TENDER DOCUMENT

NIT No.: BHI/PI(S)/665/1054

FOR

Tender for Detail Engineering, Manufacturing, Testing and Supply of 'TAKE-UP 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
(A GOVT. OF INDIA ENTERPRISE)
B- 252, Street No. - 5, Smriti Nagar, Bhilai- 490020 (C.G)
Mob. No. +919425296161, E-mail Id: epibhilai@gmail.com
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 16 mm for drive pulley and 12 mm for tail and other pulleys.

Drive pulleys shall be covered with minimum 12 mm 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 30 mm interval. The eccentricity of pulley shell shall not be more than + 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 500 kg/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 radiographically 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

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EPI – Bhilai                                            Volume-2                                              Page 2 of 2
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 SHALL HAVE DISTRIBUTED 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). BALANCING MASS SHALL BE STAGGERED WELDED TO THE PULLEY SHELL. ALL PULLEYS SHALL BE STRESS RELIEVED BEFORE MACHINING.
4. SHAFT NOT TO BE UNDERCUT AT CHANGE OF DIAMETERS. CHAMFERING AT CHANGE IN Dia. SHALL NOT BE MORE THAN 1 IN 5.
5. MANUFACTURING TOLERANCES SHALL BE AS PER ISA 8531.
6. SHAFTS TO BE ALL OVER MACHINED, TOLERANCE ON DIAMETER OF SHAFT@1 AT BEARING SHALL BE h9.
7. HUB SHAFT IS 115% OF ROUNDNESS OF PULLEY SHELL SHALL NOT BE MORE THAN ±0.5% OF THE DIAMETER PRIOR TO LAGGING.
8. CENTERING SHAFTS TO BE INSERTED ON BOTH ENDS OF SHAFT AS PER DIN 3.32 SHAPE DS.
9. NO INTERMEDIATE DIAPHRAGMS AND SEPARATOR ON END DIAPHRAGMS SHALL BE PROVIDED.
10. ONLY ONE LONGITUDINAL WELD IN SHELL PER PULLEY SHALL BE PROVIDED. WELD TO BE GROUND SMOOTH.
11. PULLEY RUBBER LAGGING:
   (b) CHECKS ON RUBBER LAGGING TO INCLUDE ABRASION LOSS, SHELL HARDNESS TEST, PEEL-OFF STRENGTH TEST AND PHYSICAL PROPERTIES. PEEL-OFF STRENGTH STRENGTH SHOULD BE 10 Kg/cm. ABRASION LOSS SHOULD BE LESS THAN 250 CUBIC cm WHEN TESTED AS PER DIN 53516.
   (c) TYPE OF RUBBER FOR LAGGING: NATURAL RUBBER BLENDED WITH STYRENE BUTADIENE RUBBER.
   (d) HARDNESS 55 TO 65 DUROMETER (SHORE A) FOR DRIVE PULLEY.
   (e) ELONGATION OVER 300%
12. STRENGTH 150-200 Kg/sq. cm.
13. HARDSHIPS AS 45-55 DUROMETER (SHORE A) FOR NON-DRIVE PULLEY.
14. ABRASION LOSS 250 CUBIC cm AS PER DIN 53516
15. SPECIFIC GRAVITY 1.4 TO 1.5
16. ADHESION STRENGTH 10 Kg/sq. cm (Minimum).
17. GENERAL BEARINGS FOR ALL PULLEYS (EXCEPT DEFLECTOR ROLLER) ARE SELF ALIGNING DOUBLE ROW SPHERICAL ROLLER TYPE WITH ADAPTOR SLEEVE.
18. HUBS OF PULLEYS SHALL HAVE FIT h7-m6 WITH THE SHAFT.
19. 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. 300°C-400°C) AND USE OF ASBESTOS CLOTH OVER THE WELD.
20. SHAFT SHALL BE FITTED WITH HUB BY 1 NO. PARALLEL KEY (STANDARD IS:2048, 1983)
21. ALL KEYS SHALL BE PRESS FIT INTO THE KEYWAYS. ALL KEYWAYS SHALL BE SIDE MILLED KEYWAYS.
22. ALL DATA AND DIMENSIONS SHALL BE CHECKED BY PULLEY MANUFACTURER BEFORE TAKING UP MANUFACTURING.
23. ALL PULLEYS ARE TO BE MARKED WITH THE FOLLOWINGS BEFORE DISPATCH.
   (a) WORK ORDER NO.
   (b) CONVEYOR NO.
   (c) PULLEY MARK NO.
24. 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 OAP.
25. THE DRIVE PULLEY SHALL HAVE 12 mm THK DIAMOND GROOVE RUBBER LAGGING & NON-DRIVE PULLEY SHALL HAVE 13 mm THK, A
26. PULLEY WEIGHT, MARKED (*) TO BE FURNISHED BY MANUFACTURERS.
27. FOUR (4) X 2 IN RUBBER PLUGS SHALL BE WELDED BELOW THE PULLEY SHELL OF ALL PULLEYS FOR SPEED SENSING.
28. PRINTING, TESTING & INSPECTION SHALL BE DONE AS PER APPROVED OAP & UCS.
29. 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 'T & T1' WILL BE ACCEPTABLE.
30. LEAK TEST OF ALL WELDS OF ALL PULLEYS TO BE CONDUCTED, 100% VT & 100% PT TO BE CONDUCTED ON BUTT WELDS OF ALL PULLEYS.
31. PULLEY SHELL FURNISHED SHALL BE ULTRASONICALLY TESTED FOR LAMINATION. ALL PLATES SHALL BE NORMALIZED, THE PROCEDURE SHALL BE AS PER APPROVED OAP.
32. ALL WELDS ON SHELL. DIAPHRAGM & HUB SHALL BE DONE INTERMITTENTLY TO AVOID DISTORTION / STRESS CONCENTRATION.
**PULLEY SCHEDULE FOR 'Z' SERIES**

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
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<th>Belt Width</th>
<th>Pulley Finishing</th>
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**PULLEY SCHEDULE FOR 'L' SERIES**

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<td>16</td>
<td>200</td>
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**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 CONVEYORS ARE TO BE RELIABLY BALANCED.
2. ALL PULLEYS ARE TO BE OF SAME SHAPE.
3. PULLEYS SHOULD BE TO BE IDENTIFIABLE.
4. ALL PULLEYS SHALL BE MADE CONSTRUCTION & STRENGTH WIZARD.
5. PULLEYS SHALL CONTAIN TO 31B1X1986.
6. ALL NON-SPIC PEELING PULLEYS WILL BE SEPARATELY LUBRICATION AS SHOWN.
7. ALL IS THE PULLEY DESIGN FOR USE AS PER INS. 1041 & WILL BE WELDED WITH A BOLT OF QUBRminent.
8. ALL IS A PULLEY SHALL BE OPERATE AS A BIZED, A PULLEY DESIGN.
9. TOTAL WIDTHS OF PULLEY IS HAVING LISTING OF NO. ZE, FL. BLOCK ASSY. FOR PULLEY.
10. FOR INDUCTION PULLEY, SHEET-1 & 2 OF THIS DRG.
11. ADJUSTMENTS WITHOUT TRAMING AS PER 1940.
12. PULLEY SHELL TO BE STRENGTH ENOUGH.
13. ONLY ONE LATERAL JUDICIAL MILD STEEL PULLEY SHEEL TO BE PROVIDED & MILD TO BE SEATED.
14. CONVEYOR SHEET 1 OF 4
15. GA DRAWING OF ALL CONVEYORS.

**HEAD END SHELD PULLEY, TAIL END SHELD PULLEY, TAIL PULLEY, HT BEND PULLEY, LT BEND PULLEY, ROLLER BEND PULLEY**

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**PLUMMER BLOCK DETAILS**

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<td>300</td>
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**REFERENCES:**
- INDIA STEEL (M) LTD. BHUAN Sheet 100 EXPANSION
- MECON LIMITED
- AUGMENTATION OF RAW MATERIAL RECEIPT & HANDLING FACILITIES WITH NEW SHIP. PARTS-B
- TECPRO SYSTEMS LTD.

**NOTES:**
- ONLY ARRIVAL OF NON DRIVE PULLEY CALIBRATING TAKE UP PULLEY (FOR 2 & 2, REAR)
Please review Fe410WB, C45, IS:1570.

Please furnish shaft & hub dimension details/drawing in this sheet.

Detail: D1
Connection between shell plate & rib

Detail: D2
Connection between hub & rib

Detail: D3
Shell welding details

View: B-B
Key connection (Typ)

View: A-A
G.A. of non-drive pulley

Plummer block details (Typ)
Floating type with one end open & one end closed

Bill of materials for one set non drive pulley:

<table>
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<th>SL.NO.</th>
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<th>DESCRIPTIONS</th>
<th>MATERIAL</th>
<th>REMARKS</th>
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<td>1</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>HUB</td>
<td>FORGED/M.S.STEEL</td>
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</tr>
<tr>
<td>4</td>
<td>2</td>
<td>END PLATES</td>
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<tr>
<td>5</td>
<td>2</td>
<td>MIDDLE DISC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>PARALLEL KEY</td>
<td>AS PER DRR</td>
<td></td>
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<tr>
<td>6A</td>
<td>2</td>
<td>PLUMMER BLOCK</td>
<td>ONE FIXED TYPE</td>
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Plumber block type & for referenced details shown in sheet

Please review Fe410WB, C45, IS:1570.

Only the arrangement has been checked. Adequacy & accuracy of design of individual component and detail quantity shall be the responsibility of equipment supplier.

For reference, with comments.
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.

CONNECTION BETWEEN SHELL PLATE & RIB

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

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

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

VIEW: A-A

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

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<tr>
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<tr>
<td>6</td>
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<td>PARALLEL KEY</td>
<td>SEE NOTE 10</td>
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<tr>
<td>BA</td>
<td>2</td>
<td>PLUMMER BLOCK (FLOATING END)</td>
<td>SEE NOTE 10</td>
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TECPO SYSTEMS LTD.

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Only the arrangement has been checked. Accuracy & correctness of design of individual components is the responsibility of equipment supplier.
READ THIS DRAWING TOGETHER WITH DRAWING NO. BSP-EPI-01-061-01-018-55-DE-00476, SHEET 3 OF 4.

DESIGN CRITERIA FOR BELT CONVEYORS

CONVEYOR CALCULATION

- 00004
- 00025
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PLUMMER BLOCK DETAILS

SHFT PK. NO. YOUR NO. TOTAL QTY.
116 NOTD SNT 528 222280CK 500 200 100 50 30 30 W-24 2 4
120 NOTD SNT 532 222240CK 480 200 100 50 30 30 W-24 2 4
120 NOTD SNT 532 222240CK 480 200 100 50 30 30 W-24 2 4
120 NOTD SNT 532 222240CK 480 200 100 50 30 30 W-24 2 4
120 NOTD SNT 532 222240CK 480 200 100 50 30 30 W-24 2 4
120 NOTD SNT 532 222240CK 480 200 100 50 30 30 W-24 2 4
120 NOTD SNT 532 222240CK 480 200 100 50 30 30 W-24 2 4
120 NOTD SNT 532 222240CK 480 200 100 50 30 30 W-24 2 4
120 NOTD SNT 532 222240CK 480 200 100 50 30 30 W-24 2 4
120 NOTD SNT 532 222240CK 480 200 100 50 30 30 W-24 2 4

TOTAL = 30 Nos.

NOTES:
1. ALL DIMENSIONS ARE IN M.M.
2. ALL PULLEYS ARE TO BE STATICALLY BALANCED.
3. PULLEYS & SHAFTS ARE TO BE FREE OF SHARP EDGES.
4. SHAFT BEARING JOURNAL ARE TO BE COATED WITH BLUE LACQUER.
5. PULLEYS SHALL BE WELDED CONSTRUCTION & STRESS RELIEVED.
7. ALL MIN-DRIVE PULLEYS WILL BE 12-THK, HOT PLAIN RUBBER LAGGED AS SHOWN.
8. ALL PULLEYS HANGING WHT., WILL BE LAST STEEL AS PER IS 1570 AND WILL BE MOUNTED WITH 4 BOLTS.
9. ALL BOLTS SHALL BE OF 57/57/57 MESS.
10. PLUMMER BLACK SHALL BE COMPLETE WITH MBS & ACCESSORIES.
11. TOTAL WT.(APPROXIMATE) INDICATED IS INCLUSIVE OF 2 NBS, PL. BLACK ASSY. PER PULLEY.
13. DAWDGING WITHOUT TOLERANCE AS FT4 AS 2102.
14. PULLEY SHAFT SHALL BE STRESS RELIEVED.
15. ONLY ONE LONGITUDINAL WELD PER PULLEY SHALL BE PROVIDED & WELD TO BE SMOOTH-GROUND FOR FABRICATED PULLEY SHELL.
16. THE OUT OF SQUARENESS SHALL NOT EXCEED +0.010 IN the DIAMETER PERIODO LAGGING.
17. GAS CUT SURFACES SHALL BE GROUND SMOOTH.
18. ALL PLUMMER BLOCKS SHALL BE HEAVY DUTY STAINLESS STEEL TYPE EQUIPPED WITH SELF ALIGNING, DOUBLE ROW SPHERICAL BEARING AND ADAPTOR SLEEVE WITH MINIMUM LIFE OF 50,000 HRS.
19. RAW MATERIAL SHELLS TO BE TAKEN MORE SO THAT FINISHED THICKNESS TO BE MAINTAINED AS SHOWN.
20. FIXED PLUMMER BLOCK AT FIXED END SHOULD HAVE LOADING SMOOTH.
21. ALL WELDMENTS SHALL BE BLENDED SMOOTH.
22. (FOR DETAILS SEE DOC. NO. 0000-W-STCO-012 SHEET 1 OF 2.)

FOR REFERENCE

WITH COMMENT

07.11.2014
07.11.2014
WITH COMMENT