
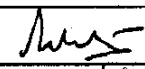

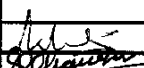
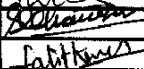
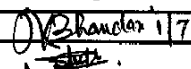

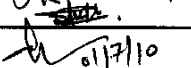
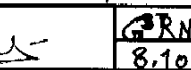
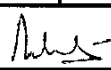
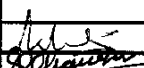
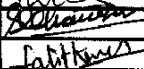
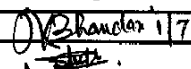

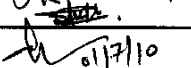
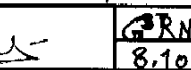
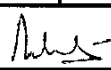
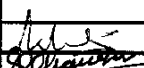
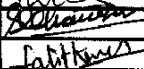
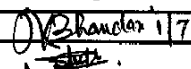

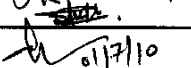
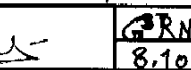
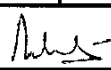





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| शीर्षक एवं दिनांक<br>SIGN. & DATE   |    | उत्पाद मानक<br><b>PRODUCT STANDARD</b>  | <b>ST48015</b><br>मुख पृष्ठ<br>PREFACE SHEET                  |
| श्रेणी सूची नम्बर एवं<br>सुपरसेड्स<br>INVENTORY NO  | केवल आंतरिक प्रयोग हेतु<br>प्रदायक को देने से पूर्व इस मुखपृष्ठ को निकाल दें ।<br><b>FOR INTERNAL USE ONLY</b><br><b>REMOVE THIS PREFACE BEFORE ISSUE TO SUPPLIERS.</b><br><br><b>Title :- Technical requirements for Local Instrument Racks (IR)</b> |   |   |
| स्वत्वाधिकार एवं गोपनीय<br><small>इस दस्तावेज में दी गई सूचना भारत की इलेक्ट्रिकल, मशीन एवं सहायक उपकरणों के उत्पादन और मरम्मत के लिए आवश्यक है। इस सूचना को गोपनीय और सुरक्षित रखना आवश्यक है।</small>                               | समतुल्य मानक/सूची आदि<br>COMPARABLE STANDARDS / CATALOGUES ETC. } : NO.   |   |   |
| COPYRIGHT AND CONFIDENTIAL.<br><small>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.</small> | सुझाए/सम्भावित प्रदायक एवं श्रेणी<br>SUGGESTED / PROBABLE SUPPLIERS AND GRADES.<br>1) Instrumentation Ltd.-----Kota   |   |   |
| कोई अन्य जानकारी<br>ANY OTHER INFORMATIONS } : NONE   |   |   |   |
| श्रेणी सूची नम्बर<br>INVENTORY NO<br><b>P-6398</b>  | शीर्षक एवं दिनांक<br>SIGN. & DATE<br><b>1/1/10</b>  | रवीकृति<br>APPROVED<br> <b>K.B.Batra</b><br>HOD-CIE | शीर्षक<br>SR No<br><b>8.10</b>                                |
| REV. NO.<br><b>00</b>   | दिनांक<br>DI<br><b>01.07.10</b>   | तैयार<br>PREPARED: <b>CIE</b>   | जारी<br>ISSUED: <b>TSX</b><br>दिनांक<br>DATE: <b>01.07.10</b> |

|  |   |   |  |                        |   |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE  |    | <b>उत्पाद मानक</b><br><br><b>PRODUCT STANDARD</b>                                   | <b>ST 48015</b><br><br>पृष्ठ 13 का 1<br>Page 1 of 13 |                        |   |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
| सामग्री सूची संख्या और अधिकारिता करना है<br>INVENTORY NO.  | ( Based on BHEL-EDN-Tech. spec. no. CE/415/LIE-LIR/TR)  |   |  |                        |   |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
| COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. | <b>TECHNICAL REQUIREMENT FOR LOCAL INSTRUMENT RACKS (IR)</b><br><br><b>I. OPEN TYPE INSTRUMENT RACKS:</b>   |   |  |                        |   |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
| स्वत्साधिकार एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इसका इस्तेमाल एवं आरक्षण का स अधिकारी को करार प्रयोग, जो कि कंपनी के हित में होना चाहिए ही न होना चाहिए।                  | 1. Instrument racks is provided for mounting pressure transmitters, switches & gauges and other accessories, in buildings and closed areas like the power house building / turbine hall at various locations.<br><br>2. The Instrument Racks shall be of following sizes (in millimeters).<br>Type A- 1800(W) x 650(D) x 2200(H) (For Transmitters / Switches / Gauges)<br>Type B- 1000(W) x 650(D) x 2200(H) (For Transmitters Switches / Gauges)<br><br>3. Racks shall be constructed on structural members of adequate strength and rigidity to ensure proper support to the mounted instruments and equipment. Racks shall be of welded construction. Each rack shall be provided with a canopy to protect the instrument from dripping water or falling objects.<br><br>4. All Valves & Manifolds shall be securely mounted and the structural design shall be such that no item shall interfere with maintenance and removal of instrument, equipment and their accessories.<br><br>5. Construction of same shall be typically as per Fig. nos.-1,2 &3.<br><br>6. <b>Service Power and Lighting</b><br>a. Each rack shall be provided with one receptacle, one light fixture with wire guard and one lighting switch. Light fixtures shall be installed on the canopy of the rack.<br><br>b. Power supplies for miscellaneous devices shall be provided with fuses located within the rack JB. Fuses shall be mounted in fuse blocks. Fuse ratings shall be suitable upto 15Amps Power supply shall be 240 V AC.<br><br>7. <b>Equipment Installation</b><br><br>Vendor shall prepare rack fabrication and piping drawings indicating the layout of each Rack. Instruments shall be installed using custom fabricated supports which are attached to the vertical members provided for this purpose. Drawings shall indicate the arrangement of all equipment, piping, valves and fittings within the rack and shall be subject to approval  |   |  |                        |   |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
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|  |   |   |  | नाम<br>NAME            | दिनांक एवं हस्ताक्षर<br>SIGNATURE & DATE  |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
| MEMBER-PSC   | K.B. BATHA  |  | अनुवादक TRANSLATED BY                                | -                      | -   |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
| QAX  | S.K.Chauhan   |  | निर्माणकर्ता WORKED BY                               | J.S.BHANDARI           |  17/10   |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
| TSX  | Lalit Kumar   |  | जांचकर्ता CHECKED BY                                 | G.GUPTA                |          |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
| सहमत विभाग<br>AGREED DEPTT.  | नाम<br>NAME   | दिनांक एवं हस्ताक्षर<br>DATE & SIGNATURE  | पर्यवेक्षणकर्ता SUPERVISED BY                        | VINOD KUMAR            |  01/7/10 |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
|  |   |   | स्वीकृति<br>APPROVED :                               | K.B.BATHA , SDGM (CIE) |  8.10    |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
| REV. 00  | 01.07.2010  |   | निर्माण<br>PREPARED :                                | CIE                    | जारी<br>ISSUED :  |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
|  |   |   |  | CIE                    | दिनांक<br>DATE :  |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
|  |   |   |  |                        | 01.07.10  |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |
| सामग्री सूची संख्या<br>INVENTORY NO.<br>P-6398   |   |   |  |                        |   |  |  |             |  |            |            |   |                       |   |   |     |             |   |                        |              |   |     |             |   |                      |         |   |                             |             |  |                               |             |   |  |  |  |                        |                        |  |         |            |  |                       |     |                  |  |  |  |  |     |                  |  |  |  |  |  |          |





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| सिग्नेचर एवं दिनांक<br>SIGN & DATE |  | <b>उत्पाद मानक</b>      | <b>ST 48015</b>               |
|                                    |  | <b>PRODUCT STANDARD</b> | पृष्ठ 13 का 2<br>Page 2 of 13 |








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| सामग्री सूची संख्या को<br>अधिचिह्नित करना है<br>SUPERSEDES<br>INVENTORY NO. | COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. | स्वसाधिकार एवं गोपनीय<br>इस दस्तावेज में दी गई सूचना भारत भारती इलेक्ट्रिकल्स की सम्पत्ति है इतना प्रकट एवं आरक्षण रूप से किया भी उचित प्रयोग, जो कि कंपनी के हित में साधिकारक हो न किया जाए। | सिग्नेचर एवं दिनांक<br>SIGN & DATE<br>24/7/10 | <p><b>8. Impulse Piping / Tubing</b></p> <p>a. Instrument racks shall be complete with impulse tubing piping, valves from enclosure bulkhead connection to all instruments and necessary drain / blow down connections. The type, sizes, material and pressure class of pipes/tubes, fittings, valves etc. shall be suitable for the intended applications as per the Schemes / Tagging list of Instrument, provided by BHEL.</p> <p>b. Bulkhead connection shall be used when instrument piping/ tubing enters the enclosure through Bulkhead plate. Typically through Bulk heads, Impulse pipe entry shall be through top side of the rack for Steam and Liquid services.</p> <p>c. All Instrument Blow down lines, except those measuring vacuum shall be connected to a two-inch header, which is extended through one end of the rack and turned downward for directing the blow down into drain.</p> <p>d. In the drain /common header, provision of spare drain connections shall be made for adding additional instruments in future as shown in the rack drgs. These connections shall be plugged suitably to avoid any flash over near by the racks.</p> <p>e. Instrument piping and tubing shall be hydrostatically tested at one and one-half times the maximum system pressure for that instrument except for low pressure and vacuum measurement the test pressure will be 8 Kg / Cm<sup>2</sup>.</p> <p><b>9. Wiring of the Racks</b></p> <p>a. A fully enclosed IP 55 (as per IS:2147) type junction box shall be provided in each rack for housing the terminal blocks, power supply fuses and other electrical accessories, as required.</p> <p>b. All electrical connections between instrument and the Terminals in Junction box shall be made. In addition all utility wiring for lighting and service power shall be installed.</p> <p>c. Vendor shall furnish general arrangement and wiring diagrams for each Instrument rack for approval.</p> <p>d. Junction boxes for the racks shall be mounted on one end of each assembly to accept field wiring through the top or bottom of the junction box. The junction box shall be 150 millimeters minimum depth. A removable bolted door shall give access to the interior of the junction box. All junction boxes shall accept same key. JB to be of Metallic type with IP 55 protection class and fitted with 24 way Terminal Block.. Door handle shall be of SS. Self locking type with common key. Door gasket shall be of synthetic rubber.<br/>Two nos. cable glands shall be provided in the JB suitable for outgoing group cable (individual &amp; overall shielded) of size: 1x8Px0.5mm<sup>2</sup></p> |
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| सामग्री सूची संख्या<br>INVENTORY NO.<br><b>P-6398</b> | REV.00 |  | निर्माणकर्ता<br>WORKED BY<br><b>G.GUPTA</b> | 01/07/10 |
|   |        |  | जांचकर्ता<br>CHECKED BY<br><b>V. KUMAR</b>  | 01/07/10 |

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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE  |    | <b>उत्पाद मानक</b><br><br><b>PRODUCT STANDARD</b> | <b>ST 48015</b><br><br>पृष्ठ 13 का 3<br><br>Page 3 of 13 |          |   |          |
| SUPERSEDES<br>INVENTORY NO.<br><br>सारणी सूची संख्या को<br>अतिरिक्तित करता है  | <p><b>II. General Requirement applicable to Transmitter Racks :</b></p> <p><b>1. Surface preparation And Painting</b></p> <p>a. All sheet metal / exterior steel surfaces shall rust free and scale free and all other residue during fabrication operation such as Oil, grease and salts etc. shall be removed by one or more solvent cleaning methods. Epoxy primer surface shall be applied to all exterior and interior surfaces. Epoxy paint shall be applied to all surfaces and the paint thickness shall be 100 to 150 microns. The finish colours for exterior and interior surfaces shall conform to the shades mentioned in scope of supply.</p> <p>b. All impulse lines starting from bulk head upto drain header including drain valves shall be finished with one coat of epoxy primer.</p> <p><b>2. Grounding</b></p> <p>a. Racks shall be provided with ground points which shall have two (2) welded GI bolts and nuts at each end of frame.</p> <p><b>3. Name plate / Label.</b></p> <p>Service details and Tag no. shall be engraved on a nameplate or label for each of the instrument. These Nameplates or Labels shall be of white non-hygroscopic material with engraved black lettering. This shall be fixed on to the Impulse Pipe closer to the instrument inside the Rack.</p> |   |  |          |   |          |
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| <b>स्वत्वाधिकार एवं गोपनीय</b><br><br>इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इस्का प्रयोग एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में खनिष्कारक हो न किया जाए।                     |   |   |  |          |   |          |
| दिनांक एवं दिनांक<br>SIGN & DATE<br>14/7/10  |   |   |  |          |   |          |
| सारणी सूची संख्या<br>INVENTORY NO.<br>P-6398   | REV.00  |   | निर्माणकर्ता<br>WORKED BY                                | G.GUPTA  |  | 01/07/10 |
|  |   |   | जांचकर्ता<br>CHECKED BY                                  | V. KUMAR |  | 01/07/10 |



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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE  |    | <b>उत्पाद मानक</b><br><br><b>PRODUCT STANDARD</b> | <b>ST 48015</b><br><br>पृष्ठ 13 का 5<br><br>Page 5 of 13  |          |
| सुपरसेरीज<br>INVENTORY NO.<br><br>सामग्री सूची संख्या को<br>अधिकारिता करता है  | <p>d) Terminal blocks shall be provided with white marking strips/self adhesive marker cards.</p> <p>e) 10 nos. of spare unused terminals shall be provided on each terminal blocks for circuit modifications and for termination of all conductors in a multi conductor control cables.</p> <p>f) Terminal blocks for termination of electrical power supply shall be type WAGO / PHOENIX make of suitable size with marking strips.</p> <p>g) The last terminal in a rail-mounted assembly shall be closed with an end plate and end bracket.</p>   |   |   |          |
| <b>COPYRIGHT AND CONFIDENTIAL</b><br>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. | <p><b>III. Documents to be Submitted by Vendor for Approval :</b></p> <ol style="list-style-type: none"> <li>1. OGA for Instrument Racks.</li> <li>2. Layout of Components in each of Instrument Rack.</li> <li>3. Electrical diagrams for each Instrument Rack.</li> <li>4. Component datasheets</li> <li>5. Quality plan including Welding Procedure specification and Welder Procedure qualification Record.</li> <li>6. The quality plan shall include Visual inspection, GA BOM/Layout features verification, Dimensions, Paint shade, thickness measurement, Alignment of sections, component ratings, Wiring, IR, HV, review of TC for instruments / Devices, Accessibility of TBs / Devices, Illumination, Tubing and Degree of protection (Review of type test certificate)</li> </ol>   |   |   |          |
| <b>स्वत्वधिकार एवं गोपनीय</b><br>इस प्रलेख में दी गई सूचना भारत भारती इंजीनियरिंग्स की संपत्ति है। इसका प्रयोग एवं आशयका रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो, न किया जाए।                          | <p><b>IV. Specific requirements</b></p> <ol style="list-style-type: none"> <li>1. Where grouping is not provided for instruments, same shall be indicated during detailed engineering.</li> <li>2. Two nos. of drain valves shall be provided where operating pressure is more than 40Kg/cm2.</li> <li>3. Spare drain connections at drain / common header as per clause I:8(d), shall be plugged with removable metallic caps. This should be ensured before dispatch of Racks.</li> <li>4. Drain/common header and other open ended points of valves/pipes etc. shall be plugged with removable rubber/plastic caps. This should be ensured before dispatch of Racks.</li> </ol> <p><b>V. Testing requirements</b></p> <p>Testing shall be carried out as per check list for Instrument valve, Impulse &amp; tubes, Socket weld fittings and SS compression fittings.</p> |   |   |          |
| दिनांक<br>SIGN & DATE<br><br> 14.7.10   |   |   |   |          |
| सामग्री सूची संख्या<br>INVENTORY NO.<br><br>P-6398   | REV.00  |   | निर्माणकर्ता<br>WORKED BY<br><br><b>G.GUPTA</b>  | 01/07/10 |
|  |   |   | जांचकर्ता<br>CHECKED BY<br><br><b>V. KUMAR</b>   | 01/07/10 |


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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE  |    | <b>उत्पाद मानक</b><br><br><b>PRODUCT STANDARD</b>                                     | <b>ST 48015</b><br><br>पृष्ठ 13 का 6<br>Page 6 of 13  |                           |         |   |          |                         |          |   |          |
| सुपरसेड्स<br>INVENTORY NO.<br><br>आपकी सूची संख्या को<br>अधिकृत किया जाएगा   | <p><b>VI. Packing and conservation:</b></p> <p>All the items shall be conserved and packed to avoid damage during shipment and handling.</p> <p><b>VII. Compliance with National/International Standard :</b></p> <p>No Indian standard exists, assistance taken from BHEL-EDN-Bangalore technical specification.</p> <p><b>VIII. Cross-referred Standards:</b></p> <p>ASTM: A3328, IS:2147 &amp; ANSI: B16.11.</p> |   |   |                           |         |   |          |                         |          |   |          |
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| <b>स्वसाधिकार एवं गोपनीय</b><br>इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इन्हें प्रकट करना एवं प्रसारण करना उसे किसी भी तरह प्रयोग, जो कि कंपनी के हित में सापेक्षित हो स किया जाए।                   |   |   |   |                           |         |   |          |                         |          |   |          |
| दिनांक एवं हस्ताक्षर<br>SIGN & DATE<br>14.7.10   |   |   |   |                           |         |   |          |                         |          |   |          |
| आपकी सूची संख्या<br>INVENTORY NO.<br><b>P-6398</b>   | REV.00  |   | <table border="1" style="width: 100%;"> <tr> <td style="width: 20%;">निर्माणकर्ता<br/>WORKED BY</td> <td style="width: 20%;">G.GUPTA</td> <td style="width: 20%; text-align: center;"></td> <td style="width: 40%;">01/07/10</td> </tr> <tr> <td>जांचकर्ता<br/>CHECKED BY</td> <td>V. KUMAR</td> <td style="text-align: center;"></td> <td>01/07/10</td> </tr> </table> | निर्माणकर्ता<br>WORKED BY | G.GUPTA |  | 01/07/10 | जांचकर्ता<br>CHECKED BY | V. KUMAR |  | 01/07/10 |
| निर्माणकर्ता<br>WORKED BY  | G.GUPTA   |  | 01/07/10  |                           |         |   |          |                         |          |   |          |
| जांचकर्ता<br>CHECKED BY  | V. KUMAR  |  | 01/07/10  |                           |         |   |          |                         |          |   |          |

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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE |  | <b>उत्पाद मानक</b><br><br><b>PRODUCT STANDARD</b> | <b>ST 48015</b><br><br>पृष्ठ 13 का 7<br><br>Page 7 of 13 |
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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE   | SUPERSEDES INVENTORY NO.              | <b>CHECK LIST FOR INSTRUMENT VALVES</b>   |   |  |  |  |  |  |
| सामग्री सूची संख्या को अधिकृत करता है | सामग्री सूची संख्या को अधिकृत करता है | COPYRIGHT AND CONFIDENTIAL<br>The information on this documents 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   | स्वसाधिकार एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इसका प्रस्ताव एवं अप्रस्ताव को से किसी भी तरह प्रयोग, जो कि कंपनी के हित में साधिकार को न विनाश करे। | <b>LEGEND :</b><br>* D: RECORDS, IDENTIFIED WITH 'right mark ' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.<br><br>** M: MANUFACTURER/SUB CONTRACTOR, C:CONTRACTOR/NOMINATED INSP.AGENCY<br>N: END USER "P" PERFORM "W" WITNESS "V" VERIFICATION |  |  |  |  |
|                                       |                                       | <b>NOTE :</b><br>1) QUANTUM OF CHECK SHALL BE AS BELOW :<br>100% - BY MANUFACTURER<br>10% - BY CONTRACTOR<br>NIL - BY M/S CUSTOMER<br><br>2) MANUFACTURER TO MAINTAIN CALIBRATED INSTRUMENT HAVING BETTER ACCURACY THAN THE ITEM UNDER TEST. INSPECTING ENGINEER SHALL CHECK THE SAME.<br>3) UT REQUIRED IF RAW MATERIAL/ FORGING SECTION IS 50mm AND ABOVE<br>4) FORGINGS SHALL BE NORMALISED BEFORE MACHINING |   |  |  |  |  |  |
|                                       |                                       | दिनांक एवं हस्ताक्षर<br>SIGN & DATE<br>14.7.10  |   |  |  |  |  |  |

| SL NO. | TESTS/CHECKS                                  | QTUM OF CHECK      | REFERENCE DOC. ACCEPTANCE NORMS.     | AGENCY** |   |   |    | REMARKS                                       |
|--------|---|--------------------|--------------------------------------|----------|---|---|----|---|
|        |   |                    |                                      | M        | C | N | D* |   |
| 1      | DIMENSIONS, TYPE                              | REFER NOTE-1 BELOW | APPROVED SPEC/ DATA SHEETS/DRG.      | P        | W | V |    |   |
| 2      | MATERIAL FOR BODY AND STEM                    | ONE SAMPLE/        | AS PER ASTM STD.* (FOR FORGING)/DRG. | P        | V | V |    | * FOR BARSTOCK ITEMS LABR. TC TO BE FURNISHED |
| 2.1    | CHEMICAL                                      | HEAT/              |                                      |          |   | V |    |   |
| 2.2    | PHYSICAL                                      | LOT                |                                      |          |   | V |    |   |
| 3      | STELITING OF SEAT                             | ↑                  | MANUFACTURE'S STD.                   | P        | V | V |    | ✓   |
| 4      | HYDRAULIC TESTING BODY AND SEAT               | REFER NOTE-1 BELOW | 1.5 TIMES RATED PRESSURE             | P        | W | V |    | ✓   |
| 5      | AIR LEAKAGE TEST                              | ↓                  | AT 7 Kg/cm <sup>2</sup>              | P        | W | V |    | ✓   |
| 6      | IDENTIFICATION & RATINGS TO BE PUNCHED MARKED | REFER NOTE-1 BELOW | APPROVED SPEC/ DATA SHEETS/DRG.      | P        | W | V |    |   |

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| सामग्री सूची संख्या<br>INVENTORY NO.<br><b>P-6398</b> | REV.00 |  | निर्माणकर्ता<br>WORKED BY<br><b>G.GUPTA</b> | जांचकर्ता<br>CHECKED BY<br><b>V. KUMAR</b> | 01/07/10<br><br>01/07/10 |
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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE |  | <b>उत्पाद मानक</b><br><br><b>PRODUCT STANDARD</b> | <b>ST 48015</b><br><br>पृष्ठ 13 का 8<br><br>Page 8 of 13 |
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| सामग्री संख्या को<br>INVENTORY NO. | सुपरसेडेस<br>INVENTORY NO. | <b>CHECK LIST FOR IMPULSE PIPES AND TUBES</b> |
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| SL NO | TESTS/CHECKS  | QUANTUM OF CHECK | REFERENCE DOC. ACCEPTANCE NORMS.                                      | AGENCY** |   |   |    | REMARKS  |
|-------|---|------------------|---|----------|---|---|----|--|
|       |   |                  |   | M        | C | N | D* |  |
| 1     | CHECK FOR DIMENSION, GRADE, SURFACE-DEFECTS   | SEE NOTE: BELOW  | APPROVED DATA SHEET AND CORRESPONDING ASTM STDS FOR GRADE OF MATERIAL | P        | V | V | ✓  | ↑<br>MANUFACTURER TO PROVIDE TEST CERT. AS PER RELEVANT ASTM STDS. MENTIONED IN SPECS<br>↓ |
| 2     | CHEMICAL PROPERTIES AND PHY. PROPERTIES AS PER RELEVANT ASTM. (GRADE SHALL BE AS PER APPROVED DATA SHEET) | FOR LOT          | ↑   | P        | V | V | ✓  |  |
| 3     | FLATTENING TEST.  |                  |   | P        | V | V | ✓  |  |
| 4     | FLARING TEST  | ##               | -DO-  | P        | V | V | ✓  |  |
| 5     | BENDING TEST.   | **               | ↓   | P        | V | V | ✓  |  |
| 6     | HYDRAULIC TEST OR EDDY CURRENT TEST   |                  |   | P        | V | V | ✓  |  |
| 7     | HARDNESS CHECK  | ##               |   | P        | V | V | ✓  |  |

**LEGEND :**  
 \* D: RECORDS, IDENTIFIED WITH 'right mark' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION.  
 \*\* M: MANUFACTURER/SUB CONTRACTOR, C:CONTRACTOR/NOMINATED INSP.AGENCY  
 N: END USER "P" PERFORM "W" WITNESS "V" VERIFICATION

**स्वायत्तिकार एवं गोपनीय**  
 इस प्रारंभ में ही यह सूचना जारी है कि इस दस्तावेज़ को समझना और इसका उपयोग केवल उचित अधिकार वाले अधिकारियों के द्वारा ही किया जाना चाहिए।

**NOTE :**

- QUANTUM OF CHECK SHALL BE AS BELOW:  
 100% - BY MANUFACTURER  
 NIL - BY M/S BHEL  
 NIL - BY M/S END USER
- MANUFACTURER TO MAINTAIN CALIBRATED INSTRUMENT HAVING BETTER ACCURACY THAN THE UNDER TEST, INSPECTING ENGINEER SHALL CHECK THE SAME.
- ## APPLICABLE FOR TUBES ONLY
- \*\* APPLICABLE FOR CS PIPES ONLY
- WHEN, MATERIAL CORRELATION IS NOT POSSIBLE. MATERIAL SAMPLES ARE TO BE TESTED AT THIRD PARTY LAB & TEST CERTIFICATES ARE TO BE SUBMITTED FOR BHEL REVIEW CHP

|                       |         |
|-----------------------|---------|
| दिनांक<br>SIGN & DATE | 14.7.10 |
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| सामग्री संख्या<br>INVENTORY NO. | REV.00 |  | निर्माणाकर्ता<br>WORKED BY | G.GUPTA  |  | 01/07/10 |
| P-6398                          |        |  | जांचकर्ता<br>CHECKED BY    | V. KUMAR |  | 01/07/10 |

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| दिनांक एवं हस्ताक्षर<br>SIGN & DATE |  | <b>उत्पाद मानक</b><br><br><b>PRODUCT STANDARD</b> | <b>ST 48015</b><br><br>पृष्ठ 13 का 9<br><br>Page 9 of 13 |
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| SUPERNODES<br>INVENTORY NO.<br><br>सामग्री सूची संख्या को<br>अधिकृतित करना है   | <b>CHECK LIST FOR SOCKET WELD FITTING</b>   |                  |                           |                 |                                 |                 |                                 |                                 |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
|---|---|------------------|---------------------------|-----------------|---------------------------------|-----------------|---------------------------------|---------------------------------|--|---------|---|---------|---|----|---|--|-----------------|---------------------------|---|---|---|---|-------------------------------|---|---------|--|-----------------|---|---|---|---|--|-----|---------------|---------|--|--|--|--|--|--------------|-----|-----------------|---------|--|--|--|--|--|--------------|-----|------------------|-------|--|--|--|--|--|---------|-----|-------------|------------------|------------------|--|--|--|--|---------------------------------|---|-----------|------|--|---|---|---|---|--|---|--|----|----------------|---|---|---|---|--|---|-------------------------|-----|--------------------|---|---|---|--|--|---|----------------------------------|-----|--------------------|---|---|---|--|--|--|
| COPYRIGHT AND CONFIDENTIAL<br>The information on this documents is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. | <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">SL NO.</th> <th rowspan="2">TESTS/CHECKS</th> <th rowspan="2">QUATUM OF CHECK</th> <th rowspan="2">REFERENCE DOC. ACCEPTANCE NORMS</th> <th colspan="4">AGENCY**</th> <th rowspan="2">REMARKS</th> </tr> <tr> <th>M</th> <th>C</th> <th>N</th> <th>D*</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>RAW MATERIAL IDENTICATION CHEMICAL COMPOSITION</td> <td>ONE PER SECTION</td> <td>APPROVED SPEC DATA SHEETS</td> <td>P</td> <td>V</td> <td>V</td> <td style="text-align: center;">✓</td> <td>LABORATORY TEST REPORT FOR 10</td> </tr> <tr> <td>2</td> <td>FORGING</td> <td></td> <td>AS PER ASTM STD</td> <td>P</td> <td>V</td> <td>V</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>2.1</td> <td>CHEMICAL TEST</td> <td>SEE COI</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>ONE PER CAST</td> </tr> <tr> <td>2.2</td> <td>MECHANICAL TEST</td> <td>REMARKS</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>PER HEAT FOR</td> </tr> <tr> <td>2.3</td> <td>DIMENSINOL CHECK</td> <td>100 °</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2.1&amp;2.2</td> </tr> <tr> <td>2.4</td> <td>NDT(BY U T)</td> <td>FOR CL 9000 ONLY</td> <td>AS PER ASTM A338</td> <td></td> <td></td> <td></td> <td></td> <td>NO DEFECT TO BE OBSERVED IN 2.4</td> </tr> <tr> <td>3</td> <td>MACHINING</td> <td>100°</td> <td></td> <td>P</td> <td>V</td> <td>V</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>4</td> <td>HYDRAULIC PRESSURE TESTING OF FITTING ( ALSO SEE NOTE-2 BELOW)</td> <td>5°</td> <td>AS PER RATINGS</td> <td>P</td> <td>V</td> <td>V</td> <td style="text-align: center;">✓</td> <td></td> </tr> <tr> <td>5</td> <td>FINAL MACHINING OF TEEs</td> <td>10°</td> <td>AS PER ANSI B16.11</td> <td>P</td> <td>V</td> <td>V</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td>DIMENSIONAL CHEK OF ALL FITTINGS</td> <td>10°</td> <td>AS PER ANSI B16.11</td> <td>P</td> <td>V</td> <td>V</td> <td></td> <td></td> </tr> </tbody> </table> <p>LEGEND:<br/>                 *D: RECORDS IDENTIFIED WITH 'right marked 'SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION<br/>                 **M: MANUFACTURER / SUB CONTRACTOR . C: CONTRACTOR NOMINATED INSP AGENCY<br/>                 N : END USER "P" PERFORM "W" WITNESS "V" VERIFICATION</p> | SL NO.           | TESTS/CHECKS              | QUATUM OF CHECK | REFERENCE DOC. ACCEPTANCE NORMS | AGENCY**        |                                 |                                 |  | REMARKS | M | C       | N | D* | 1 | RAW MATERIAL IDENTICATION CHEMICAL COMPOSITION | ONE PER SECTION | APPROVED SPEC DATA SHEETS | P | V | V | ✓ | LABORATORY TEST REPORT FOR 10 | 2 | FORGING |  | AS PER ASTM STD | P | V | V | ✓ |  | 2.1 | CHEMICAL TEST | SEE COI |  |  |  |  |  | ONE PER CAST | 2.2 | MECHANICAL TEST | REMARKS |  |  |  |  |  | PER HEAT FOR | 2.3 | DIMENSINOL CHECK | 100 ° |  |  |  |  |  | 2.1&2.2 | 2.4 | NDT(BY U T) | FOR CL 9000 ONLY | AS PER ASTM A338 |  |  |  |  | NO DEFECT TO BE OBSERVED IN 2.4 | 3 | MACHINING | 100° |  | P | V | V | ✓ |  | 4 | HYDRAULIC PRESSURE TESTING OF FITTING ( ALSO SEE NOTE-2 BELOW) | 5° | AS PER RATINGS | P | V | V | ✓ |  | 5 | FINAL MACHINING OF TEEs | 10° | AS PER ANSI B16.11 | P | V | V |  |  | 6 | DIMENSIONAL CHEK OF ALL FITTINGS | 10° | AS PER ANSI B16.11 | P | V | V |  |  |  |
| SL NO.  | TESTS/CHECKS  |                  |                           |                 |                                 | QUATUM OF CHECK | REFERENCE DOC. ACCEPTANCE NORMS | AGENCY**                        |  |         |   | REMARKS |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
|   |   | M                | C                         | N               | D*                              |                 |                                 |                                 |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
| 1   | RAW MATERIAL IDENTICATION CHEMICAL COMPOSITION  | ONE PER SECTION  | APPROVED SPEC DATA SHEETS | P               | V                               | V               | ✓                               | LABORATORY TEST REPORT FOR 10   |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
| 2   | FORGING   |                  | AS PER ASTM STD           | P               | V                               | V               | ✓                               |                                 |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
| 2.1   | CHEMICAL TEST   | SEE COI          |                           |                 |                                 |                 |                                 | ONE PER CAST                    |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
| 2.2   | MECHANICAL TEST   | REMARKS          |                           |                 |                                 |                 |                                 | PER HEAT FOR                    |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
| 2.3   | DIMENSINOL CHECK  | 100 °            |                           |                 |                                 |                 |                                 | 2.1&2.2                         |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
| 2.4   | NDT(BY U T)   | FOR CL 9000 ONLY | AS PER ASTM A338          |                 |                                 |                 |                                 | NO DEFECT TO BE OBSERVED IN 2.4 |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
| 3   | MACHINING   | 100°             |                           | P               | V                               | V               | ✓                               |                                 |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
| 4   | HYDRAULIC PRESSURE TESTING OF FITTING ( ALSO SEE NOTE-2 BELOW)  | 5°               | AS PER RATINGS            | P               | V                               | V               | ✓                               |                                 |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
| 5   | FINAL MACHINING OF TEEs   | 10°              | AS PER ANSI B16.11        | P               | V                               | V               |                                 |                                 |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |
| 6   | DIMENSIONAL CHEK OF ALL FITTINGS  | 10°              | AS PER ANSI B16.11        | P               | V                               | V               |                                 |                                 |  |         |   |         |   |    |   |  |                 |                           |   |   |   |   |                               |   |         |  |                 |   |   |   |   |  |     |               |         |  |  |  |  |  |              |     |                 |         |  |  |  |  |  |              |     |                  |       |  |  |  |  |  |         |     |             |                  |                  |  |  |  |  |                                 |   |           |      |  |   |   |   |   |  |   |  |    |                |   |   |   |   |  |   |                         |     |                    |   |   |   |  |  |   |                                  |     |                    |   |   |   |  |  |  |

NOTE : 1) MANUFACTURER TO MAINTAIN CALIBRATED INSTRUMENT HAVING BETTER ACCURACY THAN THE ITEM UNDER TEST. INPECTING ENGINEER SHALL CHECK THE SAME.  
 2) HYDRAULIC PRESSURE TEST SHALL BE CARRED ON UNDRILLED BRANCH-TEE  
 3) HYDRAULIC PRESSURE TEST ON FITTINGS | QUANTUM CHECK BY CONTRACTOR | TWO NOS OF EACH TYPE ON NO LEAKAGE TO BE OBSERVED  
 4) MARKING OF RATING ON FITTING BY PUNCHING SHALL BE CARRIED OUT BY MANUFACTURER  
 5) FORGINGS SHALL BE NORMALISED BEFORE MACHINING RECORDS TO BE MAINTAINED

|  |  |        |  |                                      |          |
|--|--|--------|--|--------------------------------------|----------|
| दिनांक एवं हस्ताक्षर<br>SIGN & DATE<br>14/7/10 | सामग्री सूची संख्या<br>INVENTORY NO.<br>P-6398 | REV.00 |  | निर्माणकर्ता<br>WORKED BY<br>G.GUPTA | 01/07/10 |
|  |  |        |  | जांचकर्ता<br>CHECKED BY<br>V. KUMAR  | 01/07/10 |

|                                      |   |   |  |
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| निर्माक एवं हस्ताक्षर<br>SIGN & DATE |  | <b>उत्पाद मानक</b><br><br><b>PRODUCT STANDARD</b> | <b>ST 48015</b><br><br>पृष्ठ 13 का 10<br><br>Page 10 of 13 |
|--------------------------------------|---|---|--|

|   |  |  |  |  |  |
|---|--|--|--|--|--|
| सुपरसेडस इन्वेंट्री नं.<br>SUPERSEDES INVENTORY NO. | <b>CHECK LIST FOR STAINLESS STEEL COMPRESSION FITTINGS</b> |  |  |  |  |
|---|--|--|--|--|--|

| SL NO. | TESTS/CHECKS        | QUANTUM OF CHECK | REFERENCE DOC. ACCEPTANCE NORMS. | AGENCY** |   |   |    | REMARKS |
|--------|---------------------|------------------|----------------------------------|----------|---|---|----|---------|
|        |                     |                  |                                  | M        | C | N | D* |         |
| 1      | DIMENSIONS          | REFER            |                                  | P        | V | V |    |         |
|        |                     | NOTE : 1         | ↑                                |          |   |   |    |         |
| 2      | MATERIAL            | SAMPLE/          | APPROVED SPECS./                 | P        | V | V |    |         |
| 2.1    | CHEMICAL            | HEAT /           | DATA SHEETS                      | P        | V | V | ✓  |         |
| 2.2    | PHYSICAL, HARDWARE  | LOT              | ↓                                |          |   |   |    |         |
|        |                     |                  | ↑                                |          |   |   |    |         |
| 3      | PROOF PRESSURE TEST | 5 RDM.           |                                  | P        | V | V | ✓  |         |
|        |                     | SAMPLE           |                                  |          |   |   |    |         |
| 4      | DISMANTLING         | 3 RDM.           | MANUFACTURER'S                   | P        | V | V |    |         |
|        | RE-ASSEMBLY TEST    | SAMPLE           |                                  |          |   |   |    |         |
|        |                     |                  | STANDARD                         |          |   |   |    |         |
| 5      | HYDRAULIC IMPULES & | 5 RDM.           |                                  | P        | V | V | ✓  |         |
|        | VIBRATION TEST      | SAMPLE           | ↓                                |          |   |   |    |         |

**LEGEND :**  
 \* D: RECORDS, IDENTIFIED WITH 'right marked ' SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION  
 \*\* M: MANUFACTURER/SUB CONTRACTOR, C:CONTRACTOR/NOMINATED INSP.AGENCY  
 N:CUSTOMER "P" PERFORM "W" WITNESS "V" VERIFICATION

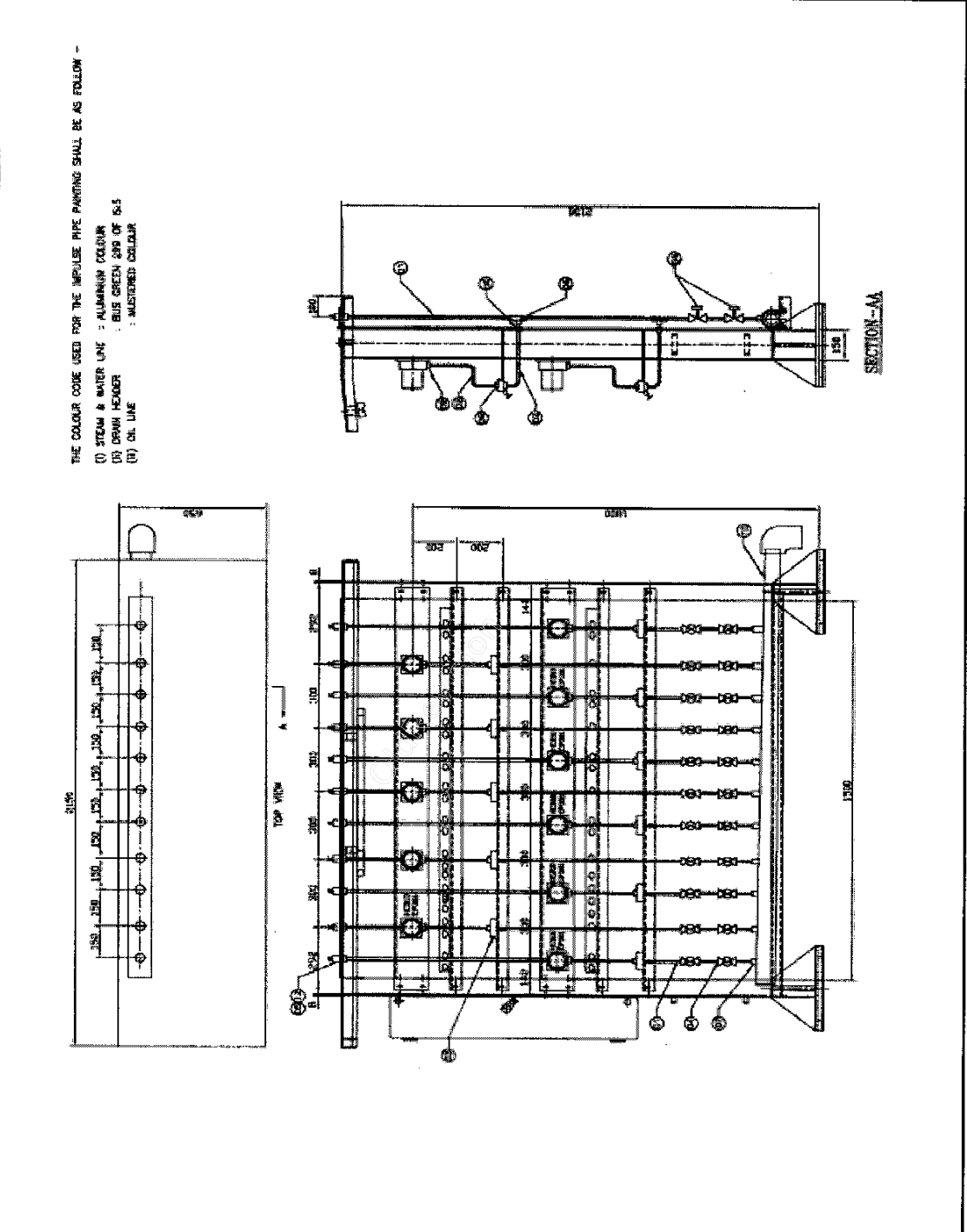
**NOTE :**  
 1) QUANTUM OF CHECK SHALL BE AS BELOW :  
 100% - BY MANUFACTURER  
 NIL -BY M/S BHEL  
 NIL -BY CUSTOMER  
 2) MANUFACTURER TO MAINTAIN CALIBRATED INSTRUMENT HAVING BETTER ACCURACY THAN THE ITEM UNDER TEST. INSPECTING ENGINEER SHALL CHECK THE SAME.

|  |   |
|--|---|
| स्वत्साधिकार एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत के ही इस्तेमाल के लिए की जाननी है। स्वत्साधिकार की रक्षा के लिए इस प्रलेख को न किये जाए।<br>This 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. | निर्माक एवं हस्ताक्षर<br>SIGN & DATE<br>14/7/10 |
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|--|--------|--------------------------------------|-------------------------------------|--------------------------|
| संपत्ती सूची संख्या<br>INVENTORY NO.<br>P-6398 | REV.00 | निर्माककर्ता<br>WORKED BY<br>G.GUPTA | जांचकर्ता<br>CHECKED BY<br>V. KUMAR | 01/07/10<br><br>01/07/10 |
|--|--------|--------------------------------------|-------------------------------------|--------------------------|

|                                       |   |                         |                                 |
|---------------------------------------|---|-------------------------|---------------------------------|
| रिजिस्ट्रार एवं दिनांक<br>SIGN & DATE |  | <b>उत्पाद मानक</b>      | <b>ST 48015</b>                 |
|                                       |   | <b>PRODUCT STANDARD</b> | पृष्ठ 13 का 11<br>Page 11 of 13 |

|   |   |  |  |
|---|---|--|--|
| रामजी सूची संख्या जो<br>INVENTORY NO.   | सुपरसेडेस<br>INVENTORY NO.  | रामजी सूची संख्या जो<br>अधिकृत करता है   | सुपरसेडेस<br>INVENTORY NO.   |
| स्वाधिकार एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रकाश एवं<br>अवकाश रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में साविकारक हो न किया जाए। | स्वाधिकार एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रकाश एवं<br>अवकाश रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में साविकारक हो न किया जाए। | कॉपीराइट एंड कॉन्फिडेंशियल<br>The information on this document is the property of Bharat Heavy Electrical<br>Limited. It must not be used directly or indirectly in any way detrimental to the<br>interest of the company. | कॉपीराइट एंड कॉन्फिडेंशियल<br>The information on this document is the property of Bharat Heavy Electrical<br>Limited. It must not be used directly or indirectly in any way detrimental to the<br>interest of the company. |



**Fig.-1- Typical assembled Instrument Rack (for 11nos. instruments)**

|                                    |        |                           |          |          |
|------------------------------------|--------|---------------------------|----------|----------|
| रामजी सूची संख्या<br>INVENTORY NO. | REV.00 | निर्माणकर्ता<br>WORKED BY | G.GUPTA  | 01/07/10 |
| P-6398                             |        | जांचकर्ता<br>CHECKED BY   | V. KUMAR | 01/07/10 |

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**स्वाधिकार एवं गोपनीय**

इस प्रलेख में दी गई सूचना भारत भारी इलेक्ट्रिकल्स की संपत्ति है इसका प्रयोग एवं आसपास का से किसी भी तरह प्रयोग, जो कि कंपनी को हित में आधिकारिक हो न किया जाए।

हस्ताक्षर एवं दिनांक  
SIGN & DATE

14.7.10

सामग्री सूची संख्या  
INVENTORY NO

P-6398

| IN-TYPE | CHANGING ELEMENTS | REMARK |
|---------|-------------------|--------|
| TYPE-A  | 1800              | 850    |
| TYPE-B  | 1200              | 850    |

**NOTE:-**

- PAINT :- EXTERIOR & INTERIOR - RA. 6002 (UPPER BASED) SCALLOPPY PATTERN FOR INTERIOR TYPE & THICKNESS SHOULD BE 100 MICRON.
- SECTION BOX SIZE: 110mm x 90 mm for TYPE-A AND SECTION BOX FOR TYPE-B

| NO  | DESCRIPTION        | QTY |
|-----|--------------------|-----|
| 01  | FRONT PLATE        | 1   |
| 02  | REAR PLATE         | 1   |
| 03  | TOP COVER          | 1   |
| 04  | BOTTOM COVER       | 1   |
| 05  | VERTICAL SUPPORT   | 2   |
| 06  | WATER TIGHT GASKET | 1   |
| 07  | WATER TIGHT GASKET | 1   |
| 08  | WATER TIGHT GASKET | 1   |
| 09  | WATER TIGHT GASKET | 1   |
| 10  | WATER TIGHT GASKET | 1   |
| 11  | WATER TIGHT GASKET | 1   |
| 12  | WATER TIGHT GASKET | 1   |
| 13  | WATER TIGHT GASKET | 1   |
| 14  | WATER TIGHT GASKET | 1   |
| 15  | WATER TIGHT GASKET | 1   |
| 16  | WATER TIGHT GASKET | 1   |
| 17  | WATER TIGHT GASKET | 1   |
| 18  | WATER TIGHT GASKET | 1   |
| 19  | WATER TIGHT GASKET | 1   |
| 20  | WATER TIGHT GASKET | 1   |
| 21  | WATER TIGHT GASKET | 1   |
| 22  | WATER TIGHT GASKET | 1   |
| 23  | WATER TIGHT GASKET | 1   |
| 24  | WATER TIGHT GASKET | 1   |
| 25  | WATER TIGHT GASKET | 1   |
| 26  | WATER TIGHT GASKET | 1   |
| 27  | WATER TIGHT GASKET | 1   |
| 28  | WATER TIGHT GASKET | 1   |
| 29  | WATER TIGHT GASKET | 1   |
| 30  | WATER TIGHT GASKET | 1   |
| 31  | WATER TIGHT GASKET | 1   |
| 32  | WATER TIGHT GASKET | 1   |
| 33  | WATER TIGHT GASKET | 1   |
| 34  | WATER TIGHT GASKET | 1   |
| 35  | WATER TIGHT GASKET | 1   |
| 36  | WATER TIGHT GASKET | 1   |
| 37  | WATER TIGHT GASKET | 1   |
| 38  | WATER TIGHT GASKET | 1   |
| 39  | WATER TIGHT GASKET | 1   |
| 40  | WATER TIGHT GASKET | 1   |
| 41  | WATER TIGHT GASKET | 1   |
| 42  | WATER TIGHT GASKET | 1   |
| 43  | WATER TIGHT GASKET | 1   |
| 44  | WATER TIGHT GASKET | 1   |
| 45  | WATER TIGHT GASKET | 1   |
| 46  | WATER TIGHT GASKET | 1   |
| 47  | WATER TIGHT GASKET | 1   |
| 48  | WATER TIGHT GASKET | 1   |
| 49  | WATER TIGHT GASKET | 1   |
| 50  | WATER TIGHT GASKET | 1   |
| 51  | WATER TIGHT GASKET | 1   |
| 52  | WATER TIGHT GASKET | 1   |
| 53  | WATER TIGHT GASKET | 1   |
| 54  | WATER TIGHT GASKET | 1   |
| 55  | WATER TIGHT GASKET | 1   |
| 56  | WATER TIGHT GASKET | 1   |
| 57  | WATER TIGHT GASKET | 1   |
| 58  | WATER TIGHT GASKET | 1   |
| 59  | WATER TIGHT GASKET | 1   |
| 60  | WATER TIGHT GASKET | 1   |
| 61  | WATER TIGHT GASKET | 1   |
| 62  | WATER TIGHT GASKET | 1   |
| 63  | WATER TIGHT GASKET | 1   |
| 64  | WATER TIGHT GASKET | 1   |
| 65  | WATER TIGHT GASKET | 1   |
| 66  | WATER TIGHT GASKET | 1   |
| 67  | WATER TIGHT GASKET | 1   |
| 68  | WATER TIGHT GASKET | 1   |
| 69  | WATER TIGHT GASKET | 1   |
| 70  | WATER TIGHT GASKET | 1   |
| 71  | WATER TIGHT GASKET | 1   |
| 72  | WATER TIGHT GASKET | 1   |
| 73  | WATER TIGHT GASKET | 1   |
| 74  | WATER TIGHT GASKET | 1   |
| 75  | WATER TIGHT GASKET | 1   |
| 76  | WATER TIGHT GASKET | 1   |
| 77  | WATER TIGHT GASKET | 1   |
| 78  | WATER TIGHT GASKET | 1   |
| 79  | WATER TIGHT GASKET | 1   |
| 80  | WATER TIGHT GASKET | 1   |
| 81  | WATER TIGHT GASKET | 1   |
| 82  | WATER TIGHT GASKET | 1   |
| 83  | WATER TIGHT GASKET | 1   |
| 84  | WATER TIGHT GASKET | 1   |
| 85  | WATER TIGHT GASKET | 1   |
| 86  | WATER TIGHT GASKET | 1   |
| 87  | WATER TIGHT GASKET | 1   |
| 88  | WATER TIGHT GASKET | 1   |
| 89  | WATER TIGHT GASKET | 1   |
| 90  | WATER TIGHT GASKET | 1   |
| 91  | WATER TIGHT GASKET | 1   |
| 92  | WATER TIGHT GASKET | 1   |
| 93  | WATER TIGHT GASKET | 1   |
| 94  | WATER TIGHT GASKET | 1   |
| 95  | WATER TIGHT GASKET | 1   |
| 96  | WATER TIGHT GASKET | 1   |
| 97  | WATER TIGHT GASKET | 1   |
| 98  | WATER TIGHT GASKET | 1   |
| 99  | WATER TIGHT GASKET | 1   |
| 100 | WATER TIGHT GASKET | 1   |

**Fig-2- Typical Fabrication drg for Instrument Rack (Type A & B)**

|        |  |                         |          |          |
|--------|--|-------------------------|----------|----------|
| REV.00 |  | निर्माकल<br>WORKED BY   | G.GUPTA  | 01/07/10 |
|        |  | जांचकर्ता<br>CHECKED BY | V. KUMAR | 01/07/10 |

|   |   |  |  |  |  |
|---|---|--|--|--|--|
| रिनक एवं हस्ताक्षर<br>SIGN & DATE   | SUPERSEDES INVENTORY NO.<br>आगामी सूची संख्या को अधिकारित करता है   | COPYRIGHT AND CONFIDENTIAL<br>The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in any way detrimental to the interest of the company. | स्वत्वाधिकार एवं गोपनीय<br>इस प्रलेख में दी गई सूचना भारत भारती इलेक्ट्रिकल्स की सम्पत्ति है इस्तेमाल प्रत्येक एवं अप्रत्याशित रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।   | हस्ताक्षर एवं दिनांक<br>SIGN & DATE<br>14.7.10   | आगामी सूची संख्या<br>INVENTORY NO.<br>P-6398 |
| उत्पाद मानक<br><b>PRODUCT STANDARD</b>  | ST 48015<br>पृष्ठ 13 का 13<br>Page 13 of 13   | BHEL   | NOTES:-<br>1. CONTINUOUS WELDING REQD. ALL WELDING IS APPLICABLE.<br>2. BOX TO BE MANUFACTURED AS PER IP-55 DEGREE OF PROTECTION IS:2147.<br>3. CABLE ENTRY FROM TOP AND BOTTOM.<br>4. STRIPPING IN JUNCTION BOX SHALL BE DONE BY SHOWN IN THE DRG.<br>WITH IN TOLERANCE OF ±10% OF INDICATED DIMENSIONS.<br>5. FOR TYPE A JOB HEIGHT 1150 & TYPE B JOB HEIGHT 800mm.<br>6. PAINT:- EXT & INT. - EPOXY BASED RAL 9002 SEMI-GLOSSY FINISH, AIR DRYING TYPE.<br>JOB'S DOOR (OUT SIDE) PAINT SHALL BE EPOXY BASED RAL-5012 AIR DRYING.<br>7. TOGGLE SWITCH PROVIDED FOR JB.<br>8. JUNCTION BOX SHALL BE MADE OF 2mm CRCA SHEET. | REV.00   | निर्माणकर्ता<br>WORKED BY<br><b>G.GUPTA</b>  |
| 21 BUSH<br>20 RUBBER GASKET<br>19 CH. SCR. M4x16 WITH NUT & WASHER<br>18 CH. SCR. M4x16 (IP-147)<br>17 RUBBER GASKET 3x16<br>16 STRIP FOR CABLE BOLTING 60x3<br>15 END PLATE FOR TERMINAL BLOCK<br>14 TERMINAL BLOCK<br>13 SIDE CLAMP<br>12 MOUNTING CHANNEL<br>11 KNOB<br>10 HENCE ASSEMBLY<br>9 ENGRAVED SIGNTY<br>7 DIBBS FOR TERMINAL<br>6 RUBBER FOR RAFTING<br>5 POWER RECP. PLATE FOR JB<br>4 BRACKET FOR MOUNTING PLATE<br>3 TOP & BOTTOM PLATE<br>2 DOOR LEAF<br>1 CASE FOR JUNCTION BOX | 3<br>A/R<br>4<br>80<br>A/R<br>2<br>TYPE-A/B<br>TYPE-A/B<br>2<br>A/R<br>2<br>2<br>1<br>1<br>2<br>3<br>3<br>4<br>2<br>1<br>4<br>1<br>1<br>1 | QTY<br>REMARKS   | Fig-3- Typical JB drg. for Instrument Rack (Type A & B)  | निर्माता<br>CHECKED BY<br><b>V. KUMAR</b>  | 01/07/10<br>01/07/10                         |
| 21 BUSH<br>20 RUBBER GASKET<br>19 CH. SCR. M4x16 WITH NUT & WASHER<br>18 CH. SCR. M4x16 (IP-147)<br>17 RUBBER GASKET 3x16<br>16 STRIP FOR CABLE BOLTING 60x3<br>15 END PLATE FOR TERMINAL BLOCK<br>14 TERMINAL BLOCK<br>13 SIDE CLAMP<br>12 MOUNTING CHANNEL<br>11 KNOB<br>10 HENCE ASSEMBLY<br>9 ENGRAVED SIGNTY<br>7 DIBBS FOR TERMINAL<br>6 RUBBER FOR RAFTING<br>5 POWER RECP. PLATE FOR JB<br>4 BRACKET FOR MOUNTING PLATE<br>3 TOP & BOTTOM PLATE<br>2 DOOR LEAF<br>1 CASE FOR JUNCTION BOX | 3<br>A/R<br>4<br>80<br>A/R<br>2<br>TYPE-A/B<br>TYPE-A/B<br>2<br>A/R<br>2<br>2<br>1<br>1<br>2<br>3<br>3<br>4<br>2<br>1<br>4<br>1<br>1<br>1 | QTY<br>REMARKS   | SECTION-AA<br>SECTION-BB<br>SECTION-CC<br>FRONT VIEW   | VARIANTS<br>CHANGING ELEMENT<br>A B C<br>FOR TYPE-A<br>1100 300 175<br>FOR TYPE-B<br>800 200 125 | REMARKS                                      |

## INSTRUMENT SCHEDULE

### IR-1

| S.NO. | KKS        | DESCRIPTION      | IR  | MEDIUM | INSTRUMENT TYPE | RANGE          | DESIGN PRESSURE | OPERATING PRESSURE | UNIT | OPERATING TEMPERATURE |
|-------|------------|------------------|-----|--------|-----------------|----------------|-----------------|--------------------|------|-----------------------|
| 1     | MAA50CP001 | HPT BLD U/STR P  | IR1 | STEAM  | PT              | (-1) - 299 BAR | 291             | 242                | bar  | 565                   |
| 2     | MAA50CP002 | HPT BLD U/STR P  | IR1 | STEAM  | PT              | (-1) - 299 BAR | 291             | 242                | bar  | 565                   |
| 3     | MAA50CP003 | HPT BLD U/STR P  | IR1 | STEAM  | PT              | (-1) - 299 BAR | 291             | 242                | bar  | 565                   |
| 4     | MAA12CP021 | MS C-V 1 D/STR P | IR1 | STEAM  | PT              | 0 - 300 BAR    | 300             | 245                | bar  | 565                   |
| 5     | MAA14CP021 | MS O/L-V D/STR P | IR1 | STEAM  | PT              | 0 - 200 BAR    | 200             | 160                | bar  | 565                   |

### IR-2

| S.NO. | KKS        | DESCRIPTION      | IR  | MEDIUM | INSTRUMENT TYPE | RANGE         | DESIGN PRESSURE | OPERATING PRESSURE | UNIT | OPERATING TEMPERATURE |
|-------|------------|------------------|-----|--------|-----------------|---------------|-----------------|--------------------|------|-----------------------|
| 1     | LBA11CP004 | MS ESV 1 U/STR P | IR2 | STEAM  | PT              | 0-300BAR      | 291             | 242                | bar  | 565                   |
| 2     | LBA11CP005 | MS ESV 1 U/STR P | IR2 | STEAM  | PT              | 0-300BAR      | 291             | 242                | bar  | 565                   |
| 3     | LBA12CP004 | MS ESV 2 U/STR P | IR2 | STEAM  | PT              | 0-300BAR      | 291             | 242                | bar  | 565                   |
| 4     | LBA12CP005 | MS ESV 2 U/STR P | IR2 | STEAM  | PT              | 0-300BAR      | 291             | 242                | bar  | 565                   |
| 5     | LBC10CP001 | CRH NRF U/STR P  | IR2 | STEAM  | PT              | (-1) - 79 BAR | 76.5            | 60                 | bar  | 347                   |
| 6     | LBC10CP002 | CRH NRF U/STR P  | IR2 | STEAM  | PT              | (-1) - 79 BAR | 76.5            | 60                 | bar  | 347                   |
| 7     | LBC10CP003 | CRH NRF U/STR P  | IR2 | STEAM  | PT              | (-1) - 79 BAR | 76.5            | 60                 | bar  | 347                   |

### IR-3

| S.NO. | KKS        | DESCRIPTION   | IR  | MEDIUM | INSTRUMENT TYPE | RANGE          | DESIGN PRESSURE | OPERATING PRESSURE | UNIT | OPERATING TEMPERATURE |
|-------|------------|---------------|-----|--------|-----------------|----------------|-----------------|--------------------|------|-----------------------|
| 1     | MAG10CP002 | CONDR 1 P     | IR2 | VACUUM | PT              | 0 - 1.3 BARABS | 1               | 0.11               | ABS  | 46                    |
| 2     | MAG10CP003 | CONDR 1 P     | IR2 | VACUUM | PT              | 0 - 1.3 BARABS | 1               | 0.11               | ABS  | 46                    |
| 3     | MAG10CP004 | CONDR 1 P     | IR2 | VACUUM | PT              | 0 - 1.3 BARABS | 1               | 0.11               | ABS  | 46                    |
| 4     | MAG10CP012 | CONDR 1 P     | IR4 | VACUUM | PT              | 0 - 1.3 BARABS | 1               | 0.11               | ABS  | 46                    |
| 5     | MAG10CP013 | CONDR 1 P     | IR4 | VACUUM | PT              | 0 - 1.3 BARABS | 1               | 0.11               | ABS  | 46                    |
| 6     | MAG10CP014 | CONDR 1 P     | IR4 | VACUUM | PT              | 0 - 1.3 BARABS | 1               | 0.11               | ABS  | 46                    |
| 7     | MAC11CP001 | LPT 1 U/STR P | IR2 | STEAM  | PT              | 0 - 10 BARABS  | 7.5             | 6                  | ABS  | 282                   |
| 8     | MAC11CP002 | LPT 1 U/STR P | IR2 | STEAM  | PT              | 0 - 10 BARABS  | 7.5             | 6                  | ABS  | 282                   |
| 9     | MAC11CP003 | LPT 1 U/STR P | IR2 | STEAM  | PT              | 0 - 10 BARABS  | 7.5             | 6                  | ABS  | 282                   |

### IR-4

| S.NO. | KKS        | DESCRIPTION | IR  | MEDIUM | INSTRUMENT TYPE | RANGE          | DESIGN PRESSURE | OPERATING PRESSURE | UNIT | OPERATING TEMPERATURE |
|-------|------------|-------------|-----|--------|-----------------|----------------|-----------------|--------------------|------|-----------------------|
| 1     | MAG20CP002 | CONDR 2 P   | IR2 | VACUUM | PT              | 0 - 1.3 BARABS | 1               | 0.11               | ABS  | 46                    |
| 2     | MAG20CP003 | CONDR 2 P   | IR2 | VACUUM | PT              | 0 - 1.3 BARABS | 1               | 0.11               | ABS  | 46                    |
| 3     | MAG20CP004 | CONDR 2 P   | IR2 | VACUUM | PT              | 0 - 1.3 BARABS | 1               | 0.11               | ABS  | 46                    |
| 1     | MAG20CP012 | CONDR 2 P   | IR4 | VACUUM | PT              | 0 - 1.3 BARABS | 1               | 0.11               | ABS  | 46                    |

## INSTRUMENT SCHEDULE

|   |            |                         |     |        |    |                |   |       |     |    |
|---|------------|-------------------------|-----|--------|----|----------------|---|-------|-----|----|
| 2 | MAG20CP013 | CONDR 2 P               | IR4 | VACUUM | PT | 0 - 1.3 BARABS | 1 | 0.11  | ABS | 46 |
| 3 | MAG20CP014 | CONDR 2 P               | IR4 | VACUUM | PT | 0 - 1.3 BARABS | 1 | 0.11  | ABS | 46 |
| 4 | MAG10CP511 | CONDR 1 PIP 1 WTR INJ P | IR5 | WATER  | PI | 0 - 16 BAR     | 1 | 0.103 | bar | 46 |
| 5 | MAG10CP512 | CONDR 1 PIP 2 WTR INJ P | IR6 | WATER  | PI | 0 - 16 BAR     | 1 | 0.103 | bar | 46 |

### IR-5

| S.NO. | KKS        | DESCRIPTION      | IR  | MEDIUM | INSTRUMENT TYPE |               | DESIGN PRESSURE | OPERATING PRESSURE | UNIT | OPERATING TEMPERATURE |
|-------|------------|------------------|-----|--------|-----------------|---------------|-----------------|--------------------|------|-----------------------|
| 1     | LBQ60CP001 | EXTN 6 P         | IR5 | STEAM  | PT              | (-1) - 39 BAR | 29.7            | 24.7               | bar  | 468                   |
| 2     | LBQ80CP001 | EXTN 8 P         | IR5 | STEAM  | PT              | 0 - 100 BAR   | 93              | 79.1               | bar  | 387                   |
| 3     | LBS31CP001 | EXTN 3.1 P (LP1) | IR5 | STEAM  | PT              | (-1) - 3 BAR  | 2.5             | 2.2                | bar  | 158                   |
| 4     | LBS40CP001 | EXTN 4 P         | IR5 | STEAM  | PT              | (-1) - 9 BAR  | 6.7             | 5.6                | bar  | 264                   |
| 5     | LBS50CP001 | EXTN 5 P         | IR5 | STEAM  | PT              | (-1) - 19 BAR | 15.5            | 12.7               | bar  | 370                   |

### IR-6

| S.NO. | KKS        | DESCRIPTION      | Mounting | MEDIUM | INSTRUMENT TYPE |                 | DESIGN PRESSURE | OPERATING PRESSURE | UNIT | OPERATING TEMPERATURE |
|-------|------------|------------------|----------|--------|-----------------|-----------------|-----------------|--------------------|------|-----------------------|
| 1     | LBG30CP011 | SS SUP-V U/STR P | IR6      | STEAM  | PT              | 0 - 16 BAR      | 14              | 12                 | bar  | 295                   |
| 2     | LBG30CP012 | SS SUP-V U/STR P | IR6      | STEAM  | PT              | 0 - 16 BAR      | 14              | 12                 | bar  | 295                   |
| 3     | LBS32CP001 | EXTN 3.1 P (LP2) | IR5      | STEAM  | PT              | (-1) - 3 BAR    | 3.7             | 2.2                | bar  | 173                   |
| 4     | MAW20CP001 | SS MFLD P        | IR6      | STEAM  | PT              | (-10) - 90 Mbar | 900             | 1.013              | mmwc | 540                   |
| 5     | MAW20CP002 | SS MFLD P        | IR6      | STEAM  | PT              | (-10) - 90 Mbar | 900             | 1.013              | mmwc | 540                   |

### IR-7

| S.NO. | KKS        | DESCRIPTION         | IR  | MEDIUM | INSTRUMENT TYPE |               | DESIGN PRESSURE | OPERATING PRESSURE | UNIT | OPERATING TEMPERATURE |
|-------|------------|---------------------|-----|--------|-----------------|---------------|-----------------|--------------------|------|-----------------------|
| 1     | LBB21CP001 | IPS B/P-V 1 U/STR P | IR7 | STEAM  | PT              | 0 - 80 BAR    | 65.3            | 53.8               | bar  | 593                   |
| 2     | LBB21CP002 | IPS B/P-V 1 U/STR P | IR7 | STEAM  | PT              | 0 - 80 BAR    | 65.3            | 53.8               | bar  | 593                   |
| 3     | LBB22CP001 | IPS B/P-V 2 U/STR P | IR7 | STEAM  | PT              | 0 - 80 BAR    | 65.3            | 53.8               | bar  | 593                   |
| 4     | LBB22CP002 | IPS B/P-V 2 U/STR P | IR7 | STEAM  | PT              | 0 - 80 BAR    | 65.3            | 53.8               | bar  | 593                   |
| 5     | MAB50CP001 | IPT BLD U/STR P     | IR7 | STEAM  | PT              | (-1) - 59 BAR | 65.3            | 53.8               | bar  | 593                   |

### IR-8

| S.NO. | KKS        | DESCRIPTION          | IR  | MEDIUM | INSTRUMENT TYPE |            | DESIGN PRESSURE | OPERATING PRESSURE | UNIT | OPERATING TEMPERATURE |
|-------|------------|----------------------|-----|--------|-----------------|------------|-----------------|--------------------|------|-----------------------|
| 1     | LBB11CP004 | INTCPT ESV 1 U/STR P | IR8 | STEAM  | PT              | 0 - 80 BAR | 65.3            | 53.8               | bar  | 593                   |
| 2     | LBB11CP005 | INTCPT ESV 1 U/STR P | IR8 | STEAM  | PT              | 0 - 80 BAR | 65.3            | 53.8               | bar  | 593                   |
| 3     | LBB12CP004 | INTCPT ESV 2 U/STR P | IR8 | STEAM  | PT              | 0 - 80 BAR | 65.3            | 53.8               | bar  | 593                   |
| 4     | LBB12CP005 | INTCPT ESV 2 U/STR P | IR8 | STEAM  | PT              | 0 - 80 BAR | 65.3            | 53.8               | bar  | 593                   |

## INSTRUMENT SCHEDULE


### IR-9

| S.NO. | KKS        | DESCRIPTION      | IR  | MEDIUM | INSTRUMENT TYPE |               | DESIGN PRESSURE | OPERATING PRESSURE | UNIT | OPERATING TEMPERATURE |
|-------|------------|------------------|-----|--------|-----------------|---------------|-----------------|--------------------|------|-----------------------|
| 1     | MAN52CP011 | LPBP-V D/STR P   | IR9 | STEAM  | PT              | (-1) - 44 BAR | 44              |                    | bar  | 150                   |
| 2     | MAN55CP011 | LPBP-V 2 D/STR P | IR9 | STEAM  | PT              | (-1) - 44 BAR | 44              |                    | bar  | 150                   |
| 3     | MAN53CF001 | LPBP INJ WTR F   | IR9 | WATER  | DPT             | 0 - 1800 mBAR | 180             | 22                 | mbar | 35                    |
| 4     | MAN53CF002 | LPBP INJ WTR F   | IR9 | WATER  | DPT             | 0 - 1800 mBAR | 180             | 22                 | mbar | 35                    |
| 5     | MAN53CF003 | LPBP INJ WTR F   | IR9 | WATER  | DPT             | 0 - 1800 mBAR | 180             | 22                 | mbar | 35                    |

### IR-10

| S.NO. | KKS        | DESCRIPTION    | IR   | MEDIUM | INSTRUMENT TYPE |               | DESIGN PRESSURE | OPERATING PRESSURE | UNIT | OPERATING TEMPERATURE |
|-------|------------|----------------|------|--------|-----------------|---------------|-----------------|--------------------|------|-----------------------|
| 1     | MAN56CF001 | LPBP INJ WTR F | IR10 | WATER  | DPT             | 0 - 1800 mBAR | 1800            | 22                 | mbar | 35                    |
| 2     | MAN56CF002 | LPBP INJ WTR F | IR10 | WATER  | DPT             | 0 - 1800 mBAR | 1800            | 22                 | mbar | 35                    |
| 3     | MAN56CF003 | LPBP INJ WTR F | IR10 | WATER  | DPT             | 0 - 1800 mBAR | 1800            | 22                 | mbar | 35                    |
| 4     | QFB01CP001 | C-AIR MFLD P   | IR10 | AIR    | PT              | 0 - 10 BAR    | 10              | 8                  | bar  | 45                    |

## Purchase Specification For Local Instrument Racks (IR)

|   |      |       |       |               |                           |          |                |                 |               |
|---|------|-------|-------|---------------|---------------------------|----------|----------------|-----------------|---------------|
| TYPE OF PRODUCT : TG-C&I  |      |       |       |               |                           |          |                |                 |               |
| NAME OF CUSTOMER / PROJECT: GADARWARA (2X800MW)   |      |       |       |               |                           |          |                |                 |               |
| BHARAT HEAVY ELECTRICALS LTD.<br><br>HEEP-Haridwar |      |       |       |               |                           | NAME     | SIGN           | DATE            | NO.OF<br>VAR. |
|   |      | DRN.  |       | SHEETAL SINGH | Sd/-                      | 05.06.14 |                |                 |               |
|   |      | CHD.  |       | VINOD KUMAR   | Sd/-                      | 05.06.14 |                |                 |               |
|   |      | APPD. |       | B S RANA      | Sd/-                      | 05.06.14 |                |                 |               |
| DEPT.   | CIE  |       | SCALE | WEIGHT(KG)    | REF.TO ASSY.DRG.          |          | ITEM NO.       | NO. OF<br>ITEMS |               |
| CODE.   | 4180 |       |       |               |                           |          |                |                 |               |
| TITLE: Purchase specification for Local Instrument Racks (IRs)  |      |       |       | CARD<br>CODE  | DOC. No. <b>CIE-IR-C6</b> |          |                | REV.<br>00      |               |
|   |      |       |       | SHT.NO 01     |                           |          | NO. OF SHT. 06 |                 |               |

## CONTENTS

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|---------|----------------------------|-------------------------|
| 01      | SCOPE OF SUPPLY            | Page nos.: 3 to 4       |
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| 03      | VENDOR LIST FOR COMPONENTS | Page nos.: 5 to 6       |
| 04      | DRAWINGS FOR IR            | IR nos.- 1 TO 10        |
| 05      | TECHNICAL REQUIREMENTS     | ST48015                 |

**Scope of supply**

The Scope of supply is as per Technical requirements attached with this specification. Vendor shall quote for each line item of the Table A&B. The unit rate shall be valid until the completion of the contracts. For this purpose vendors shall maintain MS Excel file indicating total Bill of materials and calculation of commissioning spares.

**TABLE: A**

| Sl. No. | Description                           | Ref. Drg/ Doc | VA R No. | IR no. | IR Type | Qty | Material code |
|---------|---------------------------------------|---------------|----------|--------|---------|-----|---------------|
| 1       | RACK FOR M.S. PRESS. INSTRUMENTS      | 11335362010   | 00       | IR01   | A       | 1   | W90318130246  |
| 2       | RACK FOR M.S. PRESS. INSTRUMENTS      | 11335362010   | 01       | IR02   | A       | 1   | W90318130254  |
| 3       | RACK FOR CONDENSER PRESS. INSTRUMENTS | 21335462010   | 00       | IR03   | A       | 1   | W90318130262  |
| 4       | RACK FOR CONDENSER PRESS. INSTRUMENTS | 21335462010   | 01       | IR04   | A       | 1   | W90318130270  |
| 5       | RACK FOR EXTN. & G.S. INSTRUMENTS     | 21335562010   | 00       | IR05   | B       | 1   | W90318130289  |
| 6       | RACK FOR EXTN. & G.S. INSTRUMENTS     | 21335562010   | 01       | IR06   | B       | 1   | W90318130297  |
| 7       | RACK FOR HRH/MS PRESS. INSTRUMENTS    | 21335660010   | 00       | IR07   | A       | 1   | W90318130203  |
| 8       | RACK FOR HRH/MS PRESS. INSTRUMENTS    | 21335660010   | 01       | IR08   | B       | 1   | W90318130211  |
| 9       | RACK FOR WATER INJECTION INSTRUMENTS  | 21336060510   | 00       | IR09   | A       | 1   | W90318130220  |
| 10      | RACK FOR WATER INJECTION INSTRUMENTS  | 21336060510   | 01       | IR10   | A       | 1   | W90318130238  |
| 11      | Commissioning spares for IR           | TABLE-B       | -        | -      | -       | 1   |               |
| 12      | Mandatory Spare                       | TABLE-C       | -        | -      | -       | 1   |               |

**Note:**

- The finish colours for exterior and interior surfaces of shall conform to the following shades:  
INTERIOR,EXTERNAL(FRONT , REAR & TOP)-RAL9002  
Final colour will be decided during detailed engineering.
- Quantity mentioned above is for per unit.
- Type test to be conducted for IR & JB of IR of each type & test report to be submitted for approval.
- Instrument grouping will be as per Instrument Rack drawings above ( Table-A).

**Commissioning Spare**

**TABLE: B**

| SL. NO | DESCRIPTION                                     | QTY | UNIT |
|--------|---|-----|------|
| 1      | VALVE MANIFOLD OF EACH TYPE & RATING            | 2   | NOS. |
| 2      | GLOVE VALVE OF EACH TYPE AND RATING             | 2   | NOS. |
| 3      | MALE CONNECTOR , ½"NPTM X TO SUIT ½" OD SS TUBE | 20  | NOS. |
| 4      | TUBE: ½"SS 316 2.1 THK                          | 15  | MTR. |

**Mandatory Spare**

**TABLE: C**

| SL. NO | DESCRIPTION  | QTY | UNIT |
|--------|--|-----|------|
| 1      | 2 WAY, 3 WAY , 5 WAY MANIFOLDS (OF EACH TYPE, CLASS, SIZE AND MODEL) | 10  | %.   |
| 2      | FITTINGS   | 10  | %.   |

**Unit rate of each item for commissioning & Mandatory spare to be provided in the offer.**

## COMPONENT VENDOR LIST

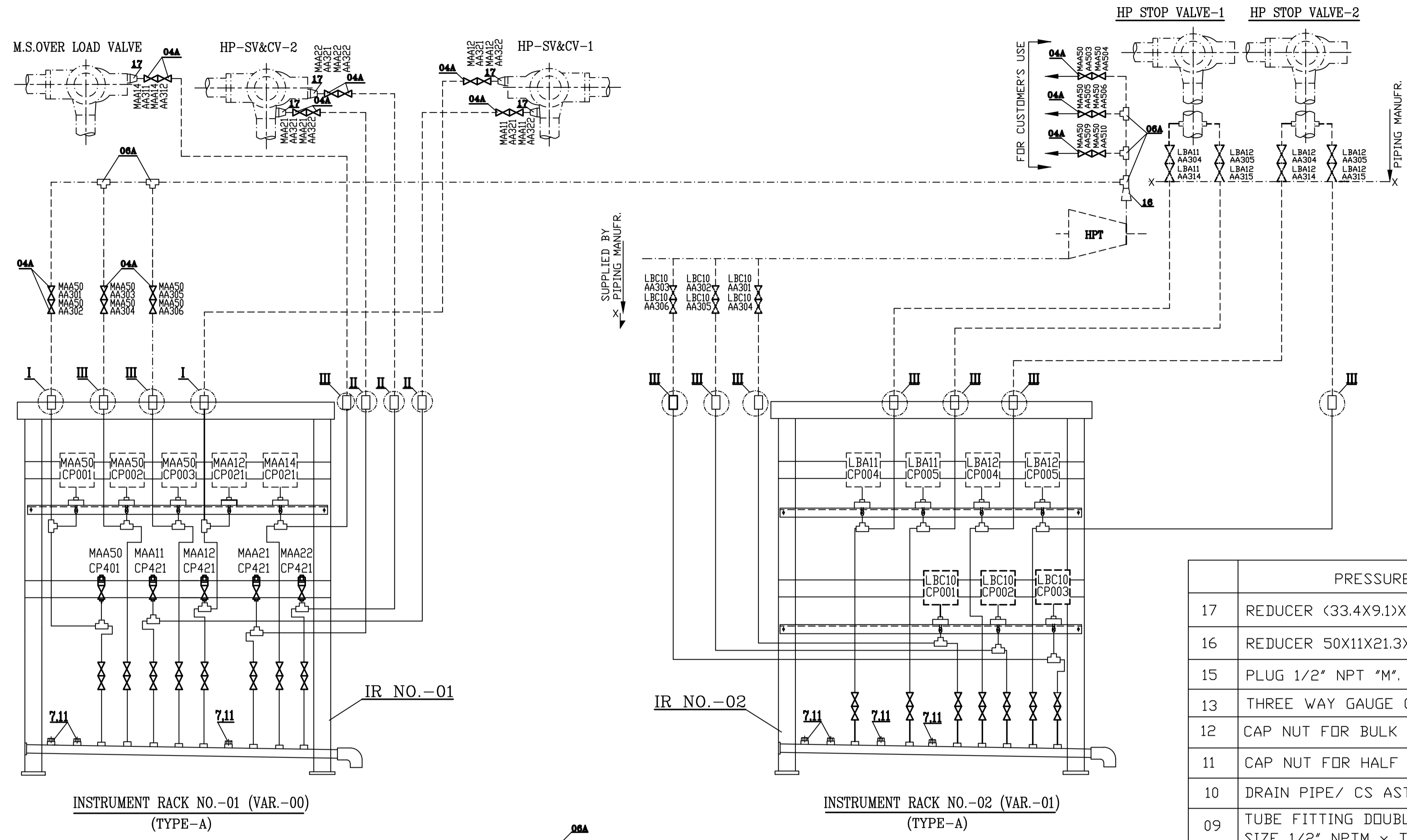
| SL NO.                     | ITEM DESCRIPTION    | RECOMMENDED VENDORS                         |
|----------------------------|---------------------|---|
| 1                          | Socket Weld Fitting | AURA INC, NEW DELHI                         |
|                            |                     | BALDOTA VALVE AND FITTING CO PVT LT, MUMBAI |
|                            |                     | EXCEL HYDRO-PNEUMATICS PVT LTD, MUMBAI      |
|                            |                     | METPRESS ENGINEERING WORKS, KOLKATA         |
|                            |                     | PRECISION ENGG INDUSTRIES, MUMBAI           |
|                            |                     | FLOWTECH, KOLKATA                           |
|                            |                     | V.K.INDUSTRIES, BANGALORE                   |
|                            |                     | VIKAS INDUSTRIAL PRODUCTS, NEW DELHI        |
|                            |                     | HP VALVES AND FITTINGS, CHENNAI             |
|                            |                     | PANAM ENGINEERS MUMBAI                      |
| 2                          | Compression Fitting | AURA INC, NEW DELHI                         |
|                            |                     | EXCEL HYDRO-PNEUMATICS PVT LTD, MUMBAI      |
|                            |                     | METPRESS ENGINEERING WORKS, KOLKATA         |
|                            |                     | PARKER HANNIFIN, USA                        |
|                            |                     | PRECISION ENGG INDUSTRIES, MUMBAI           |
|                            |                     | HP VALVES AND FITTINGS, CHENNAI             |
|                            |                     | SWAGELOCK, USA                              |
|                            |                     | ASTEC VALVES & FITTINGS PVT LTD, THANE      |
|                            |                     | FLUIDCONTROLS, MUMBAI                       |
|                            |                     | PANAM ENGINEERS, MUMBAI                     |
| 3                          | Instrument Valves   | AURA INC, NEW DELHI                         |
|                            |                     | BALDOTA VALVE AND FITTING CO PVT LT, MUMBAI |
|                            |                     | BHARAT HEAVY ELECTRICALS LTD, TRICHY        |
|                            |                     | EXCEL HYDRO-PNEUMATICS PVT LTD, MUMBAI      |
|                            |                     | INSTRUMENTATION LIMITED, PALGHAT            |
|                            |                     | METPRESS ENGINEERING WORKS, KOLKATA         |
|                            |                     | PRECISION ENGG INDUSTRIES, MUMBAI           |
|                            |                     | SHALIMAR VALVES, MUMBAI                     |
| HYDAIR ENGG WORKS, LONAVAL |                     |   |
| 4                          | Valve Manifolds     | AURA INC, NEW DELHI                         |
|                            |                     | BALDOTA VALVE AND FITTING CO PVT LT, MUMBAI |
|                            |                     | EXCEL HYDRO-PNEUMATICS PVT LTD, MUMBAI      |
|                            |                     | METPRESS ENGINEERING WORKS, KOLKATA         |
|                            |                     | PRECISION ENGG INDUSTRIES, MUMBAI           |
|                            |                     | FLOWTECH, KOLKATA                           |
|                            |                     | HP VALVES AND FITTINGS, CHENNAI             |
|                            |                     | ASTEC VALVES & FITTINGS PVT LTD, THANE      |
| HYDAIR ENGG WORKS, LONAVAL |                     |   |

TCS

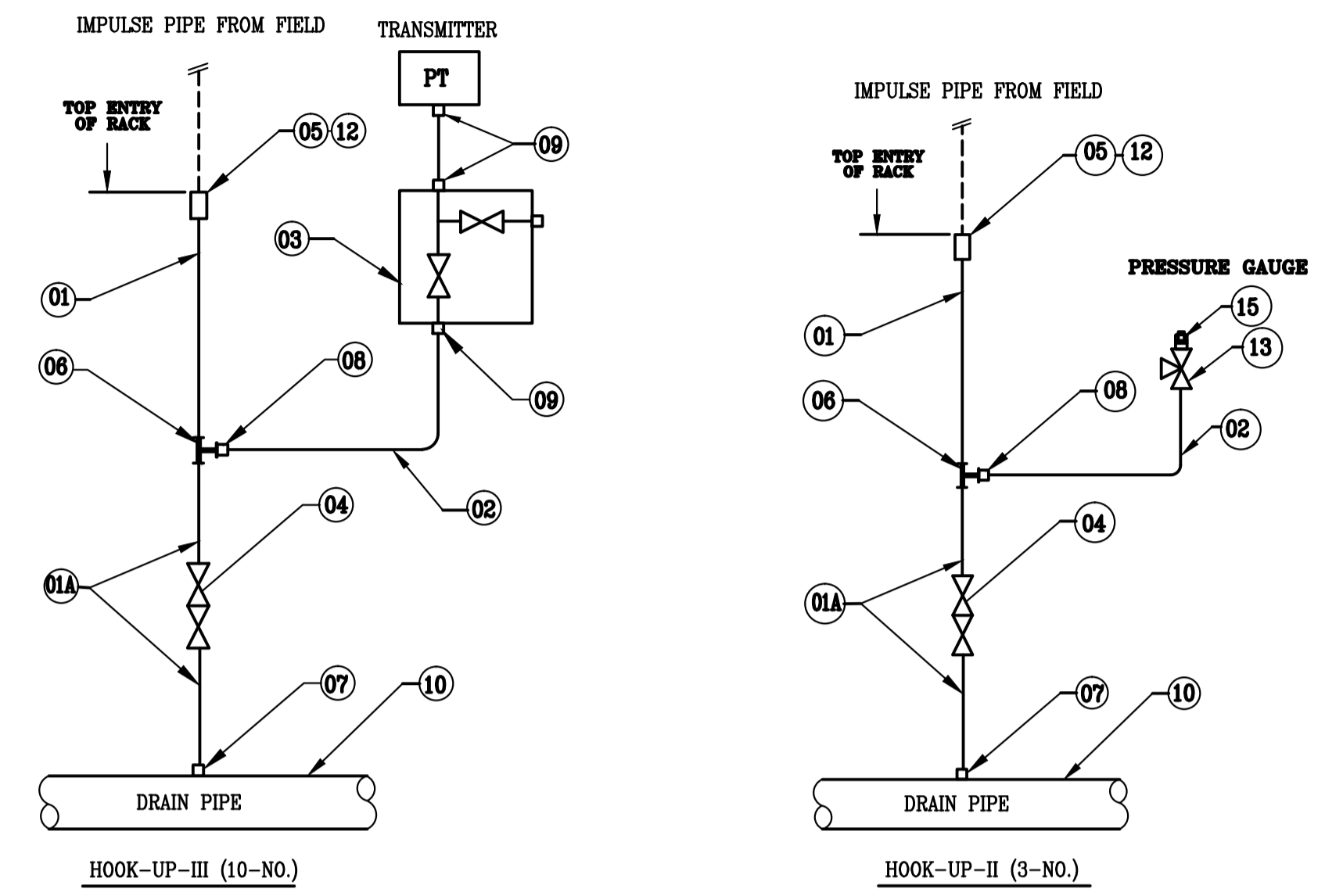
| SI No | Item Description               | RECOMMENDED VENDORS                     |
|-------|--------------------------------|---|
| 5     | SEAMLESS TUBE / PIPES          | CHOKSI TUBE COMPANY Ltd                 |
|       |                                | RATNAMANI METALS & TUBES LTD, AHMADABAD |
|       |                                | TROUVAY AND CAUVIN, GULF                |
|       |                                | BHEL TRICHY                             |
|       |                                | TPS TECHNITUBE , GERMANY                |
|       |                                | MAHALAKSHMI SEAMLESS, MAHARASHTRA       |
|       |                                | MANNESMAN AG GERMANY                    |
|       |                                | HEAVY METAL TUBES AHMADABAD             |
|       |                                | JINDAL SAW PIPES                        |
|       |                                | SUMITOMO CORPORATION JAPAN              |
| 6     | INSTRUMENTATION CABLES         | DELTON CABLES                           |
|       |                                | RELIANCE CABLES                         |
|       |                                | CORDS CABLE                             |
|       |                                | UNIVERAL CABLES , SATNA                 |
|       |                                | DELTON CABLES , FARIDABAD               |
|       |                                | PARAMOUNT CABLES , ALWAR                |
|       |                                | UNIVERAL CABLES , SATNA                 |
|       |                                | RELIANCE ENGRS. ,BANGALORE              |
|       |                                | CORDS CABLES , RAJASTHAN                |
|       |                                | NICCO CABLE , KOLKATA                   |
| 7*    | JUNCTION BOX<br>( MILD STEEL ) | K.S. INSTRUMENTS , BANGALORE            |
|       |                                | BALIGA LIGHTNING , CHENNAI              |
|       |                                | KHODAY CONTROL SYSTEMS , BANGALORE      |
|       |                                | MANISHA ENTERPRISES , PUNE              |
|       |                                | ELECTRO MECHANICAL ( INDIA ) , KOLKATA  |

NOTE: \*VENDOR LIST OF JUNCTION BOX (JB) APPLICABLE ONLY IF JB IS A BOUGHT OUT ITEM.

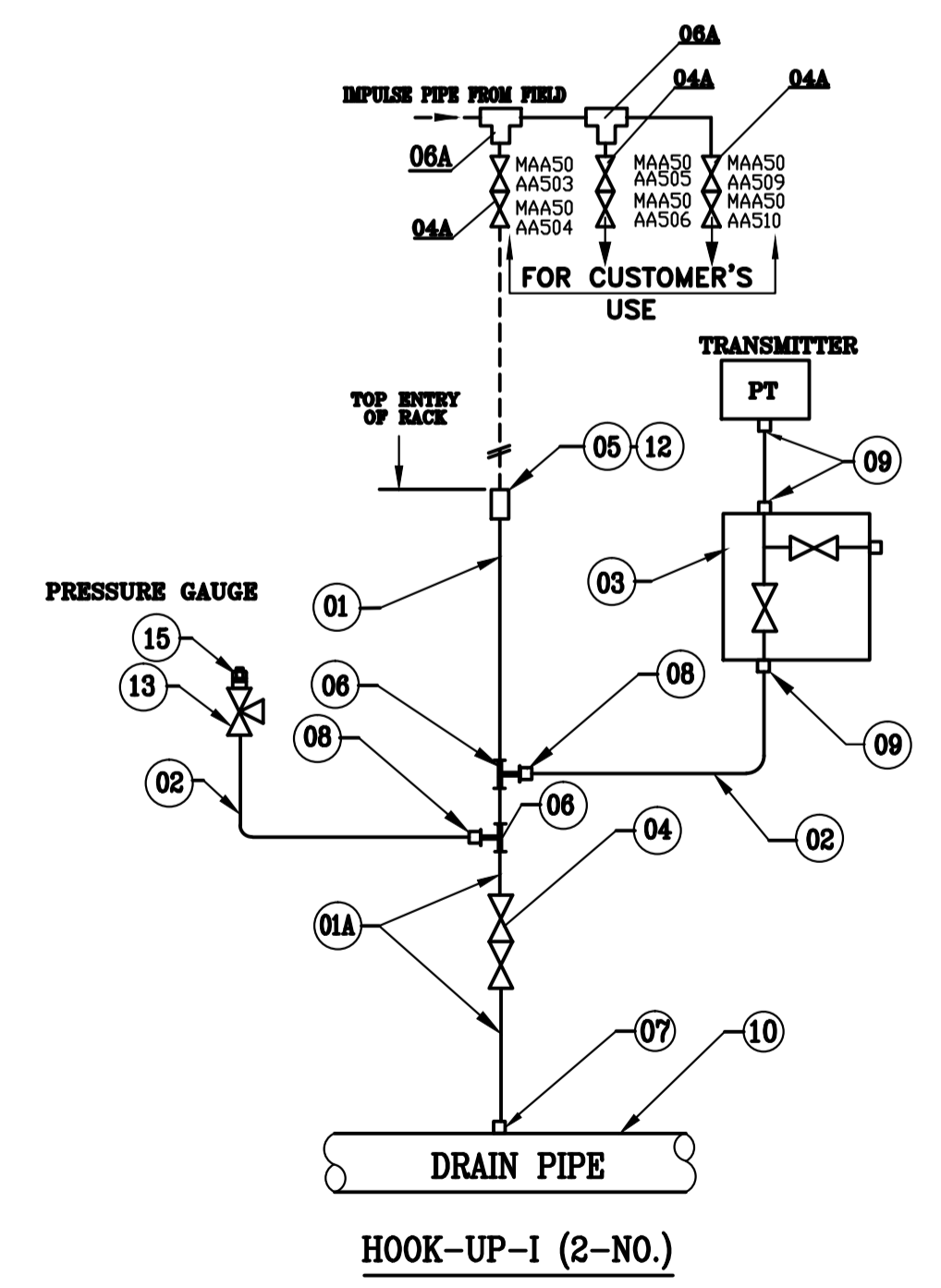
11335362010  
DRAWING NO.



NOTE:- 01: ITEM NO. 04A,6A,16&17 INDICATED BEYOND BULK HEAD, SHALL BE SUPPLIED AS LOOSE WITH THE ASSEMBLED RACK.  
02: ALL THE BULK HEADS & ITEM NO. 5, INDICATED IN SHALL BE ACCOMMODATED & INSTALLED IN RESPECTIVE RACKS.



| ITEM | DESCRIPTION  | QTY | REMARKS |
|------|--|-----|---------|
| 17   | REDUCER (33.4X9.1)X(21.3X7.47) Gr.-F91   | 05  | LOOSE   |
| 16   | REDUCER 50X11X21.3X7.47 Gr.-F91  | 01  |         |
| 15   | PLUG 1/2" NPT "M".   | 05  |         |
| 13   | THREE WAY GAUGE COCK/SS316/SIZE 1/2" NPTx1/2"OD S.S. TUBE.   | 05  |         |
| 12   | CAP NUT FOR BULK HEAD ASTM A105.   | 15  |         |
| 11   | CAP NUT FOR HALF COUPLING ASTM A105.   | 07  |         |
| 10   | DRAIN PIPE/ CS ASTM A106 Gr-C / SIZE 2" NB/ SCH-80.  | 02  |         |
| 09   | TUBE FITTING DOUBLE FERRULE DOUBLE COMPRESSION/ MAT. SS316/ SIZE 1/2" NPTM x TO SUIT 1/2" OD S.S. TUBE.                                | 36  |         |
| 08   | TEE TUBE UNION/ SS316 / SIZE OD OF 1/2" NB SW x TO SUIT 1/2" OD S.S. TUBE.   | 17  |         |
| 07   | HALF COUPLING/ASTM A105/SIZE 1/2" NB SW / CL 9000 lbs.   | 22  |         |
| 06A  | FORGED TEE / SIZE 1/2" NB/SW/F91 CAS: X10 CrMOVNB91 OR EQUIVALENT SIZE 1/2" (SW-DN-15) 21.3X7.47, CLASS 4500. TEE EQUAL 21.3X21.3X7.47 | 5   |         |
| 06   | FORGED TEE/ASTM A105/SIZE 1/2" NB SW / CL 9000 lbs. TEE UNEQUAL(21.3X7.47X13.5X2.6)  | 17  |         |
| 05   | BULK HEAD/ASME SA213, Gr.-T-91 SIZE 1/2" NB (21.3X7.47) SW / CL 9000 lbs.  | 15  |         |
| 04A  | FORGED GLOBE VALVE/ BODY ASTM A336 Gr. F91 CAS: X10 CrMOVNB9-1 OR EQUIVALENT.  | 22  |         |
| 04   | FORGED GLOBE VALVE/ BODY ASTM A182 F22/ASTM ASTM A182 Gr-F6A/ SIZE 1/2" NB SW/ CL 3000 SPL.  | 30  |         |
| 03   | TWO VALVE MANIFOLD, 1/2" NPTF/BODY/TRIM S.S. 316 / PR. TESTING 3000 PSI.   | 12  |         |
| 02   | SEAMLESS S.S. TUBE ASTM A213 TP 316H/SIZE 1/2" OD, THICK 2.1mm.  | A/R |         |
| 01A  | IMPULSE PIPE/ ASTM A335, Gr-P-22 /SIZE 1/2" NB/SCH-XXS. (21.3X2.77)  | A/R |         |
| 01   | IMPULSE PIPE/ ASME SA213, Gr-T-91 /SIZE 1/2" NB/SCH-XXS. (21.3X7.47)   | A/R |         |



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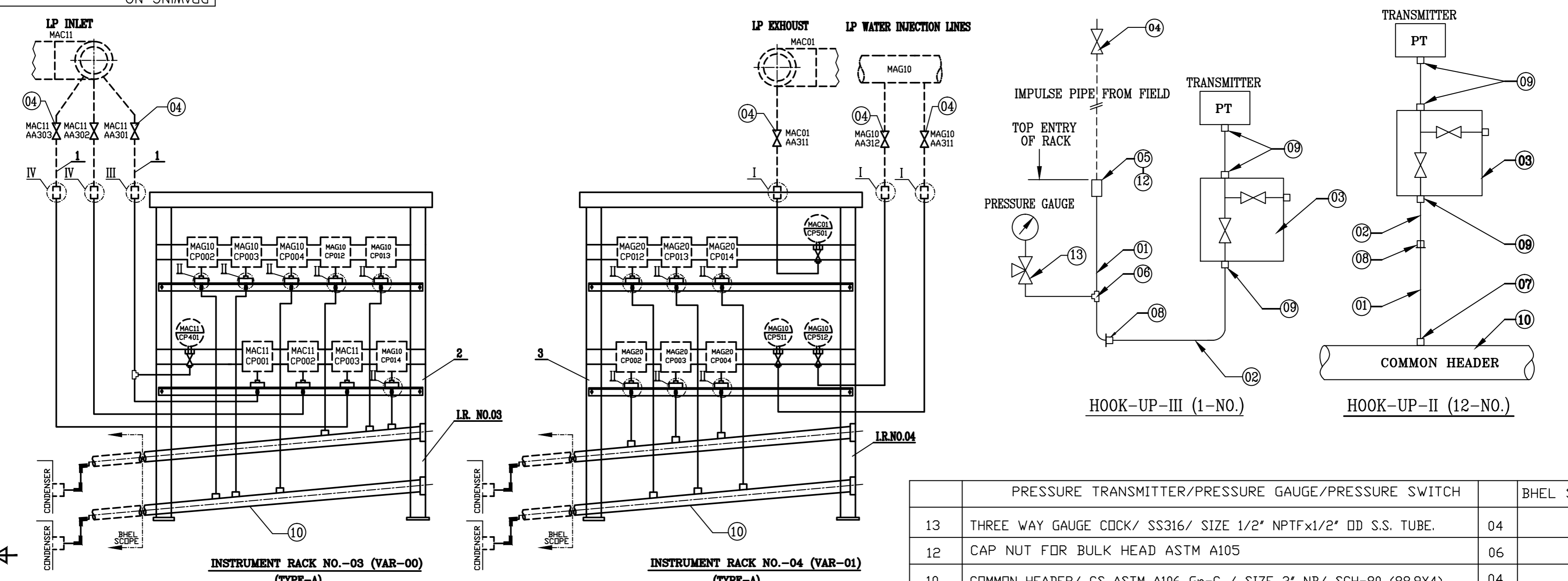
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SIGN & DATE \_\_\_\_\_  
INVENTORY NO. \_\_\_\_\_

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| VAR.NO. | MATERIAL CODE |

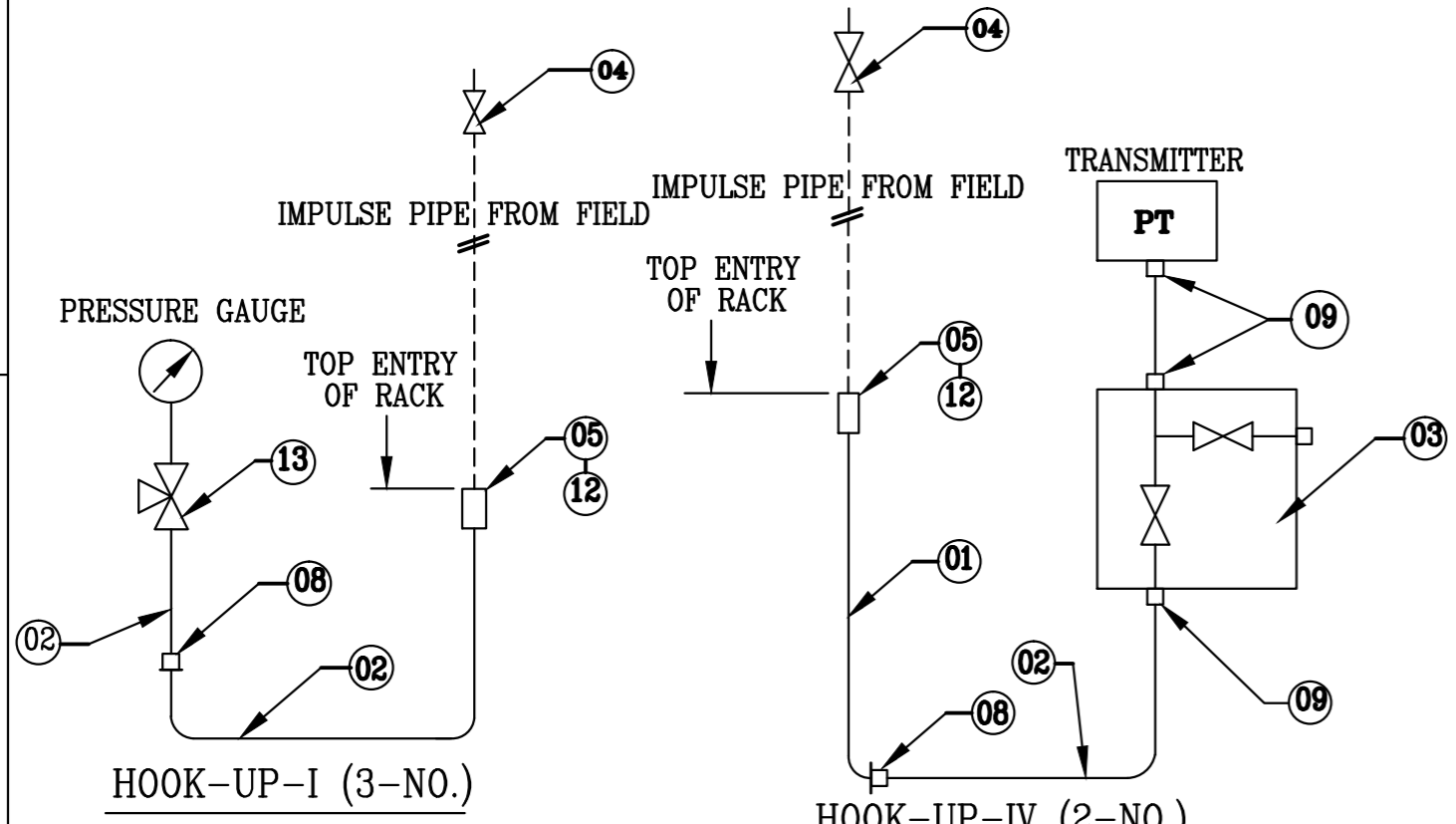
|  |                          |                  |   |                        |  |
|--|--------------------------|------------------|---|------------------------|--|
| CBOM NO.<br>21335362000  | STATUS OF DRG.<br>AGREED | NAME             | SIGN  | DATE                   | TYPE OF PRODUCT OR NAME OF CUSTOMER/ PROJECT<br><b>STEAM TURBINE</b> |
| GRADE OF UNTOL. DIM.:-<br>M/CG- V/C/M/F AA 0230208<br>WELDING-A/B/C/D-AA621104<br>GAS CUTTING-T3'AA0621101 | REV. DATE                | ALTERED CHECKED  | BRIJ LAL SHEETAL                                | DEPT. STE<br>CODE 4011 | SCALE<br>N.T.S.  |
| REV. DATE  | ALTERED CHECKED          | BRIJ LAL SHEETAL | DEPT. STE<br>CODE 4011                          | SCALE<br>N.T.S.        | WEIGHT(Kg.)<br>200   |
| NOTE 2 ADDED AS PER C/A ND- STE-14-F0253   |                          |                  | TITILE<br><b>ASSY. RACK FOR MS PRESS. INSTR</b> |                        | REF. TO ASSY. DRG.   |
| Bharat Heavy Electricals Ltd. HARDWAR  |                          |                  |   | NAME<br>SSTEBLR        | SIGN<br>SSTEBLR  |
| Bharat Heavy Electricals Ltd. HARDWAR  |                          |                  |   | DATE<br>05/06/2014     | NO. OF VARS.<br>73, 74   |
| Bharat Heavy Electricals Ltd. HARDWAR  |                          |                  |   | DATE<br>05/06/2014     | NO. OF ITEMS<br>73, 74   |
| Bharat Heavy Electricals Ltd. HARDWAR  |                          |                  |   | DATE<br>05/06/2014     | NO. OF SHEETS<br>73, 74  |
| Bharat Heavy Electricals Ltd. HARDWAR  |                          |                  |   | DATE<br>05/06/2014     | NO. OF SHEETS<br>73, 74  |
| Bharat Heavy Electricals Ltd. HARDWAR  |                          |                  |   | DATE<br>05/06/2014     | NO. OF SHEETS<br>73, 74  |

DRAWING NO. 21335462010

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| ITEM | DESCRIPTION   | QTY. | REMARKS |
|------|---|------|---------|
| 13   | THREE WAY GAUGE COCK/ SS316/ SIZE 1/2" NPTFx1/2" OD S.S. TUBE.  | 04   |         |
| 12   | CAP NUT FOR BULK HEAD ASTM A105   | 06   |         |
| 10   | COMMON HEADER/ CS ASTM A106 Gr-C / SIZE 3" NB/ SCH-80 (88.9X4)  | 04   |         |
| 09   | TUBE FITTING DOUBLE FERRULE DOUBLE COMPRESSION/ MAT. SS316/ SIZE 1/2" NPTM x TO SUIT 1/2" OD S.S. TUBE. | 45   |         |
| 08   | TEE TUBE UNION/ SS316 / SIZE OD OF 1/2" NB SW x TO SUIT 1/2" OD S.S. TUBE.                              | 18   |         |
| 07   | HALF COUPLING/ASTM A105/SIZE 1/2" NB SW / CL 3000 lbs.  | 12   |         |
| 06   | FORGED TEE/ASTM A 182 GR.-F11/SIZE 1/2" NB/SW 3000 PSI.   | 01   |         |
| 05   | BULK HEAD/ASTM A105/SIZE 1/2" NB SW / CL 3000 lbs.  | 06   |         |
| 04   | FORGED GLOBE VALVE/ BODY ASTM A105/STEM ASTM A182 Gr-F6A/ SIZE 1/2" NB SW/ CL 800.                      | 06   |         |
| 03   | TWO VALVE MANIFOLD, 1/2" NPTF/BODY/TRIM SS316/PR TESTING 3000 PSI.                                      | 15   |         |
| 02   | SEAMLESS S.S. TUBE, ASTM A213 TP 316H/SIZE 1/2" OD, THICK 2.1mm.  | A/R  |         |
| 01   | IMPULSE PIPE/ ASTM A106, Gr-C /SIZE 1/2" NB/SCH-80.   | A/R  |         |



**NOTE:-** 01: ITEM NO. 04 INDICATED BEYOND BULK HEAD, SHALL BE SUPPLIED. AS LOOSE WITH THE ASSEMBLED RACK.  
02: ALL THE BULK HEADS & ITEM NO. 5, INDICATED IN SHALL BE ACCOMMODATED & INSTALLED IN RESPECTIVE RACKS.

|      |              |                          |             |                |                  |
|------|--------------|--------------------------|-------------|----------------|------------------|
| 01   | W90318130270 | CBOM NO.                 | 21335462000 | STATUS OF DRG. |                  |
| 00   | W90318130262 | VAR.ND.                  |             | AGREED DEPT.   |                  |
|      |              | MATERIAL CODE            |             | NAME           | SIGN             |
|      |              | GRADE OF UNTOL. DIM.:-   |             | DATE           |                  |
|      |              | M/CG- V/C/M/F AA 0230208 |             |                |                  |
|      |              | WELDING-A/B/C/D-AA621104 |             |                |                  |
|      |              | GAS CUTTING-T3'AA0621101 |             |                |                  |
| REV. | DATE         | ALTERED CHECKED          | REV.        | DATE           | ALTERED CHECKED  |
|      |              |                          | 01          | 19.08.14       | BRIJ LAL SHEETAL |

TYPE OF PRODUCT **STEAM TURBINE**  
OR  
NAME OF CUSTOMER/ PROJECT

**BHARAT HEAVY ELECTRICALS LTD. HARDWAR**

|     |         |         |            |             |
|-----|---------|---------|------------|-------------|
| DRN | SSTEBLR | SSTEBLR | 18/06/2014 | NO. OF VAR. |
| CHD | SSTESS1 | SSTESS1 | 18/06/2014 |             |
| APD | ASTEVK  | ASTEVK  | 01/07/2014 |             |

DEPT. STE CODE 4011

SCALE N.T.S.

WEIGHT(Kg.) 200

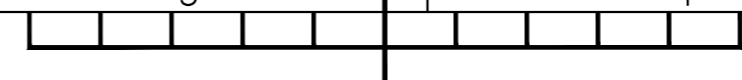
REF. TO ASSY. DRG.

TITLE **ASSY.RACK COND. PRESS. INSTRUMENTS**

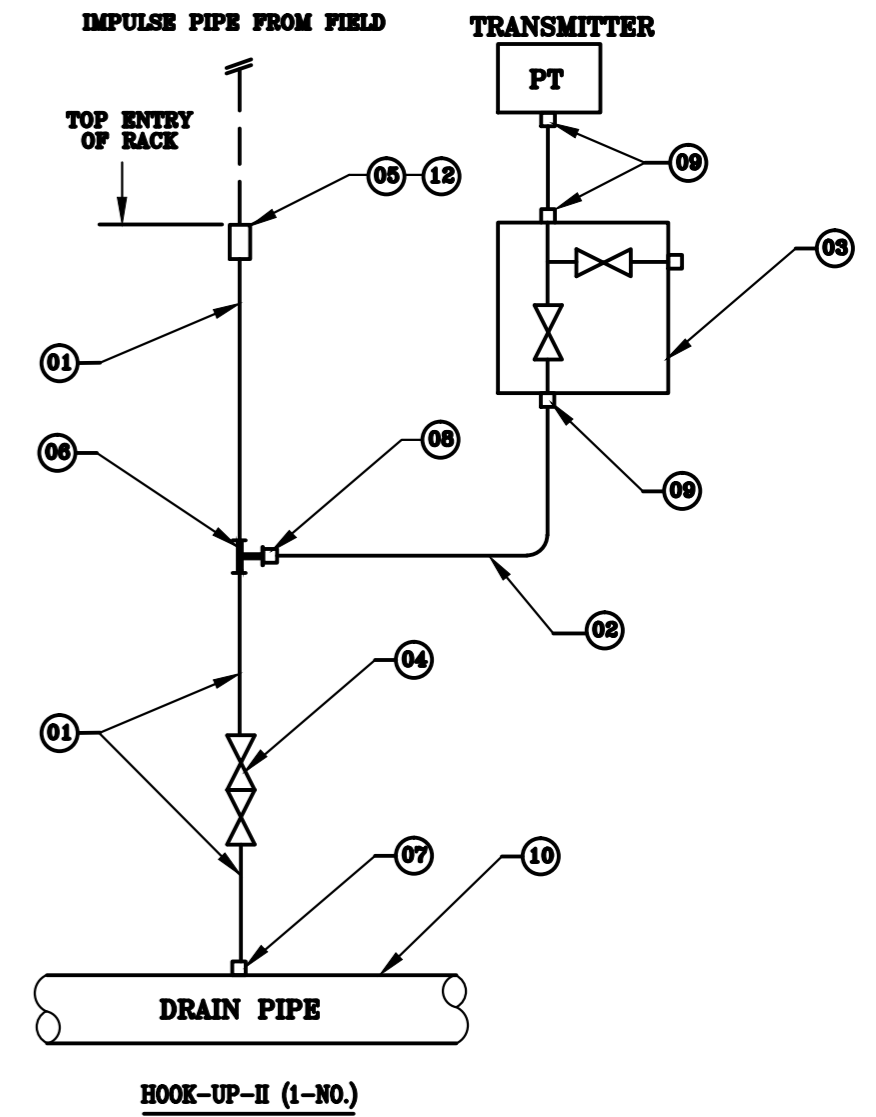
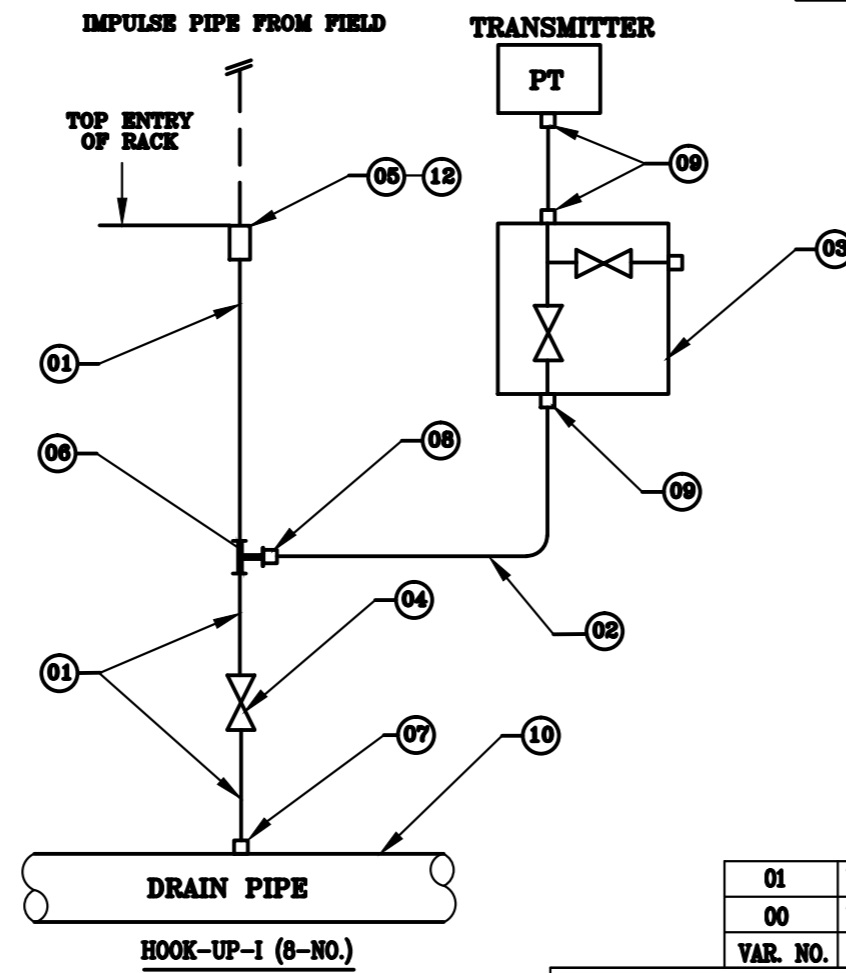
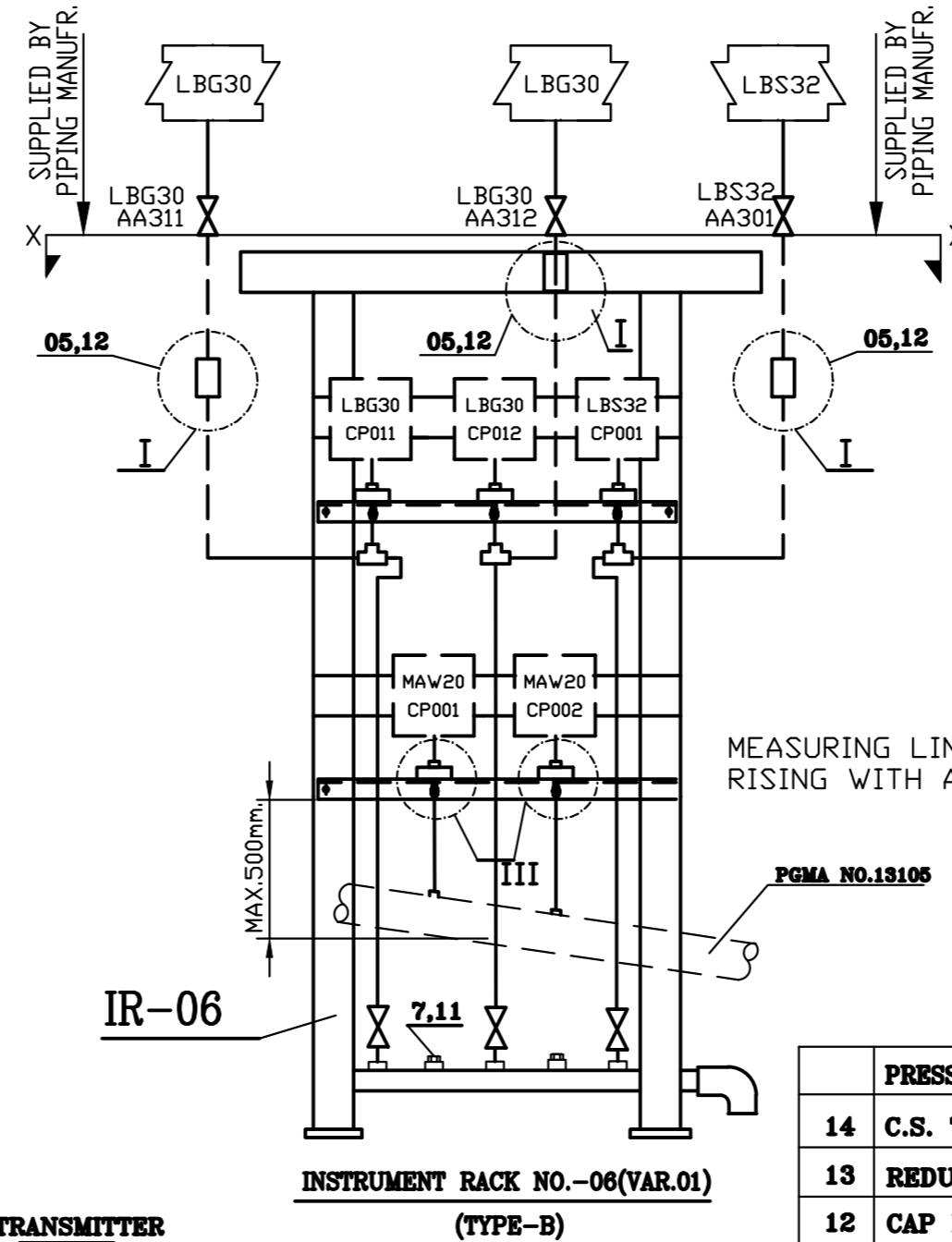
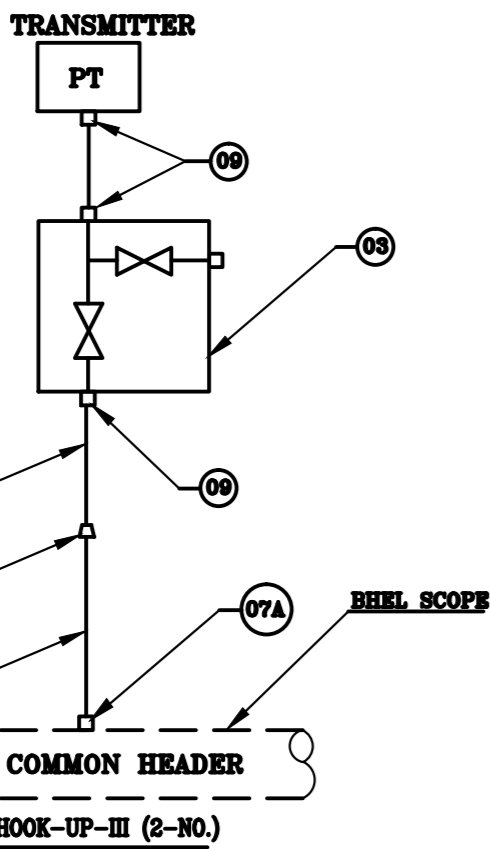
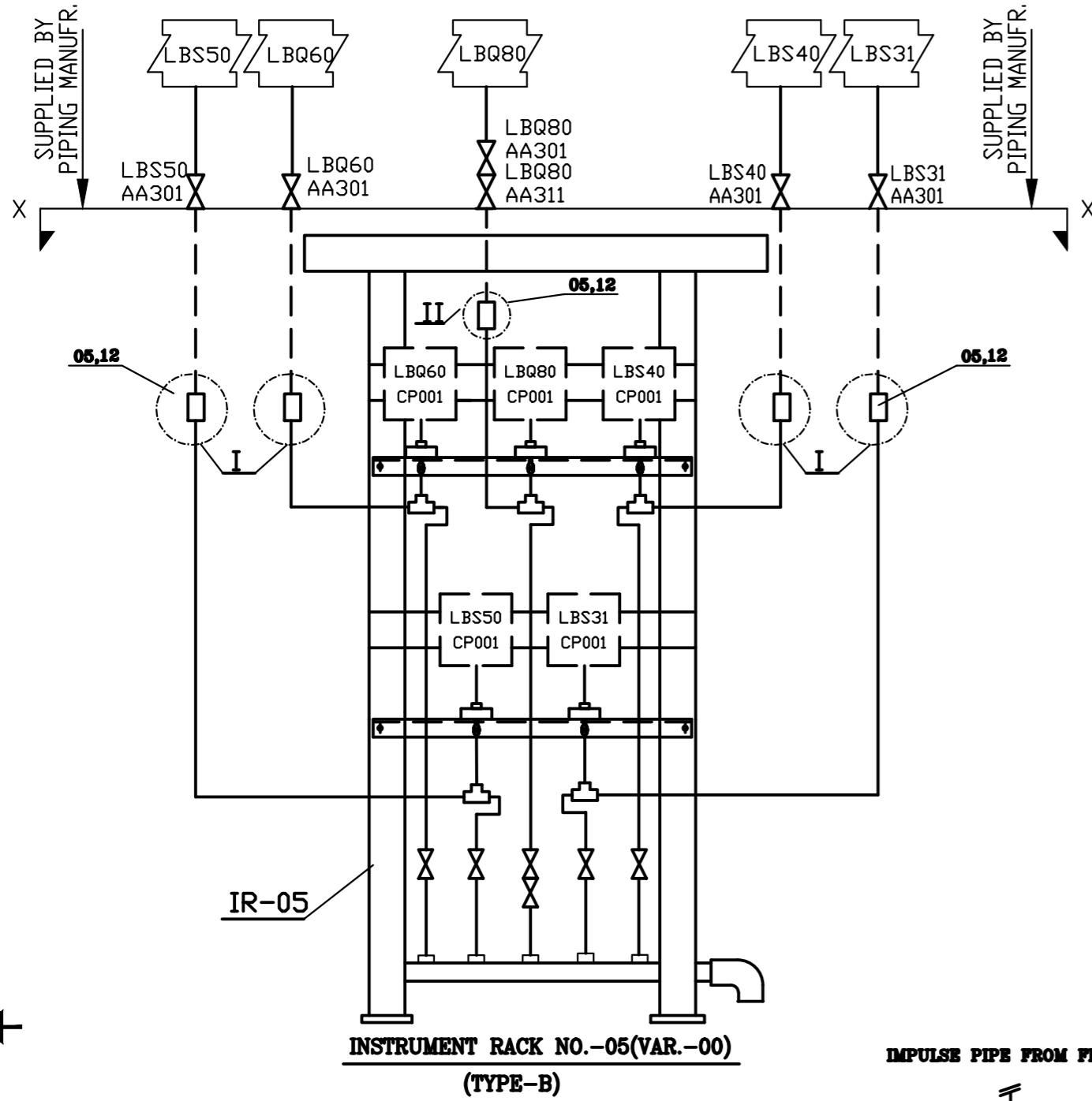
DRAWING NO. **21335462010**

SHEET NO. 1 NO. OF SHEETS 1

NOTE 2 ADDED AS PER C/A ND- STE-14-F0248



DRAWING NO. 21335562010



MEASURING LINES TO BE RISING WITH A MIN. OF 10%

| ITEM | DESCRIPTION  | QTY | REMARKS |
|------|--|-----|---------|
| 14   | C.S. TUBE/CS ASTM A106 Gr.-C/SIZE $\phi$ 33.7X3.38/SCH-80  | AR  |         |
| 13   | REDUCER ASTM 105 (33.7X3.38X21.3X2.6) CL 3000lbs   | 02  |         |
| 12   | CAP NUT FOR BULK HEAD ASTM A105  | 09  |         |
| 11   | CAP NUT FOR HALF COUPLING ASTM A105  | 02  |         |
| 10   | DRAIN PIPE/ CS ASTM A106 Gr-C / SIZE 2" NB/ SCH-80   | 02  |         |
| 09   | TUBE FITTING DOUBLE FERRULE DOUBLE COMPRESSION/ MAT. SS316/ SIZE 1/2" NPTM x TO SUIT 1/2" OD SS TUBE | 33  |         |
| 08   | TEE TUBE UNION/ SS316 / SIZE OD OF 1/2" NB SW x TO SUIT 1/2" OD SS TUBE                              | 09  |         |
| 07A  | HALF COUPLING/ASTM A105/SIZE 3" NB SW / CL 3000lbs   | 02  | LOOSE   |
| 07   | HALF COUPLING/ASTM A105/SIZE 1/2" NB SW / CL 3000lbs   | 11  |         |
| 06   | FORGED TEE/ASTM A105/SIZE 1/2" NB SW / CL 3000lbs  | 09  |         |
| 05   | BULK HEAD/ASTM A105/SIZE 1/2" NB SW / CL 3000lbs   | 09  |         |
| 04   | FORGED GLOBE VALVE/ BODY ASTM A105/STEM ASTM A182 Gr-F6A/ SIZE 1/2" NB SW/ CL 800                    | 10  |         |
| 03   | TWO VALVE MANIFOLD, 1/2" NPTF/BODY/TRIM SS316/PR TESTING 3000PSI                                     | 11  |         |
| 02   | SEAMLESS SS TUBE, ASTM A213 TP 316H/SIZE 1/2" OD, THICK 2.1mm  | A/R |         |
| 01   | IMPULSE PIPE/ ASTM A106, Gr-C /SIZE 1/2" NB/SCH-80   | A/R |         |

|          |               |              |             |                |      |
|----------|---------------|--------------|-------------|----------------|------|
| 01       | W90318130297  | CBOM NO.     | 21335562000 | STATUS OF DRG. |      |
| 00       | W90318130289  | AGREED DEPT. |             | NAME           | SIGN |
| VAR. NO. | MATERIAL CODE | NAME         | SIGN        | DATE           |      |

|                        |                          |                          |                          |
|------------------------|--------------------------|--------------------------|--------------------------|
| GRADE OF UNTOL. DIM.:- | M/CG- V/C/M/F AA 0230208 | WELDING-A/B/C/D-AA621104 | GAS CUTTING-T3'AA0621101 |
| REV.                   | DATE                     | ALTERED                  | BRIJ LAL                 |
|                        |                          | CHECKED                  | SHEETAL                  |

NOTE 1 ADDED AS PER C/A ND- STE-14-F0251

TYPE OF PRODUCT **STEAM TURBINE**  
OR  
NAME OF CUSTOMER/ PROJECT

|     |         |         |            |             |
|-----|---------|---------|------------|-------------|
| DRN | SSTEBLR | SSTEBLR | 20/06/2014 | NO. OF VAR. |
| CHD | SSTESS1 | SSTESS1 | 21/06/2014 |             |
| APD | ASTEVK  | ASTEVK  | 02/07/2014 |             |

|           |       |             |                    |          |
|-----------|-------|-------------|--------------------|----------|
| DEPT. STE | SCALE | WEIGHT(Kg.) | REF. TO ASSY. DRG. | ITEM NO. |
| CODE 4011 | N.T.S | 180         |                    |          |

TITLE **ASSY.RACK FOR EX. & GLAND.SEAL INST**

DRAWING NO. **21335562010**

SHEET NO. 1 NO.OF SHEETS 1

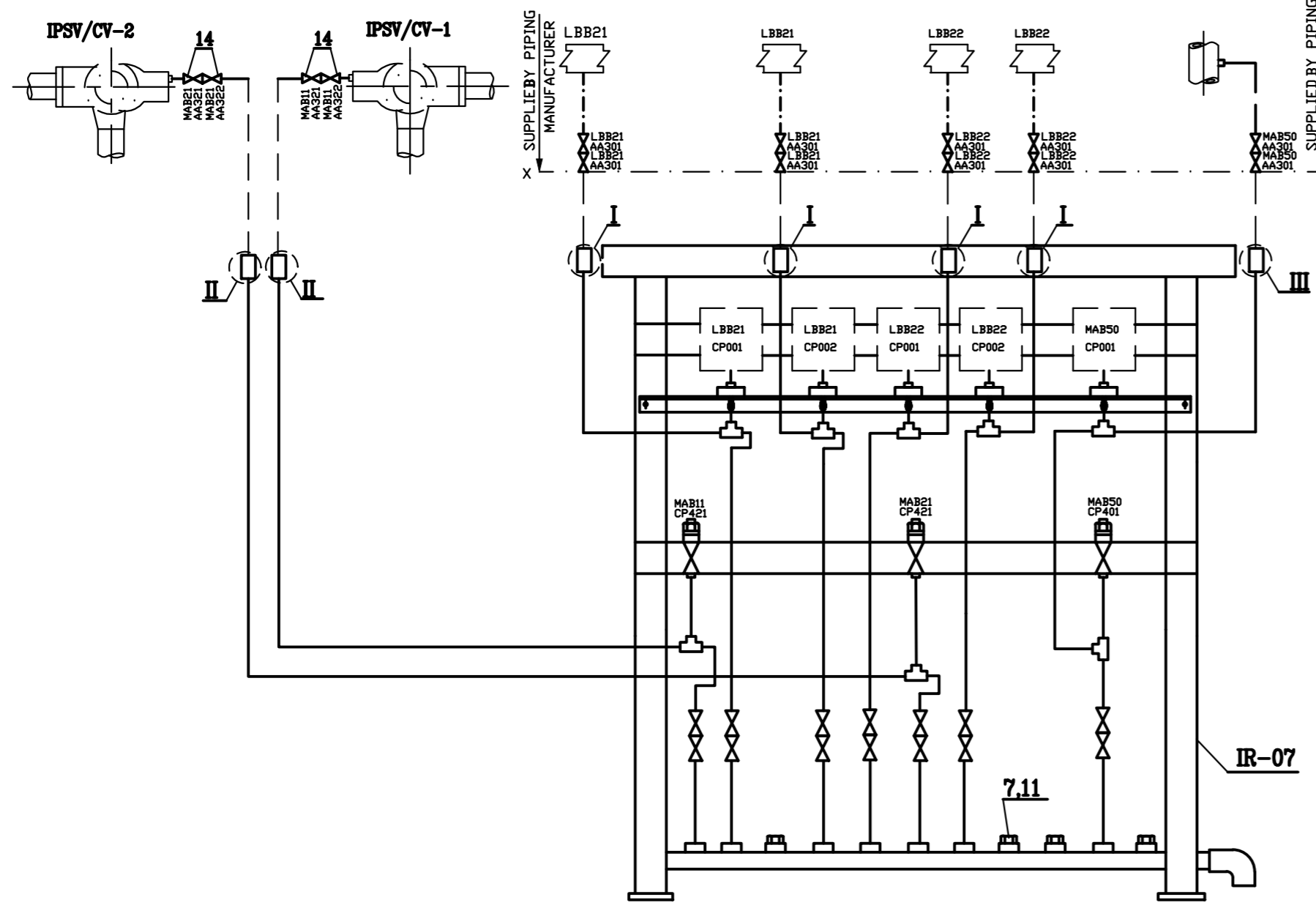
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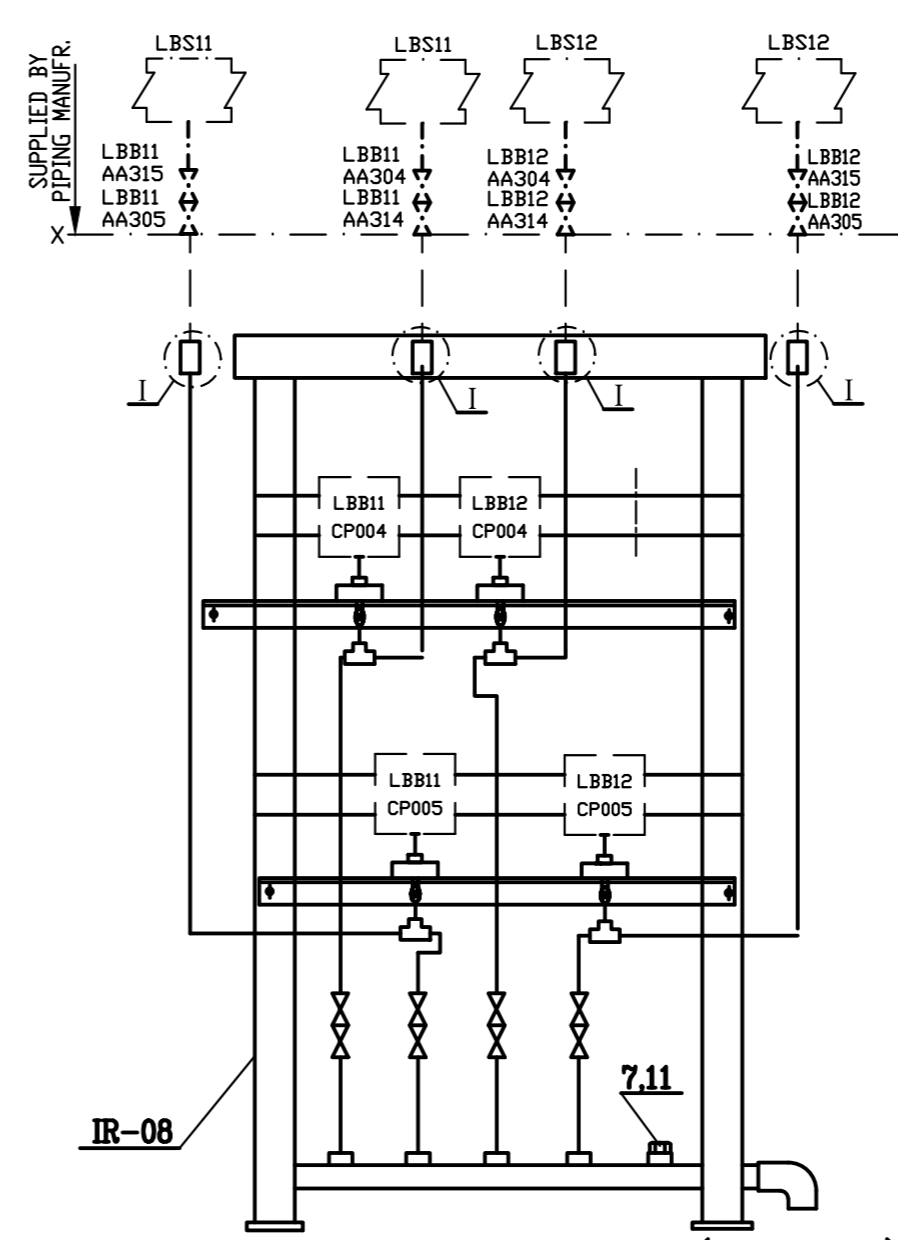
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INVENTORY NO.

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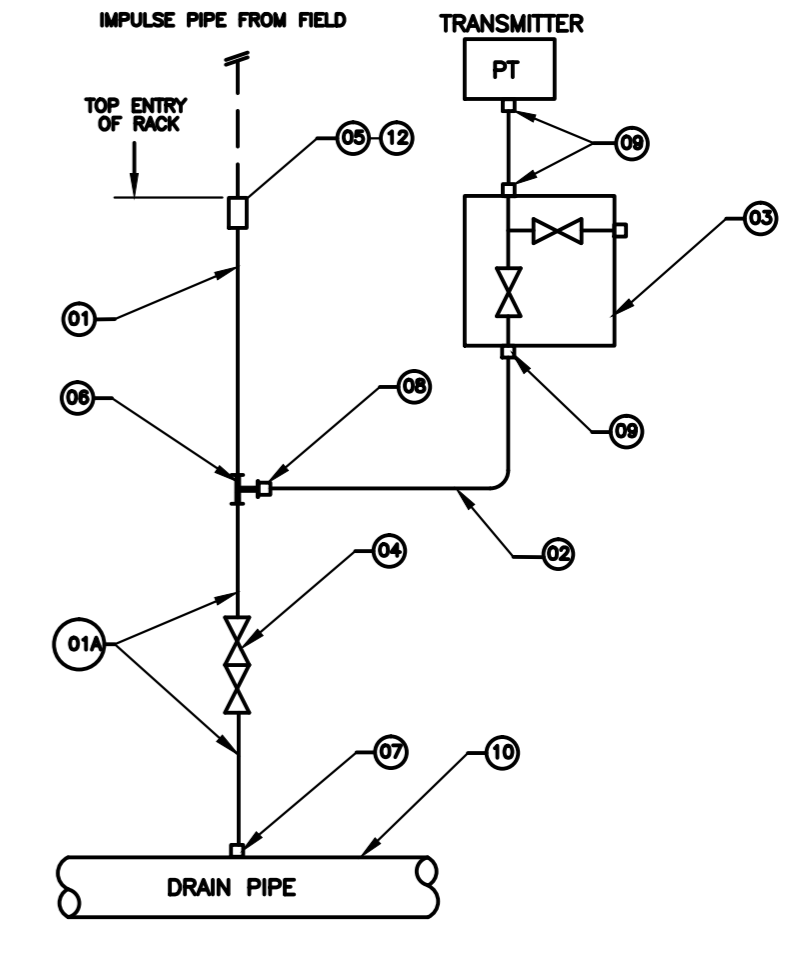


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(TYPE-A)

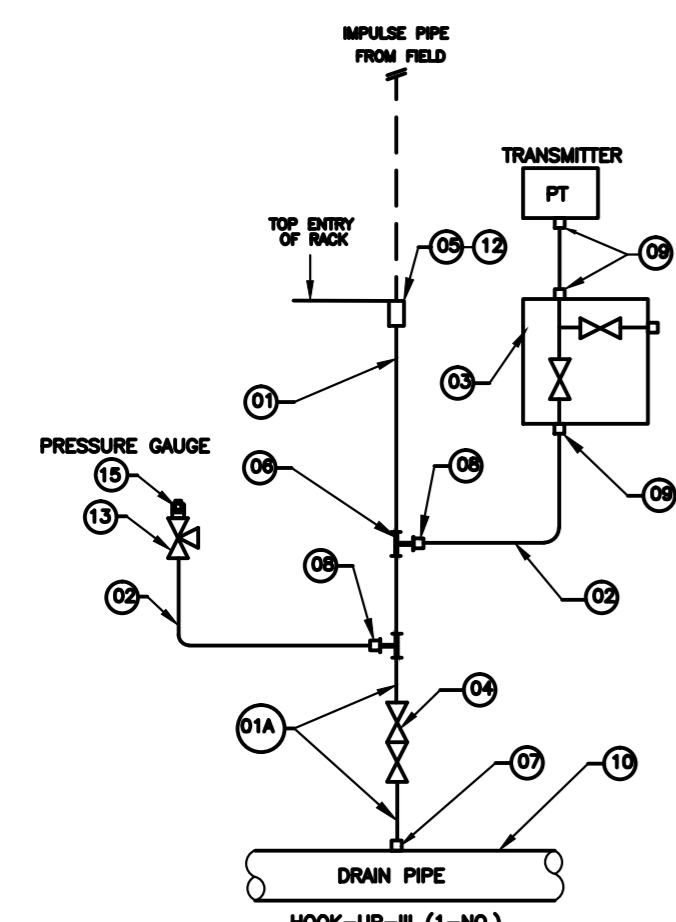


INSTRUMENT RACK NO. 08(VAR.-01).  
(TYPE-B)

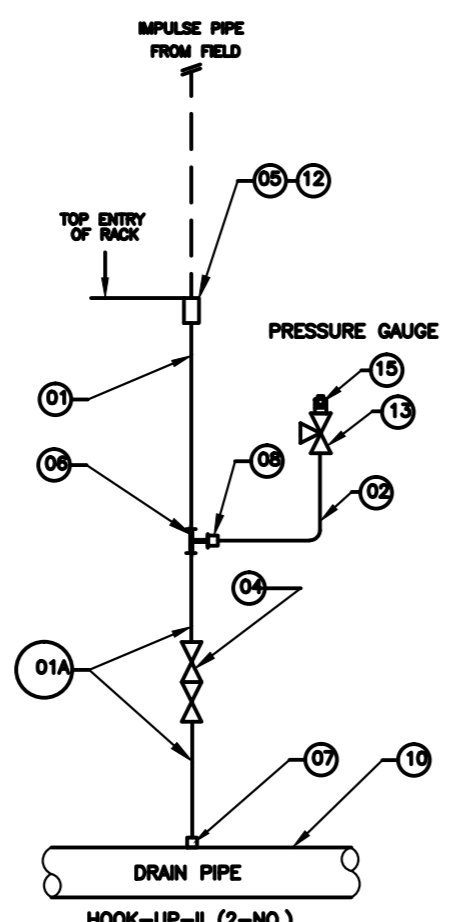
NOTE:- 01: ITEM NO.-14, INDICATED BEYOND BULK HEAD, SHALL BE SUPPLIED AS LOOSE WITH THE ASSEMBLED RACK  
02: ALL THE BULK HEADS & ITEM NO. 5, INDICATED IN SHALL BE ACCOMMODATED & INSTALLED IN RESPECTIVE RACKS.



HOOK-UP-I (8-NO.)



HOOK-UP-III (1-NO.)



HOOK-UP-II (2-NO.)

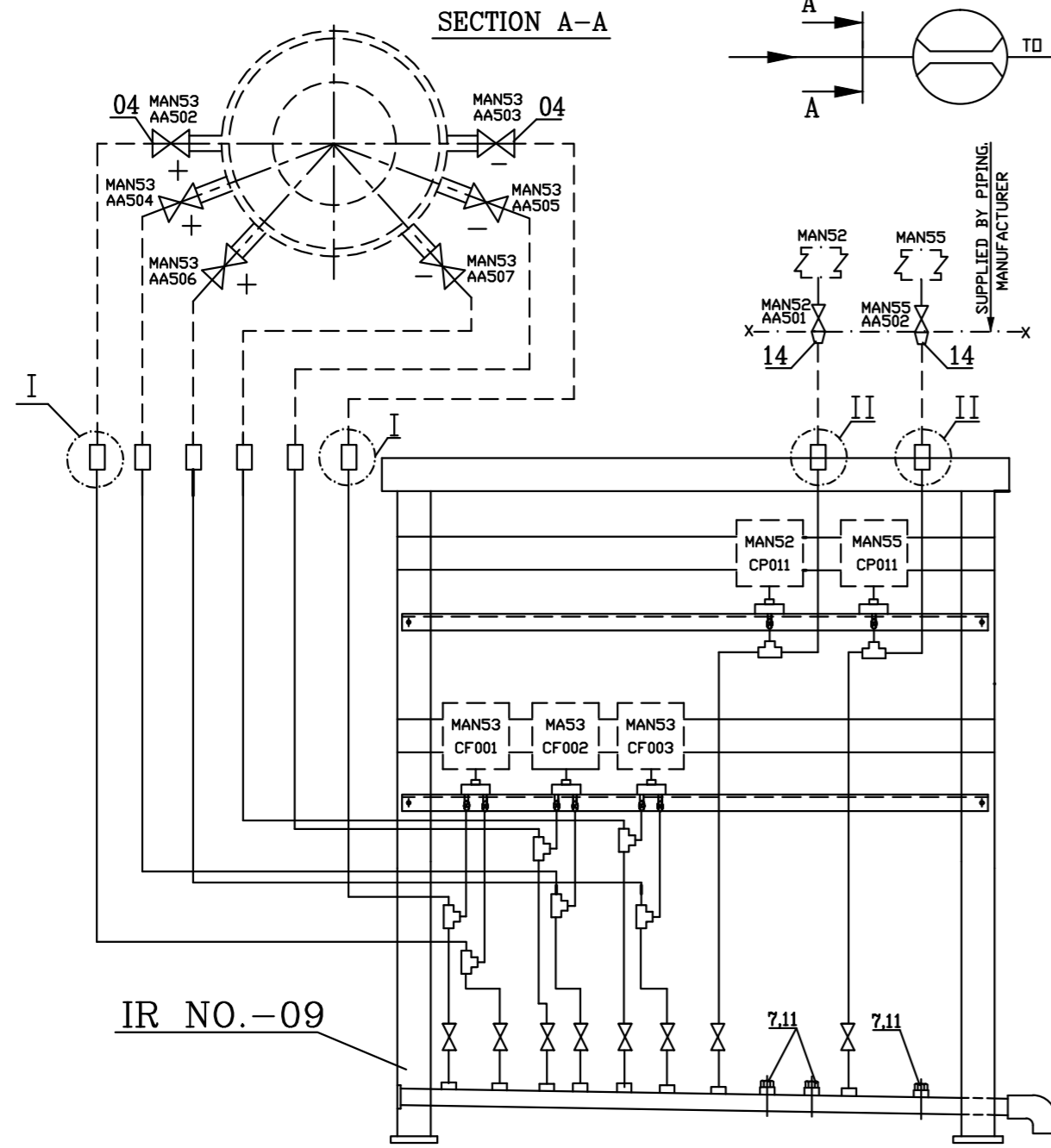
| ITEM | DESCRIPTION  | BHEL/SAR SCOPE |         |
|------|--|----------------|---------|
| 15   | PLUG 1/2" NPTM   | 3              |         |
| 14   | FORGED GLOBE VALVE ASTM,336, Gr. A91 (AS: X10CrMoVNb 9-1 Or EQUIVALENT                               | 4              |         |
| 13   | THREE WAY GAUGE COCK/ S316/ SIZE 1/2" NPTFx1/2" OD SS TUBE   | 3              |         |
| 12   | CAP NUT FOR BULK HEAD ASTM A105  | 11             |         |
| 11   | CAP NUT FOR HALF COUPLING ASTM A105  | 5              |         |
| 10   | DRAIN PIPE/ CS ASTM A106 Gr-C / SIZE 2" NB/ SCH-80   | 2              |         |
| 09   | TUBE FITTING DOUBLE FERRULE DOUBLE COMPRESSION/ MAT. SS316/ SIZE 1/2" NPTM x TO SUIT 1/2" OD SS TUBE | 27             |         |
| 08   | TEE TUBE UNION/ SS316 / SIZE OD OF 1/2" NB SW x TO SUIT 1/2" OD SS TUBE                              | 12             |         |
| 07   | HALF COUPLING/ASTM A182 GR-F22/SIZE 1/2" NB SW/CL 9000lbs  | 16             |         |
| 06   | FORGED TEE/ASME SA213 Gr. T91/SIZE 1/2" NB SW / CL 9000lbs   | 12             |         |
| 05   | BULK HEAD/ASME SA213 Gr. T91/SIZE 1/2" NB SW / CL 9000lbs  | 11             |         |
| 04   | FORGED GLOBE VALVE/ BODY ASTM A182 F22/STEM ASTM A182 Gr-F8A/ SIZE 1/2" NB SW/ CL 3000 SPL           | 22             |         |
| 03   | TWO VALVE MANIFOLD, 1/2" NPTF/BODY/TRIM SS316/PR TESTING 9000PSI                                     | 9              |         |
| 02   | SEAMLESS SS TUBE, ASME SA213 Gr. T91 316H/SIZE 1/2" OD, THICK 2.1mm                                  | A/R            |         |
| 01A  | IMPULSE PIPE/ ASTM A335, Gr.P22/ SIZE 1/2" NB/ SCH-XXS   | A/R            |         |
| 01   | IMPULSE PIPE/ ASME A335, Gr-T91/ SIZE 1/2" NB/ SCH-XXS   | A/R            |         |
| ITEM | DESCRIPTION  | QTY            | REMARKS |

|                          |              |                      |                |                 |           |                           |        |                      |             |                    |              |
|--------------------------|--------------|----------------------|----------------|-----------------|-----------|---------------------------|--------|----------------------|-------------|--------------------|--------------|
| 01                       | W90318130211 | CBOM NO.             | STATUS OF DRG. | TYPE OF PRODUCT |           |                           |        | STEAM TURBINE        |             |                    |              |
| 00                       | W90318130203 | 21335660000          |                | OR              |           |                           |        |                      |             |                    |              |
| VAR. NO. MATERIAL CODE   |              | AGREED DEPT.         | NAME           | SIGN            | DATE      | NAME OF CUSTOMER/ PROJECT |        |                      |             |                    |              |
| GRADE OF UNTOL. DIM.:-   |              |                      |                |                 |           | DRN                       |        | SSTEBLR              | SSTEBLR     | 08/04/2013         | NO. OF VAR.  |
| M/CG- V/C/M/F AA 0230208 |              |                      |                |                 |           | CHD                       |        | SSTEGG               | SSTEGG      | 08/04/2013         |              |
| WELDING-A/B/C/D-AA621104 |              |                      |                |                 |           | APD                       |        | ASTEVK               | ASTEVK      | 16/04/2013         | 73, 74       |
| GAS CUTTING-T3'AA0621101 |              |                      |                |                 |           | DEPT. STE                 |        | SCALE                | WEIGHT(Kg.) | REF. TO ASSY. DRG. | ITEM NO.     |
| REV.                     | DATE         | ALTERED              | BRIJ LAL       |                 | CODE 4011 |                           | N.T.S. | 210                  |             |                    | NO. OF ITEMS |
|                          |              | CHECKED              | SHEETAL        |                 |           |                           |        |                      |             |                    | 75, 77       |
|                          |              | NOTE 2 ADDED AS PER  |                |                 |           | TITLE                     |        | ASSY.RACK FOR HRH/MS |             | DRAWING NO.        |              |
|                          |              | C/A ND- STE-14-F0249 |                |                 |           | PRESSURE INSTRUMENTS      |        | 21335660010          |             | SHEET NO. 1        |              |
|                          |              |                      |                |                 |           |                           |        |                      |             | NO. OF SHEETS 1    |              |

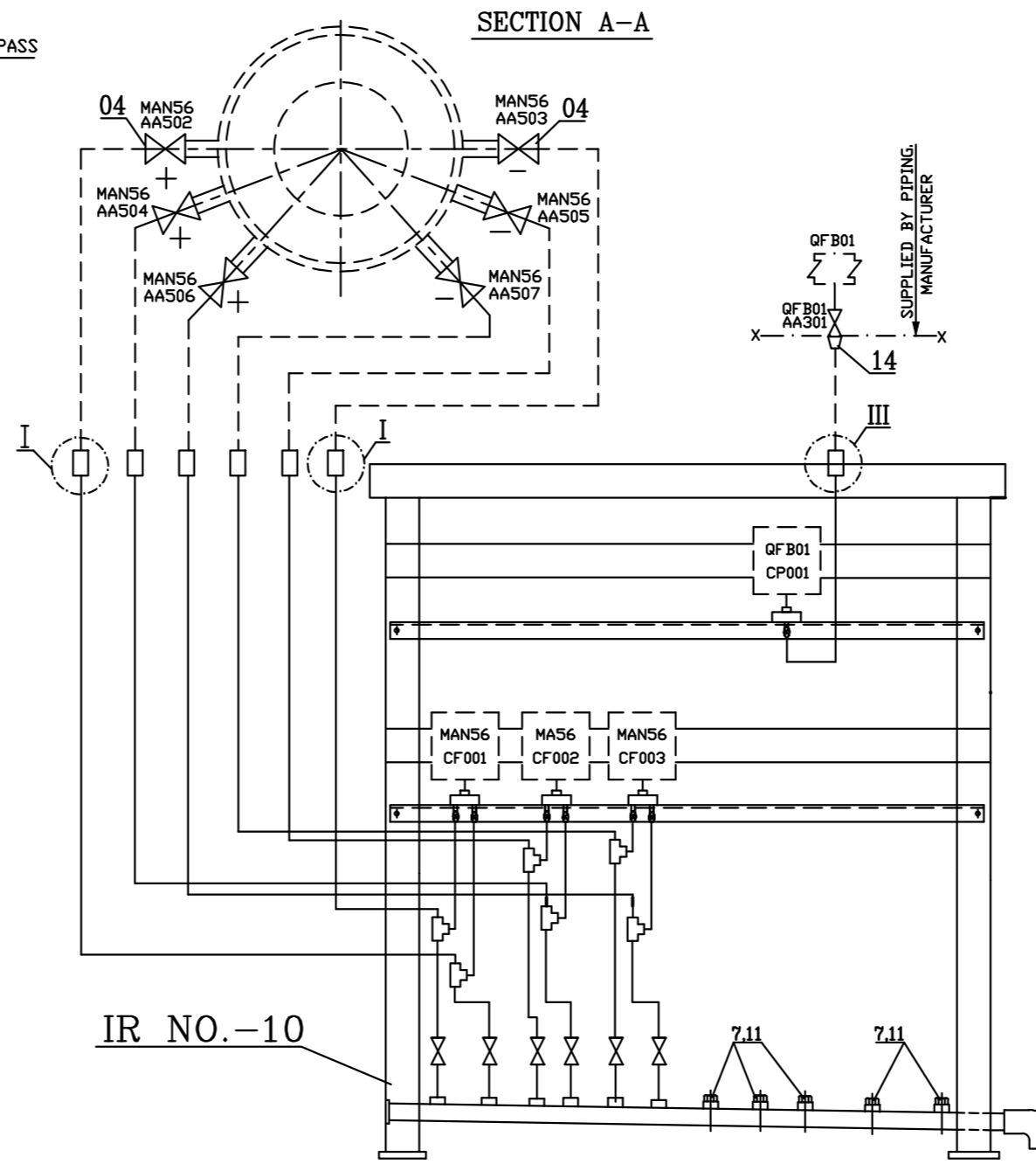
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INVENTORY NO. SIGN & DATE REF. DRG NO.

21336060510  
DRAWING NO.

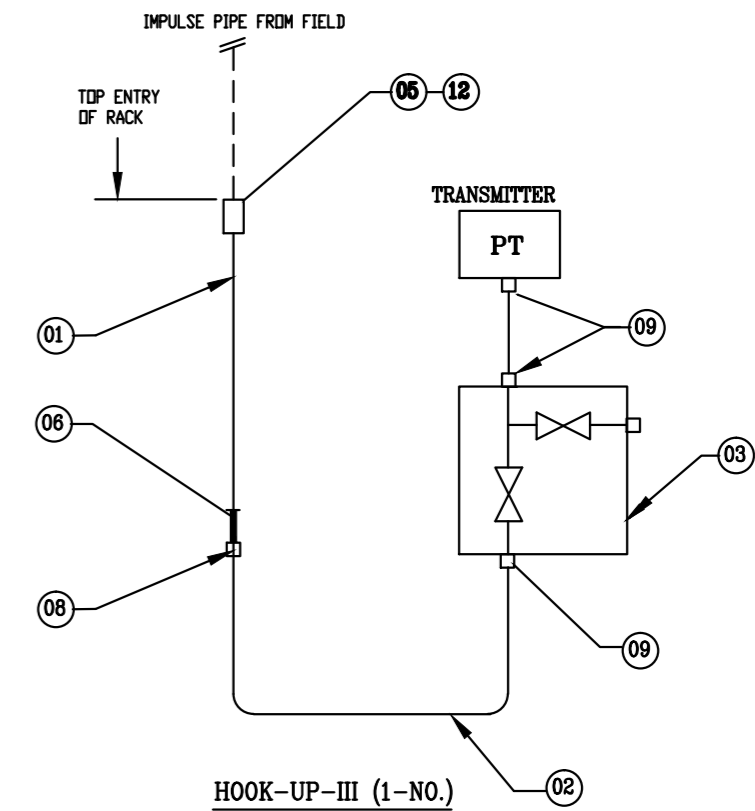


INSTRUMENT RACK NO.-09 (VAR.-00)  
(TYPE-A)

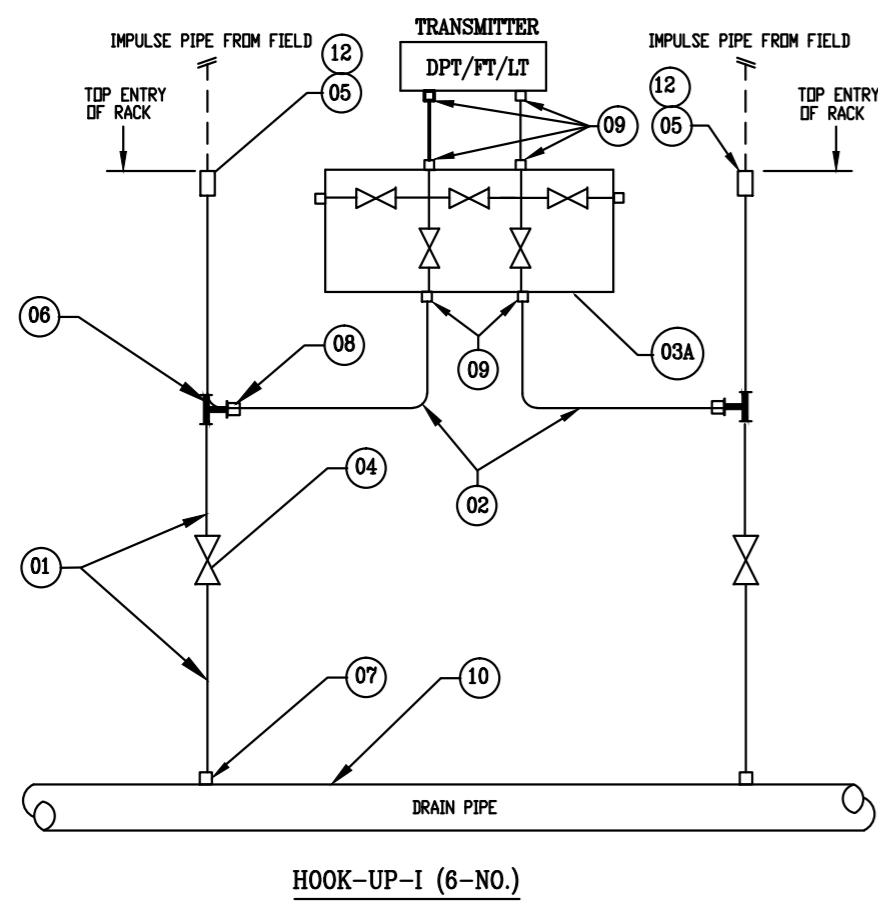


INSTRUMENT RACK NO.-10 (VAR.-01)  
(TYPE-A)

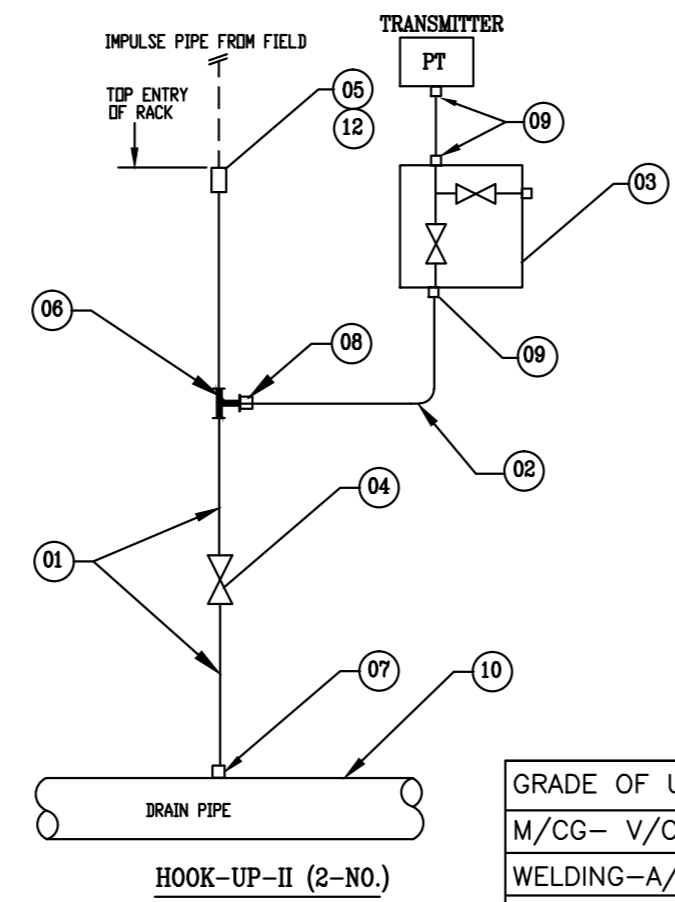
NOTE:- 01: ITEM NO. 04,14 INDICATED BEYOND BULK HEAD, SHALL BE SUPPLIED AS LOOSE WITH THE ASSEMBLED RACK.  
02: ALL THE BULK HEADS & ITEM NO. 5, INDICATED IN SHALL BE ACCOMMODATED & INSTALLED IN RESPECTIVE RACKS.



HOOK-UP-III (1-NO.)



HOOK-UP-I (6-NO.)



HOOK-UP-II (2-NO.)

| ITEM | DESCRIPTION  | QTY | REMARKS   |
|------|--|-----|---|
| 14   | REDUCER/ASTM A105 / SIZE 1' NB SW x 1/2' NB SW/CL 3000lbs  | 03  |   |
| 12   | CAP NUT FOR BULK HEAD ASTM A105  | 15  |   |
| 11   | CAP NUT FOR HALF COUPLING ASTM A105  | 08  |   |
| 10   | DRAIN PIPE/ CS ASTM A106 Gr-C / SIZE 2' NB/ SCH-80   | 02  |   |
| 09   | TUBE FITTING DOUBLE FERRULE DOUBLE COMPRESSION/ MAT. SS316/ SIZE 1/2" NPTM x TO SUIT 1/2" OD SS TUBE | 45  |   |
| 08   | TEE TUBE UNION/ SS316 / SIZE OD OF 1/2" NB SW x TO SUIT 1/2" OD SS TUBE                              | 15  |   |
| 07   | HALF COUPLING/ASTM A105/SIZE 1/2" NB SW / CL 3000lbs   | 22  |   |
| 06   | FORGED TEE/ASTM A105/SIZE 1/2" NB SW / CL 3000lbs  | 15  |   |
| 05   | BULK HEAD/ASTM A105/SIZE 1/2" NB SW / CL 3000lbs   | 15  |   |
| 04   | FORGED GLOBE VALVE/ BODY ASTM A105/STEM ASTM A182 Gr-F6A/ SIZE 1/2" NB SW/ CL 800                    | 26  |   |
| 03A  | FIVE VALVE MANIFOLD, 1/2" NPTF/BODY/TRIM SS316/PR TESTING 3000PSI                                    | 06  |   |
| 03   | TWO VALVE MANIFOLD, 1/2" NPTF/BODY/TRIM SS316/PR TESTING 3000PSI                                     | 03  |   |
| 01   | W90318130238   | 02  | SEAMLESS SS TUBE, ASTM A213 TP 316H/SIZE 1/2" DD, THICK 2.1mm |
| 00   | W90318130220   | 01  | IMPULSE PIPE/ ASTM A106, Gr-C /SIZE 1/2" NB/SCH-80            |

| VAR.NO. | MATERIAL CODE |
|---------|---------------|
| 01      | W90318130238  |
| 00      | W90318130220  |

| REV. | DATE     | ALTERED | CHECKED | REV. | DATE     | ALTERED | CHECKED |
|------|----------|---------|---------|------|----------|---------|---------|
| 01   | 19.08.14 | CHECKED |         | 01   | 19.08.14 | CHECKED |         |

GRADE OF UNTOL. DIM:-  
M/CG- V/C/M/F AA 0230208  
WELDING-A/B/C/D-AA621104  
GAS CUTTING-T3'AA0621101

NOTE 2 ADDED AS PER  
C/A NO- STE-14-F0254

TYPE OF PRODUCT **STEAM TURBINE**  
OR  
NAME OF CUSTOMER/ PROJECT

| DRN      | NAME     | SIGN     | DATE       | NO.OF VAR. |
|----------|----------|----------|------------|------------|
| SSSTEJSB | SSSTEJSB | SSSTEJSB | 19/04/2013 |            |
| CHD      | SSTEVK   | SSTEVK   | 20/04/2013 |            |
| APD      | ASTEVK   | ASTEVK   | 24/04/2013 | 73, 74     |

DEPT. STE  
CODE 4011  
SCALE  
WEIGHT(Kg.)  
REF. TO ASSY. DRG.  
ITEM NO.

TITLE  
**ASSY.RACK FOR WATER INJECTION INSTRUMENTS.**  
DRAWING NO.  
**21336060510**

SHEET NO. 1 NO.OF SHEETS 1  
SIZE A2

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INVENTORY NO.  
SIGN & DATE  
REF. DRG NO.