FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 1 204 07 20803

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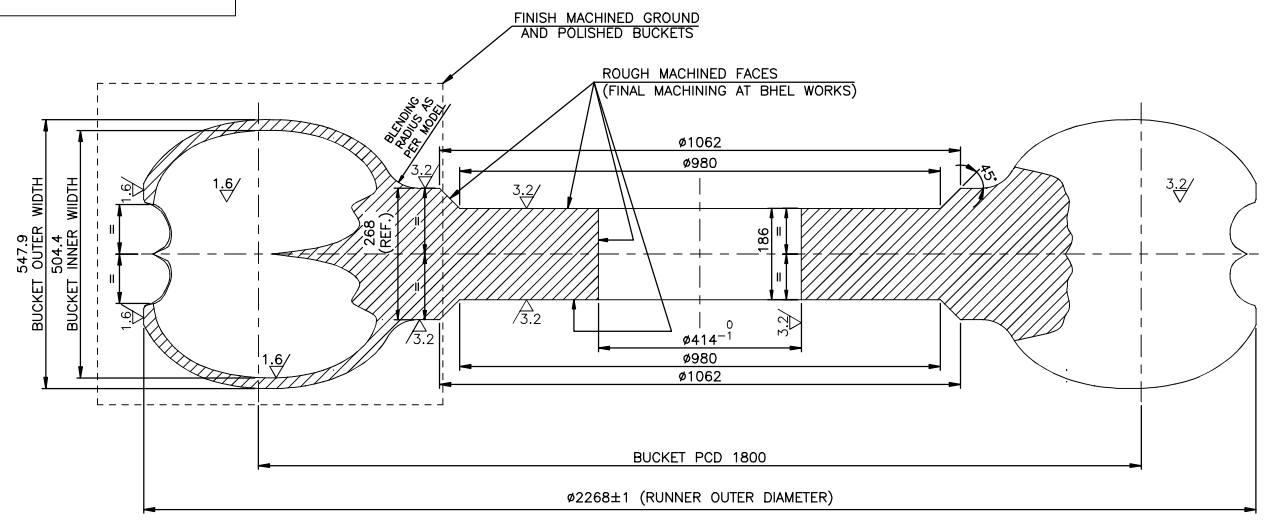
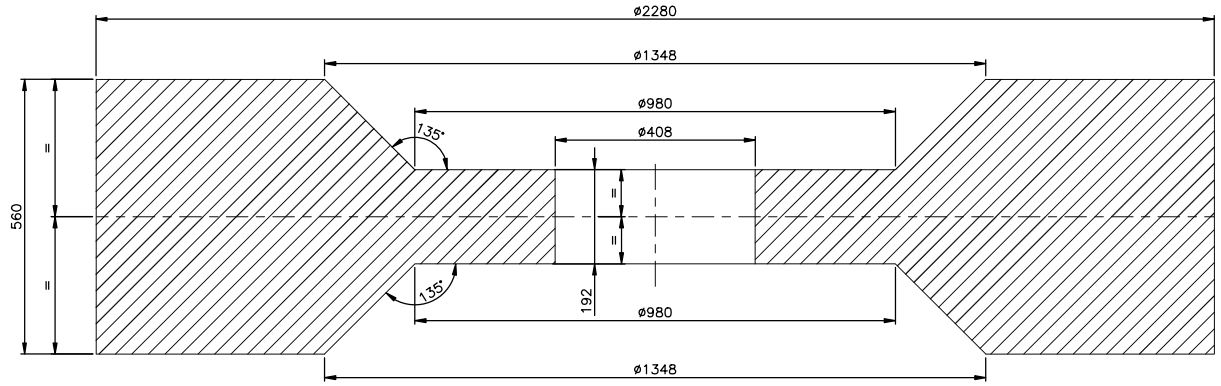
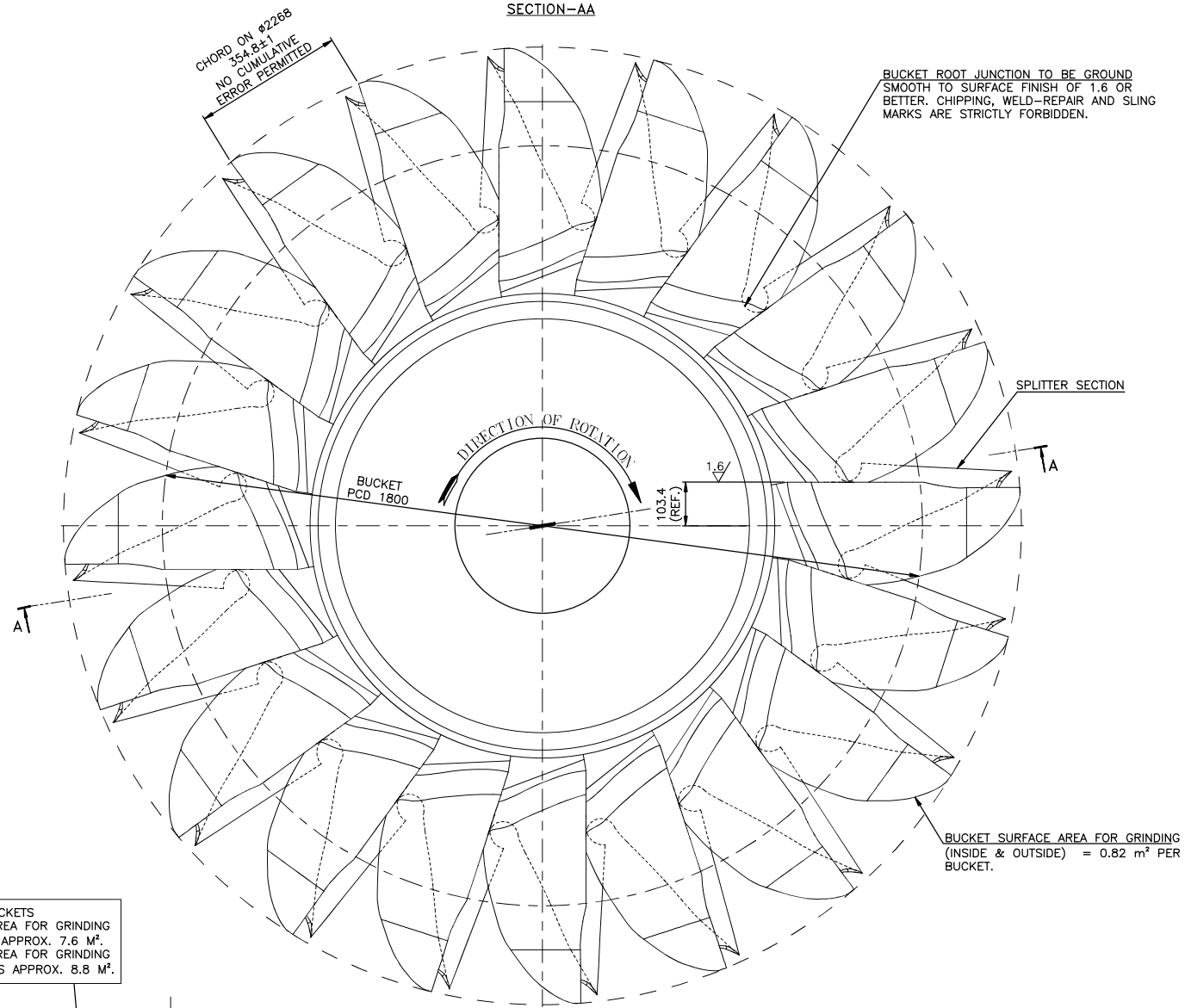


SECTION–AA

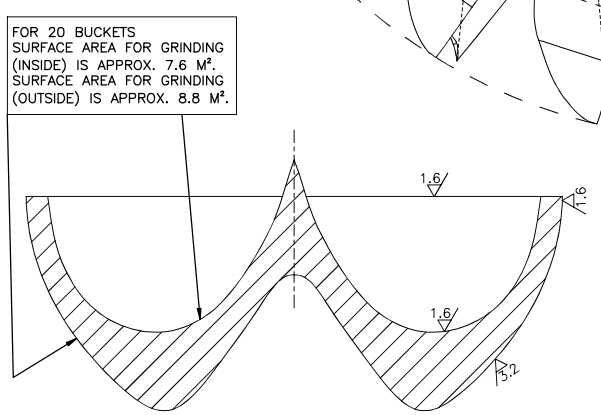


TENTATIVE DIMENSION OF DISC FORGING FOR PELTON RUNNER (APPROX WEIGHT = 14651 kg)



PLAN VIEW

FOR 20 BUCKETS
SURFACE AREA FOR GRINDING (INSIDE) IS APPROX. 7.6 M².
SURFACE AREA FOR GRINDING (OUTSIDE) IS APPROX. 8.8 M².



SURFACE FINISH OF BUCKETS

TECHNICAL REQUIREMENTS:

1. FORGING MATERIAL: STAINLESS STEEL DISC FORGING TO SPECIFICATION ASTM A 473 M TYPE S41500.

2. SCOPE OF SUPPLY–
   a. MACHINED RUNNER AS PER T.R. NO. 3. PELTON RUNNER HAVING 20 NOS. BUCKETS SHALL BE MACHINED FROM SINGLE DISC FORGING WITH THE HELP OF 5 AXIS CNC MILLING MACHINE. TENTATIVE SHAPE OF FORGED DISC IS SHOWN IN THE DRAWING. WEIGHT OF FORGED DISC WILL BE APPROX–14651 kg.
   b. TEMPLATES (TWO SETS) AS PER INSPECTION SHEETS SHALL BE SUPPLIED IN EVENT OF ORDER. ONE SET OF TEMPLATES SHALL BE USED BY VENDOR FOR INSPECTION AT HIS WORKS AND SHALL BE DISPATCHED ALONG WITH THE LAST RUNNER. THE OTHER SET SHALL BE DISPATCHED WITH THE FIRST RUNNER.

3. SUPPLY CONDITION FOR RUNNER:
   a. RUNNER FORGING SHALL BE SUPPLIED WITH FULLY FINISH MACHINED GROUND AND POLISHED BUCKETS AND ROUGH MACHINED COUPLING FACES AND CENTRAL BORE AS SHOWN IN SECTION–AA.
   b. NO CHIPPING OR SLING MARKS ARE TO BE LEFT ON RUNNER.
   c. TOOL MARKS OR TEARING OF METAL BY FINISHING TOOL, IS NOT ACCEPTABLE ON THE SURFACE OF INNER AND OUTER BUCKET PROFILE SUCH MARKS IF ANY SHALL BE REMOVED BY GRINDING & POLISHING.
   d. BUCKETS ARE TO BE PROTECTED SUITABLY TO AVOID ANY DAMAGE DURING TRANSIT.

4. INSPECTION AT VENDOR'S WORK–
   a. TEMPLATES SHALL BE MANUFACTURED AS PER INSPECTION SHEET.
   b. TEMPLATES SHALL BE PUNCHED MARKED FOR IDENTIFICATION.
   c. VISUAL SURFACE FINISH AND DIMENSIONAL INSPECTION AS PER THIS DRAWING.
   d. PROFILE INSPECTION AS PER RUNNER INSPECTION SHEET.

5. DOCUMENTS TO BE FURNISHED BY BHEL IN EVENT OF ORDER :
   b. 3D MODEL FOR BUCKET PROFILE AND HUB DETAILS (IN EVENT OF ORDER)
   c. INSPECTION SHEETS OF PELTON RUNNER.

NOTE–
- BEFORE START OF MACHINING VENDOR TO GET THE LATEST REVISION NO. OF DRAWING, CONFIRMED FROM HYDRO TURBINE ENGINEERING, BHEL, BHOPAL.
- IN CASE OF SLIGHTEST DOUBT CONSULT HYDRO TURBINE ENGINEERING, BHEL, BHOPAL.
- INSPECTION AT SUPPLIER'S WORK SHALL BE CARRIED OUT AS PER APPROVED QUALITY PLAN.

REV.	DATE	ALTERED / CHECKED / APPD.	ZONE

ADDITIONAL INFORMATION

STATUS OF DRAWING 'U'

DISTRIBUTION OF PRINTS

HTE–2 THX–1 WTM(P)–1 WTM(S)–4 FGM–7

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT: RAHUGHAT HEP (2x20 MW)

BHARAT HEAVY ELECTRICALS LTD. BHOPAL

	NAME	SIGN	DATE
DRN	RAMESH		07.04.2022
CKD	N.D.		07.04.2022
APPD	S.K.		07.04.2022

DEPT. H.T.E. CODE 402 | UNTOL. DIMS. GR. AS PER STD.DRG. 32000049014 | SCALE 1:7.5 | WEIGHT(K.G.) 4990 | REF.TO ASSY.DRG. 1 204 07 20802 | ITEM NO. | NO.OF ITEM 01 | NO. OF VAR.

TITLE: FORGED PELTON RUNNER (ROUGH MACHINED)

DRAWING NO. 1 204 07 20803 REV. 00

SHT. NO. 01 NO. OF SHT. 01

A1 SIZE

893484/2022/HEP-WTM20207 FIRST ANGLE PROJECTION

(ALL DIMENSIONS ARE IN mm)

DRG. NO. 1 204 07 20804

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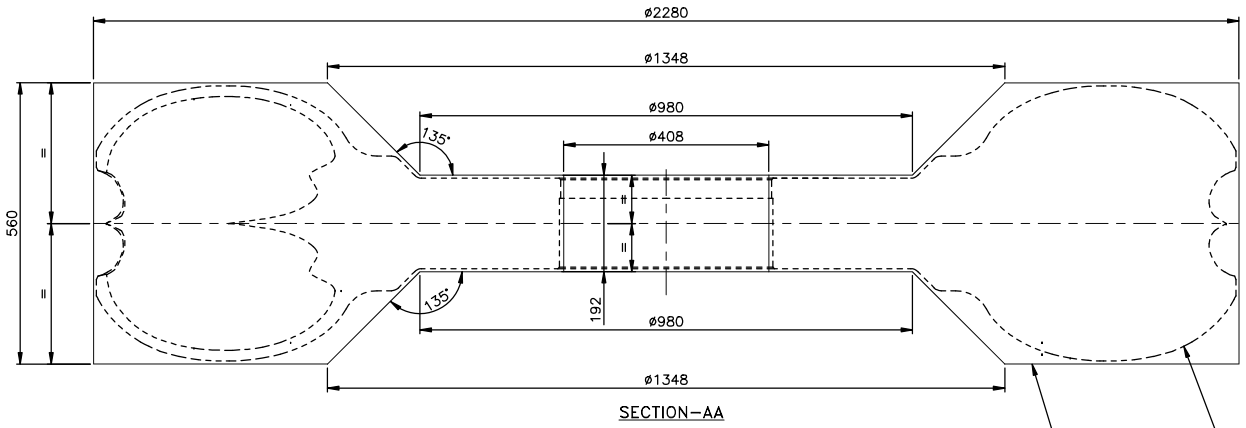
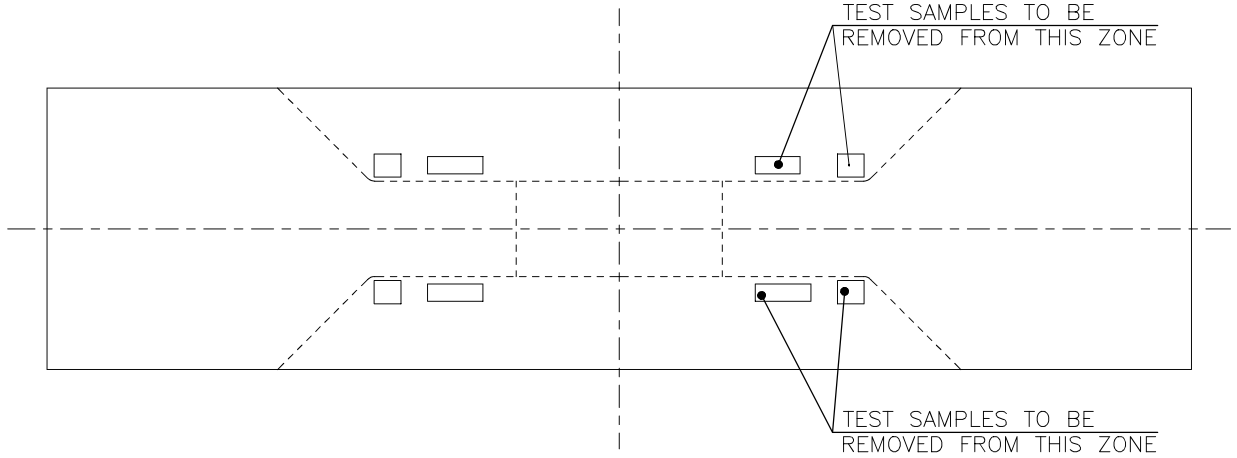


SECTION–AA

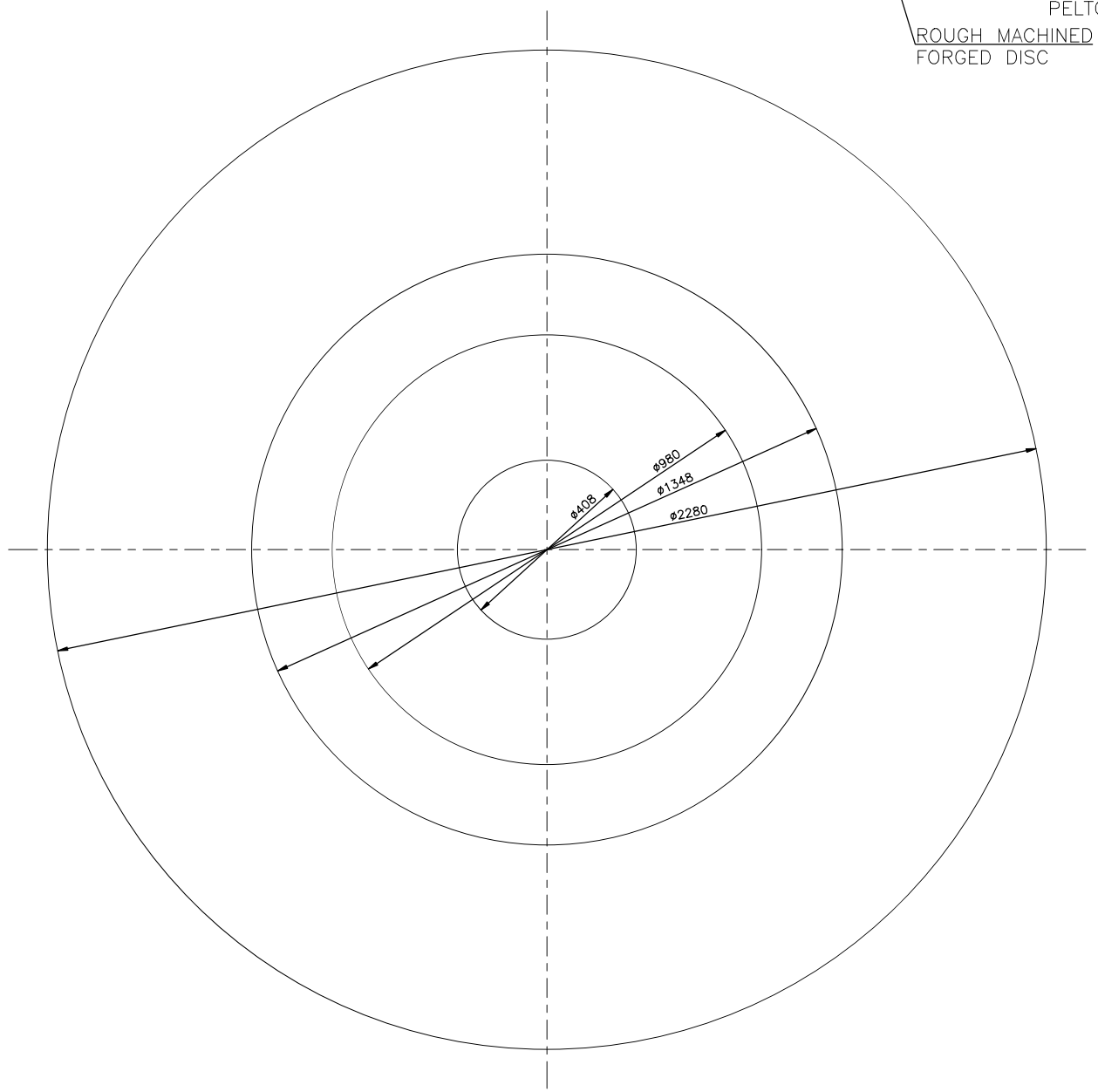
FINISH MACHINED PELTON RUNNER

ROUGH MACHINED FORGED DISC



SOLID DISC FORGING

(REQUIRED FORGING RATIO TO BE ACHIEVED IN FORGED DISC AFTER UPSETTING AND DRAWING OPERATION)



PLAN VIEW

TECHNICAL REQUIREMENTS:

1. FORGING MATERIAL:
   a. STAINLESS STEEL FORGING TO SPECIFICATION ASTM A 473 M TYPE S41500 WITH SUPPLEMENTARY REQUIREMENTS AS PER CLAUSE NO. 3 OF PRODUCT STANDARD HT 00253 (LATEST REVISION) ENCLOSED WITH PURCHASE INDENT.
   b. IMPACT ENERGY TEST BY CHARPY V–NOTCH METHOD SHALL BE CARRIED OUT ON AT LEAST 3 SAMPLES EACH IN RADIAL AND TANGENTIAL DIRECTION AT 0°C.
   A MINIMUM IMPACT VALUE OF 120J SHALL BE OBSERVED ON EACH SAMPLES IN BOTH RADIAL AND TANGENTIAL DIRECTIONS.
   c. FOR TEST SAMPLES REFER CLAUSE NO. 7 OF HT 00253.

2. SUPPLY CONDITION:
   a. ROUGH MACHINED FORGED DISC TO DIMENSIONS AS PER SECTION–AA AND SURFACE FINISH 6.3 MICRONS OR BETTER.
   b. IN THE ROUGH MACHINED DISC, AN ALLOWANCE OF 5 TP 6 MM ON FACE AND 10 MM ON DIAMETER HAS BEEN PROVIDED. TOLERANCE ON ROUGH MACHINED DIMENSIONS SHALL BE 0/+1 MM UNLESS OTHERWISE SPECIFIED.
   c. FORGING SHALL BE FREE FROM DEFECTS I.E. CRACKS, SCALES, FINS, POROSITY, SEGREGATION, HARD SPOTS AND EXCESSIVE NON METALLIC INCLUSIONS.
   d. NO CHIPPING OR SLING MARKS TO BE LEFT ON ROUGH MACHINED RUNNER.

3. DOCUMENTS REQUIRED ALONG WITH TECHNICAL OFFER –
   a. SUPPLIER SHALL FURNISH A MANUFACTURING PROCESS PLAN ALONG WITH THE TECHNICAL OFFER. THE PLAN SHALL INCLUDE ALL MANUFACTURING PROCESS DETAILS OF MELTING, REFINING, POURING, INGOT , FORGING PROCESS (UPSETTING/DRAWING), TOP AND BOTTOM DISCARD, HEAT TREATMENT IDENTIFICATION OF TEST SAMPLE, NDT ETC.
   b. SUPPLIER SHALL FURNISH A SKETCH SHOWING NO. AND LOCATION OF ALL TEST PIECES IN RADIAL AND TANGENTIAL DIRECTION.
   c. VALUE OF FORGING RATIO, A SKETCH SHOWING DETAILS OF UPSETTING AND DRAWING OPERATION TO ACHIEVE FORGING RATIO.

4. NON–DESTRUCTIVE TESTING: NDT OF ROUGH MACHINED FORGED DISC SHALL BE CARRIED OUT AS GIVEN BELOW–
   a. DYE PENTRATION TEST – 100%
   b. MAGNETIC PARTICLE TEST –100%
   c. ULTRASONIC TEST – 100%
   APPLICABLE STANDARDS SHALL BE AS PER HT 00253.

5. FOR MANUFACTURING REQUIRMENTS REFER CLAUSE NO. 4 OF HT 00253.
6. FOR HEAT TREATMENT AND ROUGH MACHINING REFER CLAUSE NO. 5 OF HT 00253.
7. FOR TEST AND CHECKS AT MANUFACTURER'S WORKS REFER CLAUSE NO. 8 OF HT 00253.

REFERENCE DRAWING AND DOCUMENTS IN ORDER OF PREFERENCE
1. FORGED DISC FOR PELTON RUNNER, DRAWING 12040720804 (LATEST REVISION).
2. BHEL PRODUCT STANDARD HT 00253 (LATEST REVISION).
3. FORGING MATERIAL SPECIFICATION ASTM A 473M (TYPE S41500) TO LATEST REVISION.

NOTE–
- BEFORE START OF MANUFACTURING VENDOR TO GET THE LATEST REVISION NO. OF DRAWING AND PRODUCT STANDARD CONFIRMED FROM HYDRO TURBINE ENGINEERING, BHEL– BHOPAL.
- IN CASE OF THE SLIGHTEST DOUBT CONSULT HYDRO TURBINE ENGINEERING, BHEL– BHOPAL.
- INSPECTION AT SUPPLIER'S WORK SHALL BE CARRIED OUT AS PER APPROVED QUALITY PLAN.
- SUPPLIER SHALL CARRY OUT INTERNAL INSPECTION BEFORE RAISING INSPECTION CALL AND FURNISH REPORTS TO BHEL BHOPAL.

REMARKS	VAR NO.	ITEM NO.	DESCRIPTION	STD.	DRAWING NO.	IT.NO. / VAR.	MATL. CODE / MATL. SPCN.	A C	UNIT	UNIT WT. / QTY.	GS	ZONE
		01	FORGED DISC				ASTM A473 S41500 / 13%Cr–4%Ni SS			14,651 / 001		

CUSTOMER	RAGHUGANGA HYDROPOWER LIMITED		
CONSULTANT	WAPCOS LIMITED, GURGAON (A GOVT. OF INDIA UNDERTAKING)		
PROJECT	RAHUGHAT HYDROELETRIC PROJECT (2x20 MW)		
ADDITIONAL INFORMATION: WO U1–39227X20305, U2–39228X20305, SPARE–39227220323			
STATUS OF DRAWING: 'U'	BHARAT HEAVY ELECTRICALS LTD. BHOPAL	DRN RS 08.08.2020	CKD ND 08.08.2020
DISTRIBUTION OF PRINTS: HTE–2, WTM(P)–1, WTM(S)–4, THX–1,		APPD SK 08.08.2020	
DEPT HTE / CODE 402	UNTOL.DIMS. GR. 32000049014	SCALE 1:7.5	WEIGHT (K.G.) 14,651
REF. TO ASSY. DRG. –	ITEM NO.	NO. OF ITEMS 01	
TITLE: ROUGH MACHINED FORGED DISC (FOR PELTON RUNNER)	DRAWING NO. 1 204 07 20804	REV 00	
	SHEET No. 01	NO. OF SHT. 01	

REV.	DATE	ALTERED / CHECKED / APPROVED

A1 SIZE