Installation, Operation and Maintenance Manual

CONDENSER

Model No. BEW6-108V6-1S
Serial No. 2869

LES SERRES VERT CANNABIS INC.
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Operating & Maintenance Instructions
Typical Heat Exchanger Construction
EP – 1010 Rev.0

General Information

Our heat exchangers are engineered and constructed to perform to the thermal and hydraulic characteristics set forth on your Specification sheets. Materials of construction and mechanical design particulars should also be listed on these pages.

The working pressure and temperature for which the heat exchanger is designed, tested, and Code-Stamped (if applicable), are also inscribed on the Manufacturer's Nameplate permanently attached to the unit. This nameplate must not be obscured by insulation or lagging.

Careful attention to the following factors will assure satisfactory performance and freedom from operating difficulties:

1. Manner of installation, including foundations and piping.
2. Operation of the exchanger within the limits of pressure, temperature, and rate flow for which it is designed, as tabulated on the exchanger Specification Sheet.
3. The thoroughness and frequency of cleaning and inspection.
4. The materials, workmanship, and tooling used in making repairs and replacements.
5. Availability in stores of adequate renewal parts for normal maintenance.

Installation

FOUNDATIONS

Exchangers must be supported on structures of sufficient rigidity that piping stresses will not be imposed due to setting.

LEVELING

Exchangers should be carefully leveled for proper drainage, and to assure alignment with piping.

Installation (continued)

DRAINS & VENTS

Plugged vent openings are located at high points to allow removal of air and non-condensables, particularly on start-up. Where lethal or flammable fluids are handled, these should be piped for safe disposal.

INSTRUMENTS & CONTROL CONNECTIONS

Where called for in the specification, connections are provided for attachment of instruments and controls. These should be positioned for best serviceability.

SHIPPING COVERS & PLUGS

These should remain in place until exchanger is set in position and ready for connecting up the piping. All openings should be inspected for debris or foreign material that could damage the system.

CLEANING

The heat exchanger system should be cleaned of debris and foreign materials which could clog tubes and strainers, and damage valves and pumps prior to initial start-up.

TEST

Exchangers have been hydrostatically tested at our factory according to Code requirements, and thoroughly inspected for leaks prior to shipment. However, rough handling during transit or moving into place can loosen gasketed seals and tube joints. It is suggested that all new exchangers be hydrostatically tested for leaks after installation and prior to start-up.

CAUTION: DO NOT USE EXTREMELY COLD WATER. DO NOT EXCEED TEST PRESSURES AND TEMPERATURES SPECIFIED ON NAME PLATE.

Maintenance

CLEANING

Cleaning schedule and procedure can only be determined from the nature of the fluid being handled, the velocity at which it moves through the exchanger, and the temperature to which it is heated.

It is standard practice to apply a dirt factor in calculating the surface requirements for performing a specified heat transfer duty. This dirt factor may be considered as a measure of additional surface judged to be necessary to compensate for fouling of heat transfer surface by scale, corrosion, or other contaminating material build-up. It is thus a measure of the time interval over which an exchanger will deliver full heat transfer performance between cleanings.

Cleaning of exchangers by flushing with chemical solvents and reagents is an approved cleaning method. Selection of cleaning reagents must take into consideration the materials used in constructing the exchanger. Services of specialists in these cleaning procedures are available to the operators. Where mechanical cleaning, utilizing wire brushes, scraping, or rodding is applied, it is necessary to exercise care to prevent damage to tubing.

TESTING FOR TUBE LEAKS

Punctured tubes, or defective tube joints where tubes are expanded or welded to the tubesheets can be identified by pressuring the shell with water or air with tubesheets exposed. With an exchanger of the straight tube, floating head construction, a test ring must be available to perform this test. This device consists of a fixture bolted to the shell flange after removal of the shell and floating tubesheet covers, to provide a packed seal.

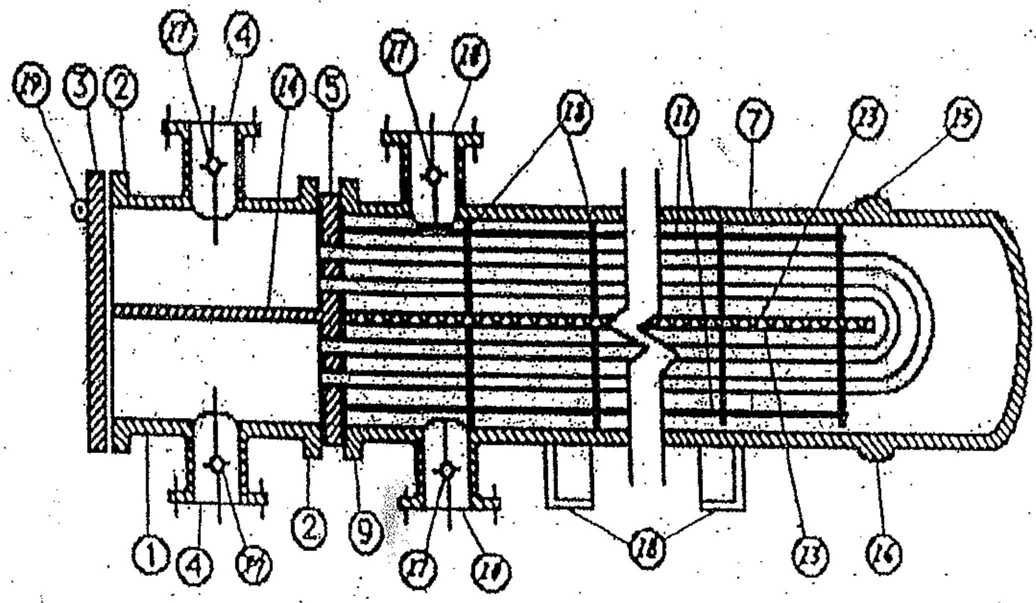
CAUTION: When pressurizing with air, it is very important that the maximum design pressure is not exceeded, because of the highly destructive results of a rupture. Careful consideration must also be given to the fire and explosion hazards which are present when testing with air in a space containing residual traces of flammable materials.

GASKET SEALS

Gasket surfaces must be cleaned and free of chips, scale, or other foreign material. Where double jacketed asbestos filled gaskets are used, the nubbin, if present, should contact the smooth side of the gasket. Always use new gaskets when re-assembling an exchanger.

Typical Heat Exchanger Construction

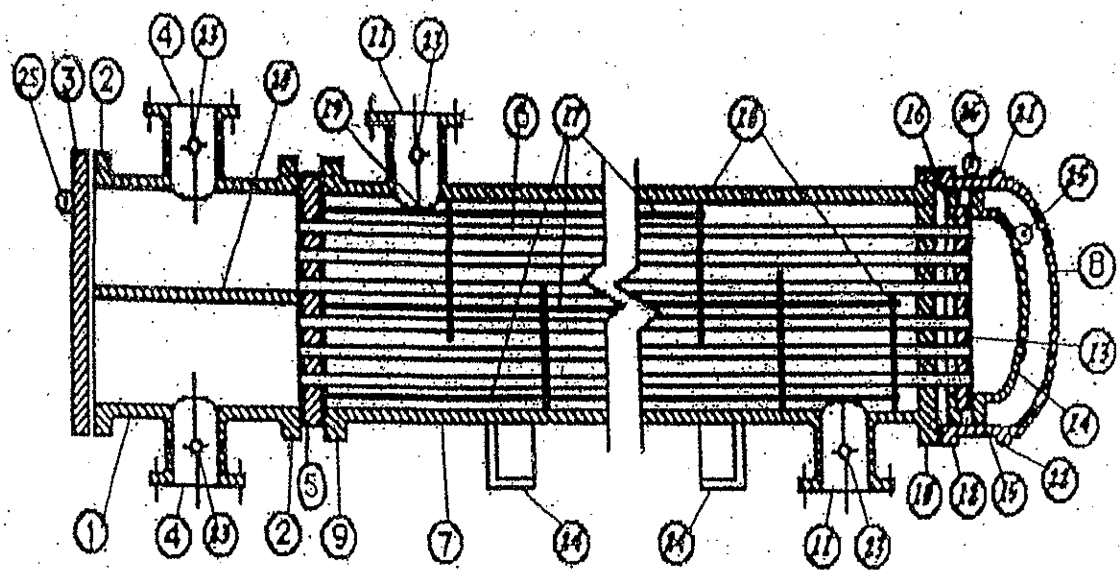
U – TUBE



Typical U – TUBE Parts List (AEU)

1. Stationary Head – Channel
2. Stationary Head Flange – Channel
3. Channel Cover
4. Stationary Head Nozzle
5. Stationary Tubesheet
6. Tubes
7. Shell
8. Shell Cover
9. Shell Flange – Stationary Head End
10. Shell Nozzle
11. Tie Rods and Spacers
12. Transverse Baffles or Support Plates
13. Longitudinal Baffle
14. Pass Partition
15. Vent Connection
16. Drain Connection
17. Instrument Connection
18. Support Saddle
19. Lifting Lug

Typical Heat Exchanger Construction



Full Floating Head Parts List (AES)

1. Stationary Head – Channel
2. Stationary Head Flange – Channel
3. Channel Cover
4. Stationary Head Nozzle
5. Stationary Tubesheet
6. Tubes
7. Shell
8. Shell Cover
9. Shell Flange-Stationary Head End
10. Shell Flange-Rear Head
11. Shell Nozzle
12. Shell Cover Flange
13. Floating Tubesheet
14. Floating Head Cover
15. Floating Head Flange
16. Floating Head Backing Device
17. Tie Rods and Spacers
18. Transfer Baffles or Support Plates
19. Impingement Baffle
20. Pass Partition
21. Vent Connection
22. Drain Connection
23. Instrument Connection
24. Support Saddle
25. Lifting Lug

FLANGED & BOLTED JOINTS

Accurate vertical and horizontal alignment, with flange faces parallel, is an important precaution when making up a flanged joint. A suggested bolt tightening sequence is to proceed "three o'clock, nine o'clock, twelve o'clock, six o'clock, etc". After initial tightening, go around the circle from one bolt to the next for final tightening.

DEFECTIVE TUBES

For temporary repair of one or more punctured tubes, tapered plugs can be driven into both ends of the holed tube. Plugs should be of hard material, tapered to a maximum of two or three thousandths to the inch. They may be chilled before inserting then lightly tapped in place. Avoid permanent damage to the tubesheet by heavy hammering of the plugs.

Where leakage develops at a roller-expanded tube joint, the joint may be secured by re-rolling, using a proper expanding tool for tube size, gauge and material. This re-rolling should proceed in successive overlapping steps, and should extend to a depth of at least two tube diameters, or a maximum of two and one-half inches. Do not expand beyond the inner tubesheet face. Do not over roll, which will harden the tube material and cause an insecure seal, and can induce stress-corrosion cracking in the tube material.

To replace punctured tubes, both ends are drilled out at the tubesheet joints, using a special wall-reducing drill. This type of drilling tool is regularly supplied by makers of tube expanding and installing tools. Sizes and types are available for all regularly used sizes and metallurgies of condenser tubes. Impact knock-out tools are also available for starting and driving the drilled out tube.

The most important requirement for a sound leak-proof expanded tube to tubesheet joint is clean, grease-free, metal-to-metal contact. Prior to installation of a new tube, thoroughly clean the tube holes with volatile solvent and wipe or blow dry. With straight tube heat exchangers, roll tubes in overlapping stepwise sequence, commencing at the outer tubesheet face at one end, and just inside the inner tubesheet face at the other end. Avoid rolling beyond the inner face to guard against cutting the tube. Avoid work-hardening of the tube by over-rolling. Good practice calls for an approximate five percent reduction in wall thickness for a sound joint after the tube has been expanded to contact.

Maintenance (continued)

WELDED TUBE JOINTS

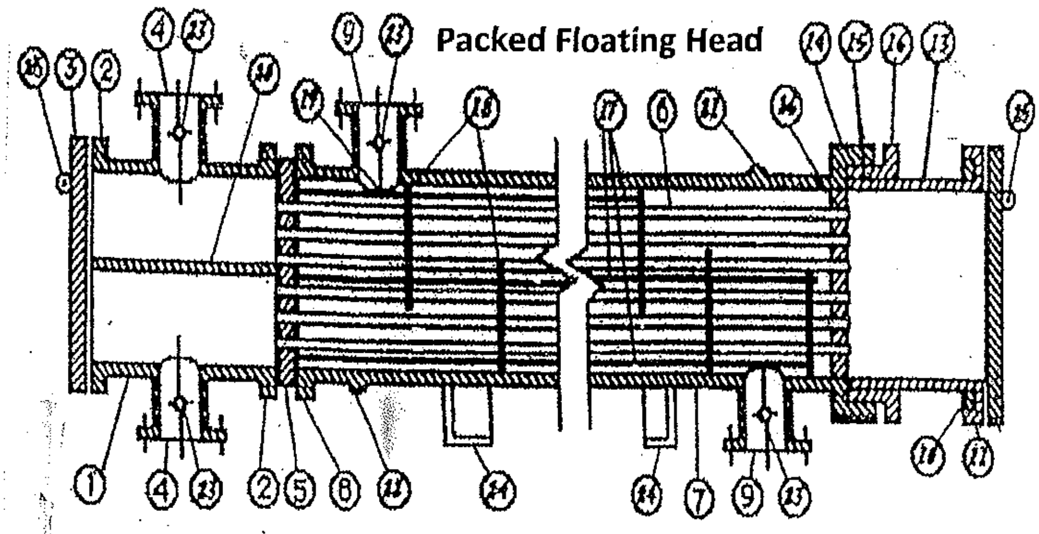
Where tubes are seal-welded or strength-welded to the tubesheets, repairs or replacement require special techniques and the exchanger manufacturer should be consulted.

RENEWAL PARTS

CMS considers it a part of its responsibility to be available at all times to assist in repairs to equipment it has built, and in expediting procurement of renewal parts as required to reduce outage time to a minimum.

Typical Heat Exchanger Construction

Packed Floating Head



Packed Floating Head Parts List (AEP)

1. Stationary Head – Channel
2. Stationary Head Flange – Channel
3. Channel Cover
4. Stationary Head Nozzle
5. Stationary Tubesheet
6. Tubes
7. Shell
8. Shell Flange – Stationary Head End
9. Shell Nozzle
10. Split Shear Ring
11. Slip – on Backing Flange
12. Floating Head Cover – External
13. Floating Tubesheet Skirt
14. Packing Box Flange
15. Packing
16. Packing Follower Ring
17. Tie Rods and Spacer
18. Transverse Baffles or Support Plates
19. Impingement Baffle
20. Pass Partition
21. Vent Connection
22. Drain Connection
23. Instrument Connection
24. Support Saddle
25. Lifting Lug
26. Floating Tubesheet

Operation

GENERAL INFORMATION

Our exchangers are engineered to specified operating conditions. If operated at excessive rates of flow, a critical velocity is reached such that destructive vibration will be propagated in the tube bank. Do not permit operation to occur at a flow-though rate which produces audible vibration disturbance.

START-UP

Shell and tube side spaces should be filled gradually and vented during the start-up period. Once vented the units can be sealed and the flow rates gradually increased to operating conditions. Heat exchangers exposed to the higher temperature ranges should be warmed up slowly and uniformly. It is good practice where conditions permit, to establish a flow of cold fluid before admitting the hot fluid.

Exchangers exposed to sudden temperature changes at extremes of cold or heat can be damages unless special consideration is applied to design and materials selection.

GASKETED SEALS

It is recommended that all gasketed joints be inspected for tightness after initial start-up at normal operating pressure and temperature. It may be necessary to take up on the bolting to compensate for yielding in the gaskets or screwed fastenings.

SHUTTING DOWN

Where possible, the flow of hot fluid should be gradually reduced and stopped, before shutting down the cold stream flow. Exchanger spaces containing residual corrosive or ice-forming fluids should be drained during prolonged outage.

TUBE PUNCTURES

Should a tube failure be observed, the exchanger should be repaired immediately to minimize damage to the equipment and prevent contamination of the fluids.

Installation (continued)

BOLTING

Bolt holes in supporting saddles are slotted to permit movement due to expansion. Therefore, the nuts should not be turned tight.

CLEARANCES FOR MAINTENANCE

Allow clearance at the channel head end to permit tube bundle withdrawal, or individual tube removal and replacement. Adequate clearance should also be available at the rear of the exchanger to allow cover removal and access to the tube sheet for maintenance. These clearance requirements can be determined from the setting plan elevation drawing.

PIPING AND CONNECTIONS

To avoid piping strains, the following precautions should be observed:

1. Weight of pipe and fittings should be independently supported and not carried by the exchangers.
2. Piping should be planned with bends, expansion joints or swing joints to minimize expansion stresses.
3. Avoid forcing piping into alignment when connecting up, so that residual strains will not be imposed on the exchanger.
4. Where the magnitude and direction of external piping forces and moments are known, and the exchanger attachments have been investigated for these reactions, it is important that they are not exceeded.

PULSATION & SURGES

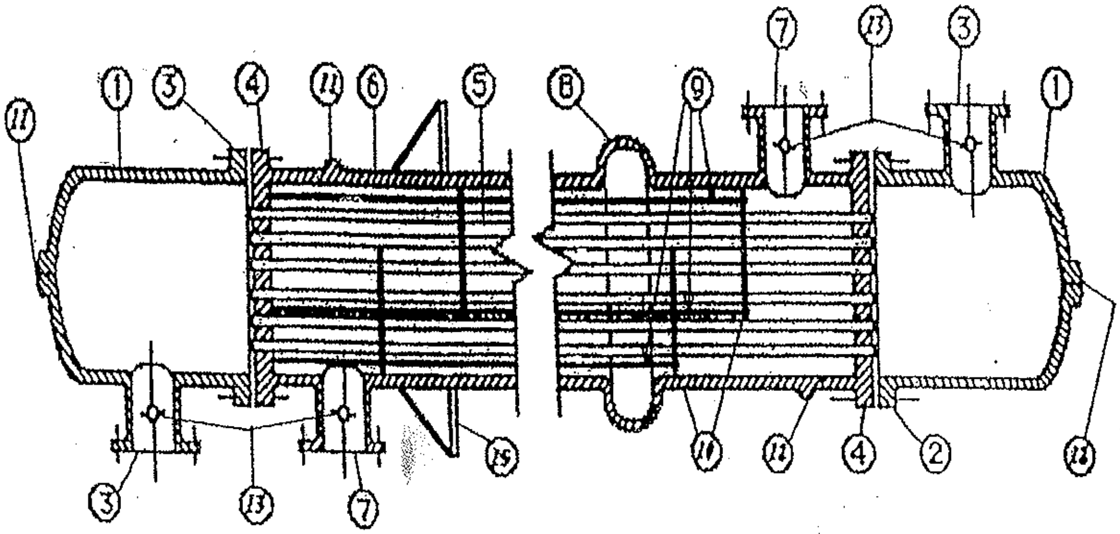
Pulsation in the fluid stream, caused by reciprocating or rotating machinery or pressure surges due to sudden changes in valve phase, should be avoided. These factors can set up destructive vibration in the tube bank, or damage the exchanger structure, particularly in the inter-pass partitioning.

BY-PASS VALVES

To permit inspection and maintenance, by-passes and valves should be provided in the piping system, to allow opening of the exchanger without interrupting flow.

Typical Heat Exchanger Construction

FIXED TUBE SHEET



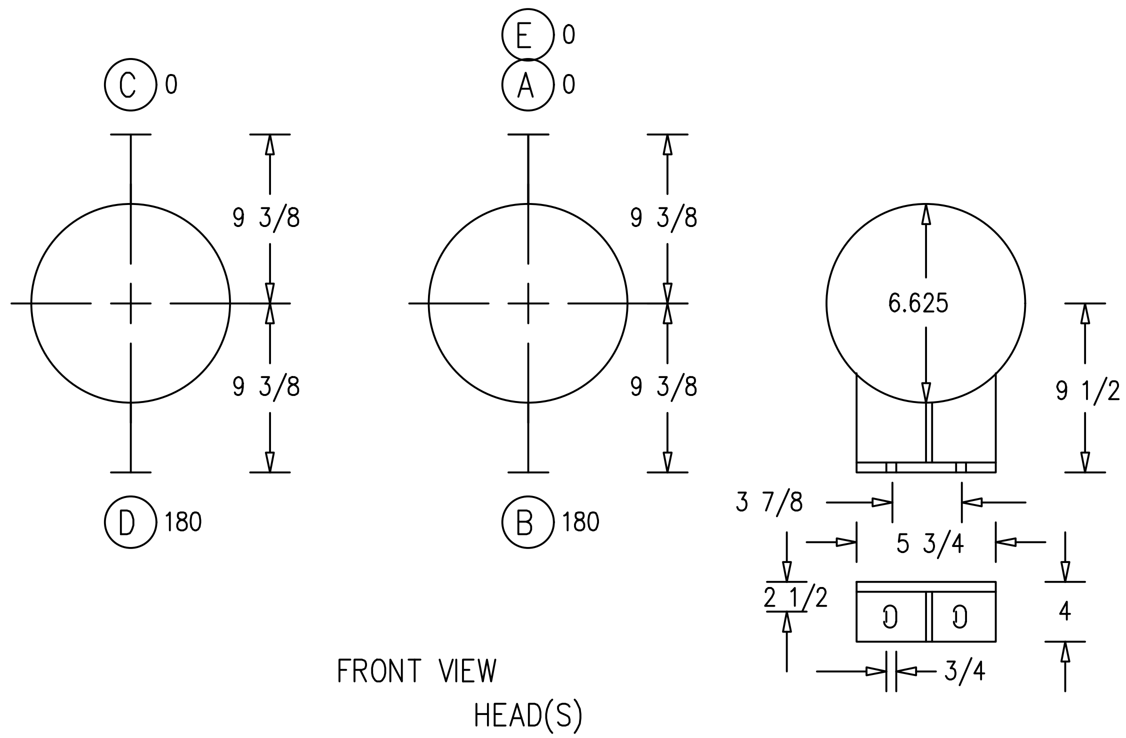
FIXED TUBE SHEET PARTS LIST (BEM)

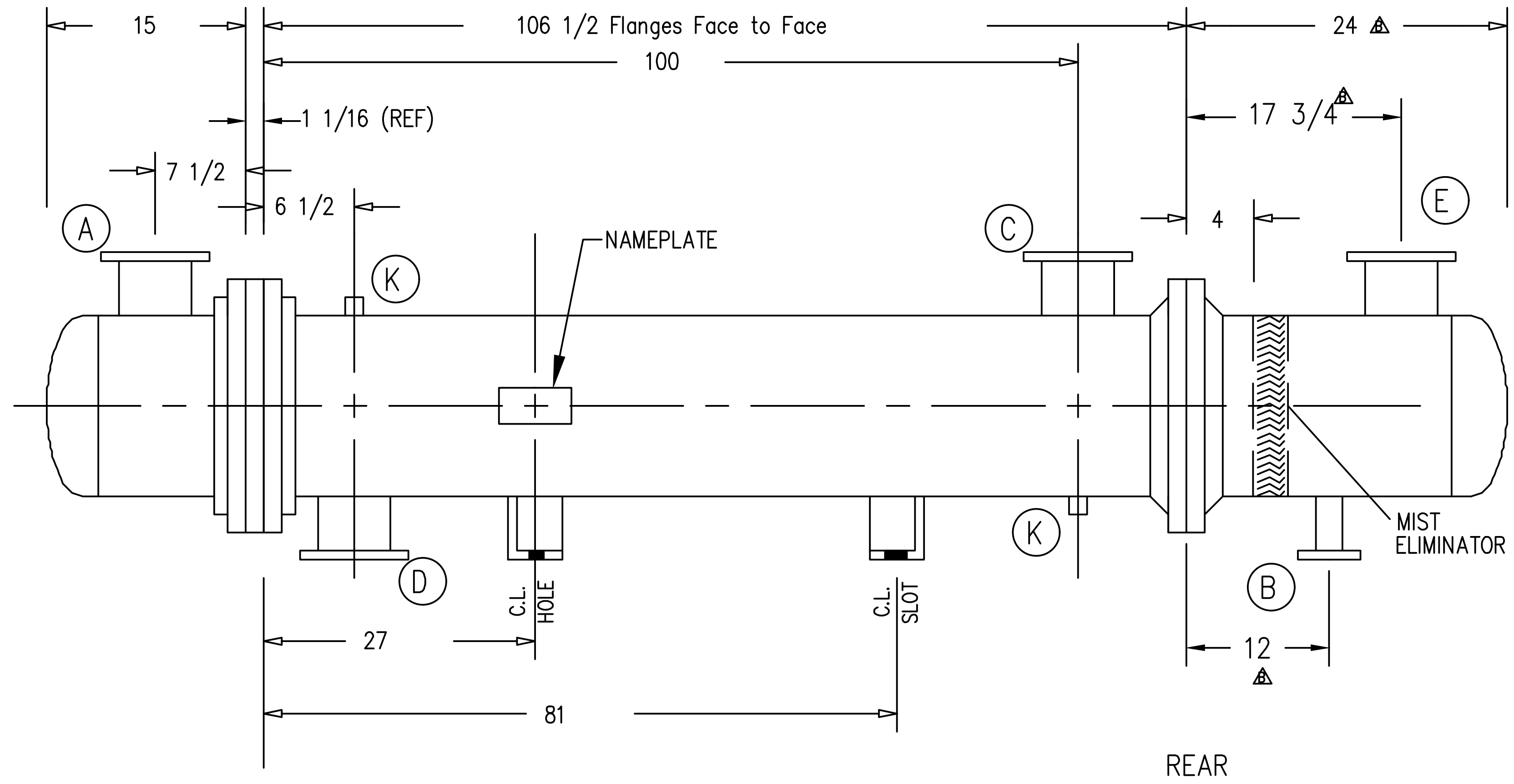
1. Stationary Head – Bonnet
2. Stationary Head Flange – Channel
3. Stationary Head Nozzle
4. Stationary Tubesheet
5. Tubes
6. Shell
7. Shell Nozzle
8. Expansion Joint
9. Tie Rods and Spacer
10. Transverse Baffles or Support Plates
11. Vent connection
12. Drain Connection
13. Instrument Connection
15. Support Bracket

THIS DRAWING SHALL NOT BE COPIED, DISPOSED OF, NOR USED FOR ANY PURPOSE OTHER THAN THAT FOR WHICH IT IS FURNISHED, WITHOUT THE WRITTEN PERMISSION OF CMS HEAT TRANSFER DIVISION, INC.

CMS MODEL: BEW6-108V6-1S
304LSS TUBESIDE & SHELLSIDE CONST.

DIMENSIONS IN INCHES
NOT DRAWN TO SCALE
BOLT HOLES STRADDLE
NATURAL CENTERLINES





	NPS / OD	SCH/THK	
Nozzle A Inlet	4	40S	150 # ASME B16.5 S.O.RF Flg SA-182 With SA-312 TP304L Wld Hi Alloy Pipe
Nozzle B Condensate Outlet	1	10S	150 # ASME B16.5 S.O.RF Flg SA-182 With SA-312 TP304L Wld Hi Alloy Pipe
Nozzle C Inlet	3	10S	150 # ASME B16.5 S.O.RF Flg SA-182 With SA-312 TP304L Wld Hi Alloy Pipe
Nozzle D Outlet	3	10S	150 # ASME B16.5 S.O.RF Flg SA-182 With SA-312 TP304L Wld Hi Alloy Pipe
Nozzle E Vapor Outlet	3	10S	150 # ASME B16.5 S.O.RF Flg SA-182 With SA-312 TP304L Wld Hi Alloy Pipe
Coupling K	3/4		3000# ASME B16.11 Half Length FPT Coupling SA-182 F304L Hi Alloy Steel Forging
Shell Cylinder	6.625	0.134	SA-312 TP304L Wld Hi Alloy Pipe
Head Cylinders	6.625	0.134	SA-312 TP304L Wld Hi Alloy Pipe
Head Covers	6.625	0.134	SA-403 304L ASME B16.9 Hi Alloy Steel Weld Cap
Front Tubesheet	11.0	0.9375	SA-240 Gr 304L Hi Alloy Steel Plate
Rear Tubesheet	6.25	1.25	SA-240 Gr 304L Hi Alloy Steel Plate
Front Tubesheet Flanges	11.0	1.0	SA-182 F304L Hi Alloy Steel Forging 150 # ASME B16.5 S.O.RF FLANGE
Rear Shell & Head Flanges	11.0	1.0	SA-182 F304L Hi Alloy Steel Forging 150 # ASME B16.5 W.N.RF FLANGE
Front Head & Shell Gasket	8.5		Teflon <Pure PTFE> 1/16" Thick Periph. width 0.94 in
Rear Tubesheet Packing	6.75		O-Ring <Hi Temp Silicone> 3/16" Tk
Bolting at Front Tubesheet	0.75		SA-193 B8 Cl.2 304SS Bolting 8 Bolts on 9.5 in B.C.
Bolting at Rear Head	0.75		SA-193 B8 Cl.2 304SS Bolting 8 Bolts on 9.5 in B.C.
Tubes	0.75	0.049	SA-249 TP304L Wld Hi Alloy Tube Bare tubes
Baffles			SA-240 Gr 304L Hi Alloy Steel Plate
Shell Supports		0.375	SA-240 Gr 304L Hi Alloy Steel Plate

AS BUILT
FINAL
BY CMS HEAT TRANSFER
C. MAURO DATE 9-18-18

DESIGN CONDITIONS	SHELL SIDE	TUBE SIDE
SERVICE	WATER	STEAM/OIL/NITROGEN COND.
DESIGN PRESSURE (MAWP) (psig)	150	150
TEST PRESSURE (psig)	195	203
DESIGN TEMPERATURE / MIN (°F)	300 / -20	365 / -20
NUMBER OF PASSES	1	1
CORROS ALLOW, C STL ONLY (in)	0.0	0.0
RADIOGRAPHY	None	None
MEAN METAL TEMPERATURE (°F)	80	176
TEMA TYPE BEW SIZE 6-108 SURFACE AREA 48 ft2		
TUBE TYPE Bare NO.OF HOLES 27 LENGTH 108 in		
LAYOUT 0.9375 in Tri TUBE-TUBESHT JT Expanded		
BAFFLE TYPE Single Segmental CUT 44 % H		
BAFFLE SPACING (in) 4.0		
IMPINGEMENT PLATE None		
CODE: ASME SECT VIII,DIV 1, 2017 TEMA CLASS C		
WEIGHT: EMPTY 382 FLOODED 533 BUNDLE 149 lb		
DATE: 5/1/18 DRAWN: NL CHKD: APPD:		

CMS
Heat Transfer Division, Inc.
273 Knickerbocker Ave. Bohemia, NY 11716

NOTES: ASME STAMP,NATIONAL BOARD INSPECTION & REGISTRATION ARE REQUIRED
EXTERNAL SURFACE FINISH:MILL FINISH, AS WELDED
IMPACT TEST NOT REQD PER SECT VIII, DIV I, PARA UHA-51(d)(1)(a)
UNIT IS IDENTICAL TO CMS 10.2841.00 REV C ONTARIO CRN OH20203.5
CRN FOR QUEBEC IS REQUIRED

NO.	DATE	BY	REVISIONS

CUSTOMER: BEPEX
P.O. NO.: 37009
EQUIP NO.: 544914 CONDENSER
QTY: ONE (1)

JOB NO. 2869 | DWG NO. 10.2869.00 | REV