TENDER DOCUMENT

NIT No.: BHI/PI(S)/665/1052

FOR

Tender for Detail Engineering, Manufacturing, Testing and Supply of ‘TAIL PULLEY PACKAGE AND ASSOCIATED WORKS’ for the project of “Augmentation of Raw Material Handling Receipt and Handling facilities with new OHP Part– B (Package- 061) of Bhilai Steel Plant, (SAIL)”.

VOLUME - 2

TECHNICAL SPECIFICATION & DRAWINGS

ENGINEERING PROJECTS (INDIA) LIMITED
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TECHNICAL SPECIFICATION & DRAWINGS

GENERAL

The following Technical Specification shall be read in conjunction with General Technical Specification (GTS) of Bhilai Steel Plant, SAIL. If there are any provisions in this Technical Specification, which are at variance with the provisions of General Technical Specification (GTS) of Bhilai Steel Plant, SAIL and General Specification, the provisions in this Technical Specification shall take precedence.

SCOPE OF SUPPLY

The scope of the supply includes Detail Engineering, manufacture, shop fabrication, assembly, testing and inspection at manufacturer’s works, packing, dispatch, transportation, delivery to site of PULLEY PACKAGE and ASSOCIATED WORKS as per specifications and scope defined in tender documents complete with all accessories.

CONVEYOR PULLEY

Pulley diameter shall be selected as per the Indian standard and IPSS where applicable. All pulleys shall be of welded steel construction. All welds shall be properly stress relieved and Pulleys are to be statically balanced. All pulley shafts shall be key fitted.

Pulley face width – As per IS: 8531 – 1986 (Re-affirmed 1998).

Pulley grooving width & depth shall be 6 mm at 30 mm interval.

Deflection of drive pulley shaft at bearing shall not exceed 1/2000.

All Pulley shaft – up to 100 mm dia. Class-IV, IS: 1875-1992, more than 100 mm dia shall be heat treated (class-4 normalised) Forged steel, 45C8, IS: 2004-1992.

Bearing: Self-aligning double row spherical roller bearing with adapter sleeve. Life – 40,000 hrs.

P. Block – Material of P.Block shall be of cast Iron (IS:210), cast steel IS: 030, Grade-280-520W (min).

Material characteristics: Material used shall be suitable for efficient operation and reliable service in steel plant condition.

All conveyors with magnetic separator at head end shall have non-magnetic SS pulleys shafts & discharge.

All pulleys shall be of welded steel construction, stress relieved before boring and machining and statically balanced. Solid end discs shall be designed and provided to give maximum strength. Pulleys shall be designed as per relevant Indian Standard and IPSS where applicable. Pulleys shall be connected to the shaft preferably through
keyless friction grip connections for HT motors and key connection for LT motors unless otherwise agreed.

Shell thickness of the pulley shall be suitable for taking bending loads on the pulley. This shall not be less than 16mm for drive pulley and 12 mm for tail and other pulleys.

Drive pulleys shall be covered with minimum 12mm thick diamond rubber lagging. Tail, bend and take-up pulleys shall be covered with minimum 10 mm thick diamond rubber lagging. The depth and width of the grooves in the lagging shall be 6 mm spaced at 30mm interval. The eccentricity of pulley shell shall not be more then + 0.5% of the diameter prior to lagging. Drive pulleys shall be machined at steel faces prior to lagging. Shore hardness of rubber for drive pulleys shall be not less than 55 deg A and for other pulleys shall be not less than 45 deg A. All pulleys shall be statically balanced to minimize the vibration during running.

Rolled steel may be used for pulley shafts of diameter up to 140 mm. Forged steel shall be used for shafts above 140 mm diameter. The deflection slope of pulley shaft at bearings shall be restricted to 1/2000 under rated load condition. Combined stress value shall be restricted to 500kg/sq.cm. Shaft diameter shall be selected based on the maximum value. The shaft diameter shall be as per IPSS.

Pulley shafts shall be supported on self-aligning double row spherical roller bearings with adequate sealing and external lubrication arrangement in plummer blocks. One bearing for each shaft shall be fixed to prevent any movement of the shaft assembly and the other bearing shall be floating to have free axial movement. All lubricating nipples shall be readily accessible without removing the guards. All plummer blocks shall also have four mounting bolts.

Welding on the pulley shell shall be tested radio graphically or by ultrasonic method. Pulley shafts shall be ultrasonically tested. Checking of out of roundness and static balancing tests shall be carried out before dispatch of the pulleys.

Bought out items shall be as per approved makes of Mecon / BSP for package 061.

**DRAWING**

1. BSP-EPI-01-061-01-018-55-DE-00476 : For Non Drive Pulley
NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. PULLEYS SHALL BE STATICALLY BALANCED AFTER LAGGING. BALANCING WEIGHT SHALL NOT BE WELDED ON DIAPHRAGM PLATE.
3. BALANCING MASSES HAVE TO BE DISTRIBUTED EQUALLY TO EACH SIDE OF PULLEY. TOTAL BALANCING MASSES SHALL NOT EXCEED 1% OF PULLEY TOTAL MASS (PULLEY TOTAL MASS = SHELL + DIAPHRAGM + KEY + HUB + SHAFT + BEARING + LAGGING)
4. SHAFT NOT TO BE UNDERCUT AT CHANGE OF DIAMETERS. CHAMFERING AT CHANGE IN DIAM. SHALL NOT BE MORE THAN 1 IN 5.
5. MANUFACTURING TOLERANCES SHALL BE AS PER IS:8531.
6. SHAFTS TO BE ALL OVER MACHINED. TOLERANCE ON DIAMETER OF SHAFT (a1) AT BEARING SHALL BE h9.
7. OUT OF ROUNDNESS OF PULLEY SHELL SHALL NOT BE MORE THAN ±0.5% OF THE DIAMETER PRIOR TO LAGGING.
8. CENTERING SHALL BE PROVIDED ON BOTH ENDS OF SHAFT AS PER DIN 332 SHAPE CS.
9. NO INTERMEDIATE DIAPHRAGMS AND STIFFENERS ON END DIAPHRAGMS SHALL BE PROVIDED.
10. ONLY ONE LONGITUDINAL WELD IN SHELL PER PULLEY SHALL BE PROVIDED. WELD TO BE GROUND SMOOTH.

PULLEY LUGGER LAGGING:

(b) CHECKS ON RUBBER LAGGING TO INCLUDE ABRASION LOSS, SHORE HARDNESS TEST, PEELOFF STRENGTH TEST AND PHYSICAL PROPERTIES. PEELOFF STRENGTH SHALL BE 10 KG/cm. ABRASION LOSS SHALL BE LESS THAN 250 CUBIC MM WHEN TESTED AS PER DIN 53516.
(c) TYPE OF RUBBER FOR LAGGING- NATURAL RUBBER BLENDED WITH STYRENE BUTADIENE RUBBER
(d) HARDNESS 50 TO 65 DIAMETER (SHORE A)- FOR DRIVE PULLEY.
(e) ELONGATION OVER 300%.
(f) STRENGTH 150-200 KG/CM².

HARDNESS 45-55 DIAMETER (SHORE A)- FOR NON DRIVE PULLEY

A) ABRASION LOSS 250 CUBIC MM AS PER DIN 53516
B) SPECIFIC GRAVITY 1.4 TO 1.5
C) ADHESION STRENGTH 10 KG/SQ. CM (MINIMUM)

11. GENERALLY BEARINGS FOR ALL PULLEYS (EXCEPT DEFLECTOR ROLLER) ARE SELF ALIGNING DOUBLE ROW SPHERICAL ROLLER TYPE WITH ADAPTER SLEEVE.
12. HUBS OF PULLEYS SHALL HAVE FIT h7- m8 WITH THE SHAFT.
13. FOLLOWING CARE SHALL BE FOLLOWED BY MANUFACTURER AT THE TIME OF WELDING BETWEEN HUB, DIAPHRAGM & SHELL
(a) PREHEAT TO 100°C.
(b) POST HEATING & SLOW COOLING OF HUB-DIAPHRAGM JOINT IS TO BE DONE (TEMP. 200°C-400°C) AND USE OF ASBESTOS CLOTH OVER THE WELD.
14. (a) THE OUTER SURFACE OF PULLEY IS TO BE MACHINED ONLY AFTER THE SHAFT/HUB ASSY. IS WELDED INSIDE.
(b) UNLESS OTHERWISE MENTIONED, ALL SURFACES SHALL HAVE 6.3 MCRON SURFACE FINISH.
15. THE SHAFT SHALL BE FIXED WITH HUB BY 1 NO. PARALLEL KEY (STANDARD IS: 2048, 1983)
16. ALL KEYS SHALL BE PRESS FIT INTO THE KEYWAYS, ALL KEYWAYS SHALL BE SIDE MILLED KEYWAYS.

17. ALL DATA AND DIMENSIONS SHALL BE CHECKED BY PULLEY MANUFACTURER BEFORE TAKING UP MANUFACTURING.
18. ALL PULLEYS ARE TO BE MARKED WITH THE FOLLOWINGS BEFORE DESPATCH.
(a) WORK ORDER NO.
(b) MANUFACTURER NO.
(c) PULLEY MARK NO.
19. IN ADDITION TO CHEMICAL & MECHANICAL PROPERTIES, PULLEY SHAFT FORGINGS SHALL BE SUBJECTED TO ULTRASONIC TESTING TO ENSURE INTERNAL SOLIDNESS & MPI RT/UT AS PER APPROVED CAP.
20. THE ENTIRE PULLEY SHALL HAVE 12 MM THICK DIAMOND GROOVE RUBBER LAGGING & NON-DRIVE PULLEY SHALL HAVE (10 MM THICK).

21. PULLEY WEIGHT, MARKED (±) THIS TO BE BURNTISHED BY MANUFACTURERS.
22. FOUR A1 WLD STEEL PLUGS SHALL BE WELDED BELOW THE PULLEY SHELL OF ALL PULLEYS FOR SPEED SENSING.
23. PRINTING, TESTING & INSPECTION SHALL BE DONE AS PER APPROVED CAP & UCS.
24. THE THICKNESS SPECIFIED IN THE TABLE FOR 'T' IS MINIMUM. IN ANY CASE, AFTER COMPLETE MANUFACTURING THE FINISHED THICKNESS SHALL NOT BE LESS THAN '1', NO NEGATIVE TOLERANCE ON '1 & 'T' WILL BE ACCEPTABLE.
25. 100% MPI/OR/BONDI ALL WELDS OF ALL PULLEYS TO BE CONDUCTED, 100% VTI & 10% RT TO BE CONDUCTED ON BUTT WELDS OF ALL PULLEYS.
26. PLATE FOR SHELL SHALL BE ULTRASONICALLY TESTED TO ENSURE LAMINATION. ALL PLATES SHALL BE NORMALIZED. THE PROCEDURE SHALL BE AS PER APPROVED CAP.
27. ALL WELDINGS ON SHELL, DIAPHRAGM & HUB SHALL BE DONE INTERMITTENTLY TO AVOID DISTORTION / STRESS CONCENTRATION.
1. Engineering & approval of most of the conveyors as listed in drawing have not yet been done & obtained by Epi. The DRG. is checked w.r.t. Doc. No. BSP-EPI-01-061-01-000-55-BD-00025, Rev-2 (91 sheets).

2. We have checked the arrangement only. Adequacy & accuracy of selection & design of pulley, its individual components and their quality/quantity shall be the responsibility of Epi.

3. Any change in pulley specification during approval of conveyor drawing shall be incorporated in this drawing & resubmitted for further approval before manufacturing.

4. Additional notes shall be as indicated in Annexure-II attached with this drawing. However, duplicated notes indicated above shall be deleted.

Comments:
- Only one bidirectional belt per pulley shall be provided & a belt to be supplied for preliminary PLUMLER BLOCK DETAILS

Sheet 1 of 4
READ THIS DRAWING TOGETHER WITH DRAWING NO. BSP-EPI-01-061-01-018-55-DE-00476, SHEET 1 OF 4.

G.A. OF NON-DRIVE PULLEY

CENTRE DISC

END DISC

SHELL

DETIAL: D1

CONNECTION BETWEEN SHELL PLATE & RIB

DETIAL: D2

VIEW: B-B

KEY CONNECTION (TYP)

PARALLEL KEY

DETIAL: D3

CONNECTION BETWEEN HUB & RIB

SHELL WELDING DETAILS

BILL OF MATERIALS FOR ONE SET NON DRIVE PULLEY

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<tr>
<th>SL.NO.</th>
<th>QTY.</th>
<th>DESCRIPTIONS</th>
<th>MATERIAL</th>
<th>REMARKS</th>
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<td>1</td>
<td>1</td>
<td>SHELL</td>
<td>IS:2062-1999</td>
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<tr>
<td>2</td>
<td>1</td>
<td>SHAFT</td>
<td>HEAT TREATED (G.LIS-400/catalogue) FORGED STEEL AISI 1044 1995</td>
<td>MORE THAN 100 KG</td>
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<td>3</td>
<td>2</td>
<td>HUB</td>
<td>FORGED/MS STEEL</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>SETS END PLATES</td>
<td>IS:2062 : 1999</td>
<td></td>
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<tr>
<td>5</td>
<td>2</td>
<td>MIDDLE DISC</td>
<td>IS:2062 : 1999</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>PARALLEL KEY</td>
<td>AS PER DSR</td>
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</tr>
<tr>
<td>6A</td>
<td>2</td>
<td>PLUMMER BLOCK</td>
<td>ONE FIXED TYPE</td>
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PLEASE FURNISH SHAFT & HUB DIMENSION DETAILS/DRAWING IN THIS SHEET.

WITH COMMENTS

07.11.2014
READ THIS DRAWING TOGETHER WITH DRAWING NO. BSP-EPI-01-061-01-018-55-DE-00476, SHEET 4 OF 4.

COMMENTS ARE SAME AS SHEET 2 OF 4.

G.A. OF NON-DRIVE PULLEY
(TAIL, BEND AND SNUB)

PLUMMER BLOCK DETAILS (TYP.)
FLOATING TYPE WITH ONE END
OPEN & ONE END CLOSED

VIEW: B-B
KEY CONNECTION (TYP)
PARALLEL KEY

SHELL WELDING DETAILS

DETAIL: D3

BILL OF MATERIALS FOR ONE SET TAIL, SNUB & BEND PULLEY

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<th>SL. NO.</th>
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<th>MATERIAL</th>
<th>REMARKS</th>
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<td>1</td>
<td>1</td>
<td>SHELL</td>
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</tr>
<tr>
<td>2</td>
<td>1</td>
<td>SHAFT</td>
<td>CARBON STEEL FORGING</td>
<td>CARBON &gt;0.3%</td>
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<tr>
<td>3</td>
<td>2</td>
<td>HUB</td>
<td>FORGED/M.S. STEEL</td>
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<tr>
<td>4</td>
<td>2</td>
<td>SETS END PLATES</td>
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<tr>
<td>5</td>
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<td>MIDDLE DISC</td>
<td>IS:2062 : 1999</td>
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<tr>
<td>6</td>
<td>2</td>
<td>PARALLEL KEY</td>
<td>SEE NOTE 10</td>
<td></td>
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<tr>
<td>6A</td>
<td>2</td>
<td>PLUMMER BLOCK (FLOATING END)</td>
<td>SEE NOTE 10</td>
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</tbody>
</table>
READ THIS DRAWING TOGETHER WITH DRAWING NO. BSP-EPI-01-061-01-018-55-DE-00476, SHEET 3 OF 4.

GA DRAWING OF ALL CONVEYORS.

DESIGN CRITERIA FOR BELT CONVEYORS

CONVEYOR CALCULATION

COMMENTS:
2. WE HAVE CHECKED THE ARRANGEMENT ONLY. ADEQUACY & ACCURACY OF SELECTION & DESIGN OF PULLEY, IT'S INDIVIDUAL COMPONENTS AND THEIR QUALITY/ QUANTITY SHALL BE THE RESPONSIBILITY OF EPI.
3. ANY CHANGE IN PULLEY SPECIFICATION DURING APPROVAL OF CONVEYOR DRAWING SHALL BE INCORPORATED IN THIS DRAWING & RESUBMITTED FOR FURTHER APPROVAL BEFORE MANUFACTURING.
4. Additional notes shall be as indicated in Annexure-II attached with this drawing. However, duplicated notes indicated above shall be deleted.

NOTES:
1. ALL DIMENSIONS ARE IN M.M.
2. ALL PULLEYS ARE TO BE FIRED & CHECKED UNDER FREE OR DESIGNED LOAD.
3. SHAFT BEARING JOURNEYS ARE TO BE COATED WITH BLUE LACQUER.
4. PULLEYS SHALL BE WELDED CONSTRUCTION & STRESS RELIEVED.
6. ALL NON-DRIVE PULLEYS WILL BE 12-TYK, HOT PLAIN ROLLER ROLLER AS SHOWN.
7. ALL PULLEYS MOUNTING WHT WILL BE LAST STEEL AS PER IS 1505 & WILL BE MOUNTED WITH 4 BOLTS.
8. ALL B.G. IN BOTH PULLEY SHAFTS MUST MAKE ONLY.
9. PULLEY BLOCK SHALL BE COMPLETE WITH B Groove & ACCEESORIES.
10. TOTAL WT (APPROXIMATE) INDICATED IS INCLUSIVE OF 2 NC. PL BLACK ASSEMBLY PULLEY.
11. FOR OTHER NON-DRIVE PULLEYS REF. ENG. NO. 0000-W-I-TDO-002 SHT. 4 CT.
12. SWINGING WITHOUT TOLERANCE AS PER CT. 2102.
13. PULLEY SHAFTS WILL BE STRESS RELIEVED.
14. ONLY ONE LONGITUDINAL WELD PER PULLEY SHAFT WILL BE PROVIDED & WELD TO BE SMOOTH & FOR FABRICATION PULLEY SHAFT.
15. THE OUT OF ROUNDNESS WILL NOT EXCEED ±0.03% OF THE DIAMETER PRIOR TO LASSING.
16. GROOVE OUT SURFACES SHALL BE GROUND.
17. ALL PULLEY RIMS SHALL BE HEAVY DUTY STEEL TYPE EQUIPPED WITH SELF ALIGNING, DOUBLE ROW SPHERICAL ROLLER BEARING & ADAPTOR SLEEVE WITH MINIMUM LIFE OF 50,000 HOURS.
18. RIM ROLLER TAPERED ROLLER BEARING SHALL BE TAKEN MORE SO THAN THICKNESS THAT THICKNESS TO BE MAINTAINED AS GIVEN.
19. FIXED PULLEY BLOCK AT FIXED END SHOULD HAVE LOCATING HOLE.
20. ALL WELDMENTS WILL BE BLENDED SMOOTH.

FOR REFERENCE

WITH COMMENT

TECPR0 SYSTEMS LTD.