

**QAP for Procurement of Breech lock Exchanger (207-E-04)**

QAP No. : CPCL-QAP-HE-565 Rev 0

Reference Engineering specification : CPCL-HE-SP-1264 Rev-0

Vendor shall prepare QAP based on CPCL-QAP-HE-565 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 & Approval	Requisition, Data sheets, ASME Sec. VIII Div I, TEMA CL-R	--	A	A	
2.0	Quality Assurance Plan (QAP)	Review & Approval	Requisition, Drawing ASME Sec VIII Div.1	P	A	A	
3.0	Technical delivery conditions of raw materials (TDC)	Review & Approval	Requisition, Specification, ASME Sec II A,	P	A	--	
4.0	Procedures for NDT, Heat Treatment, Hydrostatic test etc.	Review & Approval	Requisition, Specification, ASME Sec VIII Div.1 & 2	P	A	R	
5.0	<b>PROCEDURES FOR WELDING &amp; WELD OVERLAY</b>						
5.1	WPS and PQR	Review & Approval for confrmity Qualification Requirement	Drg., Requisition, Specification, ASME Sec IX	H	W/R*	-	*W for new procedure
5.2	WPQ	Review & Approval for confrmity Qualification Requirement	ASME Sec IX	H	W/R*	-	*W for new procedure
5.3	Mock up test for Tube to Tube sheet Joint	Review & Approval for confrmity Qualification Requirement	Drg., Specification, ASME Sec VIII Div.1	H	R	-	
6.0	<b>MATERIAL INSPECTION</b>						
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.			
	<b>MATERIALS AFTER RECEIPT</b>						
6.3	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, Structures etc.	Identification Correlation & Transfer of Markings, Visual & Dimensional Inspection, PMI check for alloy steel & SS components	ASME Sec. II A Drawing,	H	R	--	
	Selection of specimen for IGC testing and intermetallic (sigma) phase evaluation on tubes, gasket retainers and pressure parts, review of report	Sample selection and Report review		H	H	-	
	Welding Consumables	Review of test Certificates	ASME Sec-II C, Requisition, Specification	R	R	--	
7.0	<b>INSPECTION OF MACHINED COMPONENTS</b>						
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	<b>INSPECTION DURING FABRICATION</b>						
8.1	U' Tubes Forming	-Mock up for 'U' tube bend (min, Radius bend)	Specification, Drawing, TEMA CL-R	H	RW	--	
		-Visual, Dimensional & PT check after forming		H	RW	--	
		-Heat treatment of U-bend of tubes and review of HT chart	ASME Sec. VIII Div. 1,	H	R	--	
		-100% Dye Penetrant test of all 'U' bends along with straight portion - 300 mm after HT	ASME Sec. V, TEMA CL-R	H	W	--	
		Hydro test of all "U" tubes after bending and Heat treatment	Drawing, Specification	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		H	R	--	
		-PT after Heat Treatment		H	RW	--	Both Inside & outside
9.0	<b>INSPECTION DURING FABRICATION</b>						
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 chipped Weld Surface	ASME Sec. VIII Div. 1	H	R	--	
9.2	Inspection of completed welds	-Visual inspection for reinforcement, undercuts, surface defects etc.		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	R	--	
		-PT of weld overlay surface		H	RW	--	
		-Chemical analysis & ferrite check for weld overlay surface		H	W	--	
		-PMI verification (base metal & weldments)	ASME Sec. VIII Div. 1 & 2	H	RW	--	
		-Production Test Coupon testing as appl.	ASME Sec V	H	W	--	
		-PWHT Chart review	Drawing, Requisition, Specification.	R	R	--	
		-RT of butt welds after PWHT		H	R	--	
		-UT of nozzle to shell/channel welds after PWHT		H	W	--	
		-UT of Weld overlay/SS clad of Shell & channel as applicable		H	RW	--	
		-PT/MT check of fillet welds after PWHT		H	R	--	
-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 Tube Sheet 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*	
	a) Inspection of Tube Bundle	-Visual & Dimensional Inspection for completeness of assembly	Drawing, Specification	H	W	--	Tighness of lamiflex seal shall be ensured

9.5	b) Inspection of shell before insertion of tube bundle	-Check for weld finish, circularity and completeness of assembly -Dummy passing	Drawing ASME Sec. VIII Div 1	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 Channel, threaded lock ring & Channel cover along with Gasket retainer diaphragm	Code & Drawing	H	W	W*	
	-Pickling & passivation of SS parts	Code & Drawing	H	W	R		
<b>10.0</b>	<b>FINAL INSPECTION</b>						
10.1	Inspection Before hydro test	-Visual & Dimensions, Completeness of assembly	Code & Drawing	H	H	W*	
10.2	Poitive material identification (PMI)	-Alloy steel & stainless steel materials final check before assembly	Requisition, Specification, ASME Sec II A,	H	W	W*	
<b>11.0</b>	<b>TESTING</b>						
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 hydro test	-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, Specification	H	R	--	
<b>12.0</b>	<b>SURFACE PREPARATION &amp; PAINTING</b>						
12.1	Surface Prepration	-Visual Inspection for finish & DFT measurement	Drawing, Specification,	H	RW	--	
12.2	Prime coat and Finish coat						
12.3	Pickling & passivation of SS surface as applicable.						
<b>13.0</b>	<b>DOCUMENTATION</b>						
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		H	H	--	
<b>14.0</b>	<b>DESPATCH</b>	-Verification of Packing, Marking etc.	Requisition, Specification, Drawing,	H	R	--	
		-Despatch Release Clearance	PO, Requisition, Specification	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