

FLUE GAS DESULFURIZATION SYSTEM

TECHNICAL SPECIFICATION

FOR

GLASS FLAKE LINING OF DRAIN SUMPS

CUSTOMER: NTPC LIMITED
BUYER: BHEL BAP RANIPET
APPLICATION: FLUE GAS DESULPHURISATION



NTPC:GFL-SUMP:R00

Prepared	Checked	Approved
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R00 dated 03-10-2019		

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1. PROJECT INFORMATION

Project information and site conditions are given in Annexure-II.

2. INTENT OF SPECIFICATION

- a) This Specification defines the minimum requirements of glass flake lining of Sump pits in the Flue Gas Desulphurization (FGD) plant for NTPC Projects.
- b) Drains Sump Pits contain Limestone/Gypsum Slurry. Drain Sump Details and Slurry conditions are given in Annexure-III . The glass flake lining shall offer better resistance to corrosion/erosion. The Slurry analysis and the area to be lined is given in Annexure-III Tank Details . Thickness of glass flake lining required is 3 mm thk.
- c) This specification covers the general design, selection of suitable glass flake material/resin, manufacture, shop inspection (As per latest applicable statutes, regulation and safety codes in the locality where the lining are to be carried out) and delivery at site, surface preparation of lining surface, lining the surface to the satisfaction of the customer, jointly calculation of total area lined, inspection of the lining at site, handling over to the ultimate customer.
- d) The glass flake lining shall conform to the latest version of DIN EN 14879-1 or any equivalent Indian/British/American/International Standards. Nothing in this specification shall construe to relieve the contractor of the required statutory responsibility. **Only Proven material has to be offered by the bidder.**
- e) Compliance to this specification shall not relieve the vendor of the responsibility of furnishing glass flake lining materials of proper design, materials and workmanship to meet the specified requirements.
- f) In case of deviation, it shall be listed in the vendor's proposal under separate section titled as "list of deviations/exceptions" to the enquiry documents. Any deviation not mentioned in this list and

3.0 QUALIFYING REQUIREMENTS

Glass Flake Lining for the Wet Limestone based Flue Gas Desulphurisation (FGD) System offered by the Bidder shall be only from such bidders(s) who has previously executed this lining application for coal based thermal power station for Wet Limestone based FGD application or similar corrosive environment of min 1000 Sq.m for atleast 1 project such that the lining should have been in successful operation for a period not less than two (2) year reckoned as on the date of bid opening. Proof of such experience (End user certificate/performance certificate/PO copy) shall be submitted along with the offer

4.0 SCOPE OF SUPPLY

- a) Complete selection and procurement/manufacture of all materials required for lining, storage, preparation of the surfaces for lining near site and installation of lining. All equipments required for lining shall be arranged by the lining vendor. Testing and supply of glass flake lining material for the duty condition specified in Annexure II.
- b) Erection and Commissioning of the glass flake lining as per the requirement. Delivery of material to site, Storage of the material, surface preparation of the surfaces to be lined, lining the surface to the satisfaction of the customer and testing the lined surface for proper adhesion, complete coverage and intactness with the base material/surface shall be under bidder's scope, cost for Erection and Commissioning shall be included in the offer.
- c) The total area to be lined/coated as indicated in this specification may vary +/-10%. Hence, after the completion of work the total area lined will be jointly calculated by BHEL and the vendor. Final payment will be made based on the calculated area. Lining price quoted by vendor per sq.m shall be considered for making the final payment.
- d) Air-Compressor, Airless Spray pumps, hopper, blasting hose, lining hose, spray tip, blasting gun, spray gun and other equipment for blasting and spray application has to be arranged by lining vendor. Power required for running the compressor, lighting, welding, cold storage, etc will be provided by BHEL free of cost. In case of Diesel compressor, vendor to arrange the diesel themselves. Water, if required, shall be provided by BHEL free of cost. Compressed air and instrument air will not be provided. Any cold storage container, if required, shall be arranged by vendor. Any scaffolding shall be made of Steel only. Scaffolding material shall be arranged by vendor. All travel, TA/DA, Stay charges, site visit charges shall be in vendor's scope.
- e) 10 copies of Operation and Maintenance Manuals containing all details of reference drawings and technical data shall be furnished by the Bidder.

5.0 ATMOSPHERIC CONDITION REQUIREMENTS

This section deals with the atmospheric condition requirement to be checked while undertaking the Glass Flake Lining at site.

1. Blasting or Coating will not be applied if following conditions prevail.
 - When temperature of the surface to be coated is less than 3°C above the dew point, or the relative humidity is higher than 85%.
 - When the base metal temperature is greater than 60°C.

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- When the atmospheric temperature is below 4°C.
 - When there is, in the opinion of lining Contractor, the likely hood of an unfavourable change in the weather condition within 2 hours after coating.
 - When there is deposition of moisture in the form of rain or condensation.
2. Humidity shall be calculated by bidder using whirling hygrometer whose thermometers are calibrated.
 3. Surface temperature shall be measured using suitable temperature gauge and calibration certificate of the same shall be provided by bidder.
 4. Record will be maintained throughout the execution period. Readings shall be taken once in every 4 hours up to the time work is in progress. The frequency of reading should be increased during adverse weather conditions.
 5. While working in unfavourable weather conditions (like monsoons or winters or if provided for in the contract or in large confined spaces where blasting and priming of the entire surface cannot be completed in one days operation, use of dehumidifier shall be resorted to. The dehumidification equipment will have to be maintained in such a way that the humidity is around 65% -75% inside the sump at all times during the work. No flash rusting of the blast surface should take place till the time it receives a primer coat.
 6. Where dehumidification equipment is to be used the humidity readings are to be taken inside and outside the equipments to be coated.
 7. Dehumidification equipment may not be necessary for contained space working if work is done at near ideal atmospheric conditions as described above.
 8. In cases where dehumidification is not possible, alternate methods of warming up the work front like use of halogen lights, room heaters are to be adopted.
 9. Humidity is to be taken at the location where the blasting coating operations taking place.

5.1 APPLICATION & MEDIUM:

Glass flake lining is done in order to protect the drain sumps which contain limestone/gypsum slurry. Coated surfaces are exposed to slurry whose conditions are given in Annexure-III. Typical Drawing of the sump is enclosed in Annexure-IV.

6.0 PRELIMINARY CHECK REQUIREMENTS

This section deals with the preliminary check requirements to be done while doing the lining work.

6.1 CHLORIDE CONTAMINATION TEST:

The 2% ferricyanide paper method will generally be used to determine the chloride contamination as described below:

1. Apply de-mineralized water on approximate 12 cm² area of substrate and wait for 3 to 4 minutes.
2. Remove excess moisture by patting the substrate with clean lint free cloth.
3. Press a ferricyanide paper of approximate 12 cm² area against the substrate for approximately 5 seconds and remove the paper.
4. Total absence of blue spots on paper indicates the substrate is free from soluble salts
5. Light speckling paper indicates the substrate has still contamination but it is as the acceptance level. The component should be released for further process.
6. Large blue spots on the paper indicate the substrate is heavily contaminated.
7. In this case the following procedure to be done before coating.
 - i. Pressures wash the substrate with copious amount of town water.
 - ii. Dry the substrate completely.
 - iii. Re-blasts the surface.
 - iv. Follow the salt contamination checking procedure again till you get the desired results.
8. The Ferricyanide papers should be stored in air tight container before and after use and the shelf life of Ferricyanide paper is one month.

6.2 ABRASIVE DRYNESS CHECK:

The abrasive to be used will be checked for dryness by taking a small quantity of abrasive on a filter /tissue paper and checking of traces of moisture absorbed in the filter/tissue paper. Frequency of test shall be once in day prior to blasting operation.

6.3 COMPRESSED AIR DRYNESS CHECK:

Compressed air to be used for blasting shall be free from oil & moisture and it will be tested adopting "Blotter Test". A piece of blasting Paper will be held in front of blast hose nozzle to check for traces of oil/moisture captured by the blotting Paper. Frequency of test shall be once in day prior to blasting operation.

7.0 SURFACE PREPARATION

This section deals with the methods of surface preparation before coating application

7.1 MASKING:

1. Bidder to ensure that areas not being coated are fully and adequately masked.
2. Bidder to ensure that stud holes, dowel/oil ways etc. are suitably masked or plugged to prevent ingress of blasting abrasives.

7.2 SURFACE PREPARATION METHODS:

The method of surface preparation dry abrasive manual blasting shall be done as follows:

1. Surface to be coated shall be abrasive blasted. Before this operation, removal of existing coating to be carried out by chipping, grinding or by other suitable means. Clean & dry Copper Slag Abrasive shall be used for ferrous base substrate.
2. The minimum recommended compressed air required for Blasting shall be 7.0 m³/min at 6 kg/cm² pressure. NACE No.1/SSPC-SP-5 equivalent to SA 2½ of Swedish Standard blast profile (75 to 100 Microns) to be followed for cleaning the surface.
3. The blasted surface shall be cleaned with dry compressed air/vacuum cleaner or with clean brush so that there is no presence of Dust & other foreign material. The surface will be then checked for chloride contamination (Refer Clause.5.1 for Chloride contamination check procedure). If contamination is found then the surface to be washed and reblasted till contamination gets removed. Vendor to ensure that the blasted surface free from chloride contamination
4. When cleanliness and blast profile are acceptable, the masking tape adjacent to the area to be coated shall be peeled back to prevent overlap and subsequent edge contamination.
5. If the blasted surface has not been primed within specified time or if there is any previous visible sign of blast condition change then the surface shall be checked for metallic salt contamination and shall be reblasted. Where large areas are required to be blasted in a day, blasting shall be carried out from morning to evening ensuring weather condition. This shall be followed by a light sweep blast of the entire area, before priming. The blast cleaned surface shall be blown off with dry oil free compressed air or vacuum cleaned. A cell tape shall be thoroughly pasted to the cleaned surfaces. The tape shall be removed after a minute to check presence of dust if any. Comparator shall be used for check the blast profile.

8.0 COATING APPLICATION

This section deals with the methods & requirements of coating application.

8.1 MIXING:

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1. All coating material tins shall be individually stirred thoroughly to obtain a homogenous consistency.
2. While doing spray application, the tins which come in pre measured kits will be fully mixed individually using a pneumatic stirrer. While doing hand application only small batches of 1 Kg. capacity shall be taken. Here the mixing will be done by using a metal spatula.
3. The mixing ratios as specified in the respective data sheet will be strictly adhered to. The base will be weighed out in kgs using mechanical weighing machines calibrated at site using any standard factory packed commercial product available freely in the market. The catalyst will be measured out in ML using marked syringes or measuring cylinders.

8.2 APPLICATION PROCESS:

1. The preparation and application of coating is done as per relevant product data sheet. Reference will be made to product datasheet or where appropriate, contract specifications for carrying out coating.
2. Coating in confined spaces should be done when the ambient temperature is low to avoid excess build up of styrene fumes.
3. The entire thickness will be built in multiple coating.
4. Each coat will consist of minimum two passes of wet on wet in perpendicular directions.
5. The Dry film thickness will built of each coat will be checked and recorded.
6. All the other people working with the paint will be provided with eye splash goggles and masks.
7. Glass flake lining material shall be chosen considering the slurry conditions given in Annexure-III
8. Minimum and maximum intercoat intervals are as follows.
 - a. For primer coat -At 20°C minimum 2 hours, maximum 14 hours.
 - b. For build-up coats-minimum tack free of previous coat, maximum 3 days.
9. Primer coat shall be of 75-100 µm thickness
10. Built up Coat shall be of 3000-3100 µm in multiple coats.
11. Total System DFT: 3000 microns
12. All weld joints phase transition joints will receive a stripe coat by brush in the same sequence of coating on the shell.

8.3 CURING & FINISH:

1. Curing:

The initial cure and final cure shall be as given in respective product data sheets. The Corrocoat data sheets give cure times as at 20 deg C. The initial cure time shall come down with the increase in the ambient temperature. The initial cure time is judged by touching the coated surface with gloved hand. Total tack freeness shall indicate initial cure releasing the coated component for further processing activities like final coats, grinding, buffing, cleaning, DFT testing etc. The final cure has relevance to taking the coated component into services. Hence, irrespective of ambient Temperatures the final cure period in terms of days as given in Corrocoat data sheet shall be adhered to.

2. Finish:

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It is to be noted that the coating will follow the profile of substrate. Any unevenness or other defects in the substrate will be reflected in the finish coating also. The finished coating shall have a matt/semi-glossy finish. A few local paint sag marks will not affect performance of coating and cannot be completely avoided. Hence it is permitted.

9.0 INSPECTION AND TESTING OF GLASS FLAKE LINING

After the completion of lining, the following tests shall be conducted by the vendor to assess the quality of glass flake lined surfaces.

1. Lining shall be visually inspected to ensure that it shall be free from poor weed out fibers, entrapped air and exposed fibers. The Glass flake lining shall also be subjected to testing at site as per relevant standards.
2. Testing of coatings is normally carried out as soon as they are sufficiently cured to give true thickness & to withstand damage by the test equipment. If defects are found, repair will be carried out as per clause 9.0
3. Spark test shall be carried out at appropriate areas in the presence of Purchaser. Vendor should conduct holiday test as per relevant standards. If the performance is found not to meet the requirements as specified, the Glass flake lining shall be rectified or replaced by the Vendor without any additional cost to the Purchaser. The repair shall be carried out as per clause 9.0
4. Proper documentation with details of tests conducted by the vendor for evaluation of glass flake lining shall be submitted to the purchaser.

10.0 REPAIRING PROCEDURE FOR GLASS FLAKE COATING

1. If the exposed or damaged surface less than 10cm² then such repair can be carried out without grit blasting. Any area in excess of this amount should be grit blasted using a vacuum blaster where possible.
2. In case of damage area less than 10cm² then it can be repaired as following.
 - a. De-contaminate surrounding area by using a suitable solvent such as methylated spirit, acetone, xylene etc. After washing clean and allow solvent to evaporate.
 - b. Roughen up exposed metal & clean using rotary wire brush or a coarse emery paper with at least 60 grade grit. Brush away residues then further roughen surface of the existing coating up to 100 mm away from the damaged area. Brush away residues & ensure the whole area is clean.
 - c. Apply a thin coat of material to the surface of the exposed metal only taking care not to cover more than a few millimetre of the existing coating. Allow this freshly applied material to become tack-free.
 - d. Brush styrene monomer over the whole surface to be repaired (i.e. the whole area roughened by emery) & allow to evaporate from the surface.

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- e. Apply at least 2 main coats material over the treated area taking care not to brush on to any roughened or contaminated areas. The Glass flake should be allowed to harden sufficiently to bear the weight of next coat before application of further coats. However it does not need to be tack-free between coats.

11.0 PERFORMANCE GUARANTEE

Performance parameters to be guaranteed by the vendor and tolerances permitted shall be as indicated in the data sheet. Glass flake lining or any portion thereof is liable for rejection if it fails to give any of the guaranteed performance parameters. The lining should be guaranteed for faultless material and workmanship, for a period of 24 months from the date of handing over. During Guarantee period any defects noticed due to faulty material and workmanship shall be rectified by vendor free of cost.

12.0 PACKING

The part items of the Glass flake lining should be identified by Tag numbers and should be packed as to minimize the possibility of damage during storage or transit. The packing should be suitable for tropical conditions. Vendor should specify the storage requirements for the Glass flake lining materials. The list of items identified as despatchable units shall be furnished along with unit weight and the quantity for preparation of packing slip at BHEL end for dispatch to site and for easy identification, storage and erection at site.

13.0 DOCUMENTATION

13.1 DOCUMENTS TO BE ENCLOSED ALONG WITH THE OFFER

1. Write-up on technical features of glass flake lining offered for primer and build up coats along with Catalogues, Resin composition, drawings etc.
2. Data sheets duly filled in for the Glass flake lining material.
3. The erection sequence/Procedure of the Glass flake lining. Detailed flow chart from start to finish of the lining to be furnished. Detailed glass flake lining application procedure to be submitted.
4. Storage methods to be followed at site and the shelf life of glass flake shall be suitably indicated in the offer
5. Man days required to complete the Glass flake lining for each area is to be spelt from start to finish.
6. Typical Quality Plan for comments.
7. Reference list of projects where similar glass flake lining work was carried out.

13.2 DATA TO BE FURNISHED BY THE VENDOR AFTER RECEIPT OF PURCHASE ORDER

1. List of datasheets and documents to be submitted for review, approval and information with submission dates
2. Quality Assurance Plan to be submitted for approval.
3. Detailed dimensional General Arrangement drawing of the lining surfaces.

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4. This drawing shall indicate all the design data and information about the material, scope of work and weight of the material supply, Packing procedure etc.
5. Installation, operation and maintenance manual.
6. Surface preparation and Lining procedures.
7. Catalogues, data sheets and drawings for Glass flake lining
8. Operation and Maintenance manuals

ANNEXURE - I

TECHNICAL DEVIATION (IF ANY)

Sl. No	Sec / Clause no.	Specification	Statement of deviations/variatio	Reason for deviation	Cause of withdrawal
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					

Note: All deviations/exceptions, if any must only be given in the Deviation Schedule. Any deviation/exception mentioned elsewhere would not be considered for evaluation.

ANNEXURE – II

PROJECT DETAILS:

a.	Project Name	Dadri Unit-5,6 (2X500 MW)
b.	Owner	NTPC Limited
c.	Buyer	BHEL, Ranipet
d.	Process/Application	Flue Gas Desulphurization

A) SITE CONDITIONS

1.	Ambient Temperature and Relative Humidity		
a.	Average Site Condition ASC		
	Ambient Temperature	:	27 deg C
	Ambient Humidity	:	60%
	Design value Outdoor hPa	:	988
2.	Design ambient conditions for Electrical Systems		
a.	Ambient Temperature (Design)	:	45 deg C
b.	Minimum design temperature	:	0 deg C
3.	Plant Elevation	:	+209.75 m above sea level
4.	Wind Load	:	Average. As per IS 875 part 3.
a.	Basic Wind speed @ 10m above ground	:	47 m/s
5.	Seismic Load	:	-

B) PROJECT LOCATION AND APPROACH

a.	State/Division	UP
b.	District	Gautam Buddha Nagar

ANNEXURE-III

Drain Sump Details

Sl.no.	Name of Sump	Sump size (4m W x 4m L X 4m H)	No. of sump	Slurry details	Total area(m2)
1	Absorber area drain sump	a) Concrete wall on all four sides & bottom to be lined b) Steel lid on the top with nozzles and manhole doors to be lined	2	Gypsum slurry	192
2	Gypsum area drain sump		1	Gypsum slurry	96
3	Limestone area drain sump		1	Limestone slurry	96

Slurry analysis is given below :

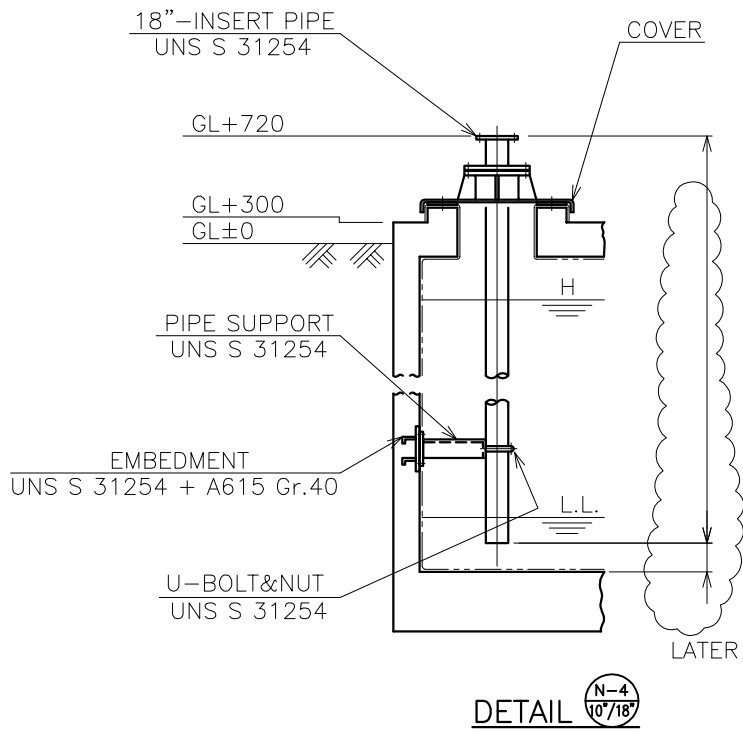
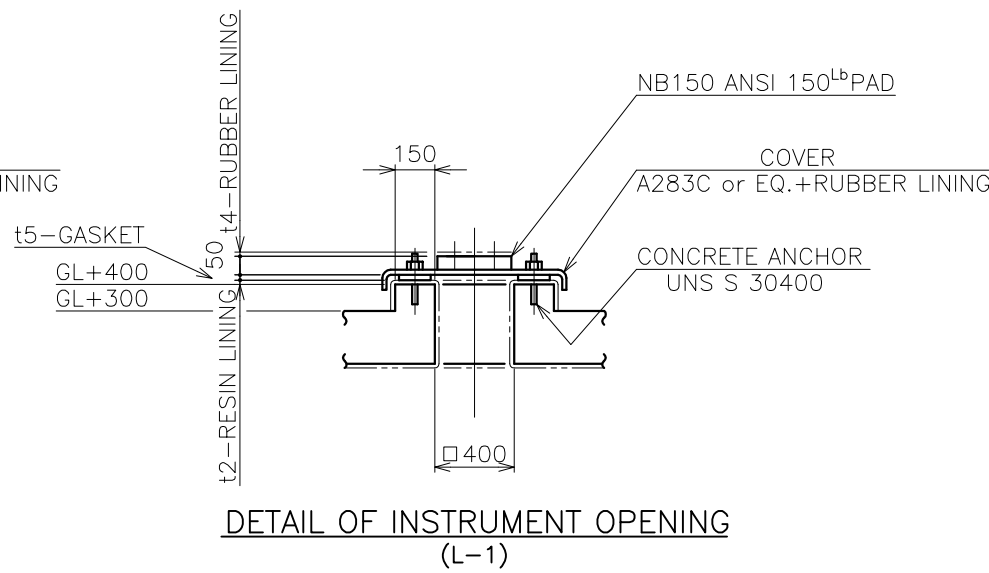
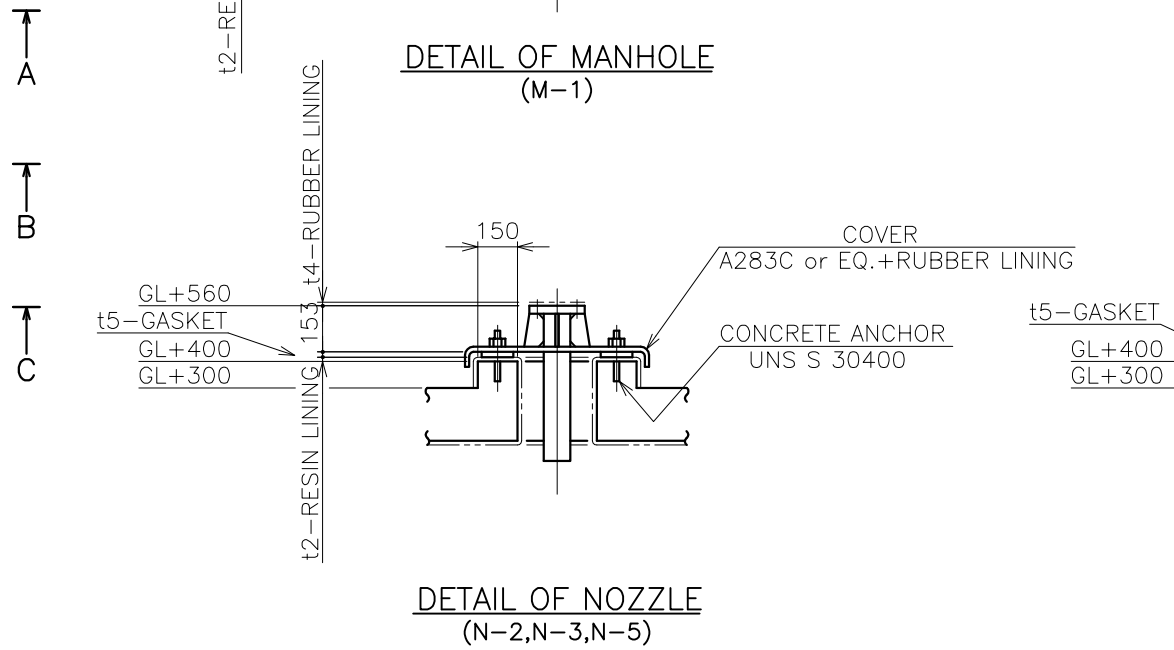
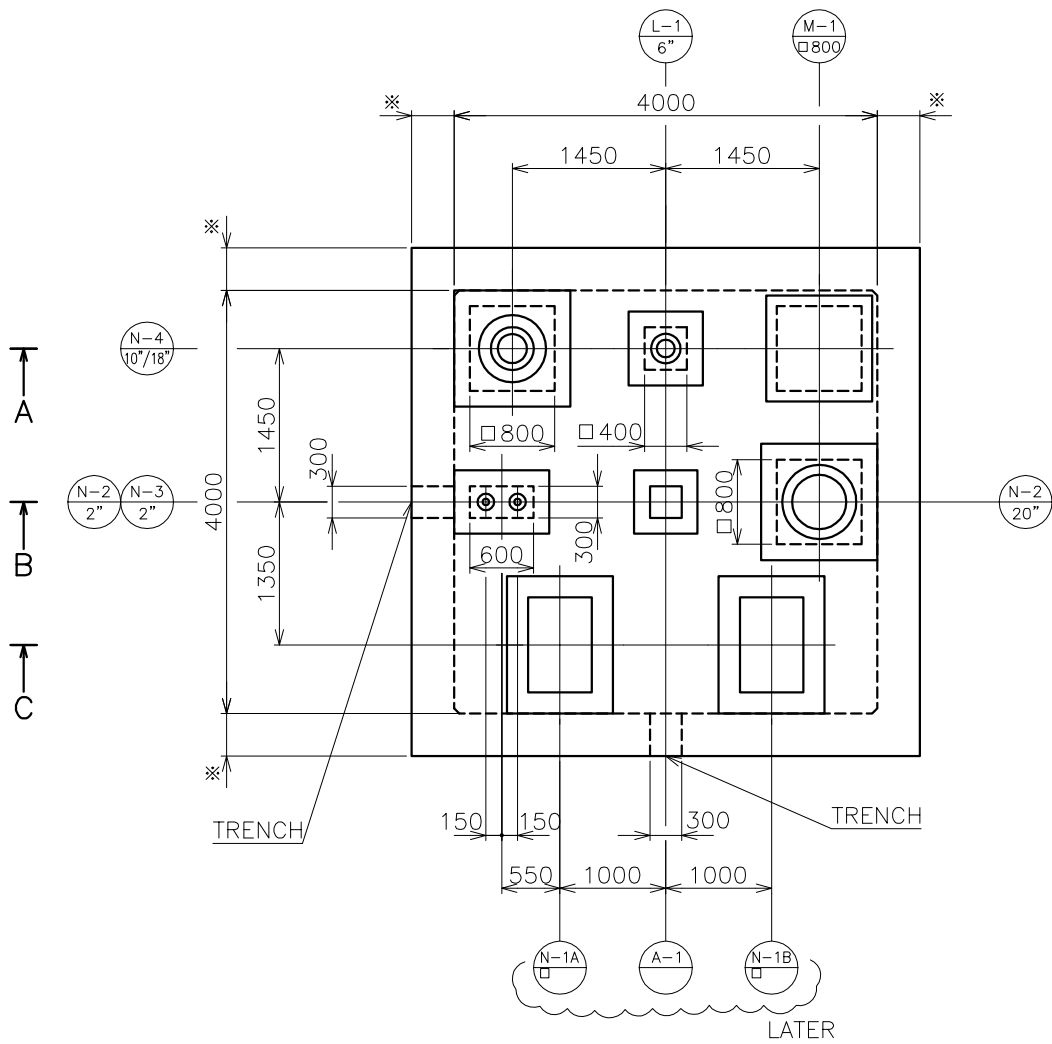
SL.NO	Slurry	Fluid parameters
1	Gypsum slurry	Liquid : Gypsum Slurry Cl conc: : < 20,000 ppm Temperature (working): 65 deg C Temperature (design):70 deg C Specific Gravity : 1.215 Viscosity : 0.01 Pa.s Solid conc. : 30 wt% SiO2 content : 20.7 g/l pH :4-8
2	Limestone slurry	Liquid :Limestone slurry Cl conc: : 120 ppm Temperature : 45 deg C Temperature (design):70 deg C Specific Gravity : 1.215 Viscosity : 0.01 Pa.s Solid conc. : 30 wt% SiO2 content : 18 g/l pH :5-8

Annexure-IV - Drain Sump-Typical

THIRD ANGLE
PROJECTION

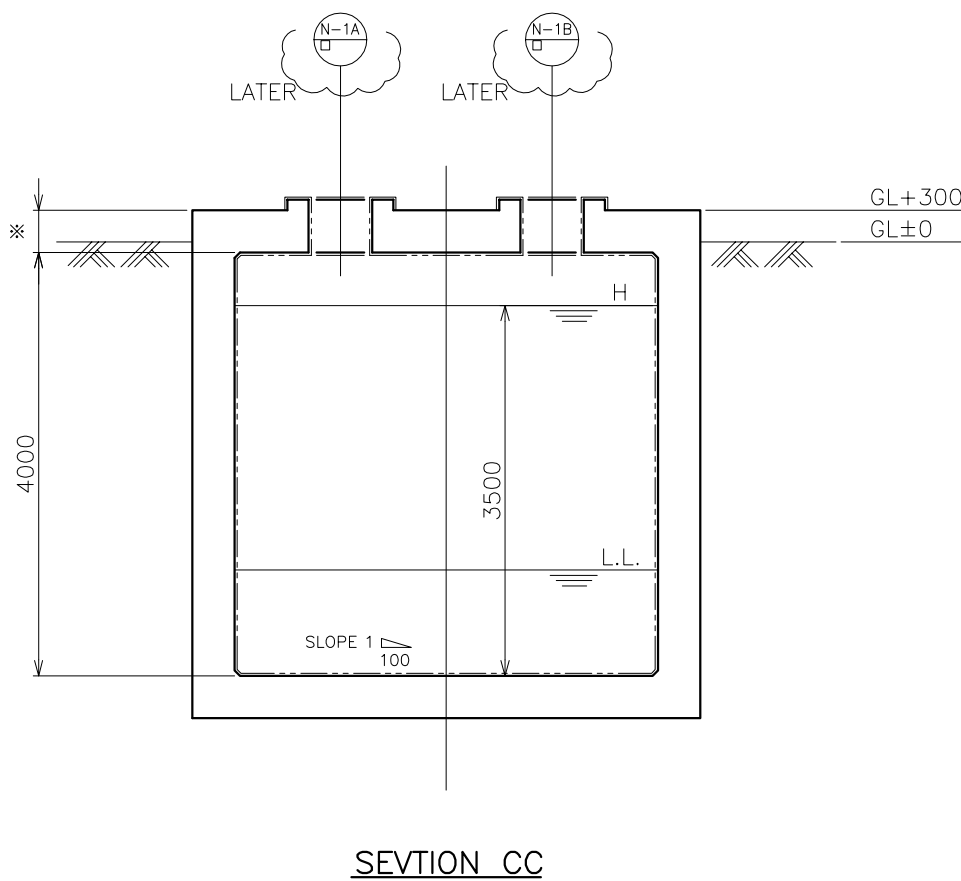
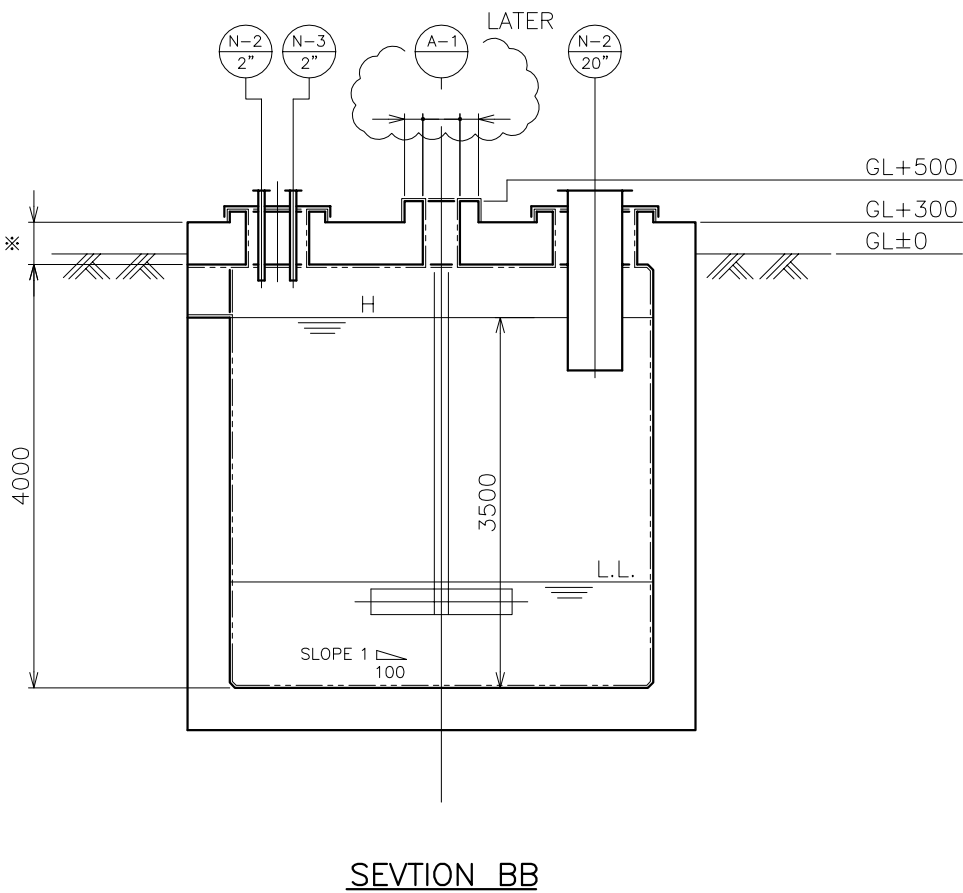
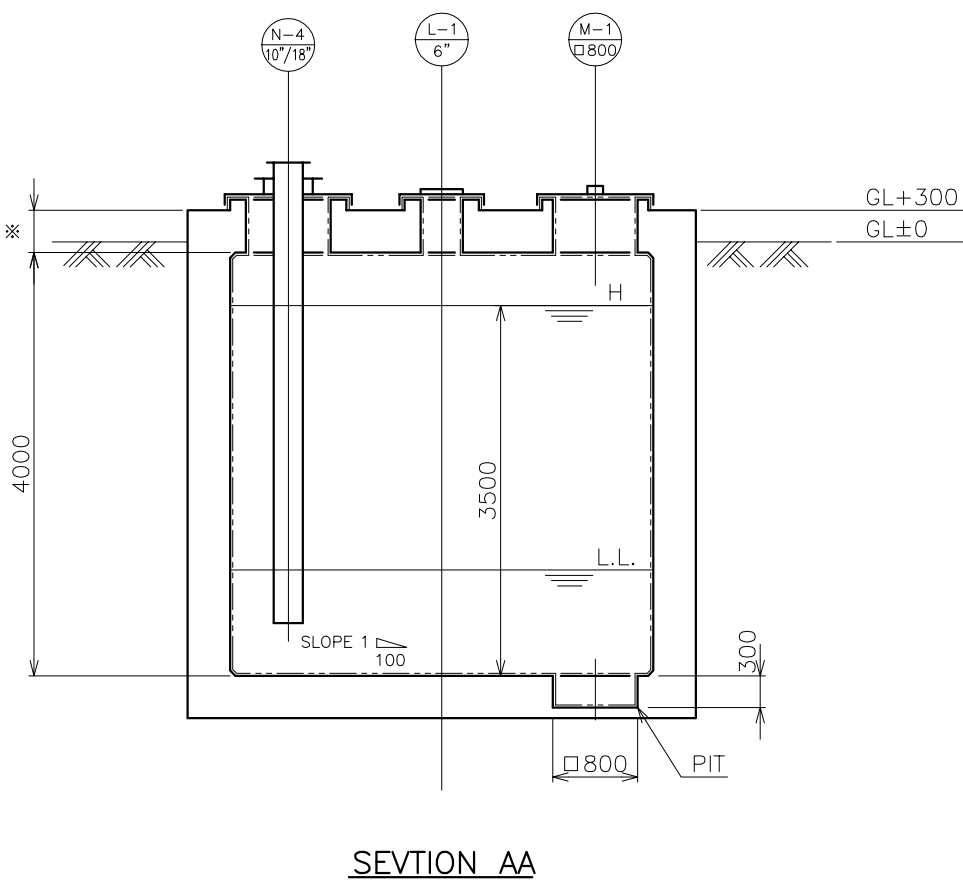
No. REQ'D
2

FOR FURTHER ACTION



- NOTES
- DESIGN LOAD OF ROOF : 0.5 t/m²
DESIGN LOAD OF AGITATOR & PUMP : REFER TO "LOADING DATA FOR MACHINERY".
 - THE BOTTOM OF SUMP TO BE INCLINED 1/100 AND TO BE CONSTRUCTED TOWARD PIT.
 - THE MARKED * SHALL BE DECIDED BY OTHERS.

FLUID CHARACTERISTICS		
SP.GRAVITY	pH	Cl Conc.
1.212	4~8	<29000ppm



DISTRIBUTION	
BHEL	1
...	...
TOTAL	1