


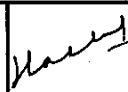
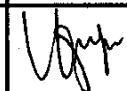
		उत्पाद मानक STEAM TURBINE ENGINEERING PRODUCT STANDARD		ST 34001 पृष्ठ 11 का 1 Page 1 of 11	
दिनांक एवं हस्ताक्षर SIGN & DATE		SUPERSEDES INVENTORY NO.		सामग्री सूची संख्या को अधिकृत करता है	
<h2 style="margin: 0;">SPECIFICATION FOR FABRICATION AND SUPPLY OF TURBINE INTEGRAL PIPING FOR POWER STATIONS</h2>					
<h3>1. PROJECT INFORMATION</h3> <p>The pipings covered under this specification are to be used in association with Turbine Generator Plant and are to be suitable for carrying steam, condensate, oil and vapour upto design conditions specified in the relevant drawings.</p>					
<h3>2. SCOPE OF WORK</h3> <p>The scope of work for the piping vendor shall be to completely supply (which includes materials , fabrication , testing , cleaning , painting , packing and despatch) the turbine integral piping systems directly to power stations.</p>					
<h4>2.1 All pipes NB50 & below shall be supplied in approximately 6.0 meter length with both ends square .</h4>					
<h4>2.2 Pipes of size above NB50 shall be pre-fabricated at the shop as per the Bill Of Materials (BOMs) mentioned in the project specific Addendum .</h4>					
<h4>2.3 Unless otherwise specified in the drawings all the free ends of the pipes are to be supplied with square ends .</h4>					
<h4>2.4 Alloy steel TIG wire for site erection shall be supplied in a separate bag/box as per the quantity mentioned in the Drawings / Bill Of Materials .</h4>					
<div style="float: left; width: 30%;"> COPYRIGHT AND CONFIDENTIAL <small>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.</small> </div> <div style="float: right; width: 65%;"> स्वत्वाधिकार एवं गोपनीयता <small>इस दस्तावेज में दी गई सूचना भारत भारती इलेक्ट्रिकल्स की सम्पत्ति है इसका प्रयोग एवं आस्त्यक्त रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए ।</small> </div>					
दिनांक एवं हस्ताक्षर SIGN & DATE 10.10-03		अनुवादक TRANSLATED BY : निर्माणकर्ता WORKED BY : S.K.GUPTA जांचकर्ता CHECKED BY : S.K.GUPTA पर्यवेक्षणकर्ता SUPERVISED BY : V.K.GUPTA			
सहमत विभाग AGREED DEPTT.		नाम NAME		दिनांक एवं हस्ताक्षर DATE & SIGNATURE	
REV.NO. 06 Dt. 29.9-03		स्वीकृति APPROVED : (B.K. BHALLA) AGM (STE)		जारी ISSUED : STE (TL) दिनांक : DATE : 27-08-80	
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COPYRIGHT AND CONFIDENTIAL 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		2.5 <u>Hydraulic Testing</u> 2.5.1 <u>Piping other than Jacking oil system</u> Hydraulic test certificate of mother pipe shall be supplied by fabricator. In the event of mill test certificate not being available, the pipelines shall be hydraulically tested in the shop as per ANSI B31.1 before fabrication. In case of standard fittings like elbows, tees, reducers, hydraulic test certificate of mother pipe shall be furnished. 2.5.2 <u>Piping for Jacking oil system</u> Mother pipes for Jacking oil system shall be tested at 1.5 times the working pressure but not less than 225 bar alternatively ultrasonically tested. 2.6 Threaded stubs shall be supplied with suitable plugs alongwith sealing washers. 2.7 The purchaser's piping layout drgs. indicate dimensioned layout of most of the piping NB 65mm and above. These piping layouts have been made after due care and are final, but any minor modification required at a later stage shall be done by the vendor at no extra cost to the purchaser. 3. <u>Bill Of Materials.</u> 3.1 The drawings listed in the annexure shall be considered as an integral part of the specification and all work shall be performed as shown there in. 4. <u>MATERIAL SPECIFICATION</u> 4.1 The material to be used for fabrication of piping are specified in the BOMs. 4.2 The vendor shall furnish the correlated mill test certificate for the material used. 4.3 Plates to be used for flanges > 25 mm shall be checked for laminations by UT as per ASTM-E-435. 5. <u>WELDING REQUIREMENTS</u> 5.1 Testing of weld shall be according to TABLE "AA" or TABLE "BB" of this purchase specification as mentioned in the pipe assembly drawings. 5.2 Welding of pipes according to BHEL standard No. HW0620599. 5.3 Access holes for shop radiography shall be provided only if the area to be radiographed is not possible through the ends of the pipe. Access holes for radiography shall be 100% radiographed after plugging.			
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सामग्री सूची संख्या INVENTORY NO. P-5038	REV. NO. 06	निर्माणकर्ता WORKED BY S.K.G.	जांचकर्ता CHECKED BY V.K.G.	29.09.03	29.09.03

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सामग्री सूची संख्या INVENTORY NO. P-5038	SUPERSEDES INVENTORY NO. सामग्री सूची संख्या को अतिरिक्तित करता है	<p>5.4 No welding or welded parts shall be painted, plated, galvanised or heat treated until inspected by the purchaser's representative.</p> <p>5.5 All edge preparation shall be done by machining. Manual flame cutting shall not be acceptable. Machine flame cutting for edge preparation shall be done where machining for edge preparation is not possible.</p> <p>5.6 Arcs shall be struck only on joints to be welded, damage caused by striking arcs elsewhere on the work piece shall be replaced or repaired to the full satisfaction of the purchaser.</p> <p>5.7 Except where necessary to grind flush for radiographic purposes the centre of re-inforcement for butt welds shall not be less than 1/16" nor more than 1/8" above the normal surface of the joined members. The re-inforcement shall be crowned at the centre and tapered on each side to the surface of the joined members. The exposed surfaces of the weld shall be chipped or ground wherever required to present a workman-like appearance & shall be free from depressions below the surfaces of the joined members.</p> <p>5.8 Fillet welds shall have a leg dimension at least equal to 1.25 times nominal wall thickness specified for the pipe.</p> <p>5.9 All weld seams in alloy steel piping and components shall be preheated for welding and stress relieved after welding as per ANSI B31.1.</p> <p>5.10 Non perpendicularity of welding ends of pipe line parts and fittings shall not be more than 0.5 mm for pipes Nb125, 1 mm for pipes Nb150 and 200, 2 mm for pipes Nb250 and above.</p> <p>6.0 <u>FABRICATION</u></p> <p>6.1 <u>Hot working:</u> Upsetting and forging operations shall be performed at temperature above 850°C. After work is completed the pipe shall be allowed to cool in still air.</p> <p>6.1.1 All bends shall be visually examined for wrinkles. Permissible wrinkles are as follows:</p> <p>a) The maximum vertical height of any wave measured from the average height of two adjoining crests to the valley should not exceed 3% of the nominal pipe size.</p> <p>b) The minimum ratio of the distance between crests as compared to the height between crests and the included valley shall be 12 to 1.</p>		
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दिनांक SIGN & DATE 17/10/03	REV. NO. 06			
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		जांचकर्ता CHECKED BY	V.K.G.		29.9.03


- 6.2 All elbows shall be of long radius type with $R=1.5 NB$ or as specified in the B.O.Ms.
- 6.3 Vendor shall clearly specify in his offer the specifications of the pipes and fittings to be used in the piping systems.
- 6.4 All piping, bends, welded joints, flanges, fitting bolting material and gaskets shall be in accordance with the respective drawings and BOMs.
- 6.5 Flanges or welded nozzles, branch connections, welding outlets, adapters, taps shall be true and faced at right angle to the axis of pipe as per ANSI B31.1.
- 6.6 All pipe bends shall be made to radii as specified on purchaser's drawings and they shall be true to angle and radii and maintain a true circular cross section of pipe without deformity or undue stretching or thinning of pipe walls. The allowable deviation from circularity at any cross section of a bend shall be as per Regulation No. 361 (b) of IBR subject to maximum of 0.5%. Pipe bends shall be ultrasonically checked for their wall thickness. Tolerance for reduction in thickness shall not be more than 12.5 %.
- 6.7 All pipe flanges and contact surfaces shall be concentric with axis of piping. All flanges & fittings shall be accurately machined & drilled true to template.
- 6.8 All flanges and machined parts bolted together shall be spot faced on the the back to ensure that nuts and bolt heads bed down properly.
- 6.9 Vendor shall completely machine all welding ends of piping, bends and fittings, wherever applicable to make all welds complete, both in the shop and in the field including those of valves, fittings for equipment. Weld rods shall deposit metal having essentially the same composition as the parts being formed.
- 6.10 Vendor shall employ qualified welders to the satisfaction of the purchaser. All welding procedures & welders/welding operators are to be qualified as per ASME sec-IX.


7. INDIAN BOILER REGULATIONS


Where ever applicable the vendor is fully responsible for obtaining the approval from any of the inspecting authorities approved by IBR. The following are the documents which are to be submitted to the Chief Inspector of Boilers as specified in IBR.


- a/ Certificate for manufacture and test of steam pipes-Form IIIA of IBR.
- b/ Certificate for manufacture and test of tubes-Form IIIB of IBR.
- c/ Arrangement and fabrication detailed drawings of all piping coming under the purview of IBR. The documents shall be submitted sufficiently in advance to suit material delivery.

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सामग्री सूची संख्या को अतिरिक्तित्व करता है	SUPERSEDES INVENTORY NO.	8. CLEANING & PAINTING <p>All hot bent, forged, fabricated and straight sections of piping except the piping mentioned below for pickling with acid shall be thoroughly cleaned, wire brushed and purged with an air blast to remove all sand and scale for inner surfaces. The outside surfaces of all pipes shall also be free of sand, loosely adhering scale, dirt and other foreign matters. The method of cleaning shall not leave any material on the inner or outer surfaces that will affect the serviceability of the pipe.</p> <p>Following pipes shall be treated by pickling with acid and neutralised before despatch :-</p> <p>(a) All small bore pipes Nb 50 and below except stainless steel material .</p> <p>(b) All Lub oil pipes (PGMA 13111) except stainless steel material .</p> <p>(c) All control oil/fluid pipes (PGMA 13112 , 13155 and 13157) except stainless steel material .</p> <p>All pipes which are cleaned by acid pickling shall be passivated & conserved in accordance with the procedure detailed below. Any alternative method used by the supplier shall have to be got approved from BHEL for which the supplier shall furnish all the details along with the acceptance norms etc. with his offer.</p> <p><u>PICKLING AND PASSIVATION PROCEDURE:</u></p> <p>For pipe sizes requiring internal cleanliness substantially equal to bare metal, pickling is an effective overall method of removing scale, rust etc.</p> <p><u>Procedure</u></p> <table border="0"> <tr> <td>Step.1</td> <td><u>Degreasing</u></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Sodium Hydroxide</td> <td>Solution >~10%</td> <td>Temperature 60-70°C</td> <td>Duration 2 Hours</td> <td></td> </tr> <tr> <td>Step.2</td> <td><u>Rinsing</u></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>By tap water</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Step.3</td> <td><u>Descaling</u></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Hydrochloric acid with inhibitor</td> <td>Solution 10-15%</td> <td>Temperature Room temp.</td> <td>Duration 50-60 minutes</td> <td></td> </tr> <tr> <td>Step.4</td> <td><u>Rinsing</u></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>By tap water</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Step.5</td> <td><u>Phosphate treatment.</u></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Phosphate with inhibitor</td> <td>Solution 8%</td> <td>Temperature 50-60°C</td> <td>Duration 50 minutes</td> <td></td> </tr> <tr> <td>Step.6</td> <td><u>Rinsing</u></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>By hot tap water above 50°C</td> <td></td> <td></td> <td></td> </tr> </table>			Step.1	<u>Degreasing</u>				Sodium Hydroxide	Solution >~10%	Temperature 60-70°C	Duration 2 Hours		Step.2	<u>Rinsing</u>					By tap water				Step.3	<u>Descaling</u>				Hydrochloric acid with inhibitor	Solution 10-15%	Temperature Room temp.	Duration 50-60 minutes		Step.4	<u>Rinsing</u>					By tap water				Step.5	<u>Phosphate treatment.</u>				Phosphate with inhibitor	Solution 8%	Temperature 50-60°C	Duration 50 minutes		Step.6	<u>Rinsing</u>					By hot tap water above 50°C			
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SUPERSEDES INVENTORY NO. सामग्री सूची संख्या को अधिकृत करता है		Step.7 All pipes should be dried with the help of hot air. Step.8 Antirust treatment. Vapour phase inhibitor shall be used for protecting the inner surface of all the pipes after cleaning by pickling or otherwise as the case may be. The recommended quantity is 60 gm/m ² min. The vapour phase inhibitor used by the supplier shall be such that it is effective for the purpose for which it is used and does leave any residue after vapourisation. This VPI should in no way corrode or influence the inner surface which is considered harmful for the pipe material or the medium for which these pipe lines are to be used. After cleaning, the pipes shall be painted as per enclosed Addendum, in case Addendum is not enclosed then the pipes shall be coated with one coat of anticorrosive chromated primer paint and two additional coats of light coloured semi matt paint. The inner surface of the pipe shall be protected with the help of vapour phase inhibitors put inside the pipe with ends sealed with plastic caps with suitable adhesives.			
COPYRIGHT AND CONFIDENTIAL 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		9. GENERAL INSPECTION All items covered by this specification shall be subjected to inspection by the purchaser or by our customer and vendor shall render all possible help in this regard to the purchaser promptly when items are ready for inspection.			
		9.1 Vendor shall agree to permit purchaser and our customer to maintain one or more of his representatives in his shop for the purpose of inspection at various stages in shop fabrication of the material specified herein. Purchaser's representatives shall at all times have free access to vendor's shops. They shall also have access to vendor's ultrasonic or radiographic inspection records, reports of repairs etc.			
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		9.3 The vendor shall submit in advance the stagewise inspection procedure and quality plan schedule of testing for the approval of the purchaser.			
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10.3		Pipe ends, flanges and other similar open ends shall be protected from both external damage (by provision of plastic caps) and ingress of dirty or moisture during transit and storage. All machined surfaces shall be protected by means of wooden protecting pieces bolted to such surfaces.																																																
10.4		Small bore items are to be bundled or bagged and fitted with wired metal tags stamped with item number & drawing number.																																																
10.5		Water proof paper and felt lining of the packages shall overlap at seams at least 15 mm and the seams shall be sealed.																																																
10.6		Each straight pipe , pipe assembly and pipe fitting shall be colour coded by marking one bend on each free end of the component for identification of material at site as mentioned below :-																																																
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		PRODUCT STANDARD STEAM TURBINE ENGINEERING		पृष्ठ 11 का 8 Page 8 of 11	
सामग्री सूची संख्या को अधिकृतित करता है	SUPERSEDES INVENTORY NO.	12. DISTRIBUTION SCHEDULE FOR VENDOR'S DRAWINGS AND DOCUMENTS In the event of order is placed, the vendor will be provided the latest B.O.Ms. and drawings to start manufacturing based on these post purchase order given BHEL bill of materials and drawings for the project. Below mentioned "Distribution Schedule" is to be followed for distribution of tender documents, bill of materials, drawings, production schedule, test reports and correspondence pertaining to the project.			
COPYRIGHT AND CONFIDENTIAL 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.		(a) Correspondence In duplicate. (b) Test reports and certificates In duplicate. (c) Quality plan In duplicate. (d) Wind sets of BHEL bill of materials and related drawings 15 copies of each system per set for each system.			
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निर्माक एवं हस्ताक्षर SIGN & DATE		14. CROSS REFERRED STANDARDS: ANSI B31.1 ASTM A403 WP321 ASTM A435 ASTM A105 HW 0620599 ASTM A285 ASTM A106 SA182 F11 SA691 SA182 F22 ASTM-A335 ASTM A182 F321 SA691 ASTM A312 ASTM A234 WP11 ASTM A234 WP22			
सामग्री सूची संख्या INVENTORY NO.	REV. NO. 06	निर्माणकर्ता WORKED BY		S.K.G.	29/9/03
P-5038		जांचकर्ता CHECKED BY		V.K.G.	29.9.03

दिनांक एवं हस्ताक्षर SIGN & DATE			उत्पाद मानक PRODUCT STANDARD STEAM TURBINE ENGINEERING	ST34001 पृष्ठ 11 का 9 Page 9 of 11																																																																																																																								
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दिनांक एवं हस्ताक्षर SIGN & DATE		उत्पाद मानक PRODUCT STANDARD STEAM TURBINE ENGINEERING	ST34001	
			पृष्ठ 11 का 11 Page 11 of 11	
सामग्री सूची संख्या INVENTORY NO.	SUPERSEDES INVENTORY NO.	NOTE:—		
सामग्री सूची संख्या को अधिकृत करता है		(A) Means 20% hardness test for grades such as 13 Cr Mo 44 and $t \geq 15\text{mm}$ or equivalent grades. (B) Means 30% hardness test for grades such as 10 Cr Mo 910 and $t \geq 15\text{mm}$ or equivalent grades. 1. Hardness test on all welds with $t \geq 15\text{mm}$ for austenitic steels. 2. Wherever test scope is less than 100%, a butting ends between circumferential weld and longitudinal weld shall be examined by SCE. Group A Materials: Material grade such as C22.3, C22.8, GSC25, H11, RST37-2, ST-35, ST35.4, ST35-8, ST37.0, 15M03 or equivalent grades. Group B Materials: Material grades like to 10Cr.M0910, 13Cr M044, 16CRM044 or Equivalent grades. Group C Materials: All group (A) materials if used in sizes beyond $DN \geq 100\text{mm}$. Group D Materials: GS 22 M044 and group B materials if used in services beyond 16 bar pressure. Group E Materials: Cr MO V steels such as GS 17 Cr MOV. 511, GS 17 CR MOV55, GS 18 CR.MO 910, X22 Cr.MOV 121 stainless steels such as X10 Cr Ni Nb 189, X10Cr Ni Ti 189 or equivalent grade. Group F Materials: Group (D) and (E) materials if used in services beyond 16 bar and size more than 100 mm.		
COPYRIGHT AND CONFIDENTIAL 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		स्वत्वाधिकार एवं गोपनीय इस प्रलेख में दी गई सूचना भारत हेवी इलेक्ट्रिकल्स की संपत्ति है इसका प्रत्यक्ष एवं अप्रत्यक्ष रूप से किसी भी तरह प्रयोग, जो कि कंपनी के हित में हानिकारक हो न किया जाए।		
दिनांक एवं हस्ताक्षर SIGN & DATE	दिनांक एवं हस्ताक्षर SIGN & DATE	REV. NO. 06		
सामग्री सूची संख्या INVENTORY NO.	सामग्री सूची संख्या INVENTORY NO.	निर्माणकर्ता WORKED BY	S.K.G.	29/9/03
सामग्री सूची संख्या INVENTORY NO.	सामग्री सूची संख्या INVENTORY NO.	जांचकर्ता CHECKED BY	V.K.G.	29.9.03



BHARAT HEAVY ELECTRICALS LIMITED, HARDWAR

STEAM TURBINE ENGINEERING

DATE: 26.03.07

PAGE NO. 1

BILL OF MATERIAL FOR TURBINE INTEGRAL PIPING FOR EACH TURBINE

CUSTOMER / PROJECT:

UNIT RATING: 500 MW

DOCUMENT NO.: 41310371160

SYSTEM DESCRIPTION: HP EVACUATION PIPING LAYOUT B.O.M.

REVISION NO.: 01

RV. NO.	ITEM NO.	DESCRIPTION OF SUB ASSLY./ITEM	DRAWING NO.	VAR. QTY	MATERIAL SPECIFICATION	REMARK
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H P TURBINE EVACUATION LINE TO CONDENSER PR.=45 BAR,TEMP.=500 C


1	PIPE	D141.3X6.35	L= 6000		1	ASTM A335 P22
2	ELBOW	90D141.3X6.35 R=D		ANSI B16.28	1	ASTM A234 WP22
3	REDUCER	D168.3X7.11/141.3X6.35		ANSI B16.9	1	ASTM A234 WP22
4	TEE UNEQUAL	D168.3X7.11/141.3X6.35		ANSI B16.9	1	ASTM A234 WP22
5	ELBOW	90D168.3X7.11		ANSI B16.9	3	ASTM A234 WP22
6	PIPE	D168.3X7.11	L= 18000		1	ASTM A335 P22
7	ELBOW	45D168.3X7.11		ANSI B16.9	1	ASTM A234 WP22
8	PIPE	D273.1X9.27	L= 12000		1	ASTM A335 P22
9	ELBOW	90D273.1X9.27		ANSI B16.9	2	ASTM A234 WP22
01	10	STUB		41310083039	1	SA182 F22 CL3

TOTAL WEIGHT OF SYSTEM= 1500.330 KG

ISSUED BY: S DEV ROY

APPROVED BY: S C AGRAWAL

QUALITY PLAN

 QC-178		Q.P. NO. _____ REV _____ SPEC. NO. _____ REV _____ DRG. NO. _____ REV _____						SHEET _____ OF _____ LEGENDS P-Performed by 1-BHEL REP W-Witnessed by 2-Vendor V-Verified by 3-Subvendor				
		SL NO 1	COMPONENT OPERATION 2	CHARACTERISTICS 3	CLASSIFICATION 4	TYPE OF CHECK 5	QUANTUM 6	REFERENCE DOCUMENT 7	ACCEPTANCE NORMS 8	FORMAT OF RECORDS 9	AGENCY <div> P W V </div>	
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NTPC QUALITY PLAN

MANUFACTURERS NAME & ADDRESS: <hr/> <hr/> <hr/>			MANUFACTURING QUALITY PLAN					PROJECT: _____ PACKAGE: _____ CONTRACT NO.: _____ CONTRACTOR: _____						
			ITEM: _____ SUB-SYSTEM: _____				QP NO. _____ REV. _____ DATE: _____ PAGE ____ OF ____							
SL NO.	COMPONENT OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORDS	AGENCY				REMARKS	
									D*	M	C	N		
1	2	3	4	5	6	7	8	9	10				11	
			LEGEND: * RECORDS IDENTIFIED WITH TICK SHALL BE ESSENTIALLY INCLUDED BY CONTRACTOR IN QA DOCUMENTATION. M: MANUFACTURER / SUB-CONTRACTOR C: CONTRACTOR NOMINATED INSPECTION AGENCY N: NTPC INDICATE “ P ” PERFORM “ W ” WITNESS AND “ V ” VERIFICATION AS APPROPRIATE “ CHP ” NTPC SHALL IDENTIFIED IN COLUM “ N ”					FOR NTPC USE:		DOC NO.				
MANUFACTURER / SUB- CONTRACTOR		CONTRACTOR												
SIGNATURE:														
						REVIEWED BY:		NAME & SIGN OF APPROVING AUTHORITY & SEAL						