MECHANICAL DATA SHEET

PLATE AND FRAME HEAT EXCHANGER

PLANT ITEM No.
24590-BOF-ME-DEP-HX-00001

Data Sheet No.
24590-BOF-MED-DEP-00001, Rev. 0

Project:	*RPP-WTP*	Description:	*Evaporator Concentrate/Feed LAW Effluent Cooler*
Project No:	*24590*	Specification:	*24590-BOF-3PS-MEP0-T0001, Rev 1*
Site:	*Hanford*	P&ID:	*24590-BOF-M6-DEP-00002006, Rev 0* (Internal use only)
Process flow diagram:	*N/A*	Process Data Sht:	*N/A*

General Data

Quality Level	*CM*	Manufacturer / Model No.	*WCR*	*A425B*
Seismic Category	*SC-IV*	Flow Type (Counter current, etc)	*Single pass countercurrent*	
Design Code	*ASME Section VIII, Div. I*	Heat Exchanger Duty (Note 9) Btu/hr	*2,450,000* (Ref. 1)*	
Code Stamp	*Yes*	Heat Exchanger Area ft^2	*369.4 **	
NB Registration	*Yes*	ΔT (LMTD) °F	*10.3 **	
Design Life (Note 12)	*40 years*			

Thermal/Hydraulic Data

	Hot Side		Cold Side	
Fluid Name	*Concentrate Feed*		*Plant Cooling Water Supply*	
Fluid Quantities: Total gpm	*94 (Ref. 1)*		*150 (Ref. 2)*	
Condensable Vapor (In/Out)	*0*	*0*	*0*	*0*
Liquid	*94*	*94*	*150*	*150*
Noncondensable	*0*	*0*	*0*	*0*
Temperature (In/Out) °F	*136 (Ref. 1)*	*88.68 **	*84 (Ref. 2)*	*150.4 **
Density lb/ft^3	*68.67*		*61.92*	
Viscosity Cp	*0.783*	*1.007*	*0.851*	*0.599*
Molecular Weight, Vapor	*N/A*	*N/A*	*N/A*	*N/A*
Molecular Weight, Noncondensable	*N/A*	*N/A*	*N/A*	*N/A*
Specific Heat Btu/lbm-°F	*1.0 (Note 11)*	*1.0 (Note 11)*	*1.0 (Ref. 2)*	*1.0 (Ref. 2)*
Thermal Conductivity Btu/hr-ft-°F	*0.370*	*	*0.351 (Note 16)*	*
Latent Heat Btu/lbm @ °F	*N/A*		*N/A*	
Inlet pressure psia	*129 (Ref. 3)*		*58 (Ref. 3)*	
Velocity ft/s	*N/A*		*N/A*	
Pressure Drop (Allowed / calculated) psi	*20 / 0.43 **		*15 / 0.90 **	
Average Contact Dose Rate (Note 4) rad/hr	*76.1*			
Oversurface %	*10% min*			

Mechanical Design Data

	Hot Side	Cold Side
Design Pressure psig	*195 (Ref. 3)*	*100 (Ref. 3)*
Design Temperature °F	*195 (Ref. 3)*	*165 (Ref. 3)*
Corrosion/Erosion Allowance inch	*None*	*None*

Material Data (Note 7)

Plates	*SA-240 316 (Note 6)*	Nozzles	*SA-312 316 (Note 6) **
End Covers	*SA-516-G70 **	Removable Shroud	*304 SS (Note 8) **
Hot Side Gasket	*NBR Clip-on*	Cold Side Gaskets	*NBR Clip-on*
Carry/Guide Bars	*C1018 Zinc Plated **	Forgings	*SA-182 F316 (Note 6)*
Tightening Bolts	*SA-193 Grade B7*	Tightening Nuts	*SA-194 Grade 2H*

Construction Data *(To be determined by the supplier when not specified by the buyer)*

	Hot Side		Cold Side	
Inlet (Size/Rating & Connection Type) in	3 (NO1)	150# RF studded, SS lined *	4 (NO3)	150# RF studded, SS lined *
Outlet (Size/Rating & Connection Type) in	3 (NO2)	150# RF studded, SS lined *	4 (NO4)	150# RF, studded, SS lined *
Total Number of Plates	145			
Size (LxWxH)	46.5 x 19.0 x 42.62		Weight of 1 plate lb	*3.3*
Empty Weight lb 1,336 *	Operating Weight lb 1,546 *			

Notes

Note 1. The contents of this document are Dangerous Waste Permit affecting.

Note 2. Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Note 3. Blank fields and fields identified with * are to be completed by the seller. Fields containing data from seller's proposal are followed by *. Seller to confirm or update this data.

Note 4: This equipment is located in R4 radiation area (Maximum Radiation Area) which is designed to have a target radiation of 25 mrem/hr. (Ref. 8 through Ref. 11)

Note 5. Frame shall be of sufficient size to allow the installation of 20% additional plates

Note 6. Maximum carbon 0.030%; dual certified to 316/316L material

Note 7. Carbon steel surfaces shall be coated per 24590-WTP-3PS-AFPS-T0001, *General Specification for Shop Allied Special Protective Coatings for Steel Items and Equipment* – Coating System T.

Note 8. If welded, stainless components are to be low carbon.

Note 9. The heat exchanger should also be capable of meeting the following:

- HX Duty of 2,630,000 btu/hr
- Concentrate feed flow of 72 gpm flow rate
- Inlet temperature of 157 °F
- No change to plant cooling water side data (inlet flow and temperature)

Note 10. Deleted

Note 11. This value is based on Seller's input. Assumption 6.2.3 of Reference 1, is to be revised to match

Note 12. Excludes replaceable elements and seals.

Note 13: Deleted

Note 14: Deleted

Note 15: Deleted

Note 16: This information is based off Table A-9 of Ref. 7

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Rev.	Description	Originator	Checker	Reviewed MET	Approved	Date
0	**Issued for Purchase** *Conformed to Seller's bid. Impacts against this document have been evaluated and there are no EIE against this datasheet*	**Originator** By: Robert Preston - rpreston Org Name: Bechtel NS&E Placed: Feb 07, 2017 **Robert Preston**	**Checked** By: Jung Shin - jwshin1 Org Name: Bechtel National Inc Placed: Feb 07, 2017 **Jung Shin**	**Reviewed No Comments** By: Debbie Adler - dladler Org Name: MET Placed: Feb 07, 2017		2/14/17
B	**Issue for Quote** ***Document was completely revised and identification of revised items is not necessary.**	**Steven Duncan**	**Surjit Pabby**	**Debbie Adler**	**Youssef Mohammad-Zadeh**	**6/14/16**
A	**For Internal Coordination**	**J. Slifer**	**R. Preston**	**N/A**	**Y. Mohammad-Zadeh**	**2/2/16**

Attachment A- References for Mechanical Datasheet 24590-BOF-MED-DEP-00001, Rev. 0 (Internal Use Only)

1. 24590-BOF-MEC-DEP-00002, Rev. A, DFLAW EMF (DEP) Heat Exchanger DEP-HX-00001 Heat Duty
2. 24590-BOF-MEC-PCW-00001, Rev. A, EMF Heat Exchanger PCW-HX-00025 Sizing
3. 24590-BOF-M6C-DEP-00009, Rev. B, Design Pressure and Temperature Calculation for EMF DEP/DVP/AFR/NLD/SHR/SNR Systems
4. 24590-BOF-MPC-PCW-00001, Rev. A, EMF Plant Cooling Water (PCW) Pump and Line Sizing
5. 24590-BOF-MPC-DEP-00007, Rev. A, DEP Evaporator Concentrate Vessel Transfer/Recirculation Pump (DEP-PMP-00003A/B) Sizing and Line Sizing
6. 24590-LAW-MED-LMP-00005, Rev. 0, Mechanical Data Sheet: Plate and Frame Heat Exchanger
7. Heat Transfer, J.P. Holman, 1972.
8. 24590-BOF-M5-V17T-00011, Rev. 0, Process Flow Diagram Direct Feed Effluent Transfer (System DEP)
9. 24590-BOF-P1-25-00001, Rev. 0, Balance of Facilities LAW Effluent Process Bldg & Law Effluent Drain Tank Bldg General Arrangement Plan at Elev. 0'-0"
10. 24590-WTP-DB-ENG-01-001, Rev. 4, Basis of Design
11. 24590-WTP-Z0C-W13T-00010, Rev. 00G, Contact Dose Rates to Equipment from Beta and Gamma Emitters*

*The conditioned effluent average contact dose rate is based on the most conservative upstream process stream of the mixing tee, which is DEP13d (Reference 11). However, since the contact dose rate for DEP13d has not been established, the average contact dose rate for process stream DEP13 (Reference 8 and Reference 11) will be used. The average contact dose rate for 0-5 year equipment life is used because it has the highest dose rate and is therefore conservative in this application.