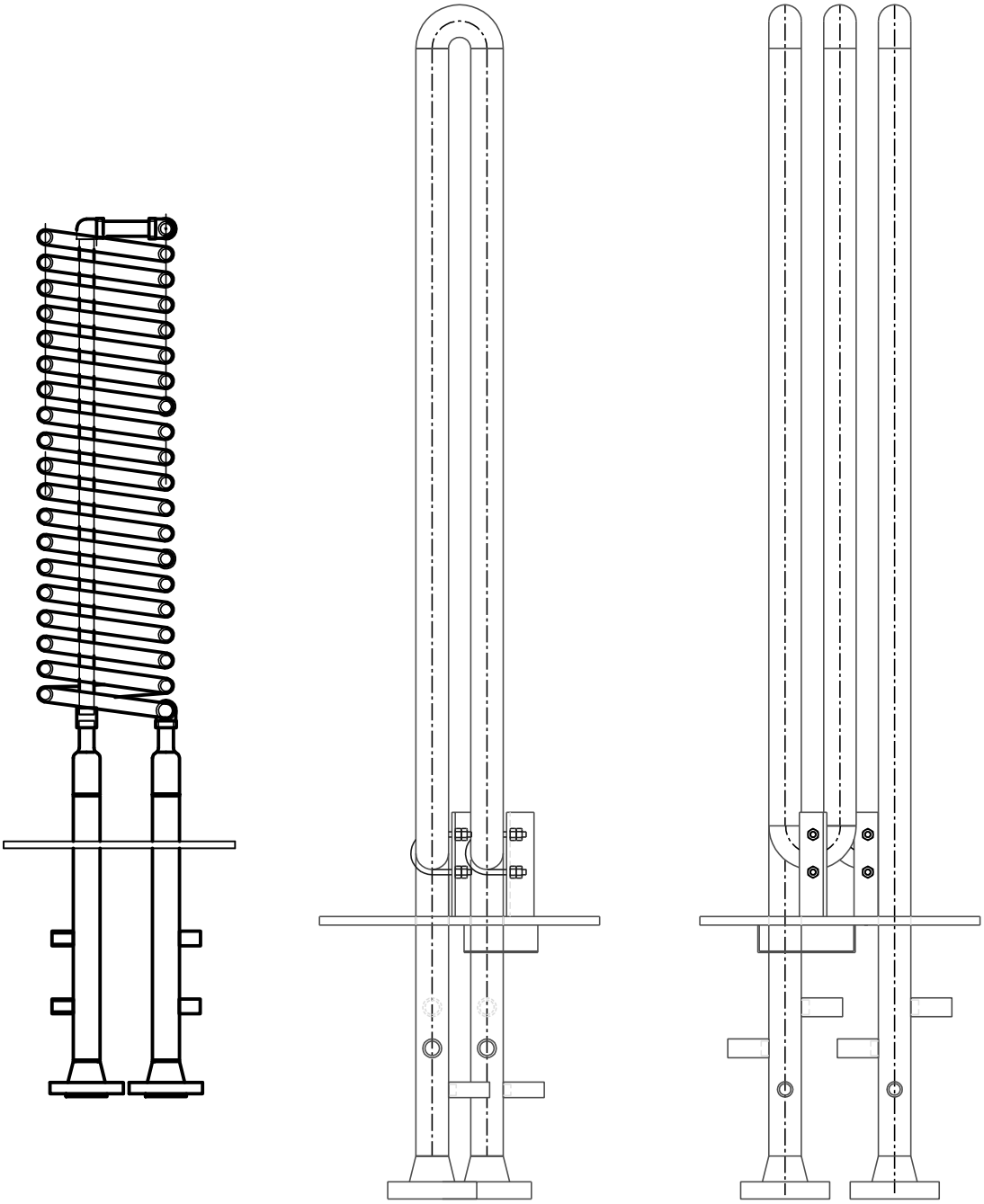


(Figure 4.2.1)

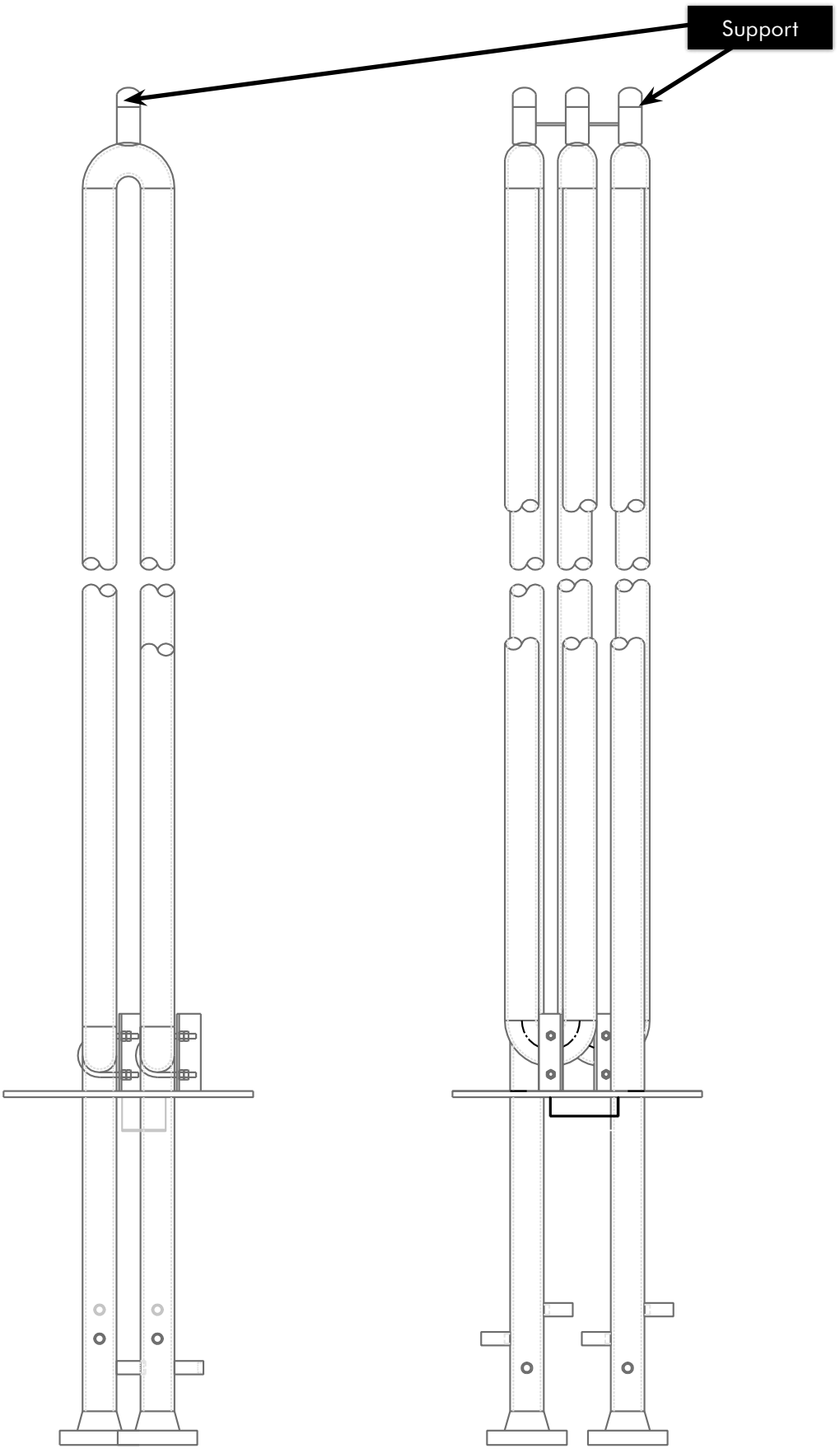
4.2.2

HIGH-PRESSURE PROCESS COIL

The high-pressure coil is the device that contains the gas to be heated. It is a registered pressure device built and certified in accordance with ASME B31.3 (pressure piping) or ASME, SEC VIII. Based upon model size and station requirements, the CWT high pressure coil can be cylindrical/helical or serpentine as depicted below.



(Figure 4.2.2a)



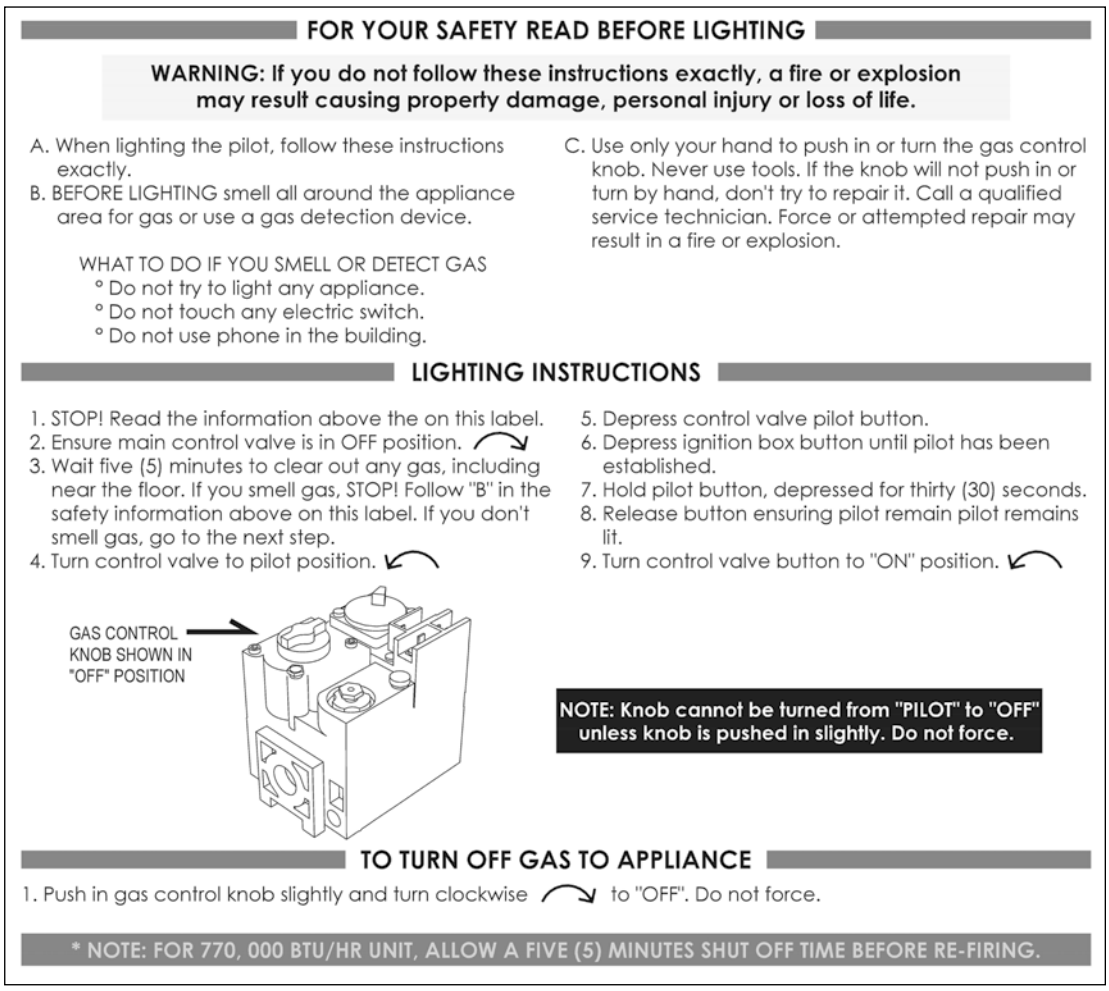
(Figure 4.2.2b) Note the nubs on the end of the coil. These provide support and grounding for the coil inside the can and are not part of the pressure envelope.

5. START-UP PROCEDURE

On start up in very cold weather the high pressure process coil may be at a temperature below it's design temperature. Ensure the unit is warmed up to higher than 0°C (32°F) prior to pressuring up the coil. If the boiler is down in very cold weather and there is no gas flow passing through the unit, the CWT should be isolated and the pipeline pressure reduced.

WARNING: *Test atmosphere around the boiler prior to lighting (procedure also on control box door). If an explosive mixture exists locate and shut off the source of the fuel and ensure the flame arrestor is in place and secure.*

1. Open main gas ball valve on the fuel gas supply.
2. Turn Robertshaw control valve to the "PILOT" position.
3. Depress and hold pilot button.
4. Insert hand held ignitor into the ignition box in the control cabinet and depress the button, while still depressing the pilot button. This causes a spark to jump across the pilot assembly. You should hear the sparking. Once the pilot lights you will no longer hear the spark. It may take several minutes for the natural gas to reach pilot area, due to the length of fuel gas supply line and the amount of trapped air.
5. Hold pilot button down for 45 seconds or more and then release.
6. Look through the site glass to confirm the pilot remained lit. If not, check that the valves on the fuel supply are open and return to step four. If this problem persists press the reset on the ESD control and try again or check fuel gas
7. With established pilot turn Robertshaw control to the "ON" position.
8. Change the setting of the line temperature switch to force heater to light. The main gas control valve should open and the heater should light.
   On first light you may get a slight burst of gas because of air in line. Turn to pilot for a second and then back to on. If the main burner does not light, confirm that all the dial type switches are calling for heat.
9. Once the boiler is operating, examine the flame and note any instability.
10. Use the CWT Line Heater checklist inspection form (section 7.16) to record the initial data.
11. For 385,000 and 770,000 Btu/hr: Allow 5 minute complete shutoff before attempting to re-fire.



6. Typical operation

During the first operating cycle of the boiler, allow the system to run. Monitor the vacuum pressure, the discharge temperature and the level of heat transfer fluid in the sight glass. During initial start up and during normal operation the level of heat fluid will vary widely in the sight glass.

While the system is warming up, you will hear clattering and clanking, which is normal. Once the steam temperature reaches 120F, the system will quiet down and eventually become virtually silent. Once the boiler is warm (the main flame bed turns on and off to keep the gas warm) note the duration of the on and off cycles and the maximum and minimum temperatures reached. The season and gas flow will determine the cycle times; slow flow means long cycles and high flow mean short cycles. Use the attached Inspection sheet (section 7.16) to record start-up data. If the boiler appears not to be warming gas sufficiently the regulator in the Robertshaw gas valve can be adjusted to a maximum value for the given installed orifice as per the rating plate. If this is still insufficient, the orifice can be drilled or changed to the next applicable size, again as per the rating plate. Only those orifices listed for a given model are acceptable to use. Insufficient fuel gas will cause the unit to run constantly, and will not heat properly. If the heater cycles off and on it has sufficient energy to heat the gas.

To achieve low flow rate setting, while burner is in operation, turn the knob on the Robertshaw gas valve to reduce the input. The minimum and maximum allowable inlet pressures are indicated on the rating plate inside the control panel.

6.1
GLYCOL

The glycol used in the CWT heater is a ClearFrost 50/50 pre-blend. Our Heat Driven Loop technology **does not use** the glycol as the heat transfer medium. Glycol in the CWT system is only for freeze protection. Customers are advised that when sending glycol samples for lab tests that the following results may be identified:

1. Low to no corrosion inhibitors present: this condition is typical for CWT units as through the process of separation that the glycol undergoes, the inhibitors actually drop out and/or burn up.

2. High solids content: The presence of some residuals of the manufacturing process are typical, as we are not able to remove them all from the system. There are no pumps or moving parts that will be affected by small or trace amounts of residuals. However, if large amounts are found, refer to the maintenance section of this manual.

3. Discoloration of the glycol in CWT systems is typical and the amount will vary from site to site depending on the station loading. Do not be alarmed. Confirm the freeze protection is still lower than the lowest ambient condition for the location of the heater.

Note for heaters that have DowFrost HD: Dow Chemical has a series of standard computer generated responses for every sample they check, the baseline for the responses is "New" DowFrost HD. Here are some examples and factory responses to each:

"This fluid has cloudy appearance and suspended solids": Typically the solids present are inherent to the manufacturing process at the factory level and should only become a concern if the iron level increases over future annual samplings.

"The pH is above the maximum recommended level for Dow fluids": There is only a concern if the pH level exceeds 12 and the pH level of the glycol should decline over time.

"Solids can be detrimental to pump seals": Our technology features no moving parts such as pumps and circulators.

"**Azole based copper inhibitor is low. Insufficient copper or copper alloy corrosion protection**": The CWT heater operates in a vacuum and inherent corrosion protection is achieved by the lack of oxygen in our system and there are no copper or copper alloy components in the CWT systems.

"**High amounts of solids will significantly reduce the heat transfer properties of this fluid**": Unlike conventional water bath heater technology, the glycol found in our heater is not used for heat transfer.

"**Concentration and freeze point comments**": As provided, the 50/50 blend of glycol and water provides freeze protection to approximately –30 degrees Fahrenheit and the user should ensure this number stays below the minimal ambient temperature of the site.

6.2
CONTROL SETTINGS

CONTROL	SETTINGS	
	STANDARD BOILER CONTROL	VACUUM BOILER CONTROL
Operating steam switch	Factory setting - 5 psi	180°F / 82°C
High-high steam switch with ESD	Factory setting - 10 psi	210°F / 99°C
Low fluid level switch	Factory setting	N/A
Low-low fluid level switch with ESD	Factory setting	N/A
Pressure safety valve	Factory setting - 15 psi	7 psi Burst Disc
Line temperature	0°C/32°F to 5°C / 41°F Depending on the conditions and the nature of the gas set this as required (About 2°C/ 35°F).	0°C/32°F to 5°C / 41°F Depending on the conditions and the nature of the gas set this as required (About 2°C/ 35°F).
Gas bundle outlet temperature (HTSD)	24°C / 75°F to 43°C / 110°F	24°C / 75°F to 43°C / 110°F
Vacuum pressure switch	N/A	-2.5 psi (-5" hg)

(Table 6.2)

Note: *When multi-heating boilers are used on a heat exchanger, the line temperature switches should be rotated, so that the single boiler is not always the lead unit.*

6.3
TUNING THE CWT BOILER

The CWT Boiler has a significant advantage over conventional systems in that it has a high turndown capability. A CWT boiler can run with variable fuel inlet pressures. This allows the operator to set the cycle time of the boiler to best fit the load. **Ideally, a perfectly tuned heater would run 100 per cent of the time on the coldest day of the year.** In practice, a well-tuned boiler will typically cycle three to four times per hour.

Cycle time is determined by firing rate and load. The "on", or firing portion of the cycle can be controlled by the firing rate. If the firing rate is increased this will shorten the on part of the cycle. Flow and pressure drop through the station controls the "off" part of the cycle.

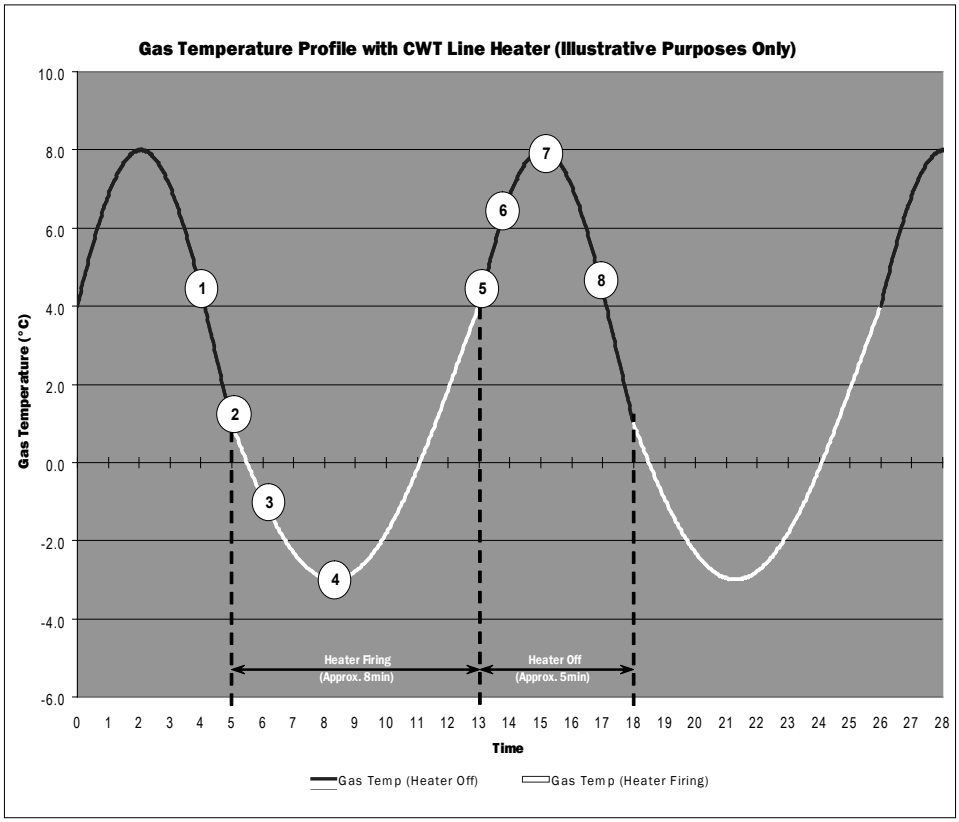
Some general rules for tuning include:

- If possible, set the firing rate during high station load conditions and let the boiler stabilize (warm up) before continuing.
- Fire at a high enough rate that the boiler will cycle at least three times per hour.
- Fire at a high enough rate to ensure the stack temperature exceeds 130°C (266° F). Below this point incomplete combustion may occur and "raining" may occur in the stack.
- Fire at a low enough rate that the stack temperature does not exceed 250°C (482° F). Above this could impair the boiler or stack.
- Obtain a combustion analysis and optimize the combustion.

Observe the flame and address any lifting and/or hunting. Consult Tecvalco for assistance.

6.4
CYCLES

The CWT Boiler normally operates with cycles on and off (figure 6.3a). The nature of the cycle depends on the firing rate and load as well as the set points on the controls - primarily the gas temperature control. (See section 6.1)



(Figure 6.4)

When the boiler fires in response to a call for heat by the gas temperature control, the boiler begins the process of boiling the water. As the steam temperature and pressure increases, more heat is delivered to the process gas. Eventually, the temperature of the gas reaches the set point of the gas temperature control and the main burner shuts down. Upon shutdown, a large amount of energy remains in the boiler and the temperature of the gas will continue to climb for some time (depending on the load). As a result the heater tends to overshoot the set point by a few degrees. Similarly when the heater is off, and the temperature is falling, when the gas line temperature control reaches the set point (plus the dead-band) it will call for heat and the boiler will fire. It might undershoot the set point before the boiler catches up.

7. MAINTENANCE

WARNING: *Never perform maintenance on the boiler when under operation or hot. Please ensure that the unit is shut and cooled down for a minimum of 25 minutes, and that all fuel gas to the device has been shut off prior to performing any maintenance operation.*

ALWAYS assume that there is pressure in the system.

7.1
MAINTENANCE SCHEDULE

It is suggested that the boiler undergo a complete inspection, maintenance and cleaning at least annually. Use the following maintenance checklist in conjunction with the CWT inspection sheet (section 7.17). The inspection can be done in connection with maintenance and can begin with a boiler that is operating; however sufficient time should be available to allow the boiler to cool prior to the maintenance activities.

Service inspections

a. A poorly adjusted or malfunctioning appliance can deposit soot and other debris which can enter the vent system. The vent should be visually inspected at least annually for the presence of deposits of soot or debris. Blow air through the stack until no debris can be seen exiting. **Always wear appropriate PPE before performing any service.**

b. The boiler must be periodically inspected by a qualified serviceman or Tecvalco service technicians.

Inspection Checklist

- ❑ Take pictures of the complete heater.
- ❑ Record heater serial number and coil serial number.
- ❑ Shut heater off and allow it to cool completely down.
- ❑ Ensure vacuum is between -22 and -29 inches.
- ❑ Check the glycol level in the sight glass.
- ❑ Open the burner box door and take pictures of burner tray and burner box.
- ❑ Remove stack and take pictures of stack walls and top of fin tubes.
- ❑ Remove burner tray gas line and disconnect pilot line from tray. Loosen off main pilot line nut. Burner tray may be difficult to remove as side walls can distort, slightly pinching the tray in place.
- ❑ When burner tray is removed take pictures of bottom of fin tubes. If possible, do a visual inspection.
- ❑ Use an air compressor to **blow off top and bottom of fin tubes**.
- ❑ Once complete, do a visual inspection. If not clean, then repeat.
- ❑ Use a vacuum cleaner to clean up the bottom of burner box and, if possible, the top of the fin tubes.
- ❑ Take pictures of cleaned-out burner box and top of fin tubes.
- ❑ Clean burners from tray with air and check orifices to see if they are clean. This may require disassembly.
- ❑ Clean flame arrestor cell with air or soapy water solution. Flame arrestor must be clean and free of debris.
- ❑ Reassemble burner tray and install back in burner box. Hook up gas line and pilot assembly.
- ❑ Check wires in burner box for defects. If necessary, replace.
- ❑ Note condition of door gaskets and flame cell. Replace if damaged.
- ❑ Close up burner box area.
- ❑ If heater has cooled down enough, take glycol samples.
- ❑ When complete, relight heater using start-up procedure.

WARNING:
Inspections and tests included in this section may be regulated by local, Federal, or other jurisdictions. Please review all applicable codes and regulations prior to conducting any activities on CWT equipment.

WARNING:
Performing pressure tests on the system can be hazardous, and should only be performed by trained professionals. Contact Tecvalco if you have any questions.

WARNING:
Keep boiler area clear and free from combustible materials, gasoline and other flammable vapors and liquids

- ❑ Once inspection is complete, test controls **using a dry block** where required, or a multimeter and pressure station set-up for pressure switches:
  - ❑ Operating steam pressure switch (5 psi) (STANDARD BOILER ONLY)
  - ❑ Operating steam pressure switch (10°C/50°F to 91°C/195°F) (VACUUM BOILER ONLY)
  - ❑ High-high steam pressure switch with ESD (10 psi) (STANDARD BOILER ONLY). Will require reset/relight.
  - ❑ High temperature ESD switch (99°C/210°F). Will require reset/relight. (VACUUM BOILER ONLY)
  - ❑ Line temperature control switch. Set to desired temperature.
  - ❑ Low water cut-off.
  - ❑ Low-low water cut-off with ESD. Will require relight.
  - ❑ Emergency push button. Will require relight.

Once the heater is up and running, complete the final checks as follows:

- ❑ Check millivolt readings.
- ❑ Check temperature of gas at station outlet, as well as in and out of the coil
- ❑ Check fuel pressure, in inches WC.
- ❑ Check steam and stack temperature.
- ❑ Perform combustion analysis, if possible.

WARNING: Do not obstruct the flow of combustion and ventilation air.

WARNING:
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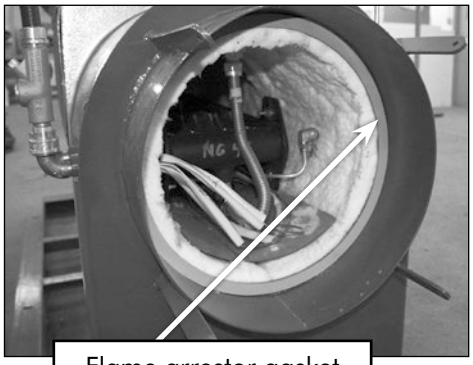
7.2

CLEANING THE FLAME ARRESTOR *(SEMI-ANNUAL)*

The flame arrestor on the boiler should be inspected and cleaned in order to ensure that it is in good working order and that enough air is provided to support proper combustion. In some cases more frequent cleaning may be required.

Always wear appropriate PPE for the service functions undertaken.

a. Ensure the boiler is off prior to removing the flame arrestor.
b. Remove the flame arrestor and examine the cell – ensure that it is not damaged. Examine the gasket around the flange and ensure it is intact and in good condition.
c. Using compressed air or nitrogen blow out any dust or contaminants that might be in the weave of the cell.
d. While the flame arrestor is removed inspect the burners – look specifically for signs of scale and or soot.
e. Replace the flame arrestor; ensure that the cell fits tightly against the back flange.



Flame arrestor gasket

7.3

SWORDFISH BURNER CLEAN-UP *(SEMI-ANNUAL)*

Assembly drawings of the burner trays can be found in Appendix G, H, and I.

1. Turn gas valve to pilot, then turn off main gas. Let cool for at least .5 hours.
2. Open heater door and disconnect main gas flex from burner manifold. Unhook pilot gas line at Hylok fitting and remove burners if possible. Disconnect pilot bracket from burner tray. This will allow operator to remove the burner tray without having to disconnect the wires.
3. Remove burners from unit.
4. Check the burner venturi ports are free of foreign particles (dust, lint and debris).
5. Clean burners with bristle brush and/or vacuum cleaner. DO NOT alter burner ports or pilot location.
6. If the fin tubes need to be inspected and cleaned move on to section 7.4 before reinstalling the burner.
7. Otherwise, reinstall burners in unit. Make sure front and rear of burners are installed correctly in burner support brackets.
8. Check all gas connections.

WARNING:
Performing pressure tests on the system can be hazardous, and should only be performed by trained professionals. Contact Tecvalco if you have any questions.

7.4
INSPECTING AND CLEANING THE FIN TUBES *(SEMI-ANNUAL)*

The fin tubes should be inspected and cleaned semi-annually. It is suggested that this be done before and after peak times (spring and fall, possibly).

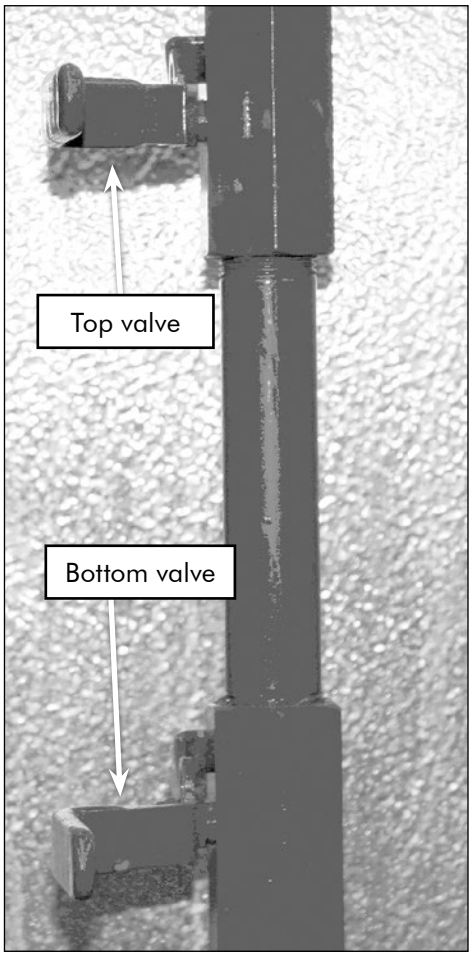
1. Perform steps 1 to 3 of swordfish burner clean-up (7.3).
3. The stack will need to be turned to the side or removed for inspection and cleaning of the top of the fin tubes.
4. Once the burner tray and stack have been removed, take pictures of the fin tubes above and below, if possible. Note any problem areas and contact Tecvalco.
5. Use an air compressor or compressed air to blow out the fin tubes from the top down and then from the bottom up. Clean up any particles from bottom of the heater and any scale still on the top of the fin tubes. If needed, use a mirror to help in the inspection.
6. When cleaning is complete take pictures to note improvements.
7. Replace the stack and burner tray.

7.5
GLYCOL SAMPLE PROCEDURE *(SEMI-ANNUAL)*

Most CWT heaters are equipped with a double valve system, which will allow you to take a glycol sample without losing an appreciable amount of vacuum.

The procedure is as follows:

1. Take the sample when the heater is cold, in summer if possible. During operation the water and glycol separate and a sample will have an unrepresentatively high amount of glycol.
2. Open the top valve and wait a minute or two.
3. Close the top valve and open the bottom to obtain the sample, close the bottom valve
4. Repeat steps 2 and 3 three or four times. Such process would purge and remove the fluid standing in the low spot and to get a sample.
5. Open the top valve.
6. Open the bottom valve for 3 seconds only. This allows the system to pour back and bring fluid into the sample leg. Close both valves.
7. Repeat steps 2 and 3 and obtain the required sample.
8. Note the vacuum pressure when complete.
9. For older Series II 140s with a temperature probe in the sample port, sample times will be much greater.
10. NOTE: Glycol samples are acceptable if they meet the minimum ambient temperature of the site location.



(Figure 7.5)

WARNING:
Inspections and tests included in this section may be regulated by local, Federal, or other jurisdictions. Please review all applicable codes and regulations prior to conducting any activities on CWT equipment.

WARNING:
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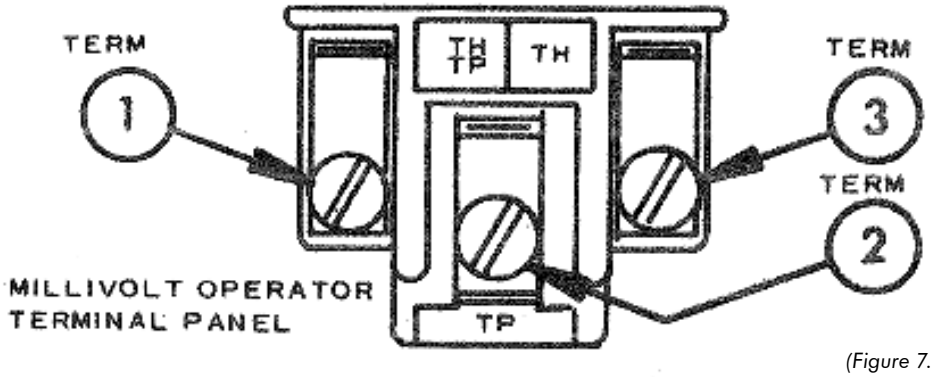
NOTE:

All CWT heaters are flushed and cleaned at the factory prior to shipping to site. Despite standard cleaning processes, it is possible that some residuals from manufacturing may remain in the system. The amount of these residuals can vary, and it is recommended that the system be inspected after the first season of peak volume service. If the levels of residuals found during inspection are high and there are visible high amounts of contaminants, there is a chance that the float controls and pressure controls can be affected. In this situation, a boiler flush may be required to remove the majority of the contaminants. You may also notice some glycol discoloration after the first peak season. This is typical for CWT heaters and the amount of discoloration will vary from site to site depending on station flow/loading and the amount of residuals remaining from the manufacturing process. This discoloration does not indicate that the primary function of the glycol (freeze protection) has be compromised. CWT heaters do not rely on the glycol for heat transfer.

7.6
TESTING THE POWERPILES *(SEMI-ANNUAL)*

Test the powerpile assembly using the following procedure:

NOTE: *Use a voltmeter set at 1000 mV*



(Figure 7.6)

NOTE: *If through age or failure the thermopiles can no longer generate the power to operate the gas valve they can be replaced quite simply. In this case all the thermostats, controls and safeties would shut down.*

Test 1 – Complete system

Connect to terminals 2 and 3. Ensure the thermostats are calling for heat (turn them up). Power should be >100 mV. The main burner should fire. If the voltage >100 mV but the valve does not open replace the valve. If the power is <100 mV proceed to test 2.

Test 2 – Thermopile output

Connect to terminals 1 and 2. The thermostats should not be calling for heat (turn them down). The main burner is off and the voltage should be > 325 mV. If it is less replace the thermopiles.

Test 3 – System resistance

(NOTE: If a suppression diode is part of your gas valve, please skip Test 3, as it will always have a high resistance.)

Connect to terminals 1 and 3. The thermostats should be calling for heat. The main burner should be on. The reading should be < 80mV. If the reading is more, clean the contacts and cycle the thermostats (to clean contacts).

Test 4 – Pilot dropout

Connect to terminals 1 and 2. Hold the pilot until the power level stabilizes. Shut the pilot off and note at which point the magnet drops (should be between 120 and 30 mV (falling). If the dropout does not occur or occurs outside these points replace the gas valve.

7.7

TEST PROCEDURE FOR STANDARD BOILER CONTROLS *(SEMI-ANNUAL)*

WARNING:
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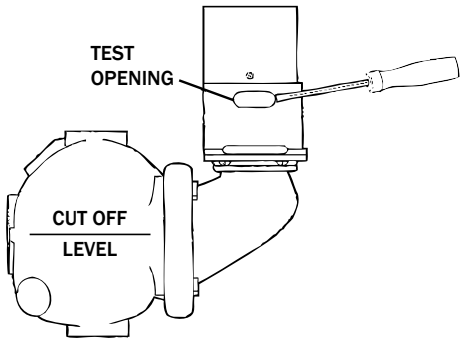
Testing of low fluid level switch and low-low fluid level switch with ESD

1. This test can be performed with the heater on.
2. When boiler is running, gently insert a screwdriver or similar tool in the test opening below the switch.
3. Lift the linkage to cause the float to drop, thereby simulating a low water condition.
4. The low fluid level switch test must disable the main gas supply, leaving the pilot operating.
5. This test will need to be performed on both low water cut-offs.
6. The low-low water cut-off has a reset on it and will need to be pushed after it has been tested.
7. Relight will be required.

Control can be tested on a hot water boiler by gently inserting a screwdriver or similar tool in the test opening below the switch (see illustration at right) and lifting linkage to cause float to drop, thereby simulating a low water condition.



7.8

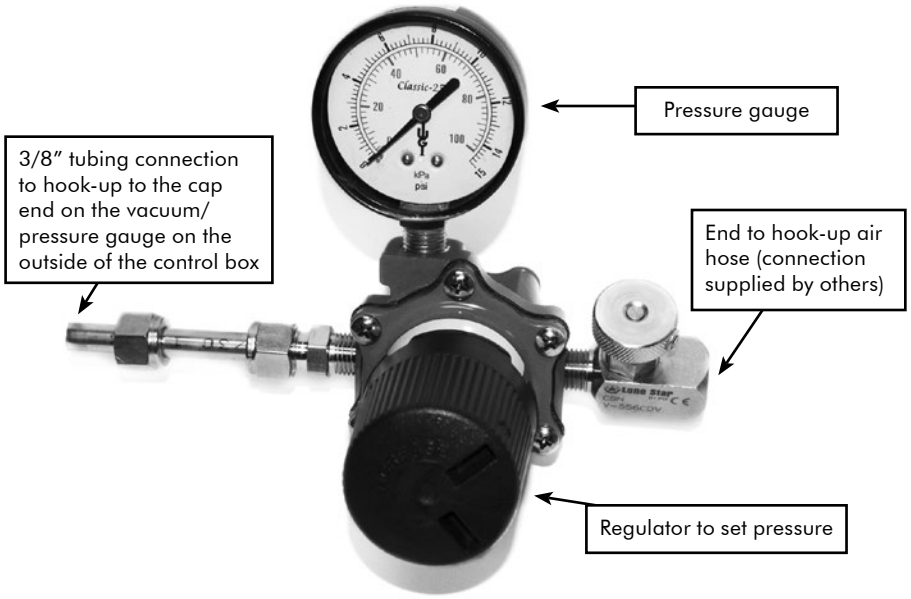
TESTING THE EMERGENCY SHUT-DOWN BUTTON *(SEMI-ANNUAL)*

WARNING:
Performing pressure tests on the system can be hazardous, and should only be performed by trained professionals. Contact Tecvalco if you have any questions.

1. This is a simple procedure. As the boiler is running, push the button. This will kill all switches and the gas. The boiler will need to be relit.

7.9

PRESSURE SWITCH TESTS (SEMI-ANNUAL)



(Figure 7.9)

WARNING:
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WARNING:
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The above photograph illustrates what the boiler pressure switch regulator tool looks like. This tool is required to test the pressure switches on the boiler.

Using the tool to perform tests on pressure switches (STANDARD BOILER ONLY)

1. The boiler will need to be turned off.
2. Let the boiler cool down for a minimum of 20 minutes.
3. Remove the lock-out wire from the 1/4" ball valve in the control cabinet and close the valve.
4. Remove the 3/8" Hylok cap on pressure gauge tee on the outside of the cabinet. A small amount of glycol may escape.
5. Connect boiler pressure switch regulator test hook-up tool to the fitting that the Hylok cap was on.
6. Ensure the valve is in the off position to ensure there is not too much pressure.
7. Hook up the hand pump or air compressor hose.
8. Keep in mind that the first switch (the operating steam pressure switch) is set to 5 psi, and the second switch (the high-high steam pressure switch with ESD) is set to 10 psi.
9. Connect a multimeter (set on continuity) to where the wires connect to the switches. This will allow the operator to know when the switches have been tripped.
10. Start to pressure up the system. The first switch should trip at 5 psi. If this is successful, disconnect the multimeter and hook it up to the high-high steam pressure switch (with ESD).
11. Continue to pressure up the system to 10 psi. The high-high steam pressure switch (with ESD) should then trip.
12. Once all pressure switches have been tested, remove the multimeter, release the pressure from the system, replace the Hylok cap on the tee, and open up the valves to the switches. Ensure valves are re-opened and locked prior to reigniting the boiler.
13. Reset the ESD on the high-high steam pressure switch (with ESD).
13. The boiler will need to be relit and a start-up will need to be performed.

7.10

TESTING PSV PRESSURE SAFETY VALVE *(SEMI-ANNUAL)* (STANDARD BOILER ONLY)

1. This will need to be tested based on State or Local jurisdiction.

NOTE: Tripping a pressure safety valve when the boiler is in a vacuum condition will introduce air into the system - reducing the overall system vacuum. Verify vacuum is within range after testing, and adjust accordingly.

WARNING:
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7.11

REPLACING DAMAGED BURST DISK (VACUUM BOILER ONLY)

When required, the following can be performed to replace a damaged burst disk.

1. Remove ABS pipe off burst disk holder and containment, then remove ruptured disk by taking out all studs and nuts on holder.
2. Make sure sealing surfaces on both parts of holder are clean and free of scarring, grooves, or debris. (If needed clean with steel wool).
3. When reinstalling disk make sure holders are evenly spaced all the way around, and hand tighten studs equally. Use 3M 90 spray glue on flange/gasket surfaces.
4. All 1.5 inch graphite rupture discs should be torqued as per the following sequence:
   a. First Pass: 5ft lbs
   b. Second Pass: 10ft lbs
   c. Third Pass: 15ft lbs
   d. Fourth Pass (repeat three times): 19ft lbs
   All 2 inch graphite rupture discs should be torqued as per the following sequence:
   a. First Pass: 5ft lbs
   b. Second Pass: 10ft lbs
   c. Third Pass: 15ft lbs
   d. Fourth Pass (repeat three times): 29ft lbs
   (NOTE: For HPX 90 style rupture disc and holder (SS): When tightening use torque wrench, first pass should be 20ft lbs using cross pattern, second pass use 65ft lbs making sure spacing is equal all the way around for units installed with rupture disc holder.
5. Reinstall ABS pipe to disk holder and containment.

(Note: For HPX 90 syle rupture disc holder (SS)) (Note: For older style painted rupture disc holders use a torque setting of 30ft lbs on first pass and 40ft lbs on second pass)

WARNING:
Performing pressure tests on the system can be hazardous, and should only be performed by trained professionals. Contact Tecvalco if you have any questions.

7.12
PROCEDURE TO FIND POSSIBLE LEAK

When required, the following checklist can be used to track down possible leaks.

- ❑ Turn heater off and let cool for one hour. (This needs to be done or steam will leave the system).
- ❑ Remove vacuum from system.
- ❑ Drain the gylcol from the system. Barrels will be required for this, so be sure to check the size of system for the amount needed.
- ❑ Using an air compressor, pressure system up. For a vacuum only system with a burst disc, the burst disc will need to be removed and capped off to prevent disc damage.
- ❑ Soap all fittings and areas that might be affected.
- ❑ Inspect areas for bubbles. Testing may require up to an hour or more.
- ❑ Fix problem areas.
- ❑ Re-pull vacuum to -24 to -30 inches Hg.
- ❑ Pull in proper amount of glycol. Note, new glycol may be required, as old fluid may have lost its water.
- ❑ Restart heater using start-up procedure.

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WARNING:
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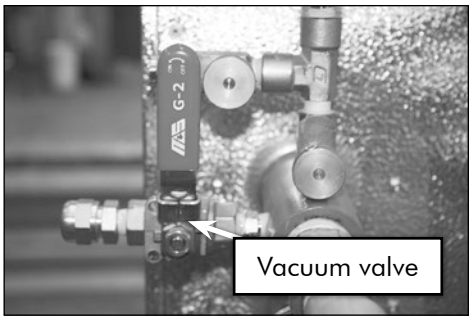
7.13
PULLING VACUUM (WHEN REQUIRED)



1. Ensure that the system is cool and that neither the main burner nor the pilot is running.
2. Ensure the system is completely drained of glycol.
3. Connect the vacuum compressor (suction side) to the vacuum valve.
4. Turn on the compressor, and then open the valve.
5. Continue evacuation of air until the vacuum gauge reaches –24 to -30 inches Hg. (The higher the vacuum that is achieved in the system, the more efficiently the system will operate).
6. Once sufficient vacuum is achieved, close the vacuum valve and shut down the compressor. Remove the compressor connections and re-install vacuum valve cap.
7. Record the pressure and temperature reading on the heater.
8. Allow unit to stand for 30 minutes.
9. Check to see if the pressure or temperature has dropped or varied in any way.
10. If the vacuum pressure has decreased with no change in temperature, there is a leak in the system. If neither of the settings has changed, proceed to the trouble shooting section. Once this procedure is completed it is a good practice to take masking tape and put a strip inside the cabinet door and indicate the date the vacuum was pulled and to what vacuum pressure, this is a good reference point when checking vacuum on subsequent site visits.

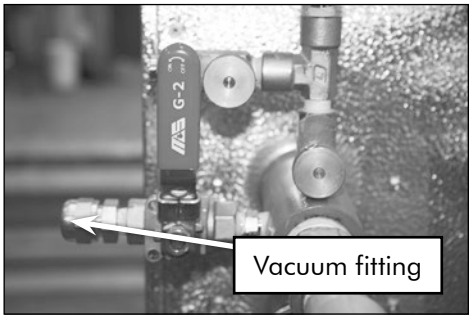
NOTE: *If there has been a vacuum leak on the heater you should assume that much of the water in the fluid has been lost – in these cases it is prudent to drain and replace the fluid.*

7.14
DRAWING GLYCOL INTO SYSTEM

New water-glycol mixture should be used when adding fluid to a system, or for new installs.

1. Remove the cap from the vacuum fitting.
2. Attach a vacuum hose to the fitting on the valve.
3. Insert the free end of the hose into the container of fluid mixture.
4. Open the valve to draw in fluid.
5. Close valve when the proper volume of fluid is drawn.

NOTE: *Do not allow air to enter the system.*



7.15
RECOMMENDED GLYCOL VOLUMES

The recommended glycol water volumes for the CWT Boiler are as follows.
In every case, when the boiler is operating there should be fluid in the site glass.
If not please contact Tecvalco.

Heater	Recommended fill volume 50/50 in US Gallons	in Litres
70	16	69
140	10.56	40
385	36.90	139.5
770 (single unit)	44.00	166
770 (multiple units)	48.00	181

(Table 7.14)

NOTE: Fluid volumes will change with multi-boilers. This volume is always indicated inside the control cabinet door on each boiler.

WARNING:
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WARNING:
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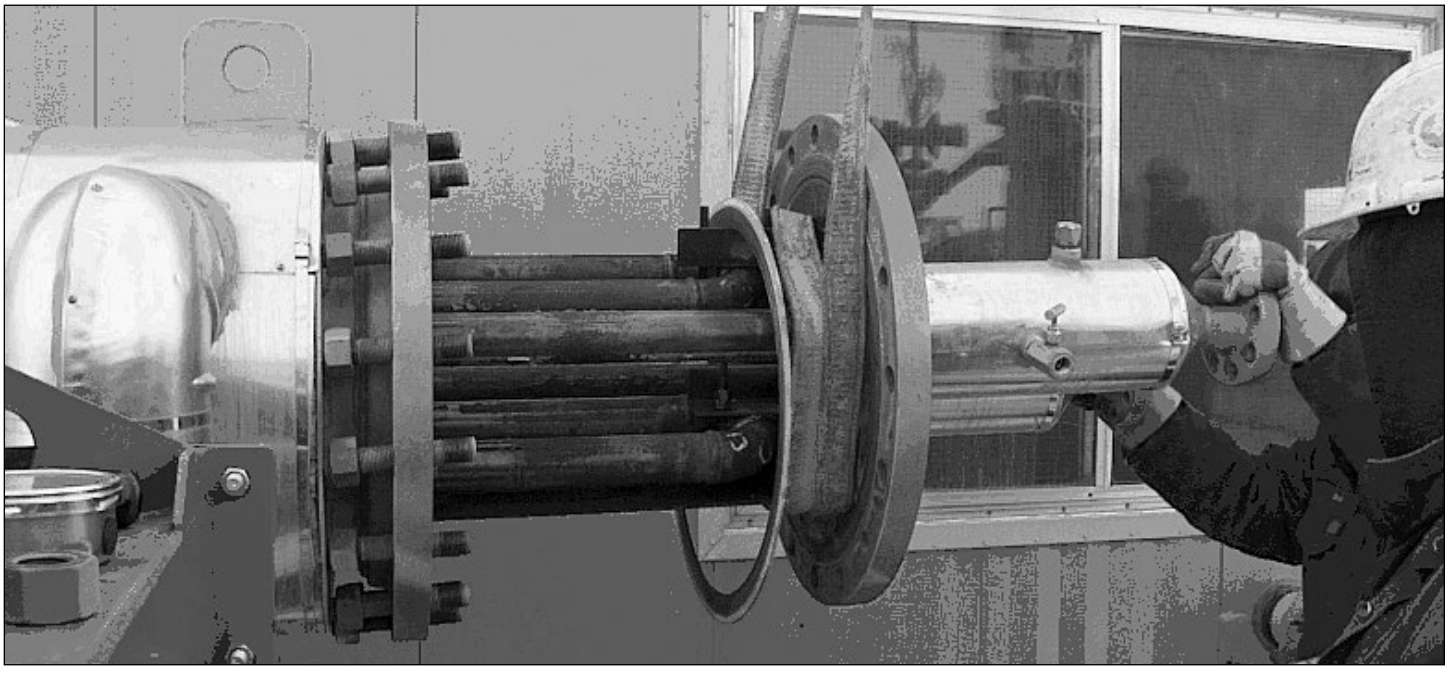
7.16

THE GAS BUNDLE REMOVAL (NATURAL GAS LINE HEATER APPLICATION)

At least every 15 years, the high-pressure coil should be removed and inspected (this period might vary depending on company policy or local codes). Prior to removing the coil, contact CWT for a replacement gasket and recommended bolt torque values. CWT will need to know the heater serial number located in the control panel, along with the model number.

1. Ensure the heater is off and cooled. Pilot extinguished, Robertshaw gas valve to off and main gas valve shut and locked out.
2. Carefully remove the insulation around the coil flange. Do not dent the cladding and save all cladding and insulation for re-install.
3. Ensure that no pressure exists in the unit or coil, and that proper lock-out procedures are followed for the high-pressure piping.
3. Remove the coil from the heater.
4. Visually inspect the coil and the can interior for signs of corrosion or damage.
5. Inspect coil as per appropriate codes (ASME, local, corporate, and other).
6. Install new gasket.
7. Install studs and nuts, torque to appropriate specifications (call CWT) and establish vacuum (see section 7.12).
8. Install all insulation and cladding as per original installation. Install all sheet metal screws in original positions and caulk all seams and openings to ensure a proper seal is provided.



(Figure 7.15)

7.17

INSPECTION CHECKLIST

The following two pages contain the CWT Heater Assessment Form. Please make copies of this form for use during your inspections.

TECVALCO LTD.
CWT HEATER ASSESSMENT FORM

TECVALCO

General Information	Date
Customer:	Location:
Model Number:	Coil Serial Number:
Serial Number:	Coil CRN:
Date of Manufacture:	

Inspection Status

Heater Status On Arrival (running, on pilot, off, cold, etc.):
Steam Temperature (°C when firing & warming):
Steam Pressure (°HG when firing & warming):
Gas In Temperature (°C when firing & warming):
Gas Out Temperature (°C when firing & warming):
Station Outlet Temperature (°C when firing & warming):
Glycol Fluid Level (trace ¼, ½, ¾, full):
Giycol Appearance (small sample):
Fuel Pressure (Inches WC):
Photos Taken (burners, fin tubes):
Blow Out Cell & Fin Tubes:

Control Settings	On Arrival	Before Departure
Discharge Temperature:	°F	°F
ESD Temperature:	°F	°F
Line Temperature:	°C	°C
Pressure Switch:		
PSI		
High Temp:	°F	°F
Are Controls Calibrated (Check using dry block or visual)	YES or NO	

Millivolt Reading

Side 1	Side 2	New Reading Side 1	New Reading Side 2
1			
2			
3			
4			

Robert Saw valve changed out? Circle YES or NO

(If changed out, new readings tabled.)

Heater Firing Rate and Gas Meter Info

Heater Firing Rate

Pilot Firing Rate:	Burner Firing Rate:
Pilot Pressure:	Burner Pressure:
Pilot Orifice:	Burner Orifice:

Gas Meter Information

Model	PFM Set
Serial Number	Reading
Meter Pressure	Atmospheric Pressure
Pressure Factor	

Fault Code Report

Component	Damage Code
Ignition Module	Commisioning
Main Reg	Wrong Orifices
Level Switch (Floats)	Loose Fittings
Flame Arrestor	Burner Cracked
Burner	Loose Connections
Wiring	Incorrect Wiring (Shop)
Pressure Switch	Incorrect Wiring (Field)
Gas Supply	Frozen
Fluid to Low	Controls Out of Calibration
	Gas Valve
	Vac Low
Cladding Condition: New / Good / Damaged	Power Piles Voltage & Continuity
Paint Condition: New / Good / Poor	Loose Tubing (Check w/no go GAP gauge)

Combustion Analysis

	Before	After
CO		
CO2		
Oxygen		
Stack Temp		
Excess Air		
Efficiency		

Boiler Firing Rate (BTR/hr):

Condition of Insulation (Scale or Sign of Moisture):
Condition of B-Vent to Steel Transition Piece:

Comments

Clock Meter Formula:

Clocked Time in Seconds x Dial Amount x Pressure Factor x 1000

3600 x _____ x _____ x 1000

(size of dial) seconds (pressure factor)

8. Troubleshooting

Please, feel free to contact Tecvalco to assist with any problems that occur.

8.1

HEATER INSPECTION CHECKLIST

Please ensure that you completely fill out a copy of the CWT Heater Inspection Checklist, found in section 7.16, as part of your troubleshooting efforts.

WARNING:
Inspections and tests included in this section may be regulated by local, Federal, or other jurisdictions. Please review all applicable codes and regulations prior to conducting any activities on CWT equipment.

WARNING:
Performing pressure tests on the system can be hazardous, and should only be performed by trained professionals. Contact Tecvalco if you have any questions.

WARNING:
Do not use this boiler if any part has been under water. Immediately call a qualified service technician to inspect the boiler and to replace any part of the control system and any gas control which has been under water.

8.2
COMMON PROBLEMS AND POSSIBLE SOLUTIONS

SYMPTOM	COMMON CAUSES	POSSIBLE CORRECTIONS
If pilot is out	Loss of fuel gas supply.	Check fuel gas supply.
	Excessive pressure in system caused high-high steam switch with ESD to activate.	Review pressure shown on gauge. If excessive, diagnose cause and fix.
	High-high steam switch with ESD issue	Check switch ESD, and test functionality.
	Low fluid level in heater has caused low fluid level switch and/or low-low fluid level switch with ESD to trip.	Check for fluid movement in sight glass. Diagnose cause and fix. Reset ESD if necessary.
	Low fluid level switch issue and/or low-low fluid level switch with ESD issue.	Check switches and ESD, and test functionality of each.
	System has exceeded allowable pressure, and the relief has failed, allowing water to escape.	Inspect pressure relief and barrel for exited water. Diagnose cause of over-pressure and fix. Replace or repair pressure relief system.
	Unsteady or fluctuating flame.	Examine the flame. Is it steady or fluctuating? Is it lifting off the burners? If so, the combustion may need tuning. Contact Tecvalco for assistance.
	Weak powerpile voltage.	Test the voltage to each powerpile. See section 7.6.
	Robertshaw gas valve magnet not holding.	Use test 4 (pilot dropout) in section 7.6
If main burner will not fire	Line temperature control switch not wired correctly.	Check wiring diagrams (found in section 4.1.5).
	System not requiring heat.	Check line temperature control switch to see if it is turning on and off at desired temperature. Set to appropriate temperature.
	Problem with line temperature switch.	Test functionality of switch. Repair or replace if necessary.
	Steam temperature exceeds setting of discharge temperature switch.	Review steam tempeature settings. May need review with Tecvalco. Possible low- or zero-flow situation, or switch is out of calibration
	Loss of fuel gas supply.	Check fuel gas supply. Ensure main gas valve is open.
	Weak powerpile voltage.	Test the voltage to each powerpile. See section 7.6.
	Robertshaw gas valve magnet not holding.	Use test 4 (pilot dropout) in section 7.6
If system won't fire pilot or main flame	Loose wiring connection.	Check ESD push button wiring and ensure connections are tight.

SYMPTOM	COMMON CAUSES	POSSIBLE CORRECTIONS
Heater has lost vacuum ** Always assume unit is under pressure until proven otherwise*	Malfunctioning vacuum gauge.	Ensure that vacuum is lost and that vacuum gauge is accurate.
	Heater is hot with high steam pressure due to operation.	Record steam pressure and steam temperature from heater. Using these values, review table 10.19.
	System has exceeded internal presure and relief has failed.	Inspect pressure relief barrel for exited fluid. If present, diagnose overpressure cause. Fix and replace pressure relief system and all fluid.
	Possible leakage of fittings, PRV, switches, etc.	Test system for leakages using procedure 7.11
Failure or release of pressure relief system	Possible leakage in pressure relief system.	Test system for leakages using procedure 7.11.
	System has exceeded allowable internal pressure setting of relief system.	Diagnose overpressure cause. Repair or replace relief system and replace all fluids.
Gas is not being heated to proper temperature	Line temperature switch settings.	Check switch settings. Function test switches. Settings can be found on page 50. Check local codes.
	Fuel gas pressure.	Check fuel gas pressure. It may need to be turned up or down, depending on requirements.
	Line temperature switch location.	Check line temperature switch for proper location. Is the switch placed just past the final pressure cut?
	Gas piping insulation.	It is recommended that the piping be insulated. If it is not, then the switch in the gas piping may pick up ambient temperature.
	Gas flow.	Check gas flow through coil. Potential zero- or low-flow through coil. See section 8.3.
	Safety switch operation.	Inspect switches in system to ensure no settings have been exceeded.
	Lost water/fluid.	Inspect glycol site glass for fluid level. Find cause and fix.

8.3

POTENTIAL ZERO-FLOW APPLICATION (NATURAL GAS LINE HEATER APPLICATION)

The CWT Boiler's application is typically designed to sense the temperature of the gas as it exits the gate station after the last pressure cut. If a zero-flow situation exists (where no, or very little gas is flowing through the system) the probe that is downstream from the facility can be subjected to ambient temperatures below the set point of the control.

As there is minimal or zero flow, the now-heated gas will not flow past the probe, and will not signal the heater to stop its firing sequence. With the external insulation on the boilers being very efficient, the heat being generated cannot escape and the overall temperature and pressure within the boiler and heat exchanger will increase.

As this occurs certain safety devices will begin to operate:

1. The steam pressure / temperature will increase above the proper limits, causing the safety device to open the circuit and stop the main flame from firing. If the unit can release enough heat to the surroundings, the switch will automatically reset, allowing the heater to resume firing as directed by the still cold downstream temperature probe.

2. If the heat cannot be released, then the pressure / temperature within the boiler and condenser will continue to increase, ultimately surpassing the range of the switch. This will open the electrical circuit, stopping the gas to the main burners and pilot, keeping the unit from firing until it is manually reset.

3. Finally, if the unit continues to release the heat and generates steam (even without a flame but potentially from the heat stored in the steel of the housing etc.) the pressure / temperature may increase to a point where the pressure relief device will open and relieve system pressure.

NOTE:

If the line temperature probe is installed at the outlet of the high-pressure coil "the set temperature" must be set accordingly.

The general rule is that for every 100 psi of pressure drop 7°F/-13.9°C temperature drop. For example, if a 500 psi pressure drop is to occur, the outlet temperature of the coil should be initially set 30°F above the temperature required after the last pressure drop i.e if a temperature of 35°F/1.67°C is required after the last pressure drop, the line temperature control should initially be set to 70°F/3.34°C.

The boiler should then be monitored for proper operation.

WARNING:
Performing pressure tests on the system can be hazardous, and should only be performed by trained professionals. Contact Tecvalco if you have any questions.

9. Glossary

9.1. Low-pressure boiler
A closed vessel in which water or other fluid is heated for heating applications. In the CWT boiler the pressure produced is less than 15 psi.

9.2. Inches of mercury:
In Hg or "Hg is a unit of measure for pressure". It is defined as the pressure exerted by a column of mercury of 1 inch in height at 32°F (0°C) at the standard acceleration of gravity.
1 in Hg = 3,386.389 pascals at 0°C.
In English units: 1 inHg = .491098 psi, or 2.036254 inHg = 1 psi.

9.3. Pascal (pa):
A measure of force per unit area i.e. equivalent to one newton per square meter or one joule per cubic meter.

9.4. Pressure (P):
The force per unit area applied to an object in a direction perpendicular to the surface.

9.5. Gauge pressure:
The pressure relative to the local atmospheric or ambient pressure.

9.6. Inches water column:
A non SI-unit of pressure and is commonly used in airflow applications in HVAC (Heat, Ventilating and Air Conditioning) because the pressure measurements are very minute.

9.7. British Thermal Unit (BTU):
The British Thermal Unit (BTU or Btu) is a unit of energy used in the power, steam generation, heating and air conditioning industries. The term "BTU" is used to describe the heat value (energy content) of fuels, and also to describe the power of heating and cooling systems. One BTU is approximately 1,054 - 1,060 joules (J).

9.8. MBTU:
One thousand BTU

9.9. MMBTU:
One million BTU

9.10. Latent heat:
The amount of energy released or absorbed by a chemical substance during a change of state (i.e. solid, liquid, or gas), or a phase transition

9.11. Vacuum:
A vacuum reference can be thought of as the opposite of a gauge reference. Vacuum references are notated with "V", for example PSIV or "HgV"

9.12. Differential:
The difference between two known pressures. Output is zero when the two pressures are the same, regardless of magnitude. Differential pressures are notated as "D" (PSID).

9.13. Absolute:
Absolute pressure is zero-referenced against a perfect vacuum, using an absolute scale, so it is equal to gauge pressure plus atmospheric pressure. Gauge pressure is zero-referenced against ambient air pressure, so it is equal to absolute pressure minus atmospheric pressure. Negative signs are usually omitted. (Wikipedia)

9.14. Gauge:
To ignore the effects of altitude or depth, a "Gage" pressure is referenced. Gauge pressure is zero referenced against ambient air pressure, so it is equal to absolute pressure minus atmospheric pressure. Negative signs are usually omitted. (Wikipedia)

9.15. Heat required to raise the temperature of a material:

$$Q_1\,(\text{Btu}) = W \cdot CP \cdot \triangle T \quad \text{or} \quad Q_1\,(\text{kWh}) = \frac{W \cdot C_p \cdot \triangle T}{3412}$$

Q1 = Heat required to raise temperature
W = Pounds of material
CP = Specific heat of material (Btu/lb-ºF)
T = Temperature rise of material
(TFinal - TInitial) ºF

9.16. SCFH:
Standard Cubic Feet per Hour

9.17. Peak load:
Measurement of the maximum amount of energy delivered at a point of time

9.18. Flue gas:
Combustion gases that are vented to the atmosphere. The equation below provides an approximation of the pressure difference, ΔP, (between the bottom and the top of the flue gas stack) that is created by the draft.

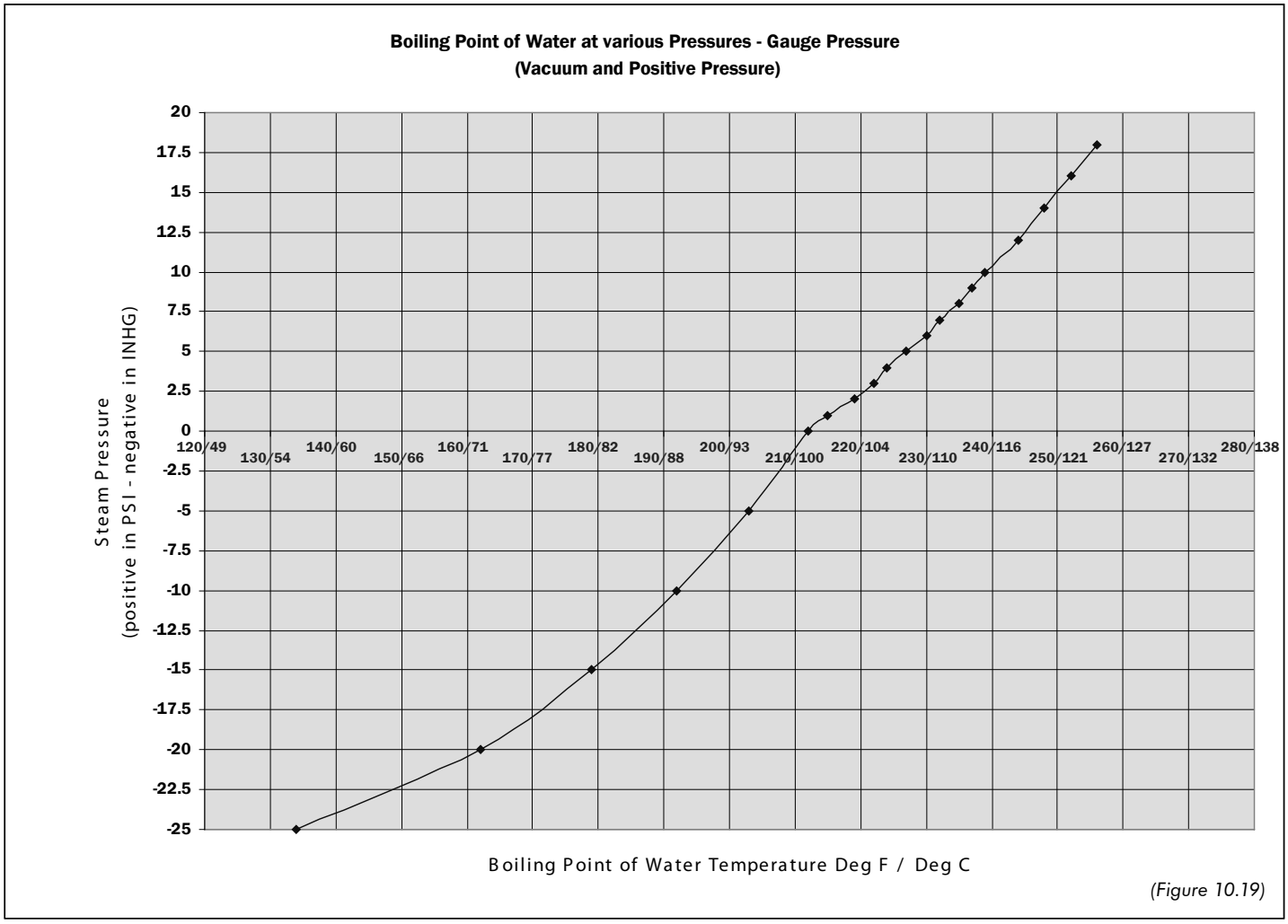
$$\triangle P = Cah\left(\frac{1}{T_o} - \frac{1}{T_i}\right)$$

ΔP = Available pressure difference, in Pa
C = 0.0342
a = Atmospheric pressure, in Pa
h = Height of the flue gas stack, in m
To = Absolute outside air temperature, in K
Ti = Absolute average temperature of the flue gas inside the stack, in K

9.19

CWT PRESSURE AND TEMPERATURE CHART

This chart can also be used as a diagnostic tool, as the pressure and temperature of the CWT Boiler steam chamber should fall on this line. If the steam temperature and pressure do not approximate the line, there might be a problem requiring further investigation.



(Figure 10.19)

The CWT Boiler typically operates with negative pressure (vacuum), and is usually in the operating range of –6 to –26 In Vacuum Hg or below 0 psig. If a CWT heating boiler is operating at close to 0 psig and close to 100°C (212°F) it may be the result of very low process load or an indication of a loss of vacuum. In every case, the most important indicator of the condition of a CWT Boiler is the pressure and temperature in the boiler. Another very important measure is the temperature of the process gas in and out of the boiler. There should be a significant increase in the temperature of the high-pressure gas as it passes through the coil.

10. Spare parts list

Associated Boiler Model	Part Number	Description
70, 140, 385, 770	CTR-289L-1-12-40	289 BP Fisher Reg 1"npt 12" - 40" WC
70, 140, 385, 770	CTR-SP-HSR-CHCBMYY	HSR 1/2" Orifice; 10-12.5" WC
140, 385, 770	BAR-PLA-30	30 Gal Plastic Barrell c/w Lid
140, 385, 770	BOL-LYNCHPIN-.188	3/16" Lynch Pin
140, 385, 770	BUR-B-.438-27	7/16" Spud Orifice Brass
140, 385, 770	BUR-SFB-098044-000	Swordfish Burner Orifice Cover
140, 385, 770	BUR-SFB-098047-000	Swordfish Burner B&G
140, 385, 770	CTR-BAR-142400-63	McD&M Series 63 LWCO
140, 385, 770	CTR-BAR-143100-63-M	Series 63-M w/reset LWCO
140, 385, 770	CTR-CT-BBQ-IGN	Canadian Tire Ignitor System
140, 385, 770	CTR-H400-S134B	VE400 Series Vacuum Switch
140, 385, 770	CTR-PADTHERM	Pilot Ass Double Thermopile
140, 385, 770	CTR-SP-289L-41	289 BP Fisher Reg 1"npt 1-4.5p
140, 385, 770	CTR-SP-HSR-CDGBMYN	HSR 1/2 orifice"-12.5"-20" WC
140, 385, 770	CTR-SP-PRV-13-202-08	Conbraco 1" PSV 15psig
140, 385, 770	CTR-SS-700-C506	700-C506 Robertshaw Gas Valve
140, 385, 770	CTR-SS-L404F1060	Honeywell switch 2-15psi
140, 385, 770	CTR-SS-L4079B1033	Honeywell w/man reset 15psi
140, 385, 770	FIE-ZB4BS54	Mush PB Operator 40MM
140, 385, 770	FIE-ZB4BZ009	PB Mounting Bezel
140, 385, 770	FIE-ZBE102	Contact block 1-N/C
140, 385, 770	FIE-ZBY9330	E-Stop Legend plate
140, 385, 770	GAU-2.5-.25B-M30-30P-L	2-1/2" x 1/4" 30-30 Psi Gauge
140, 385, 770	GAU-3-9-50-500-S	3" x 9" 50-500 Deg Gauge
140, 385, 770	GAU-4-.5B-2000P	4" x 1/2" 0-2000 Psi BM Gauge
140, 385, 770	GAU-INCH-2.5-.25-0-15	2-1/2" x 1/4" 0-15 Inch Gauge
140, 385, 770	HEA-IGNBOX-ASSY	4" x 4" x 2" CWT Ignition Box
140, 385, 770	HEA-IGNHH-ASSY	CWT Portable Hand Held Ignitor
140, 385, 770	HOS-GFAH-.75-18	3/4" x 18" F x F Flex hose
140, 385, 770	THR-SS-1-.5-9-.250	1" x 1/2" x 9" x .250 SS THR
140, 385, 770	VAV-NDL-MXF-.5	1/2" CS MxF Needle Valve
140, 385, 770	WIR-SHCAB-1P-18G	18 Ga x 1 Pair Shielded Cable
140, 385, 770	WIR-SPW-7MM-HD	7mm HD Spark Plug Wire
70, 140, 385	CTR-EM1-0-100	Jumo Discharge Temp Switch SPST
70, 140, 385	CTR-EM5-0-100	Jumo ESD Switch SPST
70, 140	FLA-FAFBC-15-4C	15" Flame Arr. Flash Back Cell
70, 140	GAU-3-4-M40-160-S	3" x 4" 40-160 Deg Gauge
70, 140	GSK-NA1001-RD-14.875-13.5	15" A-Fire flame cell gasket
70, 140	THR-SS-.75-.5-4-.250	3/4" x 1/2" x 4" x .250 SS THR
140, 385	CTR-T675A-1565	Honeywell 0-100F American Cust
385, 770	FLA-FAFBC-20-4C	20" Flame Arr Flash Back Cell
385, 770	GSK-304SS-FLEX-150-4	4" 150# 304SS Flex Gasket
385, 770	GSK-NA1001-RD-20-18.625	20"ODx18.625"ID Gasket
385, 770	HEA-10-SGLASS-PAI-ASSY	10" Sight Glass Paint Assembly
70	BAR-PLA-16	16 Gal Plastic Barrel c/w Lid
70	CTR-PS-MPS25-1C-DV15D	Prosense Vacuum Switch

SPARE PARTS LIST

Associated Boiler Model	Part Number	Description
70	FIR-BVENT-5-5	5" x 5 B-Vent Pipe
70	FIR-BVENT-HWCAP-5	5" High Wind Cap
70	GSK-GR-1.5-300#-150-.125	Graphite Gasket
140	FIR-BVENT-6-5	6" x 5' B-Vent Section
140	FIR-BVENT-HWCAP-6	6" Hi-Wind Cap
140	GSK-GR-RD-20.5-14.125-26	20.5 ODx14.125ID 26H Graphite
140	GSK-N1001-RD-10.625-6.625-8	EXHAUST STACK GASKET
140	HEA-140-3-1100	140 Boiler Stack Support Assm.
385	FIR-BVENT-8-3	8" x 3' B-Vent Section
385	FIR-BVENT-8-5	8" x 5' B-Vent Section
385	FIR-BVENT-RAINCAP-8	8" B-Vent Rain Cap
385	GSK-NA1001-RD-12.5-8.625-8	12.5 "Od x 8.625"id 8 hole gasket
385	HEA-BVENT-SUPPORT-8	8" Bvent Stack Support
770	CTR-SS-T678A-1015	100 F 20'Capillary-US only
770	FIR-BVENT-12-3	12" x 3' B-Vent Section
770	FIR-BVENT-RAINCAP-12	12" B-Vent Rain Cap
770	GSK-NA1001-RD-16-12.625-12	16"OD X 12.625"ID 12 HOLE GASKET
770	GSK-NA1001-RT-47/43-24/20	New 770 Square Gasket
770	HEA-770-2C-800A	Stack Adapter Assembly

Options

Associated Boiler Model	Part Number	Description
70, 140, 385	CTR-COIL-HTSD-1F	High temp shut-down, Farenheit
770	CTR-COIL-HTSD-2F	High temp shut-down, Farenheit
70, 140, 385	CTR-COIL-HTSD-1C	High temp shut-down, Celsius
140, 385, 770	PUM-YEL-JAC-PMP-11FM	Yellow Jacket pump, 11 cfm
70, 140, 385, 770	COS-VAC-OIL	Oil for vacuum pump, 4 litre container
70, 140, 385, 770	CTR-SP-T14399T0012	HSR spring, 6" wc to 8" wc (Yellow)
70, 140, 385, 770	CTR-SP-T14405T0012	HSR spring, 8" to 10" wc (Black)
70, 140, 385, 770	CTR-SP-T14400T0012	HSR spring, 10" wc to 12.5" wc (Silver)
70, 140, 385, 770	CTR-SP-T14401T0012	HSR spring, 12.5" to 20" wc (Gray)

11. Equipment warranty - repair and return procedure

This warranty shall apply to items manufactured by Tecvalco, and supplied to Buyer for use within a Tecvalco authorized distribution territory. Items manufactured by Tecvalco and supplied to the Buyer for use in locations within Canada or the United States are subject to the equipment warranty as applicable.

Warranty

During the warranty period subject to the limitations herein, Tecvalco warrants that the product manufactured by any Tecvalco company and supplied to Buyer by Tecvalco or through an authorized Tecvalco distributor shall be free from defects in materials and workmanship and will conform to applicable specifications and drawings. This warranty extends only to the original end use customer and is not transferable. Tecvalco's liability herein, whether based upon breach of warranty or contract or negligence in manufacture, shall be limited to replacement, repair or refund of a prorated purchase price paid by Buyer at Tecvalco's election of all such defective or nonconforming items, provided that this warranty shall apply only where Buyer has given Tecvalco written notice of such defects or nonconformity within the applicable warranty period after delivery by Tecvalco of such items to the Buyer. In no event shall Tecvalco's total liability hereunder exceed the price paid by Buyer to Tecvalco for such item. Tecvalco shall have the right prior to return to inspect at Buyer's facility any items claimed to be defective or nonconforming.

Warranty Period

The warranty period for Tecvalco manufactured products commences from the date of invoice to the Buyer and except as noted below, continues for a period of 18 months (the Warranty Period). Exceptions to this warranty period are as follows: items not manufactured by Tecvalco will carry the remaining warranty and related terms and conditions of the original manufacturer, where enforceable.

The foregoing constitutes the sole and exclusive remedy of the Buyer and exclusive liability of Tecvalco and is in lieu of any and all other warranties expressed or implied or statutory as to merchant liability, fitness for purpose sold, description, quality, productiveness or any other matter. Without limiting the foregoing, in no event shall Tecvalco or its suppliers be liable to Buyer for any incidental, special, punitive, exemplary or consequential damages experienced by either Buyer or a third party (including, but not limited to loss of profits or loss of use). Tecvalco is not liable for damages for any cause whatsoever (whether based in contract, tort, or otherwise) in excess of the amount paid for the item.

Returns

Repair of all defective or malfunctioning products by Tecvalco will be made at a location determined solely by Tecvalco. Return authorization must be obtained in writing from Tecvalco including those for repair, Buyer's rights to repair or replacement are governed by this warranty.

Shipping

The Buyer shall pay the cost of shipping the products from the Buyer's facility to a Tecvalco designated repair location. Tecvalco will return repaired or replaced equipment at Buyer's cost to the Buyer's facility. Buyer shall be responsible for payment of customs duties, importation fees, VAT or other like charges.

Repair Charges

In-warranty period repairs will be made at no charge to Buyer provided that failure is not due to misuse, mishandling or act of God. An in-warranty product that is returned for repair and found not to be defective or malfunctioning or for which failure is caused by misuse, mishandling or act of God, shall be subject to Tecvalco's actual costs for testing and handling.

The costs of out-of-warranty repairs including return shipment are subject to charges as quoted by Tecvalco. Buyer's acceptance of these charges is necessary before repairs will be made. Return shipping shall use the most economical shipment means available. Upon request of the Buyer, Tecvalco will use other means of shipment, in which case Buyer shall pay the cost of shipping directly.

WARRANTY

Repair Warranty

Repair work performed on in-warranty products is warranted for the remainder of the original warranty period or six (6) months, whichever is greater. Repair work performed on out-of-warranty equipment is warranted for six (6) months from the date of shipment of the repaired unit from Tecvalco. This six (6) month period covers only the actual repair(s) made to the product and is exclusive of potential non-related faults that may occur during the six (6) month period.

Alteration to Equipment Purchased

Modification or alteration to purchased products by anyone, other than that specifically authorized by Tecvalco, shall void and nullify, in its entirety, all warranty provisions set forth in the preceding.

Engineering Changes

Tecvalco reserves the right to upgrade and modify product items ordered without prior approval or modification to Buyer and without incurring any obligation or liability to make the same or similar changes in items previously manufactured.

Post-Sale Support

Please contact your authorized Tecvalco distributor or call Tecvalco Technical Support at 1-877-879-4748.

APPENDIX A:

CWT 140,000 BTU/HR STANDARD BOILER PACKING LIST

ITEM	PART NUMBER	PART TITLE	PART DESCRIPTION	QTY
1	P103-140-3	FUEL GAS HEADER	FUEL GAS HEADER ASSEMBLY	1
2	FIT-SST-BUSH-1-.25	BUSHING	1" x 1/4" SCH40 SST BUSHING	1
3	FIT-SST-NIP-1-2	NIPPLE	1" x 2" SCH40 SST NIPPLE	2
4	FIT-SST-NIP-1-4	NIPPLE	1" x 4" SCH40 SST NIPPLE	1
5	FIT-SST-NIP-1-6	NIPPLE	1" x 6" SCH40 SST NIPPLE	1
6	FIT-SST-TEE-150-1	TEE	1" 150#NPT 316 TEE	2
7	GAU-INCH-2.5-.25-0-15	GAUGE	2-1/2" x 1/4" 0-15 INCH GAUGE	1
8	VAV-SS-B-1-2000-T-FP	BALL VALVE	1" 2000# SS FP BALL VALVE	1
9	FIR-BVENT-6-3	EXHAUST STACK	6" x 3' B-VENT SECTION	1
10	FIR-BVENT-6-5	EXHAUST STACK	6" x 5' B-VENT SECTION	1
11	FIR-BVENT-HWCAP-6	EXHAUST STACK	6" HI-WIND CAP	1
12	HEA-140-3-1100	EXHAUST STACK	STACK SUPPORT ASSM. 140 BOILER	1
13	BOL-GR5-.5-1.5	BOLT	NC, GRADE 5, 1/2" x 1-1/2"	12
14	NUT-GR5-.5	NC NUT	1/2" GRADE 5 NC NUT	12
15	WAS-GR5-F-.5	WASHER	1/2" GRADE 5 FLAT WASHER	24
16	CTR-HIGH-TEMP-SHUT-DOWN	ASSEMBLY	HI-TEMPERATURE SHUT DOWN ASSEMBLY	AS REQUIRED
17	CTR-SS-T675A-1565	REMOTE TEMP CONTROL	HONEYWELL 0-100F	1
18	ELE-A10P8	ELECTRICAL PANEL	PANEL, 8" x 6"	1
19	ELE-BOX-A1086CHQRFG	ELECTRICAL BOX	HOFFMAN 10x8x6 FIB JB	1
20	FIE-5232	CONDUIT	C16104 STR LIQ TIGHT CON 1/2"	2
21	FIE-AL-NIP-.5-C	NIPPLE	1/2" x CLOSE ALUMINUM NIPPLE	1
22	FIE-CSA050-30	FLEX CONDUIT	1/2" LIQUID TITE FLEX CONDUIT	5.25 m
23	FIE-GK50N	ENCLOSURE	1/2" GK50N ENCLOSURE 35/85 GSK	1
24	FIE-K50A	BACK PLATE	1/2" ALUM K50A BLANK BACKPLATE	1
25	FIE-LB50A	ALUMINUM CONDUIT	1/2" LB50A ALUMINUM COND BODY	1
26	FIE-ST-050-464	CONNECTOR	1/2" STO50-464 STAR TECK CONN	2
27	FIE-UNY50NRA	UNION	1/2" XP ALUM. UNION UNY50NRA	1
28	GAU-4-.5B-2000P	GAUGE	4" x 1/2" 0-2000 PSI BM GAUGE	2
29	HEA-BOIL-MANUAL-XXX	MANUAL	BOILER MANUAL (CURRENT VERSION)	3
30	NUT-LOCK-.75	LOCK NUT	3/4" LOCK NUT	3
31	THR-THERMOWELL	TBD BY SALES		
32	WIR-SHCAP-1P-18G	CABLE	18 GAUGE x 1 PAIR SHIELDED CABLE	35 m

APPENDIX B:

CWT 385,000 BTU/HR STANDARD BOILER PACKING LIST

ITEM	PART NUMBER	PART TITLE	PART DESCRIPTION	QTY
1	P103-385	FUEL GAS HEADER	FUEL GAS HEADER ASSEMBLY	1
2	FIR-BVENT-8-3	EXHAUST STACK	8" x 3' B-VENT SECTION	1
3	FIR-BVENT-8-5	EXHAUST STACK	8" x 5' B-VENT SECTION	1
4	FIR-BVENT-RAINCAP-8	EXHAUST STACK	8" B-VENT RAIN CAP	1
5	HEA-BVENT-SUPPORT-8	EXHAUST STACK	8" BVENT STACK SUPPORT	1
6	BOL-GR5-.5-1.5	BOLT	NC, GRADE 5, 1/2" x 1-1/2"	12
7	NUT-GR2-.5	NC NUT	1/2" GRADE 2 NC NUT	12
8	WAS-GR5-F-.5	WASHER	1/2" GRADE 5 FLAT WASHER	24
9	CTR-HIGH-TEMP-SHUT-DOWN	ASSEMBLY	HI-TEMPERATURE SHUT DOWN ASSEMBLY	AS REQUIRED
10	GAU-3-6-50-500-S	GAUGE	3" x 6" 50-500 DEG GUAGE	1
11	CTR-SS-T675A-1565	REMOTE TEMP CONTROL	HONEYWELL TEMP CON. 0 - 100F	1
12	ELE-A10P8	ELECTRICAL PANEL	PANEL, 8" x 6"	1
13	ELE-BOX-A1086CHQRFG	ELECTRICAL BOX	HOFFMAN 10x8x6 FIB JB	1
14	FIE-5232	CONDUIT	C16104 STR LIQ TIGHT CON 1/2"	2
15	FIE-AL-NIP-.5-C	NIPPLE	1/2" x CLOSE ALUMINUM NIPPLE	1
16	FIE-CSA050-30	FLEX CONDUIT	1/2" LIQUID TITE FLEX CONDUIT	5.25 m
17	FIE-GK50N	ENCLOSURE	1/2" GK50N ENCLOSURE 35/85 GSK	1
18	FIE-K50A	BACK PLATE	1/2" ALUM K50A BLANK BACKPLATE	1
19	FIE-LB50A	ALUMINUM CONDUIT	1/2" LB50A ALUMINUM COND BODY	1
20	FIE-ST-050-464	CONNECTOR	1/2" STO50-464 STAR TECK CONN	2
21	FIE-UNY50NRA	UNION	1/2" XP ALUM. UNION UNY50NRA	1
22	GAU-4-.5B-2000P	GAUGE	4" x 1/2" 0-2000 PSI BM GAUGE	2
23	HEA-BOI-MANUAL-XXX	MANUAL	BOILER MANUAL (CURRENT VERSION)	3
24	THR-THERMOWELL	TBD BY SALES		
25	WIR-SHCAP-1P-18G	CABLE	18 GAUGE x 1 PAIR SHIELDED CABLE	31 m
26	NUT-GR5-LOC-.75	NUT	3/4" NYLON LOCK NUT	3

APPENDIX C:

CWT 770,000 BTU/HR STANDARD BOILER PACKING LIST

ITEM	PART NUMBER	PART TITLE	PART DESCRIPTION	QTY
1	P103-770	FUEL GAS HEADER	FUEL GAS HEADER ASSEMLBY	1
2	FIR-BVENT-12-3	EXHAUST STACK	12″ x 3′ B-VENT SECTION	3
3	FIR-BVENT-RAINCAP-12	EXHAUST STACK	12″ B-VENT RAIN CAP	1
4	HEA-770-2-800	EXHAUST STACK	770 BOILER/EVAP STACK SUPPORT	1
5	BOL-GR5-.5-1.5	BOLT	NC, GRADE 5, 1/2″ x 1-1/2″	12
6	NUT-GR2-.5	NC NUT	1/2″ GRADE 2 NC NUT	18
7	WAS-GR5-L-.5	LOCK WASHER	1/2″ GRADE 5 LOCK WASHER	24
8	CTR-HIGH-TEMP-SHUT-DOWN	ASSEMBLY	HI-TEMPERATURE SHUT DOWN ASSEMBLY	AS REQUIRED
9	GAU-3-12-50-500-S	GAUGE	3″ x 12″ 50-500 DEG GUAGE	1
10	CTR-SS-T678A-1015	REMOTE TEMP CONTROL	T678A-1015 Honeywell Temp. Con.	1
11	ELE-A10P8	ELECTRICAL PANEL	PANEL, 8″ x 6″	1
12	ELE-BOX-A1086CHQRFG	ELECTRICAL BOX	HOFFMAN 10x8x6 FIB JB	1
13	FIE-5232	CONDUIT	C16104 STR LIQ TIGHT CON 1/2″	2
14	FIE-AL-NIP-.5-C	NIPPLE	1/2″ x CLOSE ALUMINUM NIPPLE	1
15	FIE-CSA050-30	FLEX CONDUIT	1/2″ LIQUID TITE FLEX CONDUIT	5.5 m
16	FIE-GK50N	ENCLOSURE	1/2″ GK50N ENCLOSURE 35/85 GSK	1
17	FIE-K50A	BACK PLATE	1/2″ ALUM K50A BLANK BACKPLATE	1
18	FIE-LB50A	ALUMINUM CONDUIT	1/2″ LB50A ALUMINUM COND BODY	1
19	FIE-ST-050-465	CONNECTOR	1/2″ STO50-465 STAR TECK CONN	2
20	FIE-UNY50NRA	UNION	1/2″ XP ALUM. UNION UNY50NRA	1
21	GAU-4-.5B-2000P	GAUGE	4″ x 1/2″ 0-2000 PSI BM GAUGE	2
22	HEA-BOI-MANUAL-XXX	MANUAL	BOILER MANUAL (CURRENT VERSION)	3
23	THR-THERMOWELL	TBD BY SALES		
24	WAS-GR5-F-.5	WASHER	1/2″ GRADE 5 FLAT WASHER	6
25	WIR-SHCAP-2P-18G	CABLE	18 GAUGE x 2 PAIR SHIELDED CABLE	35 m

APPENDIX D:

CWT 70,000 BTU/HR VACUUM BOILER PACKING LIST

ITEM	PART NUMBER	PART TITLE	PART DESCRIPTION	QTY
1	P103-70	FUEL GAS ASSEMBLY	FUEL GAS ASSEMBLY	1
2	GAU-3-6-50-500-S	STACK TEMPERATURE GAUGE	3" x 6" 50-500 DEG GAUGE	1
3	VAV-SS-B-1-2000-T-FP	BALL VALVE	1" 2000# SS FP BALL VALVE	1
4	FIR-BVENT-5-5	EXHAUST STACK	5" x 5' B-VENT SECTION	1
5	FIR-BVENT-HWCAP-5	EXHAUST STACK	5" HI-WIND CAP	1
6	HEA-140-3-1100	EXHAUST STACK	STACK SUPPORT ASSM. 140 BOILER	1
7	BOL-GR5-.5-1.5	BOLT	NC, GRADE 5, 1/2" x 1-1/2"	12
8	NUT-GR5-.5	NC NUT	1/2" GRADE 5 NC NUT	12
9	WAS-GR5-F-.5	WASHER	1/2" GRADE 5 FLAT WASHER	24
10	CTR-SS-T675A-1565	REMOTE TEMP CONTROL (US)	HONEYWELL 0-100F	1
11	CTR-SS-T675A-2084	REMOTE TEMP CONTROL (CDN)	HONEYWELL 0-100F	1
12	ELE-A10P8	ELECTRICAL PANEL	PANEL, 8" x 6"	1
13	ELE-BOX-A1086CHQRFG	ELECTRICAL BOX	HOFFMAN 10x8x6 FIB JB	1
14	FIE-5232	CONDUIT	C16104 STR LIQ TIGHT CON 1/2"	2
15	FIE-AL-NIP-.5-C	NIPPLE	1/2" x CLOSE ALUMINUM NIPPLE	1
16	FIE-CSA050-30	FLEX CONDUIT	1/2" LIQUID TITE FLEX CONDUIT	5.25 m
17	FIE-GK50N	ENCLOSURE	1/2" GK50N ENCLOSURE 35/85 GSK	1
18	FIE-K50A	BACK PLATE	1/2" ALUM K50A BLANK BACKPLATE	1
19	FIE-LB50A	ALUMINUM CONDUIT	1/2" LB50A ALUMINUM COND BODY	1
20	FIE-ST-050-464	CONNECTOR	1/2" STO50-464 STAR TECK CONN	2
21	FIE-UNY50NRA	UNION	1/2" XP ALUM. UNION UNY50NRA	1
22	GAU-4-.5B-2000P	GAUGE	4" x 1/2" 0-2000 PSI BM GAUGE	2
23	CWT_HEA_MANUAL_001	MANUAL	BOILER MANUAL (CURRENT VERSION)	3
24	NUT-LOCK-.75	LOCK NUT	3/4" LOCK NUT	3
25	THR-THERMOWELL	TBD BY SALES		
26	WIR-SHCAP-1P-18G	CABLE	18 GAUGE x 1 PAIR SHIELDED CABLE	35 m

APPENDIX E:

CWT 140,000 BTU/HR VACUUM BOILER PACKING LIST

ITEM	PART NUMBER	PART TITLE	PART DESCRIPTION	QTY
1	P103-140	FUEL GAS ASSEMBLY	FUEL GAS ASSEMBLY	1
2	GAU-3-6-50-500-S	STACK TEMPERATURE GAUGE	3" x 6" 50-500 DEG GAUGE	1
3	VAV-SS-B-1-2000-T-FP	BALL VALVE	1" 2000# SS FP BALL VALVE	1
4	FIR-BVENT-6-5	EXHAUST STACK	6" x 5' B-VENT SECTION	1
5	FIR-BVENT-HWCAP-6	EXHAUST STACK	6" HI-WIND CAP	1
6	HEA-140-3-1100	EXHAUST STACK	STACK SUPPORT ASSM. 140 BOILER	1
7	BOL-GR5-.5-1.5	BOLT	NC, GRADE 5, 1/2" x 1-1/2"	12
8	NUT-GR5-.5	NC NUT	1/2" GRADE 5 NC NUT	12
9	WAS-GR5-F-.5	WASHER	1/2" GRADE 5 FLAT WASHER	24
10	CTR-SS-T675A-1565	REMOTE TEMP CONTROL (US)	HONEYWELL 0-100F	1
11	CTR-SS-T675A-2084	REMOTE TEMP CONTROL (CDN)	HONEYWELL 0-100F	1
12	ELE-A10P8	ELECTRICAL PANEL	PANEL, 8" x 6"	1
13	ELE-BOX-A1086CHQRFG	ELECTRICAL BOX	HOFFMAN 10x8x6 FIB JB	1
14	FIE-5232	CONDUIT	C16104 STR LIQ TIGHT CON 1/2"	2
15	FIE-AL-NIP-.5-C	NIPPLE	1/2" x CLOSE ALUMINUM NIPPLE	1
16	FIE-CSA050-30	FLEX CONDUIT	1/2" LIQUID TITE FLEX CONDUIT	5.25 m
17	FIE-GK50N	ENCLOSURE	1/2" GK50N ENCLOSURE 35/85 GSK	1
18	FIE-K50A	BACK PLATE	1/2" ALUM K50A BLANK BACKPLATE	1
19	FIE-LB50A	ALUMINUM CONDUIT	1/2" LB50A ALUMINUM COND BODY	1
20	FIE-ST-050-464	CONNECTOR	1/2" STO50-464 STAR TECK CONN	2
21	FIE-UNY50NRA	UNION	1/2" XP ALUM. UNION UNY50NRA	1
22	GAU-4-.5B-2000P	GAUGE	4" x 1/2" 0-2000 PSI BM GAUGE	2
23	CWT_HEA_MANUAL_001	MANUAL	BOILER MANUAL (CURRENT VERSION)	3
24	NUT-LOCK-.75	LOCK NUT	3/4" LOCK NUT	3
25	THR-THERMOWELL	TBD BY SALES		
26	WIR-SHCAP-1P-18G	CABLE	18 GAUGE x 1 PAIR SHIELDED CABLE	35 m

APPENDIX F:

CWT 385,000 BTU/HR VACUUM BOILER PACKING LIST

ITEM	PART NUMBER	PART TITLE	PART DESCRIPTION	QTY
1	P108-385	GAS TRAIN	JOB SPECIFIC GAS HEADER ASSEMBLY	1
2	GAU-3-6-50-500-S	STACK TEMP GAUGE	3" x 6" 50-500 DEG GAUGE	1
3	FIR-BVENT-8-3	EXHAUST STACK	8" x 3' B-VENT SECTION	2
4	FIR-BVENT-8-5	EXHAUST STACK	8" x 5' B-VENT SECTION	1
5	FIR-BVENT-RAINCAP-8	EXHAUST STACK	8" B-VENT RAIN CAP	1
6	HEA-BVENT-SUPPORT-8	EXHAUST STACK	8" BVENT STACK SUPPORT	1
7	BOL-GR5-.5-1.5	BOLT	NC, GRADE 5, 1/2" x 1-1/2"	12
8	NUT-GR2-.5	NC NUT	1/2" GRADE 2 NC NUT	12
9	WAS-GR5-F-.5	WASHER	1/2" GRADE 5 FLAT WASHER	24
10	CTR-HIGH-TEMP-SHUT-DOWN	ASSEMBLY	HI-TEMPERATURE SHUT DOWN ASSEMBLY	AS REQUIRED
11	GAU-3-6-50-500-S	GAUGE	3" x 6" 50-500 DEG GUAGE	1
12	CTR-SS-T675A-1565	REMOTE TEMP CONTROL	HONEYWELL TEMP CON. 0 - 100F	1
13	ELE-A10P8	ELECTRICAL PANEL	PANEL, 8" x 6"	1
14	ELE-BOX-A1086CHQRFG	ELECTRICAL BOX	HOFFMAN 10x8x6 FIB JB	1
15	FIE-5232	CONDUIT	C16104 STR LIQ TIGHT CON 1/2"	2
16	FIE-AL-NIP-.5-C	NIPPLE	1/2" x CLOSE ALUMINUM NIPPLE	1
17	FIE-CSA050-30	FLEX CONDUIT	1/2" LIQUID TITE FLEX CONDUIT	5.25 m
18	FIE-GK50N	ENCLOSURE	1/2" GK50N ENCLOSURE 35/85 GSK	1
19	FIE-K50A	BACK PLATE	1/2" ALUM K50A BLANK BACKPLATE	1
20	FIE-LB50A	ALUMINUM CONDUIT	1/2" LB50A ALUMINUM COND BODY	1
21	FIE-ST-050-464	CONNECTOR	1/2" STO50-464 STAR TECK CONN	2
22	FIE-UNY50NRA	UNION	1/2" XP ALUM. UNION UNY50NRA	1
23	GAU-4-.5B-2000P	GAUGE	4" x 1/2" 0-2000 PSI BM GAUGE	2
23	CWT_HEA_MANUAL_001	MANUAL	BOILER MANUAL (CURRENT VERSION)	3
25	THR-THERMOWELL	TBD BY SALES		
26	WIR-SHCAP-1P-18G	CABLE	18 GAUGE x 1 PAIR SHIELDED CABLE	31 m
27	NUT-GR5-LOC-.75	NUT	3/4" NYLON LOCK NUT	3

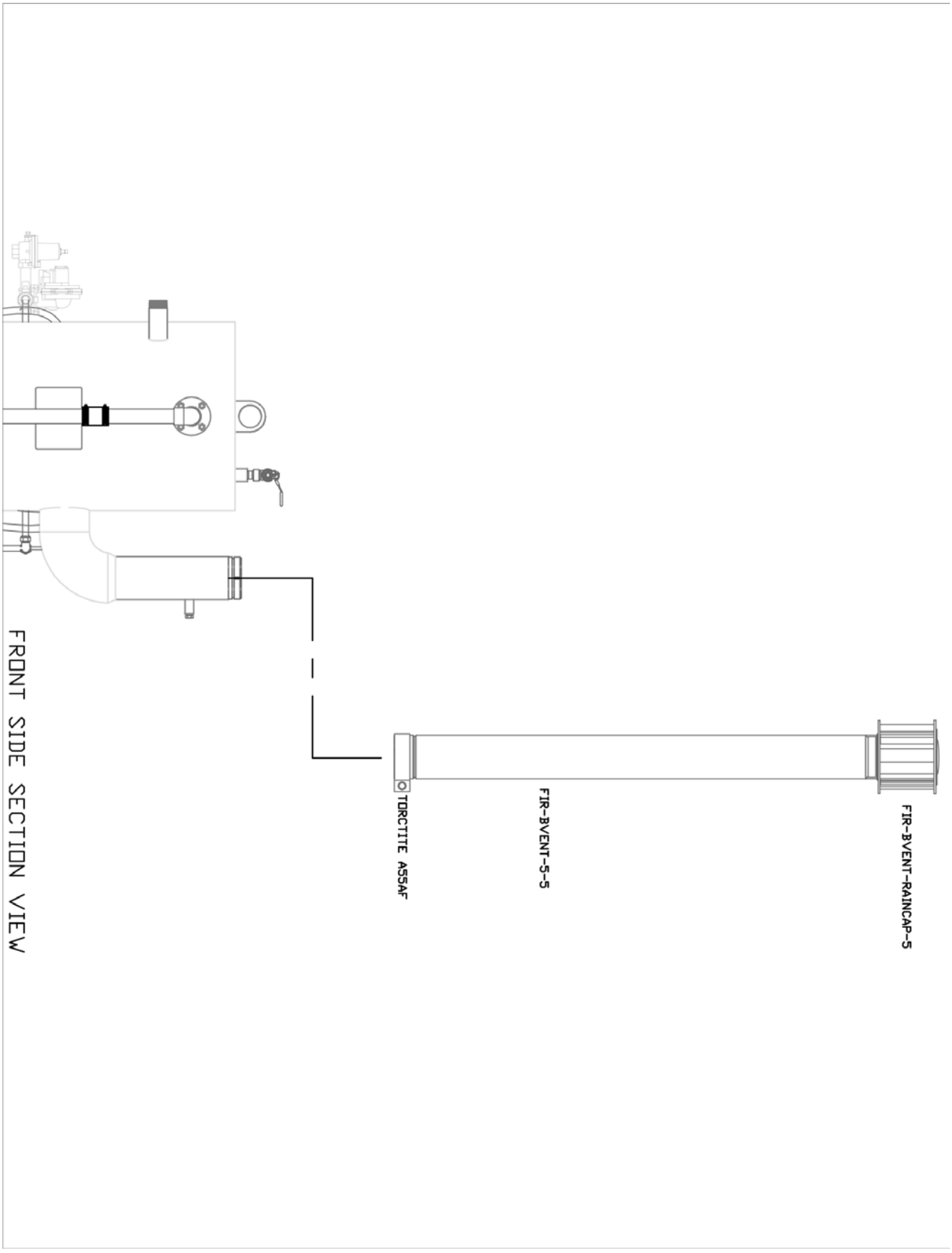
APPENDIX G:

CWT 770,000 BTU/HR BOILER PACKING LIST

ITEM	PART NUMBER	PART TITLE	PART DESCRIPTION	QTY
1	P103-770	GAS TRAIN	JOB SPECIFIC GAS HEADER ASSEMBLY	1
2	GAU-3-12-50-500-S	STACK TEMP GAUGE	3" x 12" 50-500 DEG GAUGE	1
3	FIR-BVENT-12-3	EXHAUST STACK	12" x 3' B-VENT SECTION	2
4	FIR-BVENT-RAINCAP-12	EXHAUST STACK	12" B-VENT RAIN CAP	1
5	HEA-770-2-800	EXHAUST STACK	770 BOILER/EVAP STACK SUPPORT	1
6	BOL-GR5-.5-1.5	BOLT	NC, GRADE 5, 1/2" x 1-1/2"	12
7	NUT-GR2-.5	NC NUT	1/2" GRADE 2 NC NUT	18
8	WAS-GR5-L-.5	LOCK WASHER	1/2" GRADE 5 LOCK WASHER	24
9	CTR-HIGH-TEMP-SHUT-DOWN	ASSEMBLY	HI-TEMPERATURE SHUT DOWN ASSEMBLY	AS REQUIRED
10	GAU-3-12-50-500-S	GAUGE	3" x 12" 50-500 DEG GUAGE	1
11	CTR-SS-T678A-1015	REMOTE TEMP CONTROL	T678A-1015 Honeywell Temp. Con.	1
12	ELE-A10P8	ELECTRICAL PANEL	PANEL, 8" x 6"	1
13	ELE-BOX-A1086CHQRFG	ELECTRICAL BOX	HOFFMAN 10x8x6 FIB JB	1
14	FIE-5232	CONDUIT	C16104 STR LIQ TIGHT CON 1/2"	2
15	FIE-AL-NIP-.5-C	NIPPLE	1/2" x CLOSE ALUMINUM NIPPLE	1
16	FIE-CSA050-30	FLEX CONDUIT	1/2" LIQUID TITE FLEX CONDUIT	5.5 m
17	FIE-GK50N	ENCLOSURE	1/2" GK50N ENCLOSURE 35/85 GSK	1
18	FIE-K50A	BACK PLATE	1/2" ALUM K50A BLANK BACKPLATE	1
19	FIE-LB50A	ALUMINUM CONDUIT	1/2" LB50A ALUMINUM COND BODY	1
20	FIE-ST-050-465	CONNECTOR	1/2" STO50-465 STAR TECK CONN	2
21	FIE-UNY50NRA	UNION	1/2" XP ALUM. UNION UNY50NRA	1
22	GAU-4-.5B-2000P	GAUGE	4" x 1/2" 0-2000 PSI BM GAUGE	2
23	CWT_HEA_MANUAL_001	MANUAL	BOILER MANUAL (CURRENT VERSION)	3
24	THR-THERMOWELL	TBD BY SALES		
25	WAS-GR5-F-.5	WASHER	1/2" GRADE 5 FLAT WASHER	6
26	WIR-SHCAP-2P-18G	CABLE	18 GAUGE x 2 PAIR SHIELDED CABLE	35 m

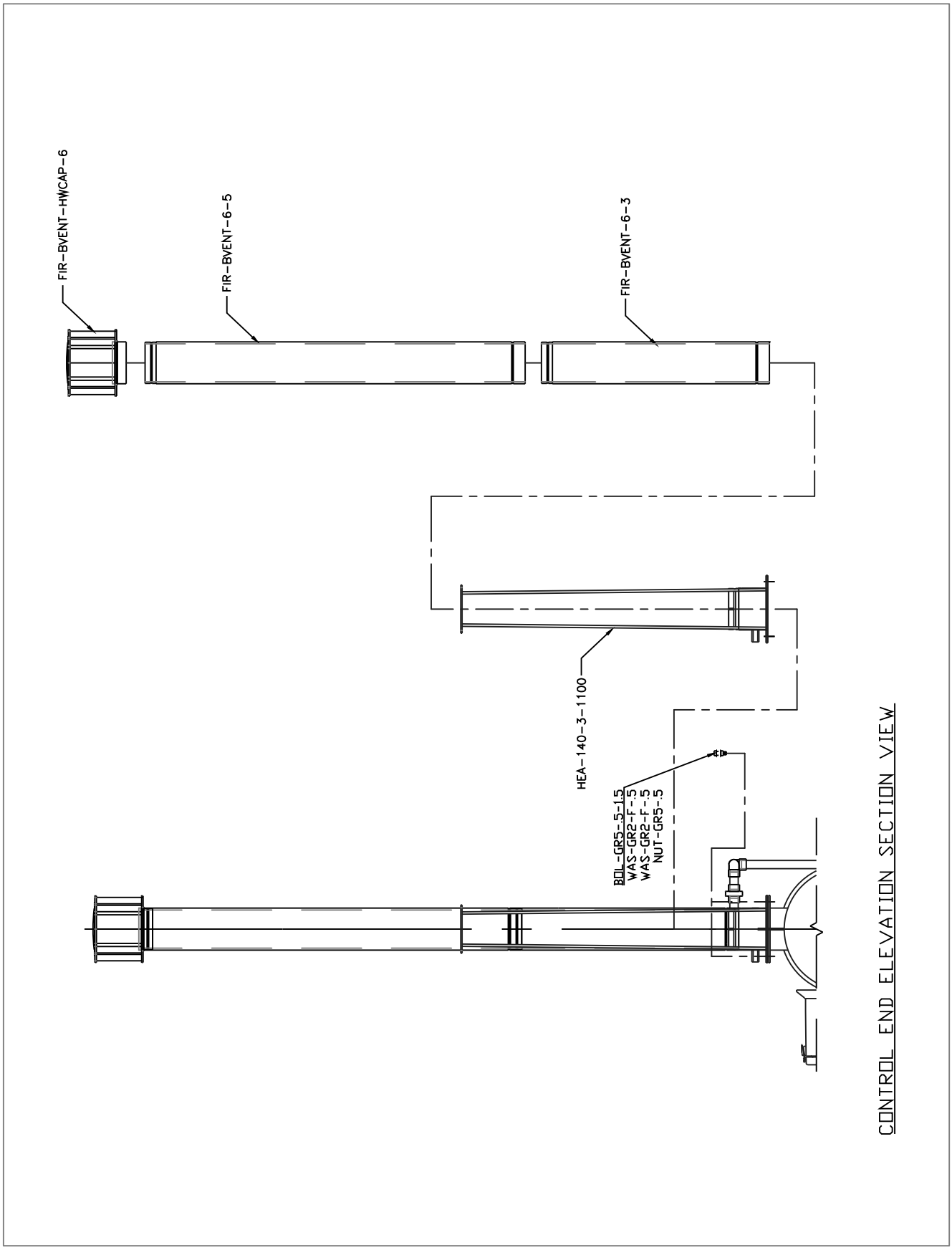
APPENDIX H:

CWT 70 Boiler Stack Assembly



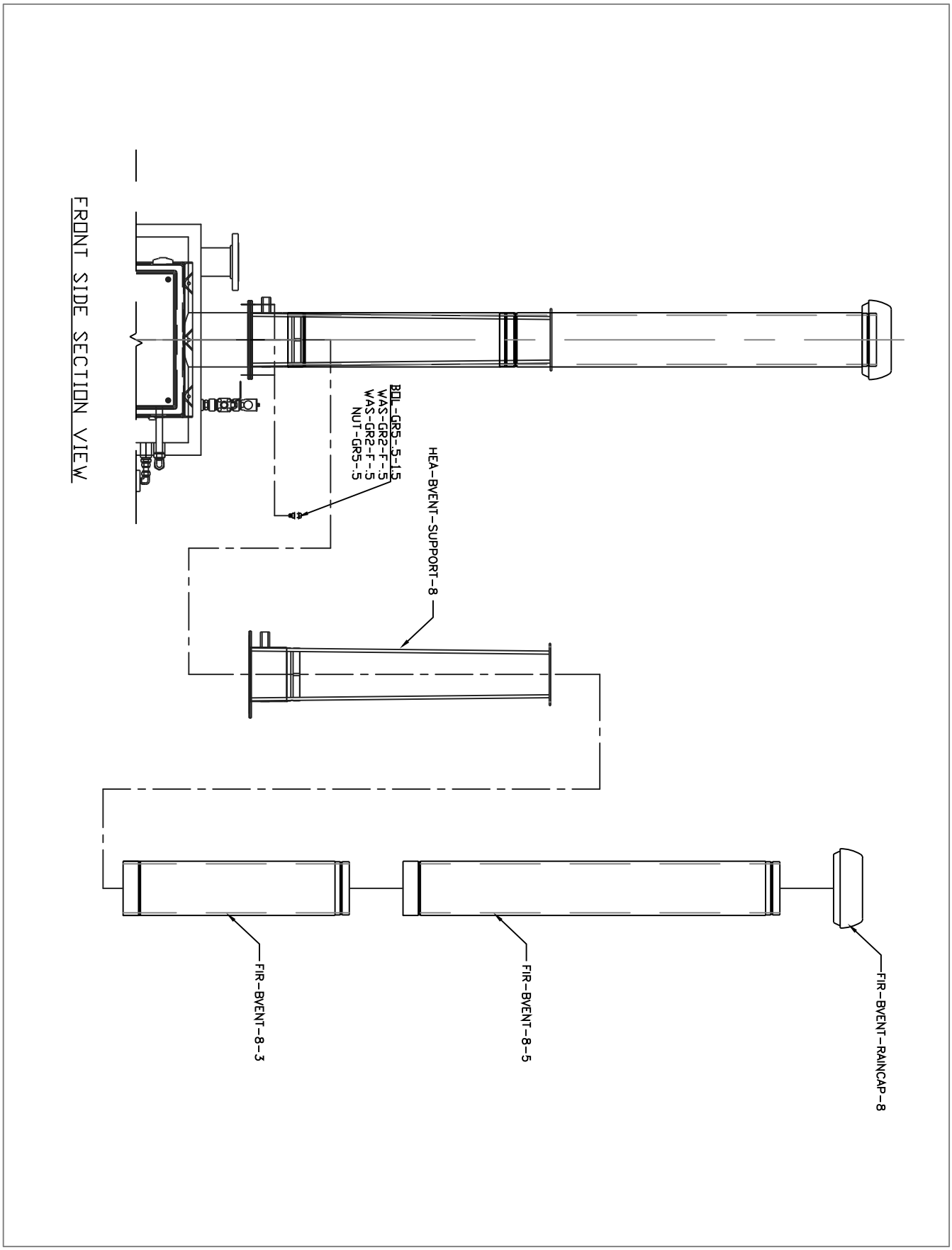
APPENDIX I:

CWT 140 BOILER STACK ASSEMBLY



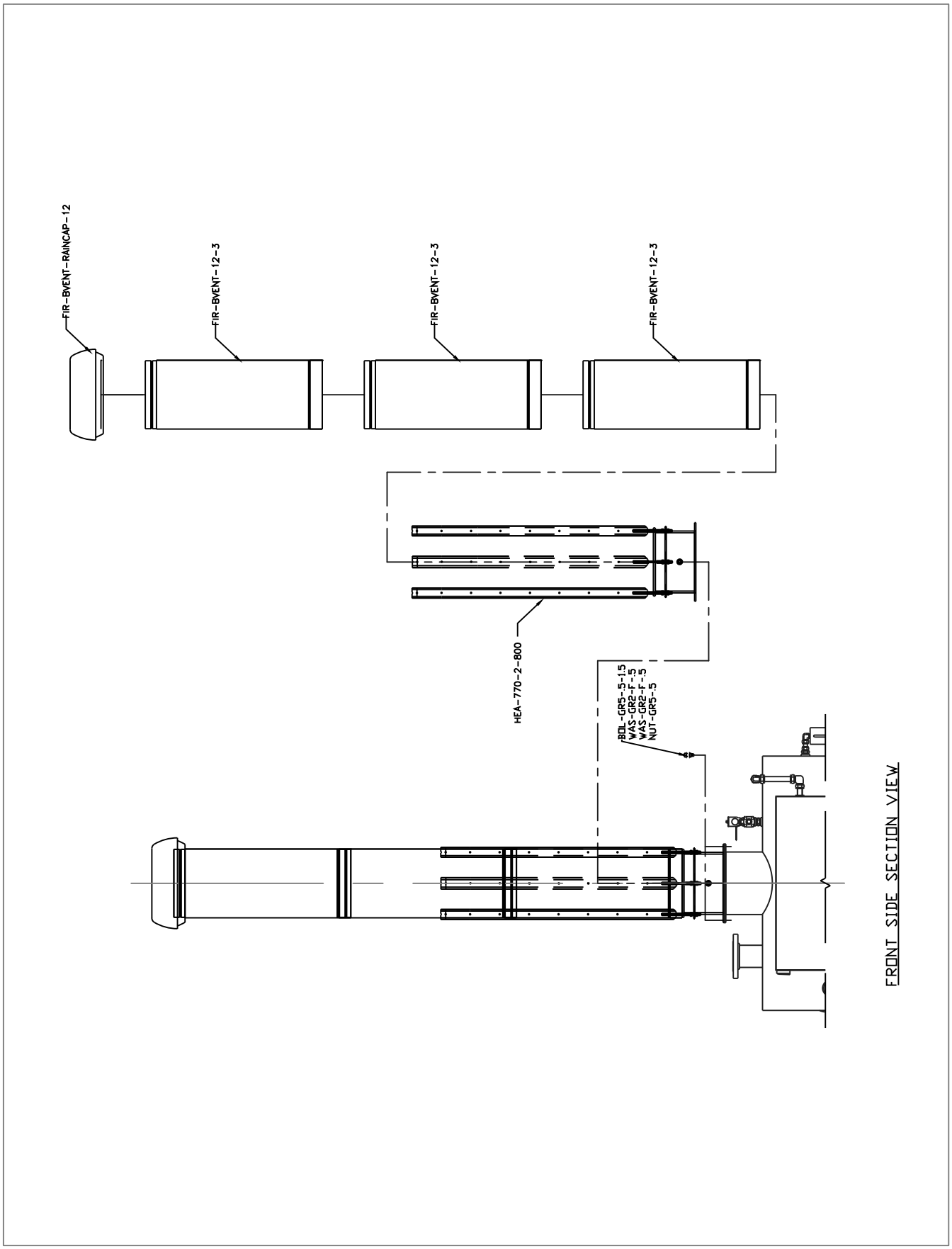
APPENDIX J:

CWT 385 BOILER STACK ASSEMBLY



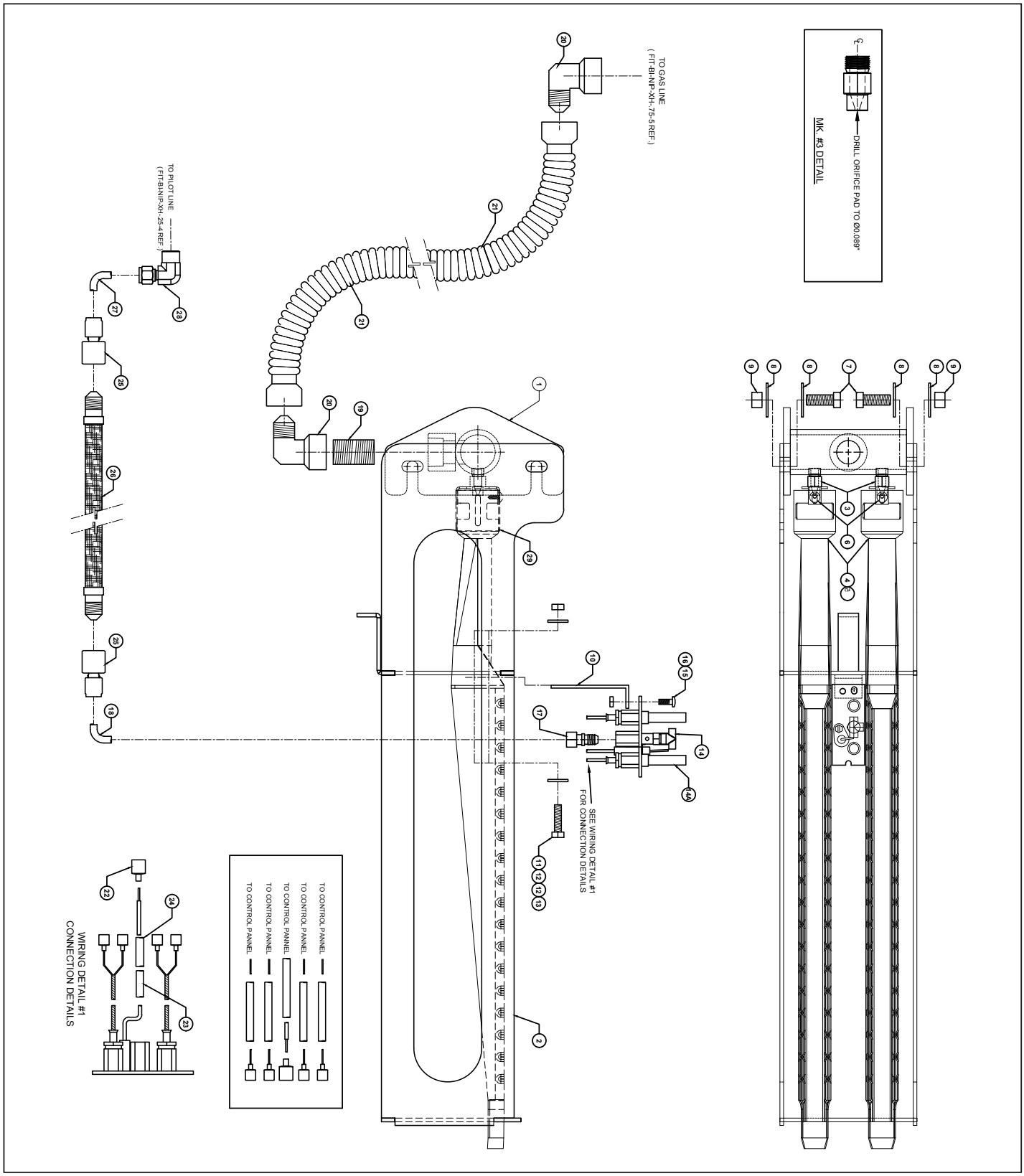
APPENDIX K:

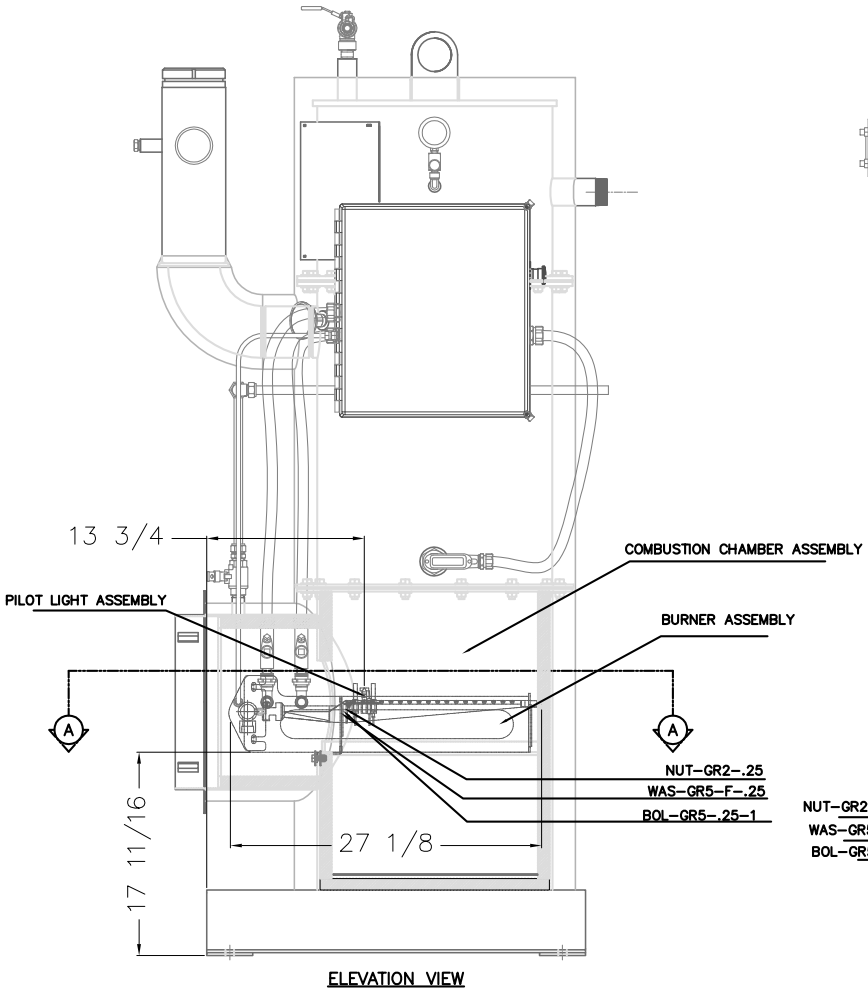
CWT 770 BOILER STACK ASSEMBLY



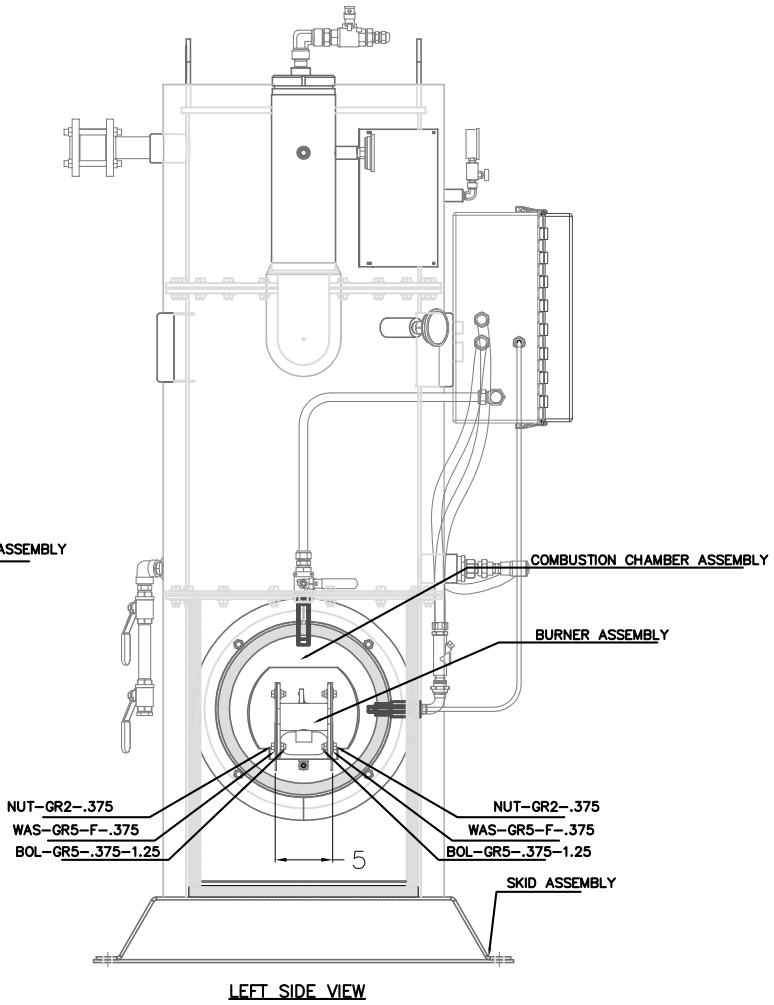
APPENDIX L:

CWT 70 CROSS-SECTION DRAWINGS

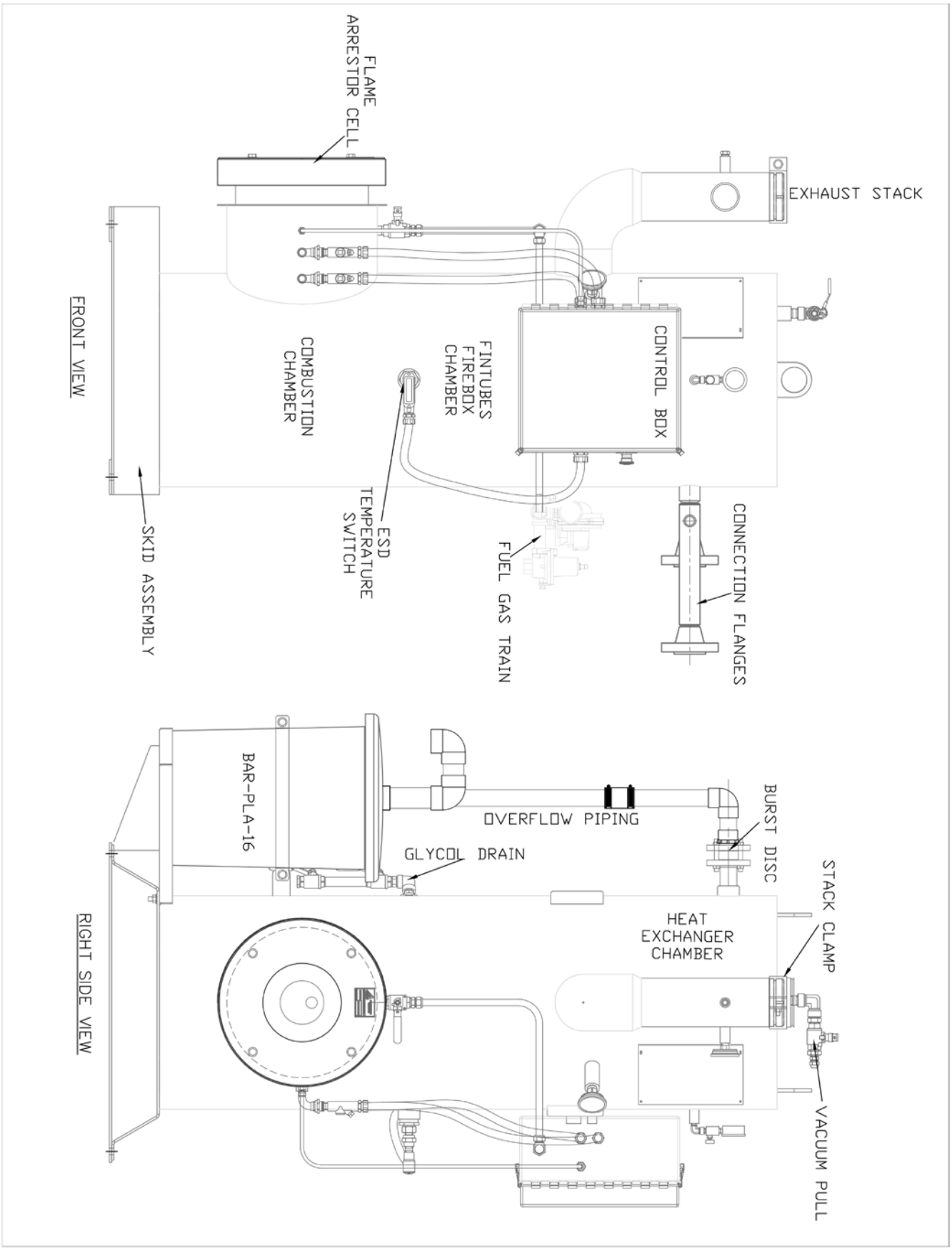




ELEVATION VIEW

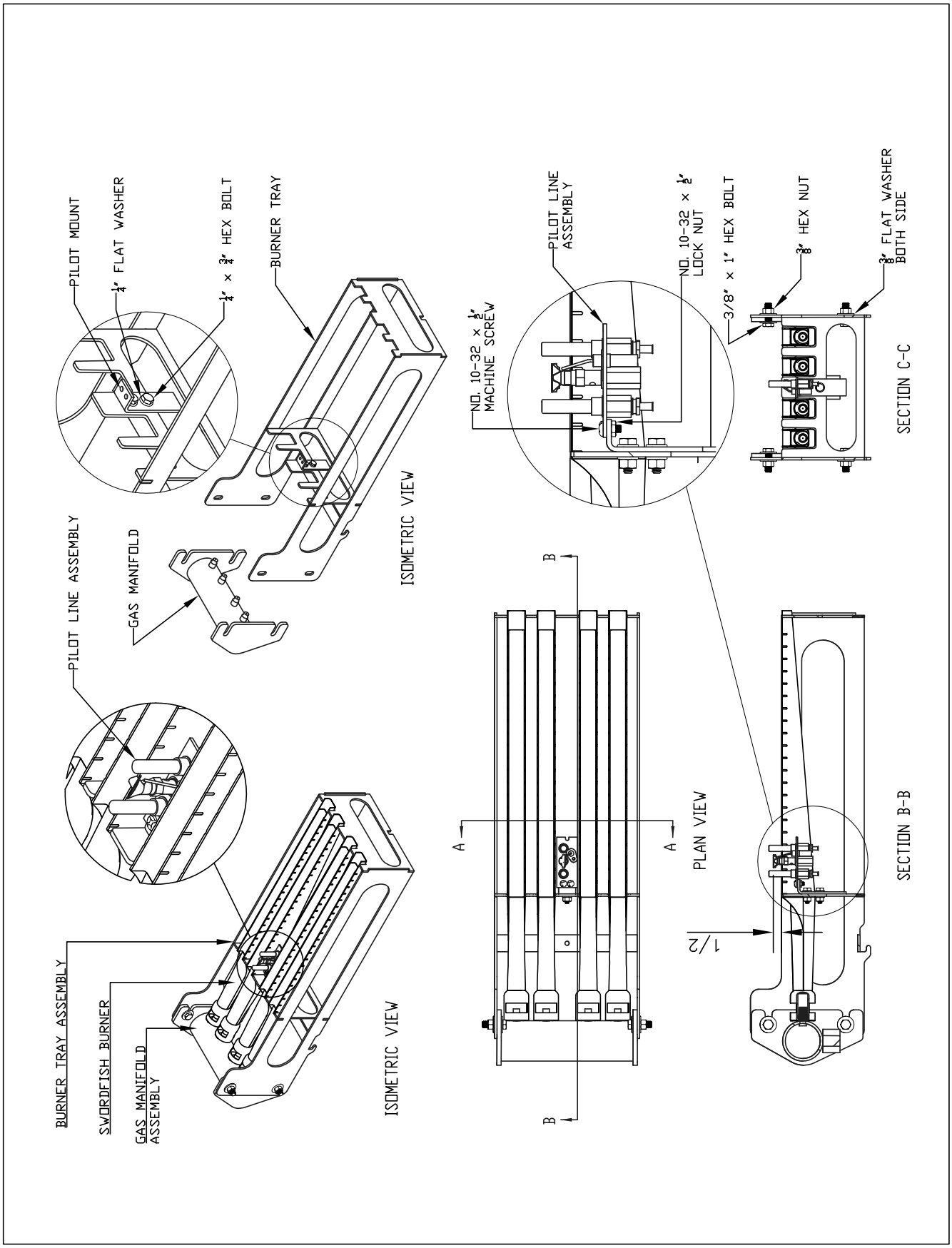


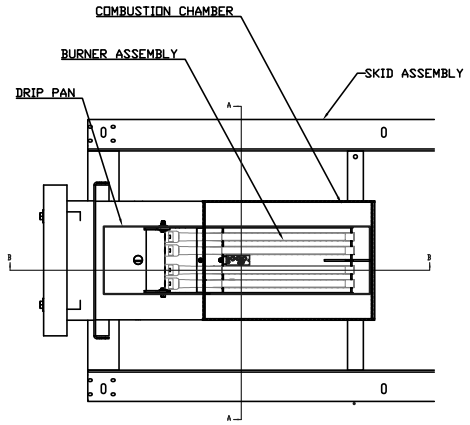
LEFT SIDE VIEW


FLAME ARRESTOR CELL
EXHAUST STACK
FRONT VIEW
COMBUSTION CHAMBER
FINTUBES FIREBOX CHAMBER
CONTROL BOX
ESD TEMPERATURE SWITCH
FUEL GAS TRAIN
CONNECTION FLANGES
SKID ASSEMBLY
BAR-PLA-16
OVERFLOW PIPING
BURST DISC
GLYCOL DRAIN
STACK CLAMP
HEAT EXCHANGER CHAMBER
RIGHT SIDE VIEW
VACUUM PULL

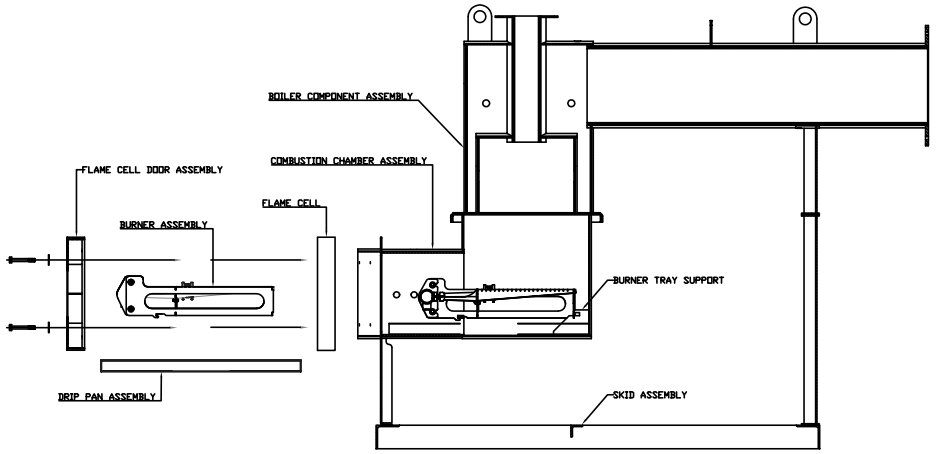
APPENDIX M:

CWT 140 BURNER ASSEMBLY AND CROSS-SECTION DRAWINGS

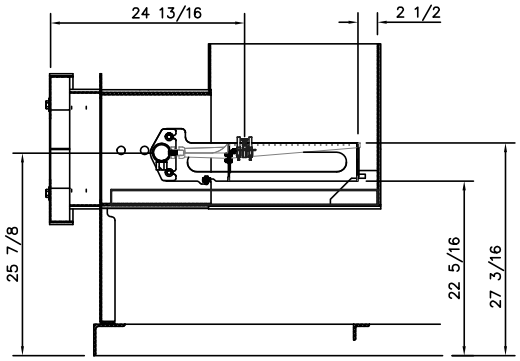




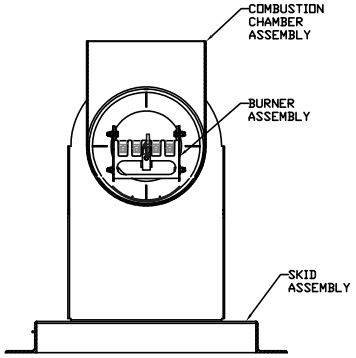
PLAN VIEW



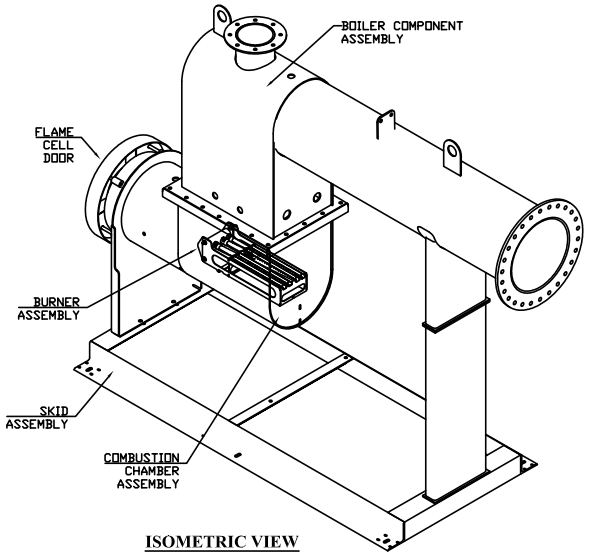
SIDE EXPLODED VIEW



SECTION B-B



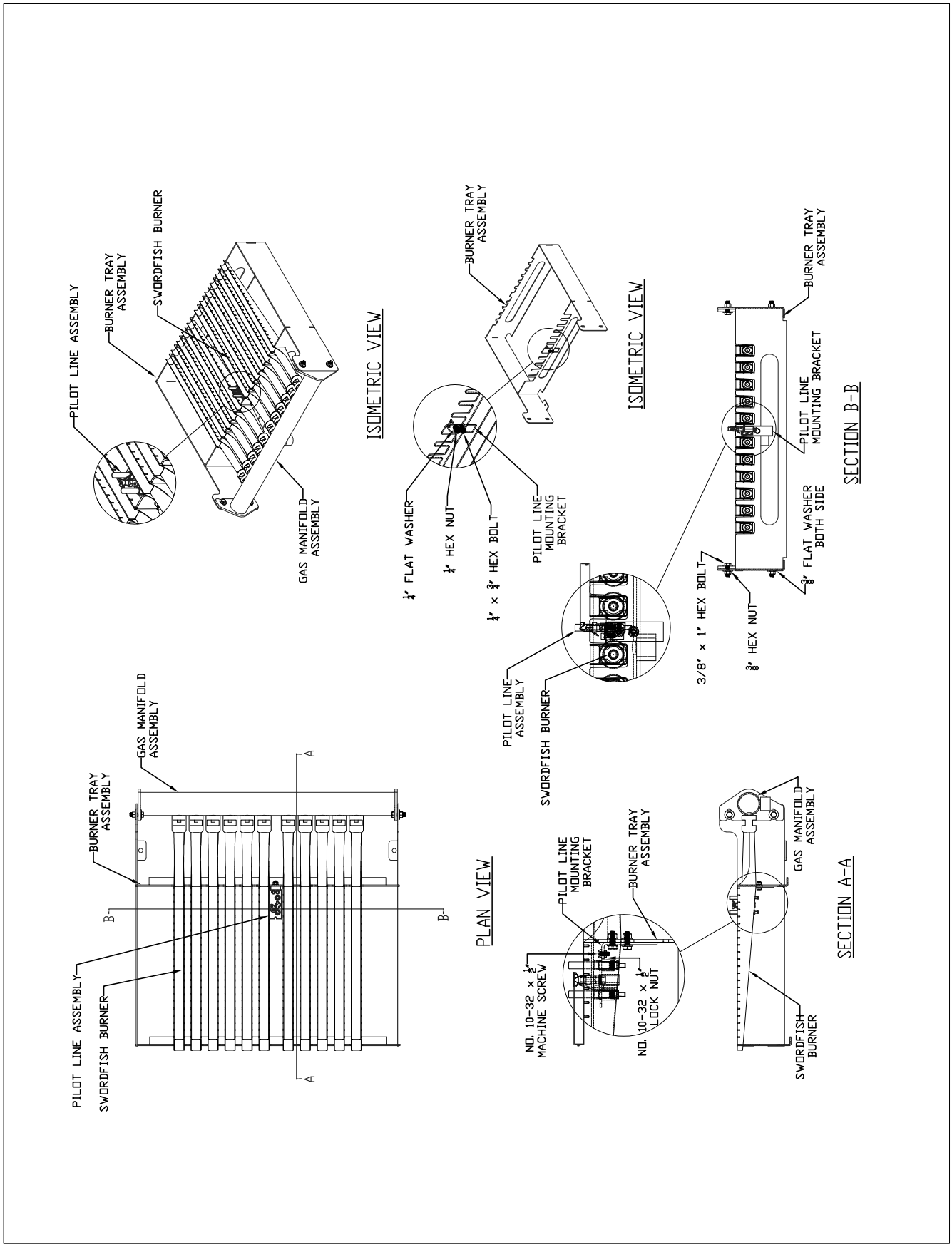
SECTION A-A

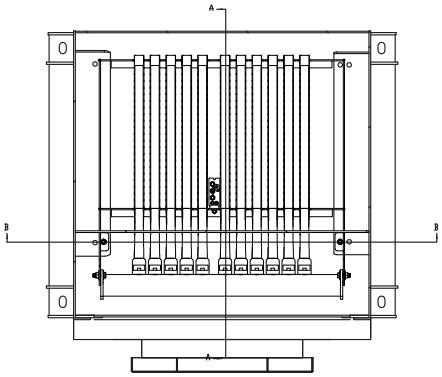


ISOMETRIC VIEW

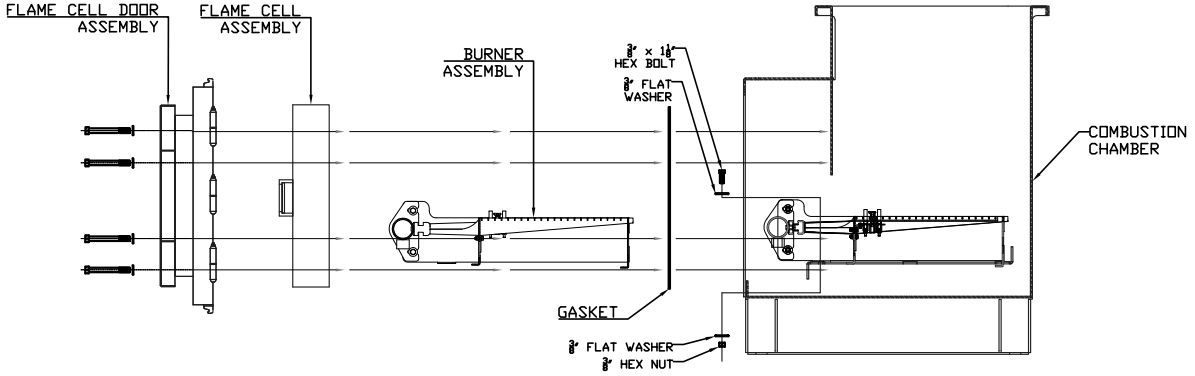
APPENDIX N:

CWT 385 BURNER ASSEMBLY AND CROSS-SECTION DRAWINGS

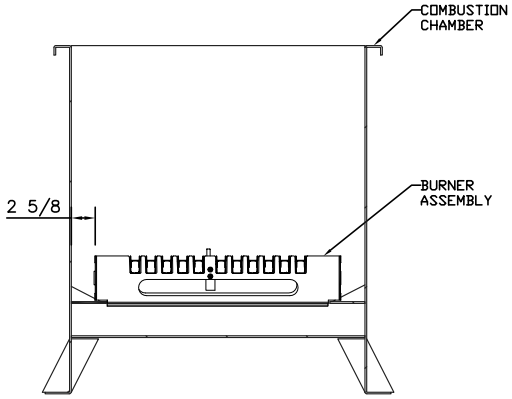




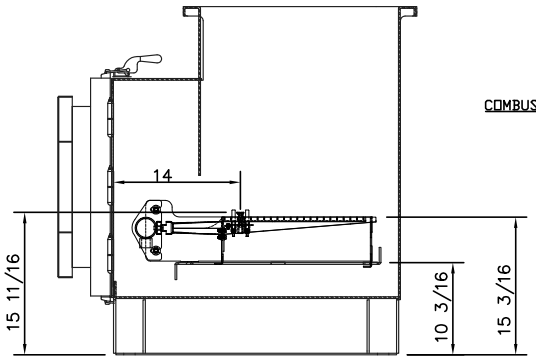
PLAN VIEW



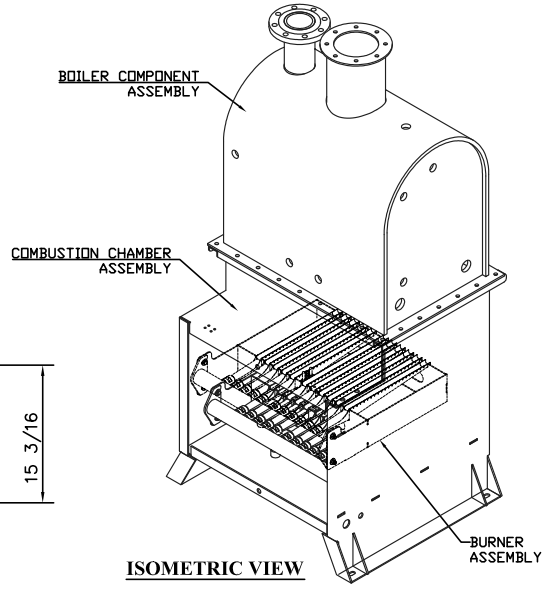
SIDE EXPLODED VIEW



SECTION B-B



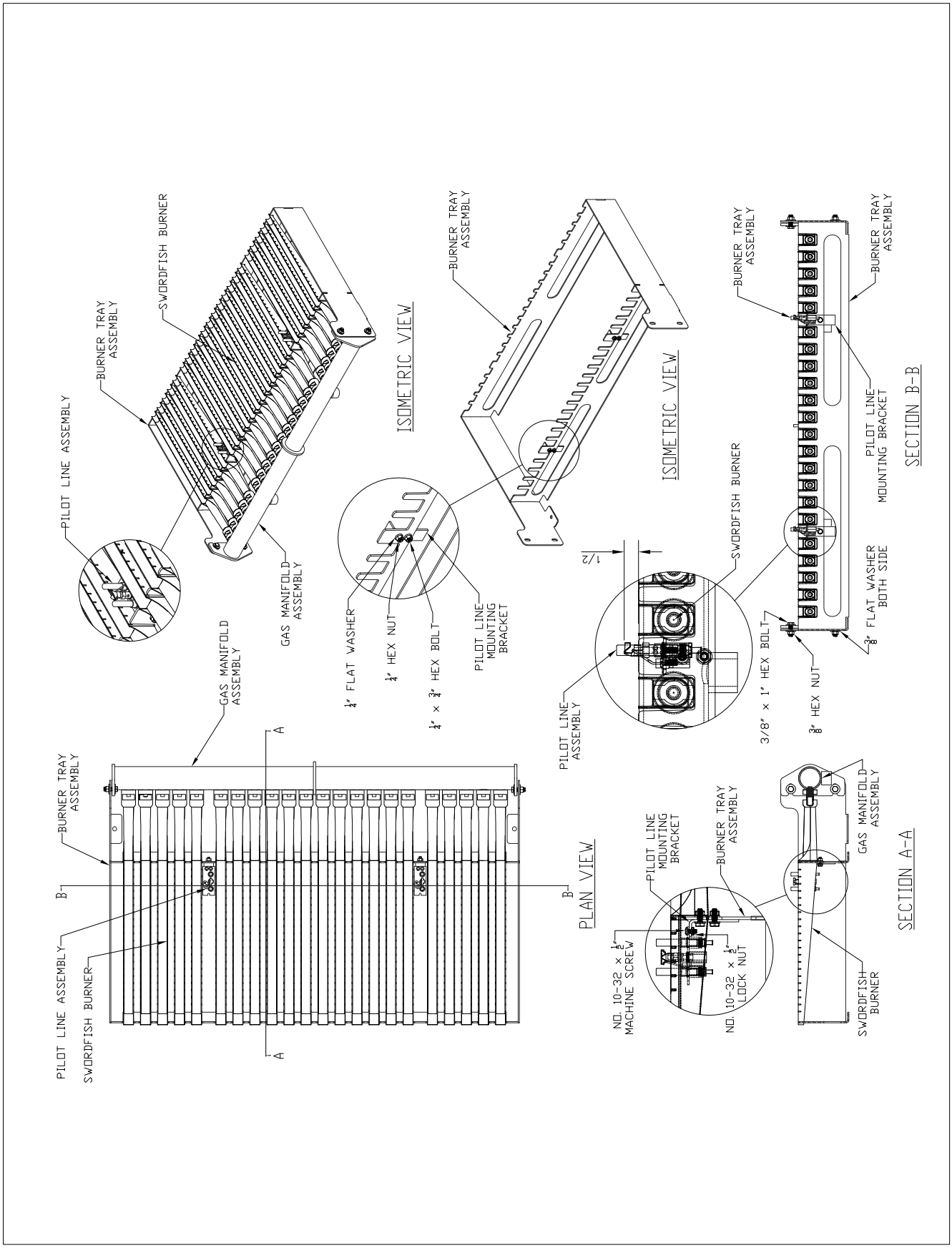
SECTION A-A

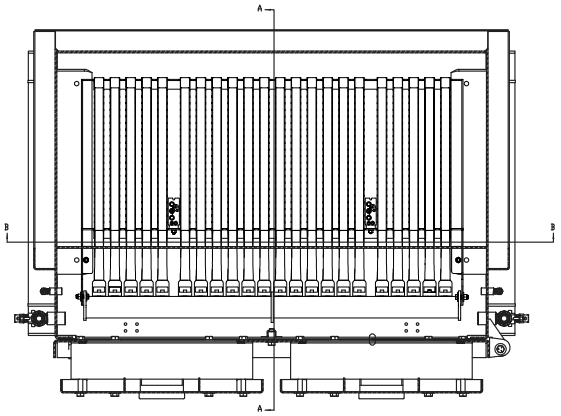


ISOMETRIC VIEW

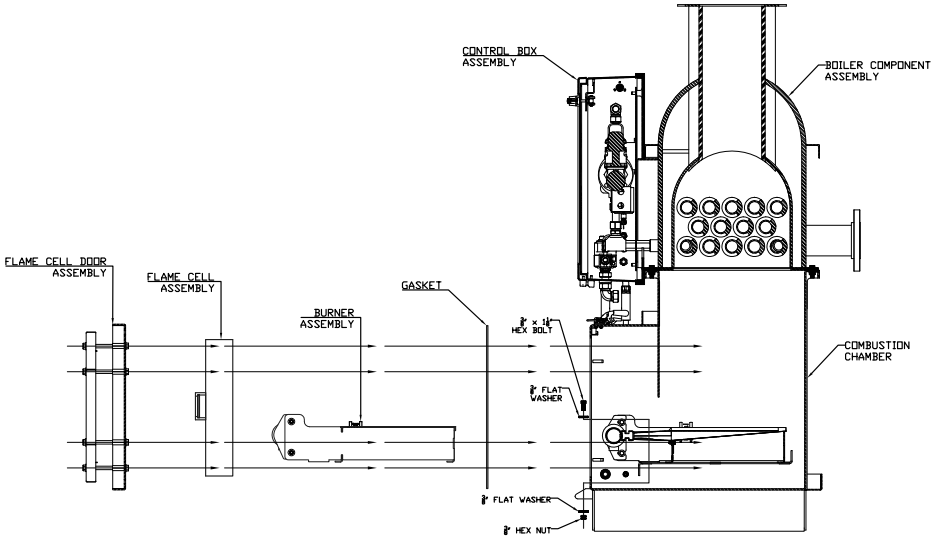
APPENDIX O:

CWT 770 BURNER ASSEMBLY AND CROSS-SECTION DRAWINGS

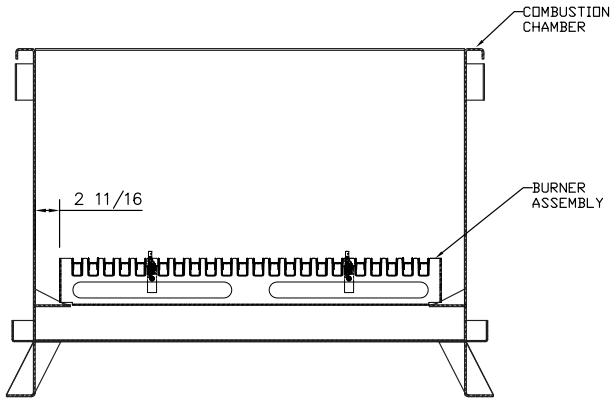




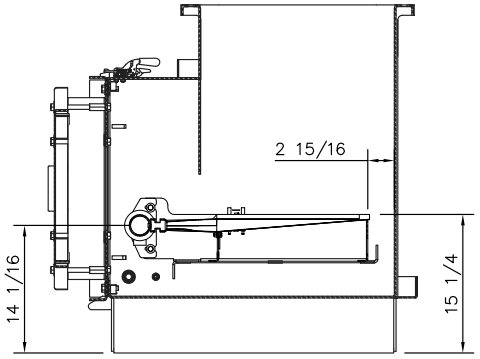
PLAN VIEW



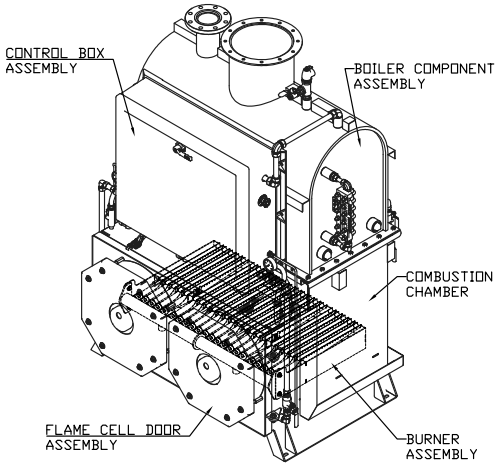
SIDE EXPLODED VIEW



SECTION B-B



SECTION A-A



ISOMETRIC VIEW

WARNING

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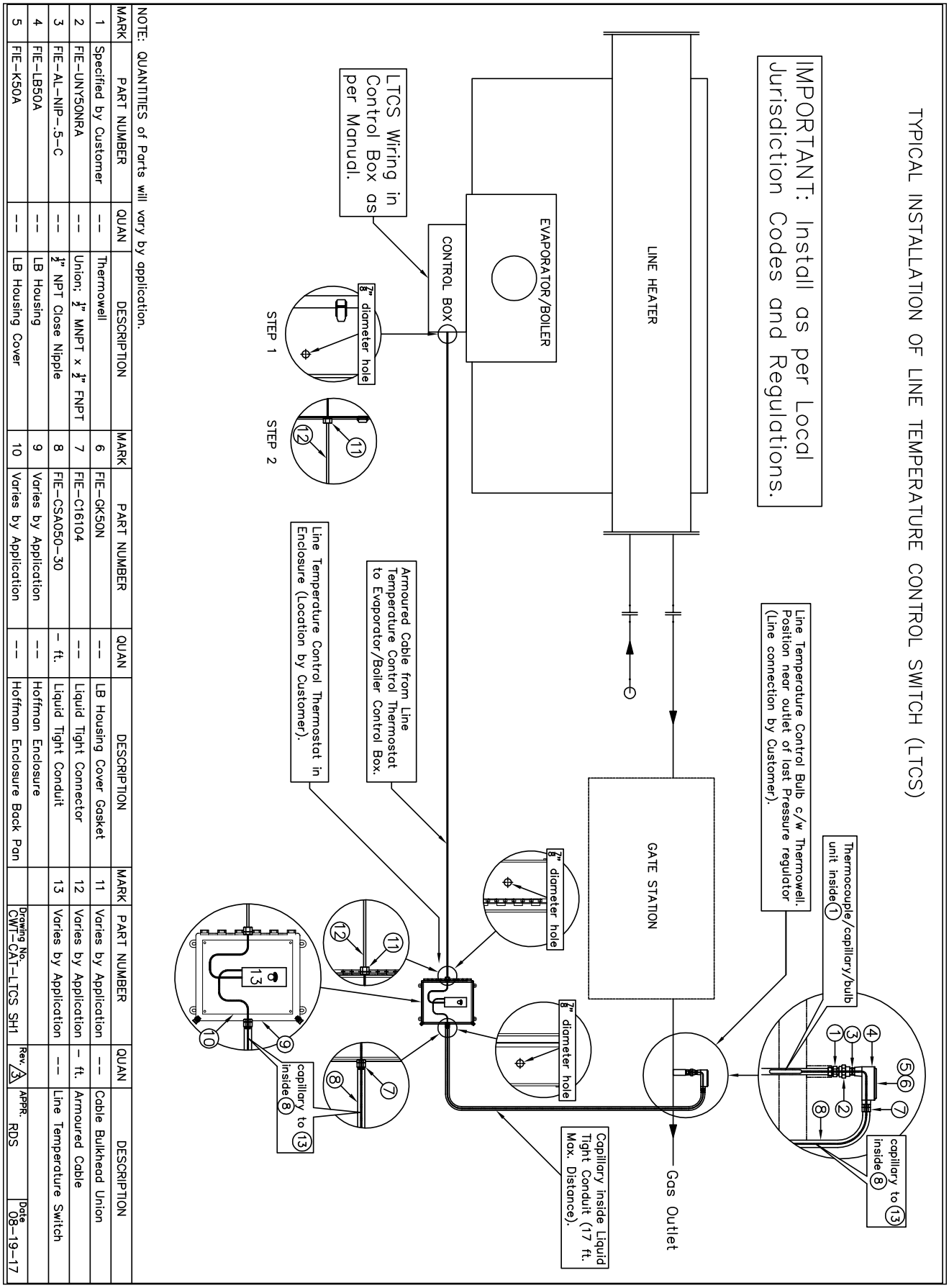
APPENDIX R:

CLASSIFICATION DRAWINGS

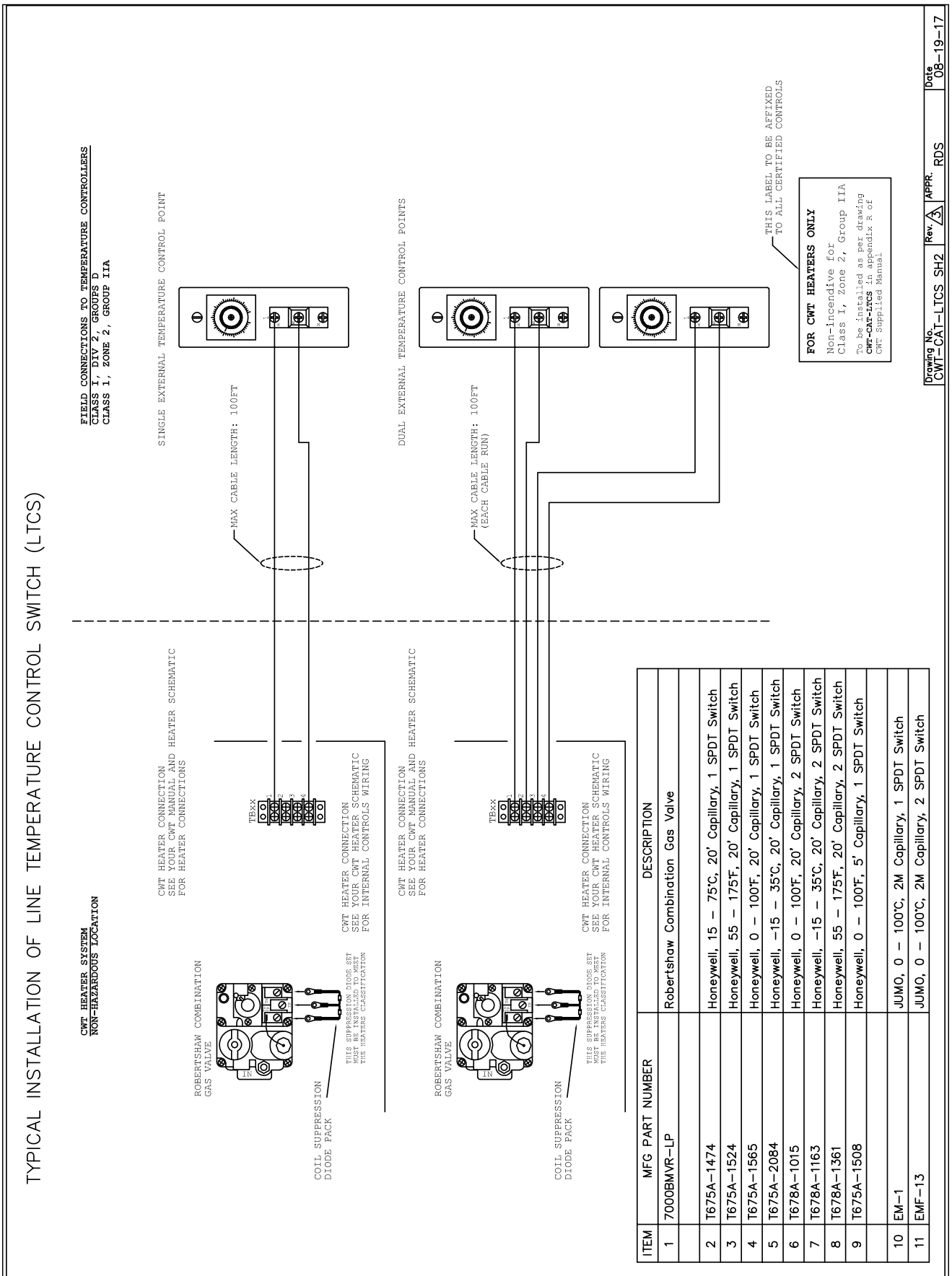


NOTE: QUANTITIES of Parts will vary by application.

MARK	PART NUMBER	QUAN	DESCRIPTION	MARK	PART NUMBER	QUAN	DESCRIPTION	MARK	PART NUMBER	QUAN	DESCRIPTION
1	Specified by Customer	--	Thermowell	6	FIE-GK50N	--	LB Housing Cover Gasket	11	Varies by Application	--	Cable Bulkhead Union
2	FIE-UNY50NRA	--	Union; 1" MNPT x 1" FNPT	7	FIE-C16104	--	Liquid Tight Connector	12	Varies by Application	- ft.	Armoured Cable
3	FIE-AL-NIP-.5-C	--	1/2" NPT Close Nipple	8	FIE-CSA050-30	- ft.	Liquid Tight Conduit	13	Varies by Application	--	Line Temperature Switch
4	FIE-LB50A	--	LB Housing	9	Varies by Application	--	Hoffman Enclosure				
5	FIE-K50A	--	LB Housing Cover	10	Varies by Application	--	Hoffman Enclosure Back Pan				

Drawing No. CWT-CAT-LTCS SH1	Rev. 3	
	APPR. RDS	Date 08-19-17

TYPICAL INSTALLATION OF LINE TEMPERATURE CONTROL SWITCH (LTCS)



ITEM	MFG PART NUMBER	DESCRIPTION
1	7000BMVR-LP	Robertshaw Combination Gas Valve
2	T675A-1474	Honeywell, 15 – 75°C, 20' Capillary, 1 SPDT Switch
3	T675A-1524	Honeywell, 55 – 175°F, 20' Capillary, 1 SPDT Switch
4	T675A-1565	Honeywell, 0 – 100°F, 20' Capillary, 1 SPDT Switch
5	T675A-2084	Honeywell, –15 – 35°C, 20' Capillary, 1 SPDT Switch
6	T678A-1015	Honeywell, 0 – 100°F, 20' Capillary, 2 SPDT Switch
7	T678A-1163	Honeywell, –15 – 35°C, 20' Capillary, 2 SPDT Switch
8	T678A-1361	Honeywell, 55 – 175°F, 20' Capillary, 2 SPDT Switch
9	T675A-1508	Honeywell, 0 – 100°F, 5' Capillary, 1 SPDT Switch
10	EM-1	JUMO, 0 – 100°C, 2M Capillary, 1 SPDT Switch
11	EMF-13	JUMO, 0 – 100°C, 2M Capillary, 2 SPDT Switch