FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM

DRAWING NO. 1-16503-40920

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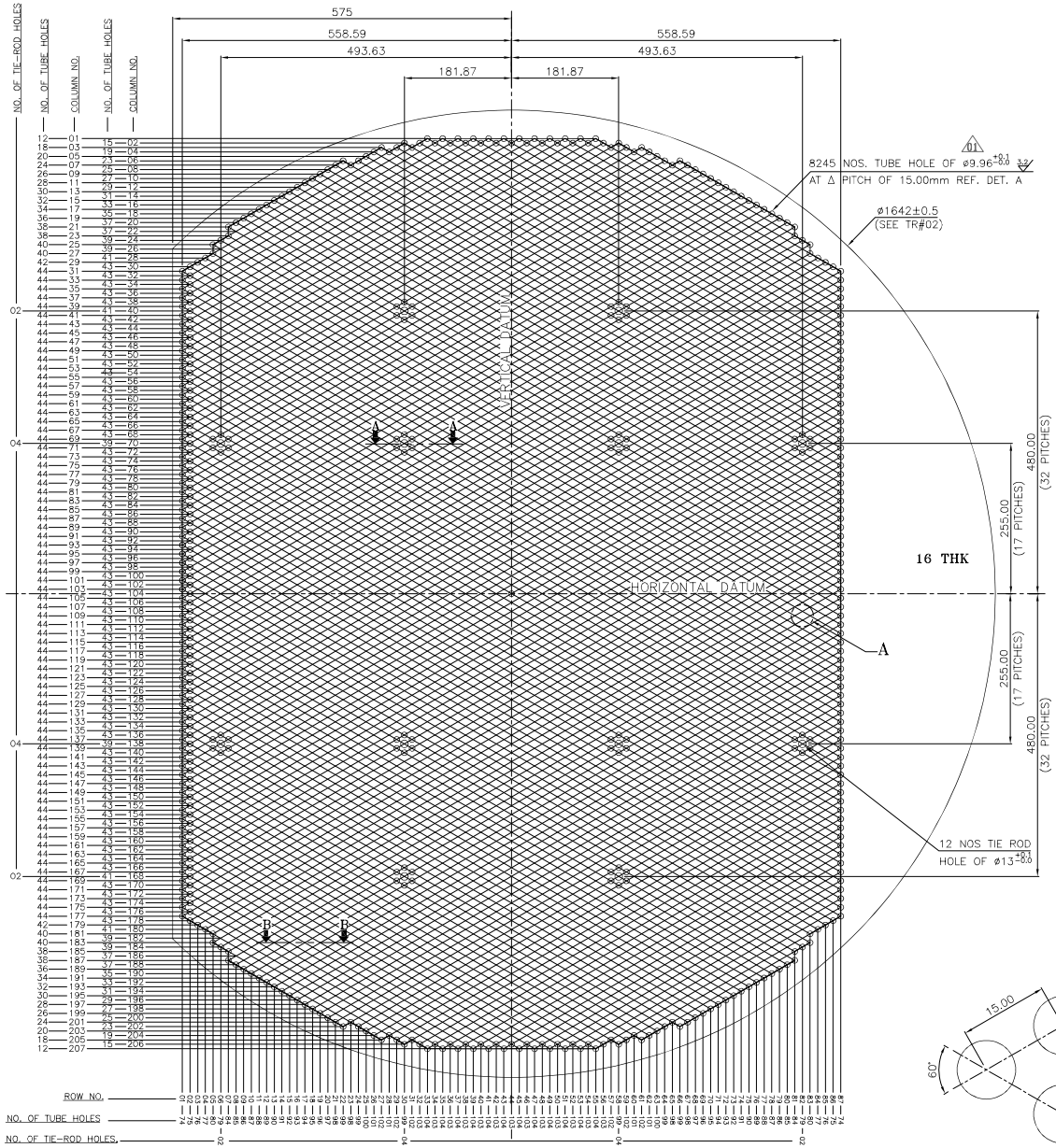
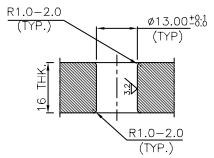
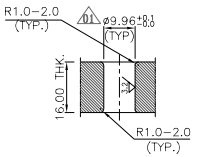


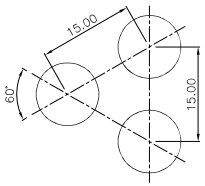
DETAIL OF ITEM NO. 001, BAFFLE PLATE (QTY-10) 01
TYP. TUBE HOLE & TIE ROD HOLE DETAILS ON BAFFLE PLATE



SECTION A-A
(TIE-ROD HOLE)



SECTION B-B
(TUBE HOLE)



PITCH DETAIL
DETAIL-A

TENTATIVE DRAWING

TECHNICAL REQUIREMENTS (TR):-

1) ALL HOLES SHALL BE ROUNDED OFF TO A RADIUS OF 1.0-2.0MM ON BOTH SIDES.
2) THE PERIPHERY SHALL BE MACHINED (IF REQUIRED), AFTER ROLLING THE SHELL TO SUIT ITS I.D.
3) DEVIATION OF ANY HOLE FROM ITS TRUE POSITION IN DIRECTIONS PARALLEL TO DATUM LINES SHALL NOT EXCEED ±0.1MM. (TO BE DEMOSTRATED ON QUALIFICATION BLOCK ONLY)

QTY	REMARKS	ITEM NO.	DESCRIPTION	DRAWING NO.	MATL. CODE	MATL. SPCN.	UNIT WT.
10		001	BAFFLE		209 00	SA 516 GR.70	160.8

REV.	DATE	ALTERED / CHECKED / APPROVED
01	15/09/23	ALTERED / CHECKED / APPROVED

DRG REVISED AS PER THE REVISION OF THERMAL DESIGN, KEEPING BAFFLE VARIANT ONE ONLY.
TUBE HOLE SIZE MODIFIED FROM 9.92 TO 9.96
REVISION AS MARKED 01

ADDITIONAL INFORMATION
DRG. LIST : 4-16503-40378
STATUS OF DRAWING
W/O. NO. : 12010-S-15459
DISTRIBUTION OF PRINTS
CDE - 1 HCM - 4 FWM - 4

(GOVERNMENT OF INDIA)
BHABHA ATOMIC RESEARCH CENTRE
(DEPARTMENT OF ATOMIC ENERGY)

उत्पाद का प्रकार / TYPE OF PRODUCT: D2O/PROCESS WATER HEAT EXCHANGER
HEAVY WATER HEAT HX-34MW DHRUVA, TROMBAY

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
भोपाल
BHARAT HEAVY ELECTRICALS LTD.
BHOPAL

	NAME	SIGN/DATE
DRN.	कमलेश गोमीत	27/07/2023
CHD.	श्री. यशवंत रमोरिया	28/07/2023
APPD.	ललित अवस्थी	29/07/2023

DEPT. CODE	UNTOL. DIMS. GR. M
CODE 411	AA 0230208
SCALE 1:25	WGHT (K.G.) –
REF. TO ASSY. DRG.	1-16503-40917
ITEM NO.	–
NO. OF ITEM	–

शीर्षक / TITLE: BAFFLE PLATE
बॉफ्फल प्लेट
ड्राईंग सं./DRAWING NO. 1-16503-40920
पुनः / REV. 01
पृष्ठ सं./SHT. NO. 01 पत्रों की संख्या/NO. OF SHT. 01

FORMAT SIZE A1

613057/2024/HEP-HCM21100

A-FORM

FORM NO BP-0021

BHARAT HEAVY ELECTRICALS LIMITED - BHOPAL

MM DEPARTMENT

ESTIMATE SHEET FOR ISSUE OF MATERIAL/COMPONENTS FROM BHEL

CHECKLIST

A-FORM NO	: A211A04
REV NO	: 0
A-FORM DATE	01-OCT-24
DATE	: 01-OCT-24
PAGE	: 1 / 1

DEPARTMENT :	211	PROJECT	: BARC	PO NO	: A211A04	END PRODUCT :	BAFFLES PLATE
INDENT NO	: 221140073	WORK ORDER NO	: 12010S15459	PO DATE	:	DELY REQD :	15012025
INDENT DATE	: 01102024	MATERIAL ISSUE DIV :	211	SUPP CODE	:	SUPP NAME :	

DETAILS OF FINISHED GOODS

A-SLNO	PO IT NO	PI IT NO	QUANTITY REQUIRED	UNIT	SHOP NO	DEST CD	COST CD	H.CELL
1	0	1	30.000	NO	211	211		211

DESCRIPTION OF SUB-ASSEMBLY/ITEM & WEIGHT/VOLUME/AREA

DRILLING OF BAFFLE PLATE

FREE ISSUE MATERIAL PER UNIT OF FINISHED GOODS

MATL CODE	QTY PSL UNIT	PSL UNIT	RATE PSL UNIT	TOTAL MATL TO BE ISSUED	ISSUE UNIT	PSL/ WIP	SMIV/ PPMIV NO	MATERIAL VALUE	TARRIF HEAD	MATL ISSUE QTY
BP9602016060	1.0000	NO	22800.000	30.00	NO	WIP		684000.000		1.0000

DESCRIPTION OF FREE ISSUE MATERIAL AND WEIGHT /VOLUME/AREA

DRILLING OF BAFFLE PLATE AS PER DRG NO-11650340920 REV-01 MATERIAL DIA 1642 X 16 TK R.WT EACH 240 KG AND F.WT EACH-160 KG APPROX (SCRAP DUDECTION @ 35.60 RS PER KG)

REMARKS ---NA---

AFORM TOTAL 684000.000

TOTAL NO OF CANCEL ITEM 0

1 MATERIAL TO BE ISSUED ON :- FREE ISSUE BASIS

2.TRANSPORT TO BE PROVIDED BY :- SUPPLIER

3.EXCISE DUTY ON ISSUE MATL TO BE BORNE BY :- SUPPLIER

4.SCRAP TO BE RETURNED :- NO

5 INVARIABLY ISSUE WT. TO BE RECORDED ON SMIV/PMIV

SIGNATURE OF INDENTOR
NAME
DESIGNATION
TELEPHONE

हरिमन मीना / HARIMAN MEENA
प्रबंधक / Manager
एच.सी.एम. विभाग / HCM Division
बी.एच.ई.एल., भोपाल / BHEL, BHOPAL

SIGNATURE OF ASC EXECUTIVE
NAME
DESIGNATION
TELEPHONE

RPT-101

613057/2024/HEP-HCM21100

Procedure for **Tube Sheet** & **Baffle Drilling** of Heavy Water process Heat Exchangers-34MW DHRUVA, TROMBAY	Date:05.09.2024 RevisionNo.:02

Name of Main Supplier		**BHARAT HEAVY ELECTRICALS LIMITED, BHOPAL (Govt. of India undertaking)**
BARC PO NO.:	DPS/CPU/04/A3/2622-TPT/PO/252364, DTD: 22.07.2022	
QAP Reference Number	QAX-TH-1601	
Customer:		**BHABHA ATOMIC RESEARH CENTER (Govt. of India)**
PROJECT:	BARC Heavy Water process Heat Exchangers-34 MW, DHRUVA, TROMBAY	
Equipment:	Heavy Water process Heat Exchangers	
Document Number:	**12010S15459/2024/HEP/HCM-01**	
Document Title:	Procedure for **Tube Sheet** & **Baffle Drilling** of Heavy Water process Heat Exchangers-34MW DHRUVA, TROMBAY	

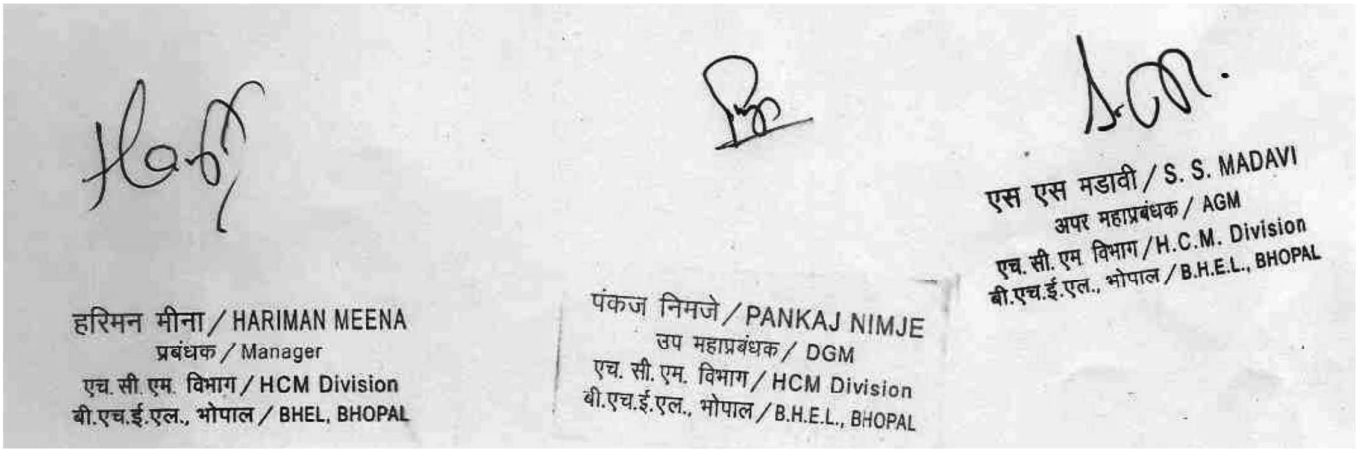
		हरिमन मीना / HARIMAN MEENA प्रबंधक / Manager एच.सी.एम. विभाग / HCM Division बी.एच.ई.एल., भोपाल / BHEL, BHOPAL	पंकज निमजे / PANKAJ NIMJE उप महाप्रबंधक / DGM एच. सी. एम. विभाग / HCM Division बी.एच.ई.एल., भोपाल / B.H.E.L., BHOPAL	एस एस मडावी / S. S. MADAVI अपर महाप्रबंधक / AGM एच. सी. एम. विभाग / H.C.M. Division बी.एच.ई.एल., भोपाल / B.H.E.L., BHOPAL	
02	05.09.2024	2+9=11	Hariman Meena	Pankaj Nimje	SS MADAVI
Rev No.	Date	Pages	Prepared By	Checked By	Approved By

613057/2024/HEP-HCM21100

Procedure for **Tube Sheet** & **Baffle Drilling** of Heavy Water process Heat Exchangers-34MW DHRUVA, TROMBAY	Date:05.09.2024 RevisionNo.:02

Revision Control Sheet:

REV. No/ Date	PAGES	Description of Revision	Prepared By	Checked By	Approved By
00/ 15.04.2024	8	Original submission	Hariman Meena	Pankaj Nimje	SS Madavi
01/ 23.07.2024	2+8=10	*1st Revised submission , (with italic font)*	Hariman Meena	Pankaj Nimje	SS Madavi
02/ 05/09/2024	2+9=11	*2nd revised submission, (With underlined italic font)*	Hariman Meena	Pankaj Nimje	SS Madavi



BHEL Bhopal	
Procedure for **Tube Sheet** & **Baffle Drilling** of Heavy Water process Heat Exchangers-34MW DHRUVA, TROMBAY	Date:05.09.2024 RevisionNo.:02

1. GENERAL

1.1 This procedure establishes the requirements for the Procedure qualification & Production drilling of tube sheet and Baffles.

1.2 Production drilling shall be taken up only after successful completion of procedure qualification, duly accepted by BHEL & BARC (QA).

1.3 Tube sheet drilling shall be done on a CNC deep hole drilling machine while baffle drilling can be done on CNC drilling machine

1.4 All measurements shall be recorded in proper formats.

2. PROCEDURE QUALIFICATION OF TUBE SHEET DRILLING (Bottom & Top TS)

2.1 Following are the requirements for the qualification Block

Item	Requirement
Material	Same as tube sheet material, heat treatment condition, NDE examinations.
Thickness	Equal to Tube sheet Thickness
Surface Flatness	Shall be within *0.5* mm, under clamped condition
Surface finish	*Same as tube sheet -material*

2.2 Drilling Machine Setting

2.2.1 Channel side (front face) shall face the M/C tool (drill) side, so as to start drilling from the Channel side surface.

2.2.2 Set the mock block or DOB (Drilling Qualification Block) suitably clamped.

2.3 Drilling

2.3.1 Drilling shall be done as per approved test block layout drawing *(attached as drg no. 41650340382 on page no.8)* and machine shall be programmed accordingly.

2.3.2 Drawing of test block with holes' layout, holes identified with respect to machine, spindles, and spindle combinations, in case of multi spindle machine, shall be prepared prior to drilling.

2.4 Nos. of Holes

Minimum 50 holes shall be drilled for Operator and Machine qualification per spindle as per test block tube hole lay out to establish drilling parameters. Drilling parameters shall be recorded. Another 25 holes to be drill to qualify additional single operator on the same machine.

2.5 Examination

Following examinations shall be carried out:

Item	Requirement Measurement of Hole size	Acceptance Standard
Hole Size	100% holes *3mm* from both faces.	As per drawing of mockup test block
	Go gauge check for full length & NOGO gauge check for all holes from both ends.	Go gauge should enter and No go gauge should not enter the hole
Ligament	100% ligaments shall be checked at front and rear face sides	As per drawing
Drift	100% holes by optical tooling at rear w.r.t. front side.	As per drawing
Visual examination	100% holes by Visual examination	Hole surface shall be cleaned properly
Surface finish of tube hole	100% holes finish by finish tester or comparator	As per drawing requirement
Hole position	*100% holes position shall be measured at front face.*	*As per drawing requirement*

Note: Above qualification shall be applicable for both top and Bottom Tube sheets.

3. TUBE-SHEET DRILLING

3.1 Tube Sheet Condition

Just prior to drilling stage, Tube sheet condition shall be as per approved manufacturing procedure / QAP.

3.2 Drilling

3.2.1 Drilling shall be carried out on qualified machine by qualified operators.

3.2.2 Tube sheet shall be set/clamped on drilling machine Suitably to carryout drilling operations

3.2.3 Suitable measures shall be taken to ensure that Tube sheet setting is not disturbed during drilling.

3.2.4 Drilling sequence and machine setting parameters shall be as per drilling program established during procedure qualification. CNC machine drilling program/sequence shall be checked/verified before drilling on the job as per sketch 1. However, drilling sequence may change for effective utilization of machine without compromising of quality of work.

3.2.5 One hole shall be drilled on the test block set along with the tube sheet before starting the shift and during the event of any change in conditions (i.e. change of drill, change found during in process checks on hole diameter, finish, ligaments by visual examination and go-no-go gauges) and only after ensuring acceptable hole quality, drilling on the production job shall be taken up.

3.2.6 The first hole on the job at the beginning of the shift shall be examined, *measured* and recorded for acceptable quality parameters limit.

3.2.7 In addition, at regular intervals during drilling operation, hole shall be inspected and measurements recorded.

3.2.8 Whenever a drill bit is replaced, the first hole shall be checked for compliance. Reground tools can also be used. Record shall be kept on the status of each grinded tool in Log book.

3.2.9 *Drill bit/Drill shall replace as per drill manufacturer's recommendations or as and when limits for hole dimensions are reached during in the inspection process, whichever falls early.*

3.3 Following documents shall be prepared for the tube sheet drilling process

3.3.1 Annexure -1 Record of qualification as per clause 2.1

3.3.2 Annexure-2 Measurement and record note as per clause 2.5.

3.3.3 Annexure-3 Record of drilling sequence, CNC Program no., drilling cutting parameters (Feed, RPM) as per clause 3.2.4.

3.3.4 Annexure-4 Record of holes as per clause no. 3.2.5 and clause no.3.2.7.

3.4 Examination

Following examinations shall be carried out on drilled Tube sheet:

Item	Requirement	Acceptance Standard
Hole size	3 % of total holes referred as "**Controlled holes/ reference holes**" selected at random by BHEL(QA). Shall be recorded by internal micrometer. ** In case of nonconformance of controlled/reference holes wrt specified diameter, an additional six percent (6%) of the holes shall be subjected to dimensional verification to ascertain conformance to the specified diameter. If any of the additional inspections yield non-conforming results, a 100% dimensional measurement of all holes using a micrometer may be carried out.*	As per approved drawing
Hole gauging	100% holes of Tube sheet shall be checked with GO gauge for full length & NOGO gauge from both ends. 3% control hole size to be recorded	Go gauge should enter and No go gauge should not enter the hole.
Ligament	100% holes to be checked by ligament gauge, 3% control hole size to be recorded	Approved drawing ,
Drift	All reference/controlled holes and all nonconformance holes at rear w.r.t front side.	Approved drawing
Visual examination	100% holes by Visual Examination.	*Inspection for any dent, incomplete hole, hole surface cleanliness.*
Hole position	*3 % of total holes referred as "**Controlled holes/ reference holes.***	*As per drawing requirement*

Surface finish measurement	All reference holes by Surface finish tester/comparator method and at front & rear ends of holes.	Approved drawing

Note:

a. **"Reference holes"** to be selected by BHEL(QA), shall in a manner representing total tube sheet drilling.

b. *Required hole size for tube sheet shall be achieved in single step drilling process*.

3.5 Special Occurrence

If abnormalities like vibration, loosening of clamping, drill breakage etc. are noticed, drilling shall be stopped and the affected hole(s) shall be evaluated. Drilling shall proceed only after a satisfactory drilling of a hole on the test block and BHEL (QA) clearance.

4. PROCEDURE QUALIFICATION OF BAFFLE DRILLING

4.1 Qualification Block

Following are the requirements for the qualification Block:

Item	Requirement
Material	Same as Baffle material including heat treatment condition, NDE examinations, etc.
Thickness	The number of plates, in a stack, used in procedure qualification, shall be the maximum permitted during production drilling
Surface Flatness	Shall be within 1mm , Under clamped condition.
Surface Finish of hole	Same as baffle (3.2 Micron)

4.2 Drilling Machine Setting

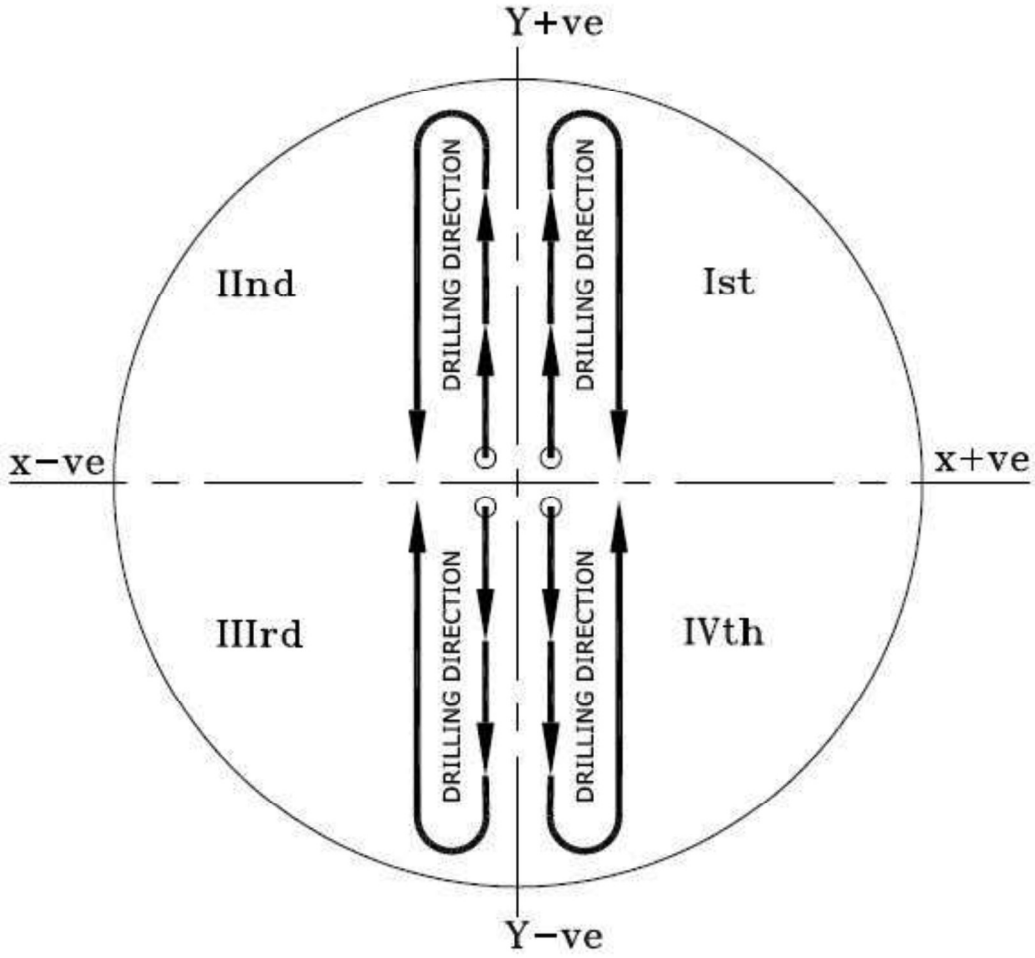
4.2.1. Setting of baffle plates on machine and clamping arrangements shall be done suitably to prevent buckling of the baffle plate before/during drilling.

4.2.1 Each of the plates in such a stack shall be punch marked suitably with respect to drill side face and plate sequence number in drilling direction, stack identification number so that baffles, from the same stack can be installed in the same sequence and facing, in the heat exchangers such that tubes can be smoothly inserted in the drilling direction.

4.3 Drilling

Drilling shall be done as per approved sequence and machine shall be programmed accordingly. Drilling area of block should be divided into 4 quadrants and prepare the annexure indicating the direction of drill bit movement in separate sketch. (*Sketch-1*)

BHEL Bhopal	
Procedure for **Tube Sheet** & **Baffle Drilling** of Heavy Water process Heat Exchangers-34MW DHRUVA, TROMBAY	Date:05.09.2024 RevisionNo.:02



SKETCH–I ' CLAUSE No. 4.3

DRILLING SEQVENCE:–

Ist QUAD ⟶ IIIrd QUAD. ⟶ IInd QUAD. ⟶ IVth QUAD.

Sketch 1. Drilling Direction & sequences

4.4 No of holes

Minimum 50 holes shall be drilled for both Operator and Machine qualification per spindle as per test baffle plate tube hole lay out to establish drilling parameters. Drilling parameters shall be recorded. Another 25 holes *per spindle shall* drill to qualify another single operator on the same machine.

4.5 Examination

Following examinations shall be carried out:

Item	Requirement	Acceptance Standard
Hole Size	100% holes	As per drawing
	Go gauge check for full length & NOGO gauge check for all holes from both ends.	Go gauge should enter and No go gauge should not enter the hole
Ligament	100% ligaments shall be checked at front and rear face sides by GO-NOGO- ligament gauge	As per drawing
Hole position	100% holes shall be measured	As per drawing
Visual examination	100% holes	Hole surface shall be cleaned properly
Surface finish	100% hole finished shall measure by Finish tester or c comparator	As per drawing requirement.

5.0 BAFFLE DRILLING

5.1 Condition

Just prior to drilling stage, Baffle condition shall be as per approved manufacturing procedure /QAP.

5.2 Drilling

5.2.1 Drilling shall be carried out on a qualified machine by qualified operators.

5.2.2 Baffle Stack shall be set in a suitable position on machine. *Stacking of baffles shall be done as per the qualification block (Attached as Drawing no. 41650340383 at page no. 9) used in qualification of baffles drilling process. Maximum stack size can be only 10(ten) baffles per stack.*

5.2.3 Drilling sequence and machine setting parameters shall be as per drilling program established during procedures qualification. CNC machine drilling program/sequence shall be checked and verified for before drilling on the job.

5.2.4 The first hole on the job at the beginning of the shift shall be examined, *measured and recorded* for acceptable quality.

5.2.5 In addition, at regular intervals during drilling operation, hole shall be checked, inspected and measurements recorded.

5.2.6 Whenever a drill bit is replaced, the first hole shall be checked for compliance. Reground tools can also be used. Record shall be kept on the status of each drill bit in Log book.

5.2.7 *One hole shall be drilled on the test block set along with the Baffle Stack before/after the shift and during the event of any change in condition (i.e. change of drill, change found during in process*

check on the hole diameter, finish ligaments by visual examination and go-no-go gauges) and only after ensuring acceptable hole quality, drilling on the production job shall be taken up.

5.3 Examination

Following examinations shall be carried out on drilled Baffles:

Item	Requirement	Acceptance Standard
Hole Diameter	Diameters of at least 3% of total holes (but not less than 5 holes /baffle) referred as "**Controlled holes/ reference holes"** shall be measured and recorded. *** In case of nonconformance of controlled/reference holes wrt specified diameter, an additional six percent (6%) of the holes shall be subjected to dimensional verification to ascertain conformance to the specified diameter. If any of the additional inspections yield non-conforming results, a 100% dimensional measurement of all holes using a micrometer may be carried out.*	Approved drawing
Gauging	100 % holes shall be checked with GO gauge & NOGO gauge. 3% control hole size to be recorded	Go gauge should enter and No go gauge should not enter the hole
Ligament	100% holes to be checked by GO-NOGO- ligament gauge. 3% control hole size to be recorded	Approved drawing
Visual examination	100% holes	*Inspection for any dent, incomplete hole, hole surface cleanliness.*
Surface finish	100% hole finished shall measure by Finish tester or comparator	As per drawing requirement.

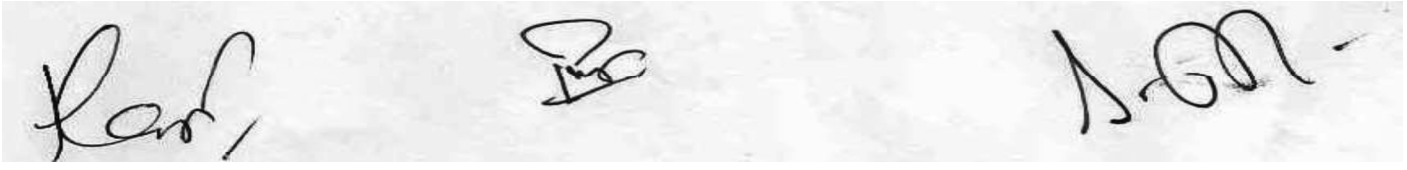
Note:

a. **"Reference Holes"** to be selected by BHEL (QA) in a manner-representing total Baffle drilling.

b. *Required hole size of baffles shall be achieved in single step drilling process.*

5.4 Special occurrence

If abnormalities like vibration, loosening of clamping, drill breakage etc. are noticed, drilling shall be stopped and the affected holes shall be evaluated and reported for clearance. Drilling shall proceed only after a satisfactory drilling of a hole on test block and purchaser or his authorized agency's clearance.



FIRST ANGLE PROJECTION

613057/2024/HEP-HCM21100

REV.	DATE	ALTERED / CHECKED / APPROVED	REV.	DATE	ALTERED / CHECKED / APPROVED	ADDITIONL INFORMATION
		ALTERED	01	12/08/2024	ALTERED DS -SD-	
		CHECKED			CHECKED HARIMAN MEENA -SD-	
		APPROVED			APPROVED SS MADAVI - -SD-	STATUS OF DRAWING: -
ZONE			ZONE		TR#6 ADDED	DISTRIBUTION OF PRINTS: CDE-2 HCM-4

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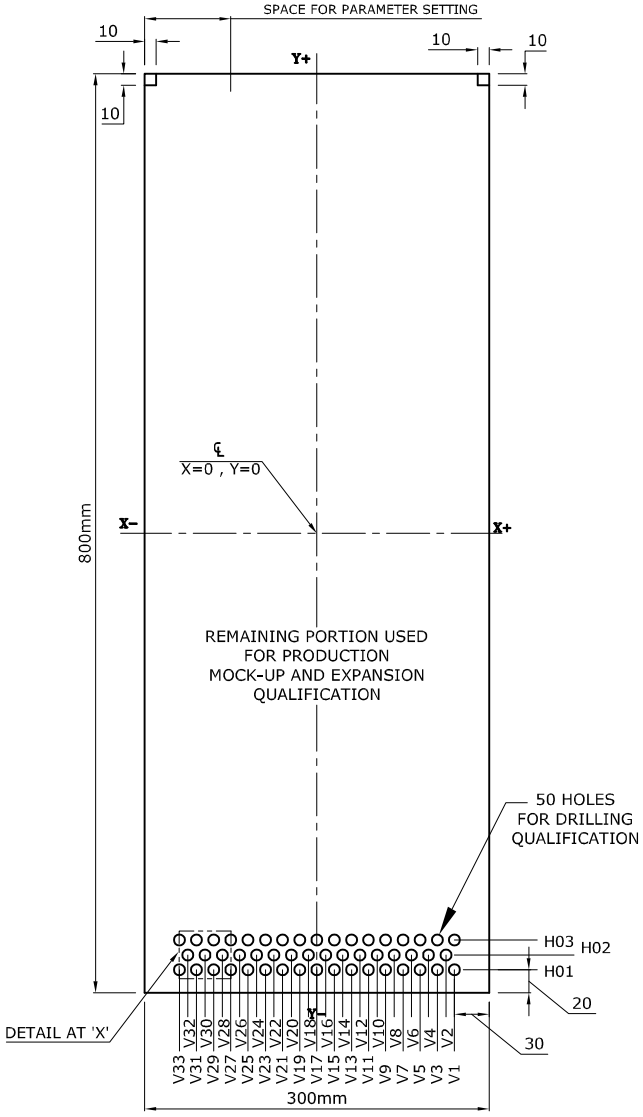

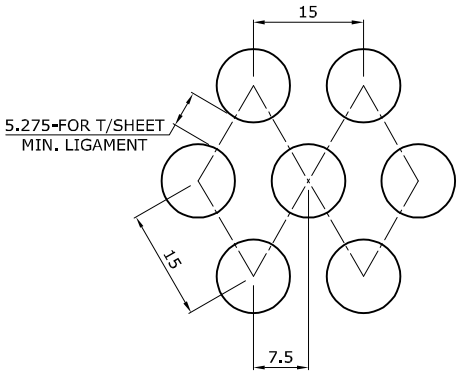

DETAIL AT 'X'

ALL DIMENSION REQUIREMENT ARE AS PER APPROVED JOB DRAWING 1-16503-40922 AND APPROVED DRILLING PROCEDURE

NOTE:–
1. TENTATIVE BLOCK DIMENSION 300x800x103(MIN) TK.
2. NO. OF HOLES 50.
3. PITCH 15 mm TRIANGULAR.

OTHER TECHNICAL REQUIREMENT
1. DRILL DRIFT ±0.162 MAX.
2. TRUE POSITION (POSITIONAL ACCURACY) = ±0.1
3. HOLE SIZE = ø9.65 $^{+0.075}_{-0.00}$
4. SURFACE FLATNESS SHALL BE WITHIN 0.5 MM.
5. HOLE SURFACE FINISH $\sqrt{3.2}$
6. CHAMFER 1X45° SHALL BE DONE ON TUBE SIDE AT ONLY ONE SIDE

-	REF. DRG. NO.		
-	SIGN. & DATE		
	INVENTORY NO.		

BARC

भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD. BHOPAL

	नाम / NAME	हस्ता / SIGN.	दि./ DATE	वेरि की संख्या NO. OF VAR.
बनाया DRN.	महेन्द्र कुमार जायसवाल		23.04.2024	
जाँचा CKD.	विनोद पटनायक		23.04.2024	
स्वीकृत APPD.	SS MADAVI	-SD-	23.04.2024	

विभाग DEPT.	उन.टाल. नाप की श्रेणी UNTOL. DIMS. GR.		अनुपात SCALE	भार कि.ग्रा. WEIGHT(K.G.)	उसे. ड्राईंग का संदर्भ REF. TO ASSY. DRG.	मद क. ITEM NO.	मद संख्या NO. OF ITEM
कोड CODE 411	M AA0230208		NTS	-	-	-	-

शीर्षक / TITLE
DETAILS OF QUALIFICATION BLOCK FOR TUBE SHEET DRILLING FOR BARC (TOP & BOTTOM)

ड्राईंग क. / DRAWING NO. **4-16503-40382** पुन./REV. **01**

पृष्ठ क./ SHT. NO. 1 पृष्ठों की सं/ NO. OF SHT.

A4 SIZE

FIRST ANGLE PROJECTION

613057/2024/HEP-HCM21100

REV.	DATE	ALTERED	REV.	DATE	ALTERED	ADDITIONL INFORMATION
		CHECKED			CHECKED	
		APPROVED			APPROVED	STATUS OF DRAWING
ZONE			ZONE			-
						DISTRIBUTION OF PRINTS
						CDE-2 HCM-4

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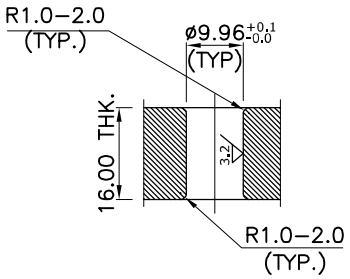

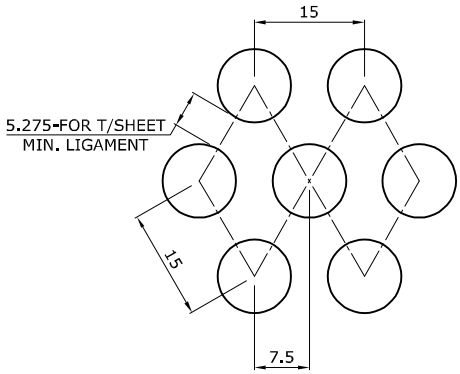

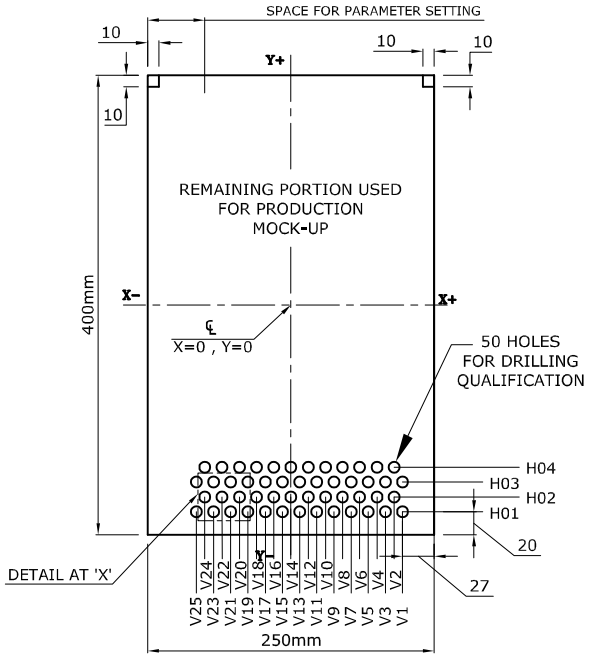

DETAIL AT 'X'

ALL DIMENSION REQUIREMENT ARE AS PER APPROVED JOB DRAWING 1-16503-40920 AND APPROVED DRILLING PROCEDURE

NOTE:–
1. TENTATIVE BLOCK DIMENSION 400x250x16(MIN) TK.
2. NO. OF HOLES 50.
3. PITCH 15 mm TRIANGULAR.

OTHER TECHNICAL REQUIREMENT
1. HOLE SIZE = ø9.96 +0.1 -0.0
2. SURFACE FLATNESS SHALL BE WITHIN 1.0 MM.
3. HOLE SURFACE FINISH 3.2 MICRON (Ra).

INVENTORY NO.	-	SIGN. & DATE	-	REF. DRG. NO.

BARC

भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल
BHARAT HEAVY ELECTRICALS LTD. BHOPAL

	नाम / NAME	हस्ता / SIGN.	दि./ DATE	वेरि की संख्या NO. OF VAR.
बनाया DRN.	DS	-SD-	12.08.2024	
जाँचा CKD.	HARIMAN MEENA	-SD-	12.08.2024	
स्वीकृत APPD.	SS MADAVI	-SD-	12.08.2024	

विभाग DEPT.	उन.टाल. नाप की श्रेणी UNTOL. DIMS. GR.		अनुपात SCALE	भार कि.ग्रा. WEIGHT(K.G.)	उसे. ड्राईंग का संदर्भ REF. TO ASSY. DRG.	मद क. ITEM NO.	मद संख्या NO. OF ITEM
CDE	M		NTS	-	-	-	-
कोड CODE 411	AA0230208						

शीर्षक / TITLE
DETAILS OF QUALIFICATION BLOCK FOR BAFFLE DRILLING FOR BARC

ड्राईंग क. / DRAWING NO. **4-16503-40383** पुन./REV. **00**

पृष्ठ क./ SHT. NO. 1 पृष्ठों की सं./ NO. OF SHT.

A4 SIZE

613057/2024/HEP-HCM21100

Annexure A

Date: 28.09.2024

Points for technical compliance for Drilling of baffles of Heavy Water Heat Exchanger BARC,

PI.....

1. **Scope of Work:** Drilling baffles for tube holes for Heavy Water Heat Exchanger BARC on labor basis as per the drawings (drg no:**1-6503-40920 Rev01**), Drilling procedure and QAP requirements. Important details of work are given below: -
   a. 8245 nos of tube hole per baffle as per drawings
   b. 12 nos of tie rod holes per baffle as per drawing,
2. **Some critical Job Specifications:**
   a. Tube Hole **dia. $9.96^{+0.1}$mm.**
   b. **Nos. of Hole/ TS: 8245**
   c. Positional Accuracy: **0.1 mm**
   d. **Hole finishing: 3.2 Micron**
   e. **Baffles thickness: 16 mm**
   f. Baffle plate material: **SA516GR70.**
   g. All the tube holes and tie rod holes shall be rounded off to a **radius of 1.0-2.0 mm** on the both the side.
3. **MATERIAL:** BHEL will free issue the ready to drill material for baffle plates & and mock block to the vendor
4. **All acceptance norms shall be as per respective baffles drawing, drawing notes and BHEL QAP.** All the dimensions shall be maintained as per drawings.
5. Quality inspection at vendor's place by BHEL QA /BHEL appointed Third Party Inspection(TPI) agency and documents will be reviewed by BARC QAP
6. **Drilling procedure and qualification need to be established on Mock block by the bidder** as per the drilling procedure document no. **12010S15459/2024/HEP/HCM-01, and the same has to be witness by BHEL QA and review by BARC QA.**
7. The mock up plates shall be returned to BHEL without tying any commercial value to it.
8. Bidder shall fulfill the requirements of **PRE-QUALIFICATION REQUIREMENT** (PQR) document for baffles plate drilling of Heavy Water Heat exchanger, BARC.
9. Scrap generated, shall be retained by the vendor at the BHEL standard scrap rate and the same shall be deducted at supplier bill along with applicable taxes.
10. Both ways transportation shall be in vendor's scope.
11. Item to be well packed, dust free and with proper identification tags.
12. **Drawing Revision** before executing the order, supplier should confirm the revision status of Drawings, QAP and Drilling Procedure from BHEL Bhopal.

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28/09/24
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613057/2024/HEP-HCM21100

BHARAT HEAVY ELECTRICALS LTD., BHOPAL

34 MW HEAVY-WATER/PROCESS-WATER SHELL & TUBE TYPE HEAT EXCHANGER (BARC, TROMBAY, MUMBAI) Baffles Drilling Drawing Nos.-11650340920,

QP NO.QAX/TH/1717 | REV. NO. 02

DATE : 03.09.2024 | PAGE : 1 OF 3

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY ** 10			REMARKS 11
1	2	3	4	5	6	7	8	9	D *	M	B	C	

ABBREVIATIONS USED IN QA PLAN

Cr.	Critical
Mj.	Major
Drg.	Drawing
Mn.	Minor
Mech.	Mechanical Properties
T	Testing (Lab.) to be done for checks
Chem.	Chemical Composition
I	Instrument
PSI	Pre-Service Inspection
QCR	Quality Control Record
SPEC.	specification
WPS	Welding Procedure Specification
Mat.	Material
WQR	Welder's Qualification Records
PQR	Procedure Qualification Records
NDT	Non Destructive Test
UT	Ultrasonic Test
MCD	Magnetic Crack Detection
DPT	Dye Penetrant Test
S/R	Stress Relieving
Meas	Measurement
TC	Test Certificate

LEGEND: * RECORDS, IDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION. ** **M:** BHEL/ BHEL's SUB-SUPPLIER **C:** BARC/BARC TPIA, **B:** BHEL/TPIA, **P**: PERFORM, **R**: RECORD REVIEW AND **W**: WITNESS

Note:# Inspection Engineer to check, approval date/ revision no. of reference document at the time of inspection

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SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY ** 10			REMARKS 11
1	2	3	4	5	6	7	8	9	D *	M	B	C	
1.0	**Baffles**												
1.1	Material (baffles plates receipt verification & identification	For traceability & co-relation	Major	Visual	100%	As per BHEL forging drawing	Approved Drawing	Inspn. Record	√	R	W		
1.2.0	**IN PROCESS**												
1.2.1	Drilling Procedure Qualification	Drilling Procedure Qualification by Drilling holes on Test block	Major	Visual & Meas.	100%	Approved Drawing/ Approved Procedure	Approved Drawing/ Approved Procedure	Inspn. Record	√	P	W	R	BHEL shall supplies the Test block
1.2.2	Baffles Plates	a.One hole Drilling Mockup on test block on Operator or tool change or machine restart	Major	Visual & Meas.	100%	Approved Drawing/ Approved Procedure	Approved Drawing/ Approved Procedure	Inspn. Record	√	P	W	-	
		b.Dimn. Conformity including hole size (by Go & No-Go gauge), ligament & Surface finish.	Major	Visual & Meas	100%	Approved Drawing	Approved Drawing	Inspn. Record	√	P	W*	R	*Gauging to be done 100% *3% control hole size to be recorded *Review/Verification of Dimension at any suitable stage will be carried out by BARC.*
		c. Tie rod holes	Major	Visual & Meas.	100%	Approved Drawing	Approved Drawing	Inspn. Record	√	P	W	*R*	

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613057/2024/HEP-HCM21100

BHARAT HEAVY ELECTRICALS LTD., BHOPAL

34 MW HEAVY-WATER/PROCESS-WATER SHELL & TUBE TYPE HEAT EXCHANGER | **QP NO.QAX/TH/1717** | **REV. NO. 02**

(BARC, TROMBAY, MUMBAI) Baffles Drilling Drawing Nos.-11650340920, | **DATE : 03.09.2024** | **PAGE : 3 OF 3**

SL. NO	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY ** 10			REMARKS 11
1	2	3	4	5	6	7	8	9	D *	M	B	C	
1.2.3		Final baffle machining after shell rolling as per shell dimension	Major	Visual & Meas	100%	Approved Drawing/ Approved Procedure	Approved Drawing/ Approved Procedure	Inspn. Record	√	P	W	-	To be done at BHEL

Note:

1. LATEST REVISIONS OF BHEL SPECIFICATIONS SHALL APPLY.
2. IN QUANTUM OF CHECK COLUMN, QUANTUM OF CHECK IS SAME FOR M, C, UNLESS OTHERWISE SPECIFIED.
3. ALL MEASURING INSTRUMENT SHOULD BE CALIBRATED.
4. LATEST APPROVED DRAWING SHALL BE FOLLOWED.
5. IN CASE OF ANY REPAIR, *decision for repair shall be taken with prior approval from BARC.*

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613057/2024/HEP-HCM21100

PRE-QUALIFICATION REQUIREMENT(PQR) FOR BAFFLES PLATE DRILLING OF BARC -34MW Heavy Water Heat Exchanger

Date:28/09/2024

S.No.	DESCRIPTION	Requirement	Bidder's Response
1.	Traders / agents are not allowed to participate	• Manufacturers/vendors who are owners of at least one in house CNC drilling Machine or CNC deep Hole drilling machine facility are allowed to quote. • Offers of parties who are traders, authorized dealers and third parties would not be considered.	YES / NO – Bidder to submit undertaking clearly stating they are not trader.
2.	Details of past experience in Drilling of baffle plates of similar nature including job executed OR under progress, in the last five years from date of issuing enquiry. No exemptions shall be given to MSE /Start up enterprises in technical evaluation of PQR.	PO Copy & Job Completion Certificate/any document mentioning successful completion of Job/mail mentioning Job Completion with Dimension.	Vendor to confirm & provide invoice/ any correlated documents and link PO copy
3.	In house facility of CNC Drilling Machine suitable for Drilling of **CS baffle** of holes	Shall produce the job as per attached drg. no. 11650340920, R-01, drilling procedure & QAP. • Baffles Hole dia. $9.96^{+0.1}$ mm and 16 mm depth (min. or higher) & accommodating Job with Outer Tube Limit (OTL) 1587.7 mm. • Positional accuracy: ±0.1mm(within) • All the holes shall be rounded off to a radius of 1.0-2.0 mm on the both the side.	Vendor to confirm suitability/capability/assurance of machine as per job requirements.
3.1	Make		Vendor to Specify
3.2	Quantity	Minimum 1 No. Machine Required	Vendor to Specify and confirm
3.3	Capacity X Axis(Horizontal)	Minimum 2500 mm.	Vendor to Specify & Confirm
3.4	Capacity Y Axis(Vertical)	Minimum 1800 mm.	Vendor to Specify & confirm
3.5	Capacity Z Axis(Axial)	Minimum 200 mm.	Vendor to Specify & confirm
3.6	Accuracy (Positional & Repetitive)	Positional accuracy: ±0.1mm(within)	Vendor to furnish latest Calibration report.
4.0	Pre-requisite	a. CNC drilling Machine or CNC deep Hole drilling machine.	Vendor to confirm that which machine he will use
		b. Fixture for mounting the job	Vendor to Note
		d. Internal Micrometer for Hole size measurement /dial gauge.	Vendor to confirm
		e. Go-No-Go Gauge	Vendor to confirm
		f. Ligament Gauge	Vendor to confirm

613057/2024/HEP-HCM21100

PRE-QUALIFICATION REQUIREMENT(PQR) FOR BAFFLES PLATE DRILLING OF BARC -34MW Heavy Water Heat Exchanger

Date:28/09/2024

5.0	Certification	All machines and Instruments used should have valid calibration certification by NABL accredited agency.	Vendor to confirm

Note:

a. After satisfactory, fulfilment of the all the above criteria/requirement, offer shall be considered for further evaluation as per NIT and all other terms of the tender.
b. All documentary evidences along with this PQR shall be duly signed and stamped by authorized person.
c. BHEL reserves the right to verify the information submitted by the vendor. In-case any information is found to false or incorrect the offer shall be rejected. Moreover, in later stages after placement of Purchase order if any information given by Vendor found false /incorrect then BHEL may take any action against the vendor as per BHEL policies and guidelines.
d. After successful qualification against PQR, credentials shall be submitted to BHEL/BARC for approval. Consideration for the placement of order is subject to technical compliance of BARC requirement and BARC approval to vendor.
e. BHEL will assumed that vendor has understand & have full clarity of all our technical requirement.

Prepared by	checked by	Approved by
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