

Design Report

Arrangement 5 - PHBD Main Heat Exchangers (26PHBD-HX-19X0) Equipment Summary

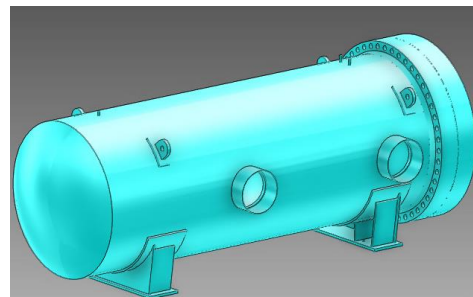
This document provides a summary of PHBD Main Heat Exchangers (26PHBD-HX-19X0)

Approval Process			
	Name	Action	Affiliation
Author	Basili L.	06 Apr 2023:signed	IO/DG/CNST/PLD/MID/TCWS
Co-Authors	West S.	06 Apr 2023:signed	IO/DG/CNST/PLD/MID/TCWS
Reviewers	Berruyer F. Ciampichetti A. Ghirelli N.	06 Apr 2023:recommended (Short Cycle)	IO/DG/CNST/PLD/MID/TCWS IO/DG/CNST/PLD/MID/CMW IO/DG/CNST/PLD/MID/TCWS
	Van hove W.	06 Apr 2023:recommended (Short Cycle)	ORNL - Oak Ridge National Laborator...
Previous Versions Reviews	Gao J.	04 Apr 2023:recommended (Short Cycle) v2.1	IO/DG/CORP/FPD/PCD/CAL
	Sharan S.	04 Apr 2023:recommended (Short Cycle) v2.1	IO/DG/CNST/PLD/MID/TCWS
	Ricou E.	27 Mar 2023:recommended v2.0	IO/DG/CNST/PLD/MID/TCWS
Approver	Lioce D.	07 Apr 2023:approved	IO/DG/CNST/PLD/MID/TCWS
Document Security: Internal Use RO: Lioce Donato			
Read Access	LG: Arrangement 5 Cost Estimation, LG: USDA Arrangement 5, LG: Management, GG: IO DDGs (and Senior Advisors), AD: IO_Director-General, AD: External Management Advisory Board, AD: OBS - Project Control Office (PCO), AD: IDM_Controller, AD: OBS - Procurement & Contracts Division (PCD), AD: Auditors, p...		

<i>Change Log</i>			
Arrangement 5 - PHBD Main Heat Exchangers (26PHBD-HX-19X0) Equipment Summary (YVTU9D)			
<i>Version</i>	<i>Latest Status</i>	<i>Issue Date</i>	<i>Description of Change</i>
v1.0	Signed	13 Mar 2023	
v2.0	Signed	27 Mar 2023	new version to implement comments by reviewers
v2.1	Signed	30 Mar 2023	Change in the cobalt content.
v2.2	Approved	06 Apr 2023	implementation of comments: - tantalum 0.01% - MW instead of KW

OPERATIONAL NARRATIVE

8 heat exchangers have the function of removing the heat collected by the clients. Every cooling train is provided of one heat exchanger. On the secondary side the heat exchangers are connected to the CCWS-1 that supply the water needed for cooling. This datasheet is referred to 6 heat exchangers. A separate datasheet is dedicated to the 2 heat exchangers that should come already with the manifold welded.

**Disclaimer:**

- Contents of this document have been assembled, reviewed and approved as for Information Only,
- May not be used for purchasing, fabrication or construction,
- May not be used as verified input to any document (may be used as unverified assumption).

PHYSICAL ATTRIBUTES

<i>Commodity Type:</i>	Shell & Tube Heat Exchanger
<i>Type:</i>	NXU Horizontal
<i>Number of units:</i>	6
<i>Approx. Footprint:</i>	6 m x 2.3 m
<i>Approx. Height:</i>	2.2 m
<i>Approx. Total Weight (wet)</i>	≈ 36600 kg
<i>Volume:</i>	10.5 m ³
<i>Service Fluid:</i>	Demineralized Water
<i>Material Notes:</i>	304L / 316L with composition requirement: cobalt <0.05 wt%, Niobium < 0.1 wt% and Tantalum < 0.01 wt%.
<i>Anchoring system</i>	Embedded Plates. Adequate anchoring to be determined
<i>Component configuration</i>	Mounted on saddles
<i>Design Life Time:</i>	20 years
<i>Special Attributes:</i>	

WBS: IBED System

PBS: 26PHBD

Functional Reference: 26PHBD-/HX-1920/HX-1930/HX-1940/HX-1950/HX-1960/HX-1980

GBS: 11-L3-02E

REFERENCE DOCUMENTS

Sizing calculation: ITER_D_PAVZLW_v3.3

PID: ITER_D_SNJ3LL_v4_2

ENVIRONMENTAL CONDITIONS

<i>Dose Rate:</i>	≤ 1.2 kGy/h
<i>Integrated Dose Rate 20yrs:</i>	≤ 20 000 kGy
<i>Magnetic Field:</i>	≤ 168 mT
<i>Normal temperature</i>	5 – 35 °C
<i>Normal Humidity</i>	40 – 60 %
<i>Normal Pressure relative to atm:</i>	-0.14 kPa
<i>Accidental Temperature</i>	130 °C
<i>Accidental Pressure relative to atm:</i>	-5 to +100 kPa
<i>Accidental Humidity</i>	100 %

DESIGN CODES AND SHIPPING

<i>French Law Pressure Category / Nuclear Class:</i>	ESPN / IV / N2
<i>Fluid Type / Fluid group</i>	Gas/Group 2
<i>Related Codes:</i>	ASME Code Sec VIII Div 2/ TEMA
<i>Conformity Assessment Module:</i>	Cat IV, module G
<i>Safety Class:</i>	SIC-1
<i>Quality Class:</i>	QC-1
<i>Seismic Class:</i>	SC1 (S)
<i>Fire:</i>	Eurocode 2h
<i>Shipping Information:</i>	Conventional Exceptional Load, Oversea packing per ASME NQA-1 Level C, DAP at ITER site

PARAMETERS

Parameter	Shell side	Tube side
<i>Fluid Type</i>	Demineralized water	Demineralized water
<i>Inlet Temperature (°C)</i>	31	114.1
<i>Outlet Temperature (°C)</i>	78.69	69.5
<i>Inlet Pressure (MPa,a)</i>	0.8	1.5
<i>HX Mass flow (kg/s)</i>	601	615
<i>Allowable Pressure Drop (MPa)</i>	0.25	0.1
<i>Fouling resistance (m² K/W)</i>	0.0001	5e-05
<i>Heat Duty (MW)</i>	117.5	
<i>Design Pressure (MPa,a)</i>	5	5
<i>Design Temperature (°C)</i>	150	150
<i>Number pass per shell</i>	2	2
<i>Thermal insulation thickness (mm)</i>	50	50
<i>Roughness</i>	N/A	1.6 μm

NOZZLE SCHEDULE

I.D.	DN / Schedule	Service
N01	DN 500 / 80	Inlet Tube side
N02	DN 500 / 80	Outlet Tube side
N03.1	DN 400 / 80	Inlet Shell side
N03.2	DN 400 / 80	Inlet Shell side
N03.3	DN 400 / 80	Inlet Shell side
N04	DN 500 / 80	Outlet Shell side
N08	DN 25 / 40S	Tube side drain 1
N09	DN 25 / 40S	To DR shell side
N10	DN 25 / 40S	To Tube side drain 2
N11	DN 25 / 40S	Tube side Vent 1
N12	DN 25 / 40S	Tube side Vent 2

Notes:

1. Approximate footprint is based on 3d model approved configuration.
2. All nozzles are butt-welded.
3. Support shall be accounted in the vendor estimate.
4. The shell side has an inlet suggested to be divided into 3 nozzles for mixing purposes.
5. The maximum height should be respected due to low space availability.
6. Also the water-box has to respect the roughness value of tube side.
7. For the Floor response spectra please refer to Cover Main Document

