



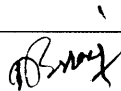
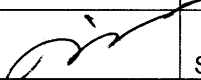

SPECIFICATION FOR
CLARIFIED WATER STORAGE STEEL TANK


SPEC.NO.ROS: 6113

REV.: 01

**BHARAT HEAVY ELECTRICALS LIMITED,
RANIPET- 632 406.**

**TECHNICAL SPECIFICATION
FOR
CLARIFIED WATER STORAGE STEEL TANK**

01	24.09.14	DBN 	PP 	SK  25/09/14	Corrosion allowance details modified.
00	03.01.14	DBN sd/-	MS sd/-	SK sd/-	Fresh issue
Rev.No	Date	Prepared	Checked	Approved	Remarks


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1.0 SCOPE

This specification covers design, engineering, supply of material, fabrication at site & assembly, inspection and testing at site as well as at site erection, Hydro testing & commissioning and painting and PG test for a effective volume of 100 cu.m tanks at site.

2.0 PROJECT INFORMATION

- 2.1 Owner : ONGC PETRO additions Limited
- 2.2 Project Title : Raw water treatment plant PH-1 n.
- 2.3 Location : ONGC PETRO additions Limited
Dahej, Bharuch, Vadodara, Gujarat.
- 2.4 Nearest Railway Station / Access :
Road
- 2.5 Atmospheric Maximum / Minimum Temperature : 45 deg. C / 13 deg. C
- 2.6 Maximum Wind speed : 62.0 Km/hr
(predominant wind speed) : 44 Km/hr
Wind Load : Calculations for wind effect shall be in accordance with
IS : 875 – (Part-3) latest revision taking into account the following :
- a) Basic wind speed
 - b) Factor K1, terrain category and corresponding values for K2, factor K3 shall be taken as per standard.
- 2.7 Seismic Zone : **Seismic Zone – III** ,
As per IS : 1893 latest.

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3.0 EQUIPMENT SPECIFICATION :

3.1 CLARIFIED WATER STORAGE TANKS:


- 1) Application : For storage of clarified water
- 2) No. of Tanks : 1 No.
- 3) Effective capacity of each Tank : 100 cu.m
- 4) Size of the Tank : 6.0 m Dia x 4.6 m Height (approx.)
Bidder to specify exact size.
- 5) Type and Shape : Vertical, Cylindrical
- 6) Type of Roof : Cone with self supporting of structure to
withstand the weight. 150 Kg/m²
- 7) Design Pressure : Atmospheric Pressure + Full of water
- 8) Design Temperature : 60 Deg. C
- 9) SP. GR. Of Liquid : 1.0
- 10) Wind Pressure/wind load : As per IS :875 part-3
- 11) Earth Quake : As per IS : 1893 + site spectra and API-650
- 12) Applicable design codes : IS: 803 / API 650
- 13) Location of Installation : Outdoor
- 14) Corrosion allowance (mm) : SHELL & BOTTOM PLATE -2 MM, ROOF-1 MM
- 15) Material of Construction : Mild Steel to IS:2062 Grade-B
 - Minimum thickness including : 6 mm (or) as per IS:803 whichever is higher
Corrosion allowance for shell plate
& roof plate as per IS 803
 - Min thickness including corrosion : 8 mm (or) as per IS:803 whichever is higher
allowance for bottom plate

Note : Vendor has to provide the detailed design calculation and approval is subjected to clearance from the customer.

- 16) Inside protection : Refer clause 6.2 .
- 17) Underneath protection : Refer clause 6.3 .
- 18) External protection : Refer clause 6.4 .
- 19) Clarified water Inlet pipe : Perforated pipe (SS 304, Sch.10 shall be
terminated up to a height of 500 mm

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- from inside bottom and perforated groove shall be at a distance of 500mm .
- 20) Overflow, drain and sample connection : Required
- 21) Overflow pipe size / MOC : one size higher than the inlet pipe size
ASTM A-53 or ASTM A 106 Gr.B,
- 22) Nozzle connections reqd./ end connections. : As per sketch,
< 50 NB Socket welded
≥ 50 NB Flanged.
- 23) Pipe / Nozzle material : SS 304 Sch.40
- 24) Nozzle flange : All the Nozzle flange shall be forged type as per ASTM A 105
- 25) Pipe material for hand railing : Carbon steel, Galvanized, Medium Grade
- 26) End connection of the valves : < 50 NB Socket welded
≥ 50 NB Flanged
- 27) Man Hole : 2 Nos. One No. on shell and the other on roof. Minimum 600 NB size to be provided with neoprene rubber gasket with SS screws, Nuts & washers
- 28) Level Indicator : Required. Flange on the top of the tank shall be provided by vendor.
- Quantity : 1 No.
- Type : Mechanical float type
- 29) Additional spare Nozzles : (Minimum) 1 Nos. on shell and 1 Nos. at top of the tank. Nozzle Shall be provided with dummy flange, neoprene rubber gaskets and fasteners.
- 30) Instruments / Accessories required : a) Sampling connections with valves
a) Overflow & drain piping shall be provided
- 3.2 VALVES:**
Valves for the tanks
(a) Isolation valve for LIT((Ball valve)) : 50 NB - 1 Nos. (CI body with SS 304Ball)
(b) Sampling valve ((Ball valve) : 50 NB - 1 Nos (CI body with SS 304 Ball)

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- 1) Inspection : As per BHEL's approval check list

Note : The specification covers the entire requirement for the steel tank. However, if any other materials / components additionally required during the detailed engineering, the same shall be intimated to successful bidder by BHEL. Vendors are expected / required to care of such additional material / components in their offer itself based on their experience and no commercial implication shall be entertained by BHEL.

3.3 LEVEL INDICATOR:

- | | |
|-----------------------------|--|
| 1) Type | : Float and Arrow Type Level Gauge |
| 2) Float Material | : SS 316 |
| 3) Float Size | : 350 mm dia |
| 4) Guide cable | : SS 316 – 1.6mm dia |
| 5) Float Cable | : SS-316 2.5 mm dia |
| 6) Spring | : SS-304 |
| 7) Cover | : SS-316 |
| 8) Roller / Pulley | : SS |
| 9) Scale Board | : Aluminum, P.U.Painted |
| 10) Pointer and Graduations | : Aluminum and SS |
| 11) Accuracy | : 1% of full scale |
| 12) Range | : Project Specific (will be intimated based on specific requirement) |
| 13) Quantity | : 1 No. |


Note : For other components, the material shall be intimated to successful bidder by BHEL during detail engineering for which no commercial implication shall be entertained by BHEL.

Approved Vendors for Level Indicator:

1. ENDRESS+HAUSER JAPAN CO. LTD INDIA / JAPAN
2. ENRAF B.V INDIA / NETHERLAND
3. L & J TECHNOLOGIES SINGAPORE / USA
4. NIVO CONTROLS PVT LTD INDIA
5. SBEM PVT LTD INDIA
6. SIGMA INSTRUMENTS CO INDIA
7. TOKYO KEISO CO LTD JAPAN
8. BAUMER TECHNOLOGIES INDIA PVT LTD/CHENNAI
9. PUNE TECHTROL PVT LTD/CHENNAI
10. V AUTOMAT AND INSTRUMENTS LTD/CHENNAI

4.0 Design Consideration

- 4.1 The steel tanks to be fabricated and supplied at site under this specification shall be generally as per enclosed clarified water storage tank drawings. 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.

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4.2

- a) The connections and accessories which are required to be supplied with each tank by the bidder shall be as indicated in specification and enclosed drawing for clarified water storage tank and sketch.
- 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).
- c) The inside piping shall be adequately/properly supported with inside of tank and shall be provided with adequately sized vent 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 supporting outside piping 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 screws, nuts and gaskets for these connections shall also be supplied by the bidder.
- g) The manhole shall be of hinged & screwed type with nuts, screws and gaskets in bidder's scope of supply. The size of the manhole shall be minimum 600 mm.


4.3 The scope of works shall also include supply and installation of special accessories as indicated in Equipment specification for clarified water storage tank and drawing. The necessary fixtures and other accessories for mounting these special fittings shall be included in the scope of work of the bidder.

4.4 Level indicator for tank shall be provided by the bidder along with all fittings & accessories as required for mounting indicator on the tanks. Float and arrow type level gauge / indicator shall be provided unless otherwise specified in specification and drawing for storage tanks.

4.5 Required number of tapings with 25NB instrument root valves shall be provided by the bidder for mounting instruments like level switches, level transmitters etc. The number of tapping's shall be as indicated in the clarified water storage tank and drawing.


4.6 The Nozzle & Valves shall be provided by the bidder as indicated in the drawing.

4.7 Pipes, fittings, nozzles, flanges and counter flanges shall be supplied by the bidder. The minimum requirement like quantity, size, type etc. are indicated in the drawing and may undergo change during detail engineering stage and these shall be supplied


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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 specification and drawing.


- 4.8 Material of construction of all tanks shall be mild steel conforms to IS – 2062 Grade – B.
- 4.10 Vent size calculation shall be furnished by the bidder during detail engineering stage based on the tank filling / emptying rate for approval and increase in vent size from the minimum size requirement, if any, shall be provided by the bidder without any commercial implication.
- The overflow pipe from overflow nozzle to nearby trench shall also be in bidder's scope of work.
- 4.11 All anchor screws, nuts, washers including pad plates shall be provided by the bidder, if required for anchoring of tank as per approved design calculation during detail engineering stage and for which no commercial implication shall be entertained by BHEL.
- 4.12 Bidder shall provide adequate numbers of earthlings / grounding pads for each tank. Each pad shall be made of stainless steel or mild steel of required size, which will be informed to the successful bidder during detail engineering stage for which no commercial implication shall be entertained by BHEL. Further, grounding of tank with the earth mat shall be in BHEL scope.
- 4.13 Platforms, monkey ladder, hand railing on the roof, knee guard, toe guard (all along the periphery of roof of the tank) etc. as per the relevant design code / good engineering practice shall be included in bidder's scope of work. All stair tread and platforms shall be made from 8mm thick. Chequered plate.
- 4.14 Suitable structural items like channels and saddle supports shall be provided for fixing the tank with foundation for drain & over flow line.
- 4.15 Draw off sump shall be provided in all vertical cylindrical storage tanks. Size and design of the same shall as per latest edition of IS 803/API 650.
- 4.2 The successful bidder shall furnish design calculations to BHEL during detailed engineering stage for approval along with the copies of 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: -

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- a) The 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. However, requirement of codes and standards shall be as indicated in the specification.
- b) Plate thickness calculation (different courses of shell plate, bottom plate and roof plate thickness), roof curb angle, top wind girder, intermediate wind girder, tank internal pressure vis –a-vis. allowable value.
- 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.
- d) Tank stability calculation (wind load / seismic / overturning stability) shall be done as per API – 650, latest edition. However, factors / coefficients as required for the design of tank shall be obtained from BHEL by the bidder after placement of order.
- d) Vent sizing calculation shall be done as per API – 2000, latest edition
- e) Sizing calculation for vent.
- f) Weight calculation of plates, appurtenances & structures separately shall be included in the Design calculation.
- 4.3 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 calculations shall necessarily be done in SI units only. 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.
- 4.4
- a) Calculation for the plate (shell, roof & bottom plate) thickness shall be got approved from BHEL / Customer during detailed engineering stage. However, if the addition / summation of calculated value of plate thickness (excluding tolerance on plate as per relevant IS) / nominal minimum thickness specified in the relevant design code / standard and corrosion allowance of 2 mm for shell & bottom plate & 1 mm for roof plant.
- 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.
- 4.5 All appurtenances and mountings shall also be designed as per relevant clauses of IS: 803 / API – 650 as per the design code indicated in drawing.

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- 4.6 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.
- 4.7 In calculating the minimum plate thickness, the specific gravity of the liquid shall not be taken less than 1.
- 4.8 For cylindrical tanks, the plates shall be cold rolled through plate bending machine by several number of passes to true curvature. The flanges shall be made by V-die and the corners welded, provided no cracks are developed.
- 4.9 Vessels seams shall be so positioned that they do not pass through vessel connections. For cylindrical vessels consisting of more than two sections longitudinal seams shall be offset.
- 4.10 Wherever possible, the inside seam weld shall be ground smooth, suitable for application of corrosion resistant primer.
- 4.11 Due consideration shall be given by the supplier for wind load and earthquake effect in the design of tanks.
- 4.12 For the tanks being of diameter larger than 3.75 m added structural supports in the form of rafter shall be provided.
- 4.13 Reinforcement in tanks shall be provided as per design code. The reinforced connection shall be completely pre - assembled into shell plate.
- 4.14 The joint efficiency factor to be adopted for design calculation shall be in accordance with the specified design code.
- 4.15 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.
- 4.16 Access ladder and hand railing shall be provided as per the relevant codes and standards.
- 4.17 Code conformance for flanges / counter flanges shall be ANSI B 16.5. Code conformance for screws and nuts shall be SA 193 & 194 respectively.
- 4.18 The number & size of nozzles (including flanges, counter flanges and inside piping) indicated in the Drawings attached with the data sheets are tentative and bidder guidance purpose only and the same may undergo change during detail engineering stage for which no commercial implication shall be entertained by BHEL.

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- 4.19 Bidder shall furnish the Standard calculation along with the roof structure calculation (if roof is designed on the basis of trusses) during detail engineering for checking the stability of roof.
- 4.20 Provision shall be made by the bidder to minimise the air ingress in the tank through float with arrow type level gauge and details of the same shall be furnished during detail engineering stage for BHEL's approval and approved arrangement shall be provided by the bidder without any commercial implication.
- 4.21 The tank shall be designed for filled water head / atmospheric pressure and design temperature for the tank shall be as specified in the equipment specification.

5.0 OTHER TECHNICAL REQUIREMENT

1. All drawings shall be prepared as per BHEL's title block and bear BHEL's drawing No. and customer / consultant's drawing no; which will be forwarded to the successful bidder during detail engineering stage.
2. Data sheets of various items shall be prepared by the bidder for 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.
3. GA 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.
4. O & M manual shall be furnished to BHEL for approval during detailed engineering stage. Final O&M manual 6 hard copies & one soft copy shall be supplied during hydro testing.
5. Field quality plan / quality assurance plan / check list shall be prepared by the bidder for 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.
6. 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.
7. Revision made by the bidder in any drawings and documents shall be highlighted by indicating the no. of revisions(including the details of revision) in a triangle without fail so that the minimum time is required by BHEL to review the drawings and documents.

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8. 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.
9. Bidder to confirm that all the drawings shall be prepared in Auto Cad - 2010 version 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.
10. The bidder to submit all the documents called in this tender within 10 days from the date of LOI and 10 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.
11. Civil works will be provided by BHEL. Hence, bidder has to furnish the civil inputs in time. Bidder has to carry out the rectification in the civil works in the event of any changes in the civil input data furnished by them or delay in submission of input data by them. Bidder to furnish the civil foundation drawing of the tanks.
 - a) **Scope of work by BHEL and bidder shall be indicated with different legend or in the form of note.**
 - b) Recommended locations of earthing pads – vendor to provide in the GA drawing.
 - c) Civil loads shall be furnished and the detailed calculation showing weights of roof, bottom, and shell plates, all accessories and nozzles etc.
 - d) Details of pockets as required for anchor screws.
12. Bidder to depute competent designer (s) immediately at BHEL's office during detailed engineering stage to discuss drawings and other technical documents as and when required by BHEL.
13. All the drawings which are required to be furnished to BHEL during detailed engineering stage shall include technical parameters, details of paints, BOQ / BOM etc 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 the drawings in soft form(Auto cad format) shall also to be provided to BHEL.
14. All drawings and documents including general arrangement drawing, data sheet, calculation etc. shall be furnished to BHEL during detailed engineering stage and

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shall include / indicate the following details for clarity w.r.t. inspection, construction, erection and maintenance etc.:-

- a) 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.
- b) All drawings and documents shall indicate the list of all reference drawings including general arrangement.
- c) All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view, all major self manufactured and bought out items shall be labeled and included in BOQ / BOM in tabular form.
- d) Specification / schedule of painting shall be made as a part of general arrangement drawing of each item indicating at least 3 make subjected to BHEL/Customer approval.


The probable paint supplier can be as follows

Indian Vendor


- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Asian paints(India) Ltd, 3. Berger paints India Ltd. 4. Shalimar Paints. 6. Chugoku Marine Paints Pvt. Ltd 8. CDC Carboline Ltd. 10. Coromandel paints & chemical 12. Grand poly coats, Vadodara 14. Cipy polyurethane Pvt. Ltd. 16. Advanced paints Ltd, Bombay 18. Jotun paints India Pvt. Ltd 20. Chembond Chemicals Ltd, Chennai | <ol style="list-style-type: none"> 2. Bombay Paints. 5.Kanasai Nerolac Paints Ltd. 7.Sigma Kalon Marine &Protective coating 9. Premier products Ltd, Mumbai 11.Anupam enterprise, Kolkata 13. Akzo Noble coatings & sealants Pvt. ltd 15.Gunjan paints Ltd. Ahmedabad. 17.VCM polyurethane paints(only polyurethane) 19. Paladin Paints Chemicals, Mumbai 21.Aashis Coating Technologies pvt.ltd |
|---|--|

Foreign Vendors

1. Sigma Kalon Protective Coatings, Singapore
 2. Ameron, USA
 3. Kansai Paints, USA
 4. Hempel paints, USA
 5. Valspar Corporation, USA
 6. Akzo Noble/International
 7. Jotun Paints, Singapore
15. 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.
 16. Commercial implication includes price implication as well as delivery implication.

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17. Size of hand rails on tank roof / top shall be minimum 32 NB and shall conform to IS 1239 (M).
18. Type of roof for vertical cylindrical storage tanks shall be self supporting cone roof as per latest edition of relevant design code.
19. 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.
20. Bidder to furnish the weight of each tank (in empty condition and water filled condition) in Tonnes for BHEL's reference only. Bidder to note that the weight in water filled condition shall be considered from bottom of tank up to top of curb angle.
21. Bidder shall check that specifications of all the items are available in the 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.
22. 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.
23. All tools and plants including welding machines, crane, hydra, fork lift, batching plant etc. and instruments as required for construction, erection and commissioning, trial run and PG test at site shall be arranged by the bidder only.
24. Bidder to furnish list of sub-vendors for various items during detail engineering stage for BHEL's review and approval and items shall be procured from these suppliers only.
26. 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.

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6.0 PAINTING

6.1 GENERAL

- a) All the equipments and steel structures shall be protected against external and internal corrosion by providing suitable painting as described below unless otherwise specified elsewhere. However, the surface of stainless steel, GI and non-metallic components shall not be applied with any painting.
- b) All painting shall be carried out in conformity with the paint manufacturer's recommendation.
- c) All the external and internal surfaces to be painted shall be thoroughly cleaned before erection by wire brushing, shot blasting and air blowing etc. as per recommended procedure.
- d) As soon as the painting items have been cleaned, within four hours of the subsequent drying it will be coated with suitable anti-corrosion protection.


6.2 The Internal surfaces clarified water storage tanks shall be painted with "Unmodified Epoxy Paint".

Surface preparation	: Sand blasting finish confirming to SA 2 1/2 as per Swedish standard SIS-05-5900
Primer	: Two(2) coat of epoxy zinc phosphate primer (two component polyamine cured epoxy resin medium, pigmented with zinc phosphate). DFT 2x40 = 80 microns
Finish Coat	: Two(2) coats of epoxy high build finish paint (polyamide cured epoxy resin medium suitably pigmented) DFT 2x100 = 200 microns
Total DFT	: 280 Microns

6.3 The underneath of bottom plates of clarified water storage tanks shall be painted as indicated below

Coal tar Epoxy Paint:

Surface preparation	: Sand blasting finish confirming to SA 2 1/2 as per Swedish standard SIS-05-5900
Primer	: Two(2) coats of high build coal tar epoxy suitably pigmented, DFT 80-100 microns per coat
Total DFT	: 160-200 Microns

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6.4 The clarified water tanks above ground outside shall be painted as indicated below Paint schedule.

Surface preparation	: Sand blasting finish confirming to SA 2 1/2 as per Swedish standard SIS-05-5900
Primer	: 1. One(1) coat of Inorganic zinc silicate coating (a two pack air drying self curing solvent based inorganic zinc silicate coating with minimum 80% zinc content on dry film. The final cure of the dry film shall pass the MEK rub test) DFT 65- 75 microns 2. One(1) coat of zinc phosphate primer(two component polyamine cured epoxy resin medium, pigmented with zinc phosphate) DFT 40 microns
Primer coat total DFT	: 105/115 Microns
Finish Coat	: 1. Two(2) coats of epoxy-high build finish paint(two pack polyamine cured epoxy resin medium suitably pigmented). DFT 2x100=200 microns per coat. 2. One (1) coat of Acrylic polyurethane finish paint(two pack aliphatic isocyanate cured acrylic finish paint DFT 40 microns
Final coat total DFT	: 240 Microns
Total DFT	: 345 - 355 microns
Colour	: Aluminium / Off white (IS-5, Grade 9006)

7.0 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 / SA 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.

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


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- 2) BS-2654 Specification for vertical steel welded storage tanks with butt welded shells for the petroleum industry.
- 3) IS-2062 Grade 'B' specification for weld able structural steel.
- 4) IS-816 Code of practice for metal arc welding for general construction in MS
- 5) IS-817 Code of practice for training and testing for metal arc welder
- 6) IS- 822 code of procedure for inspection of welds.

8.0 DESIGN REQUIREMENT

8.1 GENERAL REQUIREMENT

- 8.1.1 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.
- 8.1.2 All tanks will be designed for the capacities, dimensions and working conditions as specified in EQUIPMENT SPECIFICATION. These 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. 2.0 mm corrosion allowance for shells, bottom and 1.0 mm for roofs above and beyond the required thickness / calculated thickness / nominal thickness as specified in the design code shall be provided.
- 8.1.3 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.
- 8.1.4 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.
- 8.1.5 Flange faces of all nozzles shall be machined and squared with the vessel centre line.
- 8.1.6 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.
- 8.1.7 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.

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8.1.8 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.

8.1.9 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.


8.1.10 Material of construction of all tanks shall be mild steel conforms to IS -2062 grade – B unless otherwise specified in the EQUIPMENT SPECIFICATION.

8.2.0 **ALIGNMENT**

- 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.
- 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.
- 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.

8.3.0 **WELDING**

- Tanks and other attachments shall be welded as per IS-816
- Welding electrode specification shall conform to Indian standard IS:814/ASME Boiler and pressure vessel code section II(C). However minimum requirement of applicable codes and appendices shall be adhered to:
- Welding sequence shall be 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

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- Low hydrogen electrodes shall be used for all manual metal arc welds of shell courses having a thickness of 12mm and above.
- Low hydrogen electrodes shall be used for attachment welds of shell to bottom or annular plate and annular plate butt joints.
- 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.
- Inspection of all welds shall be carried out in accordance with the governing code of construction. All material used by the purchaser such as electrodes, gaskets, screws, nuts etc shall be conforming to relevant standards of repute and approved by the purchaser prior to use.

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

8.4.0 **STAIRCASE / ACCESS LADDER AND HAND RAILING**


Access cage ladder , one (1 no.) vertical cylindrical tank shall be provided for access to the tank roof as per applicable standard.

Pipe hand railing shall be provided on the roof as per applicable standard.. 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.

- 8.4.1 Unless otherwise specified, for all flanged connections, vendor shall furnish suitable counter flanges and necessary screws (ASTM A-193 Gr. B7),Nuts(ASTM A-194 Gr.2H) & washers (SS) and gaskets materials.
- 8.4.2 Gaskets shall be 3 mm thick full-face rubber or CAF. On completion of hydraulic test / water till test, contractor shall replace the gaskets used during testing at his own cost.
- 8.4.3 Float and board type level indicator with arrow shall be provided.
- 8.4.4 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 sever storm, if any occurring during erection.


9.0 **VERTICAL CYLINDRICAL STORAGE TANKS**

- 9.1 construction and shall be designed in accordance with codes and standards as specified in the EQUIPMENT SPECIFICATION. The vertical cylindrical storage

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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.

- 9.2 Conical roof shall be self-supported. The roof shall have a slope as specified in the relevant design code to ensure drainage of rainwater. Needed roof rafters and purling adequately designed shall be provided.
- 9.3 All plates to be used for fabrication of tank shall be checked and all sides trimmed to make them square.
- 9.4 All bottom plates shall have lap weld joints on all sides with overlap not less than five times the plate thickness.
- 9.5 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.
- 9.6 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 1000 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.
- 9.7 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.
- 9.8 Tank roof shall be either self supported or supported over rafters / steel fabricated central column(s). Adequately sized and spaced rafters and purlins shall be provided. All rafters shall have sliding screwed connections at one end and preferably on the tank periphery side. The roof-supporting frame shall have needed tie rods or bracing sets.
- 9.9 Roof plates shall have lap joints with lap not less than 25 mm and lap weld over the top surface only. Roof plates shall have continuous fillet welds around the tank curb angle. No joint of roof plate over the supporting frame shall be made.

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- 9.10 Needed openings for mounting various specified accessories shall be well reinforced in accordance with application codes and as approved. Manhole shall the screwed and hinged covers unless otherwise specified.
- 9.11 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.
- 9.12 All spare nozzle shall be provided with dummy flange, Neoprene rubber gasket, SS screws screws((ASTM A-193 Gr. B7 & ASTM A-194 Gr.2H) nuts & washers.

10.0 TESTING AND INSPECTION AT MANUFACTURERER'S WORKS

10.1 GENERAL


- 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.
- All materials used for manufacture of the equipment under this specifications shall be of tested quality. Relevant test certificates shall be made available to the purchaser before the finals hop 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.
- Cast steel / alloy cast iron components shall be tested for both physical and chemical properties. Test bears shall be either integral or taken from the same ladle of material as the casting they represent.
- All materials including valves, instruments, pipings, flanges, counter flanges etc. shall be procured from BHEL approved manufactures only.

10.2 TESTING AND INSPECTION FOR TANKS

10.2.1 NON - PRESSURE TANKS


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

- 1) Identification of materials to manufacturer's test certificates

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- 2) Inspection of plate edges after edge preparation and checking curvature against templates if shell plates sent after rolling
- 3) Checking of dimension and match marking.
- 4) Inspection during fabrication at appropriate stages including fit ups.
- 5) Bottom testing
 - After all 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 around the tank periphery. Soap suds or other suitable material shall be applied to all joints for detection of leaks.
 - Fuel oil may be used instead of air and soap suds to test for leaks, subject to prior agreement and approval of the purchaser. The vacuum box used shall comply with IS-803, 1976 (figure 24)
 - Alternatively, the bottom seems 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)
- 5) 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 as required by the code.
- 6) 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.
- 7) Examination of Radiographs including radiographic techniques, supervision of other non-destructive tests and heat treatment procedure as required by codes and specifications.
- 8) The tanks under this specification shall be tested as per the relevant design and testing code / standard. Supplier shall submit the detailed testing procedure for 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.

All field – testing shall be performed prior to any painting or coating application

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All the tools, tackle, equipments, fasteners and consumables required for site inspection & Testing etc. are in vendors scope.

10.2.2 REPAIR OF LEAKS

- 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.
- 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.
- 3) In all other joints, whether between shell plates or bottom plates or both, leak shall be repaired only welding and if necessary, after first cutting out the defective part.
- 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.
- 5) No welding shall be done on any tank unless all lines connecting thereto have been completely blanked off.

11.0 TECHNICAL DETAILS FOR CIVIL WORKS:

Complete foundation details required for this tank shall be provided by the vendor well in advance. However design of the foundation and construction will be taken care by BHEL / BHEL's agencies.


12.0 SPARES

12.1 Commissioning Spares:

The bidder should take care of this requirement since commissioning is under bidder's scope if required. The commissioning spares List and the individual price shall be indicated and included in the main supply. Any unutilized startup spares shall be handed over to the purchaser. The commissioning spares shall be delivered well in time before the start-up & commissioning of the plant.

13.0 ERECTION, HYDRO TEST ,COMMISSIONING & HANDING OVER:

Successful bidder has to manufacture the equipment as per approved drawing and dispatch the materials sequentially required for erection of the clarified water storage tank. Scope includes receipt of materials at site, its unloading, handling storage, erection (site fabricated) to OPAL Dahaj, Gujarat., site testing and hydro test & commissioning as per approved quality plans and handing over of clarified water storage tank. All loose components shall be preferably packed in wooden boxes and shall be kept in safe custody of BHEL stores. Space for raw material storage will be given by BHEL at site and necessary material handling equipment shall be arranged by successful bidder for all the handling.

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Erection of equipment shall be commenced upon readiness of the civil works and appropriate stage checks shall be offered for inspection to BHEL / customer. Upon completion of erection, bidders to commission the tank and shall carryout the performance guarantee test stipulated elsewhere. The plant shall be handed over to BHEL/Customer upon successful completion and acceptance of PG test.

The required power supply and water will be provided free of charge by BHEL at one point. All other requirements are to be taken care of by the vendor.


14.0 DRAWINGS AND DOCUMENTS REQUIRED:

14.01 ALONG WITH BID

Sl. No	Description
1	GA Drawing of the tank (incl. Nozzle Orientation)
2	Filled up data sheet (Annexure – 1)
3	Design calculation of the Tank (typical)
4	Typical Manufacturing Quality Plan.
5	Typical Field Quality Plan
6	Activity /Bar chart schedule.
7	Reference list of Tanks provide by you the customer/plant
8	Deviation schedule duly filled if any (Annexure – 2)
9	Preliminary civil requirements – Foundation details.
10	Un-priced commercial offer on the scope of supply.

14.02 AFTER RECEIPT OF ORDER

Sl. No	Description
	PASE –I (for approval) within 10 days from the date of ordering
1	GA Drawing of the tank (incl. Nozzle Orientation and elevation)
2	Filled up data sheet (Annexure – 1)
3	Foundation and loading details of the tank
4	Design calculation of the Tank.
5	Tank Fabrication drawings
6	Manufacturing Quality Plan.
7	Field Quality Plan including stage checks

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8	Activity /Bar chart schedule.
9	Hydro Test Procedure (PG test)
PASE –I I (for information)	
1	Details of bottom, roof & shell plates cutting plan
2	Details of roof structure
3	Details of Breather arrangement
4	Details of stairway, grating and hand railing
5	Erection Manual
6	Welding quality plan and stage inspection reports
7	Test certificates & reports
8	As Built Drawings
9	Analysis report of Equipments / Piping / Structures / Systems employing software package as detailed in specification
	- Input
	- Output
	- Drawing / Sketches
10	Operations and Maintenance Manual
11	Vendor details in respect of proposed vendors including contract evaluation report of the previous executed contracts.

16. IMPORTANT POINTS TO THE VENDORS :


i) Tanks shall be fabricated as per the dimensions , details of nozzles, instrumentation etc in line with the sketch enclosed. Location and orientations of various nozzles will be confirmed during detailed engineering's.

ii) Final Quality plan shall be submitted for the approval of BHEL by the successful bidder.

iii) Stage inspection and final inspection at vendor's works and at site by BHEL/Customer and approved inspection agency as applicable.

12. ATTACHMENT :

1. Clarified water storage steel tank GA Drawing No :**1-WT-220-00484/ Rev.00**,
2. Ring foundation for clarified water storage steel tank Drg.No. **3-WT-220-00495/ Rev.00**


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Annexure - 1

EQUIPMENT DATA SHEET FOR CLARIFIED WATER STORAGE TANK WITH VALVES & ACCESSORIES

1.0 CLARIFIED WATER STORAGE TANK:

- 1) Application : For storage clarified water
- 2) No. of Tanks :
- 3) Gross capacity of each Tank m³ :
- 4) Effective capacity of each Tank m³ :
- 5) Size of the Tank :
- 6) Type and Shape :
- 7) Design Pressure :
- 8) Design Temperature :
- 9) Design codes / Statutory regulations :
- 10) Location :
- 11) Material of Construction :
- 12) Corrosion allowances :
- 13) Minimum plate thickness :
 - (with Corrosion allowance)
 - Shell :
 - Bottom :
 - Roof :
- 14) Inside protection :
- 15) External Painting :
- 16) Permeate Inlet pipe :
- 17) Overflow, drain and sample connection :
- 18) Overflow pipe size/ Moc :
- 19) Nozzle connections reqd./end connections:
 - < 50 NB
 - ≥ 50 NB
- 20) Pipe / Nozzle material :
 - ≤ 50 NB
 - ≥ 65 NB
- 21) Pipe material for hand railing :
- :
- 22) End connection of the valves :
 - < 50 NB
 - ≥ 50 NB
- 23) Valve Material :
 - < 50 NB
 - > 65 NB
- 24) No. of Man Holes provided :
 - Type & size :
 - Location :
 - Type of cover plate :
- 25) Level Indicator :
 - Quantity :
 - Type :
 - Quantity :

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- 26) Additional spare Nozzles :
- 27) Instruments / Accessories required :
- Sampling connections with valves :
 - Overflow & drain piping :
 - Stair case & platform for external approach :
 - Ladder for access inside :
- 28) Weight of completely fabricated tank including :
all supports and fittings etc. in empty condition
- 29) Weight of completely fabricated tank including :
all supports and fittings etc. in flooded condition
- 30) All counter flanges with nuts and screws, washers & gaskets included in scope of supply : Yes / No

2.0 VALVES:

- 1) Body and Bonnet For 40 NB and below :
For 50 NB and above :
- 2) Wedge and Seat Ring For 40 NB and below :
For 50 NB and above :
- 3) Trim :
- 4) Screws and Nuts :
- 5) Rating For 40 NB and below :
For 50 NB and above :
- 6) Ends For 40 NB and below :
For 50 NB and above :
- Design standards
For Ball valve \geq 50 NB :
- 7) Testing standards For Ball valve \geq 50 NB :

3.0 LEVEL INDICATOR:

- 1) Type :
- 2) Float Material :
- 3) Float Size :
- 4) Guide cable MOC / Size :
- 5) Float Cable MOC / Size :
- 6) Spring MOC :
- 7) Cover MOC :
- 8) Roller / Pulley MOC :
- 9) Scale Board MOC / construction :
- 10) Pointer and Graduations MO :
- 11) Accuracy :
- 12) Range :
- 13) Quantity :



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ANNEXURE -2

TECHNICAL DEVIATIONS

<i>Sl. No</i>	<i>Section no.</i>	<i>Clause No.</i>	<i>Page / No.</i>	<i>Specification</i>	<i>Statement of Deviations/variations</i>	<i>Reason for Deviation</i>	<i>cost of withdrawal</i>

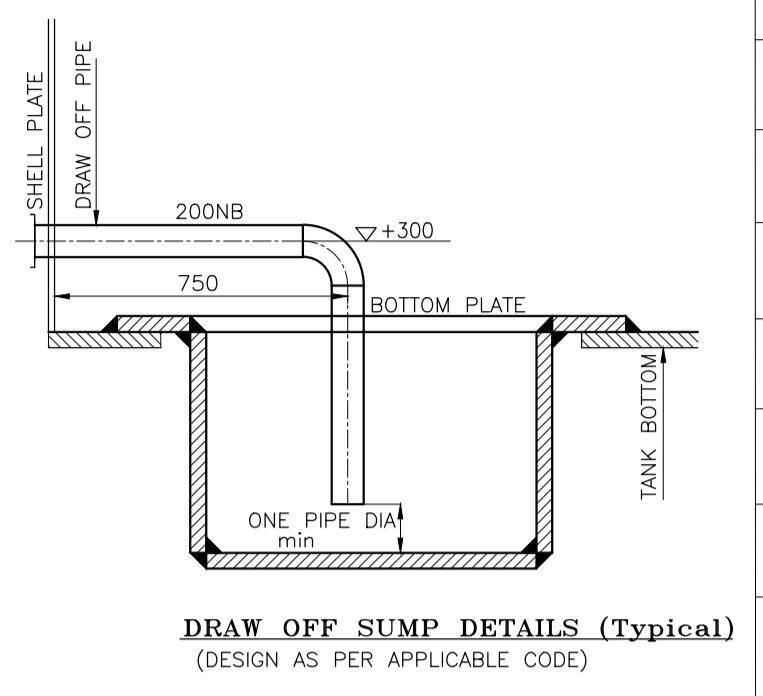
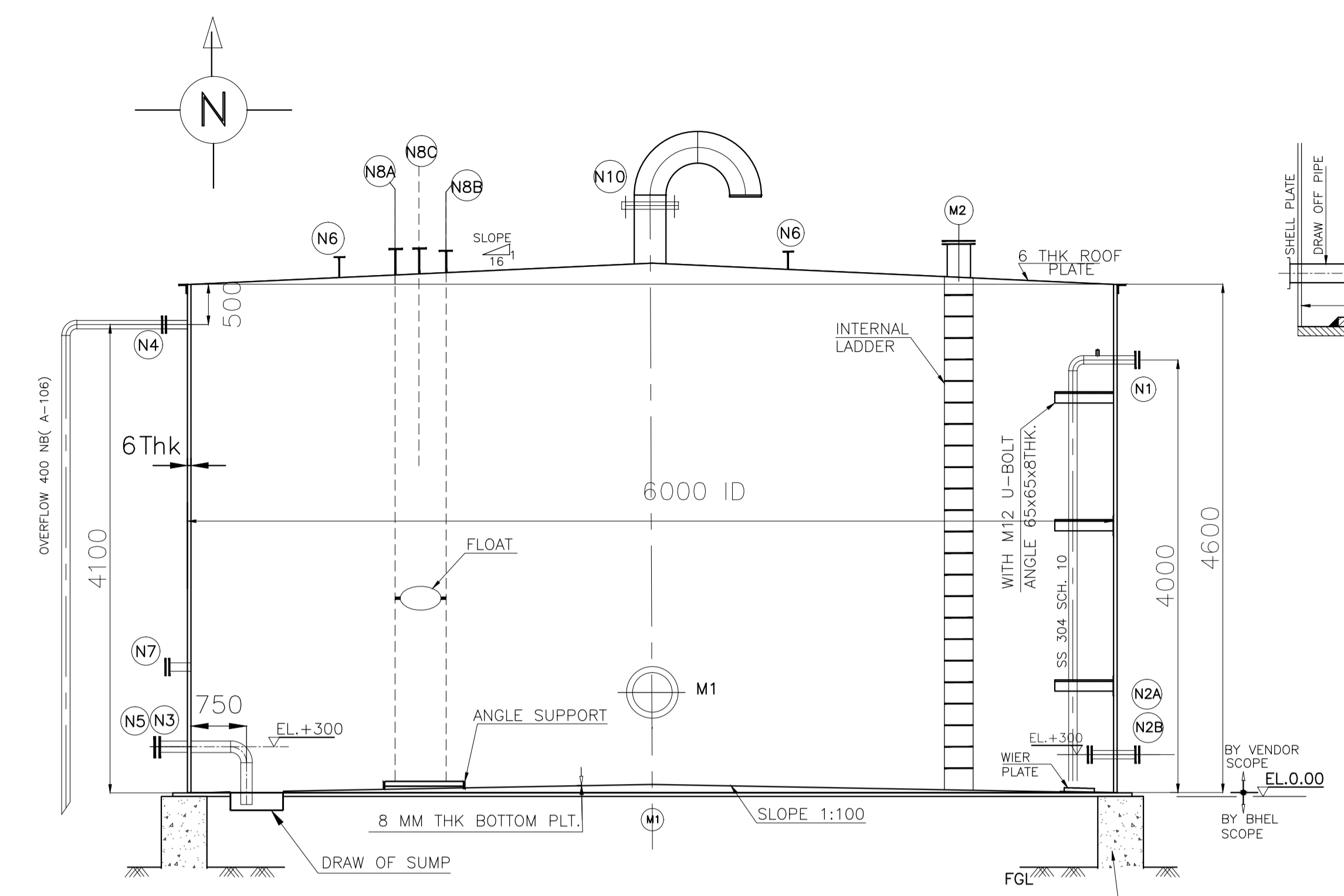
1-WT-220-00484
DRAWING NO.

ALL DIMENSIONS ARE IN MILLIMETRES

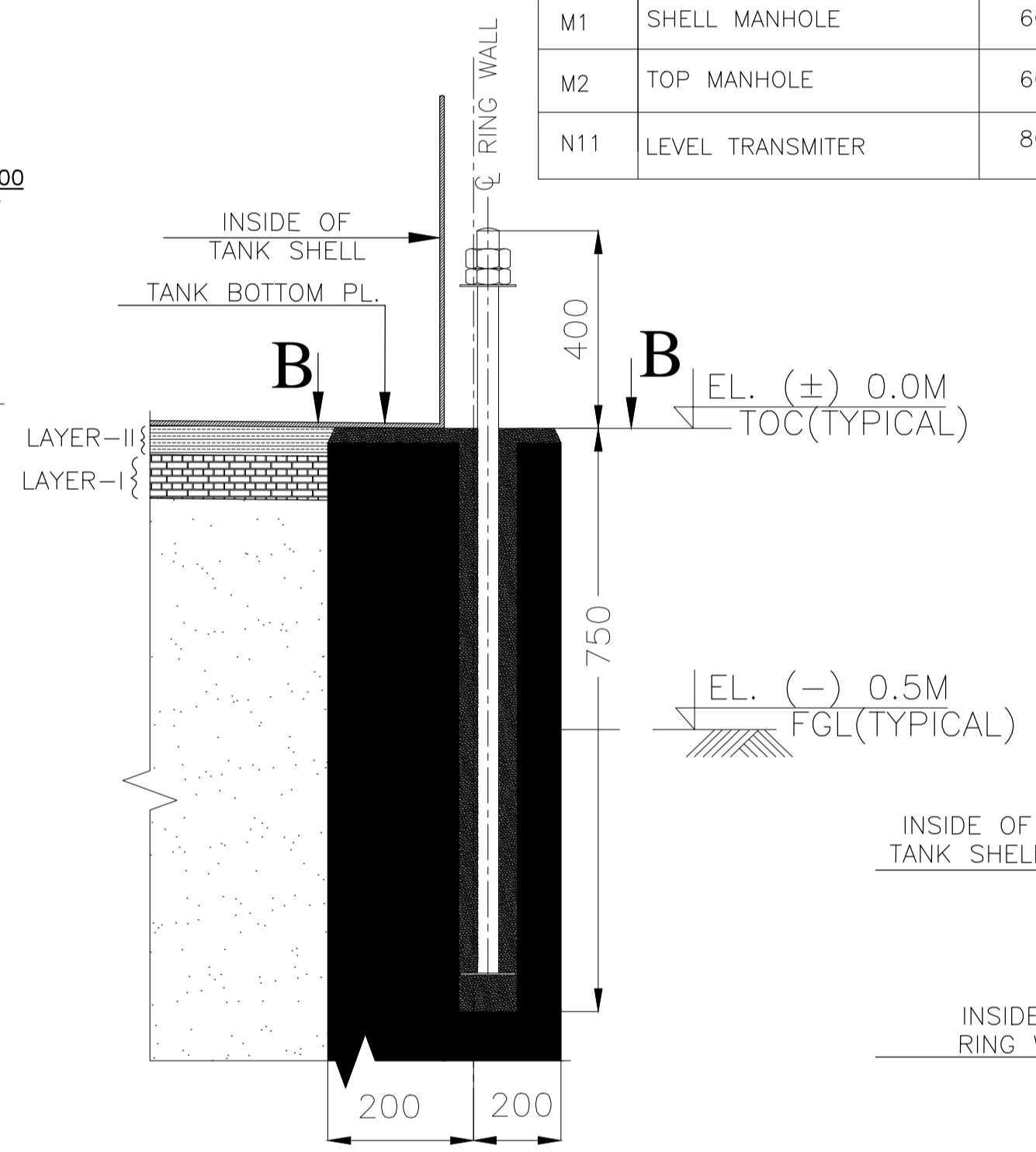
NOZZLE SCHEDULE

SL.NO	SERVICE	SIZE (NB)	NOZZLE C. EL. w.r.t BOTTOM OF BOTTOM PLATE	MATERIAL
N1	CLARIFIED WATER INLET	400	4000	SS304
N2-A	CLARIFIED WATER OUTLET	350	350	SS304
N2-B	DILUTION WATER PUMP	80	300	SS304
N3	DRAIN	200	300	SS304
N4	OVER FLOW	450	4100	SS304
N5	LEVEL TRANSMITTER (RADER TYPE)	50	TANK TOP	SS304
N6	SPARE NOZZLE (TOP)	100	TANK TOP	SS304
N7	SPARE NOZZLE (BOP)	100	500	SS304
N8-A	LEVEL INDICATOR	25	TANK TOP	SS304
N8-B				
N8-C				
N9	SAMPLING	50	500	SS304
N10	AIRVENT	200	TANK TOP	SS304
M1	SHELL MANHOLE	600	500	IS:2062 Gr.B
M2	TOP MANHOLE	600	TANK TOP	IS:2062 Gr.B
N11	LEVEL TRANSMITTER	80	300	SS304

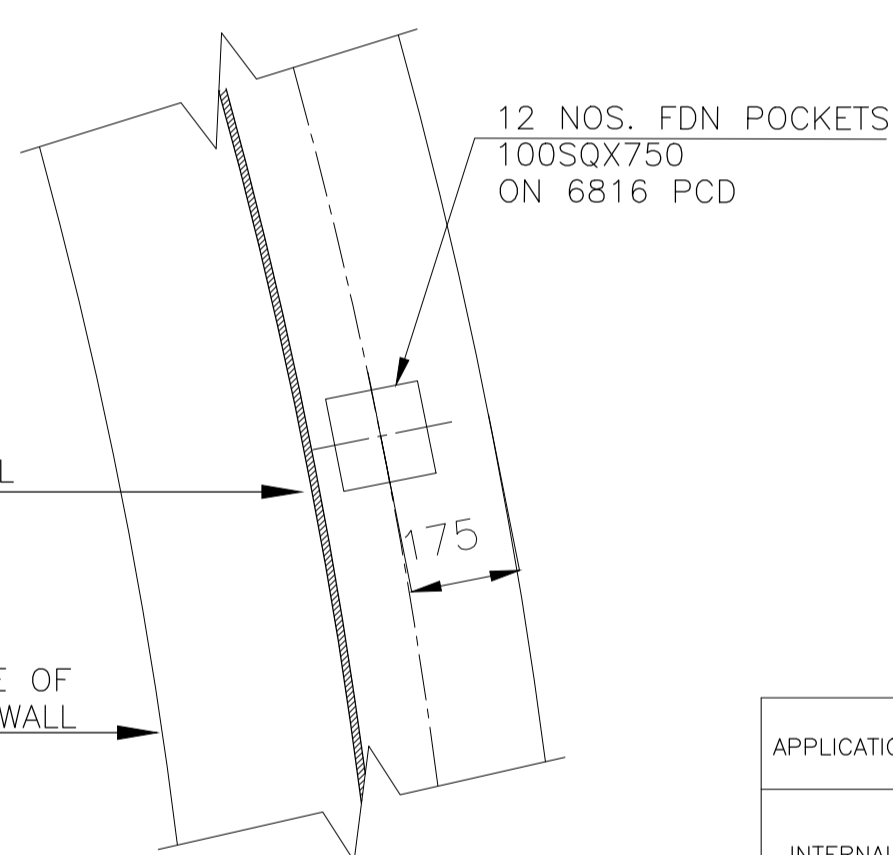
TANK DIA:	6000mm DIA	TANK HEIGHT:	4600mm HT.(VERTICAL CYLINDRICAL)
SHELL / BOTTOM / ROOF PLATE THK (WITH CORROSION ALLOWANCE)	= 6 / 8 / 6 mm		
CODE/ STATUTORY REGULATIONS	IS-803/API 650		
DESIGN PRESSURE	ATM + FULL OF WATER		
OPERATING PRESSURE	ATM		
DESIGN TEMP. (°C)	60		
OPERATION TEMP. (°C)	38		
SP. GR. OF LIQUID	1.0		
DESIGN SP.GR.	1.0		
WIND PRESSURE	AS PER IS : 875 PART-3		
EARTH QUAKE	AS PER IS-1893 + SITE SPECTRA		
CORROSION ALLOWANCE (mm)	SHELL - 2.0 , ROOF - 1.0, & BOTTOM -2.0		
RADIOGRAPHY	SPOT /AS PER CODE / BHEL SPEC.		
LONG JOINT EFFICIENCY	0.85		
LOCATION OF INSTALLATION	OUTDOOR		
STORED PRODUCT	CLARIFIED WATER		
TESTING	AS PER CODE / SPECS.		
NET CAPACITY (M3)	115.6		
EFFECTIVE CAPACITY (M3)	104.5		
NOMINAL CAPACITY (M3)	130.0		
EMPTY WT. (KGS)	VENDOR TO SPECIFY		
WEIGHT FULL OF WATER (KGS)	VENDOR TO SPECIFY		
TYPE OF ROOF	CONE WITH SELF SUPPORTING ROOF STRUCTURE		
QUANTITY	1 (ONE)		



ELEVATION
(All Nozzles are not in one plane)



CONCRETE RING DETAILS
(TYPICAL)



DETAILS BB

Notes:

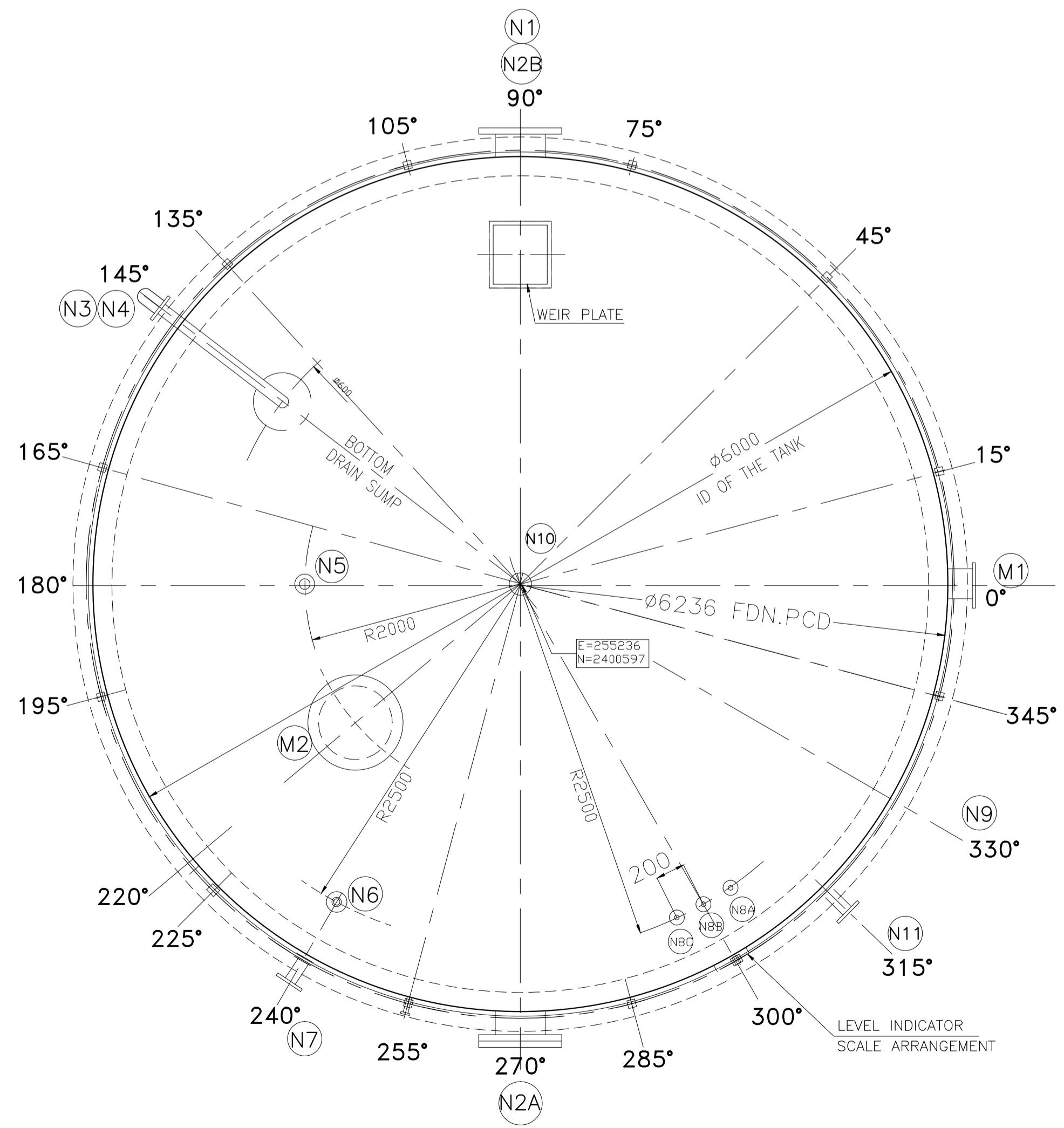
1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED.
2. ALL VERTICAL AND HORIZONTAL SHELL JOINTS SHALL HAVE FULL PENETRATION AND FULL FUSION WELDS AND SHALL BE OF DOUBLE WELDED BUTT JOINT CONSTRUCTION.
3. VERTICAL JOINTS SHOULD PREFERABLY BE OFFSET BY ATLEAST 1000 mm.
4. FIRST SHELL COURSE PLATES SHALL BE ARRANGED SO THAT THE VERTICAL JOINTS MAY CLEAR THE BOTTOM WELDS BY ATLEAST 300 mm.
5. VERTICAL JOINTS OF THE SHELL COURSES SHALL ALSO CLEAR THE NOZZLE ATTACHMENT, WELDS OF R.PAD WELDS SPACING SHALL BE AS PER CODE.
6. ROOF PLATE TO SHELL CURB ANGLE WELDING SHALL BE CONTINUOUS FILLET 5mm MAX.
7. ALL NOZZLES FLANGE DIMENSIONS SHALL BE AS PER ANSI B-16.5 UPTO 500NB
8. ALL VERTICAL AND HORIZONTAL SHELL WELD JOINTS SHALL HAVE FULL PENETRATION AND FULL FUSION WELD AND ROOF AND BOTTOM SHALL BE LAP WELDED JOINT CONSTRUCTION.
9. ALL ELEVATION ARE WITH RESPECT TO BOTTOM OF TANK.
10. FLOAT & ARROW TYPE LEVEL GAUGE SHALL BE PROVIDED BY THE VENDOR.
11. ALL MATING FLANGES & FASTENERS OF ALL NOZZLES TO BE SUPPLIED ALONG WITH TANK NOZZLES.
12. THE USABLE CAPACITY OF THE TANK SHALL BE 100 Cu.M
13. THE NOZZLE SIZE & THE ORIENTATION OF NOZZLES ARE TENTATIVE ONLY, EXACT ORIENTATION OF THE NOZZLE WILL BE PROVIDED DURING DETAILED ENGINEERING
14. N2-A NOZZLE SHALL BE PROJECTED INSIDE FOR FIXING STRAINER.
15. CAGE LADDER, HANDRAILING & TOE GUARD ON TANK TOP SHALL BE PROVIDED.

MATERIAL SPECIFICATION

SHELL, ROOF, BOTTOM	IS-2062 GR.B	
MANWAY NECKS	IS 2062 GR.B.	MANWAY FLANGES IS 2062.
NOZZLE NECKS:	SS 304,SCH.40	REINFORCING PADS IS-2062 GR.B
NOZZLE FLANGES :	ASTM A 105(FORGED)	GASKETS : NON ASBESTOS
BOLTING FOR NOZZLES	SA 193/194	
BOLTING FOR STRUCTURE	IS-1363	STRUCTURALS IS-2062 GR.B
INTERNALS	SS-304	PIPE FITTINGS (EXTERNAL) SA-106
SPIRAL STAIRWAY & PLATFORM	IS-2062 GR.B	HANDRAILING IS-1239 CL.M.(G.I PIPE)
EXTERNAL GUSSETS	IS-2062 GR.B	
EXTERNAL SUPPORT PAD	IS-2062 GR.B	REINFORCEMENT PAD IS-2062 GR.B
INTERNAL BOLT;	SA 193/194	

PAINTING SCHEDULE

APPLICATION	PROCESS	PAINT TYPE	NO. OF COATS	DRY FILM THICKNESS IN MICRON	TOTAL DFT IN MICRON
INTERNAL SURFACE	SURFACE PREPARATION	BLAST CLEAN TO SA 2.5 AS PER SIS-05-5900			
	PRIMER	EPOXY ZINC PHOSPHATE PRIMER	02	2X40	280 MICRON
	FINISH PAINT	EPOXY HIGH BUILD FINISH PAINT	02	2X100	
EXTERNAL SURFACE	SURFACE PREPARATION	BLAST CLEAN TO SA 2.5 AS PER SIS-05-5900			
	PRIMER	INORGANIC ZINC SILICATE COATING	01	65-75	345-355 MICRON
		ZINC PHOSPHATE PRIMER	01	40	
FINISH PAINT	EPOXY HIGH BUILD FINISH PAINT	02	2X100		
UNDERNEATH	SURFACE PREPARATION	BLAST CLEAN TO SA 2.5 AS PER SIS-05-5900			
	PRIMER	HIGH BUILD COAL TAR EPOXY SUITABLY PIGMENTED	02	80-100	160-200



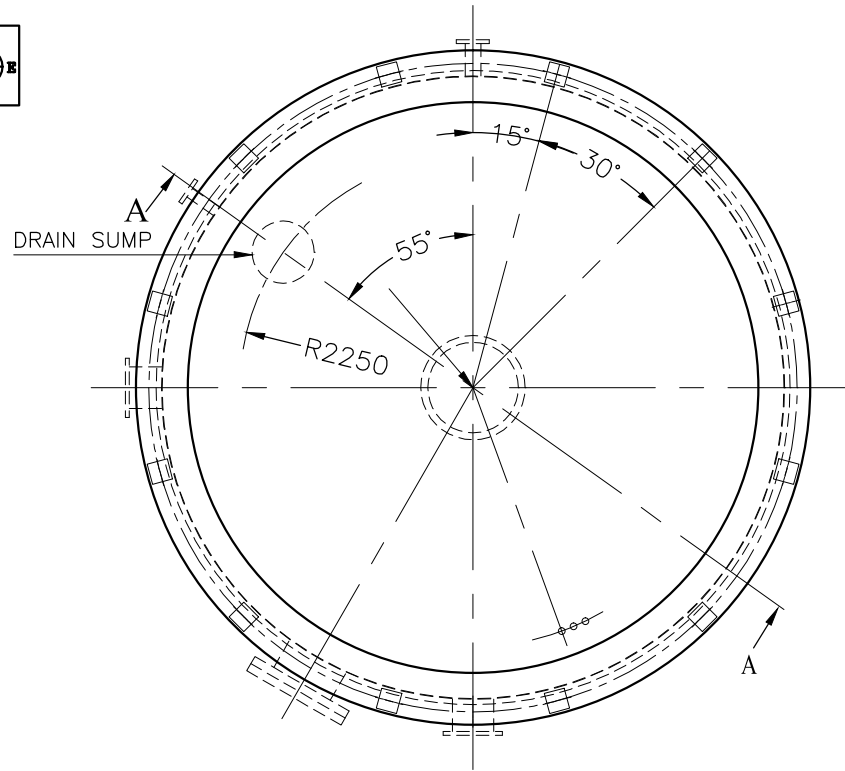
PLAN
CLARIFIED WATER STORAGE TANK

FOR TENDER PURPOSE

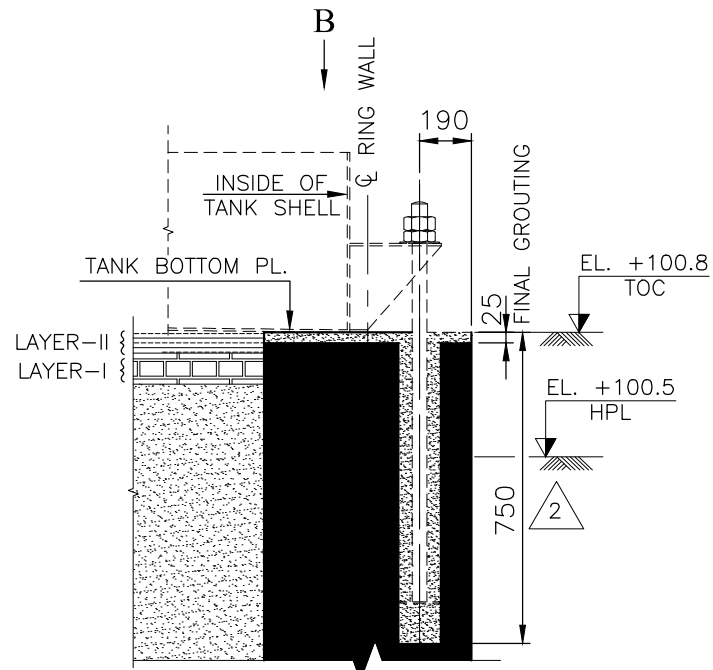
document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way without the prior written consent of the company.	TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT	RAW WATER TREATMENT PLANT				
	BHARAT HEAVY ELECTRICALS LTD., UNIT: BOILER AUXILIARIES PLANT, RANIPET - 632 406.	DRN	DBN	SIGN	DATE	NO OF VAR.
	DEPT NP UNTOI DIM CODE 976 PR:QA:500	CHD	PP		24.09.14	
	TITLE CLARIFIED WATER STORAGE TANK (CAP. 100 CU.M)	APPD	SK		24.09.14	
	SCALE	WEIGHT (KG).	REF. TO ASSY/OLD DRG.	ITEM NO.	NO. OF PAGES	
	---	---			1/1	
	CARD CODE	DRAWING NO.			REV	
	U 01	1-WT-220-00484			00	

3-WT-220-00495

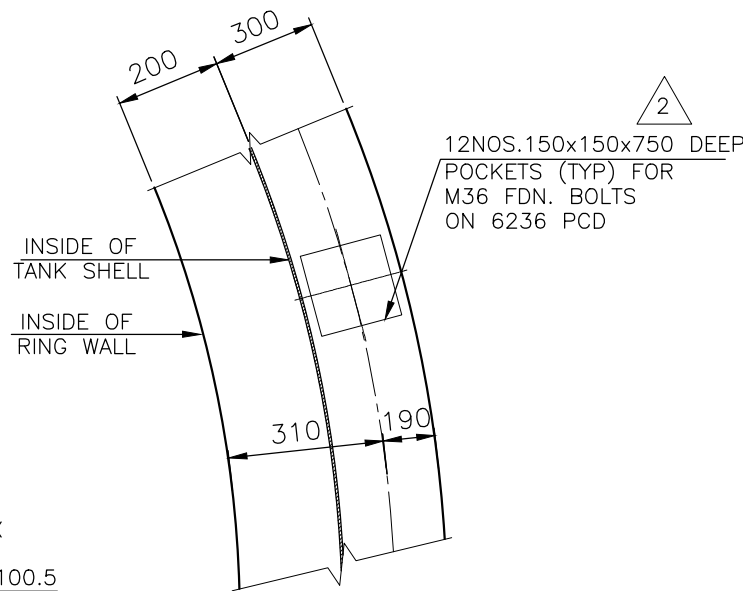
DRAWING NO.



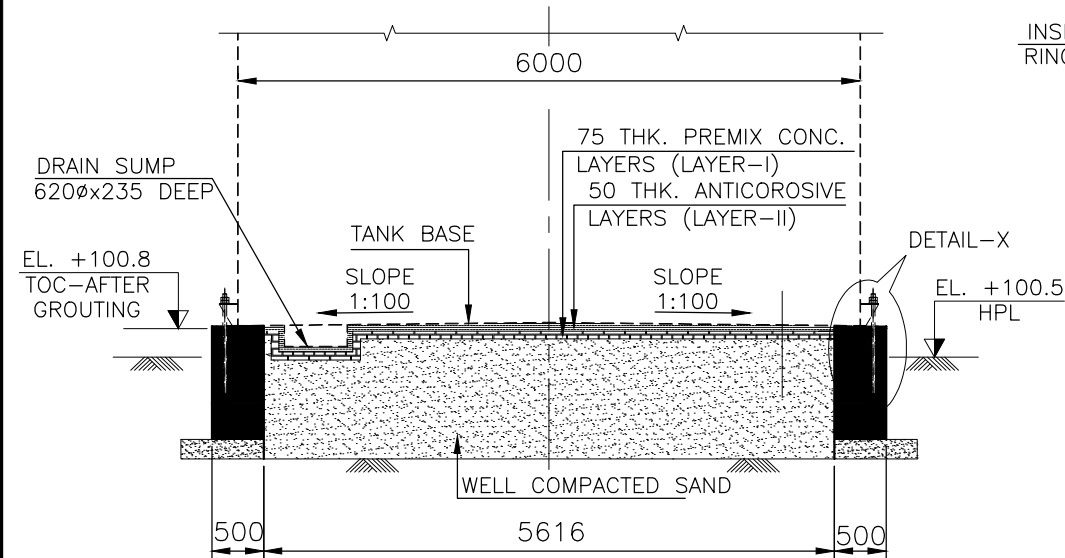
RING WALL - PLAN



DETAIL-X



VIEW - B

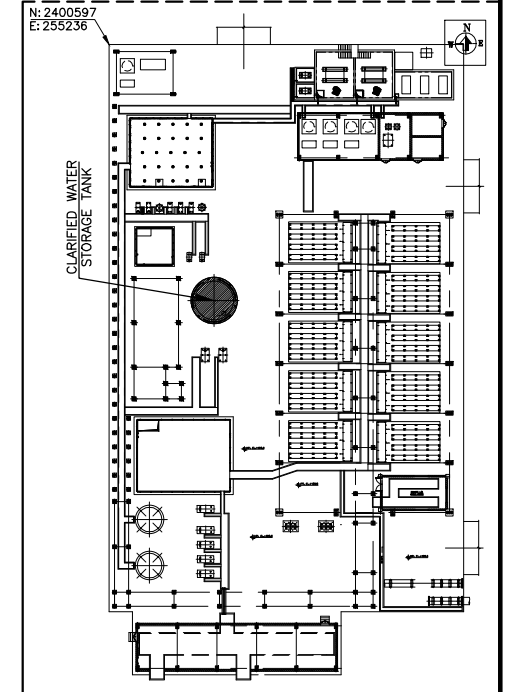


SECTION A-A

TANK DETAILS :

1. MOC OF SHELL AND BOTTOM PL. : IS2062 GR.B
2. CAPACITY : 100 M³
3. QTY : 1 NOS.
4. ID OF TANK : 6000 MM
5. HEIGHT OF TANK : 4600MM CYL.+200MM CON.
6. OPERATING WEIGHT : 140000 Kgs.

ALL DIMENSIONS ARE IN MILLIMETRES



KEY PLAN

NOTES:

1. RAW WATER TREATMENT PLANT HIGH PAVED LEVEL (HPL) EL. IS 100.5.
2. FOUNDATION POCKETS SHALL BE PERPENDICULAR TO THE SURFACE OF FOUNDATION.
3. LAYER-I : 75 THK OF COMPACTED STONES, SCREENINGS, FINE GRAVEL, CLEAN SAND OR SIMILAR MATERIAL MIXED IN HOT ASPHALT.
LAYER-II : 50 THK OF ANTI CORROSIVE LAYER OF SCREENED COARSE SAND WITH 8-10% OF BITUMEN.

LEGEND

- BOC - BOTTOM OF CONCRETE
- TOC - TOP OF CONCRETE
- MAXWL - MAXIMUM WATER LEVEL
- MINWL - MINIMUM WATER LEVEL
- IP - INSERT PLATE

REF. DRAWING:

1. CLARIFIED WATER STORAGE TANK GA DRG. 1-WT-220-00484/R.00

FOR TENDER PURPOSE

REV	DATE	ALTERED: BBS
02	10.05.14	CHECKED: GR
ZONE	FOUNDATION POCKET DEPTH HOLD REMOVED	
REV	DATE	ALTERED: BBS
01	12.04.14	CHECKED: GR
ZONE	RING WALL CENTRE CO-ORDINATE ALTERED	

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TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		WATER TREATMENT PLANT OPaL, DAHEJ, GUJRAT			
BHARAT HEAVY ELECTRICALS LTD., UNIT: BOILER AUXILIARIES PLANT, RANIPET - 632 406.	DRN	NAME BBS/DBN	SIGN	DATE 24.09.14	NO.OF VAR.
	CHD	GR		24.09.14	
	APPD	MN		24.09.14	
DEPT NP	GRADE OF UNTOL.DIM PR:QA:500	SCALE NTS	WEIGHT (KG).	REF. TO ASSY/OLD DRG.	ITEM NO.
CODE 9776					
TITLE CLARIFIED WATER STORAGE TANK FOUNDATION DETAILS			CARD CODE U 01	DRAWING NO. 3-WT-220-00495	REV 00