2X800 MW DVC KODERMA TPS PHASE II
1X800 MW NTPC SIPAT STPP STAGE-III

TECHNICAL SPECIFICATION
FOR
MISCELLENEOUS TANKS (SITE FABRICATED)

SPECIFICATION NO.: PE-TS-519/520-167-A001

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERIING MANAGEMENT
NOIDA

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INTENT OF SPECIFICATION

1.0 INTENT OF SPECIFICATION

1.1 The specification covers Supply part, Services part and Mandatory spares for **MISC. TANKS (SITE FABRICATED)**, comprising of design (i.e. Preparation and submission of drawing /documents including "As Built" drawings and O&M manuals), engineering, manufacture, fabrication, assembly, inspection / testing at vendor's & sub-vendor's works, painting, maintenance tools & tackles, fill of lubricants & consumables till handing over, mandatory spares along with spares for erection, start-up and commissioning, forwarding, proper packing, shipment and delivery at site, erection & commissioning, trial run at site and carrying out Hydro test at site, training of customer/ client O&M staff covering all aspects of the tank - Operation & Maintenance, Troubleshooting etc. & handover in flawless condition of the package to the customer, complete with all accessories cover under scope of work as per BHEL NIT & tender technical specification, amendment & agreements till placement of order of the **MISC. TANKS (SITE FABRICATED) for 2x800MW KODERMA TPS PHASE-II and 1X800MW SIPAT, STAGE-III STPP.**

1.2 The contractor shall be responsible for providing all material, equipment & services, which are required to fulfil the intent of ensuring operability, maintainability, reliability and complete safety of the complete work covered under this specification, irrespective of whether it has been specifically listed herein or not. Omission of specific reference to any component / accessory necessary for proper performance of the equipment shall not relieve them of the responsibility of providing such facilities to complete the supply, erection and commissioning, performance and guarantee/demonstration testing of **MISC. TANKS (SITE FABRICATED)**.

1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment / system shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in Customers judgement is not in full accordance herewith.

1.4 The extent of supply under the contract includes all items shown in the drawings, notwithstanding the fact that such items may have been omitted from the specification or schedules. Similarly, the extent of supply also includes all items mentioned in the specification and /or schedules, notwithstanding the fact that such items may have been omitted in the drawing. Similarly, the extent of supply also includes all items required for completion of the system for its safe, efficient, reliable and trouble-free operation.

1.5 Items though not specifically mentioned but needed to make the system complete as stipulated under these specifications are also to be furnished unless otherwise specifically excluded.

1.6 The general terms and conditions, instructions to tenderer and other attachment referred to elsewhere are hereby made part of the tender specifications. The equipment / material and works covered by this specification is subject to compliance to all the attachments referred in the specification. The tenderer shall be responsible for adherence to all requirements stipulated herein.

1.7 While all efforts have been made to make the specification requirement complete & unambiguous, it shall be bidders' responsibility to ask for missing information, ensure

completeness of specification, to bring out any contradictory / conflicting requirement in different sections of the specification and within a section itself to the notice of BHEL and to seek any clarification on specification requirement in the format enclosed under Sec.-III of the specification **within 10 days of receipt of tender documents**. In absence of any such clarifications, in case of any contradictory requirement, the more stringent requirement as per interpretation of Purchaser/Customer shall prevail and shall be complied by the bidder without any commercial implication on account of the same. Further in case of any missing information in the specification not brought out by the prospective bidders as part of pre-bid clarification, the same shall be furnished by Purchaser/ Customer as and when brought to their notice either by the bidder or by purchaser/ customer themselves. However, such requirements shall be binding on the successful bidder without any commercial & delivery implication.

1.8 Deviations, if any, should be very clearly brought out clause by clause along with cost of withdrawal in the enclosed schedule (in Section -II); otherwise, it will be presumed that the vendor's offer is strictly in line with NIT specification. If no cost of withdrawal is given against the deviation, it will be presumed that deviation can be withdrawn without any cost to BHEL/it's customer.

1.9 In the event of any conflict between the requirements of two clauses of this specification & requirements of different codes/standards and between respective clauses of sub-section C & sub-section D, more stringent clause as per the interpretation of the owner shall apply.

1.10 In case all above requirements are not complied with, the offer may be considered as incomplete and would become liable for rejection.

1.11 Unless specified otherwise, all through the specification, the word contractor shall have same meaning as successful bidder/vendor and Customer/Purchaser/Employer will mean BHEL and/or Customer as interpreted by BHEL in the relevant context. Please refer GCC/SCC for better clarity.

1.12 Various codes and standards to be used shall be as indicated in various parts of the specification. In case bidder uses any standard other than those indicated in the specification, the onus of establishing equivalence of the same with the specified standards will rest with the bidder and acceptance of the same shall be sole prerogative of customer.

1.13 All text/ numeric in the document / drawings to be generated by the successful bidder will be in English language only.

1.14 The bidder's offer shall not carry any sections like clarification, interpretations and /or assumptions.

PROJECT INFORMATION WITH WIND & SEISMIC DESIGN CRITERIA

PROJECT INFORMATION

S. No.	DESCRIPTION	2X800MW KODERMA TPS PH-II	1X800MW SIPAT STPP STAGE-III
1	**CUSTOMER**	DVC	NTPC Limited
1.1	**CUSTOMER'S CONSULTANT**	NA	NA
2	**LOCATION**	Benjhidih Village of Koderma District Jharkhand, India	Bilaspur Chattisgarh, India
3	**METEOROLOGICAL DATA**		
3.1	SUMMER OUTSIDE DBT	38.6 deg C	40.7 deg C
3.2	SUMMER OUTSIDE WBT	25.7 deg C	23.1 deg C
3.3	MONSOON OUTSIDE DBT	30.6 deg C	29.1 deg C
3.4	MONSOON OUTSIDE WBT	23.8 deg C	25.7 deg C
3.5	WINTER OUTSIDE DBT	22.8 deg C	25.3 deg C
3.6	WINTER OUTSIDE WBT	9.1 deg C	16.0 deg C
3.7	PEAK GROUND HORIZONTAL ACCELERATION (MCE), AS PER SPEC	0.24*g	0.14*g
3.8	BASIC WIND SPEED	39 m/s	47 m/s
3.9	THE RISK COEFFICIENT “K1”	1.06	1.07
4.0	CATEGORY OF TERRAIN	CATEGORY- 2	CATEGORY- 2
4.1	HEIGHT ABOVE MSL	373 m	245 m
4	**ELECTRICAL DATA**		
4.1	AMBIENT TEMPERATURE FOR DESIGN OF ELECTRICAL EQUIPMENT	50 deg C	50 deg C
4.2	RATED FREQUENCY	50Hz	50Hz
4.3	FREQUENCY VARIATION	(+)3 to (-)5%	(+)3 to (-)5%
4.4	AC VOLTAGE	415V, 3 Phase	415V, 3 Phase
4.5	AC VOLTAGE VARIATION	+/-10%	+/-10%
4.6	SYSTEM FAULT LEVEL AT RATED VOLTAGE	50KA for 1.0 sec	50KA for 1.0 sec
4.7	SHORT TIME RATING FOR TERMINAL BOXES	50KA for 0.25 sec	50KA for 0.25 sec
5	**ANALYSIS OF DM WATER TO BE USED FOR MAKE-UP WATER TO CONDENSER**		
	CHARACTARISTICS	VALUE	
i)	SILICA (Max.)	0.02 ppm as Sio2	
ii)	IRON as Fe	NIL	
iii)	TOTAL HARDNESS	NIL	
iv)	pH VALUE	6.8 to 7.2	
v)	CONDUCTIVITY	Not more than 0.1 micro mho /cm	

SUB SECTION-C1

SPECIFIC TECHNICAL REQUIREMENTS

1.0 SCOPE OF SUPPLY

1.1 Steel tanks fabricated and supplied at site under this specification shall be as per enclosed Data Sheet and GA drawing for Condensate Storage Tanks. Modifications may be made by the bidder to suit good engineering practice to the satisfaction of the customer. The customer, however, reserves the right to reject any modifications.

1.2 **FOR 2X800 MW KODERMA TPS PHASE-II**

Two (2) numbers of Condensate Storage Tanks of vertical cylindrical type in MS construction internally painted with epoxy shall be provided. The design features of the tanks & accessories shall be as per IS: 803/API-650. The tanks shall be provided with NaOH / KOH breather along with chemical solution and overflow seal pot. Effective capacity of each condensate storage tank shall be 450 cum minimum.

FOR 1X800 MW SIPAT STAGE-III STPP

One (1) number of Condensate Storage Tank of vertical cylindrical type in MS construction internally painted with epoxy shall be provided. The design features of the tank & accessories shall be as per IS: 803/API-650. The tank shall be provided with NaOH / KOH breather along with chemical solution and overflow seal pot. Effective capacity of condensate storage tank shall be 450 cum minimum.

1.3 General design, construction features, manufacturing, shop inspection, testing at manufacturer's works and surface preparation are in bidder's scope.

1.4

a) The connections and accessories which are required to be supplied with each tank by the bidder shall be as indicated in the enclosed Tank Data Sheet.

b) The piping material inside the tank shall be supplied by the bidder. All inlet piping shall be extended up to the bottom of the tank and the clearance between the bottom of the tank and the edge of the inlet piping shall be kept as 500 mm (maximum).

Pipes and fittings for the tanks is excluded from the bidder scope. However, tank nozzles shall be in bidder's scope. Also pipe supports on the inside surfaces of the tank shall be in bidder's scope.

c) The inside piping shall be adequately supported and shall be provided with adequately sized vent(anti-siphoner) connection at pipe top.

d) Weir plates of adequate thickness (minimum 8 mm) shall be provided for all inlet piping.

e) Pad plates on the tanks for welding support structure of outside & inside piping & cable shall be provided by the bidder. Details of the pad plates (sizes, quantity etc.) shall be informed to bidder during detail engineering.

f) Fabrication and supply of all flanges and counter flanges for all nozzles of tank connections shall be included in the scope of work of the bidder. Necessary bolts, nuts & gaskets for these connections shall also be supplied by the bidder.

g) The manhole shall be of hinged and bolted type with nuts, bolts and gaskets in bidder's scope of supply. The size of the manhole shall be minimum 600 mm if not specified in the specification.

1.5 Level Indicator as per attached DATA SHEET & GA DRAWING OF TANK to be provided for all Condensate Storage Tanks.

1.6 Nozzles, flanges and counter flanges for the tank shall be supplied by the bidder. The minimum requirement like quantity, size, type, MOC etc. are indicated in the GA drwg of Tanks and may undergo change during detail engineering stage and these shall be supplied by the bidder as per the approved drawings / documents for which no commercial implication shall be entertained by BHEL. Material of construction of all pipes, fittings, nozzles, flanges and counter flanges shall be as per DATA SHEET and GA drawing for Condensate storage tanks.

1.7 All valves shall be of stainless-steel construction. The DATA SHEET along with sketch for Condensate storage tanks is enclosed herewith the spec. The size & quantities indicate for pipes & valves in GA drawing and sketch of the tank are bare minimum requirement and any additional requirement to complete the system shall be in the scope of bidder without any price and delivery implication to BHEL.

1.8 NaOH / KOH breather and seal pot shall be located in the bottom / ground level and necessary connection from tank vent to NaOH / KOH breather shall be provided through SS pipe for DM water storage tanks.

1.9 The overflow pipe from overflow nozzle to seal pot shall also be in bidder's scope of work.

1.10 The minimum number of anchor bolts along with the minimum size has been specified in GA Drawing of Tank. However, any additional anchor bolts of higher size if found applicable during detailed Engineering shall be provided by bidder without any commercial implication.

1.11 Painting of the tanks is included in bidder's scope of work. Painting specifications of storage tanks are given under Painting schedule in GA drwg of tanks. Painting requirements specified are minimum requirement. Any modification in painting requirement found applicable during detained engineering, shall be under bidder's scope without any commercial implication.

1.12 Commissioning spares as required for commissioning of the tanks are in bidder's scope.

1.13 Platforms, inter-connecting platforms, monkey ladder inside tank, staircase, handrailing, knee guard and toe guard (in stair case and all along the periphery of roof of the tank), as per the relevant design code / good engineering practice has been included in bidder's scope of work. All staircase treads and platforms shall be 32 mm steel fabricated gratings. Gratings shall be galvanized as per latest code/standard. Width of staircase shall be 1200 mm.

1.14 Any other item required for making the installation complete in all respect and for satisfactory operation of the tank and items mounted thereon, meet layout and accessibility & operability requirements for the scope within the terminal points useless specifically mentioned under EXCLUSION.

2.0 SCOPE OF SERVICES

Services shall include but not be limited to the followings:

2.1 Design, engineering, preparation of detailed fabrication drawings, GA drawings, design calculation, STAAD calculation of Roof structure, bill of material, tag and piece numbers, welding procedures etc. Stiffeners and other structural framing for supporting the tank shall be designed by the fabricator and properly shown in the fabrication drawings.

2.2 Erection & Commissioning of Tanks.

2.3 Erection of all foundation bolts / anchor bolts etc. as required for any equipment/ foundation /concrete.

2.4 Minor civil work like chipping of foundation, grouting below base plate for all structures, tanks, equipment, grouting of pockets. Supply of grouting material is under bidder's scope.

2.5 Inspection & testing and carrying out demonstration test of tanks.

2.6 Painting of tank and other equipment within the battery limit.

2.7 Any other service as required to make the installation complete in all respects shall be deemed to be included in bidder's scope of work whether mentioned above or not.

2.8 Relevant scope of services as per GTR, GCC, SCC & ECC.

2.9 Any other service required for making the installation complete in all respect within battery limits and for satisfactory erection & commissioning of the system unless specifically mentioned under EXCLUSION.

3.0 DESIGN CONSIDERATIONS

3.1 The successful bidder shall furnish design calculations to BHEL during detailed engineering stage for approval along with relevant pages of authentic supporting literature e.g. Code, Hand book, National / international Standards etc. Calculation shall be necessarily done in SI UNITS only for the followings:

a) Tanks shall be designed as per IS – 803 / API – 650 / AWWA – D 100 / IS –2825 / BS – 2594 / Good engineering practice as applicable and referred code shall be of latest edition.

b) Weight calculation of plates, appurtenances, platforms & structures separately shall be included in the design calculation.

c) Design of roof and roof structures for vertical storage tanks shall be designed based on guidelines given in the book titled "Process equipment design" by Brownell and Young. Further, roof structure shall preferably be constructed on external side of roof.

d) Tank stability calculation (wind load / seismic / overturning stability) shall be done as per API – 650/IS-803, latest edition. However, factors / coefficients as required for the design of tank shall be obtained from BHEL by the bidder after placement of order.

e) Vent sizing calculation shall be done as per API – 2000, latest edition

3.2 The successful bidder shall indicate references of all the clauses indicating their page number from respective standard in the design calculation during detail engineering stage. All steps including formulas and abbreviations shall be clearly shown in the calculation. All inputs / assumptions shall be indicated in the first sheet of the calculation.

3.3

a) Bottom plate shall be 10 mm thick (minimum). Minimum 8 mm (excluding tolerance on plate as per relevant IS) thick plates including corrosion allowance shall be provided for shell plates and minimum 8 mm for roof plates for all tanks.

b) Negative tolerance on plate thickness shall not be considered in the plate thickness calculation and also shall not be provided in the tank. Only positive tolerance shall be considered.

3.4 Tank shall be suitably constructed for safe, proper and continuous operation under all conditions that can be expected in a plant life without undue strain, corrosion or other operating difficulties.

3.5 In calculating the minimum plate thickness, the specific gravity of the liquid shall be taken as per GA drawing of Tank .

3.6 For cylindrical tanks, the plates shall be cold rolled through plate bending machine by several number of passes to true curvature.

3.7 Vessels seams shall be so positioned that they do not pass though vessel connections. For cylindrical vessels consisting of more than two sections longitudinal seams shall be offset.

3.8 Wherever possible, the inside seam weld shall be ground smooth, suitable for application of corrosion resistant primer.

3.9 The joint efficiency factor to be adopted for design calculation of shell thickness shall be as per relevant design code unless specified in the specification.

3.10 All roofs and supporting structures shall be designed to support dead load plus a uniform live load of not less than 150 kg/m2 of projected area.

3.11 Code conformance for flanges / counter flanges shall be ANSI B 16.5. Code conformance for bolts and nuts shall be SA 193 & 194 respectively. Further, all fasteners used in wetted condition must be of Alloy 926 or better material so that even if it comes in contact with liquid by swelling of rubber lining, thread remains unaffected. Raw material of fastener must undergo Inter-Granular Corrosion test as per ISO-3651, Part-1 for Nitric Acid test.

3.12 The number & size of nozzles (including flanges, counter flanges and inside piping) indicated in the tank GA drawing are tentative and for bidder guidance purpose only and the same may undergo change during detail engineering stage for which no commercial implication shall be entertained by BHEL.

3.13 Bidder shall furnish the STAAD.Pro calculation for following:
a. Roof Structure calculations for checking the stability of roof.
b. Shell buckling under Roof and other Shell Appurtenances loading.

3.14 Bidder to note that surface cleaning shall be of Blast clean type. However, Grit blasting shall be decided during detail engineering for which no commercial implication shall be entertained by BHEL.

3.15 Bidder to note that foundation drawing along with loading data & anchor bolt details shall be provided by bidder within two weeks' time from the LOI. However, Bidder to provide minimum anchor bolts for tank, as specified in Tank GA drawing.

3.16 A corrosion allowance of 1.5 mm shall be considered for calculating the shell thickness of tanks.

3.17 Water Tanks shall be provided with Roof Structural Support in the form of Rafters and a Center Column.

3.18 **Material of Construction-** All atmospheric tanks shall be fabricated of steel conforming to IS: 2062. The pipe flanges, manhole/manhole covers reinforcement pads etc. shall be fabricated out of the same material as that one used for the vessel/tank.

3.19 **Fabrication-**The vessel ends for storage tanks of vertical type shall have flat bottom. The plates to be used for fabrication shall preferably have a minimum width of 1500 mm. All welding shall be performed by ASME qualified welders under Section-IX of ASME Boiler and Pressure Vessel code and welding electrodes shall be as per relevant Codes/Standards viz. AISC Section 1.17 etc.

4.0 WELDING

4.1 Welding shall be in accordance with the requirement of IS: 803, 816, 817 and 823 or equivalent.

4.2 Welding sequence shall be adopted in such a way so as to minimize the distortion due to welding shrinkage. Contractor shall indicate in his drawing the sequence of welding proposed by him, which should meet prior approval of the Engineer.

4.3 All welders shall be BHEL / customer / consultant qualified as per the approved quality plan / field quality plan which will be submitted by the successful bidder during detail engineering stage. WPS and PQR shall be submitted by the successful bidder to BHEL / customer for review and approval.

5.0 TEST AND INSPECTION

5.1 The particulars of the proposed tests and the procedure for the tests shall be submitted to the Owner / Engineer for approval before conducting the tests. The successful bidder shall submit FQP (field quality plan) and demonstration test procedure for BHEL / customer / consultant's approval during detail engineering stage. In the event of any change in the field quality plan and demonstration test procedure, the same shall be incorporated by the bidder in the document and approved document shall be adhered by the bidder without any commercial implication.

5.2 DPT / MPI on all welds (100%).

5.3 All cross / Tee joints and butt welds are to be Radiographed in line with the joint efficiency as specified in relevant code.

5.4 For the offered tanks, hydro fill test shall be carried out for at least 24 hours. Atmospheric storage tanks on inside surface shall be leak tested before painting.

5.5 All quality plans / checklists for various items shall be furnished during detail engineering stage for BHEL / customer's approval and any changes required by BHEL / customer shall be incorporated in the documents and adhered without any price implication. However, minimum requirement of MQP as indicated in the technical specification shall be followed. All necessary items as required for inspection and testing of the tank including instruments shall be arranged by the bidder.

6.0 MANDATORY SPARES:

Mandatory Spares shall be supplied as per Annexure-VI, Sub-Section-D, Section-I of spec.

7.0 LIST OF COMMISSIONING SPARES:

The items required for successful commissioning of the Tank shall be specified by bidder under 'List of commissioning Spares' given under Section-III of specification.

8.0 TERMINAL POINTS

Matching counter flanges for all nozzles mounted on the tanks. However, counter flanges for all nozzles of water tanks shall be provided by the bidder.

9.0 EXCLUSIONS

a. Tank foundation & associated civil works, all instruments like level gauges, Level Transmitters, etc are excluded from bidder's scope of work. However, required no. of nozzles for the same shall be in bidder's scope of work.

b. All piping from the counter flange of the nozzles of respective tanks except overflow pipe from overflow nozzle to seal pot is excluded from bidder's scope of work. Further the supply and erection of the piping material inside the tank shall be in bidder's scope.

10.0 DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH THE BID

The bidder must submit the drawings / documents as mentioned under "LIST OF DOCUMENTS TO BE SUBMITTED WITH BID" (In Section-III, Annexure-1) along with their bid. In absence of any of these documents, BHEL reserves right not to evaluate the offer of the concerned bidder.

11.0 DRAWINGS/ DOCUMENTS REQUIRED DURING DETAIL ENGINEERING

The successful bidder shall submit the drawing / documents as mentioned under SECTION-I, Sub-Section-D, Annexure-IV during detail engineering for approval / information / reference (as the case may be).

12.0 OTHER TECHNICAL REQUIREMENTS

1) 15 days' time is required by BHEL to offer their comments on the drawings and documents being submitted by the bidder (during detailed engineering stage in the event of L.O.I being placed) from the date of receipt.

2) Bidder to depute competent designer (s) at BHEL's office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL.

3) Bidder to assess the capability of their sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them. No deviations shall be entertained.

4) Commercial implication includes price implication as well as delivery implication.

5) Size of handrails on stairway and tank roof / top shall be minimum 32 NB and shall conform to IS 1239 (M). Handrails shall be galvanized as per relevant code/standard.

6) Type of roof for vertical cylindrical storage tanks shall be either supported cone roof as per latest edition of relevant design code.

7) Commissioning of tanks will consist of installation of all accessories of tanks as per approved drawing/specification, charging of tank, water-fill test (for minimum 24 hours after complete filling of tank), satisfactory functioning of all accessories, emptying of tank, subsequent painting of complete tanks and changing of gaskets as per specification requirement.

8) Bidder to furnish prices and unit price of each item of proposed tanks as per BHEL's price format only along with the final price bid.

9) Bidder shall check that specifications of all the items are available in the NIT specification. However, in the event of absence of specification for any item, bidder will approach BHEL to furnish the specification of missing items and new specification will be adhered by the bidder for which no commercial implication shall be entertained by BHEL.

10) All tools and plants including welding machines, crane, hydra, etc. and instruments as required for construction, erection and commissioning, trial run and functional demonstration test at site shall be arranged by the bidder.

11) Bidder to furnish list of sub-vendors based on sub-vendor list enclosed with the specification during detail engineering stage for BHEL's / Customer review and approval and items shall be procured from these suppliers only.

12) Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structural, flanges, counter flanges etc. from BHEL approved sub vendor only. No argument on this account shall be entertained.

GENERAL TECHNICAL REQUIREMENT

1.00.00 **INTRODUCTION**

This part covers technical requirements which will form an integral part of the Contract. The following provisions shall supplement all the detailed technical specifications and requirements brought out in Section-VI, the Technical Specification and the Technical Data Sheets.

2.00.00 **BRAND NAME**

Whenever a material or article is specified or described by the name of a particular brand, manufacturer or vendor, the specific item mentioned shall be understood to be indicative of the function and quality desired, and not restrictive; other manufacturer's products may be considered provided sufficient information is furnished to enable the Employer to determine that the products proposed are equivalent to those named.

3.00.00 **NOT USED**

4.00.00 **COMPLETENESS OF FACILITIES**

4.01.00 Bidders may note that this is a EPC Package contract. Each of the plant shall be engineered and designed in accordance with the specification requirement. All engineering and associated services are required to ensure a completely engineered plant shall be provided.

4.02.00 All equipments furnished by the Contractor shall be complete in every respect, with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/or those needed for erection, completion and safe operation of the equipment and for the safety of the operating personnel, as required by applicable codes, though they may not have been specifically detailed in the respective specifications, unless included in the list of exclusions.

All same standard components/ parts of same equipment provided, shall be interchangeable with one another.

4.03.00 For the C&I systems, the Contractor shall be required to provide regular information about future upgrades and migration paths to the Employer.

5.00.00 **CODES & STANDARDS**

5.01.00 In addition to the codes and standards specifically mentioned in the relevant technical specifications for the equipment / plant / system, all equipment parts, systems and works covered under this specification shall comply with all currently applicable statutory regulations and safety codes of the Republic of India as well as of the locality where they will be installed, including the following :

a) Indian Electricity Act

b) Indian Electricity Rules

c) Indian Explosives Act

d) Indian Factories Act and State Factories Act

e) Indian Boiler Regulations (IBR)

f) Regulations of the Central Pollution Control Board, India

g) Regulations of the Ministry of Environment & Forest (MoEF), Government of India

h) Pollution Control Regulations of Department of Environment, Government of India

i) State Pollution Control Board.

(j) Rules for Electrical installation by Tariff Advisory Committee (TAC).

(k) Building and other construction workers (Regulation of Employment and Conditions of services) Act, 1996

(l) Building and other construction workers (Regulation of Employment and Conditions of services) Central Rules, 1998

(m) Explosive Rules, 1983

(n) Petroleum Act, 1984

(o) Petroleum Rules, 1976,

(p) Gas Cylinder Rules, 1981

(q) Static and Mobile Pressure Vessels (Unified) Rules, 1981

(r) Workmen's Compensation Act, 1923

(s) Workmen's Compensation Rules, 1924

(t) NTPC Safety Rules for Construction and Erection

(u) NTPC Safety Policy

(v) CERC (Indian Electricity Grid Code) Regulations, 2023

(w) CEA (Flexible Operation of Coal Based Thermal Power Generating Units) Regulations, 2023

(x) Any other statutory codes / standards / regulations, as may be applicable.

5.02.00 Unless covered otherwise in the specifications, the latest editions (as applicable at the date fifteen (15) days prior to the date of bid submission), of the codes and standards given below shall also apply:

a) Bureau of Indian standards (BIS)

b) Japanese Industrial Standards (JIS)

c) American National Standards Institute (ANSI)

d) American Society of Testing and Materials (ASTM)

e) American Society of Mechanical Engineers (ASME)

f) American Petroleum Institute (API)

g) Standards of the Hydraulic Institute, U.S.A.

h) International Organization for Standardization (ISO)

i) Tubular Exchanger Manufacturer's Association (TEMA)

j) American Welding Society (AWS)

k) National Electrical Manufacturers Association (NEMA)

l) National Fire Protection Association (NFPA)

m) International Electro-Technical Commission (IEC)/ European Norm (EN)

n) Expansion Joint Manufacturers Association (EJMA)

o) Heat Exchange Institute (HEI)

p) IEEE standard

q) JEC standard

xxxii) BOP documents such as P&IDs, Sizing calculations for various equipment's, performance curves, datasheet etc. (For CHP, AHP, PU, Water System etc.) shall be as per MDL.

xxxiii) Bidder shall submit all tabulated design calculations/ data (e.g. Pipe schedule, valve schedule, etc.), in both EXCEL format as well as in PDF format to enable NTPC for fast review /approval.

8.03.02 **INSTRUCTION MANUALS**

The Contractor shall submit to the Employer, draft Instruction Manuals for all the equipments covered under the Contract by the end of one year from the date 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 finalisation and approval of the Employer the Instruction Manuals shall be submitted as indicated in **Annexure-IV.** 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.

A) ERECTION MANUALS

The erection manuals shall be submitted at least three (3) months prior to the commencement of erection activities of a particular equipment/system. The erection manual should contain the following as a minimum.

a) Erection strategy.

b) Sequence of erection.

c) Erection instructions.

d) Critical checks and permissible deviation/tolerances.

e) List of tools, tackles, heavy equipments like cranes, dozers, etc.

f) Bill of Materials

g) Procedure for erection and General Safety procedures to followed during erection/installation.

h) Procedure for initial checking after erection.

i) Procedure for testing and acceptance norms.

j) Procedure / Check list for pre-commissioning activities.

submission to the Employer. In case drawings are found to be submitted without proper 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 as interface engineering & integration of systems, facilities, equipment & works under Employer's scope and submit all necessary drawings/ documents for the same.

l) The Contractor shall submit adequate prints of drawing / data / document as per Annexure-VI. 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.

m) 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.

8.03.05 e-Learning Package:

e-learning packages shall be supplied for the equipment / system for the following Steam Turbine Generator & auxiliaries and Steam Generator & auxiliaries along with associated electrical and C&I system.

8.03.05.01 Steam Turbine Generator & Auxiliaries

Steam Turbine including stop valves, control valves, overload valves and cross over piping. Steam Turbine Auxiliary Systems including Quick Closing and Ordinary NRVs, Turbine gland sealing system, Lubricating oil system and its purification system, Centralized oil storage and its purification system, Control fluid and its purification system, governing and protection system, exhaust hood spray cooling system, drainage and vent system, turbine preservation system, HP/LP Bypass system.

Generator and Auxiliary System including Generator, complete hydrogen cooling, carbon dioxide and nitrogen gas systems as applicable, complete seal oil system, complete water cooling system where applicable and complete excitation system.

Condensing Plant including Condenser, Condenser air evacuation system and Condenser on load tube cleaning system as applicable etc.

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.

13.00.00 LUBRICANTS, SERVO FLUIDS AND CHEMICALS

13.01.00 All the first fill and one year's topping requirement of consumables such as greases, oils, lubricants, servo fluids / control fluids, gases (excluding H_2, CO_2 and N_2 for Generator) etc. which will be required to put the equipment covered under the scope of specifications into successful commissioning/initial operation and to establish completion of facilities shall be supplied by the contractor. Suitable standard lubricants as available in India are desired. Efforts should be made to limit the variety of lubricants to minimum.

Bidder scope shall include supply of H_2, CO_2 and N_2 as applicable for the Generator till successful commissioning of Generator.

Bidder shall supply a quantity not less than 10% of the full charge or one (1) year topping requirement mentioned above (Whichever is higher) of each variety of lubricants, servo fluids, gases etc. (as detailed above) 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. However, the lube oil for Main Turbine, Drive Turbine, TDBFP and MDBFP shall be kept same in view of ease of operation and maintenance.

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 LUBRICATION

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 MATERIAL OF CONSTRUCTION

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 utilised for various components shall be those which have established themselves for use in such applications.

16.00.00 RATING PLATES, NAME PLATES & LABELS

16.01.00 Each main and auxiliary item of plant 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.

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.

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 Safety and relief valves shall be provided with the following:

a) Manufacturer's identification.

b) Nominal inlet and outlet sizes in mm.

c) Set pressure in Kg/cm^2 (abs).

d) Blowdown and accumulation as percentage of set pressure.

e) Certified capacity in Kg of saturated steam per hour or in case of liquid certified capacity in litres of water per minute.

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 **TOOLS AND TACKLES**

The Contractor shall supply with the equipment one complete set of all special tools and tackles and other instruments required and other instruments 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.

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.

18.00.00 **WELDING**

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 **COLOUR CODE FOR ALL EQUIPMENTS/ PIPINGS/ PIPE SERVICES**

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.

20.00.00 **PROTECTION AND PRESERVATIVE SHOP COATING**

20.01.00 **PROTECTION**

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 non-metallic protection device. All ends of all valves and piping and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage. All primers/paints/coatings shall take into account the hot humid, corrosive & alkaline, subsoil or over ground environment as the case may be.

The requirements for painting specification shall be complied with as detailed out in Part-A & B of the Technical Specification.

20.02.00 **PRESERVATIVE SHOP COATING**

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 requirements covered in the relevant part of the Technical Specification.

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.

20.03.00 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.

20.04.00 All other steel surfaces which are not to be painted shall be coated with suitable dust preventive compound subject to the approval of the Employer.

20.05.00 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.

20.06.00 Painting for Civil structures and equipment/system covered under this package shall be done as specified under technical requirements on civil works in relevant part of this specifications.

21.00.00 **QUALITY ASSURANCE PROGRAMME**

21.01.00 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, the Contractor shall adopt suitable quality assurance programme to control such activities at all points, as necessary. Such programmes shall be outlined by the Contractor and shall be finalized during detailed engineering with employer / authorized representative after discussion. 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:

a) His organisation structure for the management and implementation of the proposed quality assurance programme

b) Quality System Manual

c) Design Control System

d) Documentation Control System

e) Qualification data for Bidder's key Personnel.

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, verification of materials purchased etc.

g) System for shop manufacturing and site erection control including process controls and fabrication and assembly controls.

h) Control of non-conforming items and system for corrective actions.

i) Inspection and test procedure both for manufacture and field activities.

j) Control of calibration and testing of measuring testing equipments.

k) System for Quality Audits.

l) System for indication and appraisal of inspection status.

m) System for authorising release of manufactured product to the Employer.

n) System for handling storage and delivery.

o) System for maintenance of records, and

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. Format for the same is attached as Annexure VIII.

22.00.00 **GENERAL REQUIREMENTS - QUALITY ASSURANCE**

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 shall be drawn up by the Bidder and will be submitted to Employer for approval. Schedule of finalization of such Quality Plans shall be finalized during detailed engineering as per attached Annexure-VIII and format No QS-01-QAI-P-1/F3. Monthly progress report shall be furnished.

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 mentioned therein and quality practices and procedures followed by Contractor's/ Sub-contractor's/ sub-supplier's Quality Control Organisation, 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 on electronic media through C-folders, a web based system of NTPC ERP, for review and approval.

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 Organisation", during various stages of site activities starting 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 along with Quality Plans. These Quality Plans and reference documents/standards etc. will be subject to Employer's approval without which manufacturer 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 authorised representative and beyond which the work will not proceed without consent of Employer in writing. All deviations to this specification, approved quality plans and applicable standards must be documented and referred to Employer along with technical justification for approval and dispositioning.

22.05.00 The contractor shall submit to the Employer Field Welding Schedule for field welding activities in the format enclosed at **Annexure-V.** 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.

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 despatched from the manufacturer's works before the same is accepted by Employer's Project Manager/Authorised representative and duly authorised for despatch by issuance of Material Dispatch Clearance Certificate (MDCC / CHP Clearance).

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

22.09.00 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.

All welding/brazing procedures shall be submitted to the Employer or its authorized representative prior to carrying out the welding/brazing.

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. All welding / brazing procedures qualified / used at shop, will be made available to NTPC during audit / inspection. Procedures to be qualified at site will be submitted to NTPC.

22.11.00 Not Used.

22.12.00 For all IBR pressure parts and high pressure piping welding, the latest applicable requirements of the IBR (Indian Boiler Regulations) shall also be essentially complied with. However, other piping shall be as per relevant code. Similarly, any other statutory requirements for the equipment/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 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 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.

In general all plates of thickness greater than 40mm & for pressure parts plates of thickness equal to or greater than 25mm shall be ultrasonically tested otherwise as specified in respective equipment specification. All bar stock/Forging of diameter equal to or greater than 40 mm shall be Ultrasonically tested.

22.17.00 The Contractor shall list out all major items/ equipment/ components to be manufactured in house as well as procured from sub-contractors (BOI).

All the sub-vendors proposed by the Main contractor for procurement of major bought out items including castings, forgings, semi-finished and finished components/equipment etc., list of which shall be drawn up by the Contractor and finalised with the Employer, shall be subject to Employer's approval on enclosed format as Annexure-III.

List of NTPC approved sub vendors against similar Pkg/items is attached as Section-VI, Part-B ,Chapter E-60 Indicative sub-vendor list.

The contractor’s proposal for any new sub vendor for any of the items identified in indicative sub-vendor list shall necessarily be furnished in the sub vendor questionnaire & main Contractor Evaluation report format attached as Annexure- VII with all relevant documents and main contractor's own physical assessment report assessed as per their quality management system for NTPC review and acceptance.

New sub vendor proposal will only be considered for NTPC review, provided the proposal is received sufficiently in time: 90 days prior to ordering date of a Bought-Out Items/Start of Manufacturing so as not to impede the progress of the contract.
Main contractor shall submit the documentation as mentioned below:
Major checks and quality requirements as mentioned below shall necessarily be assessed by main contractor and complied with documentary support in case the same is not the part of their Quality management system.

i. Duly Filled Main supplier Evaluation Report.
ii. Duly Filled Sub-Supplier Questionnaire.
iii. Factory Registration Certificate.
iv. Overall Organization Chart with Manpower details (Design, Manufacturing, Quality etc.)
v. Supply reference list of the Sub-Supplier indicating similar product supply order reference no., customer name, rating of product, date /year of supply, date / year of commissioning.
vi. List of Manufacturing Equipment available with sub vendor.
vii. List of Testing Equipment available with sub vendor.
viii. Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any.
ix. Details of Outsourced Manufacturing Processes, if any.

x. Quality control exercised during receipt, in-process & final inspection.
xi. Compliance of Statutory requirements (As applicable)

After first submission of proposal to NTPC, in absence of relevant documents/ Incompleteness of the proposal, The main contractor will be given a period of maximum 07 days to submit the compliance of the NTPC comments. In case of noncompliance, it will be presumed that main contractor is not serious about pursuing the proposal & the proposal will be foreclosed.

The proposed Sub vendor will be assessed broadly on following mandatory criteria

i) Quality Management System Compliance including raw material/BOI control, traceability & control over outsources process
ii) Design Capabilities (As applicable)
iii) Manufacturing, Testing & Storage Facility
iv) Processing Capabilities
v) Supply Experience indicating similar product supply order reference no., customer name, rating of product, date /year of supply, date / year of commissioning
vi) Safety Aspect

In case of major observations or non-compliance observed during sub vendor works visit (Jointly with the main contractor) with respect to the submitted documents, proposed sub vendor will not be considered for acceptance and Main contractor will be solely responsible in such cases.

Monthly progress reports on sub-vendor detail. Submission / approval shall be furnished preferably on enclosed format at Annexure-IV. 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 inquiries shall call for quality plans to be submitted by the suppliers. The quality plans called for from the sub-contractor shall set out, during the various stages of manufacture and installation, the quality practices and procedures followed by the vendor's quality control organisation, the relevant reference documents/standards used, acceptance level, inspection of documentation raised, etc. Such quality plans of the successful vendors shall be finalised with the Employer and such approved Quality Plans shall form a part of the purchase order/contract between the Contractor and sub-contractor. Within two (2) 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 the monthly basis by the Contractor along with a report of the Purchase Order placed so far for the contract.

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-contractor'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 subcontractor'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/equipment 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/ authorised representative.

22.24.00 **Environmental Stress Screening**

Environmental stress screening test process / procedure for eliminating infant mortile components for DDCMIS / PLC based system & for other systems having substantial electronics components (as determined by employer) like Electronic transmitter, CCTV components, PA systems etc. shall be furnished for NTPC acceptance

22.25.00 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 & 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.

22.26.00 **Software Reliability / Quality Certification**

Certification from OEM's authorized signatory that software offered with DDCMIS, PLC, CCTV, PA, Pyrometer, CEMS, AAQMS, EQMS, BHMS etc. declaring that the all the offered software(s) had gone through the established software quality test and offered software is not of β-version and offered software is also free from all known bugs as on date of approval of systems documents by NTPC as a part of quality documentation review and approval process during detail engineering.

23.00.00 **QUALITY ASSURANCE DOCUMENTS**

23.01.00 The Contractor shall be required to submit the QA Documentation in soft copies, as identified in respective quality plan with tick (✓)mark.

23.01.01 Each QA Documentation shall have a project specific Cover Sheet bearing name & identification number of equipment and including an index of its contents with page control on each document.

The QA Documentation file shall be progressively completed by the Supplier's sub-supplier to allow regular reviews by all parties during the manufacturing.

The final quality document will be compiled and issued at the final assembly place of equipment before despatch. However, **soft copies will be furnished** not later than two (2) weeks.

23.02.00 Typical contents of QA Documentation is as below:-

(a.) Quality Plan

(b.) Material mill test reports on components as specified by the specification and approved Quality Plans.

(c.) Manufacturer / works test reports/results for testing required as per applicable codes and standard referred in the specification and approved Quality Plans.

(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.

(e.) Heat Treatment Certificate/Record (Time- temperature Chart)

(f.) All the accepted Non-conformance Reports (Major/Minor)/deviation, including complete technical details / repair procedure).

(g.) CHP / Inspection reports duly signed by the Inspector of the Employer and Contractor for the agreed Customer Hold Points.

(h.) Certificate of Conformance (COC) wherever applicable.

(i.) MDCC

23.03.00 Similarly, the contractor shall be required to submit soft copies containing QA Documentation pertaining to field activities as per Approved Field Quality Plans and other agreed manuals/ procedures, prior to commissioning of individual system.

23.04.00 Before despatch / 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.

(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.

(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.

(c.) If a decision is made for despatch, 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 & 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 two (2) weeks after the despatch of equipment.

23.05.00 **TRANSMISSION OF QA DOCUMENTATION**

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.

For the particular case of phased deliveries, the complete quality document to the Employer shall be issued not later than two (2) weeks after the date of the last delivery of equipment.

24.00.00 **PROJECT MANAGER'S SUPERVISION**

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 'Settlement of Disputes' clause in Section GCC, the Contractor shall proceed to comply with the Project Manager's decision.

24.02.00 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:

(a.) Interpretation of all the terms and conditions of these documents and specifications

(b.) Review and interpretation of all the Contractor's drawing, engineering data, etc.

(c.) Witness or his authorised 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

(d.) Inspect, accept or reject any equipment, material and work under the contract

(e.) Issue certificate of acceptance and/or progressive payment and final payment certificates

(f.) Review and suggest modifications and improvement in completion schedules from time to time, and

(g.) Supervise Quality Assurance Programme implementation at all stages of the works.

25.00.00 **INSPECTION, TESTING AND INSPECTION CERTIFICATES**

25.01.00 The word 'Inspector' shall mean the Project Manager and/or his authorised 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.

25.02.00 The Project Manager or his duly authorised 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 authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor's own premises or works.

25.03.00 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 (for domestic) / 45 days (for foreign) 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.

25.04.00 The Project Manager or Inspector shall within fifteen (15) days (for domestic) / 45 days (for foreign) 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.

25.05.00 When the factory tests have been completed at the Contractor's or subcontractor'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. Failure on the part of 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.

25.06.00 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 authorised 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 authorised representative to accomplish testing.

25.07.00 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.

25.08.00 To facilitate advance planning of inspection in addition to giving inspection notice as specified at clause no. 25.03.00 - 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

30.00.00 **NOISE LEVEL**

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) meter 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

i) Safety valves and associated vent pipes for which it shall not exceed 105 dBA-115 dBA.

ii) Regulating drain valves in which case it shall be limited to 90 dBA-115 dBA.

iii) Mill noise which will be limited to 85-90 dBA.

iv) TG unit in which case it shall not exceed 90 dBA.

v) For HP-LP bypass valves and other intermittently operating control valves, the noise level shall be within the limit of 90 dBA.

vi) For BFP Motor Noise level shall be within the limit of 90 dBA.

31.00.00 **PACKAGING, TRANSPORTATION AND STORAGE**

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 at site due to improper packing and presevation. The Contractor shall ascertain the availability of Railway wagon sizes from the Indian Railways or any other agency concerned in India well before effecting despatch of equipment. Before despatch 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 & preassembly to bare minimum. The Employer's Inspector shall have right to insist for completion of works in shops before despatch of materials for transportation.

In addition to above, the contractor shall take all necessary measures for storage of all electronic equipment / systems at site in a dust free Air conditioned space ensuring proper temperature & humidity.

ANNEXURE-III

एनटीपीसी NTPC	**Project :** **Stage ::** **Package :** **Supplier :** **Contractor No. :**	**LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL** **SUB-SYSTEM :**	**DOC. NO.:** **REV. NO.:** **DATE :** **PAGE : OF**

S. N.	Item	QP/ Insp. Cat.	QP No.	QP Sub. Schedule	QP approval schedule	Proposed sub-supplier	Place	Sub-suppliers approval status / category	Sub-supplier Details submission schedule	Remarks

LEGENDS

SYSTEM SUPPLIER/SUB-SUPPLIER APPROVAL STATUS CATEGORY (SHALL BE FILLED BY NTPC)

A – **For these items proposed vendor is acceptable to NTPC. To be indicated with letter "A" in the list alongwith the condition of approval, if any.**

DR **– For these items "Detailed required" for NTPC review. To be identified with letter "DR" in the list.**

NOTED **– For these items vendors are approved by Main Supplier and accepted by NTPC without specific vendor approval from NTPC. To be identified with "NOTED.'**

QP/INSPN CATEGORY:

CAT-I **: For these items the Quality Plans are approved by NTPC and the final acceptance will be on physical inspection witness by NTPC.**

CAT-II **: For these items the Quality Plans approved by NTPC. However no physical inspection shall be done by NTPC. The final acceptance by NTPC shall be on the basis review of documents as per approved QP.**

CAT-III **: For these items Main Supplier approves the Quality Plans. The final acceptance by NTPC shall be on the basis certificate of conformance by the main supplier.**

UNITS/WORKS **: Place of manufacturing Place of Main Supplier of multi units/works.**

ANNEXURE-IV

एनटीपीसी NTPC	**Project :** **Package :** **Contractor :** **Contractor No. :**		**Stage ::**			**STATUS OF ITEM REQUIRING QP& SUB-SUPPLIER APPROVAL**			**DOC. NO.:** **REV. NO.:** **DATE :** **PAGE : OF**		
S. N.	**Item / Service**	**QP/ Insp. Cat.**	**QP Sub. Schedule Approval schedule**	**Date of sub-mission**	**Date of commt Appl.**	**Status Code C/II/I**	**Proposed Sub-suppliers**	**Place of manufacturing works**	**Approval Status**	**Sub-supplier detail submission schedule**	**Remarks**

FORMAT 1/1 Engg. Div. / QA&I

ANNEXURE-V

एनटीपीसी NTPC	**Project :** **Stage :** **Contractor :** **Contractor No. :** **System :**	**FIELD WELDING SCHEDULE** **(To be raised by the contractor)** **Welding Code: ……**	**DOC. NO.:** **REV. NO.:** **DATE :** **PAGE : OF**

Sl. No.	**DRG No. for Weld Location and Identification mark**	**Description of parts to welded**	**Matl. Spec.**	**Dimensions**		**Process of welding**	**Type of Weld**	**Electrode filler spec.**	**WPS. No.**	**Min. pre-heat**	**Heat treatment**		**NDT method/ Quantum**	**REF**		**Remarks**
											Temp.	**Holding time**		**Spec. No.**	**ACC Norm Ref.**	

NOTES:

SIGNATURE

FORMAT	1/1	**Engg. Div. / QA&I**

S. No.	Description of Drgs./Docs.	No. of Prints	No. of Portable Hard Disk
1	Drawings, Data sheets, Design calculations, Purchase specifications and other documents		
	First submission and submission with major changes		
	▪ Layout (A0&A1 sizes)	3	-
	▪ Other Drawings/Documents (A0 & A1 sizes)	3	-
	▪ P&ID (All sizes)	3	-
	a) Final drawings/documents (Directly to site)	3	2
	b) "As Built" Drawing/Documents (Directly to site)	3	2
	c) Analysis reports of Equipments / piping / structures components/system employing software packages as detailed in the specifications.	2	2
2	Erection Manual (Directly to site)	3 sets	2
3	Operation & Maintenance manual i) First Submission	0	--
	ii) Final Submission (Directly to site)	3 sets	2
4	Plant Hand Book i) Final Submission	1	1
5	Commissioning and Performance Test Procedure manual i) First Submission	1 set	--
	ii) Final Submission (Directly to site)	3 sets	2

S. No.	Description of Drgs./Docs.	No. of Prints	No. of Portable Hard Disk
6	Performance and Functional Guarantee Test Report i) First Submission	1 sets	--
	ii) Approved Copies (Direct to Site)	3 sets	2
7	Project Completion Report (Directly to site)	3 sets	2

PAINTING SPECIFICATION

CLAUSE NO.	PAINTING REQUIREMENTS
1.00.00	**Specification of surface preparation & painting**
1.01.00	Surface preparation methods and paint/primer materials shall be of the type specified herein. If the contractor desires to use any paint/primer materials other than that specified, specific approval shall be obtained by the contractor in writing from the employer for using the substitute material.
1.02.00	All paints shall be delivered to job site in manufacturers sealed containers. Each container shall be labelled by the manufacturer with the manufacturer's name, type of paint, batch number and colour.
1.03.00	Unless specified otherwise, paint shall not be applied to surfaces of insulation, surfaces of stainless steel/nickel/ copper/brass/ monel/ aluminum/ hastelloy/lead/ galvanized steel items, valve stem, pump rods, shafts, gauges, bearing and contact surfaces, lined or clad surfaces.
1.04.00	All pipelines shall be Colour coded for identification as per the NTPC Colour-coding scheme, which will be furnished to the contractor during detailed engineering.
1.05.00	**SURFACE PREPARATION**
1.05.01	All surfaces to be painted shall be thoroughly cleaned of oil. Grease and other foreign material. Surfaces shall be free of moisture and contamination from chemicals and solvents.
1.05.02	The following surface preparation schemes are envisaged here. Depending upon requirement any one or a combination of these schemes may be used for surface preparation before application of primer. SP1 Solvent cleaning SP2 Application of rust converter (Ruskil or equivalent grade) SP3 Power tool cleaning SP4 Shot blasting (shot blasting shall be used as surface preparation method for hot worked pipes prior to application of primer) SP4* Shot blast cleaning/ abrasive blast cleaning to SA21/2 (near white metal) 35-50 microns SP5 Shot blasting/ abrasive blasting. SP6 Emery sheet cleaning/Manual wire brush cleaning.
1.06.00	**APPLICATION OF PRIMER/PAINT**
1.06.01	The paint/primer manufacturer's instructions covering thinning, mixing, method of application, handling and drying time shall be strictly followed and considered as part of this specification. The Dry film thickness (DFT) of primer/paint shall be as specified herein.
1.06.02	Surfaces prepared as per the surface preparation scheme indicated herein shall be applied with primer paint within 6 hours after preparation of surfaces.
1.06.03	Where primer coat has been applied in the shop, the primer coat shall be carefully examined, cleaned and spot primed with one coat of the primer before applying intermediate and finish coats. When the primer coat has not been applied in the shop, primer coat shall be applied by brushing, rolling or spraying on the same day as the surface is prepared. Primer coat shall be applied prior to intermediate and finish coats.
1.06.04	Steel surfaces that will be concealed by building walls shall be primed and finish painted before the floor is erected. Tops of structural steel members that will be covered by grating shall be primed and finish painted before the grating is permanently secured.

CLAUSE NO.	PAINTING REQUIREMENTS
1.06.05	Following are the Primer/painting schemes envisaged herein: PS3 - Zinc Chrome Primer (Alkyd base) by brush/Spray to IS104. PS3* - Zinc Chrome primer (Alkyd base) by dip coat. PS4 - Synthetic Enamel (long oil alkyd) to IS2932. PS5 - Red Oxide Zinc Phosphate primer (Alkyd base) to IS 12744 PS9 - Aluminum paint to IS 2339. PS9* - Heat resistant Aluminum paint to IS-13183 Gr.-I (for temperature 400 degC – 600 degC), IS-13183 Gr.-II (for temperature 200 degC- 400 degC and IS-13183 Gr.-III (for temperature upto 200 degC) PS13 - Rust preventive fluid by spray, dip or brush. PS14 - Weldable primer-Deoxaluminate or equivalent. PS16 - High Build Epoxy CDC mastic `15'. PS17 - Aliphatic Acrylic Polyurethane CDE134, %V=40.0(min.) PS18 - Epoxy based TiO2 pigmented coat PS19 - Epoxy Zinc rich primer (92% zinc in dry film (min.), %VS=35.0(min.) PS-20 - Epoxy based finish paint
1.06.06	All weld edge preparation for site welding shall be applied with one coat of wieldable primer.
1.06.07	For internal protection of pipes/tubes, VCI pellets shall be used at both ends after sponge testing and ends capped. VCI pellets shall not be used for SS components and composite assemblies.
1.06.08	SG membrane walls and other Flue gas swept pressure part surfaces shall be applied with appropriate primer for protection of surfaces during transit, storage and erection.
1.06.09	a) All un-insulated equipments, pipes, valves etc. covered in sub-section A-07 (Steam Turbine & Auxiliary system) shall be painted with paint not inferior to Epoxy resin based paints with minimum DFT of 150 microns. The paint shall be applied in three stages i.e. primer, intermediate and finish coats in following manner: ▪ Primer coat – Epoxy based zinc phosphate ▪ Intermediate - Epoxy based TiO_2 pigmented coat ▪ Finish coat - Epoxy based finish coat/Two pack polyurethane coat b) Equipment, pipes etc. with high temperature shall be painted with heat resistant aluminum paint (to be selected based on the service condition of component as per IS-13183). Two coats of paint shall be applied with total DFT 40 microns. c) Surface preparation before painting shall be carried out according to requirement indicated in this sub-section and international standard.
1.06.10 A)	Specification for the application of Epoxy coating for internal protection of DM tank & other vessels/tanks (as applicable) shall be as follows: Primer : One coat of unmodified epoxy resin along with polymide hardener. Paint : Two (2) coats unmodified epoxy resin along with Aromatic adduct

CLAUSE NO.	PAINTING REQUIREMENTS
	hardener. Total thickness of primer and paint should not be less than 400 microns. B) Specification for application of chlorinated Rubber paint for external protection vessel, tanks, piping, valves & other equipments shall be as follows: i) For Indoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be done either manually or by any other approved method. (b) Primer coat shall consist of one coat of chlorinated rubber based zinc phosphate primer having minimum DFT of 50 microns. (c) Intermediate coat (or under coat) shall consist of one coat of chlorinated rubber based paint pigmented with Titanium dioxide with minimum DFT of 50 microns. (d) Top coat shall consist of one coat of chlorinated rubber paint of approved shade and colour with glossy finish and DFT of 50 microns. Total DFT of paint system shall not be less than 150 microns. ii) For Outdoor vessel, tanks, piping, valves & other equipments: (a) Surface preparation shall be blast cleared using non-siliceous abrasive after usual wire brushing, which shall conform to Sa 2-1/2 Swiss Standard. (b) Primer coat shall consist of one coat of epoxy resin based zinc phosphate primer having minimum DFT of 100 microns. (c) Intermediate coat (or under coat) shall consist of epoxy resin based paint pigmented with Titanium dioxide with minimum DFT of 100 microns. (d) Top coat shall consist of one coat of epoxy paint suitable pigmented of approved shade and colour with glossy finish and DFT of 75 microns. Additionally finishing coat of polyurethane of minimum DFT of 25 microns shall be provided. The paint may be applied in one coat, in case high built paint is used, otherwise two coats shall be applied. Total DFT shall not be less than 300 microns.

ANNEXURE-I

LIST OF MAKES OF SUB-VENDOR ITEMS

Annexure I

BHEL APPROVED SOURCES

SUB-VENDORS - MISCELLANEOUS TANKS

S.NO	ITEM	SUB-VENDORS	PLACE	TECHNICAL LIMIT
1	**CS PIPES ERW** Inspection Cat. -CAT II	TISCO	JAMSHEDPUR	UP TO 350 NB
		SAIL	ROURKELA	
		SURYA ROSHNI	BAHADURGARH	UP TO 400 NB
		JINDAL	GHAZIABAD	UP TO 350 NB
		RATNAMANI	KUTCH	UP TO 400 NB
		MAHARASHTRA SEAMLESS	RAIGARH	UP TO 500 NB
		WELSPUN	ANJAR	UP TO 400 NB (IS 3589)
2	**CS PIPES SEAMLESS** Inspection Cat. -CAT II	MAHARASHTRA SEAMLESS	RAIGARH	UP TO 350 NB
		ISMT	AHMEDNAGAR	UP TO 150 NB
		JINDAL SAW	NASHIK	
		REMI METAL GUJRAT LTD	BHARUCH	UP TO 150 NB HOT FINISH & UPTO 100NB COLD FINISH
		ISMT	BARAMATI	UP TO 200 NB
3	**SS PIPES** Inspection Cat. -CAT II	REMI	TARAPUR	
		RATNAMANI	KUTCH	
		APEX TUBES	BEHROR (ALWAR)	
		PRAKASH STEELAGE LTD	MUMBAI	SS SEAMLESS PIPE UPTO 50MM
		SUMITAMO	JAPAN	
4	**STRUCTURAL STEEL / MS PLATE** Inspection Cat. -CAT III	SAIL		
		ESSAR STEEL		
		TISCO		
		RINL		
		JINDAL		
		M/S UTTAM VALUE STEEL (LLOYDS)		
		ISPAT		
		JSW		
		INDIAN IRON & STEEL CO. LTD		
5	**GATE, GLOBE AND CHECK (STAINLESS STEEL VALVES)** Inspection Cat. -CAT II	A.V. VALVES LTD	AGRA	
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	
		M/S GM ENGINEERING	RAJKOT	
		INTERVALVE (INDIA) LTD.	PUNE	A) STEEL GATE VALVES: UPTO 50NB, #800 AND 65NB TO 150NB, #150 B) STEEL GLOBE VALVES: UPTO 50NB, #800 AND 65NB TO 100NB, #150 C)SUPPLIER NOT REGISTERED FOR NR VALVES
		LEADER VALVES LTD.	JALANDHAR	
		NITON VALVE INDUSTRIES PVT LTD	MUMBAI	
		NSSL LIMITED.	NAGPUR	
		STEEL STRONG VALVES (I) PVT.LTD.,	MUMBAI	LIMIT AS PER VD FILE AS ATTACHED IN SHEET 2
		VALTECH INDUSTRIES	MUMBAI	CAST CARBON & ALLOY STEEL - VALVE/RATING/SIZE- GV/150/900,GV/300/400, GV/600/300 , GV/GLV/NRV/900/250 , GLV/300/300,GLV/150/350/ , SCNRV/150/700, SCNRV/300/350, SCNRV/600/250.

BIS MARKED, MANUFACTURERS WITH VALID BIS LICENSE.

		V.K. VALVES PVT. LTD.,	JALANDHAR	
		WEIR BDK VALVES	NEW DELHI	
		AUDCO		
		OSWAL INDUSTRIES		
6	**GATE, GLOBE AND CHECK (CS STEEL VALVES)** Inspection Cat. -CAT II	A.V. VALVES LTD	AGRA	
		ATAM VALVES PVT. LTD.	JALANDHAR	
		FLUIDLINE VALVES COMPANY PVT.LTD.	GHAZIABAD	
		M/S GM ENGINEERING	RAJKOT	
		INTERVALVE (INDIA) LTD.	PUNE	A) STEEL GATE VALVES: UPTO 50NB, #800 AND 65NB TO 150NB, #150 B) STEEL GLOBE VALVES: UPTO 50NB, #800 AND 65NB TO 100NB, #150 C)SUPPLIER NOT REGISTERED FOR NR VALVES
		LEADER VALVES LTD.	JALANDHAR	
		NITON VALVE INDUSTRIES PVT LTD	MUMBAI	
		NSSL LIMITED.	NAGPUR	
		STEEL STRONG VALVES (I) PVT.LTD.,	MUMBAI	LIMIT AS PER VD FILE AS ATTACHED IN SHEET 2
		VENUS PUMPS AND ENGG. WORKS	KOLKATA	CC/CSS-GATE-BBT-UPTO600NB CL UPTO300,GATE-PSBT UPTO250NB CL 1500,GLV-BBT-UPTO300NB CL UPTO600,SCNRV-BBT-UPTO600NB CL UPTO150,SCNRV-BBT-UPTO300NB CL 300,SCNRV-PSBT-UPTO150NB CL UPTO900
		VALTECH INDUSTRIES	MUMBAI	CAST CARBON & ALLOY STEEL - VALVE/RATING/SIZE- GV/150/900,GV/300/400, GV/600/300 , GV/GLV/NRV/900/250 , GLV/300/300,GLV/150/350/ , SCNRV/150/700, SCNRV/300/350, SCNRV/600/250.
		V.K. VALVES PVT. LTD.,	JALANDHAR	
		WEIR BDK VALVES	NEW DELHI	
		AUDCO -L&T	CHENNAI / COIMBATORE	
		OSWAL INDUSTRIES		
		HITECH	AHMEDABAD	
		KSB WATER PUMPS / VALVES	COIMBATORE	
		KBL	KONDHAPURI	
		HAWA ENGINEERS	AHMEDABAD	
		BHEL	GOINDWAL	
		FOURESS ENGG	MUMBAI	UPTO 600 NB, CL-300 & 300NB CL-600
		FOURESS ENGG	AURANGABAD	
7	**LEVEL INDIATOR FLOAT AND DIAL TYPE** Inspection Cat. -CAT III	FLOW STAR	FARIDABAD	
		SCIENTIFIC DEVICES	MUMBAI	
		GAUGES BOURDEN	PANVEL	
		PUNE TECHTROL	PUNE	
		SBEM	PUNE	
		LEVCON	KOLKATA	
		SIGMA	MUMBAI	

		CHEMTROL		
		DK INSTRUMENT	KOLKATA	
		V AUTOMAT	DELHI	
8	**PAINT** Inspection Cat. -CAT III	ASIAN PAINT		
		BERGER		
		KANSAI NEROLAC		
		JOTUN		
		SHALIMAR		
		JENSON & NICHOLSON (I) LTD		
		CDC CARBOLINE (I) LTD.		
		ADDISON PAINTS LTD		
		GRAND POLYCOAT		
		BOMBAY PAINTS		
		HEMPLE PAINTS (SINGAPORE)		
		AKZONOBEL COATINGS		
9	**FITTINGS (MS/SS)** Inspection Cat. -CAT III	PIPE FIT ENGINEERS	VADODARA	
		GUJRAT INFRA PIPES	VADODARA	
		MS FITTINGS	KOLKATA	
		TUBE PRODUCT	VADODARA	
		SIDDARTH & GAUTAM	FARIDABAD	
		EBY	MUMBAI	
		NL HAZRA	KOLKATA	
		EXCEL METAL		
		INTERTECH		
		FITTECH		
		METAL LLOYDS	MUMBAI	
		TRUE FORGE	FARIDABAD	
10	**SEAL POT / NAOH BREATHER**	SELF MANUFACTURED ITEM		
	INSPECTION CATEGORIZATION			
	1. CAT I :INSPECTION BY OWNER, BHEL/BHEL NOMINATED TPIA & VENDOR .MDCC WILL BE ISSUED BASED ON INSPECTION REPORT IN LINE ITH APPROVED QAP.			
	2. CAT II:INSPECTION BY BHEL/BHEL NOMINATED TPIA & VENDOR. MDCC WILL BE ISSUED BASED ON INSPECTION REPORT IN LINE ITH APPROVED QAP.			
	3. CAT III: MDCC WILL BE ISSUSED BASED COC & MTC ISSUSD BY VENDOR AND VERIFICATION BY BHEL/OWNER IN LINE WITH APPROVED QAP/CHECK LIST			

The make of Sub-vendor items shall be generally as indicated above which is subject to customer / BHEL approval during detail engineering.

Make of any unlisted items shall be subject to customer / BHEL approval during detail engineering. For such items, bidder to furnish list of sub-vendors during detail engineering stage for Customer / BHEL's review and approval. Bidder shall furnish following supporting documentation within 1 month of placement of LOI. Thereafter no request for additional sub-vendor shall be entertained.

a) Documentation to show that the equipment /system has been supplied for a plant of similar or higher capacity.

b) Documentation in the form of certificate that the equipment/system has been operating satisfactorily for two years as on the scheduled date of bid opening.

The successful bidder will get the makes of all items approved from Customer/ Consultant during detail engineering within two months of placement of LOI. The complete list will be necessarily be submitted within one month of placement of LOI to ensure timely placement of order for BOIs

Bidder to assess the capability of their proposed sub-vendors in terms of preparation of drawings, calculations, documents, quality assurance, supply of material etc. as per project schedule before placing the order on them.

Dealers are not acceptable for any item of the package. Bidder shall procure all items including plates, structural, flanges; counter flanges etc. from approved sub vendor only.

ANNEXURE-II

REFERENCE QUALITY PLANS

The QP's furnished in this annexure is the minimum requirement. Detailed QAP shall be reviewed during detail engineering and shall be subject to end customer approval.

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-XXX-167-A001	DATE: XX.XX.XX
	CUSTOMER :		QP NO.: PE-QAP-XXX-167-A001(PI)	DATE: 11.02.2020
	PROJECT:		PO NO.: LATER	DATE: XX.XX.XX
	ITEM: PIPE FITTINGS ,FLANGES & ACCESSORIES	SYSTEM: MISC.TANKS (SITE FABRICATED)	SECTION:	SHEET 1 OF 1

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	**			
					M C/ N			*D	M	C	N	
1	Pipes Fittings, Flanges & Accessories	Check for Type, Model No., Tag No.,	MI	Visual	100%	As per Approved Data Sheet/ Tech spec.	As per Approved Data Sheet/ Tech spec.	Inspection Report	P	V	V	
2		Dimensions	MI	Dimensional	100%	As per Approved Data Sheet/ Tech spec.	As per Approved Data Sheet/ Tech spec.	Inspection Report	P	V	V	
3		Physical and chemical Properties	MI	Review of TC	For Lot	As per Approved Data Sheet/ Tech spec.	As per Approved Data Sheet/ Tech spec.	Mfgr. TC	P	V	V	
4		Hydro test	MA	Hydro Test	100%	As per Approved Data Sheet/ Tech spec.	As per Approved Data Sheet/ Tech spec.	Inspection Report	P	V	V	

NOTES:

1. BHEL reserves the right for conducting repeat test, if required.
2. Photographs of packing of material before final dispatch is to submitted.

LEGENDS:
*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N**: CUSTOMER,
P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE
MA: MAJOR, **MI**: MINOR, **CR:** CRITICAL

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	11.2.2020	S. K. YADAV	Checked by:	11.02.2020	ASHISH PANIGRAHI
Reviewed by:	11.02.2020	SAYAN ROY	Reviewed by:	11/2/2020	R K JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-XXX-167-A001	DATE:XX.XX.XX
	CUSTOMER :		QP NO.: PE-QAP-XXX-167-A001(LI)	DATE:11.02.2020
	PROJECT:		PO NO.:LATER	DATE: XX.XX.XX
	ITEM: LEVEL INDICATOR	SYSTEM: MISC. TANKS (SITE FABRICATED)	SECTION:	SHEET 1 OF 1

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6	7	8	9	**			
					M C/ N			*D	M	C	N	
1	Level Indicator	Check for Type, Model No., Tag No.	MA	Visual	100%	Approved Data Sheet	Approved Data Sheet	Mfgr. TC	P	V	V	
2		Float Leakage Test	CR	Mechanical	100%	Approved Data Sheet	Approved Data Sheet	Mfgr. TC	P	V	V	
3		Review of TC for Material	CR	Visual	For Lot	MTC	MTC	Mfgr. TC	P	V	V	

NOTES:

1. BHEL reserves the right for conducting repeat test, if required.
2. Photographs of packing of material before final dispatch is to submitted.

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
** **M**: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N**: CUSTOMER,
P: PERFORM, **W**: WITNESS, **V:** VERIFICATION, AS APPROPRIATE
MA: MAJOR, **MI**: MINOR, **CR:** CRITICAL

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	11.2.2020	S. K. YADAV	Checked by:	11.2.2020	ASHISH PANIGRAHI
Reviewed by:	11.02.2020	BAYAN ROY	Reviewed by:	11/02/2020	R K JAISWAL

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/ BIDDER/ SUPPLIER NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-XXX-167-A001	DATE: XX.XX.XX
	CUSTOMER :		QP NO.: PE-QAP-XXX-167-A001(PL)	DATE: 11.02.2020
	PROJECT:		PO NO.: LATER	DATE: XX.XX.XX
	ITEM: MS PLATES	SYSTEM: MISC.TANKS (SITE FABRICATED)	SECTION:	SHEET 1 OF 1

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*				
					M	C/ N				D	M	C	N	
1.0 RAW MATERIAL														
1	STEEL PLATES	Chemical composition and Mechanical test	MA	Review of corelated MTC	one/heat		IS:2062	IS:2062	Mfgr. TC	√	P	V	V	Refer Note below
2		Visual and dimensional check	MA	Visual and measurement	100%		Mfg.TC	Mfg.TC IS1852	Mfgr. TC	√	P	** W	** W	
3		Identification/ marking	MA	Corelation establish	100%		As per manufacturing practice	As per manufacturing practice IS 2062	Mfgr. TC	√	P	V	** W	

LEGENDS:

*RECORDS, INDENTIFIED WITH "TICK"(√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION,
M: SUPPLIER/ MANUFACTURER/ SUB-SUPPLIER, **C**: MAIN SUPPLIER/ BHEL/ THIRD PARTY INSPECTION AGENCY, **N**: CUSTOMER,
P: PERFORM, **W**: WITNESS, **V**: VERIFICATION, AS APPROPRIATE
MA: MAJOR, **MI**: MINOR, **CR**: CRITICAL

** **NOTE:** i) In case material is dispatched directly from Approved sub-vendor plant/stockyard or procured from dealer against co related TC's witnessing by BHEL is waived off and material will be accepted based on MTC of approved sub vendor.

** ii) In case material is procured from dealer and co related TC's are not available, check on 100% quantity of plates will be performed on sample drawn from them at NABL certified/approved laboratory for chemical & physical properties, however dimensional check shall be witnessed by BHEL.

iii) BHEL reserves the right for conducting repeat test, if required.

iv) Photographs of packing of material before final dispatch is to submitted.

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:	11.2.2020	S. K. YADAV	Checked by:	11.2.2020	ASHISH PANIGRAHI			Reviewed by:			
Reviewed by:	11.02.2020	SAYAN ROY	Reviewed by:	11/2/2020	R K JAISWAL			Approved by:			

	MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	QUALITY PLAN						SPEC. NO : PE-TS-435-100-M001					DATE: 17.01.2020
भेल BHEL		CUSTOMER :						QP NO.: PE-QP-435-100-M004(C)					DATE: 17.01.2020
		PROJECT:						PO NO.: LATER					DATE: XXX
		ITEM: CAST SS GATE/ GLOBE VALVE (ABOVE 50NB SIZE),CLASS 150, MANUAL				SYSTEM: LP PIPING (WATER SYSTEM)		SECTION:					SHEET 1 OF 4

SL NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			10
1.0 MATERIAL:														
1.1	BODY, BONNET, YOKE,WEDGE/ DISC, SEAT, SPINDLE BODY SEAT, BACK SEAT, THRUST PLATE	1. PHYSICAL & CHEMICAL PROPERTIES	MA	PHYS, CHEM. TESTS	ONE/ HEAT	-	APPD. DRG.	APPD. DRG.	MTC	√	P/ W	V	V	CORRELATION OF BODY & BONNET REQD. WITH MTC HEAT NO.
		2. HEAT TREATMENT	MA	REVIEW OF H.T. RECORDS	100%	-	-DO-	-DO-	H.T. INTERNAL INSPN RECORDS	√	P/ W	V	V	SOLUTION ANNEALING FOR SS VALVES
		3. SURFACE DEFECTS	MA	VISUAL	100%	-	MSS-SP-55	MSS-SP-55	INSPN REPORT	√	P/ W	V	V	
1.2	BODY, BONNET & DISC/ WEDGE	a) **CASTINGS** 1. SURFACE DEFECTS	CR	PT	100%	-	ASME B16.34	ASME B16.34	INSPN REPORT	√	P/ W	V	V	RT ON CHANGE OF SECTION FOR 1 ALL VALVES. (RT FILM REVIEW BY BHEL)
		2. SUB-SURFACE DEFECTS	CR	RT/UT	100%		ASME B16.34	ASME B16.34	INSPN REPORT					
		b) **FORGINGS** 1. SURFACE DEFECTS	CR	PT	100%	-	ASME B16.34	ASME B16.34	INSPN REPORT	√	P	V	V	
		2. SUB-SURFACE DEFECTS	CR	UT	100%		-DO-	-DO-	-DO-					
2.0	SS/ STELLITE DEPOSIT ON DISC & BODY SEAT, BACK SEAT	1. SURFACE DEFECTS	CR	PT	100%	-	ASTM E165 & APP.DRG.	ASME B16.34	INSPN REPORT	√	P/ W	V	V	
		2. HARDNESS	MA	TESTING	100%		APP.DRG.	APP.DRG./ASME B16.34	MTC	√	P/ W	V	V	

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	17.01.20	GK Morye	Checked by:	21.1.2020	KK Yadav
Reviewed by:	20.1.2020	Sanjay Kumar	Reviewed by:	20/1/2020	RK Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-435-100-M001	DATE: 17.01.2020
BHEL	CUSTOMER :		QP NO.: PE-QP-435-100-M004(C)	DATE: 17.01.2020
	PROJECT:		PO NO.: LATER	DATE: XXX
	ITEM: CAST SS GATE/ GLOBE VALVE (ABOVE 50NB SIZE),CLASS 150, MANUAL	SYSTEM: LP PIPING (WATER SYSTEM)	SECTION:	SHEET 2 OF 4

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			10
3.0 GEAR BOX (AS APPLICABLE)														
3.1	GEAR, WORM GEAR & SHAFT	1. PHYSICAL, CHEMICAL PROPS.	MA	PHYSICAL, CHEM. TESTING	1/BATCH	-	REL. STD./ DATA SHEET/ MFG. DRG.	REL. STD./ DATA SHEET/ MFG. DRG.	MTC	√	P/ W	V	V	
		2. HARDNESS	MA	MEASUREMENT	100%		REL. STD./ DATA SHEET/ MFG. DRG.	REL. STD./ DATA SHEET/ MFG. DRG.	MTC	√	P/ W	V	V	
3.2	GEAR BOX ASSEMBLY	1. APPEARANCE	MA	MEASUREMENT	100%		APPD. DRG/ IS 8935	APPD. DRG./ DATA SHEET/ IS 8935	ACTUATOR CERT.	√	P/ W	V	V	
		2. PERFORMANCE	MA	ELECTRICAL	SAMPLE		MFG. STD.	MFG. STD.	TEST REPORT	√	P/ W	V	V	
		3. DIMENSIONS	MA	PHYSICAL	100%		APPD. DRG/ IS 8935	APPD. DRG/ IS 8935	-DO-	√	P/ W	V	V	
		4. DESIGN VERIFICATION												
		a) TORQUE CAPABILITY	MA	TESTING (TORQUE AT TWICE OF RATED TORQUE OF GEAR BOX)	ONE/ TYPE/SIZE/RATED TORQUE	-	APPROVED PROCEDURE	APPROVED PROCEDURE	MTC	√	P/ W	V	V	REFER NOTE-3
		b) GEAR BOX P.O.D. (LIFE CYCLE TEST)	MA	CYCLE TESTING	ONE/ TYPE/SIZE/RATED TORQUE		APPROVED PROCEDURE	APPROVED PROCEDURE	MTC	√	P/ W	V	V	REFER NOTE-3
4.0 IN-PROCESS INSPECTION														
4.1	MACHINING OF ALL COMPONENTS INCLUDING BW	1. DIMENSIONS, WORKMANSHIP AND FINISH	MA	MEAS.,VISUAL	100%	-	MFG.DRG.	MFG.DRG.	LOG BOOK	-	P	V	V	

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	17-01-20	GK Morye	Checked by:	20/1/2020	KK Yadav		
Reviewed by:	20.1.2020	Sanjay Kumar	Reviewed by:	20/1/2020	RK Jaiswal		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	QUALITY PLAN			SPEC. NO : PE-TS-435-100-M001	DATE: 17.01.2020
	CUSTOMER :			QP NO.: PE-QP-435-100-M004(C)	DATE: 17.01.2020
	PROJECT:			PO NO.: LATER	DATE: XXX
	ITEM: CAST SS GATE/ GLOBE VALVE (ABOVE 50NB SIZE),CLASS 150, MANUAL		SYSTEM: LP PIPING (WATER SYSTEM)	SECTION:	SHEET 3 OF 4

SL NO.	COMPONENT & OPERATIONS	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9		**			10
					M	C/N				D	M	C	N	
	ENDS	2.SURFACE & SUB-SURFACE DEFECTS	CR	1. PT 2. MPI (ACCESSIBLE AREA OF BODY & BONNET)	100%	-	ASME B16.34	ASME B16.34	LOG BOOK	-	P/W	V	V	
		3.SUB SURFACE DEFECTS (SPINDLE, BODY / DISCS SEAT RING)	CR	UT	100%	-	ASME B16.34	ASME B16.34	LOG BOOK	-	P/W	V	V	1. IF DIA/THK IS EQUAL OR GREATER THAN 40 mm. 2 IF BODY/ DISC SEATS THICKNESS EQUAL OR GREATER THAN 25 MM
4.2	WEDGE/DISC & SEAT RING, SPINDLE AND BACK SEAT	1. LAPPING	CR	BLUE MATCHING	100%	-	UNIFORM METAL TO METAL CONTACT	UNIFORM METAL TO METAL CONTACT	INSPN REPORT	√	P	V	V	
5.0	ASSEMBLY	1. DIMENSIONS	MA	MEAS.	100%	-	APPD.DRG.	APPD.DRG.	-DO-	√	P	V	V	
		2. WEAR TRAVEL	MA	MEAS.	100%	-	BSEN ISO 10434	-DO-	-DO-	√	P	V	V	FOR GATE VALVE ONLY
		3. VALVE LIFT	MA	MEAS.	100%	-	APPD.DRG.	-DO-	-DO-	√	P	V	V	
6.0 TESTING														
6.1	BODY, SEAT, BACK SEAT	1. LEAK TIGHTNESS OF BODY	CR	HYDRAULIC TEST	100%	REFER NOTE-2	APPD. DRG. /ASME B16.34	NO LEAKAGE	INSPN. REPORT	√	P	W	V	
		2. LEAK TIGHTNESS OF BACK SEAT AND SEAT	CR	HYDRAULIC TEST	100%		-DO-	LEAKAGE PERMISSIBLE AS PER API 598	-DO-	√	P	W	V	
		3. LEAK TIGHTNESS OF SEAT	CR	PNEUMATIC TEST	100%		-DO-	-DO-	-DO-	√	P	W	V	
6.2	OPERATIONAL TESTING FOR MANUALLY OPERATED VALVES	SMOOTH & FULL OPENING AND CLOSING	CR	MANUAL	100%	REFER NOTE-2	-DO-	SMOOTH OPERATION OF VALVES & CLEAR BORE	INSPN. REPORT	√	P	W	V	

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	17.01.20	GK Morye	Checked by:		KK Yadav		
Reviewed by:	20.1.2020	Sanjay Kumar	Reviewed by:		RK Jaiswal		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	QUALITY PLAN			SPEC. NO : PE-TS-435-100-M001	DATE: 17.01.2020
	CUSTOMER :			QP NO.: PE-QP-435-100-M004(C)	DATE: 17.01.2020
	PROJECT:			PO NO.: LATER	DATE: XXX
	ITEM: CAST SS GATE/ GLOBE VALVE (ABOVE 50NB SIZE),CLASS 150, MANUAL		SYSTEM: LP PIPING (WATER SYSTEM)	SECTION:	SHEET 4 OF 4

SL. NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**		10
					M	C/N				D	M	C	N
7.0	COMPLETE VALVES	OVERALL DIMENSION	MA	MEASUREMENT	SAMPLE	-	APPD.DRG	APP.DRG.	INSPN. REPORT	√	P	V	V	
8.0	END CONNECTION DETAILS	DIMENSIONS	MA	MEASUREMENT	100%	REFER NOTE-2	APPD. DRG.	APPD. DRG.	-DO-	√	P	W	V	
9.0	FINAL INSPECTION	CLEANLINESS & COMPLETENESS, NAME WITH VALVE TAG NOS.	MA	VISUAL	100%	-	APPD. DRG.	APPD. DRG.	INSPN. REPORT	√	P	V	V	
10.0	PACKING	APPD. DRG.	MA	VISUAL	100%	-	APPD. DRG.	APPD. DRG.	SOFT COPY OF PHOTO GRAPH	-	P	V	V	**REFER NOTE-4**

NOTES:

1. In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed/verified by supplier's TPI.
2. 10% or min. 2 nos. at random by BHEL/Customer & 100% by supplier for each type, size & rating.
3. Review/ Verification of Test Report/Certificate, in case these tests have been carried out earlier (Within the last 5 years from placement of PO) on the identical Model/Type/Rating of tested Gear Box at an independent laboratory or witnessed by reputed customer like NTPC etc. or third party inspection agency like Lloyds, TUV, DNV etc. if the above Test Reports/Certificates are not available or not found satisfactory by BHEL/Customer, then the required TYPE TEST to be carried out by the Vendor on Gear Box without any commercial implications at his own cost & witnessed by BHEL/Customer.
4. Supplier to provide the followings:
   a. Photographs of valves duly placed inside the wooden box just before the final packing.
   b. Photographs of the wooden box in which valves have been finally packed just before dispatch.
   c. Clearance for dispatch of valves will be given only after receipt of the photos of valves in satisfactory condition as mentioned above.

LEGENDS:

***D**: Records, identified with "Tick"(√) shall be essentially included by supplier in QA Documentation.

** **M**: Supplier/ Manufacturer/ Sub-Supplier
P: Perform
MA: Major Characteristic
MTC: Mill Test Certificate
RT= Radiographic Test
C: Main Supplier/BHEL/ Third Party Inspection agency
W: Witness
MI: Minor Characteristic
PT: Penetrant Test
MPI=Magnetic Particle Inspection
N: Customer
V: Verification
CR: Critical Characteristic
UT: Ultrasonic Testing

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	17.01.20	GK Morye	Checked by:		KK Yadav		
Reviewed by:	20.1.2020	Sanjay Kumar	Reviewed by:	21.1.2020	RK Jaiswal		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	QUALITY PLAN			SPEC. NO : PE-TS-435-100-M001	DATE: 17.01.2020
		CUSTOMER :			QP NO.: PE-QP-435-100-M004(A)	DATE: 17.01.2020
		PROJECT:			PO NO.: LATER	DATE: XXX
		ITEM: FORGED SS GATE,GLOBE VALVE/ HOSE VALVE(FCS), SIZE 25 TO 50NB,CLASS 800,MANUAL OPERATION		SYSTEM:	SECTION:	SHEET 1 OF 3

SL. NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			10
					M	C/N				D	M	C	N	
1.0 MATERIAL:														
1.1	BODY, BONNET, DISC, SPINDLE,	1. PHYS. & CHEM. PROPERTIES	MA	PHYSICAL & CHEMICAL TEST	ONE/ HEAT	-	APPROVED DRAWING	APPROVED DRAWING	MTC	√	P/ W	V	V	CORRELATION OF BODY& BONNET REQD. WITH MTC HEAT NO.
		2. HEAT TREATMENT	MA	REVIEW OF H.T.	100%	-	-DO-	-DO-	HT(MTC)	√	P/ W	V	V	SOLUTION ANNEALING FOR STAINLESS STEEL
1.2	BODY, BONNET	SURFACE & SUB SURFACE DEFECTS	CR	PT	100%	-	ASME B16.34 AND TECH. SPEC.	ASME B16.34	MTC	√	P/ W	V	V	PT FOR SS VALVES
2.0	SS/ STELLITE DEPOSIT ON DISC & BODY SEAT	SURFACE DEFECTS	CR	PT	100%	-	ASME B16.34 & APPD DRG.	ASME B16.34 & APPD DRG.	MTC	√	P/ W	V	V	
3.0 IN-PROCESS INSPECTION:														
3.1	MACHINING OF ALL COMPONENTS	1. DIMENSIONS, WORKMANSHIP AND FINISH	MA	MEAS.,VISUAL	100%	-	MFG.DRG.	MFG DRG.	LOG BOOK	-	P	V	V	
		2.SURFACE & SUB SURFACE DEFECTS	CR	PT (machined hard surfaces)	100%	-	ASME B16.34	ASME B16.34	-DO-	-	P	V	V	
3.2	DISC & SEAT RING	LAPPING	CR	BLUE MATCHING	100%	-	UNIFORM METAL TO METAL CONTACT		INSPN. REPORT	√	P	V	V	
4.0 TESTING:														
4.1	BODY, SEAT, BACK SEAT	1. LEAK TIGHTNESS OF BODY	CR	HYDRAULIC TEST	100%	REFER NOTE-2	APPD. DRG./ BSEN ISO 15761	NO LEAKAGE	INSPN REPORT	√	P	W	V	
		2. LEAK TIGHTNESS OF BACK SEAT AND SEAT	CR	HYDRAULIC TEST	100%		-DO-	LEAKAGE PERMISSIBLE AS PER API 598	-DO--	√	P	W	V	

BHEL						BIDDER/ SUPPLIER	
ENGINEERING			QUALITY			Sign & Date	
	Sign & Date	Name		Sign & Date	Name	Seal	
Prepared by:	17.01.20	GK Morye	Checked by:		KK yadav		
Reviewed by:	20.1.2020	Sanjay Kumar	Reviewed by:	20/1/2020	RK Jaiswal		

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS	QUALITY PLAN		SPEC. NO : PE-TS-435-100-M001	DATE: 17.01.2020
	CUSTOMER :		QP NO.: PE-QP-435-100-M004(A)	DATE: 17.01.2020
	PROJECT:		PO NO.: LATER	DATE: XXX
	ITEM: FORGED SS GATE,GLOBE VALVE/ HOSE VALVE(FCS), SIZE 25 TO 50NB,CLASS 800,MANUAL OPERATION	SYSTEM:	SECTION:	SHEET 2 OF 3

SL. NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	*	AGENCY			REMARKS
					M	C/N				D	M	C	N	
1	2	3	4	5	6		7	8	9		**			10
		3. LEAK TIGHTNESS OF SEAT	CR	PNEUMATIC TEST	100%	REFER NOTE-2	APPD. DRG./ BSEN ISO 15761	LEAKAGE PERMISSIBLE AS PER API 598	INSPN REPORT	√	P	W	V	
4.2	OPERATIONAL TESTING FOR MANUALLY OPERATED VALVES	SMOOTH & FULL OPENING AND CLOSING	CR	MANUAL	100%	REFER NOTE-2	SMOOTH OPERATION OF VALVES & CLEAR BORE		INSPN REPORT	√	P	W	V	
5.0	COMPLETE VALVES	OVERALL DIMENSION	MA	MEAS	SAMP-LE	-	APPD.DRG	APP.DRG	-DO-	√	P	V	V	
6.0	END CONNECTION DETAILS	DIMENSIONS	MA	MEAS.	100%	REFER NOTE-2	APPD. DRG.	APPD. DRG.	-DO-	√	P	W	V	
7.0	FINAL INSPECTION	CLEANLINESS & COMPLETENESS, NAME WITH VALVE TAG NOS.	MA	VISUAL	100%	-	APPD. DRG.	APPD. DRG.	INSPN. REPORT	√	P	V	V	
8.0	PAINTING	1. SURFACE PREPARATION 2.UNIFORMITY & THICKNESS	MI MI	VISUAL MEASUREMENT	100% 100%		APPD. DRG. -DO-	APPD. DRG. -DO-	-DO- -DO-	√	P	V	V	APPLICABLE FOR FCS HOSE VALVE
9.0	PACKING	APPD. DRG.	MA	VISUAL	100%	-	APPD. DRG.	APPD. DRG.	SOFT COPY OF PHOTOGRAPH	√	P	V	V	REFER NOTE '3'

BHEL					
ENGINEERING			QUALITY		
	Sign & Date	Name		Sign & Date	Name
Prepared by:	17.01.20	GK Morye	Checked by:	20.01.2020	KK yadav
Reviewed by:	20.1.2020	Sanjay Kumar	Reviewed by:	20.1.2020	RK Jaiswal

BIDDER/ SUPPLIER	
Sign & Date	
Seal	

FOR CUSTOMER REVIEW & APPROVAL			
Doc No:			
	Sign & Date	Name	Seal
Reviewed by:			
Approved by:			

	MANUFACTURER/BIDDER/VENDOR NAME & ADDRESS		QUALITY PLAN					SPEC. NO : PE-TS-435-100-M001				DATE: 17.01.2020
BHEL			CUSTOMER :					QP NO.: PE-QP-435-100-M004(A)				DATE: 17.01.2020
			PROJECT:					PO NO.: LATER				DATE: XXX
			ITEM: FORGED SS GATE,GLOBE VALVE/ HOSE VALVE(FCS), SIZE 25 TO 50NB,CLASS 800,MANUAL OPERATION			SYSTEM:		SECTION:				SHEET 3 OF 3

SL NO.	COMPONENT & OPERATIONS	CHARACTERIST-ICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD		AGENCY			REMARKS
1	2	3	4	5	6		7	8	9	*	**			10
					M	C/N				D	M	C	N	

NOTES:

1. In case of foreign supplier, all test certificates shall be furnished by the supplier, duly witnessed/verified by supplier's TPI.
2. 10% or min. 2 nos. at random by BHEL/Customer & 100% by supplier for each type, size & rating.
3. Supplier to provide the followings:
   a. Photographs of valves duly placed inside the wooden box just before the final packing.
   b. Photographs of the wooden box in which valves have been finally packed just before dispatch.
   c. Clearance for dispatch of valves will be given only after receipt of the photos of valves in satisfactory condition as mentioned above.

LEGENDS:

***D**: Records, identified with "Tick"(√) shall be essentially included by supplier in QA Documentation.

** **M**: Supplier/ Manufacturer/ Sub-Supplier
P: Perform
MA: Major Characteristic
MTC: Mill Test Certificate

C: Main Supplier/BHEL/ Third Party Inspection agency
W: Witness
MI: Minor Characteristic

N: Customer
V: Verification
CR: Critical Characteristic

BHEL						BIDDER/ SUPPLIER		FOR CUSTOMER REVIEW & APPROVAL			
ENGINEERING			QUALITY			Sign & Date		Doc No:			
	Sign & Date	Name		Sign & Date	Name	Seal			Sign & Date	Name	Seal
Prepared by:	17.01.20	GK Morye	Checked by:	17.01.2020	KK yadav			Reviewed by:			
Reviewed by:	20.1.2020	Sanjay Kumar	Reviewed by:	20/1/2020	RK Jaiswal			Approved by:			

ANNEXURE-VII

एनटीपीसी NTPC	**SYSTEM EQUIPMENT** **Misc. Tanks**	**STANDARD FIELD QUALITY PLAN** **CONFORMING TO CODE: IS:803-1976**	QP NO.: 0000-999-QOM – I -001 Rev. No 0 Date 15-02-2005 Page 1 Of 1 VALID UPTO : 14-02-2008	REVIEWED BY: APPROVED BY अनुमोदित APPROVED अनिल गुप्ता ANIL GUPTA अपर महाप्रबंधक (गुणवत्ता आश्वासन) Addl. General Manager (QA) एन टी पी सी लि./NTPC LTD.

SL. NO	ACTIVITY AND OPERATION	CHARACTERISTICS / INSTRUMENTS	CLASS # OF CHECK	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	D *	REMARKS
1.	2.	3.	4.	5.	6.	7.	8.	9.		10.
1	**RAW MATERIAL INSPECTION**									
1.1	MS Plates	Mechanical & Chemical	B	Mechanical & Chemical	1 sample per Heat	Appd Drg./ Data Sheet	Relevant Material Specs	TC		In absence of Correlated TCs, Check Testing shall be witnessed by NTPC.
		Surface Defects	B	Visual	100%	No Pitting/ Corrosion	Damaged Plates not to be used	IR		
		Thickness	B	Measure	100%	Appd Drg.	Appd Drg.	IR		
2	**IN PROCESS INSPECTION**									
2.1	Welding	WPS/PQR/WQR	A	Qualification / Verification	100%	ASME Sec-IX	ASME Sec-IX	WPS/ PQR		See Note # 1.
		Marking, Cutting, Rolling, Joint Set-up	C	Visual & Measure	100%	Appd Drg.	Appd Drg.	IR		
		NDT on Back Gauging	B	DPT	100%	ASTM E-165	No Indications	IR		Except for Bottom Plates.
		NDT on Root Run	B	DPT	100%	ASTM E-165	No Indications	IR		For Bottom Plates only.
		NDT on Finished Welds	A	Vacuum Testing	100%	IS:803	No Leakage	IR		For Bottom Plates only.
3	**FINAL INSPECTION**									
3.1	Finished Tank	Finish, Orientation	B	Visual	100%	IS:803 & Appd. Drg.	IS:803 & Appd. Drg.	IR		
		Dimensions including Verticality, Ovality	B	Visual & Measure	100%	IS:803 & Appd. Drg.	IS:803 & Appd. Drg.	IR		
		NDT on Final Welding	A	DPT	100%	ASTM E-165	No Indications	IR		Except for Bottom Plates. See Note # 2.
		Leak Proof ness	A	Water Fill Test	100%	IS:803 & Appd. Drg.	No Leakage	IR		For 24 Hours
3.2	Painting	Surface Preparation	B	Visual	100%	IS:803, Appd. Drg., NTPC Specs	IS:803, Appd. Drg., NTPC Specs	IR		
		Coating Thickness, Colour	B	Visual & DFT	100%	IS:803, Appd. Drg., NTPC Specs	IS:803, Appd. Drg., NTPC Specs	IR		

Note : - 1. Only Qualified Welders are to be used. If Welders qualified by NTPC/ BHEL/ LRQA/ BVQI are available & continuously doing the job, then re-qualification is not necessary.
2. NDT on Finished weld shall also include Spot RT (10%), if Joint efficiency is taken as 0.85, in line with requirements of Code.

LEGEND: * RECORDS, INDENTIFIED WITH "TICK" (√) SHALL BE ESSENTIALLY INCLUDED BY SUPPLIER IN QA DOCUMENTATION.
LEGEND TO BE USED: CLASS #: A = CRITICAL, B = MAJOR, C = MINOR; 'A' SHALL BE WITNESSED BY NTPC FQA, **'B'** SHALL BE WITNESSED BY NTPC ERECTION/ CONSTRUCTION DEPTT AND **'C'** SHALL BE WITNESSED BY MAIN SUPPLIER (A & B CHECK SHALL BE NTPC CHP STAGE)

FORMAT NO.: QS-01-QAI-P-10/F4-R1 1/1 **ENGG. DIV./QA&I**

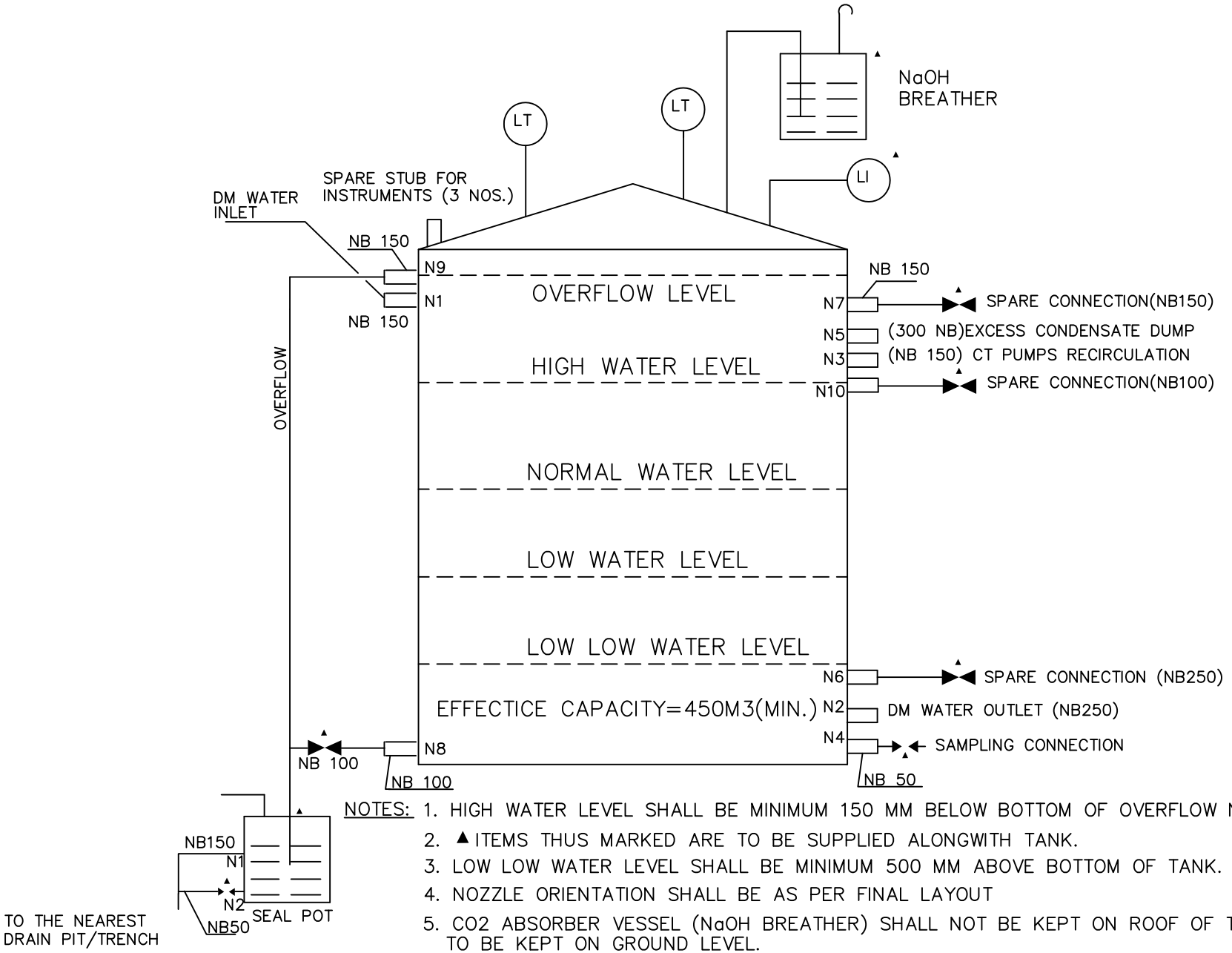
ANNEXURE-III

TANK DATA SHEET WITH SKETCH

1.0	SERVICE IDENTIFICATION	CONDENSATE STORAGE TANK
2.0	P&ID NO.	8003-001-110-PVM-L-048/3112-110-PVM-F-042
3.0	SYSTEM	CONDENSATE SYSTEM
4.0	EFFECTIVE CAPACITY (EACH) (m^3)	**450 m3(MIN.)**
5.0	NUMBER REQUIRED	**ONE (01)** NOS. FOR STATION AS PER IS:803 in 1X800 MW SIPAT STAGE-III STPP **TWO (02)** NOS. FOR STATION AS PER IS:803 in 2X800 MW KODERMA TPS PH-II
6.0	STORAGE MEDIUM	DM WATER /CONDENSATE
7.0	TYPE	VERTICAL, CYLINDRICAL ATMOSPHERIC
8.0	TENTATIVE SIZE	AS PER RESPECTIVE GA DRAWING
9.0	PRESSURE CLASS	DESIGN FOR FILLED WATER HEAD /ATMOSPHERIC/AS PER GA DRAWING
10.0	MATERIAL OF CONSTRUCTION	MS (IS-2062 Gr. B or EQUIVALENT) AS PER SPECIFIED CODE
10a	MIN. PLATE THICKNESS	a) SHELL THICKNESS: AS PER ATTACHED GA DRAWING b) ROOF PLATE THICKNESS: 8MM(MIN.) c) BOTTOM PLATE THICKNESS: 10MM(MIN.)
11.0	DESIGN TEMPERATURE	60 ^{0}C
12.0	LOCATION OF INSTALLATION	OUTDOOR
13.0	NOZZLE CONNECTIONS REQD/	SOCKET WELDED FOR SIZE ≤ NB50
	END CONNECTION	FLANGED FOR SIZE > NB50
14.0	PIPE / NOZZLE MATERIAL	STAINLESS STEEL SA312 TP 304
15.0	VALVES MATERIAL	STAINLESS STEEL
16.0	VALVES END CONNECTION	SOCKET WELDED FOR SIZE ≤ NB50
		BUTT WELDED FOR SIZE > NB50
18.0	APPLICABLE CODES / STATUTORY REGULATIONS	AS APPLICABLE IS-803 & API-650
17.0	INSTRUMENTS / ACCESSORIES / SPECIAL FITTINGS REQUIRED	a) CONSERVATION VENT VALVE /NAOH BREATHER b) OVERFLOW & DRAIN PIPING WITH DRAIN VALVE c) SAMPLING CONNECTION WITH ISOLATING VALVE d) SEAL POT WITH DRAIN VALVE ETC FOR OVERFLOW. e) 2 NOS. TAPPINGS ON ROOF TOP FOR ULTRASONIC LEVEL TRANSMITTERS. 1 NO. ADDITIONAL SPARE TAPPING ALSO TO BE PROVIDED FOR THE INSTRUMENT. GA DRAWING AND INSTALLATION

		DRAWING OF EARLIER PROJECT ATTACHED FOR REFERENCE. f) LEVEL INDICATOR TO COVER ENTIRE RANGE (MECHANICAL FLOAT TYPE WITH DIAL TYPE INDICATOR) WITH FITTINGS AS SPECIFIED ELSEWHERE IN THE SPEC. g) STAIRCASE & PLATFORM AS PER GA DRAING h) MIN. 1200 MM HAND RAILING ALL AROUND ON THE ROOF OF THE TANK.
18.0	SURFACE PREPARATION	AS PER CUSTOMER'S APPROVED PAINTING SCHEDULE FOR TANK, BREATHER AND SEAL POT.
19.0	INSIDE PROTECTION	
20.0	EXTERNAL PAINTING	REFER SURFACE PREPARATION & PAINTING ELSEWHERE IN THE SPECIFICATION
21.0	MANHOLE PER TANK	TWO (2) NOS. ONE ON SHELL & THE OTHER ON ROOF

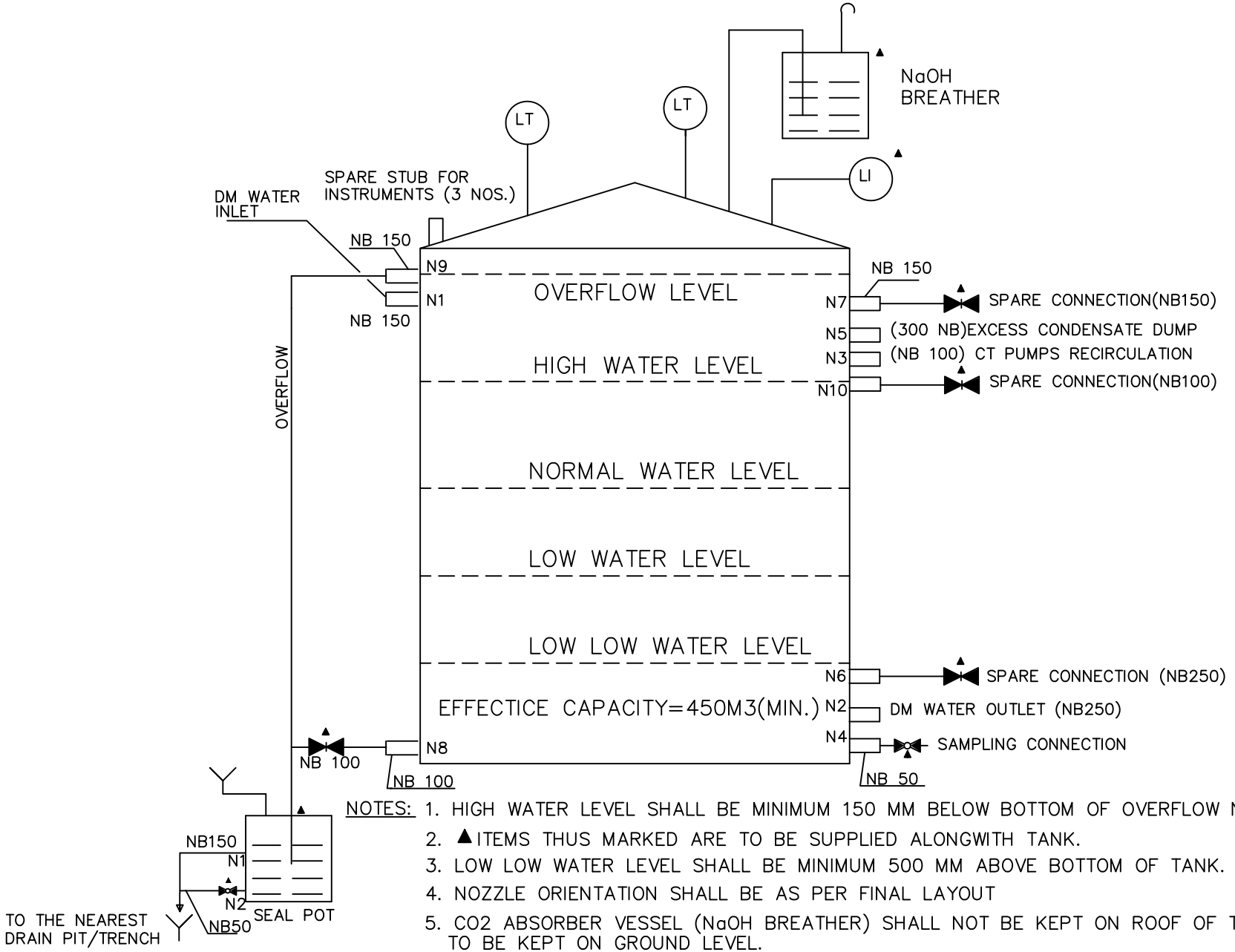
SKETCH FOR CONDENSATE STORAGE TANK



NOTES:

1. HIGH WATER LEVEL SHALL BE MINIMUM 150 MM BELOW BOTTOM OF OVERFLOW NOZZLE.
2. ▲ ITEMS THUS MARKED ARE TO BE SUPPLIED ALONGWITH TANK.
3. LOW LOW WATER LEVEL SHALL BE MINIMUM 500 MM ABOVE BOTTOM OF TANK.
4. NOZZLE ORIENTATION SHALL BE AS PER FINAL LAYOUT
5. CO2 ABSORBER VESSEL (NaOH BREATHER) SHALL NOT BE KEPT ON ROOF OF TANK, BUT TO BE KEPT ON GROUND LEVEL.
6. NOZZLE N3, N5, N7 & N10 SHALL BE LOCATED ABOVE THE OVERFLOW NOZZLE N9.
7. NOZZLE N2, N4, N6 & N8 SHALL BE LOCATED BELOW LOW LOW WATER LEVEL.

SKETCH FOR CONDENSATE STORAGE TANK



NOTES:
1. HIGH WATER LEVEL SHALL BE MINIMUM 150 MM BELOW BOTTOM OF OVERFLOW NOZZLE.
2. ▲ITEMS THUS MARKED ARE TO BE SUPPLIED ALONGWITH TANK.
3. LOW LOW WATER LEVEL SHALL BE MINIMUM 500 MM ABOVE BOTTOM OF TANK.
4. NOZZLE ORIENTATION SHALL BE AS PER FINAL LAYOUT
5. CO2 ABSORBER VESSEL (NaOH BREATHER) SHALL NOT BE KEPT ON ROOF OF TANK, BUT TO BE KEPT ON GROUND LEVEL.
6. NOZZLE N3, N5, N7 & N10 SHALL BE LOCATED ABOVE THE OVERFLOW NOZZLE N9.
7. NOZZLE N2, N4, N6 & N8 SHALL BE LOCATED BELOW LOW LOW WATER LEVEL.

ANNEXURE-IV

MASTER DRAWINGS LIST WITH SCHEDULE OF SUBMISSION

DRAWINGS /DOCUMENTS REQUIRED DURING DETAILED ENGINEERING (2X800 MW DVC KODERMA TPS PH-II)

S. NO.	DOCUMENT NO.	DOCUMENT TITLE	SCH. DATE OF SUB. FROM LOI (IN WEEKS)	DRAWING CLASSIFICATION
1	PE-V0-519-167-A101	DESIGN CALCULATION OF CONDENSATE STORAGE TANKS INCLUDING STAAD CALCULATION OF ROOF STRUCTURE	3	PRIMARY
2	PE-V0-519-167-A003	GAD OF CONDENSATE STORAGE TANKS	4	PRIMARY
3	PE-V0-519-167-A201	DATA SHEET OF PIPES, FITTINGS, PLATES & STRUCTURE OF CONDENSATE STORAGE TANKS	6	SECONDARY
4	PE-V0-519-167-A202	GA & TDS OF LEVEL INDICATOR ON ROOF OF TANK	6	SECONDARY
5	PE-V0-519-167-A203	GA & TDS OF VALVES FOR CONDENSATE STORAGE TANKS	6	SECONDARY
6	PE-V0-519-167-A301	QAP/CHECKLIST OF COMPONENTS OF CONDENSATE STORAGE TANKS	6	SECONDARY
7	PE-V0-519-167-A302	QAP OF VALVES FOR MISC. TANKS	6	SECONDARY
8	PE-V0-519-167-A303	SUB VENDOR LIST WITH INSPECTION CATEGORY FOR MISC. FGD TANKS	3	PRIMARY
9	PE-V0-519-167-A501	O&M MANUAL OF CONDENSATE STORAGE TANKS	8	SECONDARY
10	PE-V0-519-167-A401	FABRICATION DRAWING OF CONDENSATE STORAGE TANKS	5	SECONDARY

DRAWINGS /DOCUMENTS REQUIRED DURING DETAILED ENGINEERING (1X800 MW NTPC SIPAT STPP STAGE-III)

S. NO.	DOCUMENT NO.	DOCUMENT TITLE	SCH. DATE OF SUB. FROM LOI (IN WEEKS)	DRAWING CLASSIFICATION
1	PE-V0-520-167-A101	DESIGN CALCULATION OF CONDENSATE STORAGE TANK INCLUDING STAAD CALCULATION OF ROOF STRUCTURE	3	PRIMARY
2	PE-V0-520-167-A111	GAD OF CONDENSATE STORAGE TANK	4	PRIMARY
3	PE-V0-520-167-A201	DATA SHEET OF PIPES, FITTINGS, PLATES & STRUCTURE OF CONDENSATE STORAGE TANK	6	SECONDARY
4	PE-V0-520-167-A202	GA & TDS OF LEVEL INDICATOR ON ROOF OF TANK	6	SECONDARY
5	PE-V0-520-167-A203	GA & TDS OF VALVES FOR CONDENSATE STORAGE TANK	6	SECONDARY
6	PE-V0-520-167-A301	QAP/CHECKLIST OF COMPONENTS OF CONDENSATE STORAGE TANK	6	SECONDARY
7	PE-V0-520-167-A302	QAP OF VALVES FOR CONDENSATE STORAGE TANK	6	SECONDARY
8	PE-V0-520-167-A303	SUB VENDOR LIST WITH INSPECTION CATEGORY FOR CONDENSATE STORAGE TANK	3	PRIMARY

9	PE-V0-520-167-A501	O&M MANUAL OF CONDENSATE STORAGE TANK	8	SECONDARY
10	PE-V0-520-167-A401	FABRICATION DRAWING OF CONDENSATE STORAGE TANK	5	SECONDARY

NOTE:

1. Drawing / Document shall be uploaded by the successful bidder on WRENCH /DMS. Procedure for the same will be informed after award of contract.
2. Resubmission of drawing/ documents shall be done within 7 days upon receipt of customer/BHEL
   comments by Bidder.

SIGNATURE: _____
NAME: _____
DESIGNATION: _____
COMPANY _____
DATE: _____
COMPANY SEAL

Other points to be considered while preparing drawings/documents:

a) Data sheets of various items shall be prepared by the bidder for Condensate storage tanks and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer / consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.

b) Drawing, nozzle schedule, design data, material of construction etc. shall be prepared by the bidder during detail engineering stage based on specification / contractual requirement and there should be no commercial implication on account of finalization of the drawings and documents.

c) Drawing covering all details shown in data sheets like design data, dimensions, material of construction, list of appurtenances, lists of specifications, details of paints, standards & codes, general notes including details of test to be conducted on Condensate storage tanks in accordance with specification and brand-name of welding electrodes to be used etc.

d) Field quality plan / quality assurance plan / check list shall be prepared by the bidder for Condensate storage tanks / each instrument / item and shall be submitted to BHEL / customer / consultant for approval after placement of order and any changes required by BHEL / customer /consultant for the same shall be incorporated and adhered by the bidder without any commercial implications.

e) Bar chart, list of drawings and documents including data sheet, manual calculation, quality plan, field quality plan, PG test procedure, list of sub-vendors, technical specification and material of construction, painting specification / schedule, dispatch schedule etc. of various items as required by BHEL / customer / consultant shall be submitted to BHEL / customer / consultant during detail engineering stage for approval and the approved drawings / documents shall be adhered by the bidder without any commercial implication.

f) All possible efforts shall be made by the bidder to get the approval of drawings and documents from BHEL / customer / consultant at the earliest and the documents prepared / generated by them or their sub-vendors shall be checked by their competent authority before submission to BHEL.

g) Revision made by the bidder in any drawings and documents shall be highlighted by indicating the no. of revisions in a triangle without fail so that the minimum time is required by BHEL to review the drawings and documents.

h) Any other drawings and documents in addition to the list of drawings and documents indicated in the NIT specification as required by BHEL for the execution of the project shall be furnished by them during detailed engineering stage and no commercial implication shall be entertained by BHEL for the same.

i) Bidder to note that all the drawings shall be prepared in Auto Cad - 2016 version or later and required number of hardcopies and soft copies shall be furnished to BHEL during detailed engineering stage. Exact requirement of number of hard copies and soft copies of all drawings and documents as required by BHEL / customer / consultant shall be informed to the successful bidder during detail engineering stage and bidder to furnish the same for which no additional cost shall be entertained.

j) Bidder to provide AutoCAD copy of drawing / document for review and interfacing with our facilities.

k) Minor civil works will be done by bidder based on tech spec. furnished by the BHEL/Customer in this spec or during detailed engineering.

l) All drawings and documents shall be furnished to BHEL during detailed engineering stage and shall include / indicate the following details for clarity w.r.t. inspection, construction, erection and maintenance etc.

   ➢ All drawings and documents shall bear BHEL's title block and drawing / document number. However, BHEL's drawing / document numbering scheme shall be furnished to the successful bidder after the placement of L.O.I.

   ➢ All drawings and documents shall indicate the list of all reference drawings including general arrangement.

   ➢ All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow-up view etc. All major self-manufactured and bought out items shall be labelled and included in BOQ / BOM in tabular form indicating all components including bought out items and their quantity, material of construction indicating its applicable code / standard, weight, make etc.

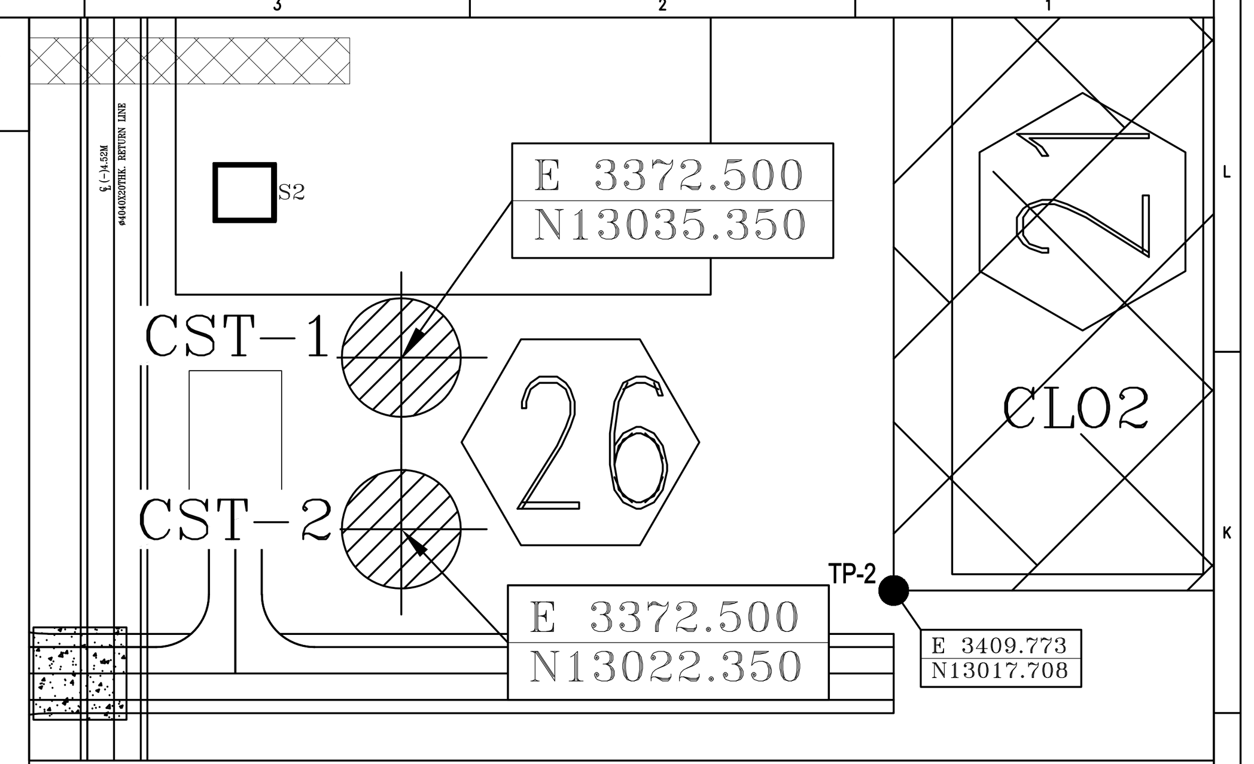
All text/ numeric in the document / drawings to be generated by the successful bidder will be in English language only.

ANNEXURE-V

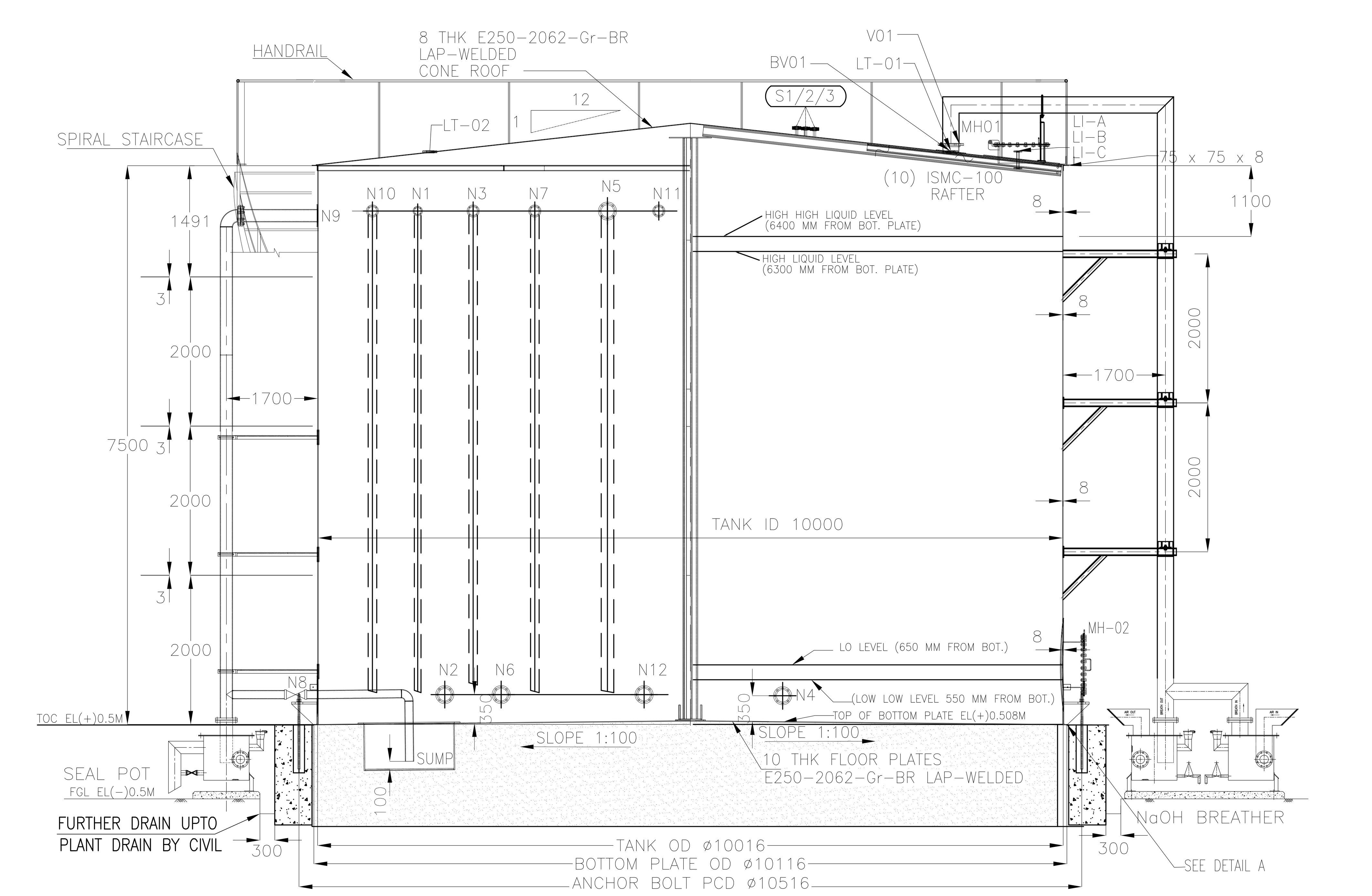
GA DRAWINGS OF MISC. TANKS

DESIGN PARAMETERS

GOVERNING STANDARD: API-650	DESIGN INTERNAL PRESSURE: 0.62 kPa	MIN. DESIGN TEMP.: 15 °C	DESIGN TEMP.: 60 °C	C.A. SHELL: 1.5 mm	RADIOGRAPH: SPOT PER CODE
EDITION: 13TH EDITION	DESIGN EXTERNAL PRESSURE: 0.25 kPa	JOINT EFFICIENCY: SHELL: 0.85 ROOF: 0.85	BOTTOM: 0.85	C.A. BOTTOM: 1.5 mm	ANCHORAGE: YES
APPENDIX(ICS): A, E, F	SPECIFIC GRAVITY: 1.0	BOTTOM SEAMS:	LW	C.A. ROOF: 1.5 mm	WINDGIRDER: NONE
CAPACITY TO TOP OF SHELL: 589 m^3	BASIC WIND SPEED: Vb= 39 m/s	FIXED ROOF SEAMS:	LW	C.A. STRUCTURE: 1.5 mm	WORKING CAPACITY: 502 m^3
DESIGN LIQUID LEVEL: 6.4 m	PEAK GROUND SEISMIC ACCELERATION: Sp= 0.24	FLOATING ROOF SEAMS:	__	NET WORKING CAPACITY: 451 m^3	DESIGN BY: DATE
MAX OPERATING TEMPERATURE: 45 °C	ALLOWABLE STRESS: 145 MPa	SHELL SEAMS:	DBW		CHECK BY: DATE



KEY PLAN

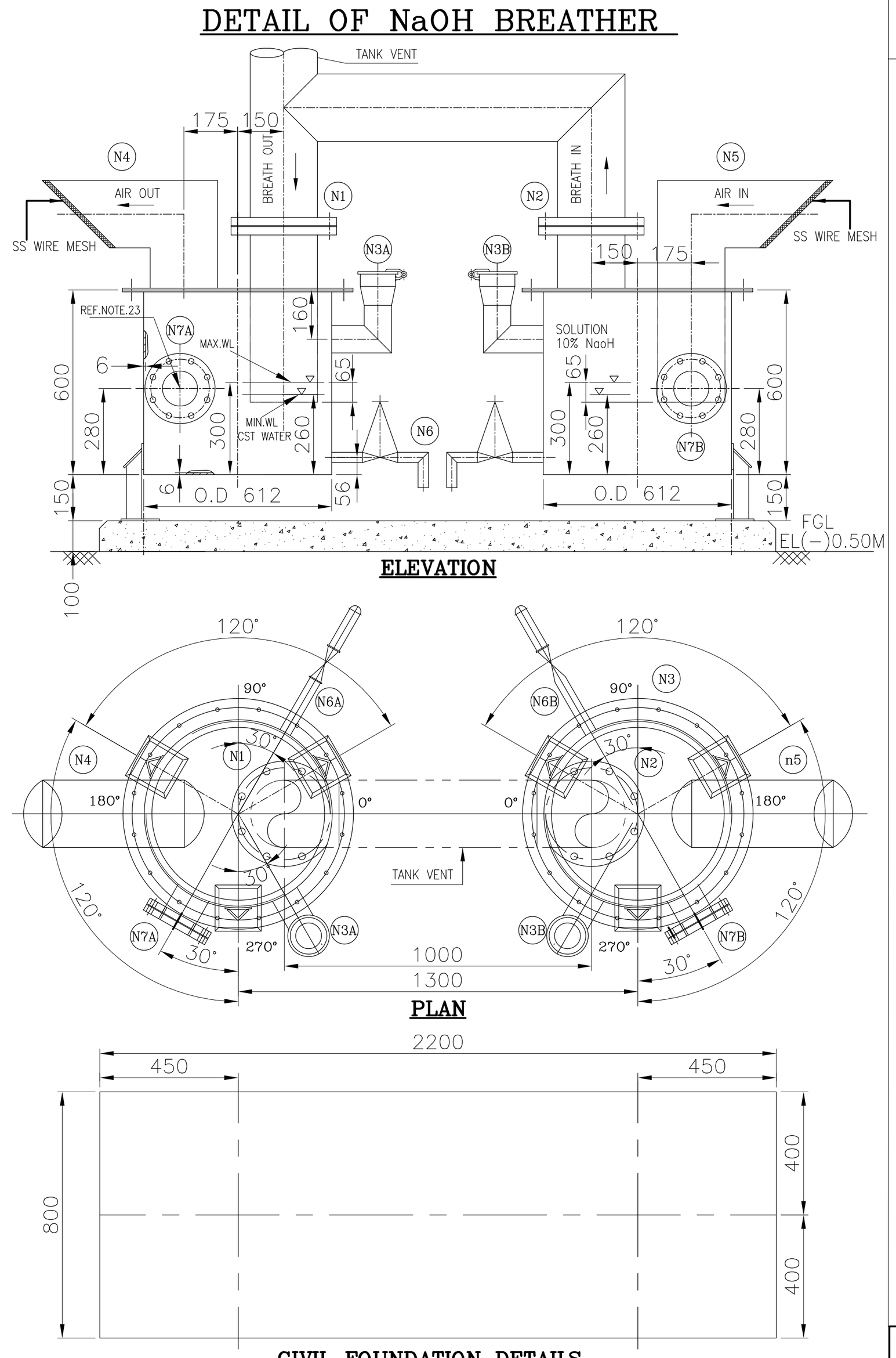


TANK ELEVATION VIEW

TANK LOAD DATA:
WEIGHT OF TANK, EMPTY : 32000 KG
WEIGHT OF TANK, FULL OF WATER : 620750 KG
SEISMIC MOMENT (RING-WALL) : 2780.4 KN-M
SEISMIC MOMENT (SLAB) : 4282.7 KN-M
WIND MOMENT : 505.5 KN-M
SHEAR DUE TO SEISMIC : 1027.0 KN
SHEAR DUE TO WIND : 40.5 KN
LOAD PER ANCHOR : 123.96 KN
ROOF LOAD : 150 KG/M2

NOTES:-
1. ALL DIMENSIONS ARE IN MM. ELEVATIONS ARE IN METRE UNLESS OTHERWISE SPECIFIED.
2. EL(+) 0.00 IS THE GROUND FLOOR LEVEL FOR MAIN POWER HOUSE BUILDING WHICH CORRESPONDS TO RL (+)373.50M.
3. TANK SURFACE SHOULD BE CLEANED THOROUGHLY AFTER FABRICATION FROM LOSSE SUBSTANCES AND FOREIGN MATERIALS LIKE DUST, RUST, SCALE, OIL, GREASE & WELDING FLUX ETC.
4. VERTICAL SHELL JOINTS SHALL BE OFFSET FROM EACH OTHER WITH A MINIMUM DISTANCE OF 5 TIMES THE THICKNESS OF SHELL COURSE UNDER CONSIDERATION.
5. BOTTOM PLATE SHALL UNIFORMLY REST ON THE FOUNDATION. THREE PLATES JOINTS IN THE BOTTOM PLATE SHALL NOT BE CLOSER THAN 300MM FROM EACH OTHER AND ALSO FROM THE TANK SHELL.
6. EARTHING LUG AND NAME PLATE SHALL BE WELDED TO THE TANK AS PER SITE REQUIREMENT.
7. ALL INLET PIPING SHALL BE EXTENDED TO THE BOTTOM OF THE TANK AND CLEARANCE BETWEEN THE BOTTOM OF THE TANK AND THE EDGES OF THE INLET PIPING SHALL BE MAXIMUM 500MM.
8. WEIR PLATE SHALL BE PROVIDED AT THE BOTTOM OF ALL INLET PIPES INSIDE TANK TO AVOID EROSION OF THE BOTTOM PLATE.
9. TREAD AND RISE FOR STAIRCASE OF THE TANK SHALL BE MAXIMUM 250MM AND 200MM RESPECTIVELY.
10. LEVEL INDICATOR SUPPORTS SHALL BE PROVIDED AT THE SHELL AND ROOF.
11. PAD PLATES AND STRUCTURE FOR SUPPORTING ALL INLET, OVERFLOW, DRAIN AND VENT PIPING OF THE TANK SHALL BE PROVIDED.
12. FINAL PAINTING SHALL BE CARRIED OUT AS PER APPROVED PAINTING SCHEDULE AFTER HYDRO TEST OF THE TANK.
13. TANK NOZZLE FLANGES SHALL BE PROVIDED WITH COUNTER FLANGES ALONG WITH NUTS AND BOLTS BY THE TANK VENDOR.
14. FABRICATION, ERECTION AND TESTING SHALL BE AS PER API 650.
15. FOR MANUAL WELDING PROCESS, THE FILLET WELD LEGS OR GROOVE WELD DEPTHS GREATER THAN 6MM SHALL BE MULTIPASS.
16. ALL TANK SHELL WELD INTERSECTIONS WHERE VERTICAL JOINTS MEET THE HORIZONTAL JOINTS SHALL BE RADIOGRAPHED, REGARDLESS OF THICKNESS.
17. ALL RADIOGRAPHY OR OTHER NDE AND ANY WELDING SHALL BE COMPLETED PRIOR TO HYDROSTATIC TESTING.
18. THE TANK HYDROSTATIC TEST SHALL BE CONDUCTED BEFORE PERMANENT EXTERNAL PIPING IS CONNECTED TO THE TANK EXCEPT FOR PIPING THAT IS NECESSARY TO FILL AND EMPTY THE TANK, WHICH SHOULD HAVE A FLEXIBLE COMPONENT TO ALLOW FOR THE SETTLEMENT.
19. ALL INLET, OVERFLOW, DRAIN AND VENT PIPING TO THE TANK SHALL BE PROVIDED WITH SUITABLE SIPHON BREAKER.
20. MANHOLE FOR THE ROOF AND SHELL OF THE TANK SHALL BE HINGED TYPE.
21. SEAL POTS AND NAOH BREATHER POTS SHALL BE PLACED ON THE CIVIL FOUNDATION BY USING THE ANCHOR FASTENER BY TANK SUPPLIER. NO POCKETS BY CIVIL AGENCY WILL BE PROVIDED IN FOUNDATION OF SEAL POTS AND NAOH BREATHERS.
22. MAX. AND MIN. WATER LEVEL MAINTAINED IN THE NAOH BREATHER AND SEAL POT SHALL BE IMPRINTED ON SIGHT GLASS.
23. HYDROSTATIC TEST SHALL BE CONDUCTED WITH FULL HEGHT OF WATER.
24. LOCATION OF STAIRCASE, NAOH BREATHER, SEAL POT AND NOZZLE ORIENTATIONS ARE TENTATIVE AND SHALL BE FINALIZED AFTER THE FINALIZATION OF LAYOUT DRAWING.

DETAIL OF NaOH BREATHER

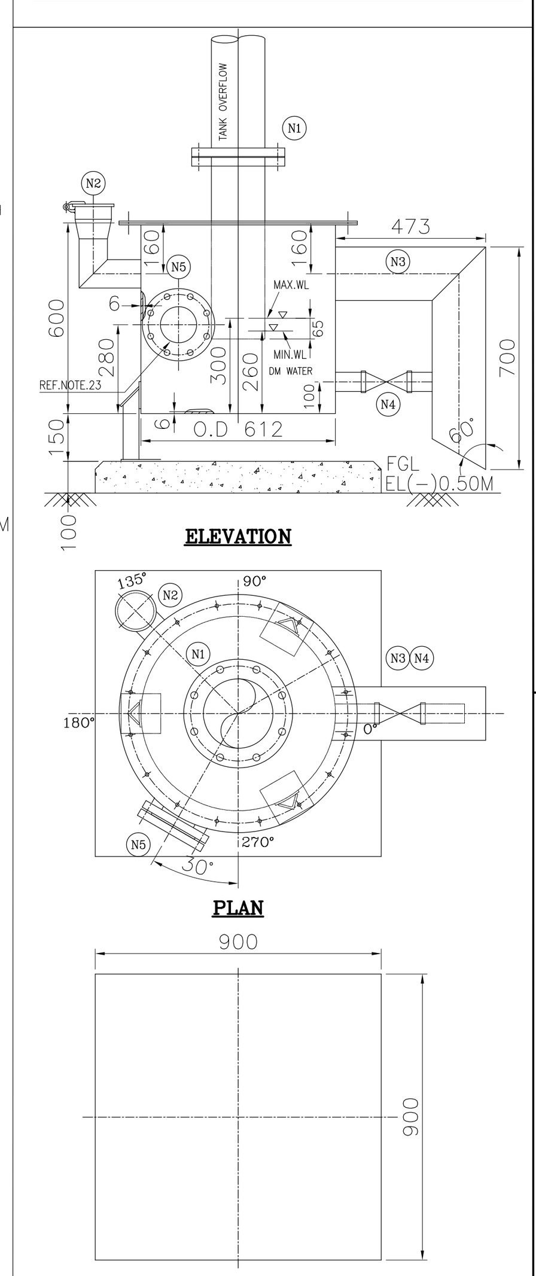


ELEVATION

PLAN

CIVIL FOUNDATION DETAILS

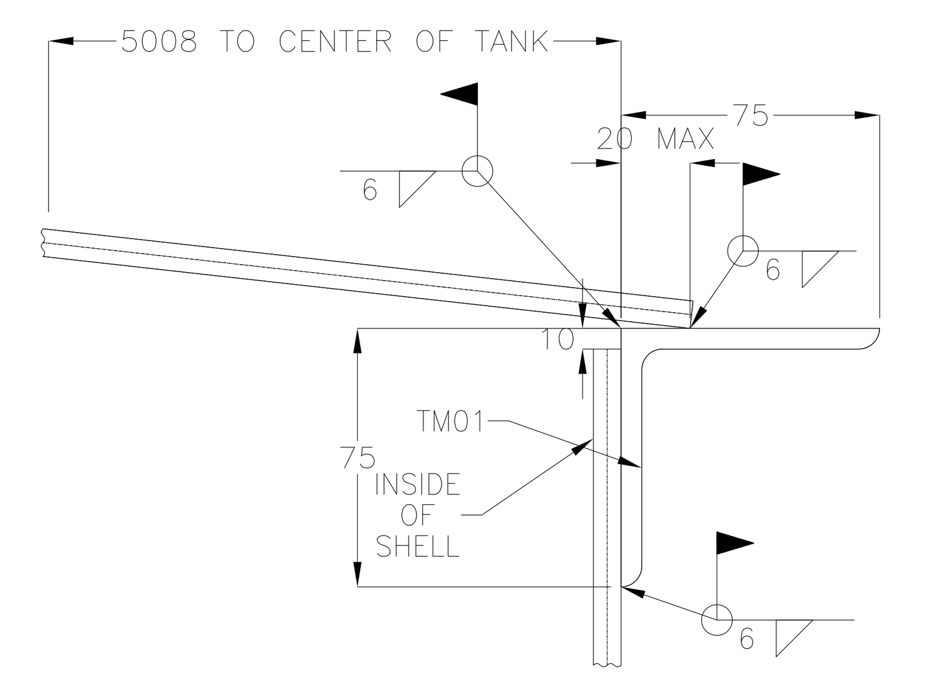
DETAIL OF SEAL POT



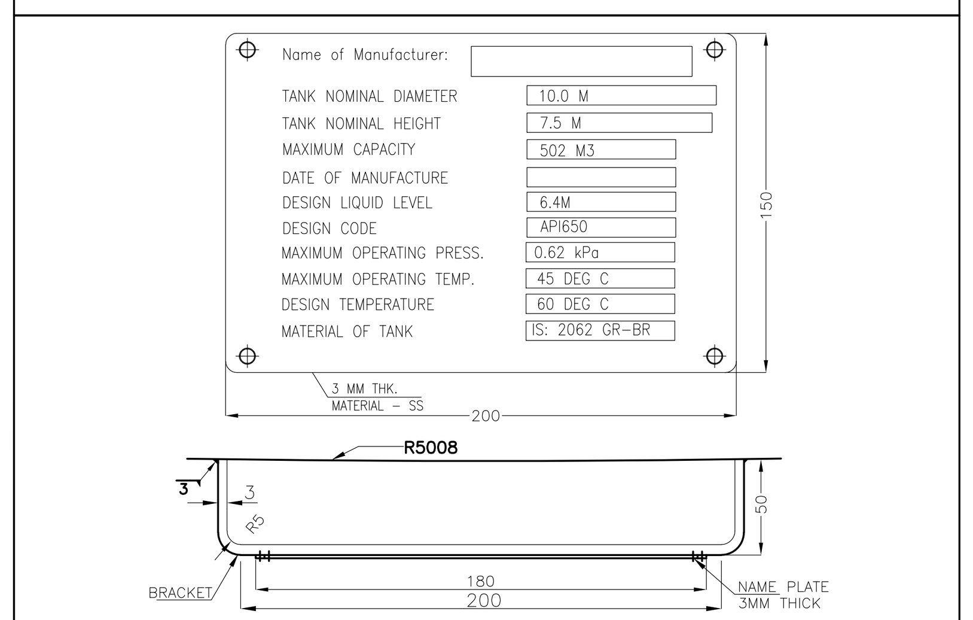
ELEVATION

PLAN

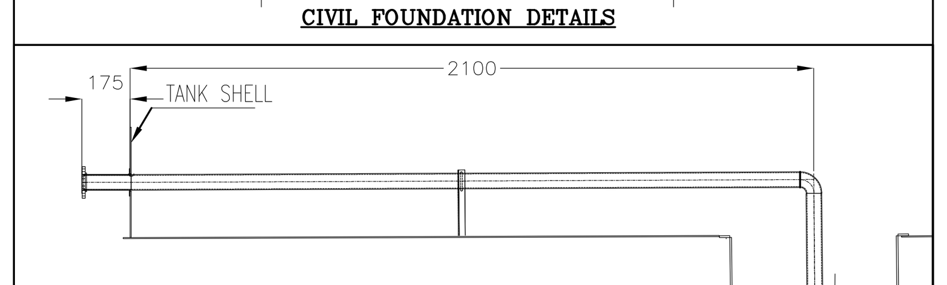
CIVIL FOUNDATION DETAILS



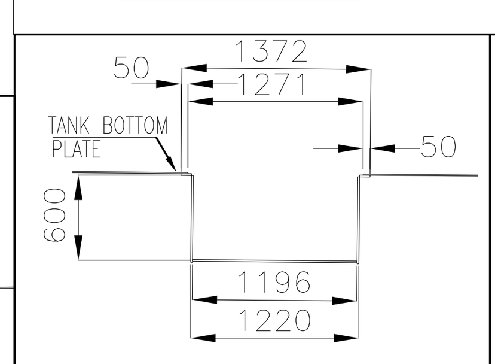
SHELL TO ROOF DETAIL



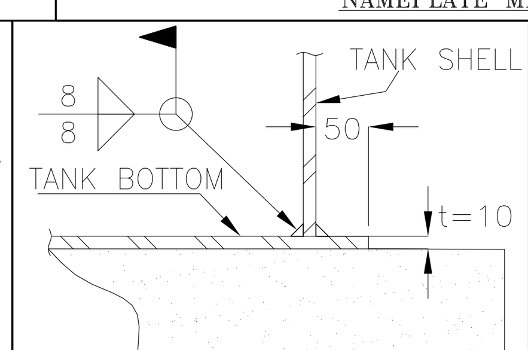
NAMEPLATE MK. NP01Ad



100NB DRAW-OFF



DRAW OFF SUMP



DETAIL A

TANK PAINTING SPECIFICATION

DESCRIPTION	INTERNAL	EXTERNAL	UNDERNEATH
SURFACE PREPARATION	BLAST CLEAN TO SA2.5 (USING NON-SILICEOUS ABRASIVE)	BLAST CLEAN TO SA2.5 (USING NON-SILICEOUS ABRASIVE)	POWER TOOL CLEANING/WIRE BRUSH CLEANING
PRIMER	1 COAT OF UNMODIFIED EPOXY RESIN ALONG WITH POLYAMIDE HARDENER OF 60 MICRONS	2 COATS OF EPOXY RESIN BASED ZINC PHOSPHATE OF 50 MICRONS EACH	2 COATS OF HIGH BUILD COAL TAR EPOXY SUITABLY PIGMENTED OF 100 MICRONS EACH
INTERMEDIATE COAT	NA	1 COAT OF RESIN BASED PAINT PIGMENTED WITH TITANIUM DIOXIDE 100 MICRONS	NA
FINISH	2 COATS OF UNMODIFIED EPOXY RESIN ALONG WITH AROMATIC ADDUCT HARDENER OF 170 MICRONS EACH	1 COAT OF EPOXY PAINT SUITABLY PIGMENTED WITH APPROVED SHADE WITH GLOSSY FINISH OF 75 MICRONS, FOLLOWED BY POLYURETHANE FINISH COAT OF 25 MICRONS.	NA
TOTAL DFT (MICRONS)	400	300	200

NOTES:
1. GI PIPES, SS PIPES & FITTINGS SHALL NOT BE PAINTED.
2. ALL STRUCTURAL STEEL SHALL BE PAINTED AT SITE.
3. METHOD OF PAINTING APPLICATION SHALL BE AS PER PAINT MANUFACTURER'S RECOMMENDATION.
4. SHADE FOR TANK SHALL BE SEA GREEN.

REFERENCE DRAWINGS:-
1. P&ID - CONDENSATE TRANSFER SYSTEM : 3112-110-PVM-F-042
2. PLOT PLAN : 3112-110-PVM-F-007

FOR TENDER PURPOSE ONLY

ALL THE REQUIREMENTS SHOWN UNDER GA DRAWING ARE BARE MINIMUM, ANY OTHER ITEM FOUND APPLICABLE DURING DETAILED ENGINEERING AS PER TECHNICAL SPECIFICATION/DESIGN CALCULATION/ FUNCTIONAL REQUIREMENT SHALL BE SUPPLIED BY BIDDER WITHOUT ANY COMMERCIAL IMPLICATION TO BHEL.

NOTE:- SCAN QR CODE FOR CHECKING THE LATEST REV. STATUS OF DRAWING.

ग्राहक ड्राइंग संख्या / CUSTOMER DRAWING NO.: 3112-122-051-PVM-B-030

ग्राहक/CUSTOMER: दामोदर घाटी निगम

कार्य संख्या / JOB NO.: 519
स्थिति / STATUS: CONTRACT

परियोजना / PROJECT: 2X800 मेगावाट कोडरमा ता. वि. के. चरण-II
2X800 MW KODERMA TPS, PHASE-II

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LTD
पावर सेक्टर/POWER SECTOR
परियोजना अभियांत्रिकी प्रबंधन
PROJECT ENGINEERING MANAGEMENT
नोएडा (उ.प्र.)/NOIDA (U.P.)

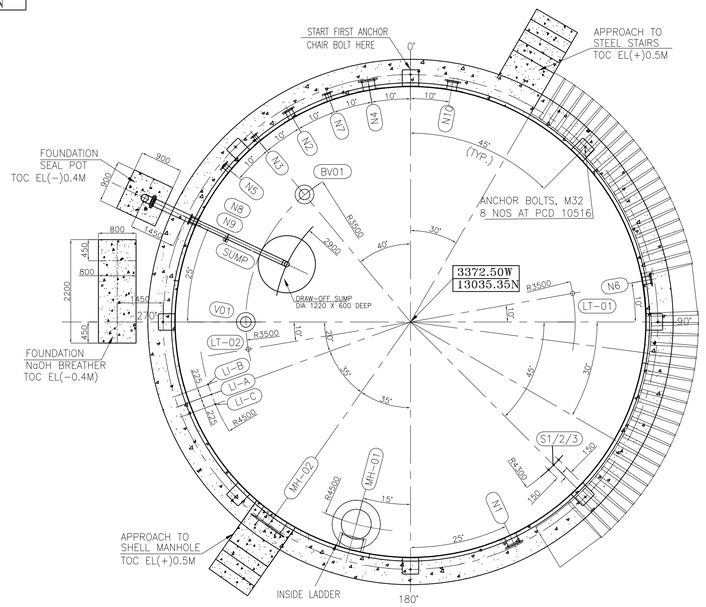
शीर्षक/TITLE: GA & LOAD DATA OF CONDENSATE STORAGE TANK 1 & 2

ड्राइंग संख्या / DRAWING NO.: PE-V0-519-167-A003
शीट / SHEET 1 OF 1
संशोधन / REV. 00

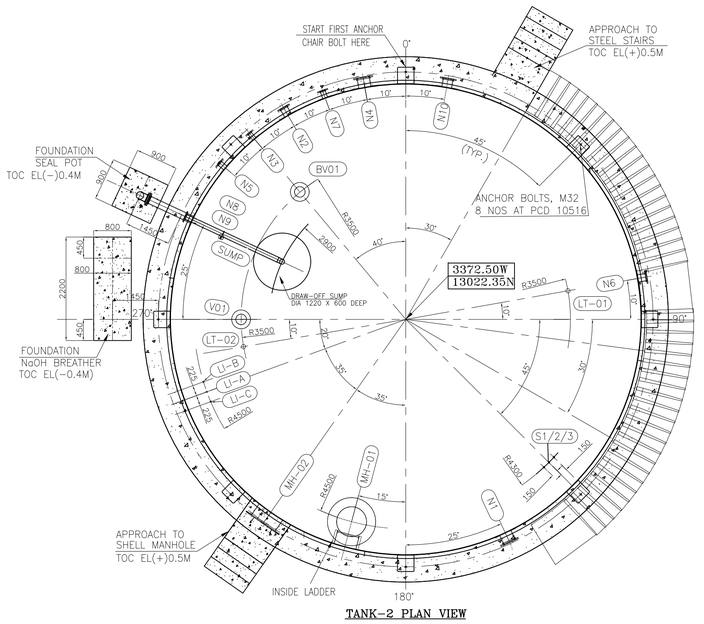
ELECTRONIC FILE NAME : Koderma Ph-II- GA & Load Data of Condensate Storage Tanks- For Tender purpose.dwg

फॉर्मेट साइज़ A0
FORMAT SIZE A0

ELECTRONIC FILE NAME : Koderma Ph-II- GA & Load Data of Condensate Storage Tanks- For Tender purpose.dwg



TANK−1 PLAN VIEW



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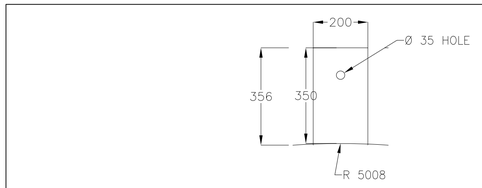
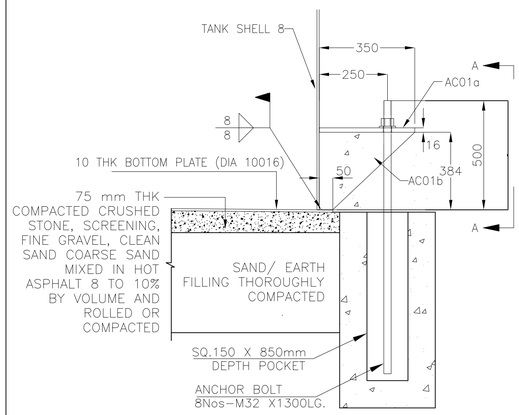
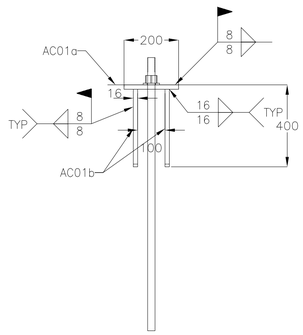


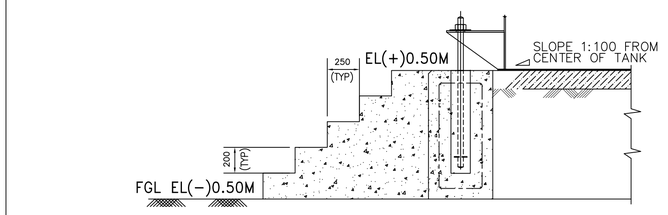
TOP PLATE AC01a DETAIL

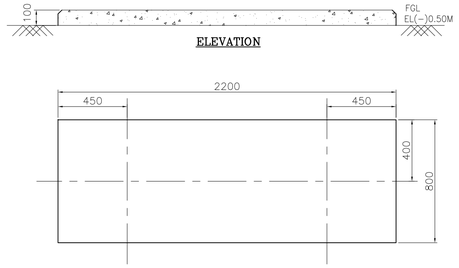


ANCHOR CHAIR DETAIL

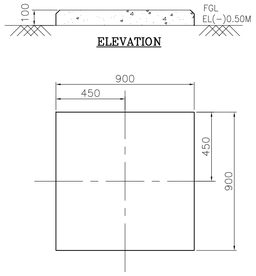


SECTION A−A





NaOH BREATHER CIVIL FOUNDATION DETAILS



SEAL POT CIVIL FOUNDATION DETAILS

ROOF APPURTENANCE

DESCRIPTION	CUSTOM MARK	FLANGE TYPE, RATING	NOZZLE THICKNESS	SIZE	OUTSIDE PROJECTION	HORZ. RADIUS FROM CENTER OF TANK ROOF	ORIENTATION
ROOF MANHOLE	MH01	PL. 8	8.0	600NB	200	4500	195°
LEVEL INDICATOR	LI−A/B/C	SORF,#150	3.38	25NB	150	4500	250°
LEVEL TRANSMITTER−1	LT−01	SORF,#150	5.49	80NB	200	3500	80°
LEVEL TRANSMITTER−2	LT−02	SORF,#150	5.49	80NB	200	3500	260°
ROOF VENT	V01	SORF,#150	7.11	150NB	150	3500	270°
BREATHER VALVE	BV01	SORF,#150	7.11	150NB	150	3500	320°
SPARE	S1/2/3	SORF,#150	5.49	50NB	150	4300	135°

SHELL APPURTENANCE

DESCRIPTION	CUSTOM MARK	FLANGE TYPE, RATING	NOZZLE THICKNESS	SIZE	OUTSIDE PROJECTION	ELEVATION FROM TOP OF BOTTOM PLATE	ORIENTATION
TANK INLET	N1	SORF,#150	10.97	150NB	200	6800	155°
TANK OUTLET	N2	SORF,#150	12.70	250NB	225	400	330°
CT PUMP RE−CIRCULATION	N3	SORF,#150	10.97	100NB	175	6800	320°
SAMPLING CONN. WITH VALVE	N4	SORF,#150	5.54	50NB	175	400	350°
EXCESS CONDENSATE RETURN	N5	SORF,#150	12.70	300NB	225	6800	310°
SPARE WITH VALVE	N6	SORF,#150	12.70	250NB	225	400	80°
SPARE WITH VALVE	N7	SORF,#150	10.97	150NB	200	6800	340°
DRAIN	N8	SORF,#150	8.56	100NB	175	260	295°
OVERFLOW	N9	SORF,#150	10.97	150NB	200	6500	295°
SPARE WITH VALVE	N10	SORF,#150	8.56	100NB	175	6800	10°
SHELL MANWAY	MH−02	PL. 10	10.0	600NB	275	800	215°
SPARE WITH VALVE	N11	SORF,#150	10.97	150NB	200	6800	235°
SPARE WITH VALVE	N12	SORF,#150	12.70	250NB	225	400	60°

MATERIAL SPECIFICATION

ITEM	MATERIAL
SHELL, BOTTOM, ROOF, RF PLATE	IS: 2062 E250 GR−BR
NOZZLES	STAINLESS STEEL TO A312 GR. 304, SOCKET WELDED FOR 50NB AND BELOW STAINLESS STEEL TO A312 GR. 304, BUTT WELDED FOR ABOVE 50NB
PIPE	STAINLESS STEEL ASTM A312 GR. TP304, SCH 10S FOR ABOVE 50NB PIPE STAINLESS STEEL ASTM A312 GR. TP304, SCH 40S FOR 50NB AND BELOW
MANHOLE NECK	IS: 2062 E250 GR−BR
NOZZLE FLANGES	STAINLESS STEEL TO A240 GR. 304
HAND RAILING (32NB)	IS: 1239 (MEDIUM GRADE), GALVANIZED AS PER IS: 4736
GASKETS	NEOPRENE RUBBER/NON ASBESTOS
BOLTING (NUTS & BOLTS)	SA 193 GR.B7 & SA194 GR.2H; IS:1367 FOR MANHOLE & ANCHOR BOLTS,
STRUCTURES	IS: 2062 E250 GR−A
FITTING OF 50 NB & BELOW(SW)	STAINLESS STEEL TO A182 GR. 304 OR A403 GR. WP304 CLASS−S; SW TO ANSI B16.11
FITTING OF ABOVE 50 NB (BUTT WELDED)	STAINLESS STEEL TO A403 GR. WP304 CLASS W; BUTT WELDED TO ANSI B16.9
NAME PLATE & EARTHING CLEAT	SS 304
ANCHOR BOLTS	IS: 2062 E250 GR−A
TREADS & PLATFORM GRATING	IS:2062 E250 GR−A (GRATINGS SHALL BE ELECTRO FORGED TYPES. MINIMUM THICKNESS OF THE GRATING SHALL BE 32 MM. ALL GRATING SHALL BE HOT DIP GALVANIZED AT THE RATE OF 610 G PER SQ. M. AFTER SURFACE PREPARATION BY MEANS OF BLAST CLEANING/ ACID PICKLING.)

MARKED	SIZE NB	TYPE	RATING	STANDARD	QTY	PROJ−ECTION	SERVICE
N7A/B	100	SORF	#150lbs;	ASME B−16.5	2	100	SIGHT GLASS
N6A/B	25	−−	−−	−−	2	−−	DRAIN WITH GLOBE VALVE
N5	200	−−	−−	−−	1	−−	VENT
N4	200	−−	−−	−−	1	−−	VENT
N3A/B	80	−−	#150lbs;	−−	2	−−	CHEMICAL INLET/DM WATER INLET
N2	200	SORF	#150lbs;	ASME B−16.5	1	200	VENT INLET
N1	200	SORF	−−	−−	1	200	VENT INLET
NOZZLE		FLANGE					

NOZZLE SCHEDULE OF NAOH BREATHER

MARKED	SIZE NB	TYPE	RATING	STANDARD	QTY	PROJ−ECTION	SERVICE
N5	100	SORF	#150lbs;	ASME B−16.5	1	100	SIGHT GLASS
N4	50	SORF	#150lbs;	ASME B−16.5	1	100	DRAIN WITH GLOBE VALVE
N3	150	−−	−−	−−	1	−−	OVERFLOW
N2	80	−−	−−	−−	1	−−	DM WATER INLET
N1	150	SORF	−−	−−	1	200	TANK OVERFLOW INLET
NOZZLE		FLANGE					

NOZZLE SCHEDULE OF SEAL POT

NOTES:

1. ELEVATIONS SHOWN ARE FROM TOP OF TANK BOTTOM AT THE LOCATION OF THE APPURTENANCE.
2. WIDTH OF STAIRCASE IS MIN 1200MM.
3. LEVEL INDICATOR IS FLOAT TYPE WITH DIAL TYPE INDICATOR (GUIDE WIRE, FLOAT AND HOUSING OF SS 316 GR. CONSTRUCTION).

NOTE:: SCAN QR CODE FOR CHECKING THE LATEST REV. STATUS OF DRAWING.

संशोधन REV.	दिनांक DATE	परीक्षित/CHD	स्वीकृत/APPD	संशोधन REV.	दिनांक DATE	परीक्षित/CHD	स्वीकृत/APPD		

ग्राहक ड्राईंग संख्या CUSTOMER DRAWING NO. 3112-122-051-PVM-B-030

ग्राहक/CUSTOMER: दामोदर घाटी निगम

कार्य संख्या/JOB NO. 519

परियोजना PROJECT: 2X800 मेगावाट कोडरमा ता. वि. के. चरण−II / 2X800 MW KODERMA TPS, PHASE−II

स्थिति STATUS: CONTRACT

मुद्रण स्केल मीटर में PRINT SCALE IN METRE: 0 2 4 6 8 10 20 30 40 50

भारत हेवी इलेक्ट्रिकल्स लिमिटेड BHARAT HEAVY ELECTRICALS LTD
पावर सेक्टर/POWER SECTOR
परियोजना अभियांत्रिकी प्रबंधन
PROJECT ENGINEERING MANAGEMENT
नोएडा (उ॰प्र॰)/NOIDA (U.P.)

DEPT CODE: M

	नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
तैयारकर्ता/DRN			
डिजाइनकर्ता/DESN			
परीक्षितकर्ता/CHD			
स्वीकृतकर्ता/APPD			

शीर्षक/TITLE: GA & LOAD DATA OF CONDENSATE STORAGE TANK 1 & 2

एमपीएल MPL	सिविल CIVIL	इलेक्ट्रिकल ELEC	स्वास्थ्य,सुरक्षा एवं पर्यावरण S&CE	वेल्डिंग WSE	मैकेनिकल MAX

डिज़ाइन DEPT. | स्केल – SCALE– NTS | हस्ताक्षर SIGN | दिनांक DATE

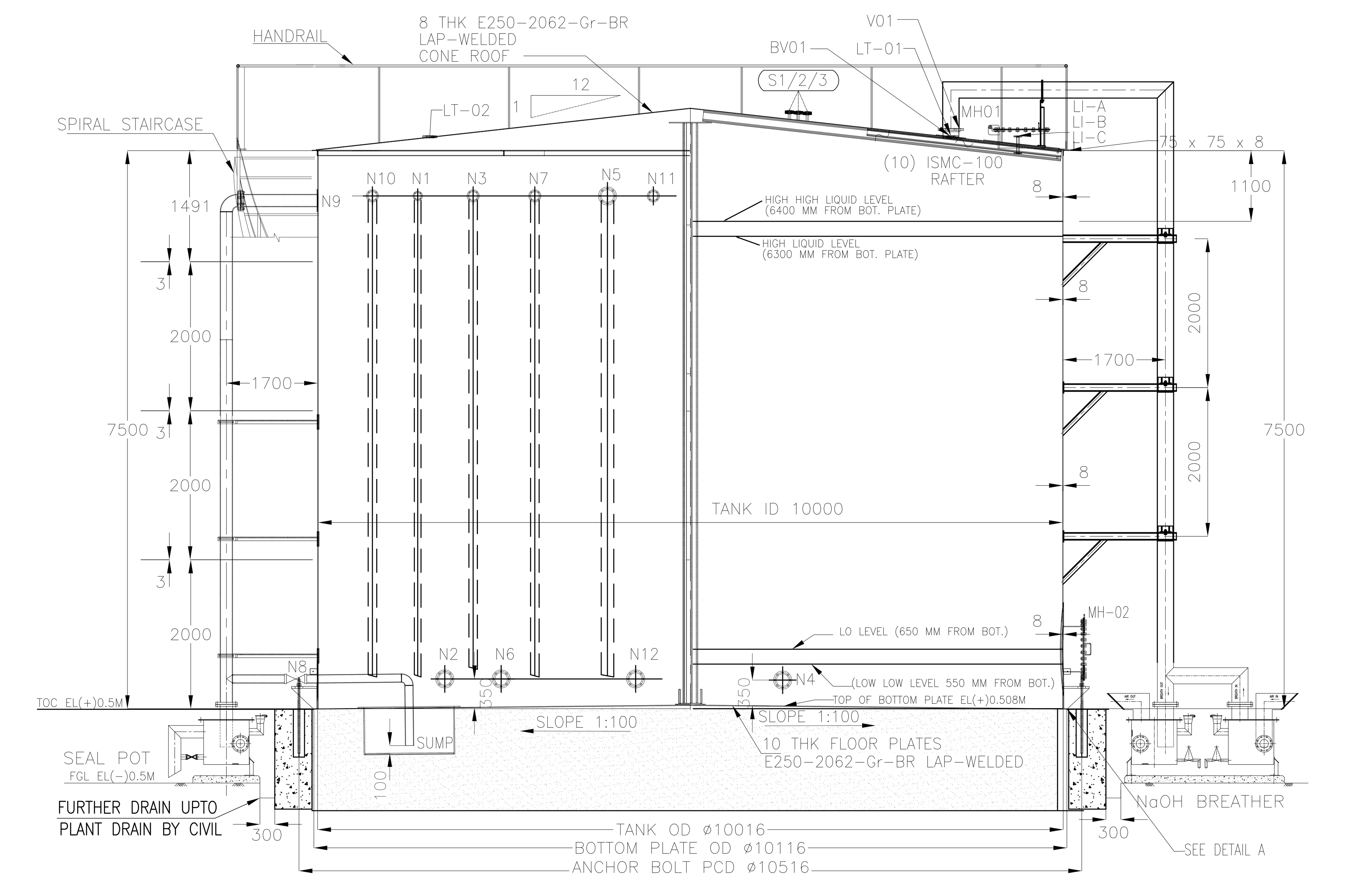
ड्राईंग संख्या / DRAWING NO. PE−V0−519−167−A003

शीट SHEET 1 OF 1 | पुनरीक्षण REV. 00

फॉर्मेट साइज़ A0 FORMAT SIZE A0

DESIGN PARAMETERS

GOVERNING STANDARD:	API-650	DESIGN INTERNAL PRESSURE:	0.62 kPa	MIN. DESIGN TEMP.: 15 °C	DESIGN TEMP.: 60 °C	C.A. SHELL:	1.5 mm	RADIOGRAPH:	SPOT PER CODE
EDITION:	13TH EDITION	DESIGN EXTERNAL PRESSURE:	0.25 kPa	JOINT EFFICIENCY: SHELL: 0.85 ROOF: 0.85	BOTTOM: 0.85	C.A. BOTTOM:	1.5 mm	ANCHORAGE:	YES
APPENDIX(ICS):	A, E, F	SPECIFIC GRAVITY:	1.0	BOTTOM SEAMS:	LW	C.A. ROOF:	1.5 mm	WINDGIRDER:	NONE
CAPACITY TO TOP OF SHELL:	589 m^3	BASIC WIND SPEED:	Vb= 47 m/s	FIXED ROOF SEAMS:	LW	C.A. STRUCTURE:	1.5 mm	WORKING CAPACITY:	502 m^3
DESIGN LIQUID LEVEL:	6.4 m	PEAK GROUND SEISMIC ACCELERATION:	Sp= 0.14	FLOATING ROOF SEAMS:	__	NET WORKING CAPACITY:	451 m^3	DESIGN BY:	DATE
MAX OPERATING TEMPERATURE:	45 °C	ALLOWABLE STRESS:	145 MPa	SHELL SEAMS:	DBW			CHECK BY:	DATE



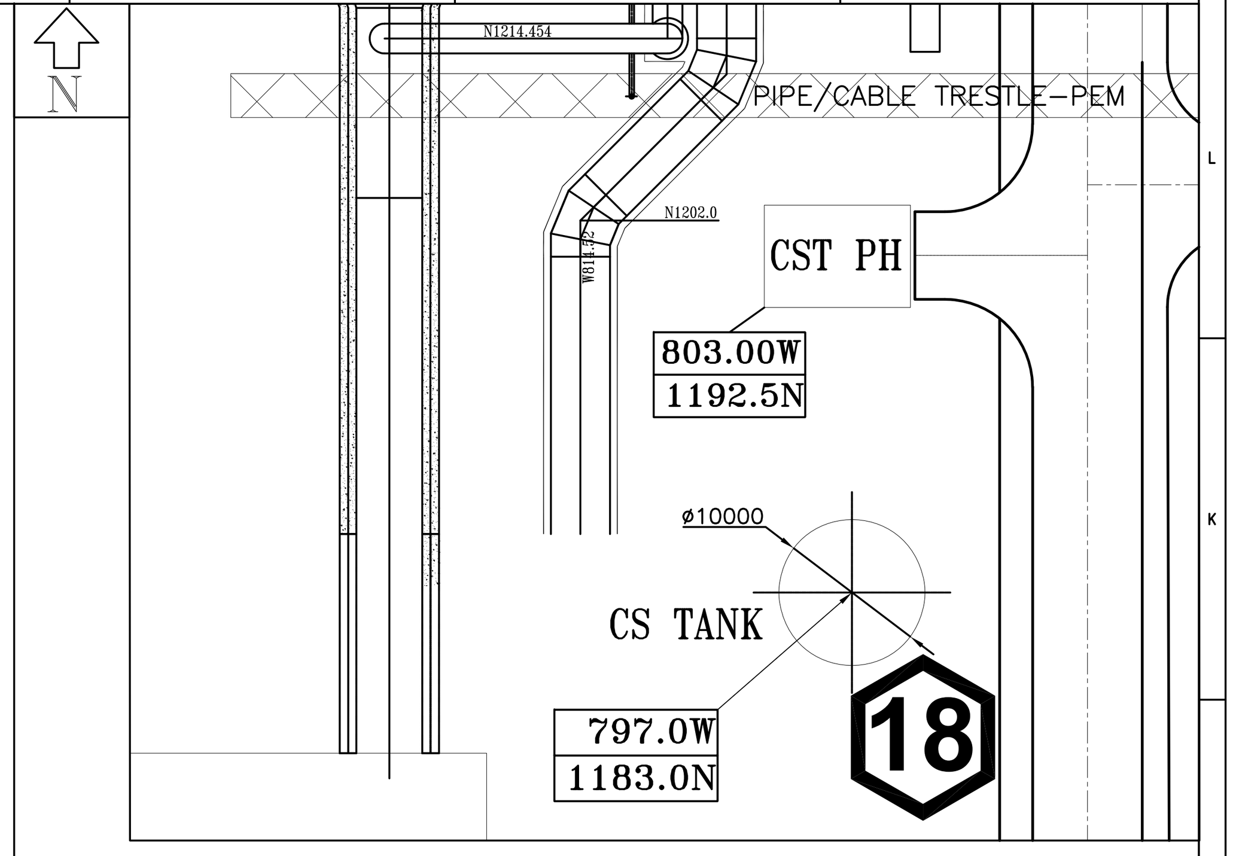
TANK ELEVATION VIEW

TANK LOAD DATA:

WEIGHT OF TANK, EMPTY : 32000 KG
WEIGHT OF TANK, FULL OF WATER : 620750 KG
SEISMIC MOMENT (RING-WALL) : 1705 KN-M
SEISMIC MOMENT (SLAB) : 2596 KN-M
WIND MOMENT : 736.5 KN-M
SHEAR DUE TO SEISMIC : 618.55 KN
SHEAR DUE TO WIND : 59.25 KN
LOAD PER ANCHOR : 68.67 KN
ROOF LOAD : 150 KG/M2

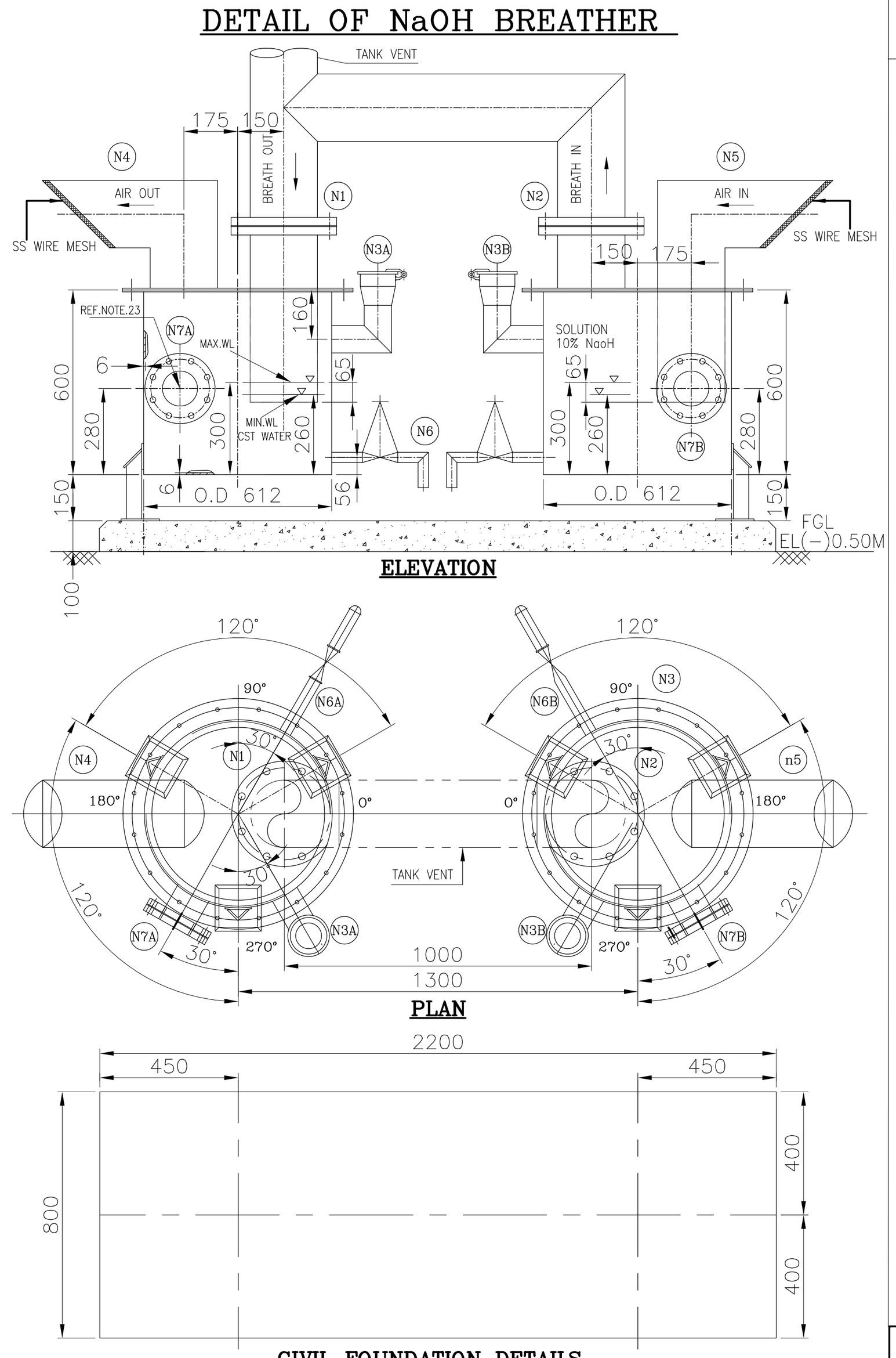
NOTES:-

1. ALL DIMENSIONS ARE IN MM. ELEVATIONS ARE IN METRE UNLESS OTHERWISE SPECIFIED.
2. EL(+) 0.00 IS THE GROUND FLOOR LEVEL FOR MAIN POWER HOUSE BUILDING WHICH CORRESPONDS TO RL (+)282.50M.
3. TANK SURFACE SHOULD BE CLEANED THOROUGHLY AFTER FABRICATION FROM LOSSE SUBSTANCES AND FOREIGN MATERIALS LIKE DUST, RUST, SCALE, OIL, GREASE & WELDING FLUX ETC.
4. VERTICAL SHELL JOINTS SHALL BE OFFSET FROM EACH OTHER WITH A MINIMUM DISTANCE OF 5 TIMES THE THICKNESS OF SHELL COURSE UNDER CONSIDERATION.
5. BOTTOM PLATE SHALL UNIFORMLY REST ON THE FOUNDATION. THREE PLATES JOINTS IN THE BOTTOM PLATE SHALL NOT BE CLOSER THAN 300MM FROM EACH OTHER AND ALSO FROM THE TANK SHELL.
6. EARTHING LUG AND NAME PLATE SHALL BE WELDED TO THE TANK AS PER SITE REQUIREMENT.
7. ALL INLET PIPING SHALL BE EXTENDED TO THE BOTTOM OF THE TANK AND CLEARANCE BETWEEN THE BOTTOM OF THE TANK AND THE EDGES OF THE INLET PIPING SHALL BE MAXIMUM 500MM.
8. WEIR PLATE SHALL BE PROVIDED AT THE BOTTOM OF ALL INLET PIPES INSIDE TANK TO AVOID EROSION OF THE BOTTOM PLATE.
9. TREAD AND RISE FOR STAIRCASE OF THE TANK SHALL BE MAXIMUM 250MM AND 200MM RESPECTIVELY.
10. LEVEL INDICATOR SUPPORTS SHALL BE PROVIDED AT THE SHELL AND ROOF.
11. PAD PLATES AND STRUCTURE FOR SUPPORTING ALL INLET, OVERFLOW, DRAIN AND VENT PIPING OF THE TANK SHALL BE PROVIDED.
12. FINAL PAINTING SHALL BE CARRIED OUT AS PER APPROVED PAINTING SCHEDULE AFTER HYDRO TEST OF THE TANK.
13. TANK NOZZLE FLANGES SHALL BE PROVIDED WITH COUNTER FLANGES ALONG WITH NUTS AND BOLTS BY THE TANK VENDOR.
14. FABRICATION, ERECTION AND TESTING SHALL BE AS PER API 650.
15. FOR MANUAL WELDING PROCESS, THE FILLET WELD LEGS OR GROOVE WELD DEPTHS GREATER THAN 6MM SHALL BE MULTIPASS.
16. ALL TANK SHELL WELD INTERSECTIONS WHERE VERTICAL JOINTS MEET THE HORIZONTAL JOINTS SHALL BE RADIOGRAPHED, REGARDLESS OF THICKNESS.
17. ALL RADIOGRAPHY OR OTHER NDE AND ANY WELDING SHALL BE COMPLETED PRIOR TO HYDROSTATIC TESTING.
18. THE TANK HYDROSTATIC TEST SHALL BE CONDUCTED BEFORE PERMANENT EXTERNAL PIPING IS CONNECTED TO THE TANK EXCEPT FOR PIPING THAT IS NECESSARY TO FILL AND EMPTY THE TANK, WHICH SHOULD HAVE A FLEXIBLE COMPONENT TO ALLOW FOR THE SETTLEMENT.
19. ALL INLET, OVERFLOW, DRAIN AND VENT PIPING TO THE TANK SHALL BE PROVIDED WITH SUITABLE SIPHON BREAKER.
20. MANHOLE FOR THE ROOF AND SHELL OF THE TANK SHALL BE HINGED TYPE.
21. SEAL POTS AND NAOH BREATHER POTS SHALL BE PLACED ON THE CIVIL FOUNDATION BY USING THE ANCHOR FASTENER BY TANK SUPPLIER. NO POCKETS BY CIVIL AGENCY WILL BE PROVIDED IN FOUNDATION OF SEAL POTS AND NAOH BREATHERS.
22. MAX. AND MIN. WATER LEVEL MAINTAINED IN THE NAOH BREATHER AND SEAL POT SHALL BE IMPRINTED ON SIGHT GLASS.
23. HYDROSTATIC TEST SHALL BE CONDUCTED WITH FULL HEGHT OF WATER.

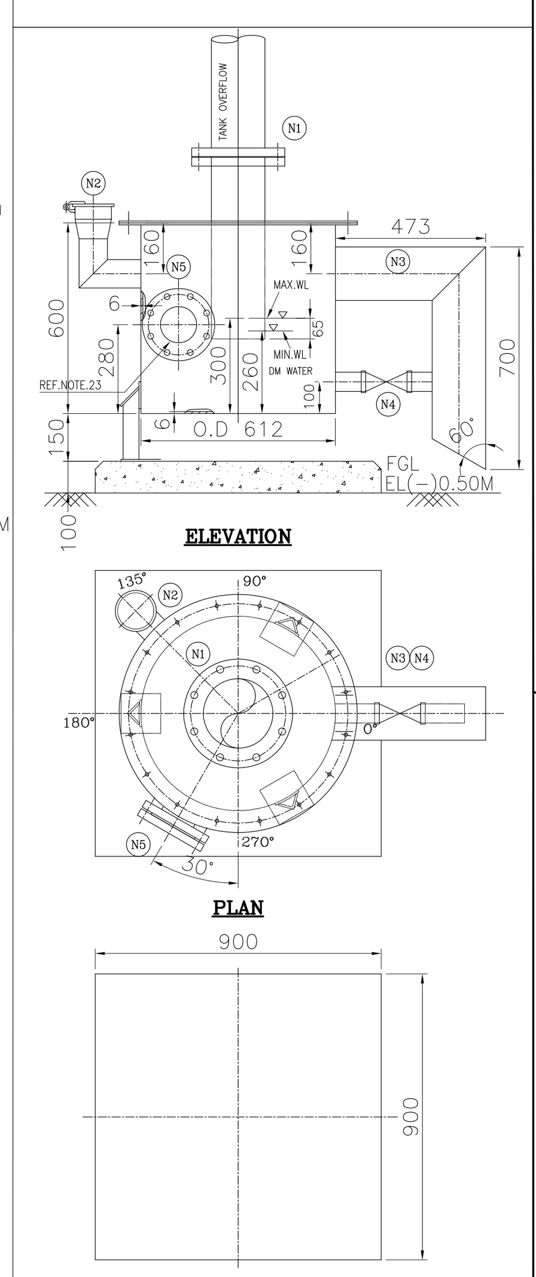


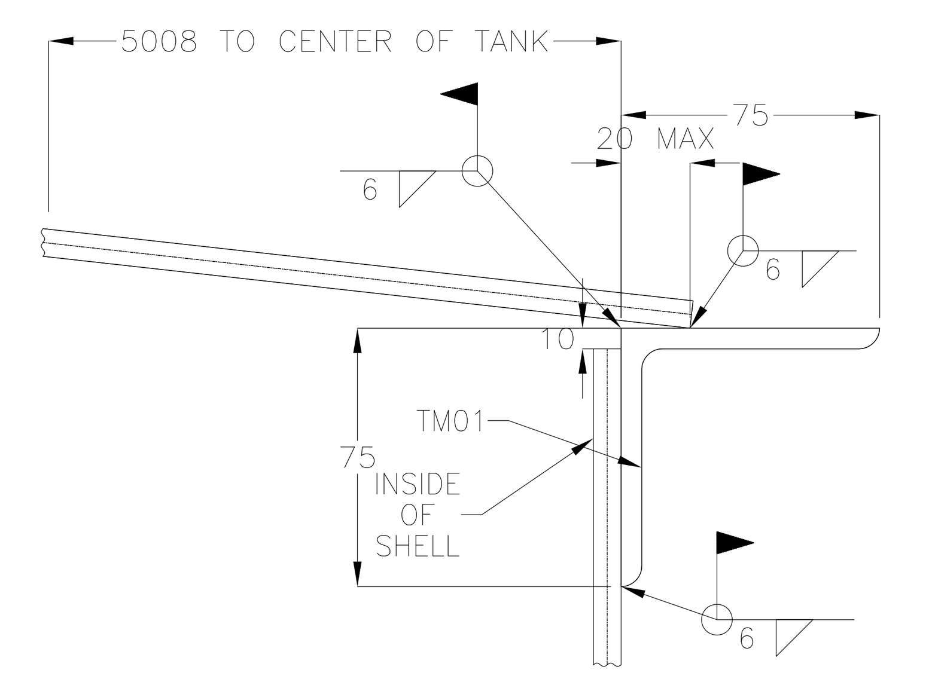
KEY PLAN

DETAIL OF NaOH BREATHER

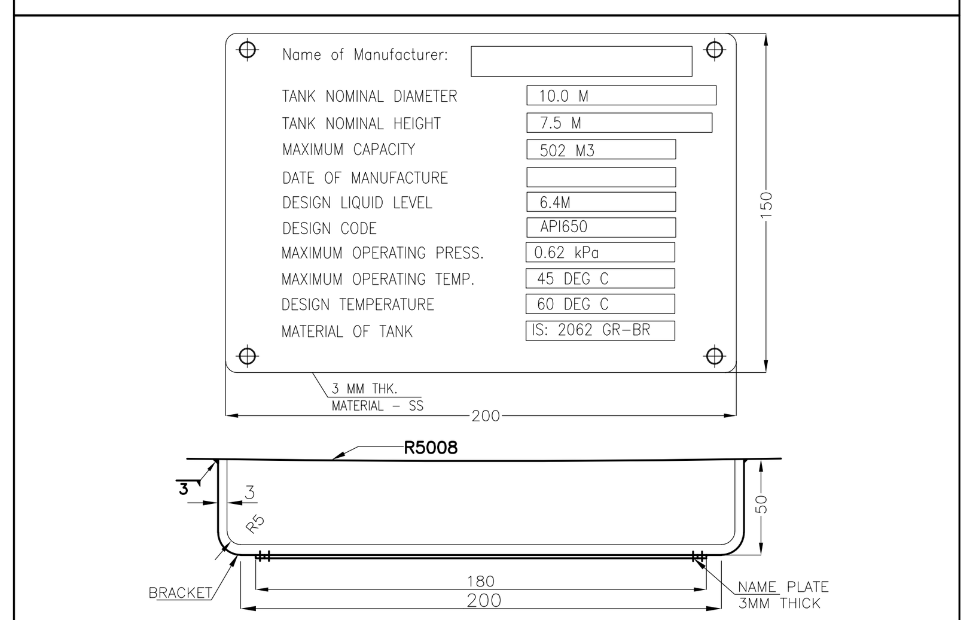


DETAIL OF SEAL POT

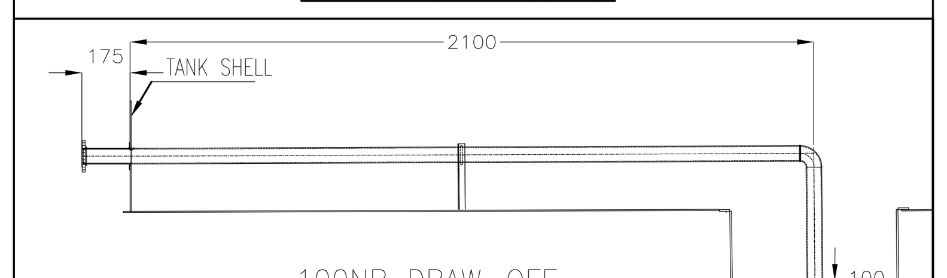




SHELL TO ROOF DETAIL



NAMEPLATE MK. NP01Ad



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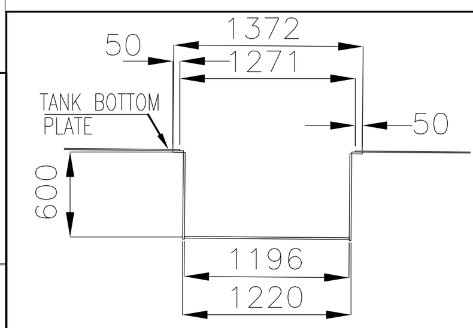

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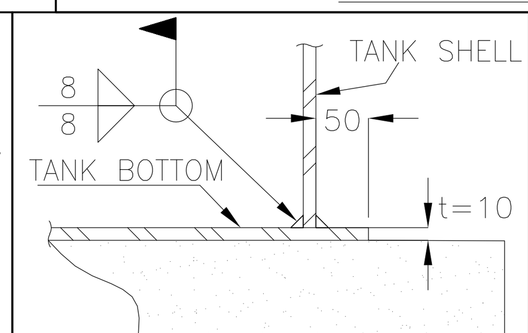


DETAIL A

TANK PAINTING SPECIFICATION

DESCRIPTION	INTERNAL	EXTERNAL	UNDERNEATH
SURFACE PREPARATION	BLAST CLEAN TO SA2.5 (USING NON-SILICEOUS ABRASIVE)	BLAST CLEAN TO SA2.5 (USING NON-SILICEOUS ABRASIVE)	POWER TOOL CLEANING/WIRE BRUSH CLEANING
PRIMER	1 COAT OF UNMODIFIED EPOXY RESIN ALONG WITH POLYAMIDE HARDENER OF 60 MICRONS	2 COATS OF EPOXY RESIN BASED ZINC PHOSPHATE OF 50 MICRONS EACH	2 COATS OF HIGH BUILD COAL TAR EPOXY SUITABLY PIGMENTED OF 100 MICRONS EACH
INTERMEDIATE COAT	NA	1 COAT OF RESIN BASED PAINT PIGMENTED WITH TITANIUM DIOXIDE 100 MICRONS	NA
FINISH	2 COATS OF UNMODIFIED EPOXY RESIN ALONG WITH AROMATIC ADDUCT HARDENER OF 170 MICRONS EACH	1 COAT OF EPOXY PAINT SUITABLY PIGMENTED WITH APPROVED SHADE WITH GLOSSY FINISH OF 75 MICRONS, FOLLOWED BY POLYURETHANE FINISH COAT OF 25 MICRONS.	NA
TOTAL DFT (MICRONS)	400	300	200

NOTES:
1. GI PIPES, SS PIPES & FITTINGS SHALL NOT BE PAINTED.
2. ALL STRUCTURAL STEEL SHALL BE PAINTED AT SITE.
3. METHOD OF PAINTING APPLICATION SHALL BE AS PER PAINT MANUFACTURER'S RECOMMENDATION.
4. SHADE FOR TANK SHALL BE SEA GREEN.

REFERENCE DRAWINGS:-
1. P&ID - CONDENSATE TRANSFER SYSTEM : 8003-001-110-PVM-L-048
2. PLOT PLAN : 8003-001-301-POC-F-001

FOR TENDER PURPOSE ONLY

ALL THE REQUIREMENTS SHOWN UNDER GA DRAWING ARE BARE MINIMUM, ANY OTHER ITEM FOUND APPLICABLE DURING DETAILED ENGINEERING AS PER TECHNICAL SPECIFICATION/DESIGN CALCULATION/FUNCTIONAL REQUIREMENT SHALL BE SUPPLIED BY BIDDER WITHOUT ANY COMMERCIAL IMPLICATION TO BHEL.

NOTE:- SCAN QR CODE FOR CHECKING THE LATEST REV. STATUS OF DRAWING.

ग्राहक ड्राइंग संख्या / CUSTOMER DRAWING NO.: 8003-001-110-PVM-B-145

ग्राहक/CUSTOMER: एन टी पी सी लिमिटेड / N T P C LIMITED

कार्य संख्या- JOB NO.: 520
स्थिति STATUS: CONTRACT
मुद्रण स्केल मीटर में PRINT SCALE IN METRE

परियोजना PROJECT: सीपत सुपर थर्मल पावर परियोजना, चरण-III (1X800 मेगावाट) / SIPAT SUPER THERMAL POWER PROJECT, STAGE-III (1X800 MW)

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LTD
पावर सेक्टर/POWER SECTOR
परियोजना अभियांत्रिकी प्रबंधन
PROJECT ENGINEERING MANAGEMENT
नोएडा (उ॰प्र॰)/NOIDA (U.P.)

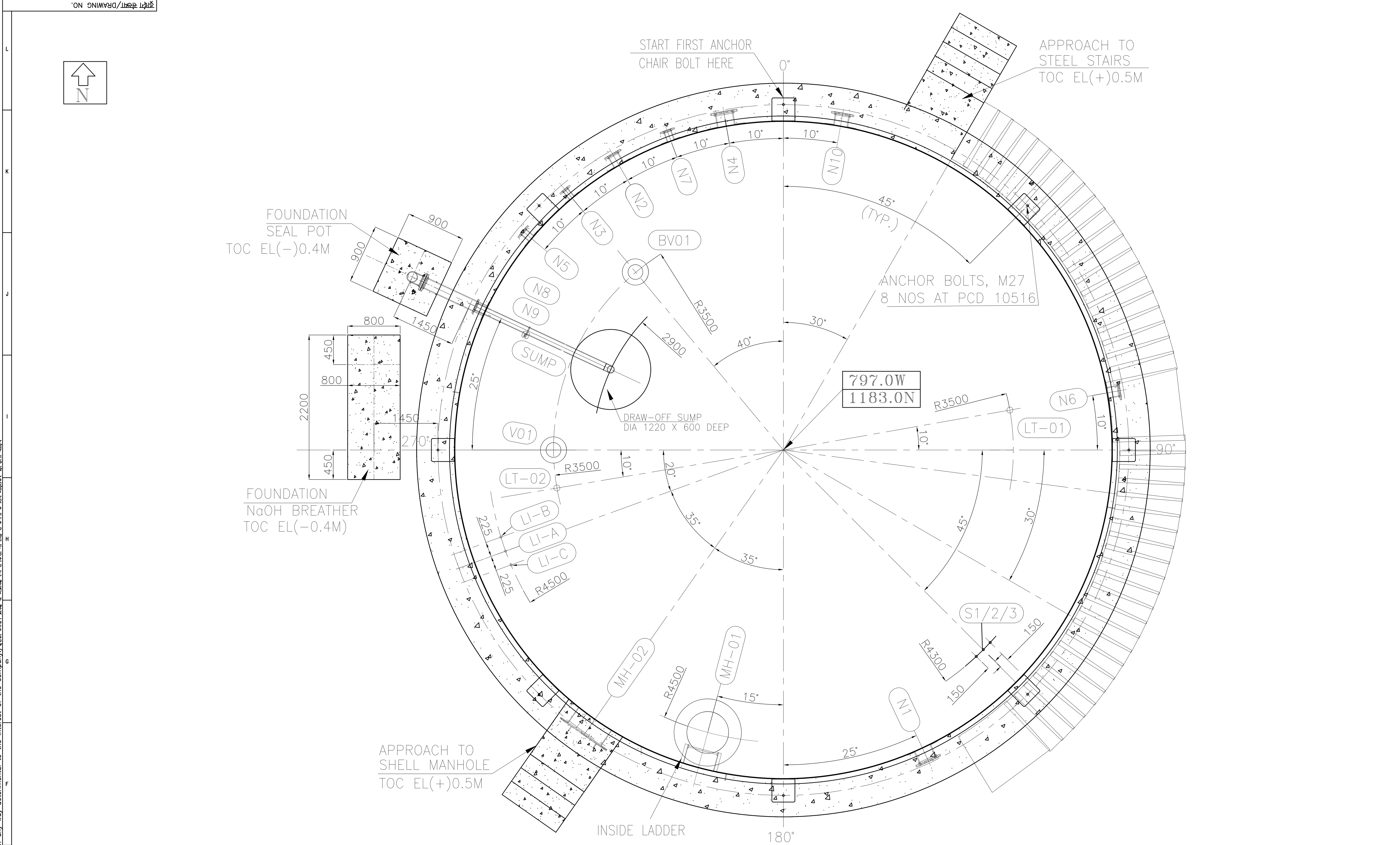
DEPT CODE: M

शीर्षक/TITLE: GA & LOAD DATA OF CONDENSATE STORAGE TANK

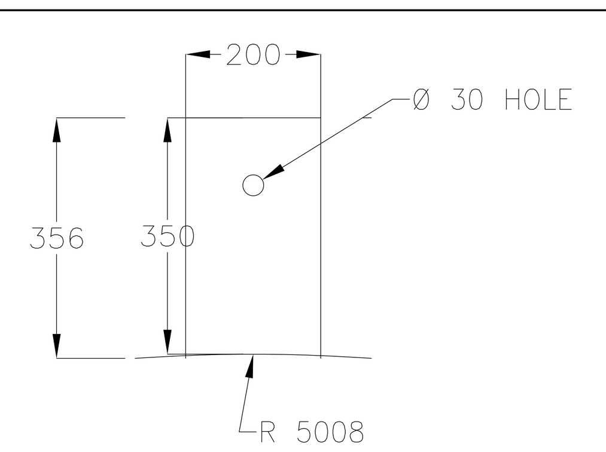
स्केल - SCALE- NTS

ड्राइंग संख्या / DRAWING NO.: PE-V0-520-167-A111
शीट SHEET 1 OF 1
पुनरीक्षण REV. 00

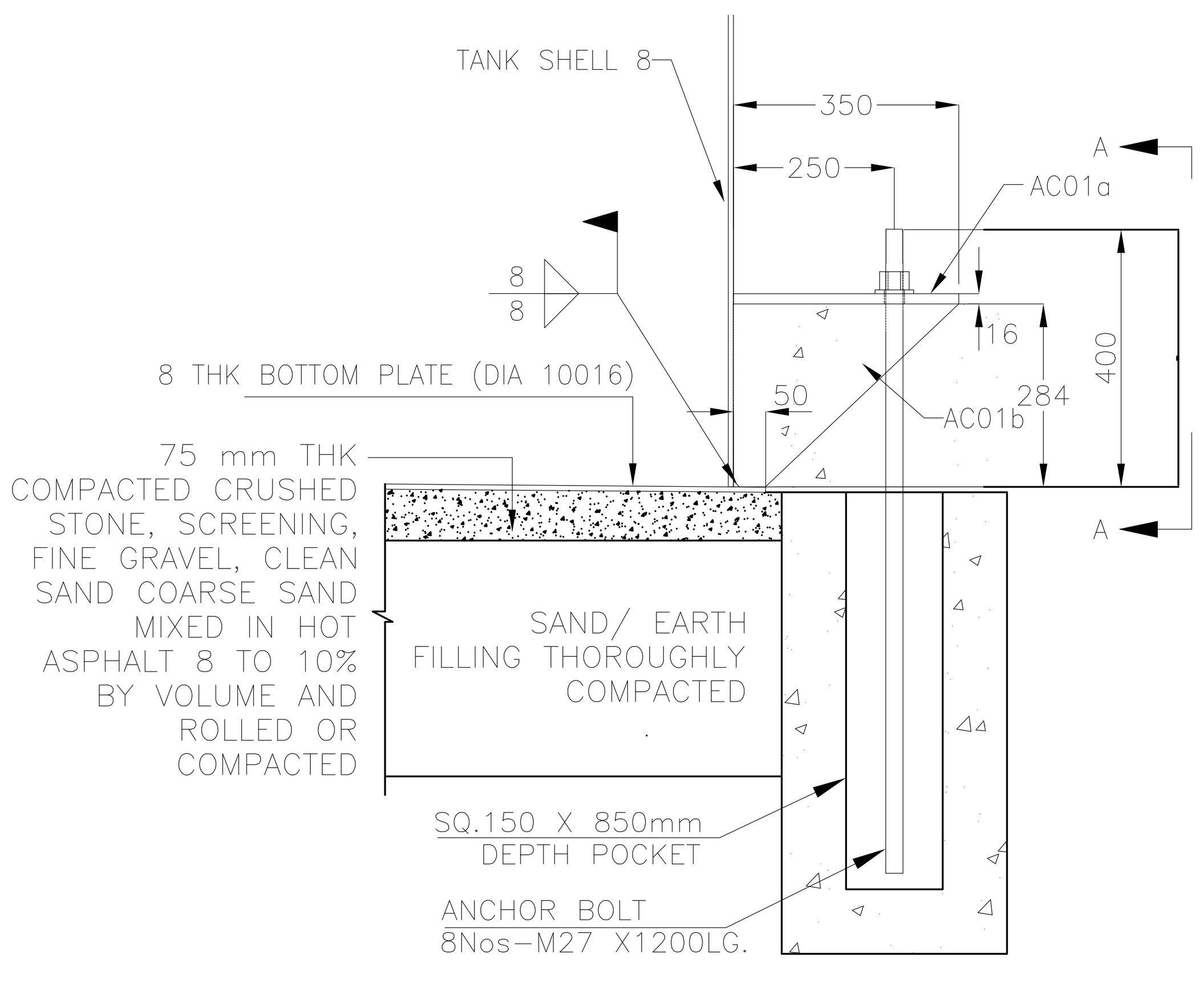
फॉर्मेट साइज A0
FORMAT SIZE A0



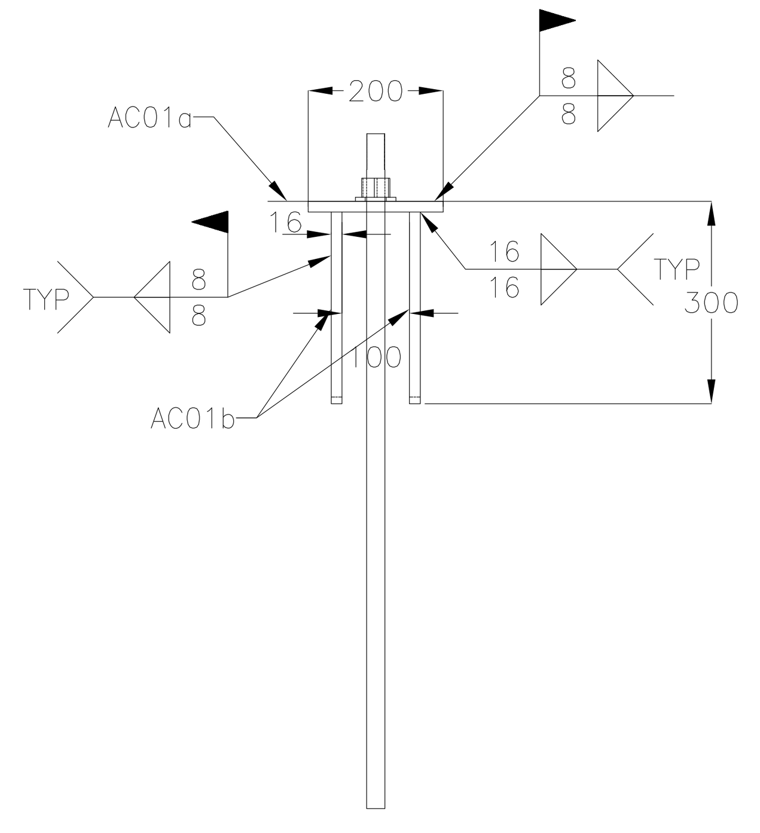
TANK- PLAN VIEW



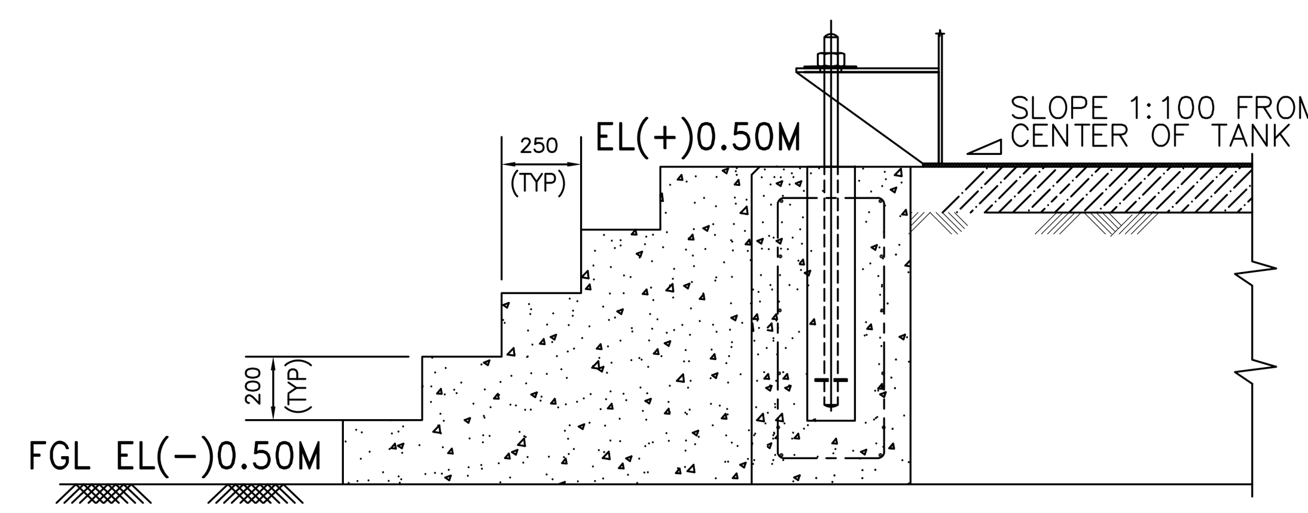
TOP PLATE AC01a DETAIL

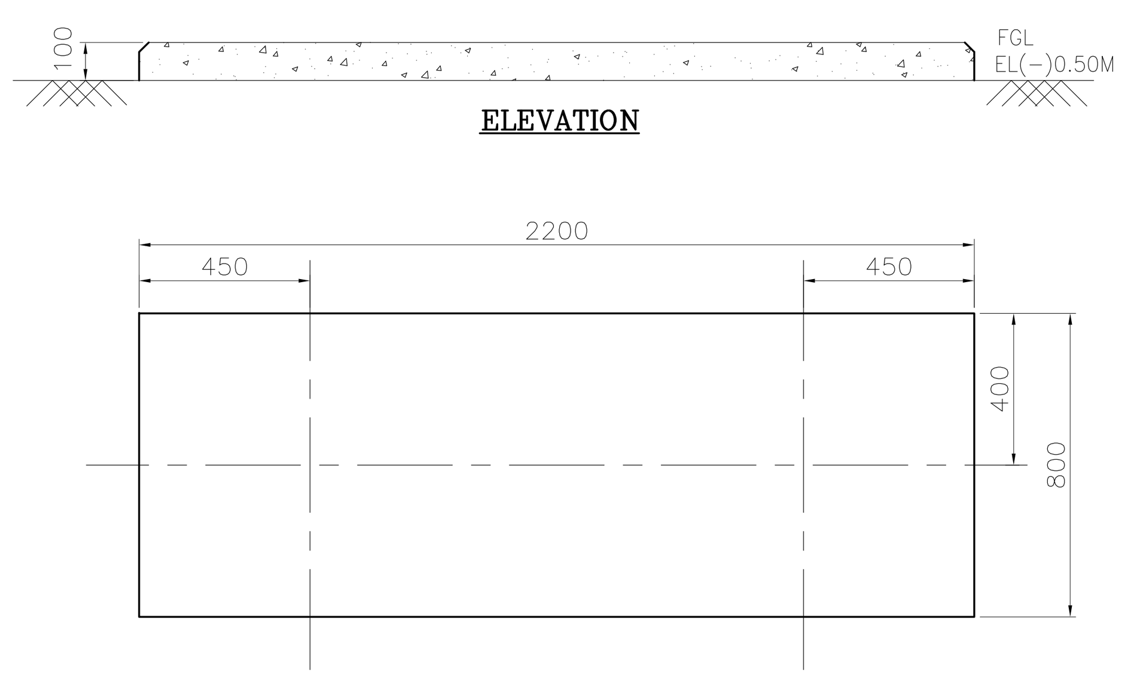


ANCHOR CHAIR DETAIL

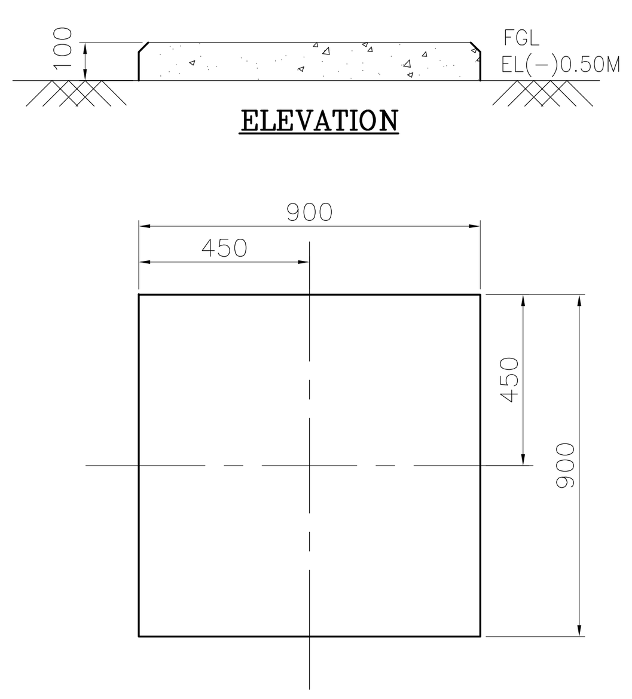


SECTION A-A





NaOH BREATHER
CIVIL FOUNDATION DETAILS



SEAL POT
CIVIL FOUNDATION DETAILS

ROOF APPURTENANCE

DESCRIPTION	CUSTOM MARK	FLANGE TYPE, RATING	NOZZLE THICKNESS	SIZE	OUTSIDE PROJECTION	HORZ. RADIUS FROM CENTER OF TANK ROOF	ORIENTATION
ROOF MANHOLE	MH01	PL. 8	8.0	600NB	200	4500	195°
LEVEL INDICATOR	LI-A/B/C	SORF,#150	3.38	25NB	150	4500	250°
LEVEL TRANSMITTER-1	LT-01	SORF,#150	5.49	80NB	200	3500	80°
LEVEL TRANSMITTER-2	LT-02	SORF,#150	5.49	80NB	200	3500	260°
ROOF VENT	V01	SORF,#150	7.11	150NB	150	3500	270°
BREATHER VALVE	BV01	SORF,#150	7.11	150NB	150	3500	320°
SPARE	S1/2/3	SORF,#150	5.49	50NB	150	4300	135°

SHELL APPURTENANCE

DESCRIPTION	CUSTOM MARK	FLANGE TYPE, RATING	NOZZLE THICKNESS	SIZE	OUTSIDE PROJECTION	ELEVATION FROM TOP OF BOTTOM PLATE	ORIENTATION
TANK INLET	N1	SORF,#150	10.97	150NB	200	6800	155°
TANK OUTLET	N2	SORF,#150	12.70	250NB	225	400	330°
CT PUMP RE-CIRCULATION	N3	SORF,#150	10.97	150NB	200	6800	320°
SAMPLING CONN. WITH VALVE	N4	SORF,#150	5.54	50NB	175	400	350°
EXCESS CONDENSATE RETURN	N5	SORF,#150	12.70	300NB	225	6800	310°
SPARE WITH VALVE	N6	SORF,#150	12.70	250NB	225	400	80°
SPARE WITH VALVE	N7	SORF,#150	10.97	150NB	200	6800	340°
DRAIN	N8	SORF,#150	8.56	100NB	175	260	295°
OVERFLOW	N9	SORF,#150	10.97	150NB	200	6500	295°
SPARE WITH VALVE	N10	SORF,#150	8.56	100NB	175	6800	10°
SHELL MANWAY	MH-02	PL.10	10.0	600NB	275	800	215°
SPARE WITH VALVE	N11	SORF,#150	10.97	150NB	200	6800	230°
SPARE WITH VALVE	N12	SORF,#150	12.70	250NB	225	400	60°

MATERIAL SPECIFICATION

ITEM	MATERIAL
SHELL, BOTTOM, ROOF, RF PLATE	IS: 2062 E250 GR-BR
NOZZLES	STAINLESS STEEL TO A312 GR. 304, SOCKET WELDED FOR 50NB AND BELOW STAINLESS STEEL TO A312 GR. 304, BUTT WELDED FOR ABOVE 50NB
PIPE	STAINLESS STEEL ASTM A312 GR. TP304, SCH 10S FOR ABOVE 50NB PIPE STAINLESS STEEL ASTM A312 GR. TP304, SCH 40S FOR 50NB AND BELOW
MANHOLE NECK	IS: 2062 E250 GR-BR
NOZZLE FLANGES	STAINLESS STEEL TO A240 GR. 304
HAND RAILING (32NB)	IS: 1239 (MEDIUM GRADE), GALVANIZED AS PER IS: 4736
GASKETS	NEOPRENE RUBBER/NON ASBESTOS
BOLTING (NUTS & BOLTS)	SA 193 GR.B7 & SA194 GR.2H; IS:1367 FOR MANHOLE & ANCHOR BOLTS,
STRUCTURES	IS: 2062 E250 GR-A
FITTING OF 50 NB & BELOW(SW)	STAINLESS STEEL TO A182 GR. 304 OR A403 GR. WP304 CLASS-S; SW TO ANSI B16.11
FITTING OF ABOVE 50 NB (BUTT WELDED)	STAINLESS STEEL TO A403 GR. WP304 CLASS W; BUTT WELDED TO ANSI B16.9
NAME PLATE & EARTHING CLEAT	SS 304
ANCHOR BOLTS	IS: 2062 E250 GR-A
TREADS & PLATFORM GRATING	IS:2062 E250 GR-A (GRATINGS SHALL BE ELECTRO FORGED TYPES. MINIMUM THICKNESS OF THE GRATING SHALL BE 32 MM. ALL GRATING SHALL BE HOT DIP GALVANIZED AT THE RATE OF 610 G PER SQ. M. AFTER SURFACE PREPARATION BY MEANS OF BLAST CLEANING/ ACID PICKLING.)

NOZZLE SCHEDULE OF NAOH BREATHER

NOZZLE MARKED	SIZE NB	FLANGE TYPE	FLANGE RATING	FLANGE STANDARD	QTY	PROJ-ECTION	SERVICE
N7A/B	100	SORF	#150lbs;	ASME B-16.5	2	100	SIGHT GLASS
N6A/B	25	--	--	--	2	--	DRAIN WITH GLOBE VALVE
N5	200	--	--	--	1	--	VENT
N4	200	--	--	--	1	--	VENT
N3A/B	80	--	#150lbs;	--	2	--	CHEMICAL INLET/DM WATER INLET
N2	200	SORF	#150lbs;	ASME B-16.5	1	200	VENT INLET
N1	200	SORF	--	--	1	200	VENT INLET

NOZZLE SCHEDULE OF SEAL POT

NOZZLE MARKED	SIZE NB	FLANGE TYPE	FLANGE RATING	FLANGE STANDARD	QTY	PROJ-ECTION	SERVICE
N5	100	SORF	#150lbs;	ASME B-16.5	1	100	SIGHT GLASS
N4	50	SORF	#150lbs;	ASME B-16.5	1	100	DRAIN WITH GLOBE VALVE
N3	150	--	--	--	1	--	OVERFLOW
N2	80	--	--	--	1	--	DM WATER INLET
N1	150	SORF	--	--	1	200	TANK OVERFLOW INLET

NOTES:

1. ELEVATIONS SHOWN ARE FROM TOP OF TANK BOTTOM AT THE LOCATION OF THE APPURTENANCE.
2. WIDTH OF STAIRCASE IS MIN 1200MM.
3. LEVEL INDICATOR IS FLOAT TYPE WITH DIAL TYPE INDICATOR (GUIDE WIRE, FLOAT AND HOUSING OF SS 316 GR. CONSTRUCTION).

NOTE:- SCAN QR CODE FOR CHECKING THE LATEST REV. STATUS OF DRAWING.

ग्राहक ड्राइंग संख्या / CUSTOMER DRAWING NO.: 8003-001-110-PVM-B-145

ग्राहक/CUSTOMER: एन टी पी सी लिमिटेड / N T P C LIMITED

कार्य संख्या- JOB NO.: 520
स्थिति STATUS: CONTRACT
मुद्रण स्केल मीटर में PRINT SCALE IN METRE: 0 2 4 6 8 10 20 30 40 50

परियोजना PROJECT: सीपत सुपर थर्मल पावर परियोजना, चरण–III (1X800 मेगावाट) / SIPAT SUPER THERMAL POWER PROJECT, STAGE-III (1X800 MW)

भारत हेवी इलेक्ट्रिकल्स लिमिटेड
BHARAT HEAVY ELECTRICALS LTD
पावर सेक्टर/POWER SECTOR
परियोजना अभियांत्रिकी प्रबंधन
PROJECT ENGINEERING MANAGEMENT
नोएडा (उ॰प्र॰)/NOIDA (U.P.)

DEPT CODE		नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
M	तैयारकर्ता/DRN			
	डिजाइनकर्ता/DESN			
	जांचकर्ता/CHD			
	अनुमोदनकर्ता/APPD			

पुनरीक्षण REV.	दिनांक DATE	परिवर्तितकर्ता ALTD	जांचकर्ता CHD	अनुमोदनकर्ता APPD	पुनरीक्षण REV.	दिनांक DATE	परिवर्तितकर्ता ALTD	जांचकर्ता CHD	अनुमोदनकर्ता APPD

शीर्षक/TITLE: GA & LOAD DATA OF CONDENSATE STORAGE TANK

एमपीएल MPL	सिविल CIVIL	इलेक्ट्रिकल ELEC	एसएण्डसीई S&CE	डब्ल्यूएसई WSE	मैक्स MAX	विभाग DEPT.
						हस्ताक्षर SIGN / दिनांक DATE

स्केल – SCALE– NTS

ड्राइंग संख्या / DRAWING NO.: PE-V0-520-167-A111

शीट SHEET 1 OF 1 पुनरीक्षण REV. 00

ड्राइंग संख्या/DRAWING NO. PE-V0-520-167-A111

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ELECTRONIC FILE NAME : Sipat Stage-III- GA & Load Data of Condensate Storage Tanks- For Tender purpose.dwg

फॉर्मेट साइज A0
FORMAT SIZE A0

ANNEXURE-VI

MANDATORY SPARES

MANDATORY SPARE LIST		
2X800MW DVC KODERMA TPS, PHASE-II		
S. No.	**PARTICULARS**	**Unit /Quantity (Nos./SET/%)**
A	**LEVEL INDICATOR FOR CONDENSATE STORAGE TANKS (2 nos.)**	20% of the total population or minimum 2 nos. of each type/rating/model
1X800MW NTPC SIPAT STPP, STAGE-III		
S. No.	**PARTICULARS**	**Unit /Quantity (Nos./SET/%)**
A	**LEVEL INDICATOR FOR CONDENSATE STORAGE TANK (1 no.)**	NOT APPLICABLE
Note:		
1) Mandatory spares shall not be dispatched before dispatch of corresponding main equipment. Pls. refer NIT for delivery schedule. The spares shall be treated and packed for a long storage under the climatic condition prevailing at site.		
2) Each spare shall be clearly marked and labelled on the outside of the packing with its description. When more than one spare part is packed in single case, a general description of the contents shall be shown on the outside of such case and a detailed list enclosed. All cases, containers and other packages must be suitably marked and numbered for the purpose of identification.		
3) All the spares shall be manufactured along with the main equipment components as a continuous operation as per same specification and quality plan.		
4)The Contractor shall warrant that all spares supplied will be new and in accordance with the Contract Documents and will be free from defects in design, material and workmanship.		

SECTION-II

SUB-SECTION-A
STANDARD TANK SPECIFICATION WITH OTHER DATA SHEETS

1.0 SCOPE

This specification covers design, engineering, supply of material, fabrication, assembly, inspection and testing at shop as well as at site, erection and commissioning, painting and functional demonstration testing at site.

2.0 CODES & STANDARDS

The design, fabrication & assembly, erection & performance of steel tanks shall comply with all latest statutory regulations and safety codes applicable in the locality where the tanks are to be installed. Tanks shall conform to the latest applicable Indian / British / USA standards. The vendor shall not be construed to be relieved of his responsibility by virtue of this specification. The tank in general shall conform to the latest editions, as applicable, out of the following standards.

I. IS-800: Code of practice for use of steel in general building construction

II. IS-803: Code of practice for design, fabrication and erection of vertical mild steel cylindrical welded oil storage tank.

III. IS-804: Specification for rectangular pressed steel tanks

IV. IS-805: Code of practice for use of steel in gravity water tank.

V. IS-816: Code of practice for metal arc welding for general construction in MS.

VI. IS-817: Code of practice for training and testing for metal arc welder

VII. IS-2825: Code of practice for unfired pressure vessel

VIII. BS-2594: Specification for carbon steel welded horizontal cylindrical storage tank

IX. BS-2654: Specification for vertical steel welded storage tanks with butt welded shells for the petroleum industry

X. Indian Factories Act

XI. American code for oil tanks API 650

XII. Material Specification as per relevant IS / or approved equal

XIII. American water works association standards (AWWA D100)

3.0 DESIGN REQUIREMENT

3.1 General Requirement

3.1.1 All tanks will be mild steel tanks. The tanks will be of welded construction and will be designed to withstand satisfactorily the internal forces due to the liquid which these tanks have to hold as specified and external forces due to wind and seismic forces without deformation or undue strain.

The plates will be cold rolled through plate bending machines by several no. of passes to the curvature.

3.1.2 Tank thickness shall be calculated as per IS803 latest edition. Intermediary wind girder design, Wind Design, Seismic design, anchor bolt design / selection etc. shall be done as per API 650 latest edition, latest addendum available at the time of detail engineering.

3.1.3 All tanks will be designed for the capacities, dimensions and working conditions as specified in this specification. The tanks will be provided with all necessary connections as specified. The design of tanks will be such as to allow easy inspection, cleaning and repair. Due consideration will be given to wind loading and adequate stiffening will be provided to prevent failure of tank due to buckling when it is empty. A 1.5 mm corrosion allowance for shells, bottom and roofs above and beyond the required thickness / calculated thickness / nominal thickness as specified in the design code shall be provided.

3.1.4 Vessel seams shall be so positioned that they do not pass through nozzle connections on vessel. For vessels consisting of more than two sections, longitudinal seams shall be offset.

3.1.5 The inside seam should be ground smooth, suitable for application of corrosion resistant primer. If the stiffening of shell, bottom and / or roof is necessary, tanks will be stiffened from outside.

3.1.6 Flange faces of all nozzles shall be machined and squared with the vessel center line.

3.1.7 All roofs and supporting structures shall be designed to support dead load plus a uniform live load of not less than 150 kg/m^2 of projected area.

3.1.8 The tanks shall be designed to have all courses truly vertical. Adequate distance between vertical joints in adjacent courses shall be taken so that the distortion is reduced to minimum.

3.1.9 When removing temporary attachments from shell plates, care should be taken that parent plate is not damaged. Holes in plate work to assist in fabrication / erection should be avoided as far as possible. The location of holes and method of filling shall be indicated in the fabrication drawing. Any projection of metal shall be chipped and ground flush with the plate surface. The plate shall not be gouged or torn in process of removing lugs.

3.1.10 In the construction of shell, very care shall be taken to minimize distortion or lack of circularity due to welding or for any other reason.

3.1.11 Material of construction of all tanks shall be mild steel conforms to IS – 2062 grade – B unless otherwise specified in the specification. Material of construction for structure (angles, channels etc.) shall be IS 2062 Gr. A.

3.2 Alignment

3.2.1 Plates to be joined by butt-welding shall be matched accurately. Misalignment in completed vertical joints shall not exceed 10% of the plate thickness or 1.5 mm for plates of 20 mm thick and under, whichever is larger.

3.2.2 In completed horizontal butt joints, the upper plate shall not project beyond the face of the lower plate at any point by more than 20% of the upper plate thickness with a maximum of 3 mm for

plate thickness exceeding 8 mm except that for plate thickness 8 mm and under, the maximum shall be 1.5 mm.

3.2.3 Each tank shall be properly constructed ensuring perfect vertical alignment with 5 mm or as specified in the relevant code / standard and tank circularity within 5 mm on diameter or as specified in the relevant code / standard. Local bulging and / or depressions at any location of tank particularly shell shall not be permitted.

3.3 WELDING

3.3.1 Tanks and other attachments shall be welded as per IS-816.

3.3.2 Welding sequence shall be so adopted that distortion due to welding shrinkage shall be minimum. Welding procedure specification shall be submitted for approval of BHEL giving details of material, welding position, sequence, type of electrode used, pre-heat & post weld requirement etc. as per the code of construction. Brand name of electrodes to be used with proper classification (e.g. E 6013) shall be as per BHEL's approval.

3.3.3 Welding shall not be carried out when the surface is wet and during periods of rain and high winds unless the welder and the work are properly shielded which should meet the approval of the purchaser.

3.3.4 Inspection of all welds shall be carried out in accordance with the governing code of construction. All materials used by purchaser such as electrodes, gaskets, bolts, nuts etc. shall be conforming to relevant standards of repute and approved by the purchaser prior to use.

3.3.5 Each tank shall be complete with access staircase, ladder and safety cage and fittings like drain connection, overflow connection(pipe) till bottom of tank, tank inlet and outlet cover, level gauge glass, fittings with isolation cocks and protection covers, tank vent connection etc. all complete with needed accessories for the completeness of the tanks.

3.3.6 All openings in tank plate shall be well reinforced in approved manner by adding pad plates of adequate size and / or structural sections.

3.4 STAIRCASE / ACCESS LADDER AND HAND RAILING

3.4.1 All cylindrical vertical tanks shall be provided with spiral staircase and shall conform to the requirements specified in design codes / standards unless specified otherwise. All stair treads shall be 32 mm steel fabricated gratings. Each tread, if needed, shall be housed in individual steel fabricated frame which shall be adequately supported from the tank outer periphery. The staircase shall have minimum 1200 mm clear width.

3.4.2 Access ladder, one (1) for each horizontal cylindrical / rectangular tank shall be provided for access to the tank roof. It shall be steel fabricated having minimum 450 mm width. Ladder stringers shall be heavy steel flats or angle section. All rungs shall be minimum 20 mm diameter rods spaced at not more than 30 mm center to center. All ladders shall have steel fabricated safety cage to the approved construction. Safety cage shall be provided about 2.5 m clear height of the ladder. Access ladder's stringers shall be widely spaced at top for free access to the tank roof.

3.4.3 All staircase and roofs of vertical cylindrical tanks shall be provided with pipe hand railings of effective height as indicated in the relevant code / standard throughout. Handrails shall be

constructed out of 32 mm medium class galvanized steel pipe conforming to IS- 1239: 1968. Handrail posts shall be arranged at spacing not greater than 1850 mm. Two (2) sets of pipes horizontal runners all along the length shall be provided. All welds joints in the handrails shall be ground flush to protect any person getting injured. Steel toe plates of 100 mm flats shall be used. Hand railing shall be fabricated and installed in an approved manner as directed by purchaser in accordance with approved drawings.

3.4.4 Unless otherwise specified, for all flanged connections, vendor shall furnish suitable counter flanges and necessary nuts, bolts and gaskets materials.

3.4.5 Unless otherwise specified, bolts and nuts shall be hexagonal head conforming to bolts and nuts shall be SA 193 & 194 respectively.

3.4.6 Gaskets shall be 3 mm thick full-face rubber. On completion of hydraulic test / water fill test, contractor shall replace the gaskets used during testing at his own cost.

3.4.7 Void.

3.4.8 During erection of tank, shell plates shall be suitably supported both for outside and inside to avoid buckling / collapsing of tank due to high-speed wind, gust or severe storm, if any, occurring during erection.

3.5 VERTICAL CYLINDRICAL STORAGE TANKS

3.5.1 The vertical cylindrical storage (non- pressure) tanks shall be of mild steel welded construction and shall be designed in accordance with codes and standards as specified. The vertical cylindrical storage tanks shall have slightly sloping bottom towards an adequately sized sump inside the tank to enable complete draining of the tank. The tank shall be designed for a wind pressure and seismic coefficient as specified.

3.5.2 Conical roof shall be either self-supported or supporting. The roof shall have a slope as specified in the relevant design code to ensure drainage of rainwater. Needed roof rafters and purlins adequately designed shall be provided.

3.5.3 All plates to be used for fabrication of tank shall be checked and all sides trimmed to make them square.

3.5.4 All bottom plates shall have butt weld joints to adequately support lining.

3.5.5 All shell course plates shall be taken during bending to prevent plate skewing. For butt weld joints, edges shall be prepared which shall be uniform and smooth throughout. To maintain needed root penetration gap at any butt weld joint, sufficient numbers of erection cleats shall be provided on all sides of outer periphery of each shell plate. Plates for tanks shall be straightened by pressing or by other non-injurious methods.

3.5.6 Each shell course shall be of uniform width throughout longitudinal weld in plates. Make up for the course width shall not be permitted. Shell plates in each course width shall be so arranged that all vertical joints be staggered having a minimum of 600 mm stagger. Shell thickness could be reduced in upper courses depending on design requirements but in no case the plate thickness shall be less than 6 mm.

3.5.7 The tank height shall be completed by the provision of top curb/ angle which shall be butt-welded to the adjacent tank plate courses. The outstanding leg of the curb angle shall be kept outside the tank periphery. All butt weld joints shall be full strength welds but for design of shell plate thickness adequate weld efficiency as recommended by applicable code(s) shall be used.

3.5.8 Tank roof shall be either self-supported or supported from rafters / steel fabricated central column(s). Adequately sized and spaced rafters and purlins shall be provided. All rafters shall have sliding bolted connections at one end and preferably on the tank periphery side. The roof-supporting frame shall have needed tie rods or bracing sets.

3.5.9 Roof plates shall have butt-joints to adequately support lining. No joint of roof plate over the supporting frame shall be made.

3.5.10 Openings needed for mounting various specified accessories shall be well reinforced in accordance with application codes and as approved. Manhole shall the bolted and hinged covers unless otherwise specified.

3.5.11 All inlet pipe nozzles located at the top of tanks shall be provided with internal piping up to 500 mm high above the tank's bottom inside with suitable weir plate at bottom. The inside piping shall be adequately supported and shall be provided with adequately sized vent connection at pipe top.

4.0 TESTING AND INSPECTION AT MANUFACTURERER'S WORKS

4.1 General

4.1.1 The supplier shall provide inspection to establish and maintain quality of workmanship in his works and that of his subcontractors to ensure the mechanical accuracy of components, compliance with drawings identity and acceptability of all materials, parts and equipment. He shall conduct all tests required to ensure that the equipment and material furnished shall conform to requirements of the acceptable codes. All tests and test procedure proposed by manufacturer shall be submitted to the purchaser for their prior approval.

4.1.2 All materials used for manufacture of the equipment under this specification shall be of tested quality. Relevant test certificates shall be made available to the purchaser before the final shop inspection. In case the relevant correlating test certificates are not available, the supplier shall arrange to carry out the necessary tests required by codes at his own cost.

4.1.3 Alloy cast iron and cast steel components shall be tested for both physical and chemical properties in absence of purchaser's representatives. Test bears shall be either integral or taken from the same ladle of material as the casting they represent.

4.1.4 All materials including valves, instruments, pipings, flanges, counter flanges etc. shall be procured from BHEL approved manufacturer's only. Dealers are not acceptable.

4.2 TESTING AND INSPECTION FOR TANKS

4.2.1 The scope of testing and inspection for pressure vessel covered in this specification shall generally comprise of the following:

I. Examination and approval of fabrication drawings to ensure that design, materials and fabrication details meet requirement of code and specifications. Purchaser will review these drawings for

interface problems and conformity with the general arrangement drawings and accord their approval.

II. Examination of materials of construction and identification with material test certificates.

III. All the plates of thickness 50 mm or more shall be ultrasonically tested to ensure freedom from laminations.

IV. Ensuring the relevant weld procedure and welder qualification tests are in accordance with stipulated code requirements.

V. Inspection of dished end flanges and alloy steel bolting where required.

VI. Inspection during fabrication at appropriate stages including fit ups.

VII. For all butt welds, the root run and final run shall be subjected to dye-penetrate or magnetic particle inspection. For all fillet welds the final run shall be subjected to dye-penetrate / magnetic particle examination.

VIII. Examination of radiographs including radiographic techniques, supervision of other non - destructive tests and heat treatment procedure as required by codes and specifications.

IX. Examination of internal cleanliness before final closure.

X. Dimensional examination of completed vessel including axis marking, proof marking, match marking etc.

XI. Witnessing of hydrostatic, pneumatic or vacuum tests or special tests as required by the code and specification. In case of hydrostatic tests, the test pressure must be kept for a minimum of two hours.

XII. Witnessing cleanliness, preservation, packing and marking.

XIII. Stamping of vessel and issue of certificates.

XIV. All tanks under this specification shall be tested as per the relevant design and testing code / standard. Supplier shall submit the detailed testing procedure for the tanks during detail engineering stage for BHEL / customer / consultant's approval and approved document shall be adhered by them and testing shall be done accordingly without any commercial implication.

4.2.2 **NON - PRESSURE TANKS**

The scope of testing and inspection for non-pressure tanks covered in this specification will comprise of the following:

i. Identification of materials to manufacturer's test certificates.

ii. Inspection of plate edges after edge preparation and checking curvature against templates if shell plates sent after rolling.

iii. Checking of dimension and match marking.

iv. Bottom testing

a. After the bottom and bottom course of shell plates have been welded, the bottom shall be tested by pumping air beneath the bottom plates to a pressure just sufficient to lift them off the foundation and in any case not less than 100 mm water gauge. The pressure shall be held by construction of a temporary dam of clay or other suitable material around the tank periphery. Soap suds or other suitable material shall be applied to all joints for detection of leaks.

b. Fuel oil may be used instead of air and soap suds to test for leaks, subject to prior agreement and approval of purchaser.

c. Alternatively, the bottom seams may be tested by vacuum box method subject to prior agreement and approval of the purchaser. The vacuum box used shall comply with IS- 803, 1976 (figure-24)

v. Shell testing

The shell of fixed roof non - pressure tanks shall be tested after completion of roof. Testing shall be done by filling the tank with water to the level of the top leg of the top curb angle and noting any leaks.

vi. Roof testing

The roof of the tank shall be tested by pumping air under the roof plates while the tank is still full of water. In the non - pressure tank, the roof shall be tested to a pressure of 75 mm of water gauge and in case of pressure roof tanks, to a pressure of one and a quarter times the pressure at which the pressure sides of the pressure / vacuum relief valve is designed to open. Soap suds or other suitable material shall be applied to all joints for detection of leaks.

vii. All field-testing shall be performed prior to any painting or coating application.

4.3 REPAIR OF LEAKS

4.3.1 All leaks detected during testing shall be repaired to the satisfaction of the purchaser and on completion retested for leakage as per approved procedure.

4.3.2 In the joints between roof plates only, pin hole leaks may be repaired by mechanical caulking. However, where there is any indication of considerable porosity, the leaks shall be sealed by laying down an additional layer of weld over the porous sections.

4.3.3 In all other joints, whether between shell plates or bottom plates or both, leak shall be repaired only by welding and if necessary, after first cutting out the defective part.

4.3.4 When the tank is filled with water for testing, defects in the shell joints shall be repaired with the water level at least 300 mm below the joint being repaired.

4.3.5 No welding shall be done on any tank unless all lines connecting thereto have been completely blanked off. No repairs shall be attempted on tanks while filled with oil, nor any tanks which have contained oil until the tanks have been emptied, cleaned and freed from gas in a safe manner. No repair shall be attempted on a tank which has contained oil except in a manner approved in writing by the purchaser, and in absence of the purchaser's inspector.

DATASHEET OF PLATES & STRUCTURAL STEEL

A.0	MS Plate		
1.0	Material		IS:2062, Gr. B
B.0	Angle, Channel, Beam, Bar and Flat		
1.0	Material		IS: 2062, Gr. A/B
C.0	Handrail		
1.0	Size of pipe		32 NB
2.0	Material		ERW pipe as per IS:1239,Part-I
3.0	Dimension standard		ANSI 36.10, plain ends

DATASHEET OF PIPES, FITTINGS, FLANGES & ACCESSORIES

1.0	SS Pipes	Material Standard	**Dimensional Standard**
1.1	50 NB and below	Stainless steel pipe as per ASTM A-312, Gr. 304 , Seamless, Sch. 40S	As per ANSI B-36.19, socket welded
1.2	65 NB and above	Stainless steel pipe as per ASTM A-312, Gr. TP-304, Seamless, Sch.10S	As per ANSI B-36.19, BW ends as per ANSI B16.25
2.0	SS Fittings(Elbow, Tees & Reducers)		
2.1	50 NB and below	Forged Stainless steel as per ASTM A-182, F-304	ANSI B 16.11, S/W ends
2.2	65 NB and above	Stainless Steel as per ASTM A-351, CF8	ANSI B 16.9, B/W ends
3.0	**SS Flanges**		
3.1	For SS Pipes up to 50 NB	ASTM A182 F304	ANSI B16.5, RF
3.2	For SS Pipes above 50 NB	ASTM A403 Gr. 304	ANSI B16.5, FF
4.0	**Gasket for SS fittings**		
4.1	Up to 50NB	SS jacketed CAF with superior oil/resistance	ANSI B 16.21
4.2	Above 50NB	PTFE (TEFLON)	ANSI B 16.21
5.0	**Bolts & Nuts**		
5.1	Wherever applicable in all the tanks.	ASTM A-193, Gr. B7 for Bolts ASTM A-194, Gr. 2H for Nuts	ASTM A-193 / A-194

DATASHEET OF VALVES

S.N	COMPONENT	DESCRIPTION
1.	Body & Bonnet	ASTM A182 Gr.F304 (50NB & below) ASTM A351 Gr.CF8M (50NB above)
2.	Wedge & Seat ring	ASTM A182 Gr.F304 (50NB & below) ASTM A351 Gr.CF8M (50NB above)
3.	Trim	ASTM A182 Gr F304
4.	Rating	Class 800 (50NB & below) Class 150 (50NB above)
5.	Ends	SW to B16.11 (50NB &below) Flanged to B16.5 (50NB above)
6.	Design Standards	B16.34 / API600 for Gate valve B16.34 / BS1873 for Globe valve
7.	Testing standards	API 598 for all valve (All sizes)
8.	Bolts & Nuts	A193 Grb7 & A194 Gr.2H

SUB-SECTION-B

FORMAT FOR OPERATION AND MAINTENANCE MANUAL

Format for Operation & Maintenance Manual

Project name :

Project number :

Package Name :

PO reference :

Document number :

Revision number :

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
1.	Cover page				
1.1	Project Name				
1.2	Customer/consultant Name				
1.3	Name of Package				
1.4	Supplier details with phone, FAX ,email address , Emergency Contact number				
1.5	Name and sign of prepared by , checked by & approved by				
1.6	Revision history with approval Details				
2.0	Index				
2.1	showing the sections & related page nos All the pages should be numbered section wise				
3.0	Description of Plant/System				
3.1	Description /write up of operating principle of system equipment/ associated sub-systems & accessories/controls system , operating conditions, performance parameters under normal , start up and special cases				
3.2	Equipment list and basic parameter with Tag numbers				
3.3	Data sheets approved by Customer/for information and catalogues provided by original manufacturer				
3.4	Associated other packages and Interface /terminal points				
3.5	P&ID & Process Diagrams				
3.6	GA Layout drawings, As-built drawings , Actual photograph of items/system (Drawings of A2 & bigger sizes are to be attached in the last)				
3.7	Single line/wiring diagrams				
3.8	Control philosophy /control write-ups				

4.0	Commissioning Activities (if not covered in separate document i.e. erection manual, commissioning manual)				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	Operation Guidelines for plant personal/user/operator				
5. 1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5. 2	Start up, normal operation and shut down procedure for equipments along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5. 3	Do's & Don't of the equipments.				
5. 4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5. 5	Parameters to be monitored with normal values and limiting values				
5. 6	Trouble shooting with causes and remedial measures				
5. 7	Routine operational checks, recommended logs & records				
5. 8	Changeover schedule if more than one auxiliary for the same purpose is given				
5. 9	Painting requirement and schedule				
5. 10	Inspection, repair , Testing and calibration procedures				
6.0	Maintenance guidelines for plant personal				
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				

6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centres ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	**Statutory and other specific requirements considerations.**				
8.0	**List of reference documents**				
9.0	**Binding as per requirement**				

SUB-SECTION-C

SITE STORAGE AND PRESERVATION GUIDELINES

SITE STORAGE AND PRESERVATION GUIDELINES

FOR

MECHNANICAL BOPs

(Doc No: PE-DC-SSG-A001 REV.00)

PROJECT ENGINEERING MANAGEMENT, POWER SECTOR

BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

1. SCOPE OF THE DOCUMENT

This guideline is prepared in intent to provide proper site storage and preservation of the Mechanical, Electrical and C & I items / equipment supplied under various bought out packages/items. This storage procedure shall be followed at different power plant sites by concerned agency for storage and preservation from the date of equipment received at site until the same are erected and handed over to the customer.

2. PURPOSE OF STORAGE & PRESERVATION

Many of the items may be required to be kept in stores for long period. It shall therefore be essential that proper methods of storage and preservation be applied so that items do not deteriorate, loose some of their properties and become unusable due to atmospheric conditions and biological elements.

3. MEASURES TO BE TAKEN FOR STORAGE, HANDLING & PRESERVATION

a) GENERAL STORAGE REQUIREMENTS

1. To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2. The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3. The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. ‘No smoking’ signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4. Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5. Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
7. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks,

preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

6. At no time shall any materials be stored directly on ground. All materials shall be stored minimum 200 mm above the ground preferably on wooden sleepers

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.
2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.
3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.
4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings
5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.
6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.
7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.
8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.
9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.

11. Following preservatives/preservation methods can be used depending upon type of equipment

    a. Rust preventive fluid (RPF)

    b. Rust protective paints

    c. Tarpaulin covers, in case of outdoor storage

    d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –

    - Ingress of moisture and corrosion damages.
    - Damage to protective coating.
    - Open ends in pipes, vessels and equipment -
        - In case any open ends are noticed, same shall be capped.

2. Any damages to equipment / materials.

    - In case of any damages, these shall be promptly notified and in all cases, the repairs / rectification shall be carried out.
    - Any items found damaged or not suitable as per project requirements shall be removed from site. If required to store temporarily, they shall be clearly marked and stored separately to prevent any inadvertent use.

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

The types of storage are broadly classified under the following heads:

i **Closed storage with dry and dust free atmosphere**. (C)

The closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated asbestos sheets / galvanised iron sheets for roofing. Brick walls / asbestos sheets can be used to cover all the sides. The floor of the shed can be finished with plain cement concrete suitably glazed. The shed shall be provided with proper ventilation and illumination.

ii **Semi-closed storage**. (S)

The semi closed shed can be constructed by using cold-rolled / tubular components for structure and corrugated / asbestos sheets for roofing. The floor shall be brick paved. If required a small portion of sides can be covered to protect components from rainwater splashing onto the components.

iii Open storage (O)

The open yard shall be levelled, well consolidated to achieve raised ground with the provision of feeder roads for crane approach along with access roads running all sides. One part of the open yard shall be stone pitched, levelled and consolidated with raised ground suitable for storing / stacking heavier and critical components with due space to handle them by cranes etc . Adequate number of sleepers, concrete block etc. to be provided to make raised platforms to stack critical materials.

A separate yard to be identified as “scrap yard” slightly away from main open yard to store wooden/steel scraps, which are to be disposed off. This is required to avoid mix up with regular components as well as to avoid fire hazard.

Some of the components, which are having both machined & un-machined surfaces and are bulky, shall be stored in open storage area on a raised ground and suitably covered with water proof / fire retardant tarpaulin.

The equipment listed below shall be stored and inspected as per requirement mentioned in the table below.

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
Raw material /mechanical items like pipes, plates, structure sections etc.)				
1.	Steel pipes (lined/unlined)	S	Damage , paint, corrosion, rubber lining peeling	Provide end cap
2.	MS Plates	S	Damage, paint, corrosion	
3.	SS Plates	S	Damage	
4.	Non-metallic pipes	S	Damage, cracks	Provide end cap
5.	Stainless steel pipes	S	Damage ,	Provide end cap
6.	MS sections, beams	S	Damage, paint, corrosion	
7.	Cable trays	S	Damage, condition of preservations	
8.	Insulation sheets	S	Damage	
9.	Insulation	C	Damage, packing	
10.	Hangers Rods	S	Damage, paint, packing	
11.	Tubes	S	Damage, paint , packing	Provide end cap
12.	Hume pipes	O	Damage	
13.	Castings	O	Damage, paint, corrosion	
Fabricated mechanical items (pressure vessels, tanks etc.)				
14.	Pressure vessels (unlined)	O	Damage, paint, corrosion,	Covered nozzles
15.	Atmospheric storage tanks (unlined)	O	Damage, paint, corrosion	Covered nozzles

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
16.	Pressure vessels (lined)	S	Damage, paint, corrosion, rubber lining	
17.	Atmospheric storage tanks(lined)	S	Damage, paint, corrosion, rubber lining	
18.	Support structures	O	Damage , paint, corrosion	
19.	Flanges	C	Damage , paint, corrosion	
20.	Fabricated pipes	S	Damage , paint, corrosion	Provide end cap
21.	Vessels internals	C	Damage , paint, corrosion ,packing	
22.	Grills	S	Damage , paint, corrosion	
23.	Angles	S	Damage , paint, corrosion	
24.	Bridge mechanism/clarifier mechanism	O	Damage , paint, corrosion	
25.	Cranes, rails	S	Damage , paint, corrosion	
26.	Stair cases	O	Damage , paint, corrosion	
27.	Ladders/handrails	O	Damage , paint, corrosion	
28.	Fabricated ducts	S	Damage , paint, corrosion	
29.	Isolation Gates	O	Damage , paint, corrosion	
30.	Fabricated boxes/panels	S	Damage , paint, corrosion	
Mechanical components like valves, fittings, cables glands, spares etc.)				
31.	Valves	S	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
32.	Fittings	S	Damage , packing	Provide end cap
33.	Cable glands	C	Damage , packing	
34.	Tools & tackles	C	Damage , packing	
35.	Nut , bolts, washers,	C	Damage , packing	
36.	Gasket & Packings	C	Damage , packing	
37.	Copper tubes	C	Damage , packing, corrosion	Provide end cap
38.	SS tubing	C	Damage , packing	Provide end cap
Rotating assemblies (pumps, blowers, stirrers, fans, compressors etc.)				
39.	Pumps	S	Damage , packing, corrosion	Shaft rotation
40.	Blowers/Compressors	S	Damage , packing, corrosion	Shaft rotation
41.	Agitators/stirrers/radial launders	C	Damage , packing, corrosion	Shaft rotation
42.	Rollers for chlorine tonner mounting	C	Damage , packing, corrosion	
43.	Centrifuge	S	Damage , packing,	
44.	Gear box	C	Damage , packing, corrosion	
45.	Bearings	C	Damage , packing, corrosion	
46.	Fans	S	Damage , packing, corrosion	
47.	Dosing skids	S	Damage , packing, corrosion	
48.	Pump assemblies	S	Damage , packing, corrosion	
49.	Air washers(INTERNALS)	S	Damage , packing	
50.	Air conditioners (split)	C	Damage , packing	

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
51.	Elevators(CONTAINERIZED)	O	Damage , packing, corrosion	
52.	Chillers/VA machines	S	Damage , packing	
53.	Air handling Unit/Package unit	S	Damage , packing	
54.	Chlorinators & Evaporators	C	Damage , packing	
55.	Ejectors	C	Damage , packing	
56.	Electrolyser	C	Damage , packing	
Miscellaneous items like chain pulley blocks, hoists etc.				
57.	Chain pulley blocks	S	Damage, Packing	
58.	Electric hoists	S	Damage, Packing	
59.	Fire extinguishers	C	Damage, expiry date	
60.	Fork Lift Truck	S	Damage, Packing	
61.	Hydraulic Mobile Crane	O	Damage, Packing	
62.	Mobile Pick Up & Carry Crane	O	Damage, Packing	
63.	Motor boats	O	Damage, Packing	
64.	Safety showers	S	Damage, Packing	
65.	Diffusers/dampers	S	Damage, Packing	
Chemicals and consumables (acid, alkali, paints, oils, reagents and special chemicals)				
66.	Hydro Chloric Acid (HCl)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical
67.	Sulphuric acid (H_2SO_4)	Store in canes/ storage tank in dyke area	Date of production/ leakage/fumes	hazardous chemical

Sl. No.	Description of the equipment	Type of Storage	Check for	Remarks
68.	Sodium hydroxide (NaOH)	Store in canes/ storage tank in dyke area	Date of production/ leakage/ fumes/ breather	hazardous chemical ,breather to be checked for air ingress
69.	Sodium hypo chlorite	To be stored under shed	Date of production/ leakage/ fumes	hazardous chemical ,self-life normally 15-30 days after which strength of chemical decays
70.	Ammonia	S	Date of production/ leakage/ fumes	Store in closed storage tanks, hazardous chemical
71.	CW treatment chemicals	S	Date of production , Self-life	Store in closed canes
72.	RO/UF cleaning chemicals	S	Date of production , Self-life	Store in closed canes
73.	Lime	C	Damage to packing , seepage	Prevent moisture, rain
74.	Alum bricks	C	Damage to packing	Prevent moisture, rain
75.	Poly electrolyte	S		Store in closed storage tanks
76.	Laboratory chemicals(powder)	C	Damage, Packing self-life	
77.	Laboratory chemicals(liquid)	C	Damage, Packing self-life	
78.	Lubrication oils	C	Leakage	
79.	Paints	S	Leakage ,air tightness	
80.	Sand	O	Damage of packing	No hooks
81.	Salt (NaCl)	C	Damage of packing, water ingress	Prevent moisture, rain
82.	Anthracite	S	Damage of packing	
83.	Activated carbon	S	Damage of packing	

Sl. No.	**Description of the equipment**	**Type of Storage**	**Check for**	**Remarks**
84.	Thermal insulation	S	Damage of packing	
85.	Cement	C	Damage of packing	Prevent moisture, rain
86.	Gravels	O	Damage of packing	
87.	ION exchange resins	C	Damage , packing	Refer manufacturer guidelines
88.	RO membranes	C	Damage , packing	Refer manufacturer guidelines
89.	UF membranes	C	Damage , packing	Refer manufacturer guidelines
90.	Cleaning chemicals	C	Damage , packing	Refer manufacturer guidelines
91.	Chemicals for analysers/calibration	C	Damage , packing	Refer manufacturer guidelines
Electrical and C & I items (motors, cables etc.)				
92.	Motors	C	Damage , packing	
93.	Cable drums	O	Damage	
94.	Control Panel /control desk, UPS ,JB	S	Damage, Packing	
95.	Instruments(gauges/analysers)	C	Damage	
Special items		As per Manufacturer's item, like Hydrogen cylinders, Ozonator, Analyser, Chlorine dioxide generators etc.		

5. CONCLUSION

Concerned storage agency at site should make sure that loss in equipment performance and wear & tear are minimised through proper storage and preservation. The above are broad guidelines and cover major equipment / materials. However specific storage practices shall be followed as per manufacturer recommendation. All the necessary measures even in addition to the ones mentioned above, if found necessary, should be taken to achieve the objective.

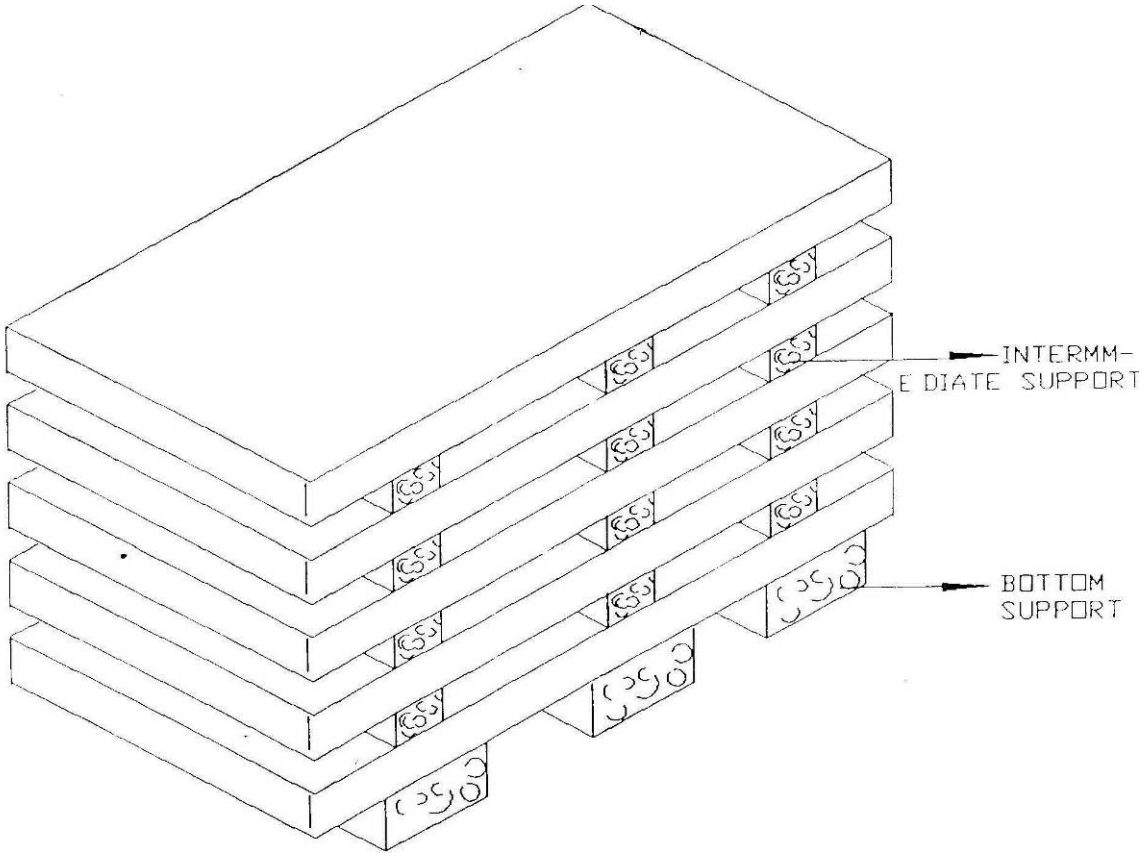


Figure – 1 – PLATE STACKING ARRANGEMENT

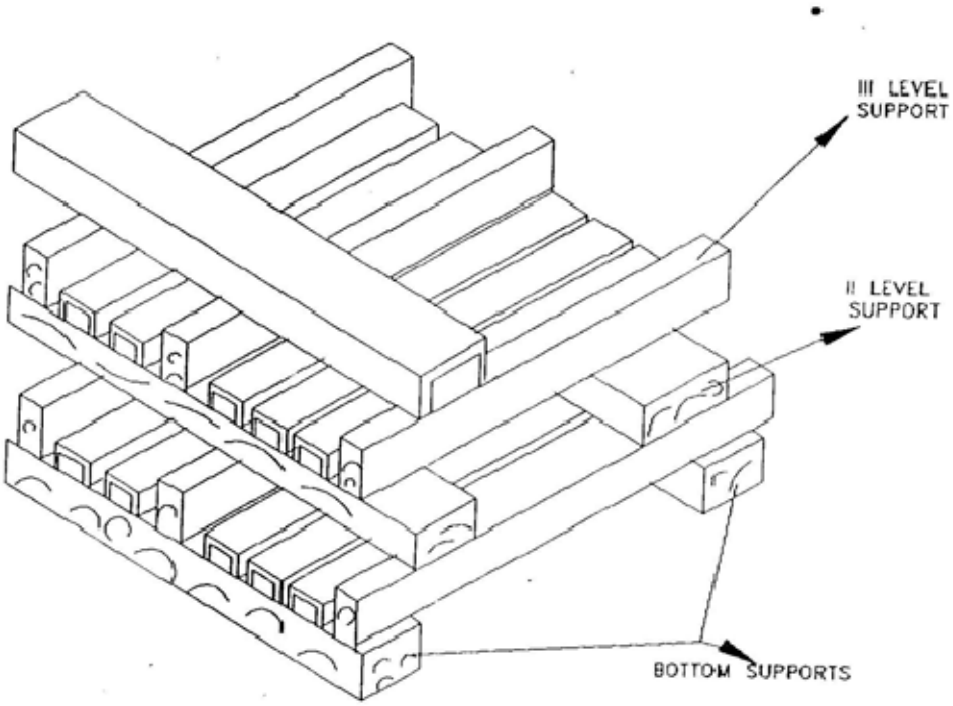


Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT

SUB-SECTION-D

PACKING PROCEDURE

DOMESTIC PACKING

COMMON GUIDELINES

1 GENERAL:

This standard lays down packing instructions for domestic packing of Components/ Assemblies/ Equipment to be despatched against Customer's contracts, for which there are no special instructions issued by the Engineering Departments. For Seaworthy Packing refer standard AA0490004 wherever applicable.

The Components/Assemblies need to be packed suitably to avoid physical damage & corrosion during transit & storage. For specific applications the concerned engineering department shall issue a product standard. Reference of this product standard, must appear in the Shipping list/Packing List.

2 SCOPE:

This procedure gives minimum guidelines to be complied with for domestic packing of Components /Assemblies/ Equipment. This domestic packing shall be suitable for different handling operations and for the adverse conditions during transportation and during indoor / outdoor storage of materials.

3 WOOD SPECIFICATION

Based on availability, the wood shall conform to specification AA51401 or AA51402.

4 TYPES OF PACKING:

The following 5 types of packing have been standardized for packing of General Components/ Assemblies.

1) '**OP**' - Open Type.
2) **'PP**' - Partially Packed.
3) '**CP**' – Crate/Box Packing - Components/Equipment requiring physical protection.
4) '**CQ**' - Case Packing – Machined components-Small & Medium Components/ Assemblies/ Equipment which require corrosion & physical protection.
5) '**CR**' - Case Packing – Electrical/Electronic Components/ Assemblies, which require special packing viz. Water Proof, Shock Proof etc…

5 DESCRIPTION OF TYPES OF PACKING:

The various types of packing, as standardized above, are described below.

5.1 'OP' - Open Type

In case, of components which are not affected by water & dust and do not require special protection, are generally not machined, shall be sent as open packages. However, these components may be sent in crates, wherever necessary.

5.2 'PP' - Partially Packed

Components which need special protection at selected portions only shall be despatched partially packed. Machined surfaces should not be allowed to come directly in contact with the wood. Such surfaces should be protected with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene

Film to Specification No. AA51420. All sharp corners and edges shall be protected by rubber mats to prevent damage to the polyethylene film

5.3 'CP' - Crate Packing

Assemblies/Components which need only physical protection from the point of view of handling shall be despatched duly packed in crates.

5.4 'CQ' - Case Packing - Machined Components/Assemblies/Equipment

Small and medium sized components/assemblies/equipment due to size/weight and to avoid handling and pilferage problems shall be packed in Case/Containers. Wherever required adequate quantity of silica gel to AA55619 or VCI Powder/Tablets, packed in thin muslin cloth cotton bags shall be suitably placed. Small machines/components of less weight shall be provided with suitable cushioning by Rubberised coir. The components inside the case shall be entirely covered with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No. AA51420, wherever required. This may be prescribed for electronic parts/critical machined components/surfaces.

For mechanical product like valves where motors are separately securely wrapped in polyethylene, the requirement of individual component wrapping shall be exempted.

5.5 'CR' - Case Packing - Electrical & Electronic Components/Assemblies

Delicate components likely to be damaged e.g. Gauges, Instruments etc. are to be wrapped in waxed paper or polyethylene air bubble film and packed in cartons. Adequate quantity of Silica gel to AA55619 packed in cotton bags of 100grams each are to be suitably placed in the cartons. The cartons shall be entirely covered with 100GSM(Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No. AA51420 before being packed in the cases. VCI Powder/Tablets can be used as an alternative to Silica Gel to AA55619.

Empty space in the cartons shall be filled with rubberized coir to get proper cushioning effect. The cartons shall be manufactured from corrugated Fiber Board, meeting requirements of AA51414.

6 PREPARATION OF PACKING CASES

6.1 DIMENSIONS:

a) Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25/20mm +2/-3 mm as per applicable drawings of the respective units.

b) Width of all planks including the tongue shall be more than 125mm and after plaining it shall be minimum 100mm.

c) Minimum number of planks shall be used for a shook.

d) Horizontal, vertical, diagonal planks shall be given for binding (number of such planks depend on the dimension of panel.

e) Width of binding planks shall be minimum 100mm.

f) Distance between any 2 binding planks shall be less than 750mm.

g) diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm

h) Distance of the outer edges of these planks from the edge of case shall be less than 250mm.

i) Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.

6.2 JOINTING OF PLANKS

Single length planks shall be used for cubicles whose overall length is less than 2400mm. For cubicles of length more than 2400mm, jointing is permitted. The jointing shall be done with one single or maximum of 2 planks of wood same as other planks of width 250 mm (minimum) with two rows of nails on either side of the joint in zigzag manner. From the joint along height side, it shall be of lap joint with overlap of at least the width of plank.

6.3 TONGUE AND GROOVE JOINTS

Two consecutive planks shall be joined by tongue and groove joint. Depth of tongue shall be 12+1 mm, thickness of tongue shall be 8 +1 mm. The groove dimensions shall be such that the tongue fits tightly into the groove to make a good joint. This type of joint can be done based on the product requirement wherever required.

6.4 PERMISSIBLE DEFECTS

Wood shall be free from knots, bows, visible sign of infection and any kind of decay caused by insects, fungus, etc.

End splits: Longest end splits at each end shall be measured and lengths added together. The added length shall not exceed 60mm per meter run of shook's. Wood pins shall be used to prevent further development of split.

Surface cracks: Surface cracks with a maximum depth of 3mm are permissible. A continuous crack of any depth all along the length is not allowed.

6.5 OTHER MATERIALS

6.5.1 NAILS

The dia. of the nails shall be 3.15mm. The length of the nails shall be 65mm wherever two planks of 25mm thickness are joined and 75mm wherever a 25mm planks is joined to a 50mm plank.

6.5.2 BLUE NAILS

These are used for nailing bituminized Kraft paper/hessian cloth to the planks. The length of the nails shall be 16mm.

6.5.3 HOOP IRON STRIPS

These are used for strapping the boxes. The width of the strips shall be 19+1mm and thickness 0.6+0.01mm. The material shall be free from rust.If sufficient nailing is done for bigger boxes, strapping need not be done.

6.5.4 CLIPS

These shall be used for strapping the hoop iron strips on the boxes.

6.5.5 BRACKETS

These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of thickness min 2mm and width 25+1mm. The brackets shall be of "L" shape, the length of each side being 100+2mm. Two holes shall be provided towards the end of each side for screwing /nailing.

6.5.6 FASTENERS

Bolts, double nuts, spring washers will have to be used for packing of some special items like transformers, reactors, breakers, etc., to hold the job to the bottom plank of the box. The bolts, nuts, washers will be provided by the vendor. Drilling of holes will have to be done using contractor's tools.

6.5.7 MULTI LAYERED CROSS LAMINATED POLYTHELENE FILM

100GSM (Colourless) Multi Layered Cross Laminated Polythelene Film Specification No: AA51420 are used to make covers to the jobs individually. The cross lamination gives qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays.

6.5.8 RUBBERISED COIR:

The rubberized coir is used as cushioning material. For the packing of loose items, items are to be arrested by using rubberized coir. For the packing of cubicles rubberized coir of thickness 25mm and width 75mm shall be used.

6.5.9 FOAM RUBBER / 'U' FOAM:

This is used for covering the delicate items. This material is provided by the vendor.

6.5.10 MARKING PLATE:

This shall be of anodized aluminium sheet. Size of the marking plate shall be maintained minimum of size as per the details specified in the Figure 4.

6.5.11 PACKING SLIP HOLDER:

This shall be of galvanized iron tinned sheet /Aluminium sheet

6.5.12 SILICA GEL:

This shall be of indicating type to conform to IS: 3401/AA55619.Silical gel shall be used for such products only where moisture needs to be avoided.

6.5.13 COTTON BAGS:

These are used for holding silica gel. The bags shall have the following matter indicated on them:

BHEL-UNIT NAME	PLACE-PINCODE
SILICA GEL	INDICATING TYPE
BLUE :	ACTIVE
ROSE :	REDUCED ACTIVITY
WHITE :	NO ACTIVITY. TO BE REPLACED WITH FRESH SILICA GEL

6.5.14 COTTON/ PLASTIC TAPE:

This is used for tying small items. And also to prevent vibrations of moving parts within the cubicles.

6.5.15 MARKING INK:

The ink used normally is black in color. In some special cases other color also will have to be used. The ink shall be non-fading/indelible and non-washable by water.

6.5.16 POLYETHYLENE BAGS:

These are to be used for keeping the Packing slips. The bag shall be of size 70mm X 100mm (minimum).

6.5.17 Hessian cloth, twine thread, paint will have to be used in packing certain items.

6.5.18 Mechanical Latching clamps:

For CLW Railway panels and similar Panels self-locking clamps can also be used on need basis in conjunction with or apart from regular bolt and nut fixing arrangement. For reusable boxes, these clamps provide easy locking and unlocking arrangement. These clamps will be made available from BHEL in some cases.

6.5.19 STICKERS

The following stickers to be put by the vendor on cubicles/Boxes after packing.

1) Case No sticker: 2 nos. Size 25.Cm x 0.45Cm
2) BHEL Monogram sticker: 1 no. Size 1.75Cm x 2.3Cm
3) Address sticker: 2 nos. Size 3.8Cm x 3.0Cm
4) Direction sticker “Front” & “Back” - 4 nos. Size 2.0Cm x 0.75Cm
5) Chain Mark Sticker: 4 Nos. Size – 3.0Cm x 0.75Cm
6) "Fragile” sticker: 2 Nos. Size. 2.1Cm x 1.5Cm
7) "DO NOT STACK” sticker - 2 Nos. Size 3.0Cm x 2.2Cm

In place of stickers, writing all the details legibly with paint shall be allowed & respective units may take decision accordingly.

7 PACKING OF CUBICLES:

7.1 The packing is to be done as per clause 5 in all respects.

7.2 The cubicles are already fixed on wooden pallets. Hence the contractor need not arrange the bottom pallets normally.

7.3 The cubicles will be of different sizes both width wise and lengthwise. The cubicles may be made up of single suite, 2 Suite, 3 Suite, 4 Suite, etc., The width of the cubicles generally varies from 400 mm to 1650mm.The length of the cubicle, generally varies from 1500 mm to 4800 mm. The height is normally 2430 mm. In some cases, the height may be less/more**.**

7.4 MULTI LAYER CROSS LAMINATED POLY FILM

The inner surface of 4 sides of shook's shall be nailed with Multi-layer cross laminated poly film (as per 6.5.7) using blue nails (as per 6.5.2) wherever 2 pieces of Cross laminated poly film are used, the joint shall have an overlap of minimum 20mm.

The inner surface of top cover shall be nailed with Multi-layer cross laminated poly film (as per 6.5.7). This sheet shall project outside on 4 sides by at least 100mm and shall be nailed properly on sides. Joining of sheets should have overlap of minimum 20mm.

The cubicles shall be covered with Multi-layer cross laminated poly film (as per 6.5.7).

7.5 SILICA GEL:

Silica gel (as per 6.5.12) packed in cotton bags shall be kept at different places inside the cubicle as per BHEL-Unit directions. Each suit of cubicle shall be provided with 1 kg of Silica gel (for a 4 suit cubicle 4 kgs of Silica Gel to be used. The bag containing silica gel to be as per 6.5.13).

7.6 LOOSE PARTS:

Any loose parts in the cubicles shall be tied using cotton/ plastic tape. Wooden battens shall be provided wherever necessary.

7.7 WOODEN BATTENS:

In case of cubicle which are not rectangular in shape like control desks, sufficient number of wooden rafters/battens of proper size shall be provided to give strength to the package.

7.8 RUBBERISED COIR:

Gap between the cubicle and the case shall be filled with rubberized coir (as per 6.5.8) with distance between consecutive layers less than 500mm.

7.9 CLAMPING:

Packing shall be bound at edges by nailing M.S. Clamps / Brackets (as per 6.5.5). Each vertical edge shall have minimum 3 clamps. Top horizontal edges will have one clamp for every meter length of package. However, minimum 4 clamps shall be nailed at the top for any cubicle.

7.10 PACKING SLIP:

Packing slip kept in the polyethylene bag (As per 6.5.16) shall be placed in the box at appropriate place. In addition, one more packing slip covered in polyethylene cover and packing slip holder (as per 6.5.11) shall be nailed to front / rear of case.

7.11 MARKING PLATE:

One no. (As per 6.5.10) shall be nailed to the front side of the case.

7.12 CASE MOUNTING:

After complete packing, stencil marking of various details and marking of symbols shall be done as per BHEL instructions using indelible / non washable marking ink.

7.13 Different types (Typical) of Cubicles with sizes for Packing

1. Single suite cubicle - 900 x 950 x2500
2. Two suite cubicle - 1650 x 950 x 2500
3. Three suite cubicle - 2400 x 950 x2500
4. Four suite cubicle - 3150 x 950 x 2500
5. Regulation cub - 1300 x 1350 x 2500
6. Thy cub - 2870 x 1350 x 2500
7. VFD Cub - 3800 x 1550 x 2500

7.14 PACKING OF CUBICLES FOR EXPORT

Refer Corporate Standard AA0490009.

8 PACKING OF LOOSE ITEMS/SPARES

1) Shape of cases shall be square, rectangular with single gabled roof or with double gabled roof depending on the nature of the job to be packed. Construction shall be as per drawings enclosed. Only gable will be additional as required.
2) Wood shall conform to specification AA51401 or AA51402 with Tongue and Groove joint as per clause 6.3.
3) Width of planks shall be at least 100 mm. Width of binding planks (battens) shall be at least 75mm.
4) External surface of planks on front and rear shall be plane 100% (except bottom plank).
5) Inner surfaces of all 6 sides shall be lined with Multi Layered Cross Laminated Polythelene Film (as per clause 6.5.7) using blue nails.
6) Rubberized coir of minimum 25mm thickness and 100 mm width shall be nailed to inner surfaces of bottom and 4 sides of box.
7) Internal packing: Items that go into the box shall be packed using 100GSM, (Colourless) Multi Layered Cross Laminated Polyethylene Film Specification No: AA51420. Any space left between the job and the sides and the top of the box shall be filled with rubberized coir to get proper cushioning effect.
8) Certain items like transformers, reactors, breakers, etc., shall be bolted to the bottom of the box using bolts, nuts and washers.
9) Silica gel as per clause 6.5.12 held in cotton bags as per clause 6.5.13 shall be kept at proper places in the box.
10) Packing slip kept in polyethylene bag (clause 6.5.16) shall be placed in the box.
11) Marking plate as per clause 6.5.10 shall be nailed to side of the box.
12) Two numbers of hoop iron strips as per clause 6.5.3 shall be strapped tightly on the case using clips.
13) Stencil marking of various details and marking of various symbols shall be done as per BHEL instructions using indelible/non-washable marking ink.
14) Loose items to be kept inside the cubicle

- The components which are removed from cubicle for shipping purpose only, such as meters shall be kept inside the cubicle individually, kept in wooden box and tied firmly in bottom of Cubicle.

- Other items which are given loose in addition to cubicle shall be packed in separate boxes.

9 BOX SIZES

9.1 BOX SIZES

Table 1 – SPARES WOODEN BOX DETAILS

SNO	BOX TYPE	BOX SIZE (in mm)	BOX Wt (in KG)	Carrying Capacity
1	A	800 X 200 X 200	15	
2	B	1500 X 200 X 200	22	
3	C	2000 X 200 X 200	27	
4	D	1100 X 200 X 200	15	
5	E	200 X 200 X 200	5	
6	F	320 X 250 X 260	13	
7	G	320 X 250 X 430	16	
8	H	430 X 370 X 430	23	
9	I	1100 X 400 X 400	45	
10	J	1500 X 500 X 400	65	
11	K	2000 X 500 X 400	93	
12	L	2500 X 500 X 400	88	
13	M	900 X 600 X 600	100	
14	N	3000 X 400 X 400	60	
15	P	600 X 500 X 400	35	
16	Q	710 X 630 X 600	90	
17	R	850 X 630 X 670	102	
18	S	1000 X 770 X 670	140	
19	T	2500 X 850 X 800	180	
20	U	1500 X 700 X 700	120	
21	W	1200X900X600	120	
22	Y	450 X 200 X 200	10	

Table 2 – WOODEN BOX DETAILS

BOX TYPE	**BOX SIZE (in MM)**	**BOX Wt (in KG)**	**Carrying Capacity**
1	320X250X260	10	
2	320X250X430	15	
3	430X370X430	25	
4	670X670X470	65	
5	720X630X600	75	
6	1000X770X660	100	
7	1100X430X670	80	
8	1200X1200X900	80	
9	1300X770X1050	155	
10	2500X850X800	225	
11	2000X1500X1200	305	
12	1850X1050X1250	260	
13	2000X800X800	180	
14	2600X1500X1600	470	
15	250X250X600	20	
16	250X250X880	30	
17	300X300X700	25	
18	380X380X880	45	
19	510X510X1400	60	
20	570X570X1400	80	
21	575X575X1875	105	
22	3600X1100X1100	390	
23	900X500X800	110	
24	2000X950X740	225	
25	1600X1120X700	220	
26	2500X2000X1200	490	
27	2900X1900X1400	525	
28	3000X1000X900	370	
29	3200X2200X950	450	
30	2150X1100X750	325	
31	2000X2000X700	130	
32	700X1200X1325	130	

Table 3 – STEEL BOXES

SL NO	TYPE	DIMENSION IN MM			WEIGHT	CARRYING CAPACITY (KGS)
		LENGTH	BREADTH	HEIGHT		
1	I	2480	1680	1500	339	4500
2	II	1200	900	600	061	2000
3	IIB	1800	850	950	115	2500
4	III	900	600	600	029	1000
5	IV	600	450	500	019	750
6	V	400	350	300	011	500

TYPICAL PATTERN OF WOODEN BOX

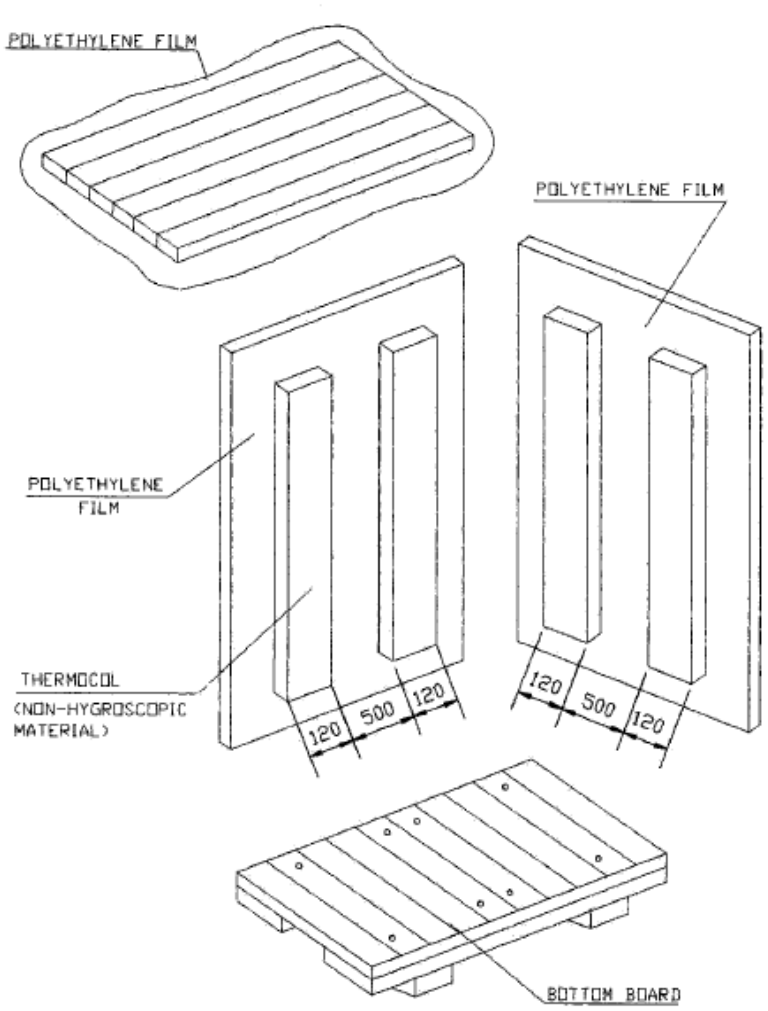


Figure 1

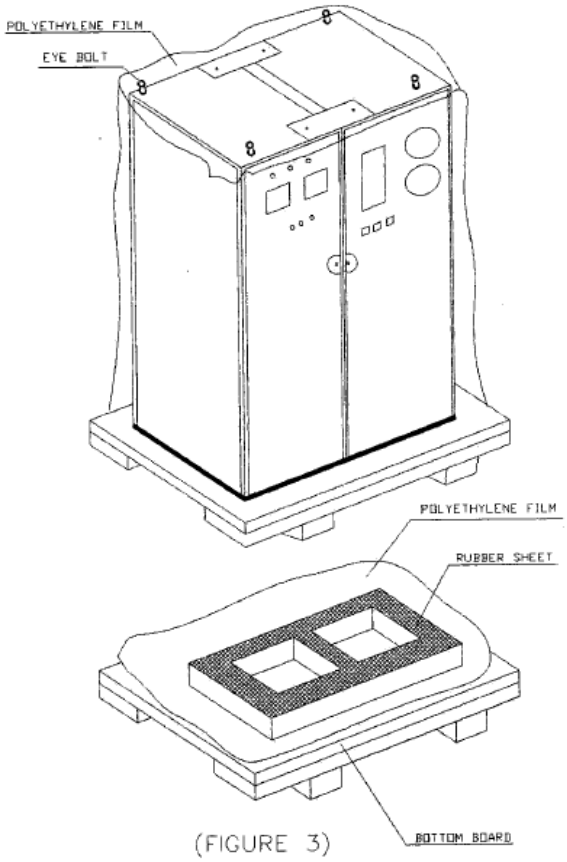


Figure 2

9.2 STEEL CONTAINERS:

Steel containers for packing can be used in case of repeated supplies of the same equipment. Empty steel containers are to be returned back from customer's end and to be reused for the next supplies. The containers are to be made of structural steel as per AA10108 with proper reinforcement with I, C and T Sections. Depends on the availability of resources & requirements units may be allowed to use standard cargo containers also instead of fabricated steel boxes.

a) Following precautions are to be taken during packing: -

b) Put the machine in the steel container properly,

c) Cover the machine with polythene.

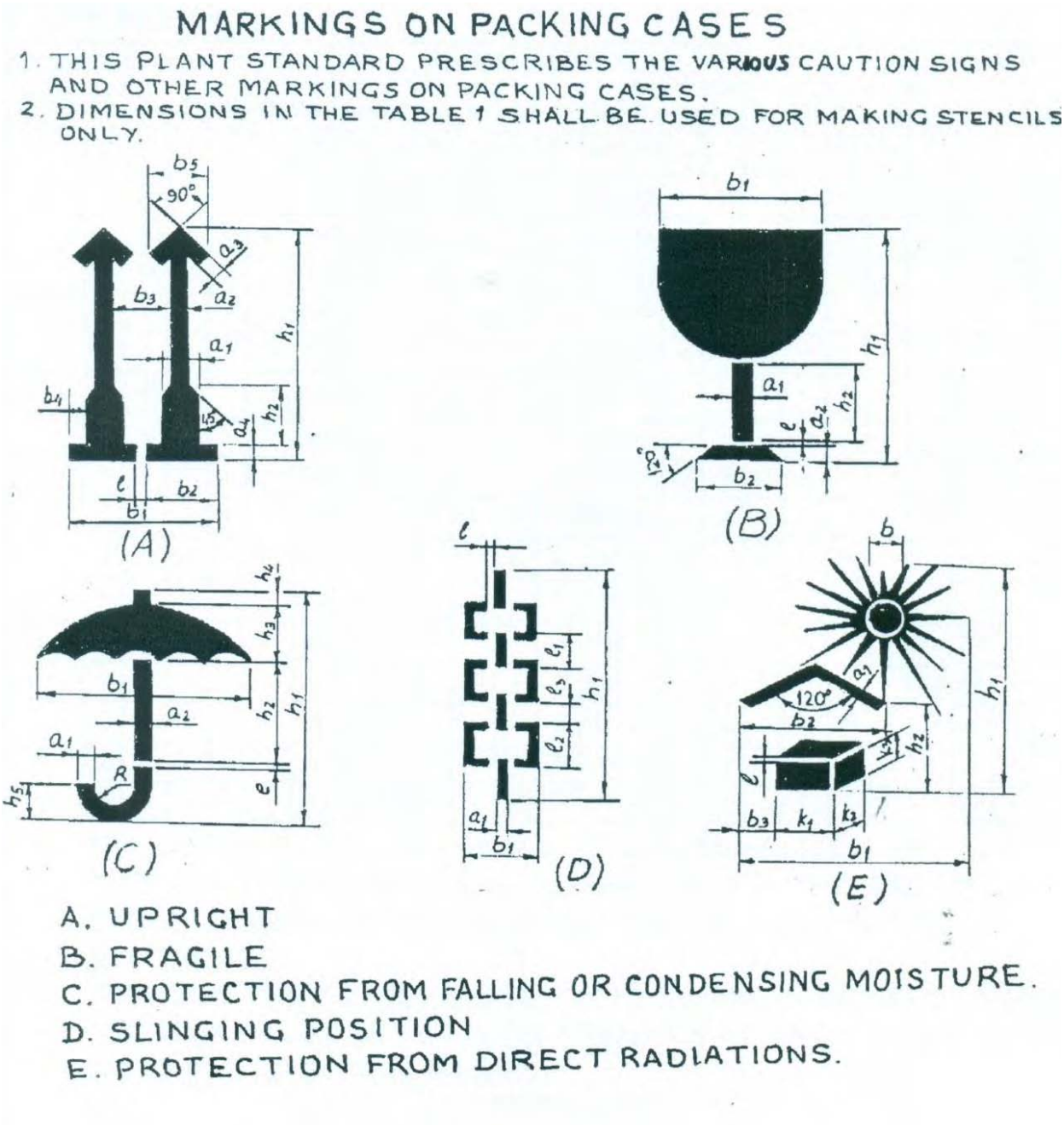
d) To arrest the movement in the steel container necessary wooden Blocks/Battons may be put.

e) Put cover on steel, container and Bolt Properly

9.3 SEALED PACKING:

Components sub-assemblies and assemblies sensitive to climatic conditions shall be packed seal tight. All the openings of the sensitive components, sub-assemblies and assemblies shall be blanketed to prevent the ingress of dust and moisture. The components sub-assemblies and assemblies are completely covered with 2 layers of polyethylene sheet. All sharp corners and edges are to be protected by rubber mats to prevent the polyethylene sheet from damage. Top surface of the case shall be free from dents to prevent rain water pockets.

10 MARKINGS/STENCILINGS



Center of Gravity

Figure 3

DESIGN-ATION		DIMENSION IN MM																						
		a1	a2	a3	a4	b1	b2	b3	b4	b5	b	l	h1	h2	h3	h4	h5	k1	k2	k3	l1	l2	l3	R
A	1	12	5	5	4	52	25	19	8	21		2	84	23										
	2	17	7	7	6	75	36	29	11	30		3	119	33										
	3	24	10	10	8	104	50	38	16	42		4	168	46										
	4	34	14	14	11	147	71	59	23	60		5	239	65										
B	1	5	5			50	33					2	84	25										
	2	7	7			71	47					3	119	36										
	3	10	10			100	66					4	168	50										
	4	14	14			142	94					5	239	71										
C	1	4	3			66						2	80	39	19	5	11							6
	2	6	4			85						3	114	55	27	7	16							9
	3	8	6			120						4	160	78	38	10	22							12
	4	11	9			170						5	227	110	54	14	31							17
D	1	6				30						4	148								30	30	10	
	2	9				42						5	209								42	42	14	
E	1	3				69	47	10			16	2	91	26				17	8	11				
	2	4				98	67	15			23	3	128	33				24	11	16				
	3	6				138	94	20			32	4	182	62				34	16	22				

Table 4

Black and Red Marking Ink to IS:1234 "Ink, Stencil, Oil Base, For Marking Porous Surfaces" or duplicating ink stencilling, oil base for marking porous surfaces.

All cases containing fragile items are to be stencilled with red marking and stencilling paint/ink

"HANDLE WITH CARE", "FRAGILE DO NOT TURN OVER".

Besides the caution signs the product information's shall be stencilled of letters with 13mm to 50mm height.

In case of consignment consists of more than one package, each package shall carry its package no as given in shipping list. All caution signs shall be stencilled in high quality full glossy out door finishing paint red in colour (AA56126). All other markings shall be carried out in black enamel(AA56126).

Caution signs & other markings shall be stencilled on both the end shooks & the side shooks.

Caution sign (for slinging) shall be stencilled only on side shooks at the appropriate place.

Note: Incase the size of package is small for using the stencils, then hand written letters/figures shall be allowed.

	BHEL – <unit> - <location> - <pin>				
CONSIGNEE					
MATERIAL					
CUSTOMER REF.			MO. NO.		
DESPATCH ADVICE NOTE NO			CASE NO		
DIMENSIONS(MM) L x B x H				NET WT –KGS	GROSS WT –KGS
SPECIAL INSTRUCTIONS	HANDLE WITH CARE - KEEP DRY DO NOT DROP - DO NOT TILT				

Figure 4 – TYPICAL MARKING PLATE (225 X 170)

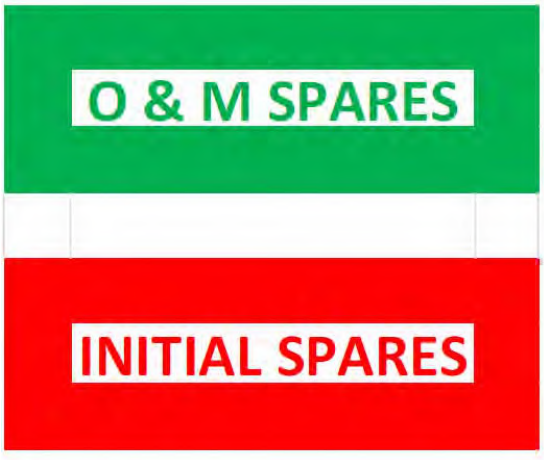


Figure 5

Easy spares [Initial and O&M] Traceability and Identification at units and as well as at sites:

11 RECYCLING OF INCOMING WOODEN PACKING CASES

OBJECTIVES

– To utilize useable wood of incoming packing cases, for manufacturing of new packing boxes.
– To recycle incoming wooden packing cases, as such, wherever possible.

1) All incoming wooden packing cases received from suppliers /customers will be opened carefully, with the intention of reusing them, by Shop.

2) After carefully taking out the contents, the empty wooden packing cases will be shifted by Shop to the specified locations i.e. bin / nearly spaces, already earmarked in stores.

3) Material shifting contractor engaged by store, will collect all such wooden packing cases and scrap wood from specified points, on a regular basis.

4) After collecting / loading the empty packing cases/ scrap wood, contractor will take the carrier first to Weighment Bridge for weighment, thereafter; he will go to Carpentry, where Carpentry representative will identify the packing cases which can be used by Carpentry for manufacturing of New Packing Boxes. All such identified packing boxes will be unloaded and handed over to Carpentry by contractor.

5) These packing boxes will be made re-useable after necessary rectification and additional work.

6) Contractor will again take the carrier for weighment and this second reading will also be recorded on the same “Weighment Slip”.

7) Weight of empty packing cases / scrap wood taken will be calculated on the basis of 1st and 2nd weighment readings recorded on the “Weighment Slip”. A copy of“Weighment Slip” (where both the weighment readings are recorded) will be given by the contractor to the carpentry representative. Based on this “Weighment Slip”, carpentry will maintain a register in which details of quantity received will be recorded.

8) All “Weighment Slips” will invariably be signed by carpentry representative (even when no boxes have been unloaded by carpentry). Store will accept the scrap wood only if “Weighment Slips” are signed by carpentry representative.

9) Balance empty packing cases / scrap wood will be handed over by contractor to Store, for storing in scrap yard.

10) A separate area in Scrap yard will be provided, for executing the work of denailing of wooden packing cases, under supervision of carpentry.

11) Carpentry contractor will identify packing cases / scrap wood for denailing, which will behanded over to him by Store, at Scrap yard, for denailing and further operation.

12) Quality and Carpentry will jointly inspect the wood generated by de-nailing process and will prepare “INSPECTION CUM RECEIPT REPORT OF USEABLE WOOD RECEIVED FROM TPS – STORE BY CARPENTRY”.

13) After acceptance of the wood by Quality and Carpentry, the same will be shifted to carpentry for receipt and its record will be maintained by carpentry.

14) This will be a Permanent Productivity Project executed by carpentry. “Productivity Savings “duly verified at the current Purchase Order rate of wood, will be sent every month to Resource Management Department, for highlighting it in their monthly progress report.

12 STANDARD METHOD OF PACKING

Table 5 - Standard Method of Packing

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
PRESSUE VESSELS								
TOWERS					O			
TANKS					O			
VESSELS					O			
GASKETS	O							
FASTENERS	O							
COVERS		O						
EXCHANGERS								

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
HEAT EXCHANGERS					O			
TUBE BUNDLE	O							
SHELL					O			
AIR FIN COOLERS					O			
COLOUMNS, MOTOR SUSPENSIONS, PLENUM CHAMBERS, SCREEN GUARDS, ETC					O			
BEARING BLOCKS	O							
FANS	O	O						
MOTORS	O							
GASKETS	O							
FASTENERS	O							
TEST FLANGES			O					
TEST RINGS			O					
COVERS			O					
CRYOGENIC VESSELS								
COLD CONVERTERS					O			
HORIZONTAL STORAGE TANKS					O			
TRANSPORTATION TANK					O			
COLD BOX					O			
DRYING UNIT					O			
DRYING BOTTLES					O			
MOISTURE SEPARATORS					O			
SILENCERS					O			
ONGC SKIDS					O			
VAPORISER		O						
SPECIAL PRODUCTS								
SI/VI PIPING		O						
CRO BIO CONTAINERS	O							
AIR BOTTLES	O							
TITANIUM BOTTLE	O							
WAR HEAD CONTAINER	O							
MISSILE CONTAINER	O							
FUEL CONTAINER	O							
AIR LOCK ASSEMBLY	O							
BOILER DRUMS					O			
BOILER ITEMS								
COILS			O					
PANELS					O			
HEADERS			O		O			
FEEDERS								
MACHINED ITEMS								
SHELL SEGMENTS					O			

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
SHELL SEGMENTS IN STACKS					O			
SPHERE PETALS								
COLOUMNS, BASE PLATES, TIERCOS, PIPES, NOZZLE E1, F1, INTERNAL PIPES, PADS ETC.					O			
ROLLERS	O							
VALVE TRAYS								
VALVE TRAY COMPONENTS	O							
LATTICE GIRDERS		O						
FASTENERS	O							
GASKETS	O							
SUB CONTRACTS								
FAB STRUCTURALS					O			
SUPPORTING STRUCTURALS					O			
STRUCTURE SUB ASSEMBLY					O			
FAB PIPES					O			
GRATINGS					O			
STAIR CASES					O			
HANDRAILS/ PLATFORMS					O			
BOUGHT OUT COMPONENTS								
IRON & STEEL (LIKE PLATES, BEAMS, ANGLES, CHANNELS ETC.)					O			
PIPE FITTINGS								
CS PIPES, TUBES					O			
SS PIPES, TUBES					O			
FIN TUBES	O							
ELBOWS		O			O			
FLANGES	O	O						
VALVES	O							
GAUGES	O							
DEMISTERS		O						
ABSCRBANTS (LIKE MOLECULAR SIEVES, ACTIVATED ALUMINA, MOBILE SORBID)						O		
PAINT TINS		O						
PAINT DRUMS						O		
IGNITORS	O							
SPRAY NOZZLES	O							
ELECTRICAL INSTRUMENTATION								
MOTORS, PUMPS, COMPRESSORS, TURBINES	O							
SWITCH BOARDS, DISTRIBUTION BOARDS, STARTERS, JUNCTION BOXES		O						
INDICATORS, VIBRATOR SWITCHES	O							

DESCRIPTION	CASE	CRATE	SKID	BUNDLE	BARE	DRUM	METAL DRUM	FIBRE DRUM
CABLE BUNDLES, CABLE DRUMS					O			
CABLE TRAYS, CABLE RACKS, EARTHING MATERIAL		O						
OPERATIONAL SPARES	O							

13 PROCEDURE FOR HANDLING OF COMPONENTS

The purpose of this procedure is to protect the quality of the components/equipment while handling in various stages of manufacturing packing & despatching.

13.1 Adequate care shall be taken in handling the material, and components to avoid damage during receipts, storage issue manufacture & despatch operations.

13.2 Appropriate material handling equipment like fork lifters, cranes etc. shall be used where needed.

13.3 Lifting by crane and transportation by trolley of critical items and large components like rotors castings etc. shall be done carefully.

13.4 For critical items, where specified, special handling fixtures shall be used for lifting.

13.5 Slings and shackles used for lifting the components/equipment shall be checked for fitness and suitability before use.

13.6 Slings used on machined surfaces shall be suitably padded. No slings shall be used on journal surfaces.

13.7 Precision machined components like blades, catches, rollers etc. shall be lifted using suitable wooden pallets.

13.8 HANDLING OF COMPONENTS ON RECEIPT/DESPATCH

Before loading/unloading a packing case from the carrier look for the following shipping instructions painted on the packing case.

a) The markings showing the upright position.

b) The markings showing the sling position

c) Markings showing the fragile contents.

d) Other required markings as per clause no.10

13.8.1 Appropriate cranes and slings should be used for different components/ cases. Slings should normally make an angle as minimum as possible (width wise) but in no case more than 15º.

13.8.2 Handling and lifting should be done without jerks or impacts.

13.8.3 Immediately after receipt of the goods, the packing should be examined all-round for any sign of damage. If necessary, lift the cover or a number of boards of the case so as to make the contents visible. In the event of sealed packing being used the plastic sheeting should not be damaged. It is imperative that the packing material is restored in original condition after the inspection.

13.8.4 On receipt of the equipment it should be checked with the shipping list and missing or damage if any should be reported immediately. It is important to arrange for immediate examination to determine the extent of the damage, the cause of the damage and where applicable the person or persons responsible for the damage. According to general practice when transporting by railway or by road vehicle the carrier concerned should be immediately called upon (within specified periods) for jointly establishing a statement of the damage. This is essential as a basis for a subsequent claim and possible damage report to the insurance company.

13.8.5 Protective coating applied on machined surfaces should not be disturbed. The plastic covering should be put back carefully so that it prevents ingress of dust and moisture. Some packing may have vapour phase inhibitor (VPI) paper enclosed inside the packing cases. This should be restored to its original place as far as possible.

13.8.6 Silica gel and such other chemicals kept in the box as desiccants and indicators should also be left in the box itself.

14 GENERAL GUIDELINES FOR ODC TRANSPORTATION/DESPATCH

Based on the Dimensions/Weight indicated in the Transportation Sketch, the type of Trailer is decided and indicated in the Tender Enquiry.

14.1 TRANSPORTATION:

1. LOW BED TRAILERS (LB 8):
   - Well Bed Length : 10000mm
   - Over Gooseneck : 13000mm
   - Width : 3000mm
   - Carrying Capacity : 40MT

2. LOW BED TRAILERS (LB 16):
   - Well Bed Length : 12000mm
   - Over Gooseneck : 16000mm
   - Width : 3000mm
   - Carrying Capacity : 75MT

3. TOW TYPE TRAILERS (WITH FRONT DOLLEY 16 TYRES): 12000MM length
   (for Exceptional equipment length: 30000mm and above)

   Bigger Dia equipment are loaded in the Well with overhanging.

   Smaller Dia equipment with excess length are loaded over Gooseneck with rear hanging.
   The Vehicle Dimensions are defined above are only guidelines for selection based on actual Dimensions/ Weight of the Consignment

14.2 PACKING:

For all ODCs, Wooden Saddles are cut to the diameter of equipment as per the Transportation Sketch.

Wooden Saddles	For Diameter up to 4000mm	For Diameter above 4000mm
Length:	1836/2743mm (6'0"/9'0")	3353mm (11'0")
Width:	300mm (1'0")	300mm (1'0")
Height:	Saddle + one/two wedges a top	Saddle + three/four wedges a top

Number of Saddles:	
Minimum	3 in case of Loading inside Well +1 when loaded on Gooseneck
Maximum:	4 in case of Loading inside Well +2 when loaded on Gooseneck

For Securing the equipment firmly on the Trailer, 19mm (3/4"), wire rope with 25mm (1") Heavy Duty Turn Buckles / BD Clamps are used as Lashing for the equipment.

14.3 NUMBER OF LASHINGS:

	CONSIGNMENT LOADED INSIDE WELL BED	CONSIGNMENT LOADED OVER GOOSENECK
a) up to 40MT	4 (2 Single Line lashing 2 Double Line Lashing)	5 (3 Single Line Lashing 2 Double Line Lashing)
b) 40MT to 60MT	5 (3 Single Line Lashing 2 Double Line Lashing)	5 (Single Line Lashing 3Double Line Lashing)
c) 60MT and above	5 (2 Single Line Lashing 3 Double Line Lashing)	6 (3 Single Line Lashing 3 Double Line Lashing)

SECTION-III

ANNEXURE–1

BIDDER SHOULD SUBMIT THE SIGNED AND STAMPED COPY OF THE FOLLOWING DOCUMENTS:

Document for Evaluation:

1. Compliance cum confirmation certificate (Refer Annexure-2 of section-III).
2. Pre-bid clarification, if any, as per format given under Section-III (Annexure-3).
3. Amendment to specification, if any, issued by BHEL duly signed and stamped.
4. Deviation schedule as per format given under Section-III (Annexure-4), in case of any deviations by bidder.
5. Documents for meeting the Pre-Qualification Requirement for Tanks
6. Unpriced Price Schedule for Tanks (mentioning quoted against each item)

ANNEXURE-2

COMPLIANCE CUM CONFIRMATION CERTIFICATE

The bidder shall confirm compliance with following by signing / stamping this compliance certificate (every sheet) and furnish same with the offer.

a) The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusions, other than those mentioned under "exclusion and those resolved as per 'Schedule of Deviations', with regard to same.

b) There are no other deviations w.r.t. specifications other than those furnished in the 'Schedule of Deviations'. Any other deviation, stated or implied, taken elsewhere in the offer stands withdrawn unless specifically brought out in the 'Schedule of Deviations'

c) Bidder shall submit QP in the event of order based on the guidelines given in the specification & QP enclosed therein. QP will be subject to BHEL / CUSTOMER approval & customer hold points for inspection / testing shall be marked in the QP at the contract stage. Inspection / testing shall be witnessed as per same apart from review of various test certificates/ Inspection records etc. This is within the contracted price without any extra implications to BHEL after award of the contract.

d) All drawings/ data-sheets / calculations etc. submitted along with the offer shall not be taken cognizance off.

e) The offered materials shall be either equivalent or superior to those specified in the specification & shall meet the specified / intended duty requirements. In case the material specified in the specifications is not compatible for intended duty requirements then same shall be resolved by the bidder with BHEL during the pre-bid discussions, otherwise BHEL / Customer's decision shall be binding on the bidder whenever the deficiency is pointed out.

   For components where materials are not specified, same shall be suitable for intended duty, all materials shall be subject to approval in the event of order.

f) The commissioning spares shall be supplied on 'As Required Basis' & prices for same included in the base price itself.

g) All sub vendors shall be subject to BHEL / CUSTOMER approval in the event of order.

h) Guarantee for plant/equipment shall be as per relevant clause of GCC / SCC / Other Commercial Terms & Conditions

i) In the event of order, all the material required for completing the job at site shall be supplied by the bidder within the ordered price even if the same are additional to approved billing break up, approved drawing or approved Bill of quantities within the scope of work as tender specification.

This clause will apply in case during site commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account

j) Schedule of drawings submissions, comment incorporations & approval shall be as stipulated in the specifications. The successful bidder shall depute his design personnel to BHEL's / Customer's / Consultant's office for across the table resolution of issues and to get documents approved in the stipulated time.

k) As built drawings shall be submitted as and when required during the project execution.

l) The bidder has not tempered with this compliance cum confirmation certificate and if at any stage any tempering in the signed copy of this document is noticed then same shall be treated as breach of contract and suitable actions shall be taken against the bidder.

m) Successful bidder shall furnish detailed erection manual for each of the equipment supplied under this contract at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

n) Document approval by customer under Approval category or information category shall not absolve the vendor of their contractual obligations of completing the work as per specification requirement. Any deviation from specified requirement shall be reported by the vendor in writing and require written approval. Unless any change in specified requirement has been brought out by the vendor during detail engineering in writing while submitting the document to customer for approval, approved document (with implicit deviation) will not be cited as a reason for not following the specification requirement.

o) In case vendor submits revised drawing after approval of the corresponding drawing, any delay in approval of revised drawing shall be to vendor's account and shall not be used as a reason for extension in contract completion.

SIGNATURE: _____

NAME : _____

DESIGNATION: _____

COMPANY: _____

DATE: _____

COMPANY SEAL

ANNEXURE-3

PRE-BID CLARIFICATION SCHEDULE

S.No.	Section/Clause/ Page No.	Statement of the referred clause	Clarification required

The bidder hereby certifies that above mentioned are the only clarifications required on the technical specification for the subject package.

SIGNATURE:_____

NAME: _____

DESIGNATION:_____

COMPANY: _____

DATE:_____

COMPANY SEAL

ANNEXURE-4 (DEVIATION SHEET WITH COST OF WITHDRAWL)

TITLE: TECHNICAL SPECIFICATION FOR MISC. TANKS (SITE FABRICATED) PACKAGE
PROJECT:-2X800MW DVC KODERMA TPS PH-II & NTPC SIPAT STPP STAGE-III

TECH SPC NO: PE-TS-519/520-167-A001

TENDER ENQUIRY REFERENCE:-

NAME OF BIDDER:-

SL NO.	VOULME/ SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF WITHDRAWL OF DEVIATION	REFERENCE OF PRICE SCHEDULE ON WHICH COST OF WITHDRAWL OF DEVIATION IS APPLICABLE	NATURE OF COST OF WITHDRAWL OF DEVIATION (POSITIVE/ NEGATIVE)	REASON FOR QUOTING DEVIATION
TECHNICAL DEVIATIONS									
COMMERCIAL DEVIATIONS									

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE

NAME	**DESIGNATIONS**	**SIGN & DATE**	

NOTES:

1. Cost of withdrawal of deviation will be applicable on the basic price (i.e, excluding taxes, duties & freight) only.
2. All the bidders have to list out all their Technical and Commercial Deviations (if any) in detail in the above format.
3. Any deviation not mentioned above and shown separately of found hidden in offer, will not be taken cognizance of.
4. Bidder shall submit duly filled unpriced copy of above format indicating "quoted" in "cost of withdrawal of deviation" column of the schedule above along with their Techno-commercial offer, wherever applicable. In the absence of same, such deviation(s) shall not be considered and offer shall be considered in total compliance to NIT.
5. Bidder shall furnish price copy of above format along with price bid.
6. The final decision of acceptance/ rejection of the deviations quoted by the bidder shall be at discretion of the Purchaser.
7. Bidders to note that any deviation (technical/commercial) not listed in above and asked after Part-I opening shall not be considered.
8. For deviations w.r.t. Credit Period, Liquidated damages, Firm prices if a bidder chooses not to give any cost of withdrawal of deviation loading as per **Annexure-VII of GCC, Rev-07** will apply. For any other deviation mentioned in un-priced copy of this format submitted with Part-I bid but not mentioned in priced copy of this format submitted with Priced bid, the cost of withdrawal of deviation shall be taken as NIL.
9. Any deviation mentioned in priced copy of this format, but not mentioned in the un-priced copy, shall not be accepted.
10. All techno-commercial terms and conditions of NIT shall be deemed to have been accepted by the bidder, other than those listed in un-priced copy of this format.
11. Cost of withdrawal is to be given separately for each deviation. In no event bidder should club cost of withdrawal of more than one deviation else cost of withdrawal of such deviations which have been clubbed together shall be considered as NIL.
12. In case nature of cost of withdrawal (positive/negative) is not specified it shall be assumed as positive.
13. In case of discrepancy in the nature of impact (positive/ negative), positive will be considered for evaluation and negative for ordering.

ANNEXURE -5

LIST OF MAKES OF SUB VENDOR ITEMS

S.NO.	ITEM NAME	MANUFACTURER	LOCATION

ANNEXURE-6

SECTION- III

PROJECT: 2X800MW DVC KODERMA TPS, PHASE-II
1X800MW NTPC SIPAT STPP, STAGE-III STPP
PACKAGE - MISC. TANKS (SITE FABRICATED)

LIST OF COMMISSIONING SPARES FOR MISC. TANKS (SITE FABRICATED)

S. No.	Description	Qty.	Unit Rate
1	Gasket of each size	2 nos.	
2	Nuts, bolts & washers of each size (nos. of bolts, nuts & washers as required for each nozzle) as per approved Drg.	1 lot	
3	Any other item required for successful commissioning of the tanks including rubber lining (to be specified clearly by bidder)	1 lot	

NOTES :

1. The items indicated in the above list are minimum. Any other spares if required shall be included by bidder in the above list.
2. Bidder shall furnish unit price of commissioning spares in above format alongwith the Bid. Any part even though not mentioned in list furnished but required at later date shall be supplied free of cost.
3. Bidder to note that the items indicated in the above list shall be provided prior to commissioning of the Misc Tanks. Further, items indicated in the list shall be supplied over and above the consumables that are supplied along with the Misc Tanks.

	PROJECTS: KODERMA TPS PH-II (2x800MW) **SIPAT STPP STAGE-III (1X800MW)** **PACKAGE: MISC.TANKS (SITE FABRICATED)** **TECHNICAL PRE-QUALIFICATION REQUIREMENT**	**PE-PQ-519/520-167-A001**	
		DATE	**AUG 2025**
		REV. No.	**00**
		PAGE No.	**Page 1 of 1**

S. No.	DESCRIPTION
1.	**TECHNICAL PRE-QUALIFICATION REQUIREMENT** **MISC. TANKS (SITE FABRICIATED)** The bidder is required to meet the proven-ness criteria and /or qualification requirement for Miscellaneous Tanks (Site fabricated) as per criteria stipulated below: • Bidder should have engineered, supplied, erected, tested and commissioned at least one (1) number of vertical cylindrical storage tank of capacity not less than 200 cum. The above system/tank should have been in successful operational for minimum one (1) year as on the date of techno commercial bid opening of the subject enquiry.

NOTES:

a.	The Bidder has to submit following supporting documents meeting above mentioned pre-qualifying requirement: Copy of minimum one (1) performance certificate (in English) from end user along with copy of related Purchase Order (PO) or Letter of Intent (LOI) or letter of Award (LOA) or Work Order (WO) in support of PQR clause mentioned at S. No. 1.0 above.
b.	Bidder shall submit design documents to substantiate technical parameters specified in PQR, if the same is not mentioned in performance certificate / purchase order.
c.	Bidder to submit all supporting documents in English. If documents submitted by bidder are in language other than English, a self-attested English translated document should also be submitted.
d.	Consideration of offer shall be subjected to customer's approval of bidders, if applicable.
e.	After satisfactory fulfilment of all the above criteria / requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.
f.	Notwithstanding anything stated above, CUSTOMER/BHEL reserves the right to assess the capabilities and capacity of the bidder to perform the contract, should the circumstances warrant such assessment in the overall interest of the CUSTOMER/BHEL.
g.	The bidder shall meet PQR based on its own credentials. Bid from joint venture (JV) company / Consortium bid is not acceptable.

Prepared By	Checked By	Approved By