

1630351/2023/HEP-ASC34203



## BHARAT HEAVY ELECTRICALS LIMITED - BHOPAL

## MM DEPARTMENT

## ESTIMATE SHEET FOR ISSUE OF MATERIAL/COMPONENTS FROM BHEL

A-FORM NO : A201M33  
REV NO : 0  
A-FORM DATE 09-AUG-23  
DATE : 16-AUG-23  
PAGE : 1 / 2

FORM NO BP-0021

## CHECKLIST

DEPARTMENT : 201 PROJECT : PO NO : A201M33 END PRODUCT : TUBE PLATE  
INDENT NO : 220130202 WORK ORDER NO : 12071S11960 PO DATE : DELY REQD : 30112023  
INDENT DATE : 05082023 MATERIAL ISSUE DIV : 201 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
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DESCRIPTION OF SUB-ASSEMBLY/ITEM &amp; WEIGHT/VOLUME/AREA

## FREE ISSUE MATERIAL PER UNIT OF FINISHED GOODS

MATL CODE	QTY PSL UNIT	PSL UNIT	RATE PSL UNIT	TOTAL MATL TO BE ISSUED	ISSUE PSL/ UNIT WIP	SMIV/ PPMIV NO	MATERIAL VALUE	TARRIF HEAD	MATL ISSUE QTY
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DESCRIPTION OF FREE ISSUE MATERIAL AND WEIGHT /VOLUME/AREA

1	0	1		4.000	NO	201	201	201	
SS CLADDED, MACHINED TUBE PLATE DRG 01681740006									
ST4120718000	1.0000	NO	393590.000	4.00	NO	WIP	1574360.000	1.0000	
TUBE PLATE FORGING AS PER DRAWING NUMBER 21681740017 REV 7 RAW MATERIAL WEIGHT-913 KG APPROX., FINISH WEIGHT-622 KG APPROX.. FOR EACH NO.									
2	0	2		4.000	NO	201	201	201	
SS CLADDED, MACHINED TUBE PLATE DRG 01681740007									
ST4120718018	1.0000	NO	393590.000	4.00	NO	WIP	1574360.000	1.0000	
TUBE PLATE FORGING AS PER DRAWING NUMBER 21681740017 REV 7, RAW MATERIAL WEIGHT-913 KG APPROX., FINISH WEIGHT-622 KG APPROX. FOR EACH NO.									
3	0	3		4.000	NO	201	201	201	
SS CLADDED, MACHINED TUBE PLATE DRG 01681740012									
ST4120718026	1.0000	NO	815710.000	4.00	NO	WIP	3262840.000	1.0000	
TUBE PLATE FORGING AS PER DRAWING NUMBER 21681740037 REV 5, RAW MATERIAL WEIGHT-1897 KG APPROX., FINISH WEIGHT-1363 KG APPROX. FOR EACH NO.									
4	0	4		4.000	NO	201	201	201	
SS CLADDED, MACHINED TUBE PLATE DRG 01681740013									
ST4120718034	1.0000	NO	815710.000	4.00	NO	WIP	3262840.000	1.0000	
TUBE PLATE FORGING AS PER DRAWING NUMBER 21681640037 REV 5, RAW MATERIAL WEIGHT-1897 KG APPROX, FINISH WEIGHT-1363 KG APPROX. FOR EACH NO.									
5	0	1		2.000	NO	201	201	201	
HE4120091040									
MOCK- UP PLATE 200 MM X 200 MM X 110 MM TK	1.0000	NO	50000.000	2.00	NO	WIP	100000.000	1.0000	

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 :-  
4. SCRAP TO BE RETURNED :- NO  
5 INVARIABLY ISSUE WT. TO BE RECORDED ON SMIV/PMIV

SIGNATURE OF INDENTOR

NAME

DESIGNATION

TELEPHONE

SIGNATURE OF ASC EXECUTIVE

NAME

DESIGNATION

TELEPHONE

दिवाकर प्रसाद तिवारी / Diwakar Prasad Tiwari  
उप प्रबंधक / Dy. Manager  
एस. टी. एम. विभाग / S.T.M Division  
बी.एच.ई.एल., भोपाल / B.H.E.L., BHOPAL

RPT-101





FORM NO BP-0021

## BHARAT HEAVY ELECTRICALS LIMITED - BHOPAL

## MM DEPARTMENT

## ESTIMATE SHEET FOR ISSUE OF MATERIAL/COMPONENTS FROM BHEL

## CHECKLIST

A-FORM NO : A201M33

REV NO : 0

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PAGE : 2 / 2

A-SLNO	PO IT NO	PI IT NO	QUANTITY REQUIRED	UNIT	SHOP NO	DEST CD	COST CD	H.CELL
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DESCRIPTION OF SUB-ASSEMBLY/ITEM &amp; WEIGHT/VOLUME/AREA

## FREE ISSUE MATERIAL PER UNIT OF FINISHED GOODS

MATL CODE	QTY PSL UNIT	PSL UNIT	RATE PSL UNIT	TOTAL MATL TO BE ISSUED	ISSUE PSL/ UNIT WIP	SMIV/ PPMIV NO	MATERIAL VALUE	TARRIF HEAD	MATL ISSUE QTY
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DESCRIPTION OF FREE ISSUE MATERIAL AND WEIGHT /VOLUME/AREA

REMARKS CHANGE IN EXISE DUTY PAID FIELD.

TOTAL NO OF CANCEL ITEM 0

AFORM TOTAL 9774400.000

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 :-

4. SCRAP TO BE RETURNED :- NO

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

RPT-101

SIGNATURE OF INDENTOR

NAME

DESIGNATION

TELEPHONE

दिवाकर प्रसाद तिवारी / Diwakar Prasad Tiwari  
उप प्रबंधक / Dy. Manager  
एस. टी. एम. विभाग / S.T.M Division  
बी.एच.ई.एल., भोपाल / B.H.E.L., BHOPAL

SIGNATURE OF ASC EXECUTIVE

NAME


DESIGNATION

TELEPHONE



Additional points to be incorporated in tender for PI 220130202

S. no.	Conditions
1	Mock-up plate shall be issued by BHEL for carrying out operation as per technical <b>annexure A</b> & applicable <b>QA plan</b> . Vendor shall have to collect the same on receipt of order at their own cost. Vendor shall have to lift tube plate forgings from BHEL Bhopal after successful execution of operation of mock-up plate.
2	The mock up plate shall be returned to BHEL along with first supply without tying any commercial value to it.
3	Bidders to note that final welding over lay of 6mm shall be required as per applicable drawing.
4	Scrap generated, if any, to be retained by the vendor free of cost. GST on the scrap generated shall be recovered by BHEL from the bidder.



दिवाकर प्रसाद तिवारी / Diwakar Prasad Tiwari  
उप प्रबंधक / Dy. Manager  
एस्. टी. एम. विभाग / S.T.M Division  
बी.एच.ई.एल., भोपाल / B.H.E.L., BHOPAL



विनीत सुमन / VINEET SUMAN  
प्रबंधक / MANAGER  
एस्. टी. एम. विभाग / STM Division  
बी.एच.ई.एल., भोपाल / B.H.E.L., BHOPAL



**For performing of welding overlay of stainless steel material, machining & drilling on Tube sheet of Tarapur**

The bidder shall produce documentary evidence (wherever called) / confirmation for technical compliance along with their offer against each point.

S. no.	Criteria	Confirmation / Documents required to be submitted in support of claim
1	Bidder to have a valid calibrated PMI tester (calibrated by NABL accredited lab) to ensure chemical composition of undiluted clad surface. In case the tester is not available in-house, same can be outsourced subject to having valid calibration record.	(Yes/No)
2	Bidder to use calibrated UT testing instruments & facility. In case UT facility is not available in-house, name the agency who shall be doing it finally. In any case UT to be done by ISNT / ASNT Level-II while doing UT.	(Yes/No – Name of the agency in case such in-house facility is not available)
3	Bidder to have WPS and PQR of welding overlay of SS on CS material duly approved by any govt. agency	(Yes/No) Vendor to submit such approved WPS and PQR
4	Raw material for SS overlay (as mentioned in drawings in tender) to be procured by the bidder from reputed supplier along-with original co-related TC only. In case original co-related TC is not available along-with the procurement, same requires to be tested at any NABL approved lab duly witnessed by BHEL-IA to ensure its chemical properties meeting the specification requirement (as specified in the WPS & PQR)	(Yes/No)
5	After receipt of order, vendor to demonstrate overlaying procedure using approved WPS & PQR on mock-up plate of size as per ASME Sec. IX. This deposit as per drawing requirement on mock-up plate shall be checked for chemical composition on top surface by PMI Tester.	(Yes/No)
6	Bidder to ensure pure chemistry at a depth of minimum of 2 mm from the top surface of the SS cladding considering the total clad thickness of 6 mm (+1 / -0 mm). Vendor on receipt of order has to demonstrate the same prior to start of cladding process.	(Yes/No)
7	Manufacturers/vendors should have in-house CNC drilling machine having accuracy of drilling as +/- 0.08 mm for tube holes with minimum X-axis travel of 800 mm & Y-axis travel of 800 mm. In case in-house machining & drilling facility is not available, same can be outsourced but the above accuracy has to be maintained.	(Yes/No) - Vendor to submit drilling machine specification mentioning accuracy & table dimension (X & Y axis). In case, machining & drilling is outsourced, bidder to submit name of agencies to whom the operations are outsourced. Bidder to submit agency's drilling machine specification mentioning accuracy & table dimension (X & Y axis).
8	Vendor should have all machine tools & valid calibrated inspection instrument required for carrying out machining work of jobs as per drawing mentioned in tender.	(Yes/No)

Diwakar Tiwari  
3/8/23  
Deputy Manager (STM/PLW)

सुमन / VINEET SUMAN  
प्रबंधक / MANAGER  
एस. टी. एम. विभाग / STM Division  
बी.एच.ई.एल., भोपाल / B.H.E.L., BHOPAL



1630351/2023/HEP-ASC34203

**PRE-QUALIFICATION REQUIREMENT FOR WELDING OVERLAY, MACHINING AND DRILLING ON TUBE PLATES (PI NUMBER - )**

Sl.No.	DESCRIPTION	Requirement	Bidder's Response
1.0	Traders / agents are not allowed to participate	<ul style="list-style-type: none"> <li>Manufacturers/vendors who are owners of at least in house cladding arrangement are allowed to quote.</li> <li>Offers of parties who are traders, authorized dealers and third parties would not be considered.</li> </ul>	YES / NO – bidder to submit statutory document clearly stating they are not trader.
2.0	Experience criteria	<p>Only those vendors who have successfully executed similar operations - i.e.</p> <ul style="list-style-type: none"> <li>minimum 6 mm tk austenitic SS overlay on CS material.</li> <li>and drilling minimum 700 nos of holes of min. dia 25 mm on CS material with minimum job weight of 2 MT &amp; minimum dia 1250 mm.</li> </ul> <p>Above should have been done in at-least 02 different financial years during last 07 years (from the tender opening date), shall be considered for evaluation.</p>	Invoice copies - 2 nos of different Financial years along with drawing / dimension report confirming above. In case drilling operation had been outsourced, invoice copies of that agency is to be submitted.

**Important note:**

- 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.
- All documentary evidences along with this PQR shall be duly signed and stamped by authorized person with name & contact details.
- BHEL reserves the right to verify the information submitted by the vendor. In-case any information is found to be false or incorrect the offer shall be rejected at any stage.
- After successful qualification against PQR, credentials shall be submitted to NPCIL for approval. Consideration for the placement of order is subject to technical compliance of NPCIL requirement and NPCIL approval of vendor.

Prepared by

दिवाकर प्रसाद तिवारी / Diwakar Prasad Tiwari  
उप प्रबंधक / Dy. Manager  
एस. टी. एम. विभाग / S.T.M Division  
बी.एच.ई.एल., भोपाल / B.H.E.L., BHOPAL

Checked by

विनीत सुमन / VINEET SUMAN  
प्रबंधक / MANAGER  
एस. टी. एम. विभाग / STM Division  
बी.एच.ई.एल., भोपाल / B.H.E.L., BHOPAL

Approved by

सुजित कुमार विश्वास / SUJIT KUMAR BISWAS  
अपर महाप्रबंधक / Addl. General Manager  
एस. टी. एम. विभाग / S.T.M. Division  
बी.एच.ई.एल., भोपाल / B.H.E.L., BHOPAL



1630351/2023/HEP-ASC34203



Steam Turbine  
Manufacturing  
BHEL BHOPAL

## QUALITY ASSURANCE PLAN

ASSY. / ITEMS: SS OVERLAY, MACHINING & DRILLING ACTIVITY FOR SS TUBE BUNDLES OF TAPP

CUSTOMER: M/S NUCLEAR POWER CORPORATION

Doc. No.: STM/PLG/TAPP01 Rev.00

Date: 05.08.23

Page: Page 1 of 1

Sl. No.	COMPONENT/ OPERATION	CHARACTERISTICS	TYPE OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENT / ACCEPTANCE NORM	FORMAT OF RECORD	AGENCY			REMARKS
							M	B/BT	N	
1	2	3	4	5	6	7	8			9
1	Material (Forging) receipt verification & identification	For traceability & co-relation	Visual	100%	As per BHEL forging drawing	IR	R	W	-	See note - 1
2	Welding Procedure & Welder Qualification	WPS/PQR/WQR	Visual	100%	As per ASME Sec.-IX	ASME Format	R	R	-	See note - 2
3	SS Overlay material on Mock up plate & Tube plate forgings	Clad material checking	I+Visual	100%	As per drawing	MTC & PMI Report	P	W	-	See note - 7
4	Tube Plate Overlay	DPT on Surface to be Overlaid	Visual	100%	As per Appendix-8 of ASME Sec. VIII Divn.1	IR	P	W	R	
		DPT on Overlaid Surface	Visual	100%	As per Appendix-8 of ASME Sec. VIII Divn.1	IR	P	W	R	
		UT on Overlaid Surface for Bonding Check	I+Visual	100%	As per drawing	IR	P	W	R	
5	Drilling of Tube Plate	Hole size & Ligament	I+Visual	100%	As per BHEL Drawing	IR	P	W	R	Calibrated Gauge
		Finish	I+Visual	100%	As per BHEL Drawing	IR	P	W	R	Calibrated Gauge
6	Tube plate final dimension	OD, Thickness and other dimensions.	I+Visual	100%	As per BHEL Drawing	IR	P	W	R	
7	Identification on final job	For co-relation with TC / IR	Visual	100%	See note - 8	See note - 8	P	W	-	See note - 8

LEGEND: M: MANUFACTURER/ SUB-SUPPLIER, B/BT: BHEL/BHEL APPOINTED TPIA, N: NPCIL P: PERFORM, W: WITNESS, R: DOCUMENTS REVIEW, UT: ULTRASONIC TESTING, DPT: DYE PENETRANT TESTING, MPT: MAGNETIC PARTICLE TESTING, TC: TEST CERTIFICATE, IR: INSPECTION REPORT, I: INSPECTION USING INSTRUMENT.

### Notes:

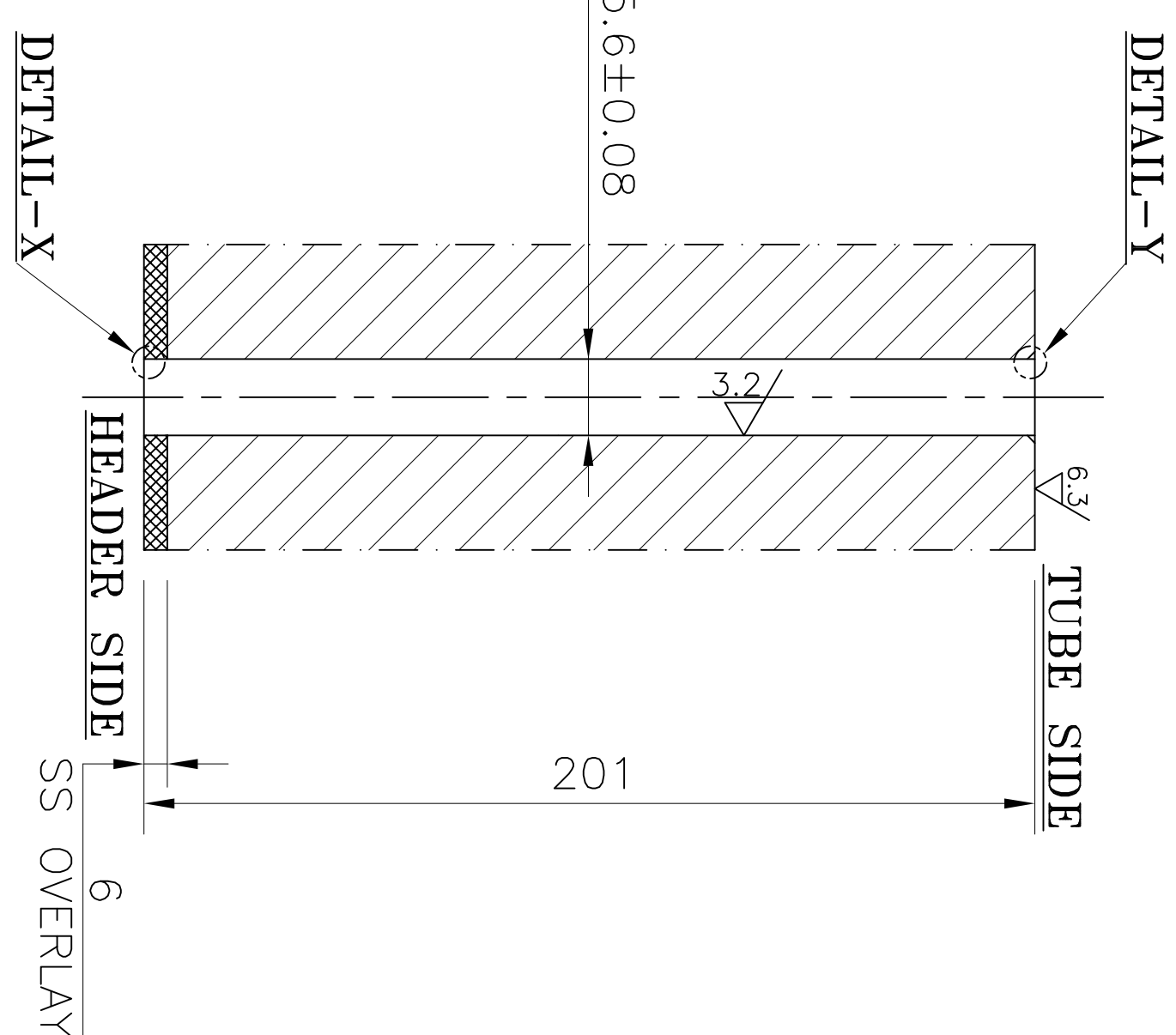
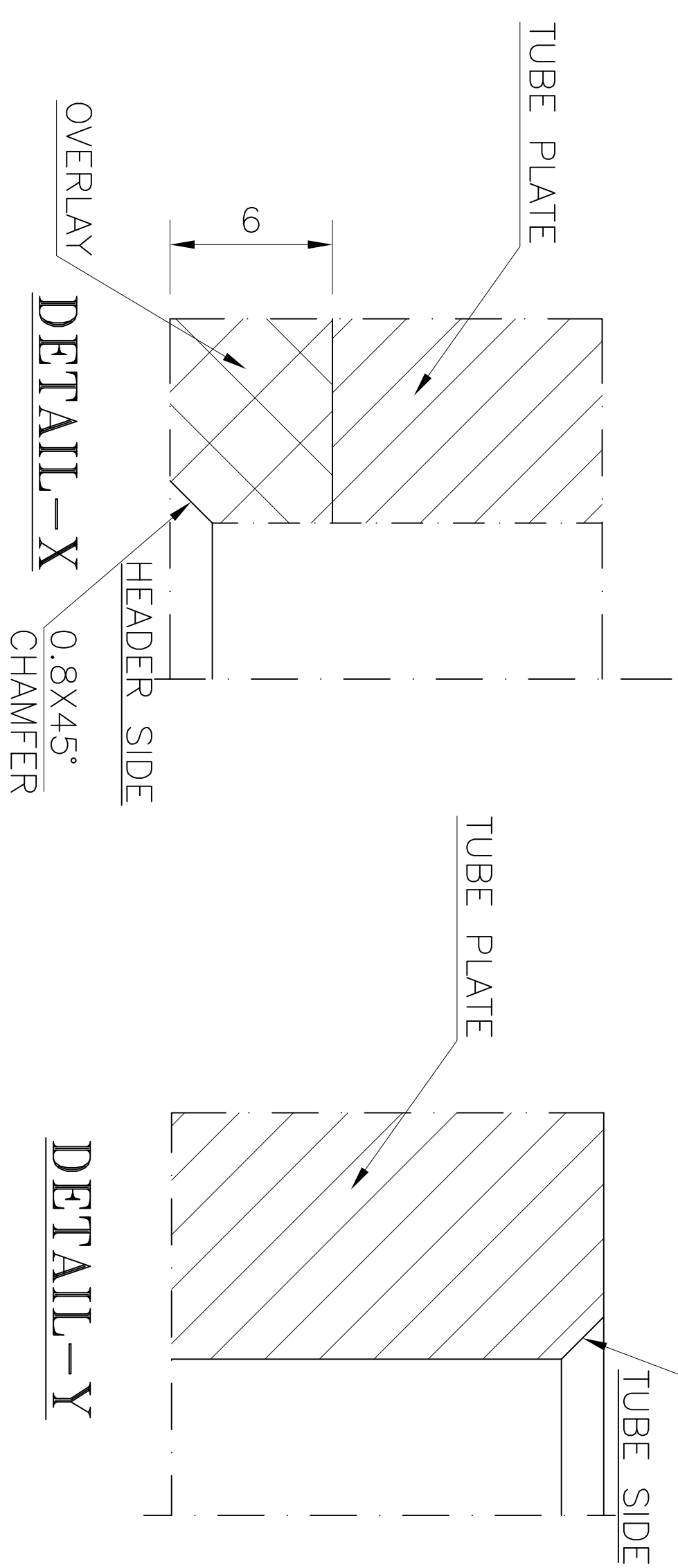
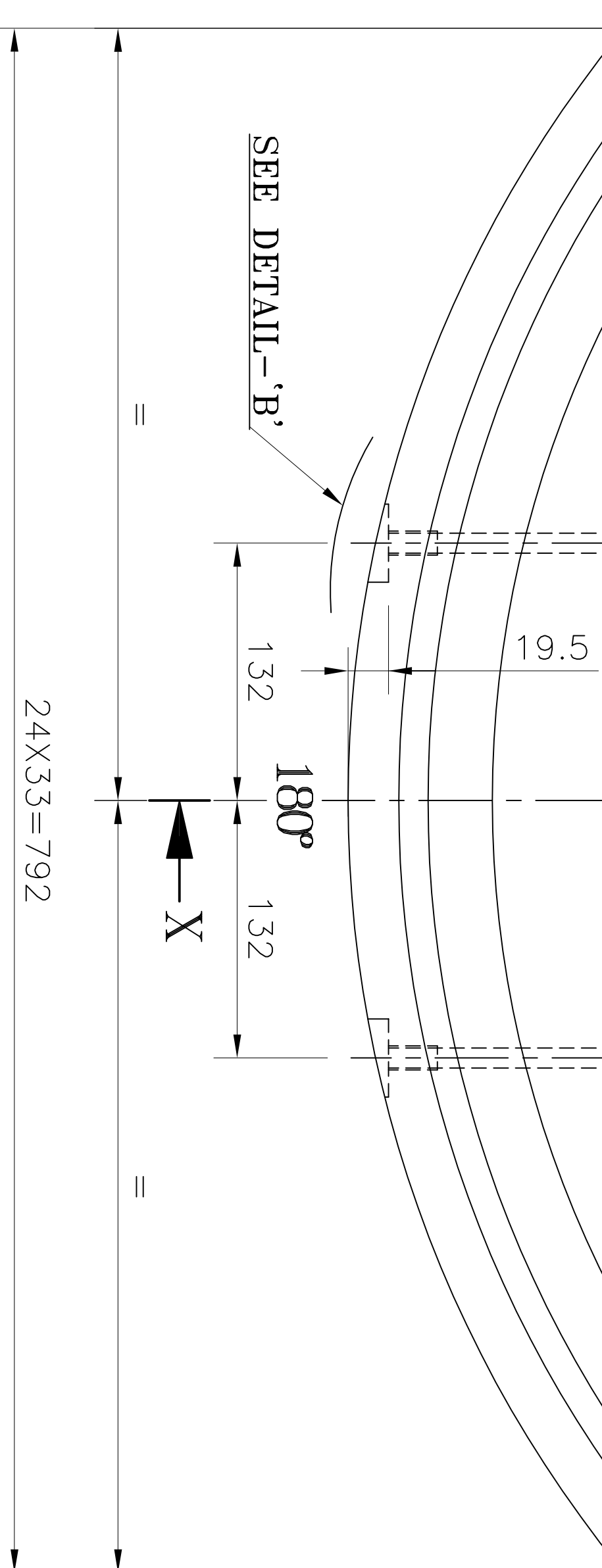
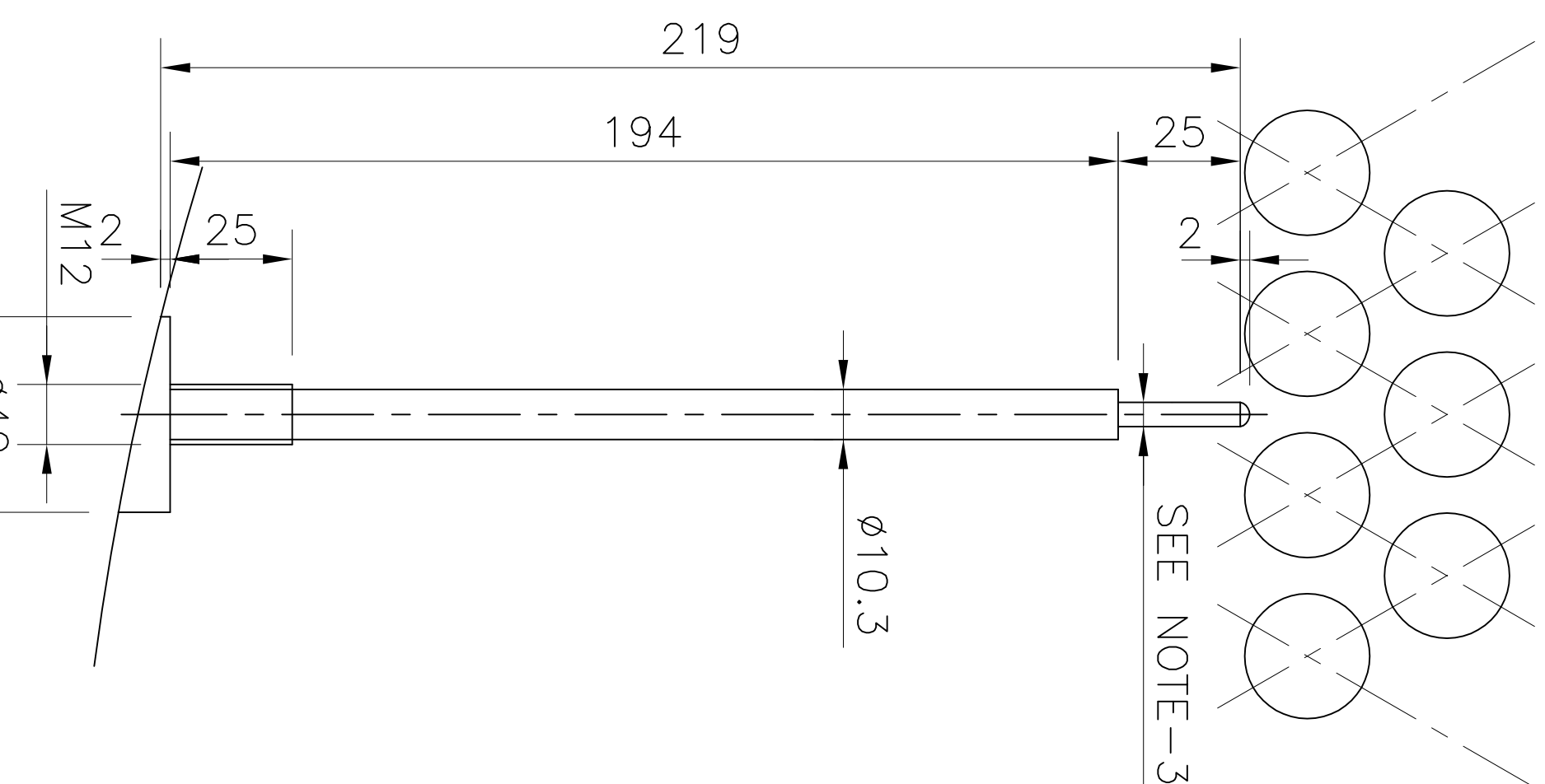
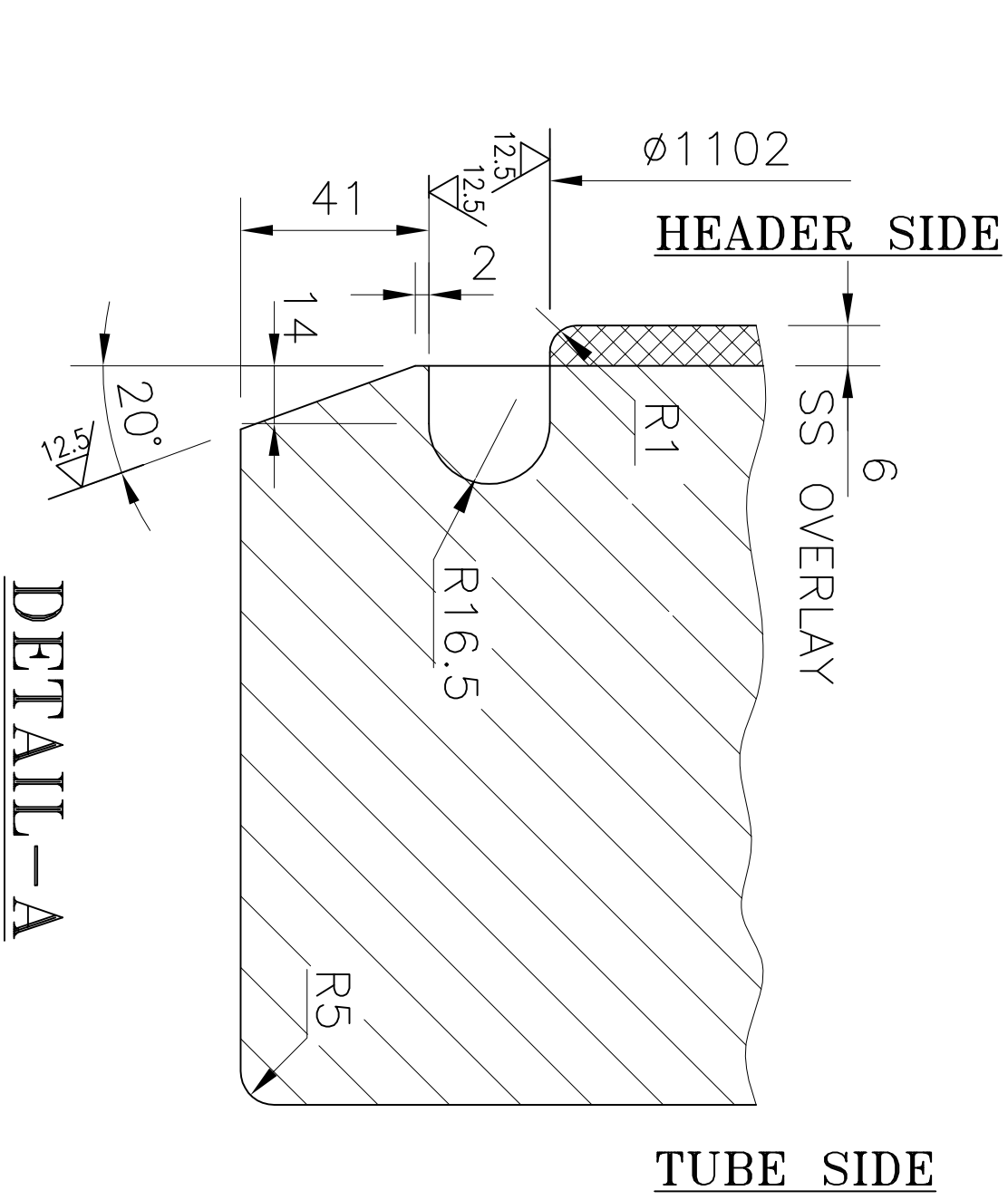
- (1) BHEL / TPIA to verify receipt of material (forgings) at vendor works as per identification marked on OD of forging as per BHEL drawing.
- (2) If WPS/PQR/WQR is already qualified earlier, same shall be submitted to BHEL & customer (NPCIL).
- (3) During manufacturing, only latest revision of drawings / specifications / codes shall be used.
- (4) During inspection only qualified personnel (NDT & welder) shall be employed. NDT person should be Level-II duly certified by ISNT / ASNT.
- (5) Only calibrated Instruments / Gauges / etc. (i.e. with valid NABL calibration record) shall be used during inspection.
- (6) All documents to be submitted with index sheet QAP clause wise.
- (7) MTC to be properly co-related with the actual material as received. In case original co-related MTC is not available, testing to be carried out at any NABL accredited lab duly witnessed by BHEL-TPIA.
- (8) Vendor to mark PO number along with PO item number and sl.no. of item in PO on the OD of the final job. BHEL / TPIA shall check the same for co-relation with TC / IR.
- (9) All instruments should have calibration record (duly calibrated by NABL lab / accredited agency).

Diwakar Tiwari  
Dy Mgr STM

Vinod Sharma  
Mgr STM

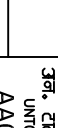
Signature of  
S.K. Bhatnagar  
05.08.23  
AGM-STM



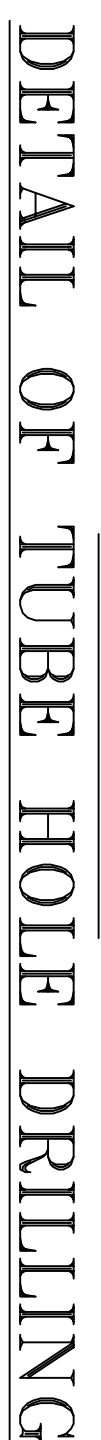
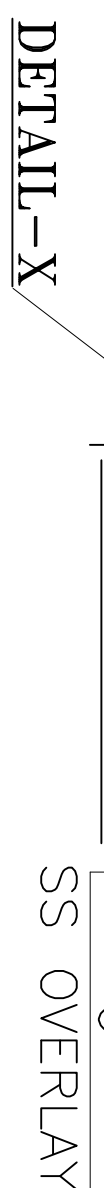
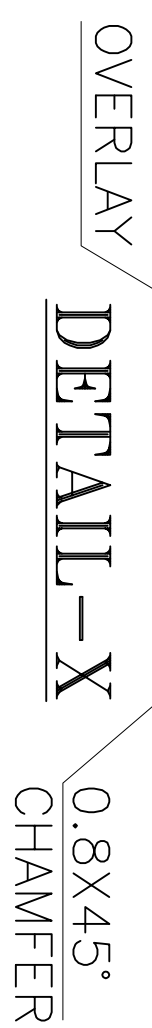
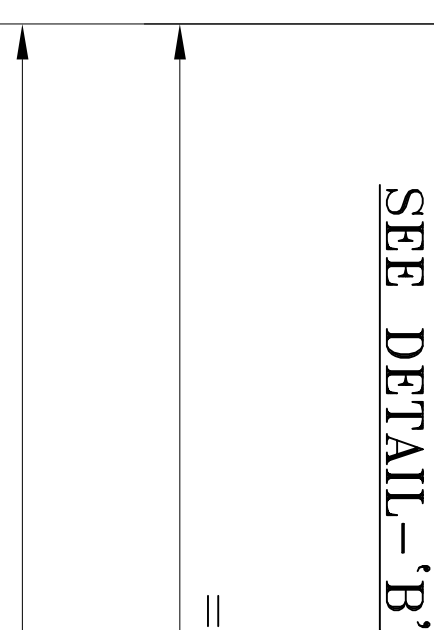
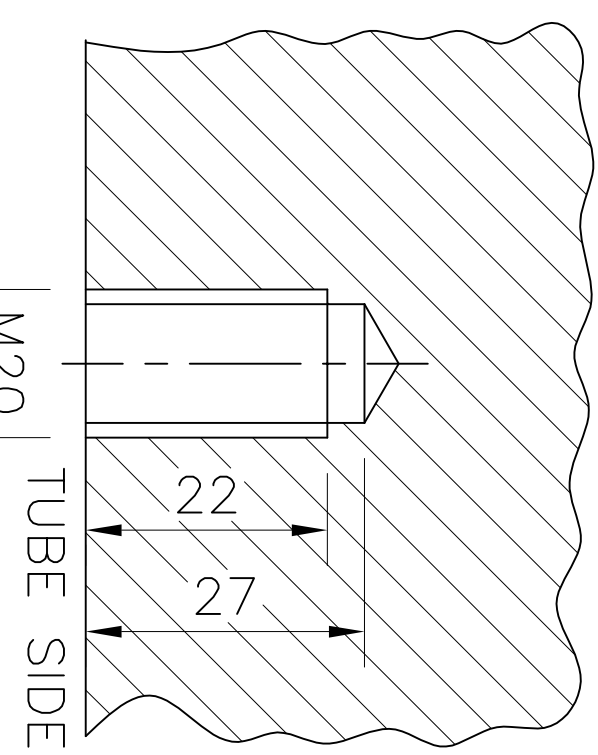
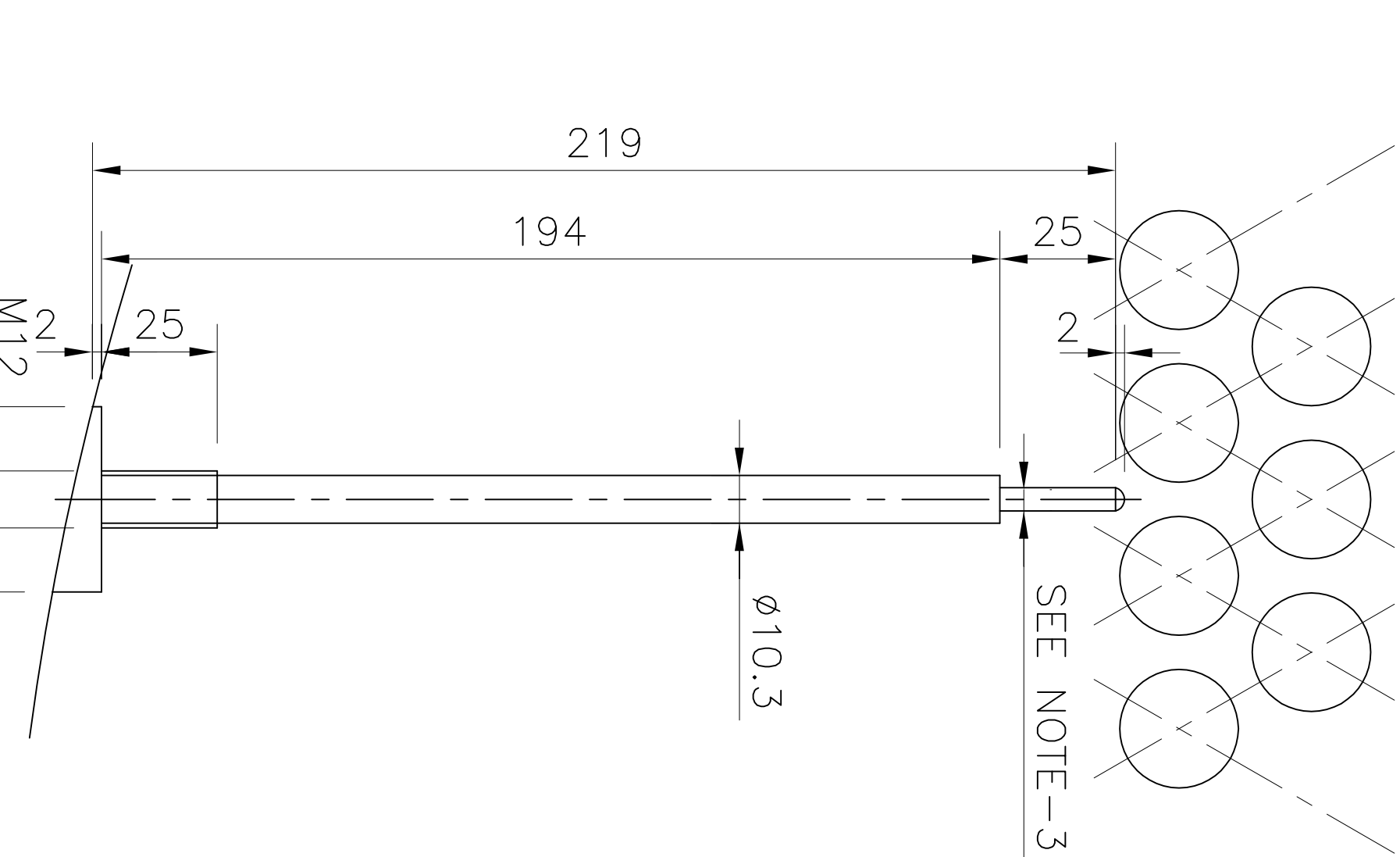
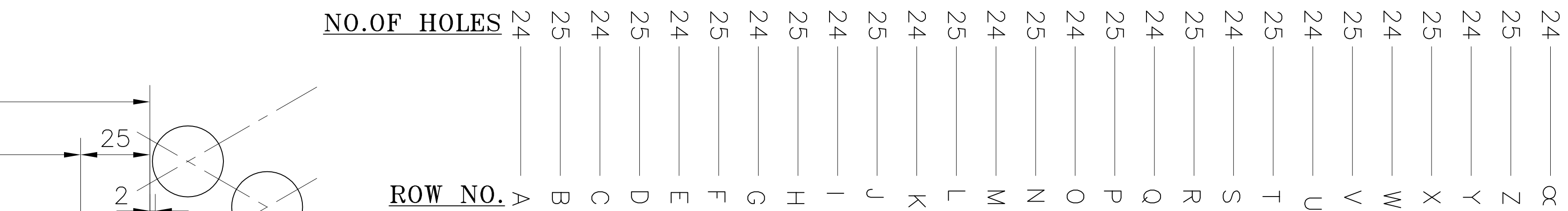


1. FOR TUBE PLATE OVERLAY, REFER DRAWING NO. 3-168116-40047 FOR K&P-3&4 AND ONGOING PROJECTS.
2. 168116-40037 FOR T&P-3&4 ONLY.
3. SPECIAL CARE REQUIRED FOR DRILLING OF DIA-10.3 HOLE TO AVOID BREAKING INTO TUBE HOLES.
4. DIA-5 FOR IARAPU-3&4, DIA-6.5 FOR REST OF THE PROJECTS.

TOOL LIST		
ITEM NO.	TOOL NO.	DESCRIPTION
001	1421636	PLAN PLUG GAUGE FOR Ø25.6±0.08
—001	1421604	FORM TOOL FOR RADIUS 25
—001	1421605	FORM TOOL FOR RADIUS 8
001	1421599	GUN DRILL DIA 25.58
001	1421600	GUN DRILL BUSH DIA 25.58
001	1421602	GUN DRILL DIA 10.3
001	1421601	SPECIAL DRILL SIZE 5.0 DIA 45MM WORKING LENGTH SHANK PORTION -10 DIA-315 LONG & 6 DIA. 50 LONG FOR HOLDING THE CHUCK
001	1421603	GUN DRILL BUSH DIA 10.3
001	1421684	PITCH PLATE FOR GUN DRILLING MACHINE(33X60")
001	1421685	ROUGHING REAMER FOR Ø25.6
001	1421686	LIGAMENT GAUGE 33MM PITCH.
001	1421687	RADIUS TOOL R5(L.H.)
001	1421688	UPPER LIMIT OF THE HOLE 25.85 DIA FOR PROCURING TOOL FOR RECTIFICATION
001	1421689	FORM TOOL FOR RADIUS 20" X 36 LONG
001	1421690	TAPER SHANK END MILL Ø40
001	1581032	COPING TEMPLATE FOR 20" CHAMFER
001	1581747	CHECKING TEMPLATE FOR RADIUS 25 GROOVE.

ADDITIONAL INFORMATION										3-year warranty on parts and labor provided on an "as-is" basis.										MSR FOR 500/700MTW									
STATUS OF DRAWING										DATE OF CONSTRUCTION																			
Distribution of PRINTS										 Baker Hughes International, Ltd. Special																			
FORM 4										100% of 2nd Party Prints 100% of 3rd Party Prints																			
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FORM 4										100% of 104th Party Prints 100% of 105th Party Prints																			
FORM 4										100% of 106th Party Prints 100% of 107th Party Prints																			



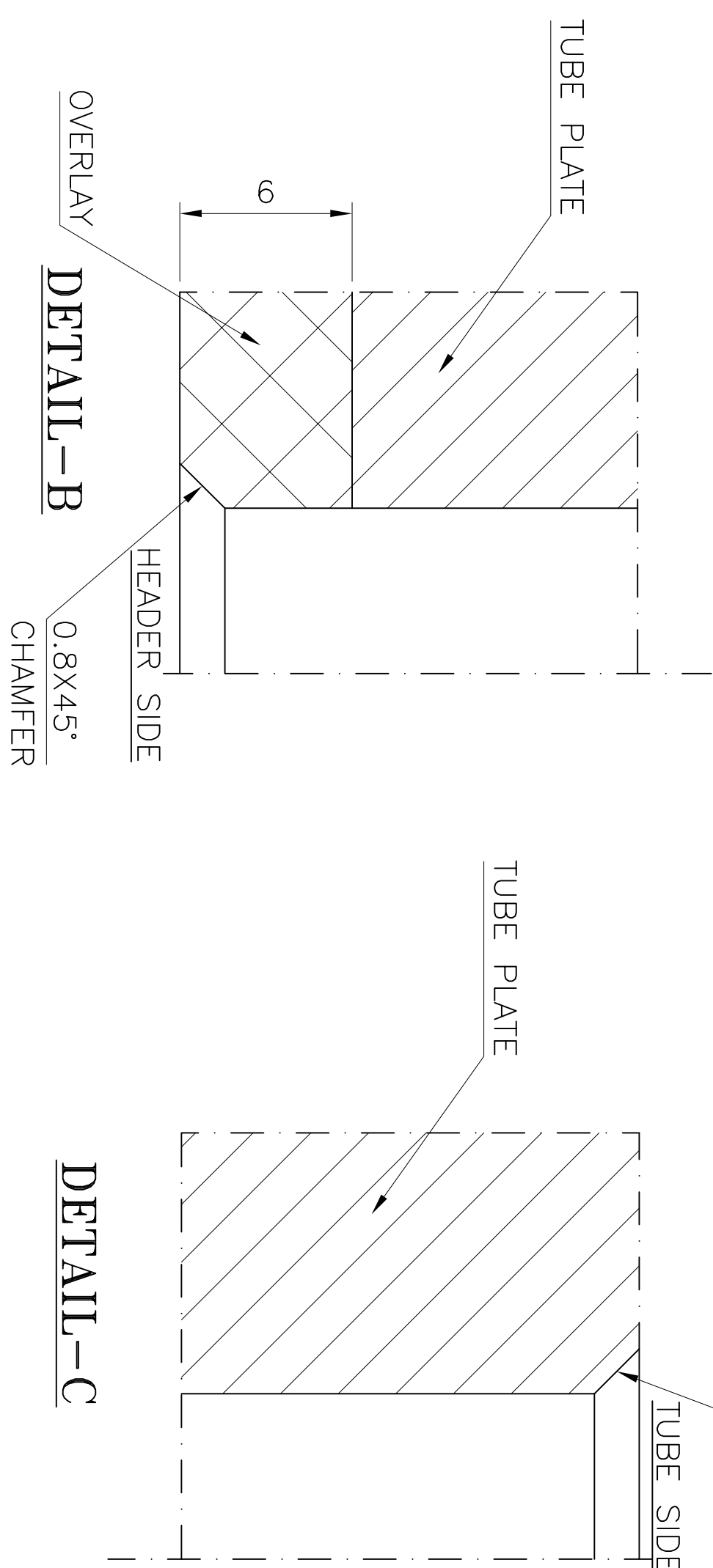
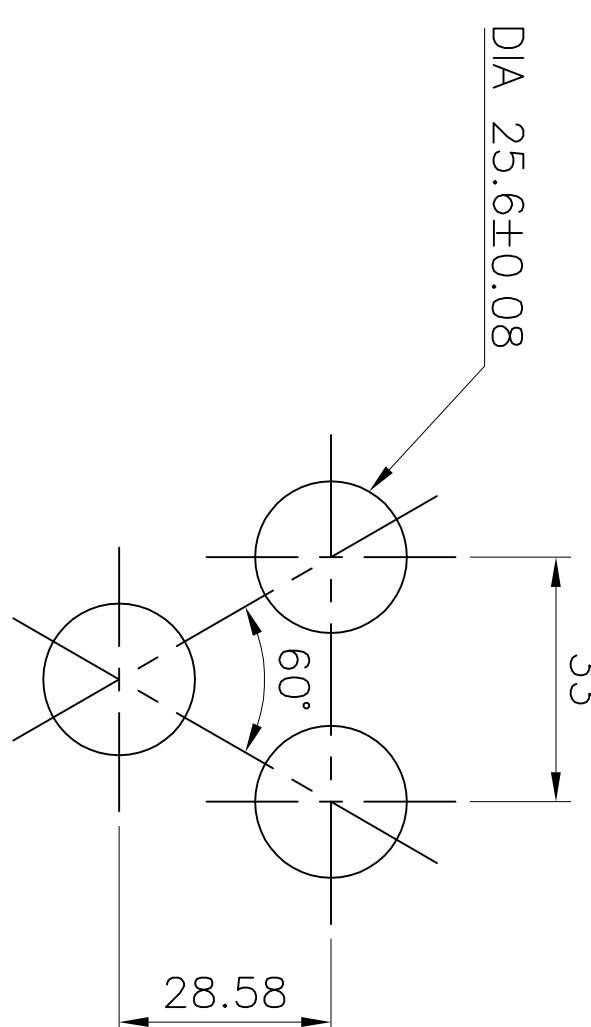
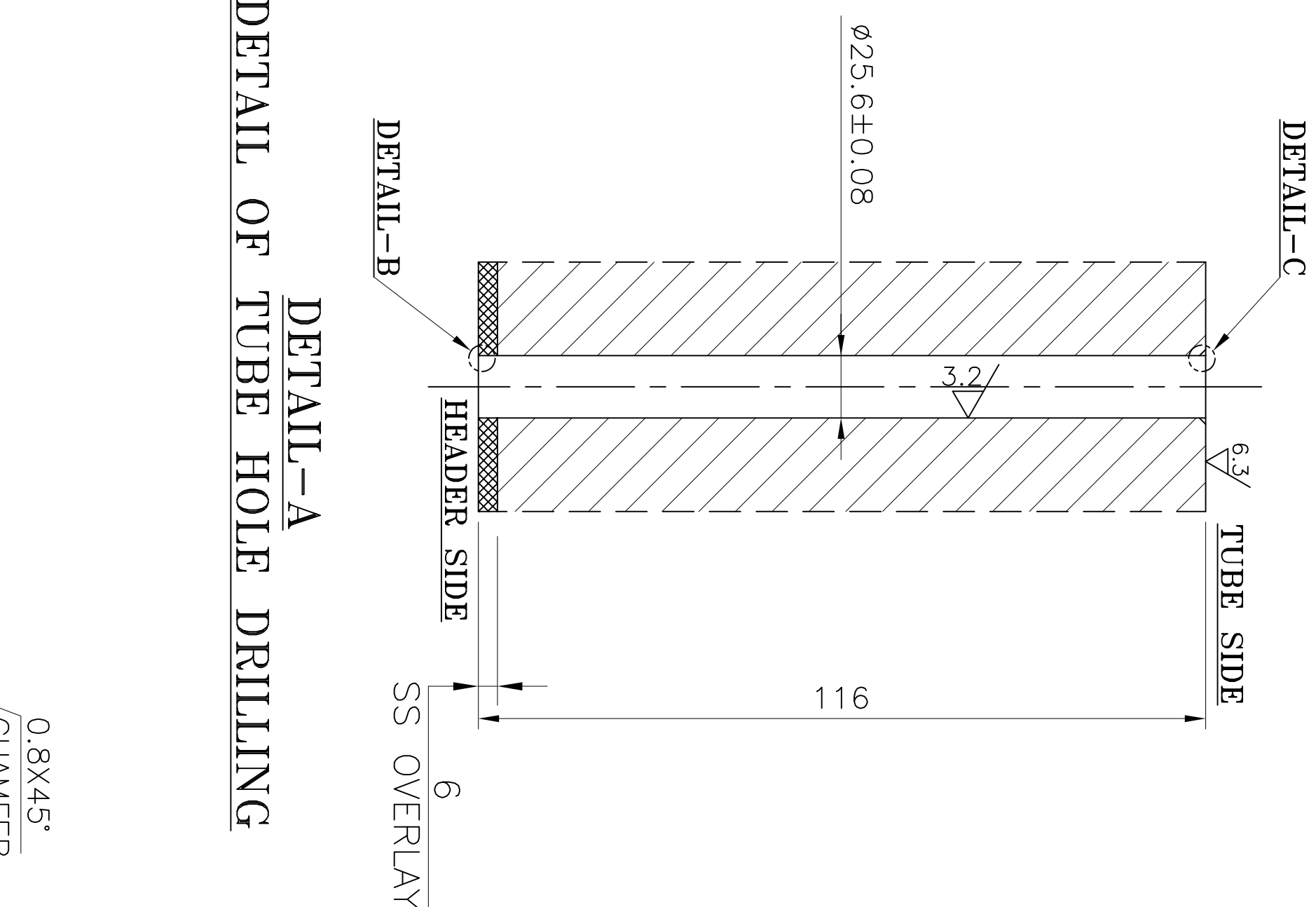


3. DIA-5 FOR TARAPUR-3&4, DIA-6.5 FOR REST OF THE PROJECTS.

NOTES:—

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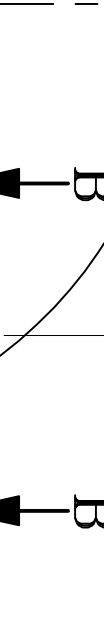
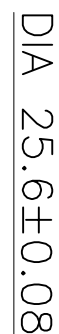
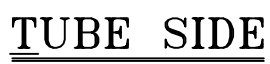
TUBE HOLE PITCHING  
DETAIL-P

TOOL LIST	
ITEM NO.	TOOL NO.
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001	1581582
001	1421599
001	1421600
001	1421636
001	1421684
001	1421685
001	1421686
001	1421687
001	1421688
001	1421691
001	1581031
001	1581746

- NOTES:-**
1. FOR TUBE PLATE OVERLAY, REFER DRAWING NO. 3-16817-40031 FOR KAP-3&4 AND ONGOING PROJECTS.
  2. FOR TUBE PLATE FORGING REFER DRG. NO. 2-16817-40017 FOR TAP-3&4 ONLY.
  3. SPECIAL CARE REQUIRED FOR DRILLING OF DIA=10.3 HOLE TO AVOID BREAKING INTO TUBE HOLES.
  4. DIA=5 FOR TAP-3&4 DIA=6 FOR REST OF THE PROJECTS.
  5. MINIMUM LIGAMENT TO BE 6.3MM.

[illegible]





NOTES:-

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THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED  
IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

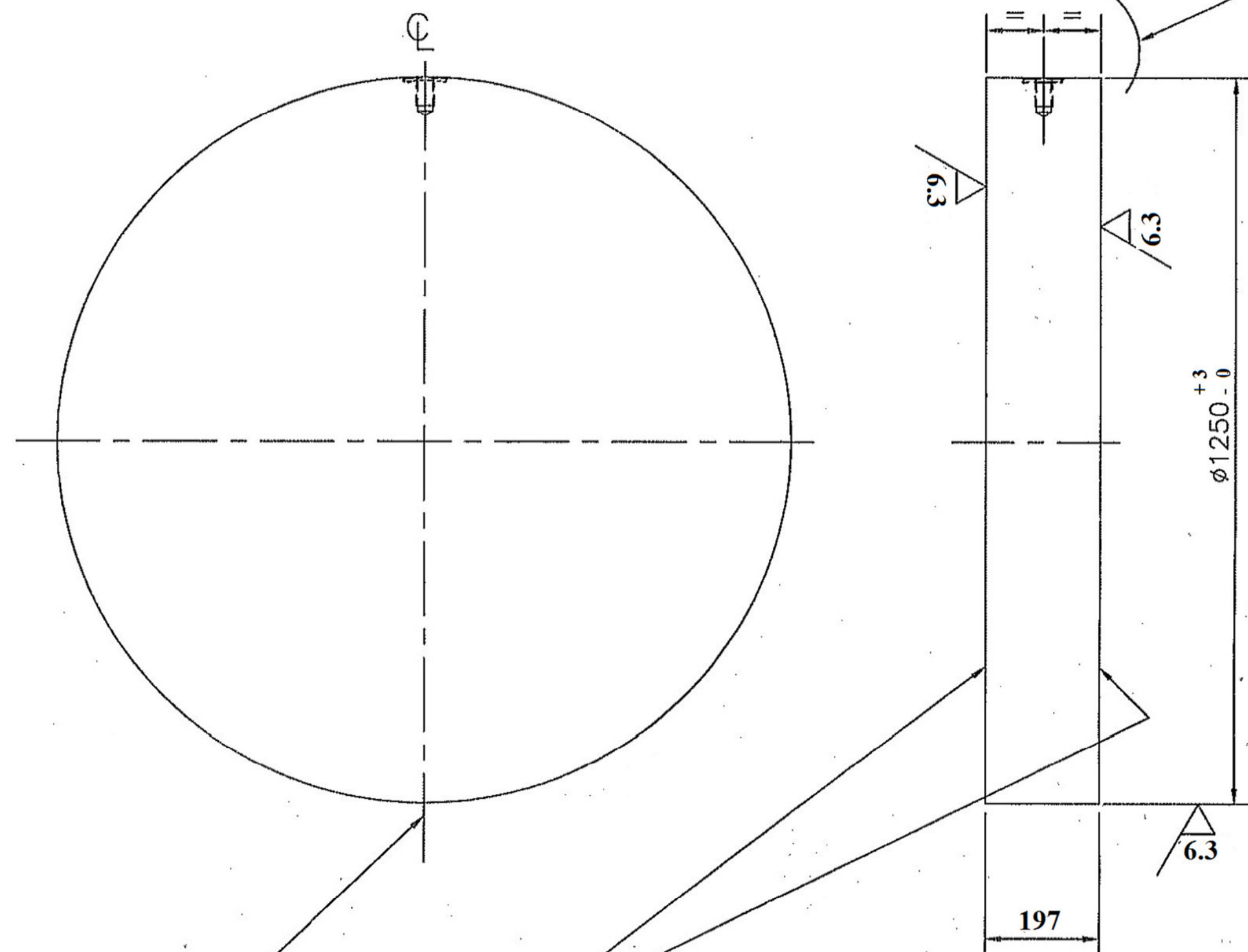


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FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN mm

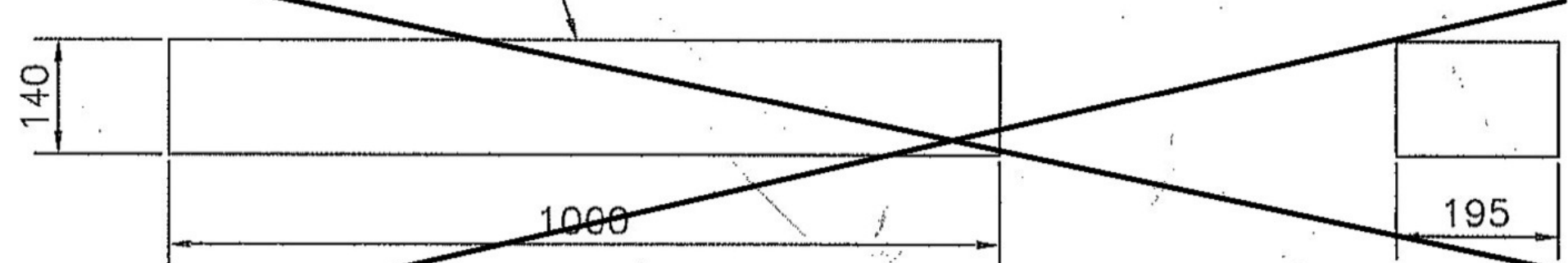
DRG. NO. 21681640037



PURCHASE FORGING NO.  
TO BE STAMPED HERE

**IMPORTANT:-**  
MACHINE FACE PARALLEL  
TO EACH OTHER AND  
PERPENDICULAR TO O.D.  
FACE.

**DETAIL OF ITEM NO. 01**



**DETAIL OF ITEM NO. 02**

**NOTES:-**

1. ALL TECHNICAL AND TESTING REQUIREMENTS SHALL BE AS PER THE MATERIAL SPECIFICATION SA266 Gr.2 TO ASME SEC.II PART-A; LATEST.
2. TEST PIECE FOR MECHANICAL AND CHEMICAL TESTING SHALL BE INTEGRAL WITH THE BASE MATERIAL AND SHALL BE AS PER THE MATERIAL SPECIFICATION ONLY.  
TEST PIECE SHALL BE OF SAME HEAT LOT AND FORGED IN THE SAME MANNER.
3. TEMPORARY RUST PREVENTIVE TO BE APPLIED AFTER MACHINING OF TUBE PLATE FORGING
4. INSPECTION BY M/S BHEL IA AND M/S NPCIL AS PER THE APPROVED QA PLAN.
5. FOR DETAIL QUALITY REQUIREMENTS, BHEL APPROVED QAP TO BE FOLLOWED IN CASE OF CONFLICTS BETWEEN THIS DRAWING AND QAP, BHEL APPROVED QAP SHALL GOVERN FINALLY.

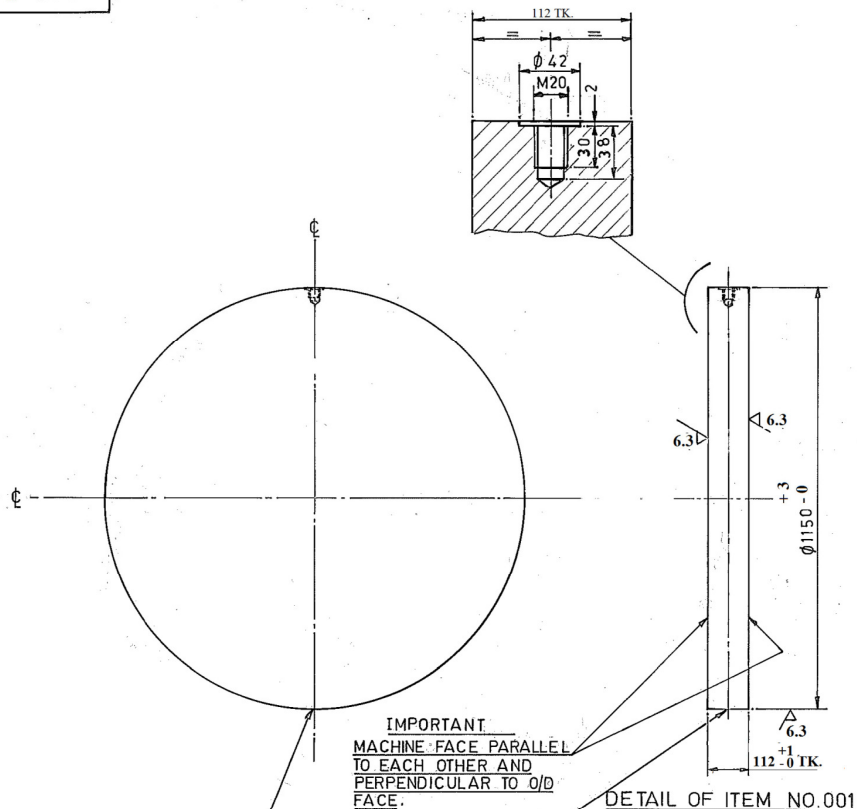
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01 1250 001		TUBE PLATE FORGING 197 TK.		SA266 Gr.2		1897.00	
VAR00	REMARKS	VAR NO.	ITEM NO.	DESCRIPTION	DRAWING NO.	UNIT	QTY.
28 CARD TYPE-3				28 CARD TYPE-1			
28 CARD TYPE-2				28 CARD TYPE-2			
ADDITIONAL INFORMATION W.O.NO. 18199-A-112-30 18200-A-154-59				MSR FOR 500/700MW			
STATUS OF DRAWING DISTRIBUTION OF PRINTS OC-1, HCM-4, FBM-4 STM-4				भारत हेवी इलेक्ट्रिकल्स लिमिटेड भोपाल BHARAT HEAVY ELECTRICALS LTD. BHOPAL			
REVISIONS REV. DATE ALTERED BY CHECKED BY 05 14.02.23 APPROVED BS YADAV LASNANI 04 16.03.13 APPROVED MLC SKB 03 06.09.12 APPROVED -SD/- 02 12.04.12 APPROVED -SD/- 01 10.3.99 APPROVED -SD/-				REVISIONS REV. DATE ALTERED BY CHECKED BY 05 14.02.23 APPROVED BS YADAV LASNANI 04 16.03.13 APPROVED MLC SKB 03 06.09.12 APPROVED -SD/- 02 12.04.12 APPROVED -SD/- 01 10.3.99 APPROVED -SD/-			
NOTE-1 MODIFIED.				NOTE - 5 ADDED AS NEW. DRG. REVISED & REDRAWN.			
NOTES MODIFIED. ITEM-02 DELETED.				MATERIAL WAS SA105N.			
DRAWING REDRAWN.				TUBE PLATE FORGING ( LIVE STEAM )			
TUBE PLATE FORGING ( LIVE STEAM )				TUBE PLATE FORGING ( LIVE STEAM )			



FIRST ANGLE PROJECTION

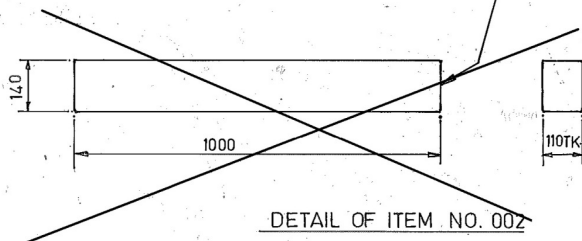
(ALL DIMENSIONS ARE IN mm.)

DRG. NO. 2-16817-40017



NOTES:-

1. ALL TECHNICAL AND TESTING REQUIREMENTS SHALL BE AS PER THE MATERIAL SPECIFICATION SA266 Gr.2 TO ASME SEC.II PART-A;LATEST.
2. TEST PIECE FOR MECHANICAL AND CHEMICAL TESTING SHALL BE INTEGRAL WITH THE BASE MATERIAL AND SHALL BE AS PER THE MATERIAL SPECIFICATION ONLY.  
TEST PIECE SHALL BE OF SAME HEAT LOT AND FORGED IN THE SAME MANNER.
3. TEMPORARY RUST PREVENTIVE TO BE APPLIED AFTER MACHINING OF TUBE PLATE FORGING
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5. FOR DETAIL QUALITY REQUIREMENTS, BHEL APPROVED QAP TO BE FOLLOWED IN CASE OF CONFLICTS BETWEEN THIS DRAWING AND QAP, BHEL APPROVED QAP SHALL GOVERN FINALLY.



MM	PROCEDURE TEST	B.O.	122.00
1400 X 1000	002 BLOCK	SA266 GR 2	
01	001 TUBE PLATE FORGING	B.O.	913.00
	112 K.	SA266 GR.2	
VAR 00	REMARKS	DESCRIPTION	DRAWING NO.

ADDITIONAL INFORMATION

STATUS OF DRAWING  
W.O.

DISTRIBUTION OF PRINTS  
OC-1  
HCM-4

TYPE OF PRODUCT  
OR  
NAME OF CUSTOMER/PROJECT

M.S.R. FOR 500/700 MW

**BHARAT HEAVY ELECTRICALS LIMITED**  
**BHOPAL**

DRN. MLT NAME *Shri* DATE *8-1-90*  
CHD. SSM  
APPD. RCI

DEPT. CDE  
CODE 411

GRADE OF UN. TOL. DIM.C/M/F  
SCALE 1:10

WEIGHT (Kg.)  
REF. TO ASSY. DRG.

TITLE  
TUBE PLATE FORGING  
(BLED STEAM)

CARD CODE  
DRAWING NO.  
2-16817-40017

REV	DATE	ALTERED	MLC	REV	DATE	ALTERED	MLC	REV	DATE	ALTERED	MLC	REV	DATE	ALTERED	MLC
07	14.02.23	CHECKED APPROVED	BS VADAV L ASNANI	06	16.03.13	CHECKED APPROVED	MLC SKB	07	14.02.23	CHECKED APPROVED	BS VADAV L ASNANI	06	16.03.13	CHECKED APPROVED	MLC SKB
NOTE-1 MODIFIED.								NOTE - 5 ADDED AS NEW. DRG. REVISED & REDRAWN							

REV	DATE	ALTERED	MLC	REV	DATE	ALTERED	MLC	REV	DATE	ALTERED	MLC	REV	DATE	ALTERED	MLC	
05	28.01.13	CHECKED	SKB	04	06.09.12	CHECKED	SKB	03	31.03.12	CHECKED	MLT	02	20.4.92	CHECKED	MLT	
F-6	DIM. 112 WAS 110 IN SECT. VIEW.				NOTES MODIFIED, ITEM-02 DELETED				NOTE NOS. 2 AND 3 DELETED, NOTE 5 MODIFIED.				NOTE NOS. 2 AND 3 DELETED, NOTE 5 MODIFIED.			

Arrow marking for stamping  
forging no. corrected.



24004-91891-3 DN GRD

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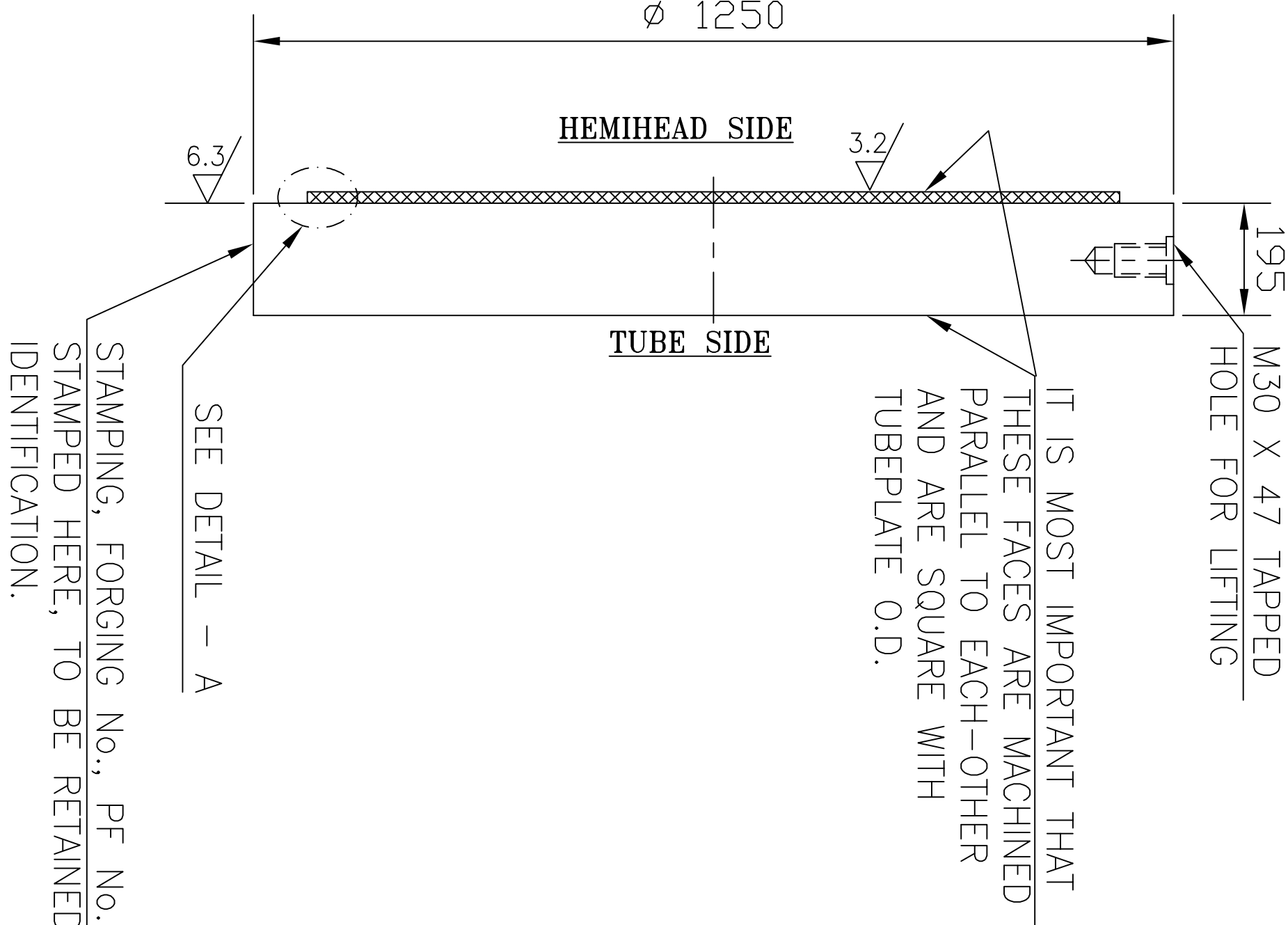
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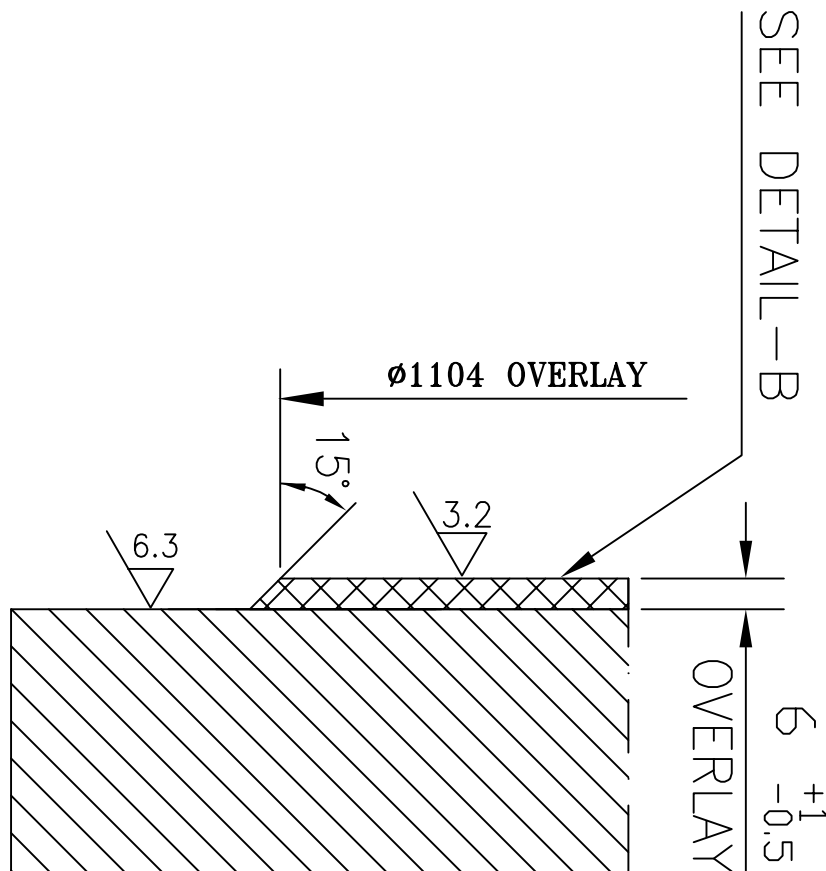
8

TECHNICAL REQUIREMENTS (TR)

- OVERLAY SHALL BE DONE USING STAINLESS STEEL ELECTRODE ER 309L FOR FIRST LAYER AND ER 308L FOR SUBSEQUENT LAYERS AS SHOWN IN DETAIL-B. FOR OVERLAY FOLLOW APPROVED PROCEDURES.
- WELD OVERLAY TO BE CHECKED BY ULTRASONIC EXAMINATION. ACCEPTANCE STANDARD FOR ULTRASONIC EXAMINATION: CALIBRATION TO BE DONE BY 3 mm DIA. HOLE AND SIGNAL LEVEL TO BE ADJUSTED TO 75% HEIGHT OF C. R. I. SCREEN. INDICATIONS GREATER THAN REFERENCE SIGNALS ARE NOT ACCEPTABLE.
- AFTER OVERLAY DEPOSIT ON TUBE PLATE TO BE CHECKED BY D.P. TEST AS PER APPENDIX-8 OF ASME SEC.VIII DIV.1;2010 A11.
- MACHINING OF WELD DEPOSIT TO BE DONE AFTER OVERLAYING. FURTHER MACHINING SHALL BE DONE AS PER M/C-ING DRAWING.
- ALL MACHINED SURFACE (EXCL. OVERLAY SURFACE) TO BE PROTECTED BY APPLYING ONE COAT OF RUST INHIBITIVE OIL TO AA 55153.

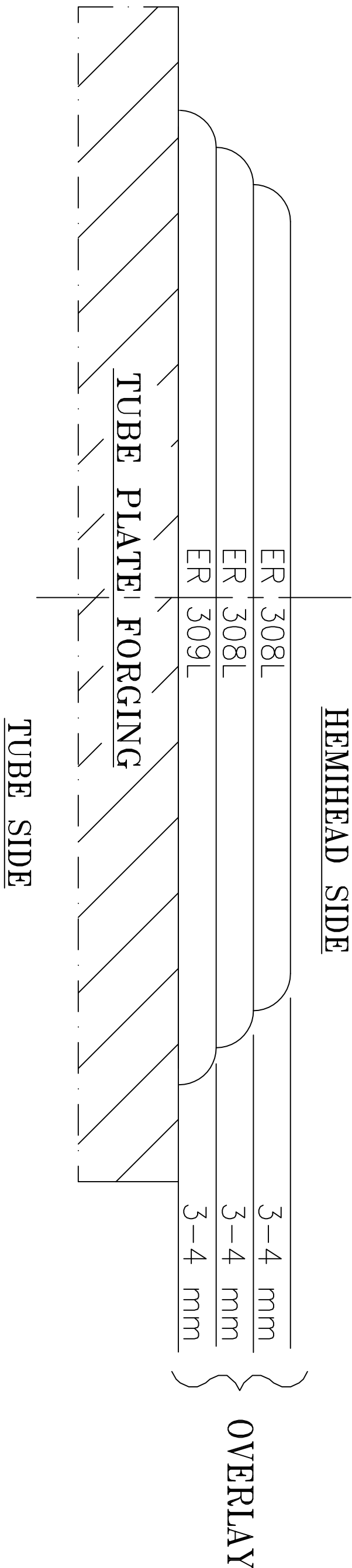


STAMPING, FORGING No., PF No.etc.  
STAMPED HERE, TO BE RETAINED FOR  
IDENTIFICATION.



DETAIL -A

M/C AFTER OVERLAY



DETAIL -B

3-17551-40167

INVENTORY NO. SIGN AND DATE

KORTPO180

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#### 4.0 INDICATIONS ON DRAWINGS:

If general tolerances in accordance with this standard shall apply, the following information shall be indicated.

Example: AA0230208 m

#### 5.0 REJECTION

Unless otherwise stated, work pieces exceeding the general tolerance shall not lead to automatic rejection provided that the ability of the work piece to function is not impaired (see clause A4).

#### 6.0 NOTE:

6.1 For “permissible deviations for Un-toleranced dimensions of castings” refer AA0230402.

6.2 For “Tolerances and machining allowances for flame cutting” refer AA0621101.

6.3 For “General tolerances for welding construction for length and angles” refer AA0621104.

6.4 For “General tolerances for welded structures form and position” refer AA0621105.

**Table 1 – Permissible deviations for linear dimensions except for broken edges**  
(external radii and chamfer heights, see table 2)

Values in millimetres

Tolerance class		Permissible deviations for basic size range							
		0.5 <sup>1)</sup> Up to 3	Over 3 Up to 6	Over 6 Up to 30	Over 30 Up to 120	Over 120 Up to 400	Over 400 Up to 1000	Over 1000 Up to 2000	Over 2000 Up to 4000
Designation	Description								
f	Fine	±0.05	±0.05	±0.1	±0.15	±0.2	±0.3	±0.5	-
m	Medium	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±2
c	Coarse	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±4
v	Very coarse	-	±0.5	±1	±1.5	±2.5	±4	±6	±8

1) For nominal sizes below 0.5 mm, the deviations shall be indicated adjacent to the relevant nominal size(s).

**Table 2 – Permissible deviations for broken edges** (external radii and chamfer heights)

Values in millimetres

Tolerance class		Permissible deviations for basic size range		
		0.5 <sup>1)</sup> up to 3	Over 3 up to 6	Over 6
Designation	Description			
f	fine	±0.2	±0.5	±1
m	medium			
c	coarse	±0.4	±1	±2
v	very coarse			

1) For nominal sizes below 0.5 mm, the deviations shall be indicated adjacent to the relevant nominal size(s)

**Table 3 – Permissible deviations of angular dimensions**

Tolerance class		Permissible deviations for ranges of lengths, in millimetres, of the shorter side of the angle concerned				
		Up to 10	Over 10 Up to 50	Over 50 Up to 120	Over 120 Up to 400	Over 400
Designation	Description					
f	fine	±1°	±0°30'	±0°20'	±0°10'	±0.5'
m	medium					
c	coarse	±1°30'	±1°	±0°30'	±0°15'	±0°10'
v	very coarse	±3°	±2°	±1°	±0°30'	±0°20'



## Annex A (informative)

### Concepts behind general tolerancing of linear and angular dimensions

A.1 General tolerances should be indicated on the drawing by reference to this standard in accordance with clause 4.

The values of general tolerances correspond to tolerance classes of customary workshop accuracy, the appropriate tolerance class being selected and indicated on the drawing according to the requirement of the components.

A.2 Above certain tolerance values, there is usually no gain in manufacturing economy by enlarging the tolerance. For example, a feature having a 35 mm diameter could be manufactured to a high level of conformance in a workshop with “customary medium accuracy”. Specifying a tolerance of  $\pm 1$  mm would be of not benefit in this particular workshop, as the general tolerance values of  $\pm 0.3$  mm would be quite adequate.

However, if, for functional reasons, a feature requires a smaller tolerance value than the general tolerance values, these should not be indicated adjacent to the dimension but should be stated on the drawing as described in clause 4. This type of tolerance allows full use of the concept of general tolerancing.

There will be “exceptions to the rule” where the function of the feature allows a larger tolerance than the general tolerances, and the larger tolerance will provide manufacturing economy. In these special cases, the larger tolerance should be indicated individually adjacent to the dimension for the particular feature, e.g. the depth of blind holes drilled at assembly.

A.3 Using general tolerances leads to the following advantages:

- drawings are easier to read and thus communication is made more effective to the user of the drawing;
- The design draughtsman saves time by avoiding detailed tolerance calculations as it is sufficient to know that the function allows a tolerance greater than or equal to the general tolerance;
- The drawing readily indicates which feature can be produced by normal process

capability, which also assists quality engineering by reducing inspection levels;

- Those dimensions remaining, which have individually indicated tolerances, will, for the most part, be those controlling features for which the function requires relatively small tolerances and which therefore may require special effort in the production – this will be helpful for production planning and will assist quality control services in their analysis of inspection requirements;
- Purchase and sub-contract supply engineers can negotiate orders more readily since the “customary workshop accuracy” is known before the contract is placed; this also avoids arguments on delivery between the buyer and supplier, since in this respect the drawing is complete.

These advantages are fully obtained only when there is sufficient reliability that the general tolerances will not be exceeded, i.e. when the customary workshop accuracy of the particular workshop is equal to or fine than the general tolerances indicated in the drawing.

The workshop should therefore

- Find out by measurements what is customary workshop accuracy is;
- Accept only those drawings having general tolerances equal to or greater than its customary workshop accuracy;
- Check by sampling that its customary workshop accuracy does not deteriorate.

Relying on underlined “good workmanship” with all its uncertainties and misunderstandings is no longer necessary with the concept of general geometrical tolerances. The general geometrical tolerances defines the required accuracy of “good workmanship”.

A.4 The tolerance the function allows is often greater than the general tolerances. The function of the part is, therefore, not always impaired when the general tolerance is (occasionally) exceeded at any feature of the work piece. Exceeding the general tolerance should lead to a rejection of the work piece only if the function is impaired.