QAP for Procurement of Breech lock Exchanger (207-E-07)

QAP No. : CPCL-QAP-HE-566 Rev 0
Reference Engineering specification : CPCL-HE-SP-1264 Rev-0
Vendor shall prepare QAP based on CPCL-QAP-HE-566 Rev 0 and Reference EIL / CPCL specifications

S.No	Inspection Activity	Type of Check	Reference Document/Accepted Standard	Inspection Agency			Remarks
				Vendor	TPI	CPCL	
1.0	Design & Drawings	Review and Approval	Requisition, Data sheets, ASME Sec. VIII Div I, TEMA CL-R	-	A	A	
2.0	Quality Assuance Plan (QAP)	Review and Approval	Requisition, Drawing ASME Sec VIII Div.1	P	A	A	
3.0	Techincal delivery conditions of raw material (TDC)	Review and Approval	Requisition, Specification, ASME Sec II A,	P	A	-	
4.0	Procedures for NDT, Heat Treatment, Hydrostatic test etc.	Review and Approval	Requisition, Specification, ASME Sec VIII Div.1 & 2	P	A	R	
5.0	**PROCEDURES FOR WELDING**						
5.1	WPS and PQR	Review and Approval for conformity of Qualification Requirement	Drg., Requisition, Specification, ASME Sec IX	H	W/R*	-	*W for new procedure
5.2	WPQ	Review and Approval for conformity of Qualification Requirement	ASME Sec IX	H	W/R*	-	*W for new procedure
5.3	Mock up test for Tube to Tube Sheet Joint	Review and Approval for conformity of Qualification Requirement	Drg., Specification, ASME Sec VIII Div.1	H	R	-	*W for new procedure
6.0	**MATERIAL INSPECTION**						
6.1	MATERIALS AT MILLS: Plates, Pipes, Tubesheet, Forgings, Fittings, Fasteners etc.	Chemical Analysis, Mechanical Properties (Incl, Impact, Hardness, etc), Visual & Dimensional Inspection, Other NDT and Heat Treatment as applicable. PMI, UT -100 % for all forgings including Tubesheet.	Requisition, Specification, Drawing, ASME Sec. II A ASME Sec VIII Div 1& 2	Insp. By Mills / TPI as applicable. Major components like shell plate, channel forging, nozzle forgings, etc shall be offered for TPI at the respective manufacturers works.			
6.2	MATERIALS AT MILLS: Tubes	Chemical Analysis, Mechanical Properties (Incl, Impact, Hardness, etc), Visual & Dimensional Inspection, Other NDT and Heat Treatment as applicable, PMI, Eddy current inspection of tubes - 100%	Requisition, Specification, Drawing, ASME Sec. II A ASME Sec VIII Div 1& 2	Tubes shall be inspected at vendor works by TPI. Scope of TPI shall include review of MTC, visual, dimension checks, witnessing of physical test and hydrotest on 10% of tubes.			
6.2	**MATERIALS AFTER RECEIPT**						
	MATERIALS AFTER RECEIPT Pressure Parts Plates, Pipes, Tubes, Forgings, Fittings, Fasteners, Gaskets etc.	Identification Correlation & transfer of Markings Visual & Dimensional Inspection, PMI check for alloy steel & SS components	ASME Sec. II A Drawing, Requisition, Specification ASME Sec VIII Div 1& 2	H	H	-	
	Non Pressure Parts Baffles, Tie rods, Spacers, Structurals, etc,	Identification Correlation & Transfer of Markings Visual & Dimensional Inspection, PMI check for alloy steel & SS components	ASME Sec. II A Drawing,	H	R	-	
	Welding consumables	Review of test Certificates	ASME Sec-II C, Requisition, Specification	R	R	-	
7.0	**INSPECTIN OF MACHINED COMPONENTS**						
7.1	Tube Sheet Machining, Drilling and Grooving of Tubesheets, Machining and Drilling of Baffles, Machining of Tie rods, Spacers and Trimming of tubes	Visual ,Dimesional ,No.of holes and pitch, Ligament Check, Orientation and layout, Hole size and finish, Depth of groove, Tie-rod holes-size and location thickness, Surface DP on both sides	Specification, Drawing, TEMA CL-R	H	H	--	
7.2	Machining of Chnl. Barrel. Girth Flanges, Chnl. Cover. Nozz, Necks etc.	Visual and Dimensional inspection	Specification, Drawing, TEMA CL-R	H	R/W	--	
7.3	Inspection of baffles, Tubesheets	No. of holes, Hole size & Finish, orientation, Diameter of baffle plate,Thickness .Baffle flow cutting	Specification, Drawing, TEMA CL-R	H	W	--	
7.4	Chnl. Threads/Lock ring thread	PT Examination	ASME Sec VIII Div 2	H	W	--	
7.5	Gasket retainer & Compression ring after machining	Visual & Complete PT Examination		H	H	W*	Including the spare items
7.6	Threading of Screw plug	Visual and Dimensional inspection		H	R	--	
8.0	**INSPECTION OF FORMED COMPONENTS**						
		- Mock up for "U" tube bend (Min. Radius bend)	Specification, Drawing, TEMA CL-R	H	RW	-	

8.1	"U" Tubes Forming	-Visual, Dimensional & PT check after forming	ASME Sec. VIII Div. 1, ASME Sec. V, TEMA CL-R Drawing, Specification	H	RW	-	
		- Heat Treatment of U-bend of tubes and review of HT chart		H	R	-	
		- 100% Dye Penetrant test of all U-bends along with straight portion - 300 mm after HT.		H	R	-	
		- Hydrotest of all "U" tube after bending and Heat Treatement.		H	W	-	
8.2	Heads	- Visual & Dimensional inspection and PT check	Drawing, Specification ASME Sec. VIII Div. 1 / ASME Sec. V	H	W	-	Hemi spherical heads shall be single piece construction
		- HT Chart review		R	R	-	
		-PT after Heat Treatment		H	RW	-	Both Inside & outside
9.0	**INSPECTION DURING FABIRCATION**						
9.1	Weld Edge preparation & set up of pressure parts	- Visual & Dimensional inspection, Weld edge, root gap, offset, cleanliness etc.	Drawing, Specification ASME Sec. VIII Div. 1	H	W	-	
		-PT/MT of weld edge preparation	ASME Sec. VIII Div. 1	H	R	-	
		-PT/MT of back chiped Weld Surface	ASME Sec. VIII Div. 1	H	R	-	
9.2	Inspection of completed welds	- Visual inspection for reinforement, undercuts, surface defects etc.	ASME Sec. VIII Div. 1 &2 ASME Sec V Drawing, Requisition, Specification.	H	W	-	
		-PT/MT of all pressure holding welds & lug		H	RW	-	
		-RT Film of butt welded joints		H	R	-	
		-PT/MT check of temporary attachment welds after removal.		H	RW	-	
		-PMI verification (base metal & weldments)		H	RW	-	
		-Production Test Coupon testing as appl.		H	W	-	
		-PWHT Chart review		R	R	-	
		-RT of butt welds after PWHT		H	W	-	
		UT of nozzle to shell/ channel welds after PWHT		H	W	-	
		PT/MT check of fillet welds after PWHT		H	RW	-	
		Hardness check of base metal, weld metal & HAZ as applicable		H	RW	-	
9.3	Core assembly with tubesheet (Tie-rods, baffle plate and spacer tubes) before tube insertion	Core setting, Baffle spacing and orientation,Tier rod tightening and weld	Drawing, Specification	H	W	--	
9.4	Tube to Tubesheet Joint	-PT after root pass and final pass	ASME Sec VIII Div 1	H	RW	--	
		-Pneumatic test for the TTJ	ASME Sec VIII Div 1	H	W	W*	
		-Expansion check of tube to tube sheet joints	Drawing, Specification	H	RW	--	
		-PT of tube to tube sheet joints after final expansion	ASME Sec VIII Div 1	H	RW	W*	
9.5	a) Inspection of Tube Bundle	Visual and Dimensional Inspection for completeness of assembly	Drawing, Specification	H	W	-	Tighness of lamiflex seal shall be ensured
	b) Inspection of shell before Insertion of tube bundle	Check for weld finish, circularity and completeness of assembly.	Drawing ASME Sec. VIII Div 1	H	RW	-	
		Dummy passing.	Drawing	H	RW	-	
	c) Breechlock Closure inspection (channel side)	-Visual & Dimensional check	Code & Drawing	H	W	W*	
		-Thread Inspection (including RMS finish) in Channel drum & Thread lock ring by gauge	Code & Drawing	H	W	W*	
		-Visual inspection of all machined components of channel side	Code & Drawing	H	W	W*	
		-Assembly of Internal cylinder, internal flange/sleeve, threaded lock ring & Channel cover along with Gasket retainer diaphragm	Code & Drawing	H	W	W*	
10.0	**FINAL INSPECTION**						
10.1	Inspection Before hydro test	-Visual & Dimensions, Completeness of assembly	Code & Drawing	H	H	W*	
10.2	Positive Material identification (PMI)	Alloy steel & Stainless Steel materials final check before assembly.	Requisition, Specification, ASME Sec II A,	H	W	W*	
11.0	**TESTING**						

11.1	Hydrostatic Test on Shell side prior to channel cover assembly	-Check for leakage if any	Drawing, ASME Sec VIII Div 1 Requisition, Specification,	H	H	W*	
11.2	Hydrostatic Test on Tube side post complete assembly	-Check for leakage if any	Drawing, ASME Sec VIII Div 1 Requisition, Specification,	H	H	W*	
11.3	Hydrostatic test, simultaneously on both tube & shell side maintaining differential pressure	-Check for leakage if any	Drawing, ASME Sec VIII Div 1 Requisition, Specification,	H	H	W*	Differential pressure shall not exceed the design limit
11.4	Final inspection after hydrotest	Visual and Dimensional Inspection	Drawing	H	W	-	
11.5	Drying of Equipment and Nitrogen filling (Gauge shall be provided to monitor pressure. Min N2 pressure to be maintained is 1.2ksc)	Dryness of Internal Surfaces	Drawing	H	R	-	
12.0	**SURFACE PREPARATION & PAINTING**						
12.1	Surface Preparation	Visual inspection for finish & DFT measurement	Drawing, Specification,	H	RW	-	
12.2	Prime coat and Finish Coat				RW		
12.3	Pickling & passivation of SS surface as applicable				RW		
13.0	**DOCUMENTATION**						
13.1	Material test Records	Verification & compilation of inspection Test Records for submission to client	Drawing	R	H	R	
13.2	NDE Reports (RT, PT, UT, MT, CVN as applicable						
13.3	Heat Treatment charts						
13.4	Hydrostatic Test Reports						
13.5	Name plate facsimile (Stamping)	Verifying Stamping Details	Drawing	H	R	-	
14.0	DESPATCH	Verification of Packing, Marking etc.	Drawing, Specification, Requisition	H	H	-	
		Despatch Release Clearance	PO, PR, PS	R	H	-	

*** CPCL may also witness the above tests jointly with TPI for which necessary communication shall be given by the vendor well in advance for making suitable arrangement.**

Legends:

H : Hold Point
A : Approval
R : Review of Records
W: Witness Point
RW : Random witness check