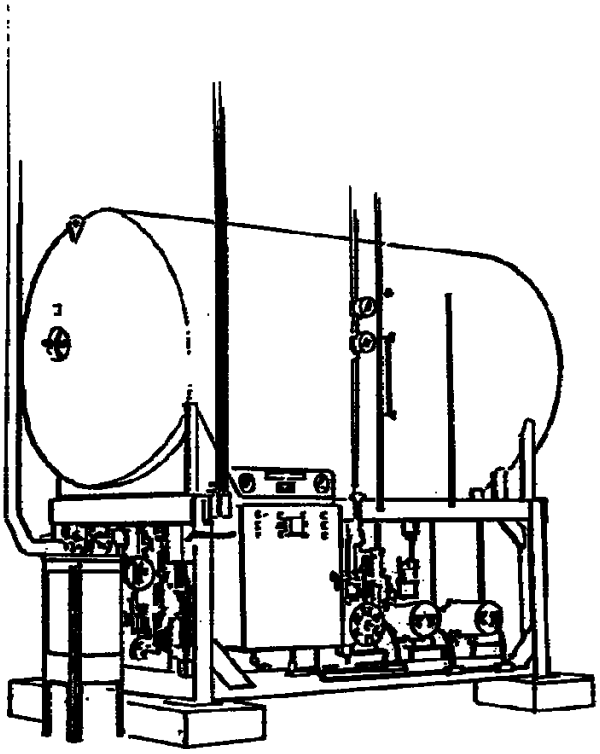
SECTION H5
SURGE TANKS



CONTENTS

ILLUSTRATIONS

TABLES

This section contains information on the complete line of surge tanks ranging in sizes from 300 to 3000 gallon capacities.

The Cleaver-Brooks Surge Tank products provide additional storage time and handle volume swings in condensate returns. Because condensate return volume is largely unpredictable, a surge tank provides a means to collect intermittent condensate returns and supply water at a relatively constant volume, while limiting discharge to drain. Contact your local Cleaver-Brooks authorized representative for component sizing information.

FEATURES AND BENEFITS

The following features and benefits apply to Cleaver-Brooks Surge Tank Products.

ASME Heads:

- Assures vessel quality in materials and fabrication.

1/4" Thick (Minimum) Shell:

- Quality construction.
- Longer material life.

Boosts Condensate Return Pressure:

- Acts as a collecting point for low pressure and gravity returns.
- Allows pumping of returns to a pressurized vessel.

Accepts Gravity Returns:

- Vessels are vented to atmosphere, therefore providing no pressure resistance that would inhibit gravity return.

PRODUCT OFFERING

Information in this section applies directly to Cleaver- Brooks package surge tanks ranging from 300 to 3,000 gallon capacity. Contact your local Cleaver-Brooks authorized representative for larger capacities. The product offering for surge tanks is shown in Table H5-1.

Surge tanks can reduce dependance on cold, untreated raw water to replace boiler system losses, by collecting condensate for re-use in the boiler. Dedicated surge tanks are required when intermittent peak loads of condensate can exceed the surge capacity of the deaerator.

The surge tank receives returning condensate and is supplemented by raw make-up water to maintain the desired operating level. Condensate and make-up water mix into a blend temperature as determined by the percentage of each. The surge tank is vented to atmosphere.

Surge tanks are designed to work with the deaerator. They can be packaged with transfer pumps, stand and controls of the same sturdy construction as the deaerator.

Table H5-1. Surge Tank Product Offering

MODEL NO.	FLOODED CAPACITY (GAL.)
SRG-300	300
SRG-450	450
SRG-600	600
SRG-900	900
SRG-1200	1200
SRG-1400	1400
SRG-1600	1600
SRG-2000	2000
SRG-2500	2500
SRG-3000	3000

NOTE: Model number (example, SRG-300) is: SRG = surge tank. 300 = 300 gal. capacity.

Custom arrangements are also available. Contact local Cleaver-Brooks authorized representative for component and sizing information.

Surge tanks provide additional storage time and handle volume swings in condensate return. Surge tanks are used when gravity or pumped condensate returns do not have enough pressure to enter the deaerator on their own. Water and treatment costs are reduced by recycling condensate that has already been treated.

Integral control automatically introduces cold water makeup to supplement condensate only when necessary to meet boiler demand. This translates into reduced fuel costs for heating boiler feedwater.

Standard Equipment

- Surge tank.
- Thermometer.
- Gauge glass.
- Required tappings, and manway.

Optional Equipment

- ASME code tank.
- Water level controller with make-up valve.
- Three valve bypass and strainer.
- Suction shutoff valve.
- Suction strainer.
- Suction flexible fitting.
- Discharge check valve.
- Discharge shutoff valve.
- Discharge pressure gauge.
- Discharge manifold.
- High water alarm.
- Low water alarm.
- Low water pump cut off.

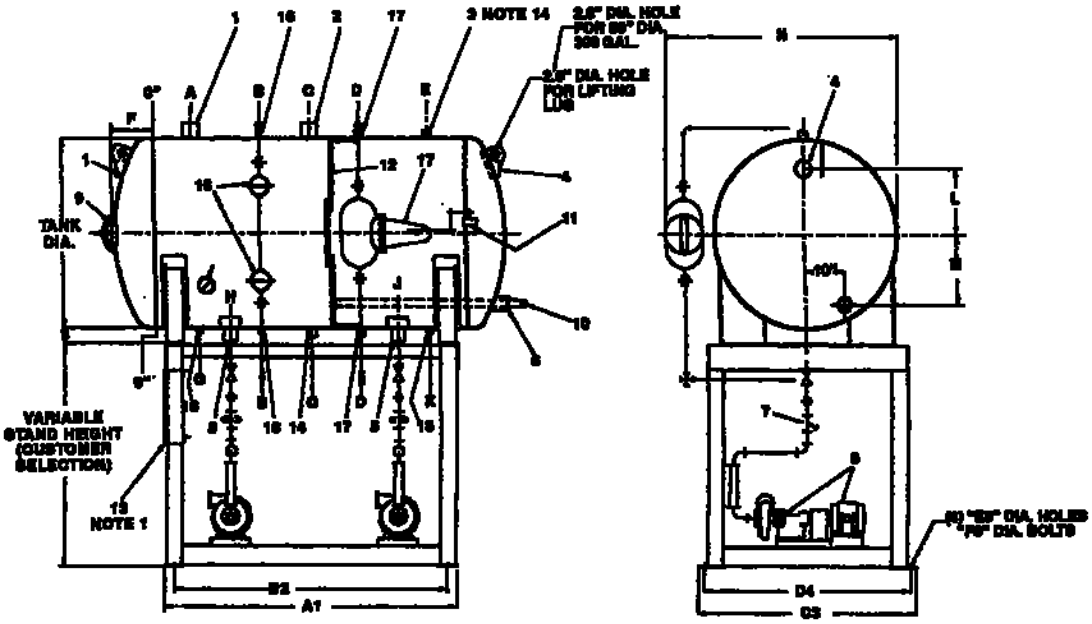
- Condensate diffuser tube.
- Control panel.
- Transfer pump and motor.
- Recirculation orifice or relief valve.
- Insulation and lagging.
- Magnesium anode (not available with lined tanks).
- Chemical feed quill.
- Drain valve.
- Stand.

Packaging

- Fully packaged, factory piped and wired.
- Half packaged, suitable for field erection with interconnecting piping and wiring by others.

DIMENSIONS AND RATINGS

Dimensions and ratings for surge tanks are shown in Figure H5-1 and Figure H5-2.



NOTES:

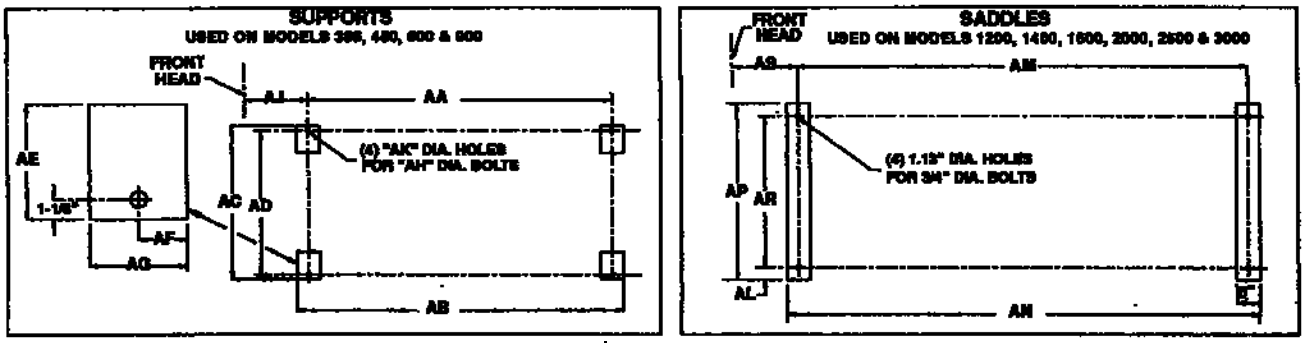
1. Mounted on packaged units only.
2. Suction piping includes strainer, gate valve and flexible connector.
3. All couplings are 3000# F.S.
4. All flanges are 150# F.F. except as noted.
5. Customer to plug all fittings not being used.
6. Mount tank above pump at elevation necessary for static head including safe allowance for piping friction as approved by pump manufacturer.
7. Accompanying dimensions, while sufficiently accurate for layout purposes, must be confirmed for construction by certified dimension prints.
8. Add suffix “P” to Model no. for packaged units (SRG45-P).
9. Using Warren #377 float cage - dimension “N” may change with other controls - contact your local Cleaver-Brooks authorized representative.
10. No interconnecting piping or wiring furnished on non-packaged units unless specified, contact your local Cleaver-Brooks authorized representative for specific piping or wiring furnished on packaged assemblies.
11. Weights shown are without controls or packaging - contact your local Cleaver-Brooks authorized representative for additions.
12. Optional tank sizes available - contact your local Cleaver-Brooks authorized representative.
13. Lifting lugs are for lifting empty tank only.
14. Raw water make-up should first pass through a water softener if hardness is present.

STAND BASE DIMENSIONS											
	Tank Capacity (gal)	300	450	600	900	1200	1400	1600	2000	2500	3000
A1	Outside Length	61	60-1/2	84-182	100	121-3/4	94	108-1/2	95-1/2	119-1/2	105-1/2
B2	C_L to C_L Anchor Bolt Holes	56	55-1/2	79-1/2	95	115-3/4	88	102-1/2	89-1/2	112-1/2	102-1/2
C3	Outside Width	49	58	58	62	60-1/2	71	71	81	83	86-1/2
D4	C_L to C_L Anchor Bolt Holes	46	55	55	59	57-1/2	68	68	78	80	79-1/2
E5		1	1	1	1	1	1	1	1	1-1/8	1-1/8
FZ		7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	1	1

Figure H5-1. Surge Tank Dimensions and Ratings - Sheet 1 of 2

STORAGE TANK DETAIL AND DIMENSIONS											
	Tank Capacity (gal)	300	450	600	900	1200	1400	1600	2000	2500	3000
	Tank Weight (lb)	935	1095	1330	1690	2420	2625	2765	3255	3680	4370
	Flooded Weight (lb)	3605	4905	6360	9195	12480	14595	16235	20610	24505	29240
	Tank Size (Dia X Length)	36x80	42x84	42x109	48x124	48x164	60x125	60x143	72x131	72x155	84x138
A		6	6	8	12	20	12	14	15	15	15
B		23-1/2	23	30	34	52	34	43	37	41	36
C		32	32-1/2	45	52	68	50	55	51	59	52-1/2
D		40	42	60	69-1/2	91-1/2	66	75	64-1/2	84-1/2	70-1/2
E		57-1/2	59	82	91-1/2	123-1/2	88	104	86-1/2	110-1/2	91-1/2
F		8-1/2	9-1/2	9-1/2	10-1/2	10-1/2	12-1/2	12-1/2	14-1/2	14-1/2	16-1/2
G		9-1/2	11	14	14	28	14	21	17	19	16
H		Contact Your Local Cleaver-Brooks Authorized Representative									
J		Contact Your Local Cleaver-Brooks Authorized Representative									
K		54	54	76	89-1/2	115-1/2	86	97	84-1/2	106-1/2	90-1/2
L		11	14	14	16	15	20-1/2	20-1/2	25-1/2	29-1/2	31
M		10	10	10	12-1/2	12-1/2	19-1/2	19-1/2	25	25	30
N		51	57	57	63	63	75	75	87	87	99
TANK CONNECTION SIZES											
	Tank Capacity (gal)	300	450	600	900	1200	1400	1600	2000	2500	3000
1	Low Pressure Return (2)	3 NPT	3 NPT	3 NPT	3 NPT	4 NPT	4 NPT	4 NPT	4 NPT	4 NPT	4 NPT
2	Vent	3 NPT	3 NPT	3 NPT	3 NPT	4 NPT	4 NPT	4 NPT	4 NPT	4 NPT	4 NPT
3	Cold Water Inlet	1-1/4 NPT	1-1/4 NPT	1-1/4 NPT	1-1/4 NPT	1-1/4 NPT	1-1/4 NPT	1-1/4 NPT	1-1/4 NPT	1-1/4 NPT	1-1/2 NPT
4	Overflow Connection	3 NPT	3 NPT	3 NPT	3 NPT	4 NPT	4 NPT	4 NPT	4 NPT	4 NPT	4 NPT
5	Pump Suction (For Each Pump)	Contact Your Local Cleaver-Brooks Authorized Representative									
ITEM LIST											
6	High Temperature Return (3 NPT)										
7	Suction Piping (Optional) (For Each Pump) (Note 2)										
8	Pump/motor (Optional)										
9	Manway (11 X 15)										
10	Diffuser Tube (2-1/2 NPT) (Optional)										
11	Makeup Valve (Optional)										
12	Gauge Glass Assembly										
13	Control Panel (Optional)										
14	Drain (2 NPT)										
15	Thermometer (3/4 NPT)	Sizes Listed for items 15 thru 18 are for Tank Connections Only.									
16	Level Alarms (1 NPT (Optional)										
17	Level Control (1-1/2 NPT) (Optional)										
18	Recirculating Connection (1 NPT) (For Each Pump)										

Figure H5-1. Surge Tank Dimensions and Ratings - Sheet 2 of 2



TANK CAPACITY (GALLONS)										
	300	450	600	900	1200	1400	1600	2000	2500	3000
AA	55-1/2	55	79	93-1/2	N/A	N/A	N/A	N/A	N/A	N/A
AB	59-1/2	59	83	99-1/2	N/A	N/A	N/A	N/A	N/A	N/A
AC	31-3/4	36-3/4	36-3/4	40-1/2	N/A	N/A	N/A	N/A	N/A	N/A
AD	29-1/2	34-1/2	34-1/2	38	N/A	N/A	N/A	N/A	N/A	N/A
AE	5	6-1/8	6-1/8	7-1/4	N/A	N/A	N/A	N/A	N/A	N/A
AF	2	2	2	3	N/A	N/A	N/A	N/A	N/A	N/A
AG	4	4	4	6	N/A	N/A	N/A	N/A	N/A	N/A
AH	5/8	3/4	3/4	3/4	N/A	N/A	N/A	N/A	N/A	N/A
AJ	12-1/2	14-1/2	15	15-1/2	N/A	N/A	N/A	N/A	N/A	N/A
AK	3/4	7/8	7/8	7/8	N/A	N/A	N/A	N/A	N/A	N/A
AL	N/A	N/A	N/A	N/A	4-1/4	6-1/8	6-1/8	7-1/2	7-1/2	7-3/4
AM	N/A	N/A	N/A	N/A	115-3/4	88	102-1/2	89-1/2	113-1/2	94-1/2
AN	N/A	N/A	N/A	N/A	121-3/4	94	108-1/2	95-1/2	119-1/2	100-1/2
AP	N/A	N/A	N/A	N/A	46-1/2	57	57	67	67	77-1/2
AR	N/A	N/A	N/A	N/A	38	44-3/4	44-3/4	52	52	62
AS	N/A	N/A	N/A	N/A	24-1/2	18-1/2	20-1/4	20-1/2	20-1/2	21-7/8

VENT CAPACITY CHART	
SIZE (NPT)	**CAPACITY (lbs/hr)**
1	175
1-1/4	350
1-1/2	525
2	1000
2-1/2	1600
3	2800
4	4800
5	10500
6	17000
8	35000

Values given based on:
1) 50 ft. equivalent pipe length.
2) Schedule 40 pipe
3) 2 psi back pressure
4) Vent capacities should be compared with anticipated venting needs. Oversized vents are available.

Figure H5-2. Surge Tank Supports and Saddles, Details and Dimensions

SECTION H5
SURGE TANKS

SAMPLE SPECIFICATIONS

The following sample specifications are provided by Cleaver-Brooks to assist you in specifying your customer's specific needs and application

PART 1 GENERAL

The following sample specifications are provided by Cleaver-Brooks to assist you in specifying your customer's specific needs and application

PART 2 PRODUCTS

1.1 Hardware

A. Surge Tank

1. Cleaver-Brooks Model _____ shall be an atmospheric, horizontal Surge Tank.
2. The surge tank shall receive returning condensate and supplement make up water to maintain the desired operating level. Condensate and make up water mix into a blended temperature, as determined by the percentage of each. The surge tank shall be vented to atmosphere. The collected water is then transferred to the deaerator.
3. The surge tank shall have _____ minutes of storage and have a capacity of _____ gallons flooded. The tank shall be _____" diameter x _____" long. An 11" x 15" elliptical manhole shall be provided for access. All nozzles shall be 3000 lbs forged steel couplings. Heads shall be ASME torispherical type (flat heads are not acceptable) constructed of ASTM A516 GR 70 carbon steel with a minimum thickness of 0.25". Shell plate to be fabricated of ASTM A36 carbon steel with a minimum thickness of 0.25".

Load Specifications

LOAD	PERCENTAGE	LBS/HR	TEMP	PRESSURE
Make up				20 psig Minimum
Low Temp Returns				
High Temp Returns				

4. The surge tank loads shall be as specified in the following table.
5. Optional - The tank shall be designed in accordance with Section VIII of the ASME Pressure Vessel Code for _____ psig, and stamped accordingly. Certification shall be required. Joint efficiencies to be 70% circumferential per table UW-12, which does not require stress relieving or nondestructive examination.
6. Optional - The tank shall be factory-insulated and lagged with blanket insulation, pins, clips, and a durable steel jacket. Block-type insulation is not acceptable. The blanket insulation is to be fiberglass, 2" thick, 1 lb/cu-ft, and have a rating of R3.85. Pins are to be located on 18" centers and holding clips attached. The steel jacket or lagging shall have a shell thickness of 22 gauge (0.299") minimum and head thickness of 12 gauge (0.1046") minimum.
7. Optional - The magnesium or sacrificial anode shall provide cathodic protection against galvanic corrosion. This rod shall be 1-5/16" diameter with a 1/4" steel core to assure a good electrical contact and added strength. The design shall have a small weep hole to signal it has been consumed. Linings shall not be acceptable in this application.

8. Optional - The high-temperature diffuser or sparge tube shall be located beneath the normal tank water level. The tube shall be constructed of 2" pipe. This tube shall provide even distribution and blending of high-temperature condensate returns.
9. Optional - The chemical feed quill shall be located beneath the normal tank water level. The quill material shall be constructed of stainless steel. The tube shall provide even distribution and blending of chemical.
10. Optional - The basic surge tank shall be equipped with the following trim and accessories. Piping on packaged units shall comply with ASME Power Piping Code B31.1.

B. Make Up Valve and Controller

1. Option (Mechanical) - _____ " inlet water regulating lever valve with _____ body and _____ connections. The valve Cv shall not exceed _____, and shall be rated for _____ gpm at _____ psig inlet pressure. The pressure drop across the valve shall not exceed a delta-P of 10 psig. This valve shall be suitable for temperatures up to 300 °F. The valve manufacture shall be _____, Model _____. This valve shall be mechanically controlled by an external float cage with cast iron body and 8" stainless steel float. The float cage manufacturer shall be _____, Model _____.
2. Option (Electronic) - _____ " inlet water motorized regulating valve with steel body and threaded NPT connections. Motor shall be 110V bi-directional type, with a permanently lubricated gear train, and directly coupled to the valve stem. The valve Cv shall not exceed _____ and be rated for _____ gpm at _____ psig inlet pressure. Valve shall not exceed a delta-P of 10 psig. This valve shall have teflon seats and be suitable for temperatures up to 300 °F. The motorized valve manufacturer shall be _____. This valve shall be electronically controlled by a solid state control with internally mounted capacitance probes. The electronic solid state control shall be able to set desired level point and acceptable deviation. The electronic solid state control shall include a selection for automatic and manual operating mode. The internals shall include two additional probes for high and low water alarm. The controller manufacturer shall be Cleaver- Brooks, Model TW82. A solenoid valve and float switch is not acceptable. (Available only in the U.S.)
3. Option (Pneumatic) - _____" inlet water diaphragm actuated regulating valve with cast iron body and connections. The valve shall be globe-type with proportional control and a spring-opposed diaphragm actuator arranged for 3 - 15 psig operating signal. The valve shall be normally open on loss of air. The valve Cv shall not exceed _____ and be rated for _____ gpm at _____ psig inlet pressure. Valve shall not exceed a delta-P of 10 psig. This valve shall have stainless steel trim with TFE packing and be suitable for temperature up to 410 °F. The diaphragm actuated valve manufacturer shall be _____, Model _____. This valve shall be pneumatically controlled by an external proportional type sensor. The sensor shall be a 14" displacer that produces a pneumatic output signal. The controller manufacturer shall be _____, Model _____. A filter regulator is to be provided to reduce 50 psig instrument air supply to 3 - 15 psig for proper operation.
4. Optional - The make up valve shall include a ANSI Class 125 lb three-valve bypass with inlet Y-type cast iron strainer. Strainer screen to be removable and of stainless steel construction.
5. Optional - High level alarm switch. This shall be an externally mounted float-type switch. The switch shall make contact on rise and break on fall. Float cage construction shall be cast iron. (Not required with electronic make up controller.)

6. Optional - Low level alarm switch. This shall be an externally mounted float-type switch. The switch shall make contact on fall and break on rise. Float cage construction shall be cast iron. (Not required with electronic make up controller.)
7. Optional - Suction piping for pumps shall consist of a gate valve, cast iron Y-type strainer with replaceable stainless steel screen and flexible connector or hose. This piping assembly shall be 125 lb class construction. The vortex breaker shall be located in the tank nozzle. Manifold suction lines are not acceptable.

C. Transfer Pump and Motor Set (Optional)

1. Quantity _____, centrifugal type transfer pump and motor set. Turbine type pumps are not acceptable in this application. Pump to be rated for _____ gpm at _____ feet TDH with _____ feet NPSH required. Pump to be _____ materials of construction as defined by the Hydraulic Institute, and have _____ seals for a maximum water temperature of 212 °F. Pump impeller to be hydraulically balanced. The pump shall be mounted on a steel baseplate and flexibly coupled with an OSHA type coupling guard to a _____ hp, _____ phase, _____ Hz, _____ Volt, _____ rpm, _____ enclosure motor. Motor to be non-overloading at the rated condition without using any portion of the service factor. Pump and motor set to be factory aligned prior to shipment. Pump manufacturer to be _____, Model _____, size _____ " x _____ ". A stainless steel recirculation orifice is to be supplied with the pump and shipped loose for field installation to provide minimum bypass flow.
2. Optional - The stand shall elevate the surge tank to provide the net positive suction head required by the pump at the rated condition to prevent cavitation. The stand shall be constructed of heavy square steel tubing for the legs and 1/4" steel plate covering the floor.

D. Control Panel

1. Optional (Base) - Control panel shall be in a NEMA 1 enclosure and wired to the National Electric Code. The wire shall be black number coded. The assembly is to contain individual motor starters with 120 Volt holding coil and fuse protection. Individual green oil-tight pump run lights shall be provided. All switches and lights to have nameplate identification. The assembled panel shall be given a factory continuity test prior to shipment.
2. Optional (Electric Components) - Audible and visual high and low water alarm function shall be provided by a bell or horn with silence switch and individual red oil-tight lights.
    a. Control circuit transformer to supply 110-120 Volts, single-phase power supply. The transformer shall be mounted, wired and fused.
    b. Auxiliary contacts shall be furnished for chemical feed pump initiation. Contacts shall be normally open.

3. Standard
    a. The surge tank shall have a gauge glass assembly that covers the entire tank diameter. The gauge glass shall be quartz 0.625 inch diameter by 24-inch maximum length. Each length of glass shall be furnished with a bronze gauge cock set and protector rods.
    b. The surge tank shall be supplied with a thermometer with a 50 to 300 °F range.
    c. The surge tank is to be hand cleaned with a solvent to SSPC- SP-1 standards prior to painting. Prime coated to not less than 1 mil thick and finish coated with an enamel paint to not less than 1 mil thick prior to shipment.
    d. Unit is to be knocked down for shipment. Piping is to be matched marked. Warranty period to be twelve months after start-up or eighteen months after shipment, whichever comes first.

Notes