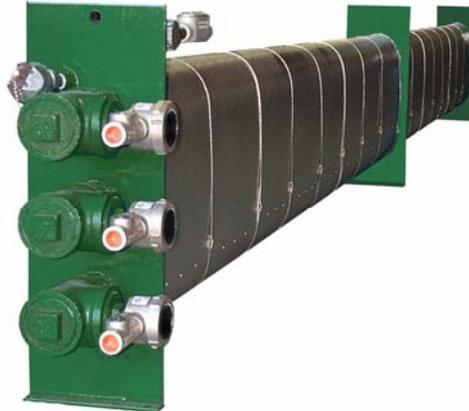




LHE OIL LINE HEATER ELECTRIC TYPE



WARNING

These instructions are intended for use only by experienced, qualified combustion start-up personnel. Adjustment of this equipment and its components by unqualified personnel can result in fire, explosion, severe personal injury, or even death.

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Required Reference: Appropriate System Schematic

LHE 10C, 15C, 20C, 25C - Y7358

LHE 110C, 125C – Y7361

LHE 30C, 40C - Y7387

LHE 150C – Y7362

LHE 50C - Y7371

LHE 175C – Y7363

LHE 60C, 70C, 75C – Y7388

LHE 200C – Y7364

LHE 80C – Y7359

LHE 225C – Y7386

LHE 90C, 100C – Y7360

LHE 250C – Y7365

These instructions are intended to serve as guidelines covering the installation, operation, and maintenance of Hauck equipment. While every attempt has been made to ensure completeness, unforeseen or unspecified applications, details, and variations may preclude covering every possible contingency. **WARNING: TO PREVENT THE POSSIBILITY OF SERIOUS BODILY INJURY, DO NOT USE OR OPERATE ANY EQUIPMENT OR COMPONENT WITH ANY PARTS REMOVED OR ANY PARTS NOT APPROVED BY THE MANUFACTURER.** Should further information be required or desired or should particular problems arise which are not covered sufficiently for the purchaser's purpose, contact Hauck Mfg. Co.



WARNING

This equipment is potentially dangerous with the possibility of serious personal injury and property damage. Hauck Manufacturing Company recommends the use of flame supervisory equipment and fuel safety shutoff valves. Furthermore, Hauck urges rigid adherence to National Fire Protection Association (NFPA) standards and insurance underwriter's requirements. Operation and regular preventative maintenance of this equipment should be performed only by properly trained and qualified personnel. Annual review and upgrading of safety equipment is recommended.

A. GENERAL INFORMATION

Heavy, waste, or recycled fuel oils require some means of viscosity control. Hauck LHE Electric Oil Line Heaters installed in the burner fuel supply line are a perfect solution to the viscosity control problem. Combustion of highly viscous fuel oils, typically in excess of 5000 SSU ($1.1 \times 10^{-3} \text{ m}^2/\text{sec}$) at ambient conditions, may require a two-stage heating system as these oils become difficult to pump at low ambient temperatures. In such cases, a Hauck SHE Electric Suction Oil Heater should be installed in the fuel storage tank to raise the oil viscosity and make it easier to pump. Tank insulation is recommended, as is some form of agitation (recirculation pump, paddle or propeller) to prevent oil separation and settling. Heat tracing is recommended and may be required, especially in cold climates, to prevent excessive heat loss and promote economical operation. Installation of weather tight insulation is necessary over the heat tracing to maximize it's benefits and promote economical operation.

Proper sizing of the burner oil supply pump is crucial to system operation. Size the pump to deliver 125 – 150% of the burner's maximum fuel usage at the recommended supply pressure. Locate the pump close to the tank to minimize the length of the supply piping from the tank to the pump inlet, and install a filter or strainer to remove any foreign objects that could damage the pump or clog the metering system and burner oil nozzle. Various strainer types are available for adequate oil filtration. Double basket strainers conveniently allow the baskets to be cleaned without shutting down the burner.

B. RECEIVING & INSPECTION

Upon receipt, check each item on the bill of lading and/or invoice to determine that all equipment has been received. A careful examination of all parts should be made to ascertain if there has been any damage in shipment.

IMPORTANT

If the installation is delayed and the equipment is stored outside, provide adequate protection as dictated by climate and period of exposure. Special care should be given to all motors and bearings, if applicable, to protect them from rain or excessive moisture.

C. CAPACITIES

Model Number	KW Rating	Oil Temperature Rise (°F)									
		40	50	60	70	80	90	100	110	120	130
		Oil Capacity (gph)									
LHE 10C	10	174	139	116	100	87	77	70	63	58	54
LHE 15C	15	262	209	174	149	131	116	105	95	87	80
LHE 20C	20	349	279	232	199	174	155	139	127	116	107
LHE 25C	25	436	349	291	249	218	194	174	158	145	134
LHE 30C	30	523	418	349	299	262	232	209	190	174	161
LHE 40C	40	697	558	465	398	349	310	279	254	232	215
LHE 50C	50	872	697	581	498	436	387	349	317	291	268
LHE 60C	60	1046	837	697	598	523	465	418	380	349	322
LHE 70C	70	1220	976	814	697	610	542	488	444	407	375
LHE 75C	75	1308	1046	872	747	654	581	523	475	436	402
LHE 80C	80	1395	1116	930	797	697	620	558	507	465	429
LHE 90C	90	1569	1255	1046	897	785	697	628	571	523	483
LHE 100C	100	1743	1395	1162	996	872	775	697	634	581	536
LHE 110C	110	1918	1534	1278	1096	959	852	767	697	639	590
LHE 125C	125	2179	1743	1453	1245	1090	969	872	792	726	671
LHE 150C	150	2615	2092	1743	1494	1308	1162	1046	951	872	805
LHE 175C	175	3051	2441	2034	1743	1525	1356	1220	1109	1017	939
LHE 200C	200	3487	2789	2325	1992	1743	1550	1395	1268	1162	1073
LHE 225C	225	3923	3138	2615	2241	1961	1743	1569	1426	1308	1207
LHE 250C	250	4358	3487	2906	2491	2179	1937	1743	1585	1453	1341

NOTES:

1. Oil Capacities based on No. 6 fuel oil exiting the oil line heater at a viscosity of 90 SSU and includes a 20% safety factor.
2. Maximum inlet pressure is 100 psig.
3. Minimum oil flow rate to actuate flow switch for LHE 10-25 is adjustable from 3 to 45 gph; for LHE 30 is 90 gph; for LHE 40-50 is 120 gph; LHE 60-125 is 180 gph; for LHE 150-250 is 360 gph.
4. Standard supply voltage is 480V/3Ph/60Hz unless otherwise specified on order.

Table 1. Capacities

C. CAPACITIES (Continued)

Model Number	KW Rating	Oil Temperature Rise (°C)									
		22.2	27.8	33.3	38.9	44.5	50.0	55.6	61.1	66.7	72.2
		Oil Capacity (lph)									
LHE 10C	10	659	526	439	379	329	291	265	238	220	204
LHE 15C	15	992	791	659	564	496	439	397	360	329	303
LHE 20C	20	1321	1056	878	753	659	587	526	481	439	405
LHE 25C	25	1650	1321	1101	942	825	734	659	598	549	507
LHE 30C	30	1980	1582	1321	1132	992	878	791	719	659	609
LHE 40C	40	2638	2112	1760	1506	1321	1173	1056	961	878	814
LHE 50C	50	3301	2638	2199	1885	1650	1465	1321	1120	1101	1014
LHE 60C	60	3959	3206	2638	2263	1980	1760	1582	1438	1321	1219
LHE 70C	70	4618	3694	3081	2638	2309	2051	1847	1681	1540	1419
LHE 75C	75	4951	3959	3301	2827	2475	2199	1980	1798	1650	1522
LHE 80C	80	5280	4224	3520	3017	2638	2347	2112	1919	1760	1624
LHE 90C	90	5939	4750	3959	3395	2971	2638	2377	2161	1980	1828
LHE 100C	100	6597	5280	4398	3770	3301	2933	2638	2400	2199	2029
LHE 110C	110	7260	5806	4837	4148	3630	3225	2903	2638	2419	2233
LHE 125C	125	8248	6597	5500	4712	4126	3668	3301	2998	2748	2540
LHE 150C	150	9898	7918	6597	5655	4951	4398	3959	3600	3301	3047
LHE 175C	175	11550	9239	7699	6597	5772	5132	4618	4198	3849	3554
LHE 200C	200	13200	10560	8800	7540	6597	5867	5280	4799	4398	4061
LHE 225C	225	14850	11880	9898	8482	7422	6597	5939	5397	4951	4569
LHE 250C	250	16500	13200	11000	9428	8248	7332	6597	5999	5500	5076

NOTES:

1. Oil Capacities based on No. 6 fuel oil exiting the oil line heater at a viscosity of $1.8 \times 10^{-5} \text{m}^2/\text{sec}$ and includes a 20% safety factor.
2. Maximum inlet pressure is **690 kPa**.
3. Minimum oil flow rate to actuate flow switch for LHE 10-25 is adjustable from 11 to 170 lph; for LHE 30 is 340 lph; for LHE 40-50 is 454 lph; LHE 60-125 is 681 lph; for LHE 150-250 is 1362 lph.
4. Standard supply voltage is 480V/3Ph/60Hz unless otherwise specified on order.

Table 2. Metric Capacities

D. DIMENSIONS

See appropriate Dimension sheet for detailed dimensional information.

E. INSTALLATION



WARNING

Under no condition should the line heater inlet pressure exceed **100 psig (690 kPa)**.

The Hauck LHE should be installed on a level stable foundation. The heater is plumbed between the discharge of the pump and the burner. The by-pass line from the burner bypass relief valve must return to the SHE (if present) or to the oil storage tank (see Figure 1 & 2). This is to avoid overheating the pump and to minimize turbulence that can contribute to pump cavitation.

IMPORTANT

Ensure that the oil supply system is adequately sized to satisfy the minimum oil flow requirement to the flow switch at low fire, i.e., adjustable from 3 to 45 gph (11 to 170 lph) for LHE 10-25, 90 gph (340 lph) for LHE 30, 120 gph (454 lph) for LHE 40-50, 180 gph (681 lph) for LHE 60-125 and 360 gph (1362 lph) for LHE 150-250. If this minimum flow rate is not achieved, the flow switch will not actuate power to the heater elements and the oil will not be heated.

Refer to appropriate dimensional drawings for the proper location of the inlet and outlet of the LHE.

CAUTION

Inlet and outlet connections to the LHE must be adhered to in order to maintain temperature control and operate safely.

Connection fittings are standard pipe thread. Proper fit and a high quality thread sealant with teflon (Loctite 565 or equal) are recommended - **do not use teflon tape**.

The electrical control panel for the LHE's is shipped loose and must be properly mounted near the heaters. Hauck LHE's require wiring of a main service line (460V/3Ph/60Hz) to the line side lugs on the main circuit interrupter. Properly sized conduit enclosed conductors should be used. See label inside control panel for voltage, phase and current ratings. In addition, individual heaters need to be connected to the load fusing in the control panel. Wiring should be enclosed in conduit and of proper size for rated heater load. Be sure to 'pack and pour the seal-off's' as per enclosed instructions. Ratings are shown on the wiring box cover of each heater.

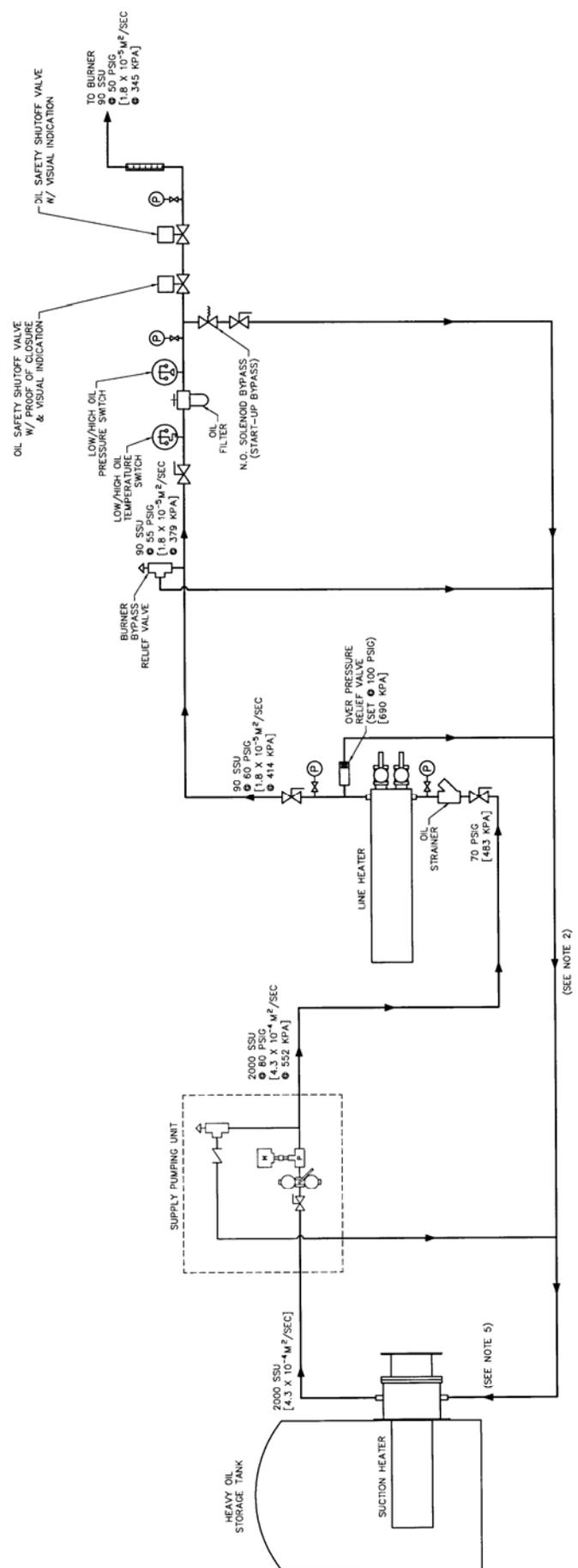
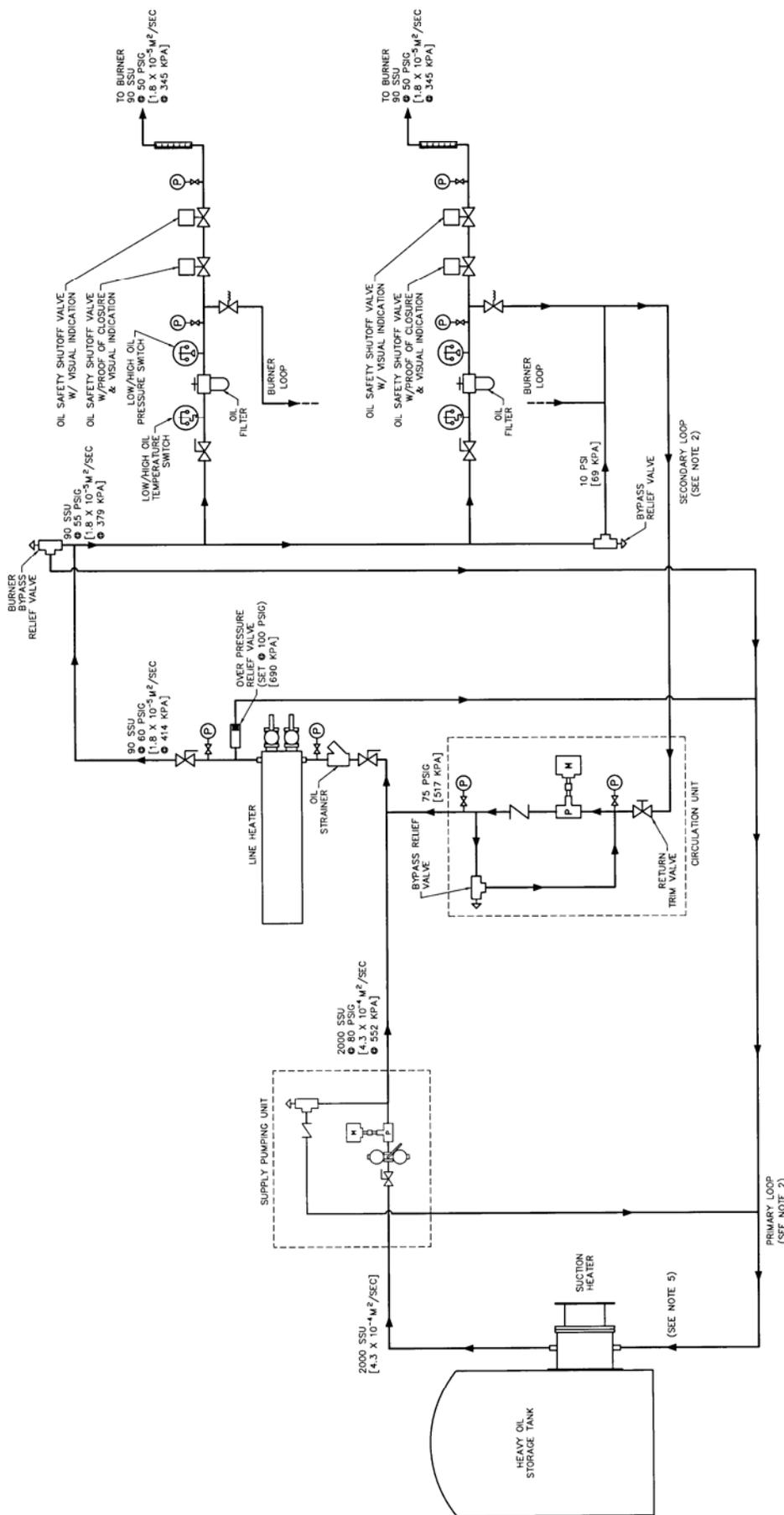


Figure 1. Typical Heavy Oil Piping – Single Burner System

- NOTES:
1. PIPING SCHEMATIC SHOWS TYPICAL COMPONENTS AND NOMINAL VISCOSITIES AND PRESSURES FOR HEAVY FUEL OIL SUPPLY; ACTUAL REQUIREMENTS ARE DEPENDENT UPON THE SPECIFIC BURNER SYSTEM (CONSULT HAUCK).
 2. OIL RETURN LINES TO BE SIZED ACCORDING TO DISTANCE TO PUMP -- MINIMUM SIZE EQUAL TO TWO PIPE SIZES LARGER THAN OIL SUPPLY LINE (SEE GL88 FOR MINIMUM LINE SIZES FOR HAUCK SUPPLY PUMPING OIL UNITS).
 3. FOR ALL HEAVY OIL APPLICATIONS, OIL PIPING MUST BE HEAT TRACED (ELECTRIC OR STEAM) AND INSULATED. SELF-REGULATING HEAT TRACING IS RECOMMENDED TO MAINTAIN THE DESIRED TEMPERATURE OF A GIVEN FUEL OIL TO ACHIEVE 90 SSU ($1.8 \times 10^{-5} \text{ M}^2/\text{SEC}$) OR LESS AT THE BURNER. ELECTRICAL HEAT TRACING WITH A NOMINAL RATING OF 12 W/FT (34W/M) COVERED WITH A NOMINAL 2" (50MM) FIBERGLASS TYPE INSULATION IS SUFFICIENT FOR MOST APPLICATIONS.
 4. IF USING NO. 6 FUEL OIL AND THE PIPING BETWEEN THE SUPPLY PUMPING UNIT AND THE HEAVY OIL MANIFOLD IS GREATER THAN 50 FT (15 M), AN ADDITIONAL BYPASS RELIEF VALVE MAY BE REQUIRED IN THE SUPPLY PIPING TO ACCOMMODATE COLD SYSTEM START UP (CONSULT HAUCK).
 5. IF SUCTION HEATER IS NOT UTILIZED, OIL RETURN LINE SHOULD BE PIPED TO THE OIL STORAGE TANK.

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(NOT TO SCALE)



- NOTES:
1. PIPING SCHEMATIC SHOWS TYPICAL COMPONENTS AND NOMINAL VISCOSITIES AND PRESSURES FOR HEAVY FUEL OIL SUPPLY; ACTUAL REQUIREMENTS ARE DEPENDENT UPON THE SPECIFIC BURNER SYSTEM (CONSULT HAUCK).
 2. OIL RETURN LINES TO BE SIZED ACCORDING TO DISTANCE TO PUMP - MINIMUM SIZE EQUAL TO TWO PIPE SIZES LARGER THAN OIL SUPPLY LINE (SEE GL8B FOR MINIMUM LINE SIZES FOR HAUCK SUPPLY PUMPING OIL UNITS).
 3. FOR ALL HEAVY OIL APPLICATIONS, OIL PIPING MUST BE HEAT TRACED (ELECTRIC OR STEAM) AND INSULATED. SELF-REGULATING HEAT TRACING IS RECOMMENDED TO MAINTAIN THE DESIRED TEMPERATURE OF A GIVEN FUEL OIL TO ACHIEVE 90 SSU (1.8 X 10⁻⁵ M²/SEC) OR LESS AT THE BURNER. ELECTRICAL HEAT TRACING WITH A NOMINAL RATING OF 12 W/FT (34W/M) COVERED WITH A NOMINAL 2" (50MM) FIBERGLASS TYPE INSULATION IS SUFFICIENT FOR MOST APPLICATIONS.
 4. IF USING NO. 6 FUEL OIL AND THE PIPING BETWEEN THE SUPPLY PUMPING UNIT AND THE HEAVY OIL MANIFOLD IS GREATER THAN 50 FT (15 M), AN ADDITIONAL BYPASS RELIEF VALVE MAY BE REQUIRED IN THE SUPPLY PIPING TO ACCOMMODATE COLD SYSTEM START UP (CONSULT HAUCK).
 5. IF SUCTION HEATER IS NOT UTILIZED, OIL RETURN LINE SHOULD BE PIPED TO THE OIL STORAGE TANK.

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(NOT TO SCALE)

Figure 2. Typical Heavy Oil Piping – Multiple Burner System

Thermocouples for both the high limit and main temperature control are installed in the LHE. The main control sensor is inserted in the discharge tee, and the high limit sensor is installed in the pipe body of the top heater unit (in multiple heater assemblies). Connect both sensors to the terminal block in the control panel using the included extension wire. Please note and maintain thermocouple polarity.

There is an oil flow switch located in the heater discharge piping. This switch will not allow the heater to energize unless there is sufficient oil flow. The flow switch must be connected to the terminal block in the control panel.

All wiring should be done by a licensed electrician and meet all NEC and local codes.

F. OPERATION



WARNING

The heater should not be operated unless the unit is full of oil and the pump is running.

IMPORTANT

The High Oil Temperature Limit controller, located inside the panel, should have the trip setpoint approximately 20°F (11°C) higher than the Oil Temperature controller setpoint.

1. Move the heater disconnect switch to the "ON" position
 - a. The Oil Temperature controller will energize and initiate its self-check.
 - b. The High Oil Temperature Limit controller will energize.
 - c. The Over Temperature Latch Relay, R1, will energize.
2. Momentarily press the illuminated "RESET" push-button.
 - a. The Over Temperature Latch Relay, R1, will de-energize.
 - b. The illuminated "RESET" push-button will de-energize.
3. Ensure that the Setpoint Temperature for the oil is correct (Press the up or down arrow on the instrument for the desired oil temperature).
4. With the oil pump running, the Oil Flow switch should close and allow the controller to energize the Line Heater Contactor for the desired oil temperature.

FAULT OPERATION

1. If the measured oil temperature exceeds the High Oil Temperature Limit controller's setpoint:
 - a. The "RESET" illuminated push-button will light.
 - b. The Over Temperature Latch Relay, R1, will energize.
 - c. Power to the Output Contact (Heat) of the Oil Temperature Controller will be removed.
 - d. The Line Heater Contact will de-energize and open, and power to the heating elements will be disconnected.

2. When the measured oil temperature drops below the High Oil Temperature Limit controller's setpoint:
 - a. Power to the Output Contact (Heat) of the Oil Temperature Controller will be supplied, and the Oil Temperature Controller will be able to energize the Line Heater Contactor.
3. The "RESET" illuminated push-button will remain lit to indicate that an over-temperature condition had occurred.
4. If the measured oil temperature has dropped below the High Oil Temperature controller's setpoint:
 - a. The Over Temperature Latch Relay, R1, will de-energize.
 - b. The illuminated "RESET" push-button will de-energize.

G. MAINTENANCE

Hauck LHE's are fully automatic and will require very little maintenance. Cleaning inside the LHE, as mentioned previously, is important and should not be neglected. A proper cleaning schedule must be set up and followed to ensure optimum LHE performance. Cleaning can typically be accomplished by flushing the unit with solvent or diesel fuel. Length of interval between cleaning will vary with use and oil type.

Another cleaning option for the LHE is available if the solvent or diesel fuel flush is ineffective or not desired. The heat exchanger tubes can be removed from the unit via the grooved coupling for cleaning of coking buildup. For minor coking buildup a simple cloth wipe will be sufficient, however, severe coking buildup may require a solvent soak folled by mechanical scraping. When reinstalling a heat exchanger tube, check the gasket on the grooved coupling – if damaged, replace with a new gasket. Ensure that the grooved coupling is seated properly on the pipe grooves before securing the bolts.

To replace a heater element, remove the cover from the wiring box and disconnect wiring to the old heater element. Remove the pipe plug from the tee, and slowly slide out the old heater element. Install new heater element by slowly sliding in the new heater element and replace the pipe plug in the tee. Reconnect wiring to new heater element and replace the cover to the wiring box.

Keeping the strainers (located upstream of the LHE) clean will help maintain proper oil flow and also help keep the LHE clean. Periodically checking and tightening of any loose electrical connections will assure years of trouble free control panel operation.

H. RECOMMENDED SPARE PARTS LIST

Item	Qty.	Part Number	Description
1	1	See Parts List	Heater Element
2	1	302108	Gasket, Grooved Coupling
3	1	300710	Temperature Controller
4	1	See Parts List	Load Fuse

Table 3. Recommended Spare Parts List

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