
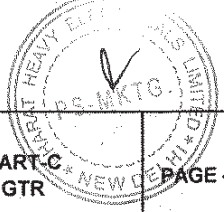

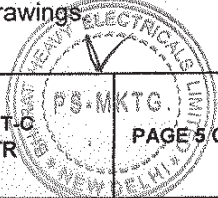


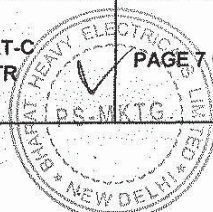



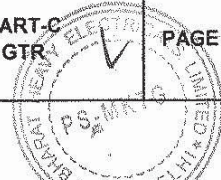
CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	
6.02.00	Liquidated damages for shortfall in meeting functional guarantee(s) during the performance and guarantee tests shall be assessed and recovered from the Contractor as specified elsewhere in this specification.	
7.00.00	<b>DESIGN OF FACILITIES/ MAINTENANCE &amp; AVAILABILITY CONSIDERATIONS</b>	
7.01.00	<b>Design of Facilities</b>  All the design procedures, systems and components proposed shall have already been adequately developed and shall have demonstrated good reliability under similar conditions elsewhere.  The Contractor shall be responsible for the selection and design of appropriate equipments to provide the best coordinated performance of the entire system. The basic requirements are detailed out in various clauses of the Technical Specifications. The design of various components, assemblies and subassemblies shall be done so that it facilitates easy field assembly and dismantling. All the rotating components shall be so selected that the natural frequency of the complete unit is not critical or close to the operating range of the unit.	
7.02.00	<b>Maintenance and Availability Considerations</b>  Equipment/facilities offered shall be designed for high availability, low maintenance and ease of maintenance. The Bidder shall specifically state the design features incorporated to achieve high degree of reliability/ availability and ease of maintenance. The Bidder shall also furnish details of availability records in the reference plants reference plants stated in his experience list.  Bidder shall state in his offer the various maintenance intervals, spare parts and man-hour requirement during such operation. The intervals for each type of maintenance namely inspection of the furnace, inspection of the entire hot gas path and the minor and major overhauls shall be specified in terms of fired hours, clearly defining the spare parts and man-hour requirement for each stage.  Lifting devices i.e. hoists and chain pulley jacks ,etc. shall be provided by the contractor for handling of any equipment or any of its part having weight in excess of 500 Kgs during erection and maintenance activities.  Lifting devices like lifting tackles, slings, etc. to be connected to hook of the hoist / crane shall be provided by the contractor for lifting the equipment and accessories covered under the specification.	
8.00.00	<b>DOCUMENTS, DATA AND DRAWINGS TO BE FURNISHED BY CONTRACTOR</b>	
8.01.00	Contractor may note that this is a Contract inclusive of the scope as indicated elsewhere in the specification. Each of the plant and equipment shall be fully integrated, engineered and designed to perform in accordance with the technical specification. All engineering and technical services required ensuring a completely engineered plant shall be provided in respect of mechanical, electrical, control & instrumentation, civil & structural works as per the scope.  Each main and auxiliary equipment/item of the plant including instruments shall be assigned a unique tag number. The assignment of tag numbers shall be in accordance with KKS system. In all drawings/documents/data sheet etc. KKS tag number of the equipment/item/instrument etc. shall be indicated.	
		
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-C GTR PAGE 4 OF 30


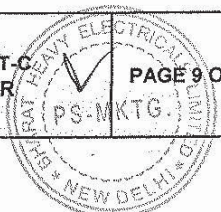
CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS 	
8.02.00	The Contractor shall furnish engineering data/drgs. in accordance with the schedule of information as specified in Technical Specification and Technical Data Sheets.	
8.03.00	The number of copies/prints/CD-ROMs/manuals to be furnished for various types of documents is given in Annexure-I.	
	<p>The documentation that shall be provided by the Contractor is indicated in the various sections of specification. This documentation shall include but not be limited to the following:</p> <p>(a) <b>Basic Engineering Documentation</b></p> <p>Prior to commencement of the detailed engineering work, the Contractor shall furnish a Plant Definition Manual within 12 weeks from the date of the Notification of Award. This manual shall contain the following as a minimum:</p> <ul style="list-style-type: none"> <li>(i) System description of all the mechanical, electrical, control &amp; instrumentation &amp; civil systems.</li> <li>(ii) Technology scan for each system / sub-system &amp; equipment.</li> <li>(iii) Selection of appropriate technology / schemes for various systems/ subsystems including techno-economic studies between various options.</li> <li>(iv) Optimization studies including thermal cycle optimization.</li> <li>(v) Sizing criteria of all the systems, sub-systems including various piping systems/ equipments/ structures/ equipment foundations along with all calculations justifying and identifying the sizing and the design margins.</li> <li>(vi) Schemes and Process &amp; Instrumentation diagrams for the various systems/ sub-system with functional write-ups.</li> <li>(vii) Operation Philosophy and the control philosophy of the equipments / system covered under the scope.</li> <li>(viii) General Layout plan of the power station incorporating all facilities in Contractor's as well as those in the Employer's scope. This drawing shall also be furnished in the form of CD-ROMs to the Employer for engineering of areas not included in Contractor's scope.</li> <li>(ix) Basic layouts and cross sections of the Main Plant Building (various floor elevations), and other areas included in the scope of the Contractor.</li> <li>(x) Documentation in respect of Quality Assurance System as listed out elsewhere in this specification.</li> <li>(xi) The successful bidder shall furnish within three (3) weeks from the date of Notification of Award, a list of contents of the Plant Definition Manual (PDMs) including techno-economic studies, which shall then be mutually discussed &amp; finalised with the Employer.</li> </ul> <p>(b) <b>Detailed Engineering Documents</b></p> <ul style="list-style-type: none"> <li>i) General layout plan of the station.</li> <li>ii) Layouts, general arrangements, elevations and cross-sections drawings for all the equipment and facilities of the plant.</li> <li>iii) Flow diagrams, Process &amp; Instrumentation Diagrams alongwith write-up and system description.</li> <li>iv) Start-up curves for boiler and both turbine and boiler combined together as a unit for various start-ups, viz. cold, warm and hot start-up.</li> <li>v) Piping isometric, composite layout and fabrication drawings</li> </ul>	
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-C GTR  PAGE 5 OF 30

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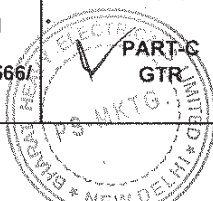
CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	
	<p>vi) Piping engineering diagrams, pipe and fittings schedules, valve schedules, hanger and support schedules, insulation schedules.</p> <p>Technical data sheets for all bought out and manufactured items. Contractor shall use the NTPC specifications as a base for placement of orders on their sub-vendors.</p> <p>viii) Detailed design calculations for components, system, piping etc., wherever applicable including sizing calculations for all auxiliaries like mills, fans, etc., as per criteria specified elsewhere in the Technical Specification.</p> <p>ix) Boiler pressure part schedule and sizing calculations. Boiler performance data and boiler design dossier.</p> <p>x) Transient, hydraulic and thermal stress analysis of piping and system wherever applicable &amp; input and output data alongwith stress analysis isometrics showing nodes.</p> <p>xi) Thermal cycle information for boiler performance calculations and heat exchanger thermal calculations etc.).</p> <p>xii) Characteristic Curves/ Performance Correction Curves.</p> <p>xiii) Comprehensive list of all terminal points which interface with Employer's facilities giving details of location, terminal pressure, temperature, fluid handled &amp; end connection details, forces, moments etc.</p> <p>xiv) Power supply single line diagram, block logics, control schematics, electrical schematics, etc.</p> <p>xv) Protection system diagrams and relay settings.</p> <p>xvi) Interconnection diagrams.</p> <p>xvii) Cable routing plan.</p> <p>xviii) Instrument schedule, measuring point list, I/O list, Interconnection &amp; wiring diagram, functional write-ups, installation drawings for field mounted instruments, logic diagrams, control schematics, wiring and tubing diagrams of panels and enclosures etc. Drawings for open loop and close loop controls (both hardware and software). Motor list and valve schedule including type of actuator etc.</p> <p>xix) Alarm and annunciation list and alarms &amp; trip set points.</p> <p>xx) Sequence and protection interlock schemes.</p> <p>xxi) Type test reports and power system stability study report.</p> <p>xxii) Control system configuration diagrams and maintenance details.</p> <p>xxiii) Detailed DDCMIS system manuals</p> <p>xxiv) Detailed flow chart for digital control system.</p> <p>xxv) Man machine interface application engineering drawings and documents.</p> <p>xxvi) Civil and structural drawings and documents for all structures, facilities and super-structural works as included in the scope of the bidder.</p> <p>xxvii) Model study reports wherever applicable.</p> <p>xxviii) Functional &amp; guarantee test procedures and test reports.</p> <p>xxix) Documentation in respect of Quality Assurance System as listed out elsewhere in this specification.</p>	
<p>LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2</p>
		<p>PART-C GTR</p> <p style="text-align: center;">✓</p> <p>PS-MKTG</p> <p>PAGE 6 OF 30</p> <p style="text-align: center;">NEW DELHI</p>

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
8.03.01	<p>xxx) Documentation in respect of commissioning as listed out elsewhere in this specification.</p> <p>xxxii) Maintenance schedule for boilers &amp; auxiliaries clearly indicating interval, duration if shutdown required, manhours required and tools &amp; tackles required for maintenance.</p> <p>The Contractor while submitting the above documents / drawings for approval / reference as the case may be, shall mark on each copy of submission the reference letter alongwith the date vide which the submissions are made.</p>		
8.03.02	<p><b>INSTRUCTION MANUALS</b></p> <p>The Contractor shall make first submission of instruction manuals for all the equipments covered under the Contract by the end of one year from the date of his acceptance of the Letter of Award. The Instruction manuals shall contain full details required for erection, commissioning, operation and maintenance of each equipment. The manual shall be specifically compiled for this project. After finalization and approval of the Employer the Instruction Manuals shall be submitted as indicated in Annexure-I. The Contract shall not be considered to be completed for purposes of taking over until the final Instructions manuals have been supplied to the Employer. The Instruction Manuals shall comprise of the following.</p> <p><b>A) Erection Manuals</b></p> <p>The erection manuals shall be submitted atleast three (3) months prior to the commencement of erection activities of particular equipment/system. The erection manual should contain the following as a minimum.</p> <ol style="list-style-type: none"> <li>i. Erection strategy.</li> <li>ii. Sequence of erection.</li> <li>iii. Erection instructions.</li> <li>iv. Critical checks and permissible deviation/tolerances.</li> <li>v. List of tool, tackles, heavy equipments like cranes, dozers, etc.</li> <li>vi. Bill of Materials</li> <li>vii. Procedure for erection.</li> <li>viii. General safety procedures to followed during erection/installation.</li> <li>ix. Procedure for initial checking after erection.</li> <li>x. Procedure for testing and acceptance norms.</li> <li>xi. Procedure / Check list for pre-commissioning activities.</li> <li>xii. Procedure / Check list for commissioning of the system.</li> <li>xiii. Safety precautions to be followed in electrical supply distribution during erection</li> </ol>		
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-T02-2	PART-C GTR PAGE 7 OF 30 	

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	<p><b>B) Commissioning Manuals</b></p> <ul style="list-style-type: none"> <li>i. Commissioning Strategy</li> <li>ii. Sequence of commissioning</li> <li>iii. Commissioning Instructions</li> <li>iv. Critical checks list for all equipments</li> <li>v. Commissioning Procedures</li> </ul> <p><b>C) Operation &amp; Maintenance Manuals</b></p> <ul style="list-style-type: none"> <li>i) The operating and maintenance instructions together with drawings (other than shop drawings) of the equipment, as completed, shall be in sufficient detail to enable the Employer to operate, maintain, dismantle, reassemble and adjust all parts of the equipment. They shall give a step by step procedure for all operations likely to be carried out during the life of the plant / equipment including, operation, maintenance, dismantling and repair including periodical activities. Each manual shall also include a complete set of drawings together with performance/rating curves of the equipment and test certificates wherever applicable. The contract shall not be considered to be completed for purposes for taking over until these manuals have been supplied to the Employer.</li> <li>ii) If after the commissioning and initial operation of the plant, the manuals require any modification / additions / changes, the same shall be incorporated and the updated final instruction manuals shall be submitted to the Employer for records.</li> <li>iii) A separate section of the manual shall be for each size/ type of equipment and shall contain a detailed description of construction and operation, together with all relevant pamphlets and drawings.</li> <li>iv) The manuals shall include the following: <ul style="list-style-type: none"> <li>a) List of spare parts along with their drawing and catalogues and procedure for ordering spares.</li> <li>b) Lubrication Schedule including charts showing lubrication checking, testing and replacement procedure to be carried daily, weekly, monthly &amp; at longer intervals to ensure trouble free operation.</li> <li>c) Where applicable, fault location charts shall be included to facilitate finding the cause of mal operation or break down.</li> </ul> </li> <li>v) Detailed specifications for all the consumables including lubricant oils, greases, chemicals etc. system/ equipment/ assembly/ sub-assembly and chemicals etc. system/equipment/assembly/sub v assembly - wise required for the complete plant.</li> <li>vi) On completion of erection, a complete list of bearings / equipment giving their location, and identification marks etc. shall also be furnished to the Employer indicating lubrication method for each type/category of bearing.</li> </ul>		
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE	<b>TECHNICAL SPECIFICATION</b> SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-C GTR	PAGE 8 OF 30 

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
8.03.03	<p><b>PLANT HANDBOOK</b></p> <p>The Contractor shall submit to the Employer a preliminary plant hand book preferably in A-4 size sheets which shall contain the design and performance data of various plants, equipments and systems covering the complete project including</p> <ul style="list-style-type: none"> <li>i) Design and performance data.</li> <li>ii) Process &amp; Instrumentation diagrams.</li> <li>iii) Single line diagrams.</li> <li>iv) Sequence &amp; Protection Interlock Schemes.</li> <li>v) Alarm and trip values.</li> <li>vi) Performance Curves.</li> <li>vii) General layout plan</li> <li>viii) Important Do's &amp; Don'ts</li> </ul> <p>The plant handbook shall be submitted within twelve (12) months from the date of award of contract. After the incorporation of Employer's comments, the final plant handbook complete in all respects shall be submitted three (3) months before start-up and commissioning activities.</p>		
8.03.04	<p><b>Project Completion Report</b></p> <p>The Contractor shall submit a Project Completion Report at the time of handing over the plant.</p>		
8.03.05	<p><b>DRAWINGS</b></p> <ul style="list-style-type: none"> <li>a) (i) All the plant layouts shall be made in computerized 3D modeling system. The Employer reserves the right to review the 3D model at different stages during the progress of engineering. The layout drawings submitted for Employer's review shall be fully dimensioned and extracted from 3D model after interference check.</li> <li>(ii) All documents submitted by the Contractor for Employer's review shall be in electronic form (soft copies) along with the desired number of hard copies as per Annexure-I of Part-C. The soft copies to be supplied shall be uploaded by the vendor in c-folder, a web based system of NTPC ERP, for which a username and password will be allotted to the new vendor by NTPC.</li> </ul> <p>Similarly the vendor can download the drawings/documents, approved/commented by NTPC, through above site.</p> <p>The soft copies of identified drawings/documents shall be in pdf format, whereas the attachments/reply to the submitted document(s) can be in .doc, .xls, .pdf, .dwg or .std formats.</p> <ul style="list-style-type: none"> <li>(iii) Final copies of the approved drawings along with required number of hard copies shall be submitted as per Annexure-I of Part-C.</li> </ul>		
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-C GTR PAGE 9 OF 30 


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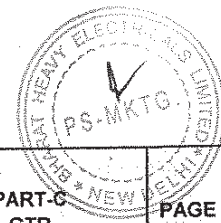
CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
(iv)	<p>The completed plant documentation including integrated 3-D model with equipment drawings, data sheets, P&amp;ID, BOQ, schematics, logic diagrams, test reports and quality plan, etc. attached to the respective equipments / systems in the 3D model shall be furnished to Employer, along with the design review software (network ready) which shall include interference check, walk-through animation, simulation, visual effect, photo realism etc. loaded on a server with 2 work stations (latest configuration for server &amp; workstation) with one A4 size colored laser printer and one A0 size colored plotter. The software shall include facility for obtaining hard copies of all the drawings/documents on standard plotter / printer.</p> <p>The requisite hardware and software shall be supplied and commissioned by the Contractor at Employer's Engineering Office Complex at Noida as per mutually agreed schedule.</p> <p>All softwares provided shall necessarily include the cost for perpetual license(s) for use on all the machines and an Annual Maintenance Contract (AMC) which shall include software upgrades as &amp; when released by the software agency for a period of three (3) years after warranty/guarantee period.</p>			
b)	All documents/text information shall be in latest version of MS Office. Electrical feeder load list shall be submitted in MS excel.			
c)	All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail indicating the type, size, arrangement, weight of each component for packing and shipment, the external connection, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearance and spaces required between various portions of equipment and any other information specifically requested in the drawing schedules.			
d)	Each drawing submitted by the Contractor (including those of sub-vendors) shall bear a title block at the right hand bottom corner with clear mention of the name of the Employer, the system designation, the specifications title, the specification number, the name of the Project, drawing number and revisions. If standard catalogue pages are submitted the applicable items shall be indicated therein. All titles, notings, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.			
e)	The drawings submitted by the Contractor (or their sub-vendors) shall bear Employer's drawing number in addition to contractor's (their sub-vendor's) own drawing number. Employer's drawing numbering system shall be made available to the successful bidder so as to enable him to assign Employer's drawing numbers to the drawings to be submitted by him during the course of execution of the Contract.			
f)	The Contractor shall also furnish a "Master Drawing List" which shall be finalized during post bid discussions and shall be duly integrated with approved L2 schedule. Master Drawing List shall be a comprehensive list of all drawings/ documents/ calculations envisaged to be furnished by him during the detailed engineering to the Employer. Such list should clearly indicate the purpose of submission of these drawings i.e. "FOR APPROVAL" or "FOR INFORMATION ONLY".			
g)	Similarly, all the drawings/ documents submitted by the Contractor during detailed engineering stage shall be marked "FOR APPROVAL" or "FOR INFORMATION"			
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-C GTR 	PAGE 10 OF 30

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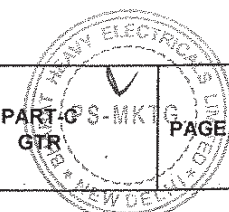
<b>CLAUSE NO.</b>	<b>GENERAL TECHNICAL REQUIREMENTS</b>	
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- prior to submission. Further space shall be identified on each drawing for approval stamp and electronic signature.
- h) The furnishing of detailed engineering data and drawings by the Contractor shall be in accordance with the time schedule for the project. The review of these documents/ data/ drawings by the Employer will cover only general conformance of the data/ drawings/ documents to the specifications and contract, interfaces with the equipments provided by others and external connections & dimensions which might affect plant layout. The review by the Employer should not be construed to be a thorough review of all dimensions, quantities and details of the equipments, materials, any devices or items indicated or the accuracy of the information submitted. The review and/ or approval by the Employer / Project Manager shall not relieve the Contractor of any of his responsibilities and liabilities under this contract.
  - i) After the approval of the drawings, further work by the Contractor shall be in strict accordance with these approved drawings and no deviation shall be permitted without the written approval of the Employer.
  - j) All manufacturing, fabrication and execution of work in connection with the equipment / system, prior to the approval of the drawings, shall be at the Contractor's risk. The Contractor is expected not to make any changes in the design of the equipment / system, once they are approved by the Employer. However, if some changes are necessitated in the design of the equipment/system at a later date, the Contractor may do so, but such changes shall promptly be brought to the notice of the Employer indicating the reasons for the change and get the revised drawing approved again in strict conformance to the provisions of the Technical Specification.
  - l) Drawings shall include all installations and detailed piping layout drawings. Layout drawings for all piping of 65 mm and larger diameter shall be submitted for review/ approval of Employer prior to erection. Small diameter pipes shall however be routed as per site conditions in consultation with site authority / representative of Employer based on requirements of such piping indicated in approved / finalized Flow Scheme / Process & Instrumentation Diagrams and/or the requirements cropping up for draining & venting of larger diameter piping or otherwise after their erection as per actual physical condition for the entire scope of work of this package.  
  
Assessing & anticipating the requirement and supply of all piping and equipment shall be done by the contractor well in advance so as not to hinder the progress of piping & equipment erection, subsequent system charging and its effective draining & venting arrangement as per site suitability.
  - m) **As Built Drawings**  
  
After final acceptance of individual equipment / system by the Employer, the Contractor will update all original drawings and documents for the equipment / system to "as built" conditions and submit no. of copies as per Annexure-I.
  - n) Drawings must be checked by the Contractor in terms of its completeness, data adequacy and relevance with respect to Engineering schedule prior to submission to the Employer. In case drawings are found to be submitted without proper endorsement for checking by the Contractor, the same shall not be reviewed and returned to the Contractor for re-submission. The contractor shall make a visit to site to see the existing facilities and understand the layout completely and collect all necessary data / drawings at site which are needed as an input to the engineering. The contractor shall do the complete engineering including interfacing and integration of all his equipment, systems & facilities within his scope of work as well


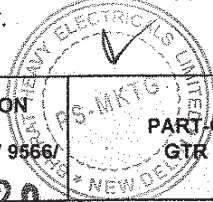
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	<p>as interface engineering &amp; integration of systems, facilities, equipment &amp; works under Employer's scope and submit all necessary drawings/ documents for the same.</p> <p>o) The Contractor shall submit adequate prints of drawing / data / document for Employer's review and approval. The Employer shall review the drawings and return soft copy to the Contractor authorizing either to proceed with manufacture or fabrication, or marked to show changes desired. When changes are required, drawings shall be re-submitted promptly, with revisions clearly marked, for final review. Any delays arising out of the failure of the Contractor to submit/rectify and resubmit in time shall not be accepted as a reason for delay in the contract schedule.</p> <p>p) All engineering data submitted by the Contractor after final process including review and approval by the Project Manager/ Employer shall form part of the contract documents and the entire works covered under these specification shall be performed in strict conformity with technical specifications unless otherwise expressly requested by the Project Manager in writing.</p>			
8.04.00	<p><b>ENGINEERING INFORMATION SUBMISSION SCHEDULE</b></p> <p>During post bid discussions, a Detailed Engineering Information Submission Schedule/ master drawing list duly integrated with approved L2 schedule shall be tied up with the Employer. For this, the bidder shall furnish a detailed list of engineering information alongwith the proposed submission schedule. This list would be a comprehensive one including all engineering data / drawings / information for all bought out items and manufactured items. The information shall be categorized into the following parts.</p> <p>i) Information that shall be submitted for the approval to the Employer before proceeding further, and</p> <p>ii) Information that would be submitted for Employer's information only.</p> <p>The master drawing list (MDL) shall be updated periodically and submitted to the employer, highlighting the change made in the MDL.</p> <p>The schedule should allow adequate time for proper review and incorporation of changes/ modifications, if any, to meet the contract without affecting the equipment delivery schedule and overall project schedule. The early submission of drawings and data is as important as the manufacture and delivery of equipment and hardware and this shall be duly considered while determining the overall performance and progress.</p>			
8.05.00	<p><b>ENGINEERING PROGRESS AND EXCEPTION REPORT</b></p>			
8.05.01	<p>The Contractor shall submit every month an Engineering progress and Exception Report giving the status of each engineering information including</p> <p>a) A list of drawings / engineering information which remains unapproved for more than four (4) weeks after the date of first submission</p> <p>b) Drawings which were not submitted as per agreed schedule.</p>			
8.05.02	<p>The draft format for this report shall be furnished to the Employer within four (4) weeks of the award of the contract, which shall then be discussed and finalized with the Employer.</p>			
<p>LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2</p>	<p>PART-C GTR</p>	<p>PAGE 12 OF 30</p>



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9.00.00	<b>TECHNICAL CO-ORDINATION MEETING</b>		
9.01.00	The Contractor shall be called upon to organize and attend monthly Design/ Technical Co-ordination Meetings (TCMs) with the Employer/Employer's representatives and other Contractors of the Employer during the period of contract. The Contractor shall attend such meetings at his own cost at NEW DELHI / NOIDA or at mutually agreed venue as and when required and fully co-operate with such persons and agencies involved during the discussions.		
9.02.00	The Contractor should note that Time is the essence of the contract. In order to expedite the early completion of engineering activities, the Contractor shall submit all drawings as per the agreed Engineering Information Submission Schedule. The drawings submitted by the Contractor will be reviewed by the Employer as far as practicable within three (3) weeks from the date of receipt of the drawing. The comments of the Employer shall then be discussed across the table during the above Technical Co-ordination Meeting (s) wherein best efforts shall be made by both sides to ensure the approval of the drawing.		
9.02.01	The Contractor shall ensure availability of the concerned experts / consultants / personnel and representatives of his sub-vendors who are empowered to take necessary decisions during these meetings. The Contractor shall be equipped with necessary tools and facilities so that the drawings/documents can be resubmitted after incorporating necessary changes and approved during the meeting itself.		
9.02.02	Should any drawing remain unapproved for more than six (6) weeks after it's first submission, this shall be brought out in the monthly Engineering Progress and Exception Report with reasons thereof.		
9.03.00	Any delays arising out of failure by the Contractor to incorporate Employer's comments and resubmit the same during the TCM shall be considered as a default and in no case shall entitle the Contractor to alter the Contract completion date.		
10.00.00	<b>DESIGN IMPROVEMENTS</b>		
	The Employer or the Contractor may propose changes in the specification of the equipment or quality thereof and if the parties agree upon any such changes the specification shall be modified accordingly.		
	If any such agreed upon change is such that it affects the price and schedule of completion, the parties shall agree in writing as to the extent of any changing the price and/or schedule of completion before the Contractor proceeds with the change. Following such agreement, the provision thereof, shall be deemed to have been amended accordingly.		
11.00.00	<b>EQUIPMENT BASES</b>		
	A cast iron or welded steel base plate shall be provided for all rotating equipment which is to be installed on a concrete base, unless otherwise specifically agreed to by the Employer. Each base plate which supports the unit and its drive assembly, shall be of a neat design with pads for anchoring the units, shall have a raised lip all around, and shall have threaded drain connections.		
12.00.00	<b>PROTECTIVE GUARDS</b>		
	Suitable guards shall be provided for protection of personnel on all exposed rotating and/or moving machine parts. All such guards shall be designed for easy installation and removal for maintenance purpose.		
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2 96 of 346	 PAGE 13 OF 30

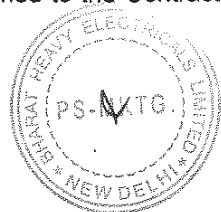
**SECTION C1, SUB SECTION III**

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	
13.00.00	<b>LUBRICANTS, SERVO FLUIDS AND CHEMICALS</b>	
13.01.00	The Bidder's scope includes all the first fill and one year's topping, requirements of consumables such as oils, lubricants including grease, servo fluids, gases and essential chemicals etc. Consumption of all these consumables during the initial operation and final filling after the initial operation shall also be included in the scope of the Bidder. Bidder shall also supply a quantity not less than 10% of the full charge of each variety of lubricants, servo fluids, gases, chemicals etc. used which is expected to be utilized during the first year of operation. This additional quantity shall be supplied in separate Containers.	
13.02.00	As far as possible lubricants marketed by the Indian Oil Corporation shall be used. The variety of lubricants shall be kept to a minimum possible.  Detailed specifications for the lubricating oil, grease, gases, servo fluids, control fluids, chemicals etc. required for the complete plant covered herein shall be furnished. On completion of erection, a complete list of bearings/ equipment giving their location and identification marks shall be furnished to the Employer alongwith lubrication requirements.	
14.00.00	<b>LUBRICATION</b>	
14.01.00	Equipment shall be lubricated by systems designed for continuous operation. Lubricant level indicators shall be furnished and marked to indicate proper levels under both standstill and operating conditions.	
15.00.00	<b>MATERIAL OF CONSTRUCTION</b>	
15.01.00	All materials used for the construction of the equipment shall be new and shall be in accordance with the requirements of this specification. Materials utilized for various components shall be those which have established themselves for use in such applications.	
16.00.00	<b>RATING PLATES, NAME PLATES &amp; LABELS</b>	
16.01.00	Each main and auxiliary item of plant including instruments shall have permanently attached to it in a conspicuous position, a rating plate of non-corrosive material upon which shall be engraved manufacturer's name, equipment, type or serial number together with details of the ratings, service conditions under which the item of plant in question has been designed to operate, and such diagram plates as may be required by the Employer.	
16.02.00	Each item of plant shall be provided with nameplate or label designating the service of the particular equipment. The inscriptions shall be approved by the Employer or as detailed in appropriate section of the technical specifications.	
16.03.00	Such nameplates or labels shall be of white non-hygroscopic material with engraved black lettering or alternately, in the case of indoor circuit breakers, starters, etc. of transparent plastic material with suitably coloured lettering engraved on the back. The name plates shall be suitably fixed on both front and rear sides.	
16.04.00	Items of plant such as valves, which are subject to handling, shall be provided with an engraved chromium plated nameplate or label with engraving filled with enamel. The name plates for valves shall be marked in accordance with MSS standard SP-25 and ANSI B 16.34 as a minimum.	
16.05.00	Hanger/ support numbers shall be marked on all pipe supports, anchors, hangers, snubbers and restraint assemblies. Each constant and variable spring support shall also have stamped upon it the designed hot and cold load which it is intended to support. Suitable scale shall also be provided to indicate load on support/hanger.	
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2 97 of 346
		
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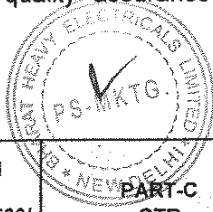
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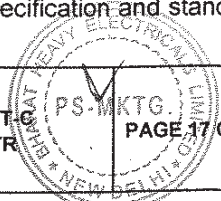
CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
16.06.00	Valves, steam traps and strainers shall be identified by Employer's tag number of a metal tap permanently attached to non pressure parts such as the yoke by a stainless steel wire. The direction of flow shall also be marked on the body.			
16.07.00	<p>Safety and relief valves shall be provided with the following :</p> <ol style="list-style-type: none"> <li>a) Manufacturer's identification.</li> <li>b) Nominal inlet and outlet sizes in mm.</li> <li>c) Set pressure in Kg/cm<sup>2</sup> (abs).</li> <li>d) Blowdown and accumulation as percentage of set pressure.</li> <li>e) Certified capacity in Kg of saturated steam per hour or in case of liquid certified capacity in litres of water per minute.</li> </ol>			
16.08.00	All such plates, instruction plates, etc. shall be bilingual with Hindi inscription first, followed by English. Alternatively, two separate plates one with Hindi and the other with English inscriptions may be provided.			
16.09.00	All segregated phases of conductors or bus ducts, indoor or outdoor, shall be provided with coloured phase plates to clearly identify the phase of the system.			
17.00.00	<p><b>TOOLS AND TACKLES</b></p> <p>The Contractor shall supply with the equipment one complete set of all special tools and tackles and other instruments required for the erection, assembly, disassembly and proper maintenance of the plant and equipment and systems (including software). These special tools will also include special material handling equipment, jigs and fixtures for maintenance and calibration / readjustment, checking and measurement aids etc. A list of such tools and tackles shall be submitted by the Bidder alongwith the offer.</p> <p>The price of each tool / tackle shall be deemed to have been included in the total bid price. These tools and tackles shall be separately packed and sent to site. The Contractor shall also ensure that these tools and tackles are not used by him during erection, commissioning and initial operation. For this period the Contractor should bring his own tools and tackles. All the tools and tackles shall be of reputed make acceptable to the Employer.</p>			
18.00.00	<b>WELDING</b>			
18.01.00	If the manufacturer has special requirements relating to the welding procedures for welds at the terminals of the equipments to be performed by others the requirements shall be submitted to the Employer in advance of commencement of erection work.			
19.00.00	<b>COLOUR CODE FOR ALL EQUIPMENTS/ PIPINGS/ PIPE SERVICES</b>			
19.01.00	All equipment/ piping/ pipe services are to be painted by the Contractor in accordance with Employer's standard colour coding scheme, which will be furnished to the Contractor during detailed engineering stage.			
<p>LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2</p>	<p>PART-C GTR</p>	<p>PAGE 15 OF 30</p>



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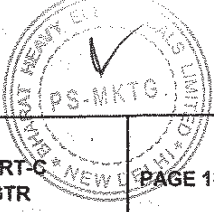
CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	
20.00.00	<b>PROTECTION AND PRESERVATIVE SHOP COATING</b>	
20.01.00	<p><b>Protection</b></p> <p>All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either metallic or a nonmetallic protection device. All ends of all valves and pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. The parts which are likely to get rusted, due to exposure to weather, should also be properly treated and protected in a suitable manner. All primers/paints/coatings shall take into account the hot humid, corrosive &amp; alkaline, subsoil or overground environment as the case may be. The requirements for painting specification shall be complied with as detailed out in Part-A &amp; B of the technical specification.</p>	
20.02.00	<b>Preservative Shop Coating</b>	
20.02.01	All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. All surfaces which will not be easily accessible after the shop assembly, shall be treated beforehand and protected for the life of the equipment. All surfaces shall be thoroughly cleaned of all mill scales, oxides and other coatings and prepared in the shop. The surfaces that are to be finish-painted after installation or require corrosion protection until installation, shall be shop painted as per the requirement covered in the relevant part of the technical specification.	
20.02.02	Transformers and other electrical equipments, if included shall be shop finished with one or more coats of primer and two coats of high grade resistance enamel. The finished colors shall be as per manufacturer's standards, to be selected and specified by the Employer at a later date.	
20.02.03	Shop primer for all steel surfaces which will be exposed to operating temperature below 95 degrees Celsius shall be selected by the Contractor after obtaining specific approval of the Employer regarding the quality of primer proposed to be applied. Special high temperature primer shall be used on surfaces exposed to temperature higher than 95 degrees Celsius and such primer shall also be subject to the approval of the Employer.	
20.02.04	All other steel surfaces which are not to be painted shall be coated with suitable rust preventive compound subject to the approval of the Employer.	
20.02.05	All piping shall be cleaned after shop assembly by shot blasting or other means approved by the Employer. Lube oil piping or carbon steel shall be pickled.	
20.02.06	Painting for Civil structures shall be done as specified in relevant part of Technical Specification.	
21.00.00	<b>QUALITY ASSURANCE PROGRAMME</b>	
21.01.00	The Contractor shall adopt suitable quality assurance programme to ensure that the equipment and services under the scope of Contract whether manufactured or performed within the Contractor's works or at his sub-Contractor's premises or at the Employer's site or at any other place of work are in accordance with the specifications. Such programmes shall be outlined by the Contractor and shall be finally accepted by the Employer / authorized representative after discussions before the award of the contract. The QA programme shall be generally in line with ISO-9001/IS-14001. A quality assurance programme of the contractor shall generally cover the following:	
<p>LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2</p>	<p style="text-align: center;"></p> <p style="text-align: center;">PART-C GTR</p>
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	
	<p>a) His organization structure for the management and implementation of the proposed quality assurance programme</p> <p>b) Quality System Manual</p> <p>c) Design Control System</p> <p>d) Documentation Control System</p> <p>e) Qualification data for Bidder's key Personnel.</p> <p>f) The procedure for purchase of materials, parts, components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw-material inspection, in process inspection verification of materials purchased etc.</p> <p>g) System for shop manufacturing and site erection control including process controls and fabrication and assembly controls.</p> <p>h) Control of non-conforming items and system for corrective actions and resolution of deviations.</p> <p>i) Inspection and test procedure both for manufacture and field activities.</p> <p>j) Control of calibration and testing of measuring testing equipments.</p> <p>k) System for Quality Audits.</p> <p>l) System for indication and appraisal of inspection status.</p> <p>m) System for authorizing release of manufactured product to the Employer.</p> <p>n) System for handling storage and delivery.</p> <p>o) System for maintenance of records, and</p> <p>p) Furnishing of quality plans for manufacturing and field activities detailing out the specific quality control procedure adopted for controlling the quality characteristics relevant to each item of equipment / component as per formats No. QS-01-QAI-P-09/F1-R1 and QS-01-QAI-P-09/F2-R1.</p>	
22.00.00	<b>GENERAL REQUIREMENTS - QUALITY ASSURANCE</b>	
22.01.00	All materials, components and equipment covered under this specification shall be procured, manufactured, erected, commissioned and tested at all the stages, as per a comprehensive Quality Assurance Programme. An indicative programme of inspection/tests to be carried out by the contractor for some of the major items is given in the respective technical specification. This is, however, not intended to form a comprehensive programme as it is the contractor's responsibility to draw up and implement such programme duly approved by the Employer. The detailed Quality Plans for manufacturing and field activities should be drawn up by the Bidder and will be submitted to Employer for approval. Schedule of finalization of such quality plans will be finalized before award as per enclosed format No. QS-01-QAI-P01/F3-R0. Monthly progress reports on MQP/FQP submission/approval shall be furnished as per enclosed format No. QS-01-QAI-P-02/F1-R0.	
22.02.00	Manufacturing Quality Plan will detail out for all the components and equipment, various tests/inspection, to be carried out as per the requirements of this specification and standards	
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2 100 of 346
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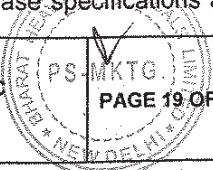
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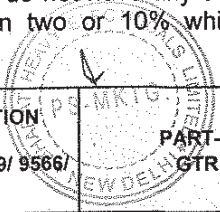
CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
	mentioned therein and quality practices and procedures followed by Contractor's Quality Control Organization, the relevant reference documents and standards, acceptance norms, inspection documents raised etc., during all stages of materials procurement, manufacture, assembly and final testing/performance testing. The Quality Plan shall be submitted through c-folder, a web based system of NTPC ERP for review and approval. Once the same is finalized, hard copies shall be submitted for approval. After approval the same shall be submitted in compiled form on CD ROM.		
22.03.00	Field Quality Plans will detail out for all the equipment, the quality practices and procedures etc. to be followed by the Contractor's site Quality Control Organization, during various stages of site activities from receipt of materials/equipment at site.		
22.04.00	The Bidder shall also furnish copies of the reference documents/plant standards/acceptance norms/tests and inspection procedure etc., as referred in Quality Plans alongwith Quality Plans. These Quality Plans and reference documents/standards etc. will be subject to Employer's approval without which manufacture shall not proceed. These approved documents shall form a part of the contract. In these approved Quality Plans, Employer shall identify customer hold points (CHP), i.e. test/checks which shall be carried out in presence of the Employer's Project Manager or his authorized representative and beyond which the work will not proceed without consent of Employer/Authorized representative in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Employer alongwith technical justification for approval and disposition.		
22.05.00	The contractor shall submit to the Employer field welding schedule for field welding activities in the format No. <b>QS-01-CQA-W-11/F1</b> . The field welding schedule shall be submitted to the Employer alongwith all supporting procedures, like welding procedures, heat treatment procedures, NDT procedures etc. atleast ninety days before schedule start of erection work at site.		
22.06.00	The contractor shall have suitable Field Quality Organization with adequate manpower at Employer's site, to effectively implement the Field Quality Plan (FQP) and Field Quality Management System for site activities. The contractor shall submit the details of proposed FQA setup (organizational structure and manpower) for employer's approval. The FQA setup shall be in place at least one month before the start of site activities.		
22.07.00	No material shall be dispatched from the manufacturer's works before the same is accepted subsequent to pre-dispatch final inspection including verification of records of all previous tests/inspections by Employer's Project Manager / Authorized representative and duly authorized for dispatch issuance of Material Dispatch Clearance Certificate (MDCC).		
22.08.00	All material used for equipment manufacture including casting and forging etc. shall be of tested quality as per relevant codes/standards. Details of results of the tests conducted to determine the mechanical properties, chemical analysis and details of heat treatment procedure recommended and actually followed shall be recorded on certificates and time temperature chart. Tests shall be carried out as per applicable material standards and/or agreed details/procedures.		
22.09.00	The contractor shall submit to the Employer Field Welding Schedule for field welding activities in the enclosed format No.: <b>QS-01-QAI-P-02/F2</b> . The field welding schedule shall be submitted to the Employer along with all supporting documents, like welding procedures, heat treatment procedures, NDT procedures etc. at least ninety days before schedule start of erection work at site.		
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2 101 of 346	PART-C GTR  PAGE 18 OF 30

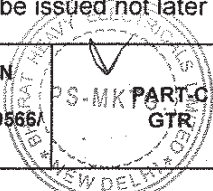
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
22.09.01	<p>All welding and brazing shall be carried out as per procedure drawn and qualified in accordance with requirements of ASME Section IX/BS-4870 or other International equivalent standard acceptable to the Employer.</p> <p>All welding/brazing procedures shall be submitted to the Employer or its authorized representative for approval prior to carrying out the welding/brazing.</p>		
22.10.00	All brazers, welders and welding operators employed on any part of the contract either in Contractor's/his sub-contractor's works or at site or elsewhere shall be qualified as per ASME Section-IX or BS-4871 or other equivalent International Standards acceptable to the Employer.		
22.11.00	Welding procedure qualification & Welder qualification test results shall be furnished to the Employer for approval. However, where required by the Employer, tests shall be conducted in presence of Employer/authorized representative.		
22.12.00	For all pressure parts and high pressure piping welding, the latest applicable requirements of the IBR (Indian Boiler Regulations) shall also be essentially complied with. Similarly, any other statutory requirements for the equipments/systems shall also be complied with. On all back gauged welds MPI/ LPI shall be carried before seal welding.		
22.13.00	All the heat treatment results shall be recorded on time temperature charts and verified with recommended/acceptable regimes.		
22.14.00	No welding shall be carried out on cast iron components for repair.		
22.15.00	Unless otherwise proven and specifically agreed with the Employer, welding of dissimilar materials and high alloy materials shall be carried out at shop only.		
22.16.00	<p>All non-destructive examination shall be performed in accordance with written procedures as per International Standards. The NDT operator shall be qualified as per SNT-TC-IA (of the American Society of non-destructive examination). NDT shall be recorded in a report which includes details of methods and equipment used, result / evaluation, job data and identification of personnel employed and details of co-relation of the test report with the job.</p> <p>All plates of thickness above 40 mm &amp; all bar stock/Forgings above 40 mm dia shall be ultrasonically tested. For pressure parts, plate of thickness equal to or above 25 mm shall be ultrasonically tested.</p>		
22.17.00	Contractor shall list out all major items /equipments / components to be manufactured in house as well as procured from sub-contractors (BOI). All the sub-contractors proposed by the Contractor for procurement of major bought out items including castings, forging, semi-finished and finished components/equipment etc., list of which shall be drawn up by the Contractor and finalized with the Employer shall be subject to Employer's approval as per enclosed format No. <b>QS-01-QAI-P-1/F3-R0</b> . The contractor's proposal shall include vendor's facilities established at the respective works, the process capability, process stabilization, QC systems followed, experience list, etc. alongwith his own technical evaluation for identified sub-Contractors enclosed and shall be submitted to the Employer for approval within the period agreed at the time of pre- award discussion and identified in "DR" category prior to any procurement. Monthly progress reports on sub-Contractor detail submission / approval shall be furnished as per enclosed as per format no. QS-01-QAI-P-02/F1-R0. Such vendor approval shall not relieve the contractor from any obligation, duty or responsibility under the contract.		
22.18.00	For components/equipment procured by the contractors for the purpose of the contract, after obtaining the written approval of the Employer, the contractor's purchase specifications and		
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2 102 of 346	PART-C GTR PS-MKTG PAGE 19 OF 30 


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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<p>inquiries shall call for quality plans to be submitted by the suppliers alongwith their proposals. The quality plans called for from the vendors shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor's quality control organization, the relevant reference documents/standards used, acceptance level, inspection of documentation raised, etc.</p> <p>Such quality plans of the successful vendors shall be finalized with the Employer and such approved Quality Plans shall form a part of the purchase order/contract between the Contractor and Vendor. Within three weeks of the release of the purchase orders/contracts for such bought out items/components, a copy of the same without price details but together with the detailed purchase specifications, quality plans and delivery conditions shall be furnished to the Employer on monthly basis by the Contractor along with a report of the purchase order placed so far for the contract.</p>			
22.19.00	Employer reserves the right to carry out quality audit and quality surveillance of the systems and procedures of the Contractor's or their sub-vendor's quality management and control activities. The contractor shall provide all necessary assistance to enable the Employer carry out such audit and surveillance.			
22.20.00	The contractor shall carry out an inspection and testing programme during manufacture in his work and that of his sub-contractor's and at site to ensure the mechanical accuracy of components, compliance with drawings, conformance to functional and performance requirements, identity and acceptability of all materials parts and equipment. Contractor shall carry out all tests/inspection required to establish that the items/equipments conform to requirements of the specification and the relevant codes/standards specified in the specification, in addition to carrying out tests as per the approved quality plan.			
22.21.00	Quality audit/surveillance/approval of the results of the tests and inspection will not, however, prejudice the right of the Employer to reject the equipment if it does not comply with the specification when erected or does not give complete satisfaction in service and the above shall in no way limit the liabilities and responsibilities of the Contractor in ensuring complete conformance of the materials/equipment supplied to relevant specification, standard, data sheets, drawings, etc.			
22.22.00	For all spares and replacement items, the quality requirements as agreed for the main equipment supply shall be applicable.			
22.23.00	Repair/rectification procedures to be adopted to make the job acceptable shall be subject to the approval of the Employer/ authorized representative.			
22.24.00	<p><b>Environmental Stress Screening</b></p> <p>All solid state electronic system / equipment / sub assembly shall be free from infant mortile components. For establishing the compliance to this requirement, the contractor / sub – contractor should meet the following.</p> <p>1) The Contractor / Sub – contractor shall furnish the established procedure being followed for eliminating infant mortile components. The procedure followed by the Contractor / Sub – contractor should be substantiated along with the statistical figures to validate the procedure being followed. The necessary details as required under this clause shall be furnished at the stage of QP finalization.</p> <p style="text-align: center;">Or</p> <p>In case the Contractor / Sub – contractor do not have any established procedure to eliminate infant mortile components then two or 10% which ever is less, most</p>			
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	 PART-C GTR	PAGE 20 OF 30

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS
22.25.00	<p>densely populated Panels shall be tested for Elevated Temperature Cycle Test as per the following procedure.</p> <p><b>Elevated Temperature Test Cycle</b></p> <p>During the elevated temperature test which shall be for 48 hours, the ambient temperature shall be maintained at 50°C. The equipment shall be interconnected with devices and kept under energized conditions so as to repeatedly perform all operations it is expected to perform in actual service with load on various components being equal to those which will be experienced in actual service.</p> <p>During the elevated temperature test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature at 50° C.</p> <p>In case of any failure during the test cycle, the further course of action should be mutually discussed for demonstrating the intent of the above requirement.</p> <p><b>2) Burn in Test Cycle</b></p> <p>The test shall be conducted on all the panels fully assembled and wired including the panels having undergone the above mentioned elevated temperature test.</p> <p>The period of Burn in Test Cycle shall be 120 hrs and process shall be similar to the elevated temperature test as above except that the temperature shall be reduced to the ambient temperature prevalent at that time.</p> <p>During the above tests, the process I/O and other load on the system shall be simulated by simulated inputs and in the case of control systems; the process which is to be controlled shall also be simulated. Testing of individual components or modules shall not be acceptable.</p> <p>During the Burn in Test the cubicle doors shall be closed (or shall be in the position same as they are supposed to be in the field) and inside temperature in the zone of highest heat dissipating components / modules shall be monitored. The temperature rise inside the cubicle should not exceed 10° C above the ambient temperature.</p> <p>The Contractor / Sub-contractor shall carry out routine test on 100% item at contractor / sub-contractor's works. The quantum of check / test for routine &amp; acceptance test by employer shall be generally as per criteria / sampling plan defined in referred standards. Wherever standards have not been mentioned quantum of check / test for routine / acceptance test shall be as agreed during detailed engineering stage.</p>
23.00.00	<p><b>Quality Assurance Documentation Package</b></p> <p>The Contractor shall be required to submit the QA Documentation in two hard copies and two CD-ROMs, as identified in respective quality plan with tick (✓) mark.</p>
23.01.00	<p>Each QA Documentation shall have a project specific Cover Sheet bearing name &amp; identification number of equipment and including an index of its contents with page control on each document.</p> <p>The QA Documentation file shall be progressively completed by the Supplier's sub-supplier to allow regular reviews by all parties during the manufacturing.</p> <p>The final quality document will be compiled and issued at the final assembly place of equipment before despatch. However CD-Rom may be issued not later than three weeks.</p>
<p>LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2</p>
	
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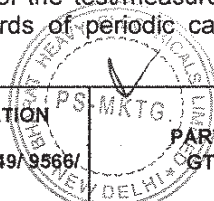
**SECTION C1, SUB SECTION III**

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	
23.02.00	<p>Typical contents of QA Documentation is as below:-</p> <ul style="list-style-type: none"> <li>(a) Quality Plan</li> <li>(b) Material mill test reports on components as specified by the specification and approved Quality Plans.</li> <li>(c) Manufacturer / works test reports/results for testing required as per applicable codes and standard referred in the specification and approved Quality Plans.</li> <li>(d) Non-destructive examination results /reports including radiography interpretation reports. Sketches/drawings used for indicating the method of traceability of the radiographs to the location on the equipment.</li> <li>(e) Heat Treatment Certificate/Record (Time- temperature Chart)</li> <li>(f) All the accepted Non-conformance Reports (Major/Minor) / deviation, including complete technical details / repair procedure).</li> <li>(g) CHP / Inspection reports duly signed by the Inspector of the Employer and Contractor for the agreed Customer Hold Points.</li> <li>(h) Certificate of Conformance (COC) wherever applicable.</li> <li>(i) MDCC</li> </ul>	
23.03.00	<p>Similarly, the Contractor shall be required to submit two sets (two hard copies and two CD ROMs), containing QA Documentation pertaining to field activities as per Approved Field Quality Plans and other agreed manuals/ procedures, prior to commissioning of individual system.</p>	
23.04.00	<p>Before dispatch / commissioning of any equipment, the Supplier shall make sure that the corresponding quality document or in the case of protracted phased deliveries, the applicable section of the quality document file is completed. The supplier will then notify the Inspector regarding the readiness of the quality document (or applicable section) for review.</p> <ul style="list-style-type: none"> <li>(a) If the result of the review carried out by the Inspector is satisfactory, the Inspector shall stamp the quality document (or applicable section) for release.</li> <li>(b) If the quality document is unsatisfactory, the Supplier shall endeavor to correct the incompleteness, thus allowing to finalize the quality document (or applicable section) by time compatible with the requirements as per contract documents. When it is done, the quality document (or applicable section) is stamped by the Inspector.</li> <li>(c) If a decision is made for dispatch, whereas all outstanding actions cannot be readily cleared for the release of the quality document by that time, the supplier shall immediately, upon shipment of the equipment, send a copy of the quality document Review Status signed by the Supplier Representative to the Inspector and notify of the committed date for the completion of all outstanding actions &amp; submission. The Inspector shall stamp the quality document for applicable section when it is effectively completed. The submission of QA documentation package shall not be later than 3 weeks after the dispatch of equipment.</li> </ul>	
23.05.00	<p><b>Transmission of QA Documentation</b></p> <p>On release of QA Documentation by Inspector, one set of quality document shall be forwarded to Corporate Quality Assurance Department and other set to respective Project Site of Employer.</p> <p>For the particular case of phased/part derivatives of equipment, the complete quality document of that particular equipment to the Employer shall be issued not later than 3 weeks after the date of the last delivery of equipment.</p>	
<p>LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2</p>	<p>PART-C GTR</p> <p align="right">PAGE 22 OF 30</p>




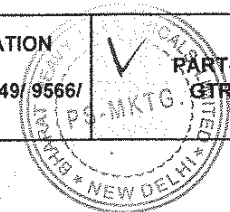
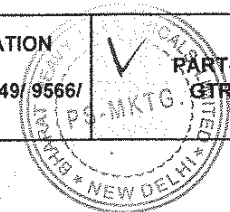
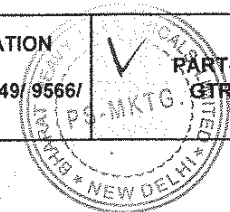
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
23.06.00	<b>Inspection, Testing and Inspection Certificates</b>			
23.06.01	The word 'Inspector' shall mean the Project Manager and/or his authorized representative and/or an outside inspection agency acting on behalf of the Employer to inspect and examine the materials and workmanship of the works during its manufacture or erection.			
23.06.02	The Project Manager or his duly authorized representative and/or an outside inspection agency acting on behalf of the Employer shall have access at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or erection and if part of the works is being manufactured or assembled on other premises or works, the Contractor shall obtain for the Project Manager and for his duly authorized representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.			
23.06.03	The Contractor shall give the Project Manager/Inspector fifteen (15) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the Inspector's. The Project Manager/Inspector, unless the witnessing of the tests is virtually waived and confirmed in writing, will attend such tests within fifteen (15) days of the date on which the equipment is noticed as being ready for test/inspection failing which the Contractor may proceed with test which shall be deemed to have been made in the inspector's presence and he shall forthwith forward to the inspector duly certified copies of test reports in two (2) copies.			
23.06.04	The Project Manager or Inspector shall within fifteen (15) days from the date of inspection as defined herein give notice in writing to the Contractor, or any objection to any drawings and all or any equipment and workmanship which is in his opinion not in accordance with the contract. The Contractor shall give due consideration to such objections and shall either make modifications that may be necessary to meet the said objections or shall inform in writing to the Project Manager/Inspector giving reasons therein, that no modifications are necessary to comply with the contract.			
23.06.05	When the factory tests have been completed at the Contractor's or sub-contractor's works, the Project Manager /Inspector shall issue a certificate to this effect fifteen (15) days after completion of tests but if the tests are not witnessed by the Project Manager /Inspectors, the certificate shall be issued within fifteen (15) days of the receipt of the Contractor's test certificate by the Project Manager /Inspector. Project Manager /Inspector to issue such a certificate shall not prevent the Contractor from proceeding with the works. The completion of these tests or the issue of the certificates shall not bind the Employer to accept the equipment should it, on further tests after erection be found not to comply with the contract.			
23.06.06	In all cases where the contract provides for tests whether at the premises or works of the Contractor or any sub-contractor, the Contractor, except where otherwise specified shall provide free of charge such items as labour, material, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Project Manager /Inspector or his authorized representatives to carry out effectively such tests on the equipment in accordance with the Contractor and shall give facilities to the Project Manager/Inspector or to his authorized representative to accomplish testing.			
23.06.07	The inspection by Project Manager / Inspector and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed Quality Assurance Programme forming a part of the contract.			
23.06.08	To facilitate advance planning of inspection in addition to giving inspection notice as specified at clause no 23.06.03 of this chapter, the Contractor shall furnish quarterly inspection programme indicating schedule dates of inspection at Customer Hold Point and final inspection stages. Updated quarterly inspection plans will be made for each three consecutive months and shall be furnished before beginning of each calendar month.			
23.06.09	All inspection, measuring and test equipment used by Contractor shall be calibrated periodically depending on its use and criticality of the test/measurement to be done. The Contractor shall maintain all the relevant records of periodic calibration and instrument			
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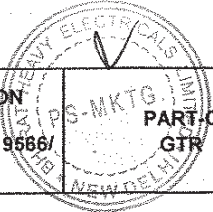
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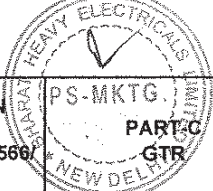
CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS													
23.07.00	<p>identification, and shall produce the same for inspection by Employer. Wherever asked specifically, the Contractor shall re-calibrate the measuring/test equipment in the presence of Project Manager / Inspector.</p> <p><b>Associated Document for Quality Assurance Programme :</b></p> <table style="width: 100%; border: none;"> <thead> <tr> <th style="text-align: left;">Document</th> <th style="text-align: left;">Format No.</th> </tr> </thead> <tbody> <tr> <td>23.07.01 List of items requiring Quality Plan &amp; Sub-supplier approval.</td> <td>QS-01-QAI-P-01/F3-R0 (Annexure-II)</td> </tr> <tr> <td>23.07.02 Status of Quality Plan and Sub-supplier approval</td> <td>QS-01-QAI-P-02/F1-R0 (Annexure-III)</td> </tr> <tr> <td>23.07.03 Field Welding Schedule</td> <td>QS-01-CQA-W-11/F1-R0 (Annexure-IV)</td> </tr> <tr> <td>23.07.04 Manufacturing Quality Plan</td> <td>QS-01-QAI-P-09/F1-R1 (Annexure-V)</td> </tr> <tr> <td>23.07.05 Field Quality Plan</td> <td>QS-01-QAI-P-09/F2-R1 (Annexure-VI)</td> </tr> </tbody> </table> <p>The above formats are enclosed as Annexure to the Part-C, GTR, Section-VI.</p>	Document	Format No.	23.07.01 List of items requiring Quality Plan & Sub-supplier approval.	QS-01-QAI-P-01/F3-R0 (Annexure-II)	23.07.02 Status of Quality Plan and Sub-supplier approval	QS-01-QAI-P-02/F1-R0 (Annexure-III)	23.07.03 Field Welding Schedule	QS-01-CQA-W-11/F1-R0 (Annexure-IV)	23.07.04 Manufacturing Quality Plan	QS-01-QAI-P-09/F1-R1 (Annexure-V)	23.07.05 Field Quality Plan	QS-01-QAI-P-09/F2-R1 (Annexure-VI)	
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24.00.00	<b>PROJECT MANAGER'S SUPERVISION</b>													
24.01.00	To eliminate delays and avoid disputes and litigation, it is agreed between the parties to the Contract that all matters and questions shall be referred to the Project Manager and without prejudice to the provisions of 'Arbitration' clause in Section GCC, Section-VI, the Contractor shall proceed to comply with the Project Manager's decision.													
24.02.00	<p>The work shall be performed under the supervision of the Project Manager. The scope of the duties of the Project Manager pursuant to the Contract, will include but not be limited to the following:</p> <ol style="list-style-type: none"> <li>a) Interpretation of all the terms and conditions of these documents and specifications.</li> <li>b) Review and interpretation of all the Contractor's drawing, engineering data, etc.</li> <li>c) Witness or authorize his representative to witness tests and trials either at the manufacturer's works or at site, or at any place where work is performed under the contract.</li> <li>d) Inspect, accept or reject any equipment, material and work under the contract.</li> <li>e) Issue certificate of acceptance and/or progressive payment and final payment certificates.</li> <li>f) Review and suggest modifications and improvement in completion schedules from time to time.</li> <li>g) Supervise Quality Assurance Programme implementation at all stages of the works.</li> </ol>													
25.00.00	<b>PRE-COMMISSIONING AND COMMISSIONING FACILITIES</b>													
25.01.00	(a) As soon as the facilities or part thereof has been completed operationally and structurally and before start-up, each item of the equipment and systems forming part of facilities shall be thoroughly cleaned and then inspected jointly by the Employer and the Contractor for correctness of and completeness of facility or part thereof and acceptability for initial pre-commissioning tests, commissioning and start-													
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%; border: none;">                 LARA STPP (2 X 800MW) /                  DARLIPALI STPP-I (2 X 800MW) /                  GAJMARA STPP-I (2 X 800MW) /                  KUDGI STPP-I (3 X 800MW)                  STEAM GENERATOR PACKAGE             </td> <td style="width: 33%; border: none; text-align: center;">                 TECHNICAL SPECIFICATION                  SECTION-VI                  BID DOC NO.: CS-9548/ 9549/ 9566/                  - 9573-102-2             </td> <td style="width: 33%; border: none; text-align: right;">                  PART-C                  GTR             </td> </tr> </table>			LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ - 9573-102-2	 PART-C GTR									
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CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	
25.02.00	<p>up at Site. The list of pre-commissioning tests to be performed shall be as mutually agreed and included in the Contractor's quality assurance programme as well as those included elsewhere in the Technical Specifications.</p> <p>(b) The Contractor's pre-commissioning/ commissioning/start-up engineers, specially identified as far as possible, shall be responsible for carrying out all the pre-commissioning tests at Site. On completion of inspection, checking and after the pre-commissioning tests are satisfactorily over, the commissioning of the complete facilities shall be commenced during which period the complete facilities, equipments shall be operated integral with sub-systems and supporting equipment as a complete plant.</p> <p>(c) All piping system shall be flushed, steam blown, air blown as required and cleanliness demonstrated using acceptable industry standards. Procedures to accomplish this work shall be submitted for approval to the Employer six months prior to the respective implementations. The Employer will approve final verification of cleanliness.</p> <p>(d) The time consumed in the inspection and checking of the units shall be considered as a part of the erection and installation period.</p> <p>(e) The check outs during the pre - commissioning period should be programmed to follow the construction completion schedule. Each equipment/system, as it is completed in construction and turned over to Employer's commissioning (start-up) Engineer(s), should be checked out and cleaned. The checking and inspection of individual systems should then follow a prescribed commissioning documentation [SLs (Standard Check List) / TS (Testing Schedule) / CS (Commissioning Schedule)] approved by the Employer.</p> <p>(f) The Contractor during initial operation and performance testing shall conduct vibration testing to determine the 'base line' of performance of all plant rotating equipment. These tests shall be conducted when the equipment is running at the base load, peak load as well as lowest sustained operating condition as far as practicable.</p> <p>(g) Contractor shall furnish the commissioning organization chart for review &amp; acceptance of employer at least eighteen months prior to the schedule date of synchronization of 1st unit. The chart should contain :</p> <ul style="list-style-type: none"> <li>i) Biodata including experience of the Commissioning Engineers.</li> <li>ii) Role and responsibilities of the Commissioning Organisation members.</li> <li>iii) Expected duration of posting of the above Commissioning Engineers at site.</li> </ul> <p><b>Initial Operation</b></p> <p>a) On completion of all pre-commissioning activities / tests and as a part of commissioning the complete facilities shall be put on 'Initial Operation' during which period all necessary adjustments shall be made while operating over the full load range enabling the facilities to be made ready for the Guarantee Tests.</p> <p>b) The 'Initial Operation' of the complete facility as an integral unit shall be conducted for 720 continuous hours. During the period of initial operation of 720 hours, the unit shall operate continuously at full rated load for a period not less than 72 hours.</p>	
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-C GTR 
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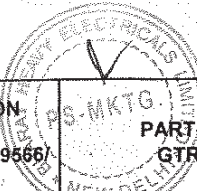
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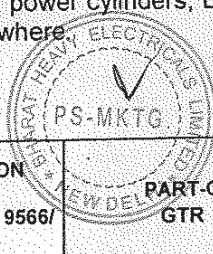
CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
26.00.00	<p>c) The Initial Operation shall be considered successful, provided that each item/ part of the facility can operate continuously at the specified operating characteristics, for the period of Initial Operation with all operating parameters within the specified limits and at or near the predicted performance of the equipment/ facility.</p> <p>d) The Contractor shall intimate the Employer about the commencement of initial operation and shall furnish adequate notice to the Employer in this respect.</p> <p>e) An Initial Operation report comprising of observations and recordings of various parameters to be measured in respect of the above Initial Operation shall be prepared by the Contractor. This report, besides recording the details of the various observations during initial operation shall also include the dates of start and finish of the Initial Operation and shall be signed by the representatives of both the parties. The report shall have sheets, recording all the details of interruptions occurred, adjustments made and any minor repairs done during the Initial Operation. Based on the observations, necessary modifications/repairs to the plant shall be carried out by the Contractor to the full satisfaction of the Employer to enable the latter to accord permission to carry out the Guarantee tests on the facilities. However, minor defects which do not endanger the safe operation of the equipment, shall not be considered as reasons for with holding the aforesaid permission.</p> <p>f) Any special equipment, tools and tackles required for the successful completion of the Guarantee Test shall be provided by the contractor, free of cost.</p> <p>g) The Guarantee tests and specific tests to be conducted on equipments have been brought out in detail elsewhere in the specification.</p> <p><b>TAKING OVER</b></p> <p>Upon successful completion of Initial Operations and all the tests, other than Guarantee Tests, conducted to the Employer's satisfaction, the Employer shall issue to the Contractor a Taking over Certificate as a proof of the final acceptance of the equipment. Such certificate shall not unreasonably be with held nor will the Employer delay the issuance thereof, on account of minor omissions or defects which do not affect the commercial operation and/or cause any serious risk to the equipment. Such certificate shall not relieve the Contractor of any of his obligations which otherwise survive, by the terms and conditions of the Contract after issuance of such certificate.</p>		
27.00.00	<p><b>GUARANTEE TESTS</b></p> <p>a) The final test as to prove the Functional Guarantees shall be conducted at Site by the Contractor in presence of the Employer. The contractor's Commissioning, Start-up Engineer shall make the unit ready to conduct such test. Such test will be commenced, within a period of three (3) months after the successful completion of Initial Operations. Any extension of time beyond the above three (3) months shall be mutually agreed upon.</p> <p>b) These tests shall be binding on both the parties of the Contract to determine compliance of the equipment with the functional guarantee.</p> <p>c) For performance/ demonstration tests instrumentations, of accuracy class, to the approval of the Employer shall be used. The numbers and location of the instruments shall be as per the specified test codes. In addition the values of parameters shall be logged from the information system provided under Employer's Distributed Digital Control Monitoring and Information system. Test will be conducted at specified load points.</p>		
<p>LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE</p>		<p style="text-align: center;">TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9586/ 9573-102-2</p> <div style="text-align: right;">  <p>PS-MKTG PART-C GTR</p> </div>	<p>PAGE 26 OF 30</p>

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	<p>d) Any special equipment, tools and tackles required for the successful completion of the Guarantee Tests shall be provided by the Contractor, free of cost.</p> <p>e) The Guarantee tests and specific tests to be conducted on equipments have been brought out in detail in Sub-Section-VI, Part A, Section-VI.</p>			
28.00.00	<b>TRAINING OF EMPLOYER'S PERSONNEL</b>			
28.01.00	<p>The scope of service under training of Employer's engineers shall include a training module covering upto thirty five (35) man months in the areas of Operation &amp; Maintenance.</p> <p>Such training should cover the following areas as a minimum in order to enable these personnel to individually take the responsibility of operating and maintaining the power station in a manner acceptable to the Employer:</p> <p>a) Training for Steam Generator &amp; Auxiliaries.</p> <p>b) Training for DDCMIS (SG C&amp;I Part) as specified in Part-B of specifications (Section-VI).</p> <p>c) Training for Electric Power Supply systems.</p> <p>d) Training for other related C&amp;I System/equipment.</p> <p>e) Training for Special packages for various PC based systems specified elsewhere in Part-B of Technical Specification, Section-VI.</p> <p>(f) Training for Power Cycle piping/ Critical Piping.</p> <p>(g) Training on Electrical equipments and systems.</p>			
28.02.00	<b>Training for Employer Engineering Personnel</b>			
28.02.01	<p>The scope of services under training shall also necessarily include training of Employer's Engineering personnel covering a training module of upto 22 man months. This shall cover all disciplines viz, Mechanical, Electrical, C&amp;I, &amp; QA etc. and shall include all the related areas like Design familiarization, training on product design features and product design softwares of major equipment and systems, engineering, manufacturing, erection, commissioning, training on operating features of equipment, quality assurance and testing, plant visits and visits to manufacturer's works, exposure to various kinds of problems which may be encountered in fabrication, manufacturing, erection, welding etc. An indicative module of the training requirement of Employer's Engineering personnel is attached as <b>Annexure-VII</b>.</p>			
28.03.00	<p>Bidder shall furnish in his offer, details of training module(s) covering above requirements which shall be subject to Employer's approval. Consolidated training period included above (i.e. 35 and 22 man months respectively for O&amp;M and Engineering ) is indicative only. Employer reserves the right to re-appropriate the training period between O&amp;M and Engineering depending upon the details of training module proposed by the Bidder.</p>			
24.04.00	<p>Exact details, extent of training and the training schedule shall be finalised based on the Bidder's proposal within two (2) months from placement of award.</p>			
28.05.00	<p>In all the above cases, wherever the training of Employer's personnel is arranged at the works of the manufacturer's it shall be noted that the lodging and boarding of the Employer's personnel shall be at the cost of Bidder. The Bidder shall make all necessary arrangements towards the same.</p>			
<p>LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE</p>		<p>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9560/ 9573-102-2 110 of 346</p>		<p>PAGE 27 OF 30</p>

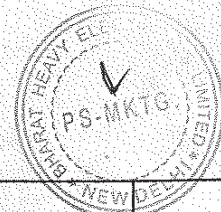
**SECTION C1, SUB SECTION III**

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS	
28.06.00	<p>Take off prices (product wise) should be indicated by the Bidder in the Bid Proposal Sheets. Employer reserves the right to include or exclude these item(s) during placement of Award.</p> <p>Note: For Training purpose one (1) man month implies 30working days (excluding all intervening holidays) per person.</p>	
29.00.00	<p><b>SAFETY ASPECTS DURING CONSTRUCTION AND ERECTION</b></p> <p>In addition to the requirements given in Erection Conditions of Contract (ECC) the following shall also cover:</p> <ul style="list-style-type: none"> <li>i) Working platforms should be fenced and shall have means of access.</li> <li>ii) Ladders in accordance with Employer's safety rules for construction and erection shall be used. Rungs shall not be welded on columns. All the stairs shall be provided with handrails immediately after its erection.</li> </ul>	
30.00.00	<p><b>NOISE LEVEL</b></p> <p>The equivalent 'A' weighted sound pressure level measured at a height of 1.5 m above floor level in elevation and at a distance of one (1) metre horizontally from the nearest surface of any equipment / machine, furnished and installed under these specifications, expressed in decibels to a reference of 0.0002 microbar, shall not exceed 85 dBA except for</p> <ul style="list-style-type: none"> <li>i) Safety valves and associated vent pipes for which it shall not exceed 105 dBA.</li> <li>ii) Regulating drain valves in which case it shall be limited to 90 dBA.</li> </ul>	
31.00.00	<p><b>PACKAGING AND TRANSPORTATION</b></p> <p>All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. While packing all the materials, the limitation from the point of view of the sizes of railway wagons available in India should be taken account of. The Contractor shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. The Contractor shall ascertain the availability of Railway wagon sizes from the Indian Railways or any other agency concerned in India well before effecting dispatch of equipment. Before dispatch it shall be ensured that complete processing and manufacturing of the components is carried out at shop, only restricted by transport limitation, in order to ensure that site works like grinding, welding, cutting &amp; preassembly to bare minimum. The Employer's Inspector shall have right to insist for completion of works in shops before dispatch of materials for transportation.</p>	
32.00.00	<p><b>ELECTRICAL ENCLOSURE</b></p> <p>All electrical equipments and devices, including insulation, heating and ventilation devices shall be designed for ambient temperature and a maximum relative humidity as specified in Electrical Portion of Part-B, Section-VI of Technical Specification.</p>	
33.00.00	<p><b>INSTRUMENTATION AND CONTROL</b></p> <p>All instrumentation and control systems/ equipment/ devices/ components, furnished under this contract shall be in accordance with the requirements stated herein, unless otherwise specified in the detailed specifications.</p>	
<p>LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-402-2</p>	<p>                    PS-MKTG                  PART-C                  GTR                  NEW DELHI             </p> <p align="right">PAGE 28 OF 30</p>

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS																																					
33.01.00	<p>All instrument scales and charts shall be calibrated and printed in metric units and shall have linear graduation. The ranges shall be selected to have the normal reading at 75% of full scale.</p> <p>All scales and charts shall be calibrated and printed in Metric Units as follows:</p> <table border="0"> <tr> <td>1.</td> <td>Temperature</td> <td>-</td> <td>Degree Celsius (deg C)</td> </tr> <tr> <td>2.</td> <td>Pressure</td> <td>-</td> <td>Kilograms per square centimetre (Kg/cm<sup>2</sup>). Pressure instrument shall have the unit suffixed with 'a' to indicate absolute pressure. If nothing is there, that will mean that the indicated pressure is gauge pressure.</td> </tr> <tr> <td>3.</td> <td>Draught</td> <td>-</td> <td>Millimetres of water column (mm wc).</td> </tr> <tr> <td>4.</td> <td>Vacuum</td> <td>-</td> <td>Millimeters of mercury column (mm Hg) or water column (mm Wcl).</td> </tr> <tr> <td>5.</td> <td>Flow (Gas)</td> <td>-</td> <td>Tonnes/ hour</td> </tr> <tr> <td>6.</td> <td>Flow (Steam)</td> <td>-</td> <td>Tonnes/ hour</td> </tr> <tr> <td>7.</td> <td>Flow (Liquid)</td> <td>-</td> <td>Tonnes / hour</td> </tr> <tr> <td>8.</td> <td>Flow base</td> <td>-</td> <td>760 mm Hg. 15 deg.C</td> </tr> <tr> <td>9.</td> <td>Density</td> <td>-</td> <td>Grams per cubic centimetre.</td> </tr> </table>	1.	Temperature	-	Degree Celsius (deg C)	2.	Pressure	-	Kilograms per square centimetre (Kg/cm <sup>2</sup> ). Pressure instrument shall have the unit suffixed with 'a' to indicate absolute pressure. If nothing is there, that will mean that the indicated pressure is gauge pressure.	3.	Draught	-	Millimetres of water column (mm wc).	4.	Vacuum	-	Millimeters of mercury column (mm Hg) or water column (mm Wcl).	5.	Flow (Gas)	-	Tonnes/ hour	6.	Flow (Steam)	-	Tonnes/ hour	7.	Flow (Liquid)	-	Tonnes / hour	8.	Flow base	-	760 mm Hg. 15 deg.C	9.	Density	-	Grams per cubic centimetre.	
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7.	Flow (Liquid)	-	Tonnes / hour																																			
8.	Flow base	-	760 mm Hg. 15 deg.C																																			
9.	Density	-	Grams per cubic centimetre.																																			
33.02.00	All instruments and control devices provided on panels shall be of miniaturized design, suitable for modular flush mounting on panels with front draw out facility and flexible plug-in connection at rear.																																					
33.03.00	All electronic modules shall have gold plated connector fingers and further all input and output modules shall be short circuit proof. These shall also be tropicalised & components shall be of industrial grade or better.																																					
34.00.00	<p><b>ELECTRICAL NOISE CONTROL</b></p> <p>The equipment furnished by the Contractor shall incorporate necessary techniques to eliminate measurement and control problems caused by electrical noise. Areas in Contractor's equipment which are vulnerable to electrical noise shall be hardened to eliminate possible problems. Any additional equipment, services required for effectively eliminating the noise problems shall be included in the proposal. The equipment shall be protected against ESD as per IEC-61000. Radio Frequency interference (RFI) and Electro Magnetic Interference (EMI) protection against hardware damage and control system mal-operations/errors shall be provided for all systems, as per EN 50082-2 (1995).</p>																																					
35.00.00	<p><b>INSTRUMENT AIR SYSTEM</b></p> <p>The instrument air supply system as supplied by the Contractor for various pneumatic control &amp; instrumentation devices like pneumatic actuators, power cylinders, E/P converters, piping / tubing etc. shall be as per the details furnished elsewhere.</p>																																					
LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE		TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	 PART-C GTR	PAGE 29 OF 30																																		

**SECTION C1, SUBSECTION III**

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS		
36.00.00	<p>Each pneumatic instrument shall have an individual air shut - off valve. The pressure regulating valve shall be equipped with an internal filter, a 50 mm pressure gauge and a built-in filter housing blow down valve.</p> <p><b>TAPPING POINTS FOR MEASUREMENTS</b></p> <p>Tapping points shall include probes, wherever applicable, for analytical measurements and sampling.</p> <p>For direct temperature measurement of all working media, one stub with internal threading of approved pattern shall be provided along with suitable plug and washer. The Contractor will be intimated about thread standard to be adopted.</p> <p>The following shall be provided on equipment by the Contractor. The standard which is to be adopted, will be intimated to the Contractor.</p> <ul style="list-style-type: none"> <li>i) Temperature test pockets with stub and thermowell</li> <li>ii) Pressure test pockets</li> </ul>		
37.00.00	<p><b>MAINTENANCE MANUALS OF ELECTRONIC MODULES;</b></p> <p>The Contractor shall have to furnish two (2) sets of all maintenance manual of each and every electronic card/module as employed on the various systems.</p>		
<p>LARA STPP (2 X 800MW) / DARLIPALI STPP-I (2 X 800MW) / GAJMARA STPP-I (2 X 800MW) / KUDGI STPP-I (3 X 800MW) STEAM GENERATOR PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2</p>	<p>PART-C GTR</p>	<p>PAGE 30 OF 30</p>





# PART - C

## ANNEXURES

LARA STPP (2x800MW) /  
DARLIPALI STPP-I (2 x 800MW) /  
GAJMARA STPP-I (2x 800MW) /  
KUDGI STPP-I (3 x 800MW)  
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION  
SECTION-VI  
PART-C

BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2



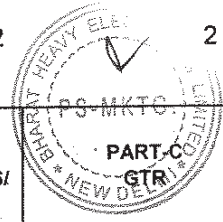
SECTION C1, SUBSECTION III

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	<b>S.NO.</b>	<b>DESCRIPTION OF MANUALS</b>	<b>NO OF PRINTS</b>	<b>NO. OF CD-ROMs</b>
	1.	PLANT DEFINITION MANUAL- Drawings "FOR APPROVAL"	2 sets	4 CD-ROMs
	2.	i) Layout drawings/P&IDs ii) Other drawings	6 2	2 CD-ROMs 2 CD-ROMs
	3.	Drawings "FOR INFORMATION"	2	2 FLOPPIES
	4.	Drawings "FINAL DRAWING"	15	4 CD-ROMs
	5.	Drawings "AS BUILT "	15	4 CD-ROMs
	6.	Datasheets, Design Calculations, Purchase Specifications, etc. and Other type of documents		
		i) For Approval	2	2 CD-ROMs
		ii) FINAL	15	4 CD-ROMs
		iii) Analysis reports of equipments/ piping/ structures components/ systems employing software packages as detailed in the specifications	2	2 CD-ROMs
	7.	Erection manual "DRAFT"	4 sets	2 CD-ROMs
	8.	Erection manual "FINAL"	4 sets	4CD ROMS
	9.	Operation & Maintenance manual "IST SUBMITTIOM"	4 sets	2 CD-ROMs
	10.	Operation & Maintenance manual "FINAL"	4 sets	4CD ROMS
	11.	Plant Hand Book "IST SUBMITTIOM"	4 sets	2 CD-ROMs
	12.	Plant Hand Book "FINAL"	4 sets	4CD ROMS
	13.	Commissioning and Performance "IST SUBMITTIOM"	4 sets	2 CD-ROMs
	14.	Commissioning and Performance "FINAL"	4 sets	4 CD-ROMs
	15.	Performance and Functional guarantees test report	4 sets	4 CD ROMS
	16.	Project completion report	15	4CD ROMS
	17.	QA programme including Organization for implementation and QA system manual (with revision-servicing)	1	1 CD ROM
	18.	Vendor details in respect of proposed vendors including contractor's evaluation report.	1	1 CD ROM
	19.	Manufacturing QPs, Field QPs, Field welding schedules and their reference documents like test procedures, WPS, PQR etc.		
		i) For review/comment	2	2 CD ROM




LARA STPP (2x800MW) /  
DARLIPALI STPP-I (2 x 800MW) /  
GAJMARA STPP-I (2x 800MW) /  
KUDGI STPP-I (3 x 800MW)  
STEAM GENERATOR PACKAGE

TECHNICAL SPECIFICATION  
SECTION-VI  
BID DOC NO.: CS-9548/ 9549/ 9566/  
9573-102-2



SECTION C1, SUBSECTION III

CLAUSE NO.	GENERAL TECHNICAL REQUIREMENTS			
	S.NO.	DESCRIPTION OF MANUALS	NO OF PRINTS	NO. OF CD-ROMs
		ii) For final approval	2	2 CD ROM
	20.	Welding Manual, Heat Treatment Manuals, Storage & preservation manuals		
		i) 1 <sup>st</sup> submission	4 sets	2 CD ROM
		ii) Final	4 sets	4 CD ROM
	21.	QA Documentation Package for items / equipment manufactured and dispatched to site	2 sets	4CD ROMS
	22.	QA Documentation Package for field activities on equipment / systems at site	2 sets	4 CD ROMS



LARA STPP (2x800MW) / DARLIPALI STPP-I (2 x 800MW) / GAJMARA STPP-I (2x 800MW) / KUDGI STPP-I (3 x 800MW) STEAM GENERATOR PACKAGE	TECHNICAL SPECIFICATION SECTION-VI BID DOC NO.: CS-9548/ 9549/ 9566/ 9573-102-2	PART-C GTR	PAGE 2 OF 2
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039



**COMPRESSED AIR SYSTEM  
2X 800MW DARLIPALLI STPP**

DOCUMENT NO.: PE-TS-395-555-A001

VOLUME- IIB

SECTION-C1

REV. 0

SUB-SECTION: IV

**VOLUME - II B**

**SECTION C1**

**SUB-SECTION - IV**

**FUNCTIONAL GUARANTEE**



**COMPRESSED AIR SYSTEM  
2X 800MW DARLIPALLI STPP**

DOCUMENT NO.: PE-TS-395-555-A001

VOLUME- IIB

SECTION-C1

REV. 0

SUB-SECTION: IV

### 1.0.0 GENERAL REQUIREMENTS

The contractor shall guarantee that the equipment offered shall meet the rating and performance requirements stipulated for various equipment covered in this specification.

The contractor shall conduct performance test and demonstrate all the guarantees covered under category I and III.

### 2.0.0 TEST INSTRUMENTATION AND THEIR CALIBRATION

All instruments required for performance testing shall be of the type and accuracy required by the code and prior to the test, contractor shall get these instruments calibrated in an independent test institute approved by the employer. All test instruments required for performance test shall be supplied by contractor.

The performance test shall be carried out as per the agreed procedure.

### 3.0.0 TEST REPORTS.

3.1.0 In case during performance guarantee test(s) it is found that the equipment / system has failed to meet the guarantees, the contractor shall carry out all the necessary modifications and / or replacements to make the equipment / system comply with the guaranteed requirements at no extra cost to the employer and re-conduct the performance guarantee test(s) with employer's consent.

3.2.0 If the demonstrated guarantees continued to be beyond the stipulated acceptable limits even after the above modifications / replacements, the employer will have the right to either of the following (at Employers discretion):

#### 3.2.1 For Category-I Guarantees.

Reject the equipment/system/plant and recover the payments already made.

**OR**

Accept the equipment/system/plant after levying Liquidated damages as specified.

#### 3.2.2 For Category-III Guarantees.

Reject the equipment/system/plant and recover from the contractor the payments already made.

**OR**

Accept the equipment/system after assessing the deficiency in respect of the various ratings, performance parameters and capabilities and recover from the contract price an amount equivalent to the damages as determined by the employer. Such damages shall, however be limited to the cost of replacement of the deficiency so as to achieve the guarantee performance.

### 3.3.0 GUARANTEES UNDER CATEGORY – I



**COMPRESSED AIR SYSTEM**  
**2X 800MW DARLIPALLI STPP**

DOCUMENT NO.: PE-TS-395-555-A001

VOLUME- IIB

SECTION-C1

REV. 0

SUB-SECTION: IV

- A) Auxiliary Power consumption - Summation of power consumption of one Instrument Air Compressors, one Air Dryer Plant and one Service Air compressors for each unit.

**Note:**

1. Test shall be carried out on all compressors with contract drive motor.
2. Base auxiliary power consumption for each unit and penalties shall be as per Annexure IV of this specification. Bidder to furnish its guaranteed auxiliary power consumption on Annexure IV with its offer.

**3.4.0 GURANTEES UNDER CATEGORY – III**

- A) Capacity and discharge pressure of each compressor (to be demonstrated at shop).
- B) Parallel operation of air compressors (to be demonstrated at site).
- C) Pressure drop across Air Drying Plant and capacity and dew point of air at the outlet of air drying plants (to be demonstrated at site).
- D) Vibration level and noise level of each air compressor, blowers and any other rotating equipment of each air drying plant shall be demonstrated at site and shop.



**COMPRESSED AIR SYSTEM  
2X 800MW DARLIPALLI STPP**

DOCUMENT NO.: PE-TS-395-555-A001

VOLUME- IIB

SECTION-C2

REV. 0

**VOLUME - II B  
SECTION C2  
ELECTRICAL SPECIFICATION**



**COMPRESSED AIR SYSTEM  
2X 800MW DARLIPALLI STPP**

DOCUMENT NO.: PE-TS-395-555-A001

VOLUME- IIB

SECTION-C2

REV. 0

**1.0 EQUIPMENT & SERVICES TO BE PROVIDED BY BIDDER/ PURCHASER**

- 1.1 Scope for supply, and erection & commissioning of various equipment forming part of electrical system for this package shall be as per Annexure-I to Section – C2 [Scope of Work (Electrical)].
- 1.2 Make of various equipment/ items in the scope of bidder shall be to approval of owner during detailed engineering stage without any commercial implications.
- 1.3 Electrical load list is enclosed, Annexure A, in the technical specification for bidder's compliance. Bidder to confirm that the system provided by them would be catered by the loads considered by BHEL as per enclosed Electrical load. Bidder to note that for the system being supplied by them, only the above loads will be provided. In case any other load is required the same would be derived / multiplied by bidder on their own from these feeders only at bidder's cost.
- 1.4 All electrical equipment shall be suitable for the power supplies, fault levels and climatic conditions indicated in project information enclosed with the specification.
- 1.5 All drawings, data sheets, Quality Plan, calculations, test reports, test certificates, etc. shall be submitted during detailed engineering stage as per formats enclosed. The same shall be subject to approval without any commercial implications.
- 1.6 Technical requirements shall be as per specifications listed in Clause 4 below.

**3.0 DOCUMENTS TO BE SUBMITTED ALONG WITH BID**

- 3.1 Bidder shall confirm total compliance to the electrical specification without any deviation from the technical/ quality assurance requirements stipulated. In line with this, the bidder as technical offer shall furnish two signed and stamped copies of the following:
- A copy of this sheet "Electrical Equipment Specification for COMPRESSED AIR SYSTEM and sheet "Electrical Scope between BHEL and Vendor" with bidder's signature and company stamp.
  - List of Erection and Commissioning spares.
  - List of Erection & Maintenance tools & tackles.
  - Electrical load requirement in the load data format.
- 3.2 No technical submittal such as copies of data sheets, drawings, write-up, quality plans, type test certificates, technical literature, etc, is required during tender stage. Any such submission even if made, shall not be considered as part of offer.

**4.0 LIST OF ENCLOSURES**

- Electrical scope between BHEL & vendor (Annexure-I).
- Electrical load data (Annexure-A).
- Technical spec. for Motors.
- Technical spec. for Control & Instrumentation cables.
- Technical spec. for Junction box, Glands & Lugs.
- Motor datasheet-A
- Datasheet-C (Motors & Cables)
- List of test for motors.
- Quality plans for motors.

## ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (SECTION C2, ANNEXURE-I)

PACKAGE : COMPRESSED AIR SYSTEM  
 SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT  
 PROJECT: 2X800MW DARLIPALI TPP

<u>S.NO</u>	<u>DETAILS</u>	<u>SCOPE SUPPLY</u>	<u>SCOPE E&amp;C</u>	<u>REMARKS</u>
1	11 kV/ 6.6 KV / 3.3 KV / 415 V Switchgear	NTPC	NTPC	415 V AC (3 ph 4 wire)/240 V AC (supply feeder) shall be provided by NTPC based on load data provided by vendor at contract stage for all equipment supplied by vendor as part of contract. Any other voltage level (AC/DC) required will be derived by the vendor.
2	Local Push Button Station ( for motors)	NTPC	NTPC	Located near the motors.
3	Power cables (LT cables), control cables and screened control cables for a) both end equipment in BHEL's scope b) both end equipment in vendor's scope c) one end equipment in vendor's scope and other end in BHEL's scope d) one end equipment in NTPC's scope	BHEL Vendor Vendor Vendor	BHEL Vendor Vendor Vendor	1. For 3.b) & c): Sizes of cables required shall be informed by vendor at contract stage (based on inputs provided by BHEL/NTPC) in the form of cable listing. Finalisation of cable sizes shall be done by BHEL/NTPC. Vendor shall provide lugs & glands accordingly. 2. Termination at BHEL/NTPC equipment terminals by BHEL/NTPC. 3. Termination at Vendor equipment terminals by Vendor.
4	Junction box for control & instrumentation cable	Vendor	Vendor	Number of Junction Boxes shall be sufficient and positioned in the field to minimize local cabling (max 10-12 mtrs) and trunk cable.
5	Any special type of cable like compensating, co-axial, prefab, MICC, etc.	Vendor	Vendor	Refer C&I portion of specification for scope of fibre Optical cables if used between PLC/ microprocessor & DCS.
6	Cable trays, accessories & cable trays supporting system. 100/50 mm cable trays/Conduits/Galvanised steel cable troughs for local cabling	NTPC Vendor	NTPC Vendor	Local cabling from nearby main route cable tray (NTPC scope) to equipment terminal (vendor's scope) shall be through 100/ 50 mm. cable trays/ conduits/ Galvanised steel cable troughs as per approved layout drawing during contract stage.
7	Cable glands, lugs & bimetallic strip for equipments supplied by Vendor	Vendor	Vendor	1. Double compression Ni-Cr plated brass cable glands 2. Solder less crimping type heavy duty tinned copper lugs for power & control cables.
8	Conduit and conduit accessories for cabling between equipments supplied by vendor.	Vendor	Vendor	Conduits shall be medium duty, hot dip galvanised cold rolled mild steel rigid conduit as per IS: 9537.
9	Lighting	NTPC	NTPC	--
10	Equipment grounding (including electronic earthing) & lightning protection	NTPC	NTPC	Refer note no. 4 for electronic earthing

## ELECTRICAL SCOPE BETWEEN BHEL AND VENDOR (SECTION C2, ANNEXURE-I)

PACKAGE : COMPRESSED AIR SYSTEM  
 SCOPE OF VENDOR: SUPPLY, ERECTION & COMMISSIONING OF VENDOR'S EQUIPMENT  
 PROJECT: 2X800MW DARLIPALI TPP

		NTPC	NTPC	NTPC	--
11	Below grade grounding				--
12	Motors with base plate and foundation hardware	Vendor	Vendor	Vendor	Makes shall be subject to BHEL/NTPC approval at contract stage.
13	Mandatory spares	Vendor	Vendor	-	Vendor to quote as per specification.
14	Recommended O & M spares	Vendor	Vendor	-	As specified elsewhere in specification
15	Any other equipment/material/service required for completeness of system based on the system offered by vendor (to ensure trouble free and efficient operation of the system).	Vendor	Vendor	Vendor	--
16	a. Input cable schedules (C & I) b. Cable interconnection detail for the above c. Cable block diagram	Vendor Vendor Vendor	Vendor Vendor Vendor	- - -	Cable listing for Control and Instrumentation Cable and electronic earthing cable in enclosed excel format shall be submitted by vendor during detailed engineering stage.
17	Cabling layout drawings	NTPC/ Vendor		-	a. In case of Compressor are HT motors, cable tray/trench layout inside compressed air building shall be prepared by BHEL/NTPC. Vendor to furnish drawing (both in print form as well as in AUTOCAD) of compressor room layout clearly indicating all motors, panels, JB's etc. which require cabling along with their terminal box/location/ Foundation etc. b. In case of Compressor are LT motors, for ensuring cabling requirements are met, vendor shall prepare & submit cable tray/trench & equipment layout (both in print form as well as in AUTOCAD) of the complete plant (including electrical area) indicating location and identification of all equipment requiring cabling for BHEL/NTPC review & approval.
18	Electrical equipment GA drawing	Vendor		-	For necessary interface review.

NOTES:

1. Make of all electrical equipments/items supplied shall be reputed make & shall be subject to approval of BHEL/NTPC after award of contract.
2. All QPs shall be subject to approval of BHEL/NTPC after award of contract without any commercial implication.
3. In case the requirement of junction box arises on account of power cable size mismatch due to vendor engineering at later stage, vendor shall supply the junction box for suitable termination.
4. Vendor shall indicate location of Electronic Earth pit in their Civil assignment drawing.

(Section C2, Annexure A, Final Electrical Load)

LOAD TITLE	RATING (KW)		UNIT (U)/STN (S)	Nos.		VOLTAGE CODE*	FEEDER CODE**	EMER. LOAD (Y)	CONT.(G)/INT.(I)	STARTING TIME >5 SEC (Y)	LOCATION	BOARD NO.	CABLE		BLOCK CABLE DRG. No.	CONTROL CODE	REMARKS	LOAD No.
	NAME PLATE	MAX. CONT. DEMAND (MCR)		RUNNING	STANDBY								SIZE CODE	NOS				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Instrument Air Compressor	530			2	1	C	U		C		Compressor House							
Service Air Compressor	530			2	2	C	U		C		Compressor House							
Instrument Air Compressor Control Panel	5.0			2	1	D	S		C		Compressor House							
Service air Compressor Control Panel	5.0			2	2	D	S		C		Compressor House							
Air Dryer Panel	2.0			2	1	D	S		C		Compressor House							
AUTO DRAIN TRAP	0.3			10		E	S		I		7 nos. feeders in compressor house. 2 nos. feeders in TG bldg at EL.0.0 M in B-C bay (one for each unit) & 1 no. feeder near DM plant bldg.							
Electrical Heater for heating of instrument air (if required) to obtain dew point (-40deg C)	50			2	1	D	S		C		Compressor House							


NOTES: 1. COLUMN 1 TO 12 & 18 SHALL BE FILLED BY THE REQUISITIONER (ORIGINATING AGENCY); REMAINING COLUMNS ARE TO BE FILLED UP BY PEM (ELECTRICAL)  
 2. ABBREVIATIONS : \* VOLTAGE CODE (7):- (ac) A=11 KV, B=6.6 KV, C=3.3 KV, D=415 V, E=240 V (1 PH), F=110 V (cc): G=220 V, H=110 V, J=48 V, K=+24V, L=-24 V  
 : \*\* FEEDER CODE (8):- U=UNIDIRECTIONAL STARTER, B=BI-DIRECTIONAL STARTER, S=SUPPLY FEEDER, D=SUPPLY FEEDER (CONTACTOR CONTROLLED)





**LOAD DATA (ELECTRICAL)**


JOB NO.	403	ORIGINATING AGENCY	PEM (ELECTRICAL)
PROJECT TITLE	2x800 MW DARLIPALLI STPP	DATA FILLED UP ON	
SYSTEM / S		DATA ENTERED ON	
DEPTT. / SECTION		DE'S SIGN. & DATE	



CLAUSE NO.	TECHNICAL REQUIREMENTS 		
1.09.00	The responsibility of coordination with electrical agencies and obtaining all necessary clearances for contractors equipment and systems shall be under the contractor scope.		
1.10.00	Degree of Protection  Degree of protection for various enclosures as per IS:4691, IEC60034-05 shall be as follows :-  i) Indoor motors - IP 54 ii) Outdoor motors - IP 55 iii) Cable box-indoor area - IP 54 iv) Cable box-Outdoor area - IP 55		
2.00.00	<b>CODES AND STANDARDS</b>  1) Three phase induction motors : IS:325, IEC:60034 2) Single phase AC motors : IS:996, IEC:60034 3) Crane duty motors : IS:3177, IEC:60034 4) DC motors/generators : IS:4722 5) Energy Efficient motors : IS 12615, IEC:60034-30		
3.00.00	<b>TYPE</b>		
3.01.00	<b>AC Motors:</b>  a) Squirrel cage induction motor suitable for direct-on-line starting. b) Continuous duty LT motors upto 160 KW Output rating (at 50 deg.C ambient temperature), shall be <b>Premium Efficiency class-IE3</b> , conforming to IS 12615, or IEC:60034-30. c) Crane duty motors shall be slip ring/ squirrel cage Induction motor as per the requirement.		
3.02.00	DC Motors Shunt wound.		
4.00.00	<b>RATING</b>  (a) Continuously rated (S1). However, crane motors shall be rated for S4 duty, 40% cyclic duration factor.  (b) Whenever the basis for motor or driven equipment ratings are not specified in the corresponding mechanical specification sub-sections, maximum		
DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI, PART B	SUB-SECTION-B-02 MOTORS	PAGE 2 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS 		
5.00.00	<p>continuous motor ratings shall be at least 10% above the maximum load demand of the driven equipment under entire operating range including voltage and frequency variations.</p> <p>(c) For BFP motors starting MVA shall be restricted to 70 MVA.</p> <p><b>TEMPERATURE RISE</b></p> <p><b>Air cooled motors</b></p> <p>70 deg. C by resistance method for both thermal class 130(B) &amp; 155(F) insulation.</p> <p><b>Water cooled</b></p> <p>80 deg. C over inlet cooling water temperature mentioned elsewhere, by resistance method for both thermal class 130(B) &amp; 155(F) insulation.</p>		
6.00.00	<p><b>OPERATIONAL REQUIREMENTS</b></p>		
6.01.00	<p><b>Starting Time</b></p>		
6.01.01	<p>For motors with starting time upto 20 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 2.5 secs. more than starting time.</p>		
6.01.02	<p>For motors with starting time more than 20 secs. and upto 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be at least 5 secs. more than starting time.</p>		
6.01.03	<p>For motors with starting time more than 45 secs. at minimum permissible voltage during starting, the locked rotor withstand time under hot condition at highest voltage limit shall be more than starting time by at least 10% of the starting time.</p>		
6.01.04	<p>Speed switches mounted on the motor shaft shall be provided in cases where above requirements are not met.</p>		
6.02.00	<p><b>Torque Requirements</b></p>		
6.02.01	<p>Accelerating torque at any speed with the lowest permissible starting voltage shall be at least 10% motor full load torque.</p>		
6.02.02	<p>Pull out torque at rated voltage shall not be less than 205% of full load torque. It shall be 275% for crane duty motors.</p>		
6.03.00	<p><b>Starting voltage requirement</b></p> <p>(a) 85% below 110 KW</p> <p>(b) 80% from 110 KW to 200 KW</p>		
<p>DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION-VI, PART B</p>	<p>SUB-SECTION-B-02 MOTORS</p>	<p>PAGE 3 OF 9</p>

CLAUSE NO.	TECHNICAL REQUIREMENTS		
	(c) 85% above 200 KW to 1000 KW (d) 80% from 1001 KW to 4000 KW (e) 75% above 4000KW  Except AOP & JOP motors running on D.G emergency supply, starting voltage shall be 80%.		
<b>7.00.00</b>	<b>DESIGN AND CONSTRUCTIONAL FEATURES</b>		
7.01.00	Suitable single phase space heaters shall be provided on motors rated 30KW and above to maintain windings in dry condition when motor is standstill. Separate terminal box for space heaters & RTDs shall be provided. However for flame proof motors , space heater terminals inside the main terminal box may be acceptable.		
7.02.00	All motors shall be either Totally enclosed fan cooled (TEFC) or totally enclosed tube ventilated (TETV) or Closed air circuit air cooled (CACCA) type. However, motors rated 3000KW or above can be Closed air circuit water cooled (CACW). CW motors can be screen protected drip proof (SPDP) type. Motors and EPB located in hazardous areas shall have flame proof enclosures conforming to IS:2148 as detailed below		
7.03.00	(a) Fuel oil area : Group – IIB  (b) Hydrogen generation :Group - IIC or (Group-I, Div-II as per plant area NEC) or ( Class-1, Group-B, Div-II as per NEMA /IEC60034)		
7.04.00	Winding and Insulation (a) Type : Non-hygroscopic, oil resistant, flame resistant (b) Starting duty : Two hot starts in succession, with motor initially at normal running temperature. (c) 11kV & 3.3 kV AC motors : Thermal class 155 (F) insulation. The winding insulation process shall be total Vacuum Pressure Impregnated i.e resin poor method. The lightning Impulse & interturn insulation surge withstand level shall be as per IEC-60034 part-15. (d) 240VAC, 415V AC & 220V DC motors : Thermal Class ( B ) or better		
7.05.00	Motors rated above 1000KW shall have insulated bearings to prevent flow of shaft currents.		
7.05.00	Motors with heat exchangers shall have dial type thermometer with adjustable alarm contacts to indicate inlet and outlet primary air temperature.		
DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE	TECHNICAL SPECIFICATIONS SECTION-VI, PART B	SUB-SECTION-B-02 MOTORS	PAGE 4 OF 9

CLAUSE NO.	TECHNICAL REQUIREMENTS		
7.06.00	Noise level for all the motors shall be limited to 85dB(A) except for BFP motor for which the maximum limit shall be 90dB(A). Vibration shall be limited within the limits prescribed in IS:12075 / IEC 60034-14 . Motors shall withstand vibrations produced by driven equipment. HT motor bearing housings shall have flat surfaces, in both X and Y directions, suitable for mounting 80mmX80mm vibration pads.		
7.07.00	In HT motors, at least four numbers simplex / two numbers duplex platinum resistance type temperature detectors shall be provided in each phase stator winding. Each bearing of HT motor shall be provided with dial type thermometer with adjustable alarm contact and preferably 2 numbers duplex platinum resistance type temperature detectors.		
7.08.00	Motor body shall have two earthing points on opposite sides.		
7.09.00	11 KV motors shall be offered with Separate Insulated Connector(Elastimould or Equivalent make) as per IEEE 386. The offered elastimould terminations shall be provided with protective cover and trifurcating sleeves. Elastimould termination kit shall be suitable for fault level of 25 KA for 0.17 seconds.		
7.10.00	3.3 KV motors shall be offered with dust tight phase separated double walled (metallic as well as insulated barrier) Terminal box. Employer shall provide termination kit for the offered Terminal box. The offered Terminal Box shall be suitable for fault level of 250 MVA for 0.12 sec. Removable gland plates of thickness 3 mm (hot/cold rolled sheet steel) or 4 mm (non magnetic material for single core cables) shall be provided.		
7.11.00	The spacing between gland plate & centre of terminal stud shall be as per Table-I.		
7.12.00	All motors shall be so designed that maximum inrush currents and locked rotor and pullout torque developed by them at extreme voltage and frequency variations do not endanger the motor and driven equipment.		
7.13.00	The motors shall be suitable for bus transfer schemes provided on the 11kV, 3.3 kV /415V systems without any injurious effect on its life.		
7.14.00	For motors rated 2000 KW & above, neutral current transformers of PS class shall be provided on each phase in a separate neutral terminal box.		
7.15.00	The size and number of cables (for HT and LT motors) to be intimated to the successful bidder during detailed engineering and the contractor shall provide terminal box suitable for the same.		
8.00.00	<p>The ratio of locked rotor KVA at rated voltage to rated KW shall not exceed the following (without any further tolerance) except for BFP motor.</p> <p>(a) Below 110KW : 10.0</p> <p>(b) From 110 KW &amp; upto 200 KW : 9.0</p>		
<p>DARLIPALI SUPER THERMAL POWER PROJECT STAGE-I (2X800 MW) STEAM TURBINE GENERATOR PACKAGE</p>	<p>TECHNICAL SPECIFICATIONS SECTION-VI, PART B</p>	<p>SUB-SECTION-B-02 MOTORS</p>	<p>PAGE 5 OF 9</p>