

|   |   |                           |                     |
|---|---|---------------------------|---------------------|
| BHEL<br>HYDERABAD   | PRODUCT STANDARD<br>TURBINES & COMPRESSORS  | TC 51879                  |                     |
|   |   | REV 00                    |                     |
|   |   | PAGE 1 OF 11              |                     |
| <b><u>FINISH MACHINED LP GUIDE WHEELS 5.0 Sqm FOR STEAM TURBINE</u></b>   |   |                           |                     |
| <b>1.0 SCOPE :</b>  |   |                           |                     |
| This specification covers Supply of LP Guide wheels of 5.0 Sqm (-4 Series) according to the enclosed Drawings and BOM.  |   |                           |                     |
| The scope includes  |   |                           |                     |
| <div><div>-</div><div>Finish Machined LP Guide Wheel as per drawings and BOM enclosed..</div></div> <div><div>-</div><div>Sealing fin groove machining is to be done by Vendor.</div></div> <div><div>-</div><div>Manufacture/Procurement(from BHEL approved vendors) of LP Guide Blades as per drawings and material specifications mentioned in the relevant BOM.</div></div> <div><div>-</div><div>Each set of LP Guide Wheel shall consist of upper and lower parts ie., in two halves and its fasteners as mentioned in the BOM</div></div> <div><div>-</div><div>Raw material is in vendor scope.</div></div> |   |                           |                     |
| <b>*Note: The Manufacturing and Assembly of Sealing fin and caulking wire will be in BHEL scope.</b>  |   |                           |                     |
| (The part no’s related to sealing fin and caulking wire in each BOM of LP guide wheels are not to be manufactured by the supplier)  |   |                           |                     |
| <b>2.0 DIMENSIONS, TOLERANCES AND SURFACE FINISH</b>  |   |                           |                     |
| The dimensions, tolerances and surface finish shall be as per relevant drawings   |   |                           |                     |
| FORMAT<br>TD-201<br>REV -00   | PREPARED BY:<br>TS PRABHAKAR  | APPROVED BY:<br>CNV RAMAN | DATE:<br>09/07/2010 |
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| <p><b>3.0 MANUFACTURE:</b></p> <p>Manufacture includes, procurement of raw material as per BHEL specifications, machining the raw material according to the individual part drawings, assembly, fabrication and inspection at every stage.</p> <p>Supplier shall submit the detailed manufacture and testing plan (MTP) for both LP Guide wheels and LP Guide Blades to BHEL for the first time supplies as per this specification and further orders shall be processed as per approved MTP only. In case of any change in process of manufacture, the supplier shall submit a revised MTP for review by BHEL.</p> <p>All raw materials used for the manufacture shall be procured from BHEL approved sources.</p> <p>The raw material used for the manufacture of hollow guide blades shall be procured as per BHEL Plant Standard <b>AA10737(enclosed here with)</b> and shall be procured from BHEL approved sources. (E.PL.004)</p> <p>Along with the offer, supplier has to submit the welding procedure followed for manufacturing of the hollow guide blades for approval.</p> <p><b>4.0 QUALITY REQUIREMENTS</b></p> <p>Following are the critical parameters to be checked during manufacture of LP guide wheels.</p> <ul style="list-style-type: none"> <li><b>4.1</b> Throat diameters</li> <li><b>4.2</b> Weld quality of each weld (100% DP test)</li> <li><b>4.3</b> Stress relieving cycle of the guide wheel</li> <li><b>4.4</b> Number of blades as per drawing in each half</li> <li><b>4.5</b> Profile gaps of LP Guide Blades at check sections</li> </ul> <p><b>5.0 INSPECTION AT SUPPLIER WORKS</b></p> <p><b>5.1</b> BHEL representative/Third party inspector shall have free access to all areas where the manufacture of the items is carried out. All reasonable facilities shall be extended to him including manpower where necessary.</p> |  |  |
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| <p><b>5.2</b> BHEL representative/Third party inspector shall be given advance information to witness the various processes, tests etc.,</p> <p><b>5.3</b> BHEL representative/Third party inspector shall be given advance information to witness the profile gaps of hollow guide blades during the manufacture/welding of suction and pressure plates of hollow guide blades</p> <p><b>5.4</b> Profiles of finished blades are to be checked using templates manufactured by supplier.</p> <p><b>5.5</b> BHEL representative/Third party inspector shall be given advance information to witness the throat dimensions during fit up of guide blades.</p> <p><b>5.6</b> Punching, identification of test coupons and raw material and execution of various tests shall be done in presence of BHEL representative/Third party inspector.</p> <p><b>6.0 TEST CERTIFICATES</b></p> <p><b>6.1</b> Following test certificates shall be furnished<br/>For guide wheels</p> <ul style="list-style-type: none"> <li>- Raw material test certificates</li> <li>- Dimensional inspection record of guide wheel</li> <li>- Actual Throat dimensions of the blades</li> <li>- Dimensional reports of guide blades</li> </ul> <p><b>6.2</b> Die penetration test (For finished hollow guide blades): Each blade shall be subjected to DPT. No cracks are acceptable</p> <p><b>7.0 DOCUMENTS TO BE FURNISHED</b></p> <p><b>7.1</b> Documents to be furnished with offer are</p> <ul style="list-style-type: none"> <li>a) MTP</li> <li>b) Check list duly filled in</li> <li>c) Source of raw material procurement</li> <li>d) Procedure to be followed for manufacturing.</li> <li>e) Welding procedure followed for manufacturing of hollow guide blades.</li> </ul> |   |   |
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| <p><b>7.2</b> The supplier shall furnish five copies of test certificate ( in English) containing following details</p> <ul style="list-style-type: none"> <li>a) TC specification no. with rev no.</li> <li>b) Item description</li> <li>c) Drawing No</li> <li>d) Supplier name</li> <li>e) Test certificates of raw material used for manufacturing the LP Guide wheels.</li> <li>f) Results of all test results stipulated in the relevant specification mentioned in BOM</li> </ul> <p><b>7.3</b> The detailed dimensional protocol of each guide wheel are to be furnished by supplier. Supplier should obtain acceptance from BHEL for any deviation of throat dimensions beyond the drawing stipulated values and shall be submitted along with the protocols.</p> <p><b>7.4</b> For LP Guide Blades, the detailed dimensional protocols of profile gaps at check sections as mentioned in the BHEL drawings (other than profile co-ordinates) of each blade shall be furnished. Supplier should obtain acceptance from BHEL for any deviation of profile gaps beyond the drawing stipulated values and shall be submitted along with the protocols.</p> <p><b>8.0 PRESERVATION AND PACKING</b></p> <p>The items shall be suitably preserved and packed to prevent damage and corrosion during transit. In case of item is supplied by overseas supplier, the packing shall be seaworthy.</p> |  |  |
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**9.0 MARKING:**

**9.1** The manufacturer's identification number of the guide wheel shall be marked on the guide wheel.

**9.2** A tag bearing the relevant 12 digit material code of BHEL shall be attached to each component.

**9.3** The following details shall be marked on the packing case

- a) Manufacturer's name
- b) BHEL order number
- c) BHEL specification number
- d) Description of Component packed.

**10.0 REJECTION AND REPLACEMENT:**

In the event of any Guide wheel proving defective during course of further assembly/testing at sites, such wheel shall be rejected and supplier shall make immediate arrangements to replace the same free of cost.

**11.0 VARIANT TABLE**

| Var. No | LP Guide wheel designation | Drawing no with variant | Material code | BOM (Doc. No) |
|---------|----------------------------|-------------------------|---------------|---------------|
| 01      | LP Guide wheel 1L (5.0Sqm) | 0-301-17-00002-00       | TC9751879019  | BOM : 01      |
| 02      | LP Guide wheel 2L (5.0Sqm) | 1-301-18-00004-00       | TC9751879027  | BOM : 02      |
| 03      | LP Guide wheel 3L (5.0Sqm) | 0-301-19-00003-00       | TC9751879035  | BOM : 03      |

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**BOM:01**

**LP GUIDE WHEEL – 1 LEFT (5.0SQM) VAR:01**

**MATERIAL CODE: TC9751879019 (1350 Kg)**

| Pos No. | Drawing No.    | Description of Part              | Pcs. | Material Spec | Raw Material Dimension |
|---------|----------------|----------------------------------|------|---------------|------------------------|
|         | 03011700002-00 | LP Guide blade Wheel- 1 Left     | 1    |               | Main Assembly          |
| 1       | 13011700002-00 | LP Guide blade Wheel Welding     | 1    |               | Assembly               |
| 1/1     | 23011700003-00 | LP Guide Blade- 1 Left           | 86   | TC9517403097  | Sub Delivery           |
|         | 13011700001-00 | Profile Co-ordinates             |      | HY19474       | Ref drg.               |
| 1/2     | 13011700003-00 | Outer Ring Machining             | 1    |               | Assembly               |
| 1/2/1   | 03011700003-00 | Outer Ring Welding               | 1    |               | Assembly               |
| 1/2/1/1 | 33011700018-00 | Half Ring                        | 2    | AA 10119      | Plate 32x              |
| 1/2/1/2 | 33011700013-00 | Half Ring                        | 2    | AA 10119      | Plate 63x              |
| 1/2/1/3 | 33011700014-00 | Half Ring                        | 2    | AA 10119      | Plate 40x              |
| 1/2/1/4 | 33011700015-00 | Plate                            | 2    | AA 10119      | Plate 120x             |
| 1/2/1/5 | 33011700016-00 | Plate                            | 2    | AA 10119      | Plate 120x             |
| 1/2/1/6 | 33011700017-00 | Lifting Piece                    | 7    | AA 10119      | Plate 25x              |
| 1/2/1/7 |                | Round Dia. 32x20                 | 5    | HY 10199      | Round 32x              |
| 1/2/1/8 | 43011700012-00 | Plate                            | 1    | AA 10119      | Plate 70x              |
| 9       |                | Channel 150x75x3200              | 2    | AA10108       |                        |
| 1/2/2   | 41110262005-00 | Hex Head Screw M30x250           | 2    | HY10663       | Round 63x              |
| 1/2/3   |                | Nut Hex P M30-8                  | 2    | AA7151115     |                        |
| 1/2/4   | 43011800014-01 | Parallel Pin 14H8x35             | 4    | HY 10776      | Wire Dia 16x           |
| 1/3     | 23011700005-00 | Inner Ring                       | 1    |               | Assembly               |
| 1/3/1   | 33011700019-00 | Half Ring                        | 2    | AA 10119      | Plate 40x              |
| 1/3/2   |                | Plate 40x60x60                   | 4    | AA 10119      | Plate 40x              |
| 1/3/3   |                | Scru Cap Soc P M20x100-12.9      | 2    | AA7123123     |                        |
| 1/3/4   |                | Nut Hex P M20-8                  | 2    | AA7151115     |                        |
| 1/3/5   |                | Pin Cyl Rnd End 10M6x20-ST       | 4    | AA7171001     |                        |
| 6       |                | Channel MC 100x50x2250           | 2    | AA10108       |                        |
| 2       | 31060262004-01 | Stud M56x250                     | 2    | AA10620       | Round 63x              |
| 3       | 41060262011-01 | Cap Nut M56                      | 2    | HY 10663      | Round 90x              |
| 4       | 41060262007-02 | Taper Pin Dia. 30x145            | 2    | AA10620       | Round 40x              |
| 5       | 41110262007-02 | Sealing Fin 0.3x0.6x9.5x         | 9    | HW 10785      |                        |
| 6       | 41110262007-03 | Sealing Fin 0.3x0.6x9.5x         | 11   | HW 10785      |                        |
| 7       |                | Rectangular Flat 1.7x1.4x150000  | 1    | HY10775       |                        |
|         | 31110162018-00 | Co-ordinates of Marking Template | 1    |               | Ref drg.               |

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## **BOM:02**

### **LP GUIDE WHEEL – 2 LEFT (5.0SQM) VAR:02**

### **MATERIAL CODE: TC9751879027 (1300 Kg)**

| Pos No.        | Drawing No.           | Description of Part               | Pcs.      | Material Spec           | Raw Material Dimension |
|----------------|-----------------------|-----------------------------------|-----------|-------------------------|------------------------|
|                | <b>13011800004-00</b> | LP Guide blade Wheel- 2 Left      | 1         |                         | Main Assembly          |
| <b>1</b>       | <b>13011800005-00</b> | LP Guide blade Wheel Welding      | 1         |                         | Assembly               |
| <b>1/1</b>     | <b>23011800002-00</b> | LP Guide Blade- 2 Left            | <b>64</b> | TC9517403100<br>HY19474 | Sub Delivery           |
|                | <b>13011800003-00</b> | Profile Co-ordinates              |           |                         | Ref drg.               |
| <b>1/2</b>     | <b>03011800002-00</b> | Outer Ring Machining              | <b>1</b>  |                         | Assembly               |
| <b>1/2/1</b>   | <b>03011800003-00</b> | Outer Ring Welding                | 1         |                         | Assembly               |
| <b>1/2/1/1</b> | <b>33011800007-00</b> | Half Ring                         | 2         | AA10119                 | Plate 32x              |
| <b>1/2/1/2</b> | <b>33011800008-00</b> | Half Ring                         | 2         | AA10119                 | Plate 32x              |
| <b>1/2/1/3</b> | <b>33011800009-00</b> | Half Ring                         | 2         | AA10119                 | Plate 140x             |
| <b>1/2/1/4</b> | <b>43011800011-00</b> | Round Pin                         | 36        | HY10199                 | Round 100x             |
| <b>1/2/1/5</b> | <b>33011800010-00</b> | Lifting Piece                     | 6         | AA10119                 | Plate 25x              |
| <b>1/2/1/6</b> | <b>43011800012-00</b> | Plate                             | 4         | AA10119                 | Plate 20x              |
| <b>1/2/1/7</b> | <b>43011800013-00</b> | Plate                             | 4         | AA10119                 | Plate 20x              |
| <b>1/2/1/8</b> |                       | Channel 150x75x3500               | 2         | AA10108                 |                        |
| <b>1/2/2</b>   |                       | Scru Hex P M20x100-8.8            | 4         | AA7121124               |                        |
| <b>1/2/3</b>   |                       | Nut Hex P M20-8                   | 4         | AA7151115               |                        |
| <b>1/2/4</b>   | <b>43011800014-00</b> | Parallel Pin Dia 14 H8 x 30       | 4         | HY10776                 | Wire Dia 16x           |
| <b>1/3</b>     | <b>23011800004-00</b> | Inner Ring                        | 1         |                         | Assembly               |
| <b>1/3/1</b>   | <b>33011800011-00</b> | Half Ring                         | 2         | AA10119                 | Plate 25x              |
| <b>1/3/2</b>   |                       | Plate 40x60x105                   | 4         | AA10119                 | Plate 40x              |
| <b>1/3/3</b>   |                       | Scru Hex P M20x80-8.8             | 4         | AA7121124               |                        |
| <b>1/3/4</b>   |                       | Nut Hex P M20-8                   | 4         | AA7151115               |                        |
| <b>1/3/5</b>   |                       | Pin Cyl Rnd End 10M6x35-ST        | 4         | AA7171001               |                        |
| <b>1/3/6</b>   |                       | Channel MC 100x50x2200            | 2         | AA10108                 |                        |
| <b>2</b>       | <b>41110262007-02</b> | Sealing Fin 0.3x0.6x9.5x          | 9         | HW10785                 |                        |
| <b>3</b>       |                       | Rectangular Flat 1.7x1.4x45000    | 1         | HY10775                 |                        |
|                | <b>31110262026-00</b> | Co-ordinates For Marking Template | 1         |                         | Ref drg.               |

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**BOM:03**

**LP GUIDE WHEEL – 3 LEFT (5.0SQM) VAR:03**

**MATERIAL CODE: TC9751879035 (2700 Kg)**

| Pos No. | Drawing No.    | Description of Part                                       | Pcs. | Material Spec              | Raw Material Dimension |
|---------|----------------|---|------|----------------------------|------------------------|
|         | 03011900003-00 | LP Guide Wheel-3 Left                                     | 1    |                            | Main Assembly          |
| 1       | 03011900014-00 | LP Guide Wheel Welding-3 Left                             | 1    |                            | Assembly               |
| 1/1     | 03011900002-00 | LP Hollow Guide Blade -3 Left (New 5.0SQM) With out Slits | 54   | TC9751869030<br>TC51869-03 | Sub Delivery           |
| 1/1/1   | 03011900002-00 | Plate (Suction Side)                                      | 54   | AA10737                    |                        |
| 1/1/2   | 03011900002-00 | Plate (Pressure Side)                                     | 54   | AA10737                    |                        |
|         | 13011900004-00 | Profile Co-ordinates                                      | 1    |                            | Ref drg.               |
|         | 13011900005-00 | Inner Profile Co-ordinates                                | 1    |                            | Ref drg.               |
|         | 03011900008-00 | Development Of Hollow Guide Blade                         | 1    |                            | Ref drg.               |
| 1/3     | 03011900005-00 | Outer Ring Machining                                      | 1    |                            | Assembly               |
| 1/3/1   | 03011900006-00 | Outer Ring Welding  | 1    |                            | Assembly               |
| 1/3/1/1 | 23011900001-00 | Half Ring   | 2    | AA10119                    | Plate 36x              |
| 1/3/1/2 | 33011900010-00 | Half Ring   | 2    | AA10119                    | Plate 63x              |
| 1/3/1/3 | 33011900011-00 | Plate   | 2    | AA10119                    | Plate 120x             |
| 1/3/1/4 | 33011900012-00 | Plate   | 2    | AA10119                    | Plate 120x             |
| 1/3/1/5 | 33011900013-00 | Half Ring   | 2    | AA10108                    | Plate 8x               |
| 1/3/1/6 | 33011900014-00 | Half Ring   | 2    | AA10108                    | Plate 8x               |
| 1/3/1/7 | 33011900015-00 | Lifting Piece   | 8    | AA10119                    | Plate 25x              |
| 1/3/1/8 |                | Round Dia. 32X25  | 5    | HY10199                    | Round 32x              |
| 1/3/1/9 | 43011900005-00 | Plate   | 1    | AA10119                    | Plate70x               |
| 1/3/10  |                | Channel 150x75x4500                                       | 2    | AA10108                    |                        |
| 1/3/2   | 43011900015-00 | Hex Head Screw M30x145                                    | 4    | AA10620                    | Round 63x              |
| 1/3/3   | 43011800014-01 | Parallel Pin Dia 14 H8 x 35                               | 4    | HY10776                    | Wire Dia 16x           |
| 1/4     | 03011900007-00 | Inner Ring  | 1    |                            | Assembly               |
| 1/4/1   | 43011900006-00 | Half Ring   | 2    | AA10119                    | Plate 45x              |
| 1/4/2   | 33011900016-00 | Half Ring   | 2    | AA10119                    | Plate 25x              |
| 1/4/3   | 43011900007-00 | Half Ring   | 2    | AA10119                    | Plate 32x              |
| 1/4/4   | 43011900008-00 | Half Ring   | 2    | AA10119                    | Plate 10x              |
| 1/4/5   | 43011900009-00 | Half Ring   | 2    | AA10119                    | Plate 10x              |
| 1/4/6   | 43011900010-00 | Plate   | 2    | AA10119                    | Plate 40x              |
| 1/4/7   | 43011900016-00 | Plate   | 2    | AA10119                    | Plate 40x              |
| 1/4/8   |                | Scru Hex P M24x80-8.8                                     | 4    | AA7121124                  |                        |
| 1/4/9   |                | Nut Hex P M24-8   | 4    | AA7151115                  |                        |
| 1/4/10  | 43011800014-00 | Parallel Pin Dia 14 H8x30                                 | 4    | HY10776                    | Wire Dia 16x           |

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| Pos No. | Drawing No.    | Description of Part               | Pcs. | Material Spec | Raw Material Dimension |
|---------|----------------|-----------------------------------|------|---------------|------------------------|
| 1/4/11  |                | Scru Grb Slt CP M10x16            | 2    | HY7125194     |                        |
| 1/4/12  |                | Channel MC 100x50x2250            | 2    | AA10108       |                        |
| 2       | 31060262004-03 | Stud M56x230                      | 4    | AA10620       | Round 63x              |
| 3       | 41060262011-01 | Cap Nut M56                       | 4    | HY10663       | Round 90x              |
| 4       | 41060262007-01 | Taper Pin Dia 30x145              | 2    | AA10620       | Round 40x              |
| 5       | 41110262007-04 | Sealing Fin 0.3x0.6x9.5x          | 10   | HW10785       |                        |
| 6       |                | Rectangular Flat 1.7x1.4x45000    | 1    | HY10775       |                        |
| 7       | 43011900014-00 | Pipe Dia 33.4x6.35x60             | 2    | AA10755       |                        |
|         | 03011900009-00 | Co-ordinates For Marking Template | 1    |               | Ref drg.               |

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**ANNEXURE-1**

This CHECK LIST shall be completely filled-in by supplier duly signed and enclosed along with Technical offer.

**TECHNICAL OFFER FOR FINISH MACHINED LP GUIDE WHEELS**

Type\_\_\_\_\_ BHEL Spec\_\_\_\_\_ Var\_\_\_\_\_

Supplier ref:\_\_\_\_\_

BHEL Enquiry ref no:\_\_\_\_\_ Date:\_\_\_\_\_

Manufacturer:\_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

| Cl No | Description  | Confirmation by supplier |
|-------|--|--------------------------|
| 2.0   | Dimensions, tolerances and surface finish as per drawing     |                          |
| 3.0   | Manufacture  |                          |
|       | BHEL SPEC REV.NO.  |                          |
|       | Source of Raw material Vendors as Per BHEL approved list     |                          |
|       | Manufacture and testing plan (MTP)                           |                          |
| 4.0   | Quality requirements of guide wheel                          |                          |
| 5.5   | Checking of profiles with templates manufactured by supplier |                          |
| 6.2   | NDT for Raw Material   |                          |
| 6.2   | MPI for finished Hollow Guide Blades                         |                          |
| 7.2   | Documents to be furnished along with supply                  |                          |
| 8.0   | Seaworthy packing if applicable                              |                          |

Date

Signature of supplier

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**RECORD OF REVISIONS**

| Rev no | Date       | Revision details | Revised by | Approved by |
|--------|------------|------------------|------------|-------------|
| 00     | 09-07-2010 | New ..           | TSP        | CNVR        |
|        |            |                  |            |             |
|        |            |                  |            |             |
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