



**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 29.07.20

SHEET 1

2 X 250 MW NSPCL BHILAI TPP-FGD

**CUSTOMER'S CONSULTANT-NTPC LIMITED
(A Government of India Enterprises)**

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS

SPECIFICATION NO. PE-TS-468-600-C001



**Bharat Heavy Electricals Limited
Project Engineering Management
PPEI Building, Power Sector,
Plot No. 25, Sector 16A,
Noida (U.P.)-201301**



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PREAMBLE

This volume is sub-divided into following sections:

- Section A : This section outlines the scope of work
- Section B : This section provides 'Project Information'
- Section C : This section indicates the technical requirements specific to the contract
- Section D : This section comprises of technical specification(s)

Note: In case of any conflict between Section-C and Section-D, Section-C of specification prevails.



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1.0 SCOPE OF WORK

The scope of work covers Engineering, Procurement and Construction (EPC) of Civil, Structural and Architectural works required for completion of 2 X 250 MW NSPCL BHILAI TPP-FGD. The scope of works described herein are in general and shall include those specified in other sections of the tender specification as well.

1.1 BRIEF SCOPE OF WORK

The scope of work includes but not limited to the following. Design and preparation of detailed Engineering/fabrication drawings, getting the design and drawings approved from BHEL & NSPCL /NTPC, supply of all materials, fabrication, erection and construction of the necessary civil, structural and architectural works associated with the Flue Gas Desulphurization (FGD) system package. The work shall have to be carried out both below and above ground level for buildings/structures/facilities and shall be involving excavation, backfilling, disposal, basements(if any), equipment foundations, Grade slab, Floor slabs/Roof, beams, columns, footings, rafts, walls, steel frames, brick walls, cladding, metal deck sheet, stairs, trenches, plinth protection, paving around buildings, garland drains, pits, handrails, monorails, fire doors, cage ladders, gratings ,precast covers, road networks, landscaping, culverts, finishes, complete architectural aspects, drainage system, sanitation, water supply, plumbing, sewage disposal system, effluent disposal system, fire protection system, earthing mats etc. for all civil, structural and architectural works.

Scope includes civil, structural and architectural works on EPC basis of RCC chimney including slip form shuttering, internal platforms, internal staircase, flue can, condensate collection and extraction system as per condensate flow model study report, wind tunnel study, chimney painting, manhole, expansion joints, roof slab, cage ladder, roof access hatch, liner test ports (for continuous pollution monitoring), grade level slab of RCC with metallic hardener floor finish, acid resistant treatment on roof slab, a large electrically operated grill type roll-up door and personnel access metallic door at grade level, roof drain basin, rain water down comer pipe (150 mm diameter galvanized pipe), connection to plant drains, louvers with bird screens for ventilation and all other openings in the wind shield, all finishing works.

Additionally, the scope also includes electricals engineering, design, manufacture, supply, erection, testing and commissioning of the electricals equipment/system complete with all materials and accessories as per electricals specification for wet stack.

Additionally, the scope also includes supply, installation, testing, commissioning etc. of rack & pinion elevator as per specification of the same for chimney. The condensate flow model study shall be carried by the bidder from absorber outlet to the top of flue liner inside the chimney on the basis of input provided by BHEL.

The scope also includes providing all labour, supervision, material, scaffolding, construction equipment's & cranes, batching plant, dewatering pumps, concrete pumps and boom placers, vibrators, consumables, tools and plants, temporary works, supplies, transportation and all incidental items not specified but reasonably implied or necessary for the completion of work in all respects.

The bidder shall do interfacing & co-ordination with Civil/Mechanical/Electrical system engineers in BHEL during detailed engineering and construction stage.

The brief list of buildings/facilities/structures covered under the scope of work is as mentioned below (**Table-1**) and shall include but not to be limited to the following.

TABLE-1

ANNEXURE-A			
S.No.	Buildings/Facility/Structure	Input	Input Received
1	FGD COMPRESSOR HOUSE	Refer Annexure –A1	Y
2	FGD CONTROL ROOM BUILDING	Refer Annexure –A2	Y
3	ACW-DMCW PUMP SHED	Refer Annexure –A3	Y
4	ACW-DMCW PUMP EQUIPMENT FOUNDATION	Refer Annexure –A4	Y
5	GYPSUM DEWATERING BUILDING INCLUDING GYPSUM CONVEYOR TAIL PULLY PLATFORM & GALLERY SUPPORTING STRUCTURES, ASSOCIATED TANK FOUNDATION.	Refer Annexure –A5	Y
6	RCC CHIMNEY	Refer Annexure –A6	Y
7	FOUNDATION FOR LIMESTONE SLURRY STORAGE TANKS (2 NOS)	Refer Annexure –A7	Y
8	FOUNDATION FOR PROCESS WATER TANKS (2 NOS)	Refer Annexure –A7	Y
9	FOUNDATION FOR AUXILLIARY ABSORBENT TANK	Refer Annexure –A7	Y
10	FOUNDATION FOR FILTERATE WATER TANK	Refer Annexure –A7	Y
11	FOUNDATION FOR SECONDARY HYDRO CYCLONE FEED TANK	Refer Annexure –A7	Y
12	FOUNDATION FOR PRIMARY HYDRO CYCLONE FEED TANK	Refer Annexure –A7	Y
13	FOUNDATION FOR WASTE WATER TANK	Refer Annexure –A7	Y
14	FOUNDATION FOR CLARIFIED (CAKE WASH) WATER TANK (2 NOS)	Refer Annexure –A7	Y
15	PAVING, DRAIN, SUMP FOR TANK AREAS	Refer Annexure –A7	Y
16	FOUNDATION FOR BELT FILTER WASH TANK (2 NOS)	Refer Annexure –A7	Y
ANNEXURE-B			
1	BALL MILL BUILDING	Refer Annexure –B1	Y
2	FOUNDATION FOR WET LIMESTONE BALL MILLS	Refer Annexure –B2	Y
3	FIRE FIGHTING SYSTEM & MISC. (FIRE WATER TRENCH, PIPE SLEEVES, HUME PIPE ETC.)	Refer Annexure –B3	Y
4	DELUGE VALVE BRICKS SHED	Refer Annexure –B4	Y
5	LIMESTONE DAY SILOS & BUILDING, ELEVATOR, BUCKET ELEVATOR AND STAIRCASE EXCLUDING SUPPLY OF BUCKET ELEVATORS & ELEVATOR.	Refer Annexure –B5	Y
ANNEXURE-C			
1	GYPSUM STORAGE SHED	Refer Annexure –C1	Y
2	GYPSUM PARKING AREA	Refer Annexure –C2	Y
3	LIMESTONE UNLOADING AREA & PARKING	Refer Annexure –C3	Y
4	SURFACE FEEDERS FROM TRUCK UNLOADING TO LTP-1	Refer Annexure –C4	Y



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5	WEIGH BRIDGE FOR LIME STONE	Refer Annexure –C5	Y
6	WEIGH BRIDGE FOR GYPSUM	Refer Annexure –C6	Y
7	LIMESTONE CRUSHER HOUSE EXCLUDING SUPPLY OF ELEVATOR.	Refer Annexure –C7	Y
8	DUST EXTRACTOR SYSTEM STRUCTURE AT CRUSHER HOUSE	Refer Annexure –C8	Y
9	PUMP HOUSE INCLUDING EQUIPMENT FOUNDATION FOR LHP AND GHP	Refer Annexure –C9	Y
10	MCC ROOM FOR LHP AND GHP	Refer Annexure –C10	Y
11	CABLE RACKS	Refer Annexure –C11	Y
12	LTP-1	Refer Annexure –C12	Y
13	DUST EXTRACTOR SYSTEM STRUCTURE AT LTP-1	Refer Annexure –C13	Y
14	LIMESTONE INTERMEDIATE STORAGE SILOS & BUILDING, BUCKET ELEVATORS AND STAIRCASE EXCLUDING SUPPLY OF ELEVATORS	Refer Annexure –C14	Y
15	GYPSUM CONVEYOR GALLERY (GBC 1A/1B)	Refer Annexure –C15	Y
16	LIMESTONE CONVEYOR GALLERY (LBC-1A & 1B)	Refer Annexure –C15	Y
17	CONVEYOR GALLERY LBF 1& 2	Refer Annexure –C15	Y
18	CONVEYOR GALLERY LBF 3 & 4	Refer Annexure –C15	Y
19	UTILITY ROOM CUM OFFICE	Refer Annexure –C16	Y
20	FOUNDATIONS FOR AIR RECIEVER	Refer Annexure –C17	Y
21	CLOSED STORAGE SHED WITH SEATING FACILITY FOR 2 TO 3 PERSONS		
22	CONTROL ROOM INCLUDING EQUIPMENT FDN. FOR TRUCK UNLOADING		
23	OPEN STORAGE YARD 1000 SQ. METERS WITH FENCING, YARD DEVELOPMENT / HARD SURFACING, FENCING, LIGHTING (HIGH MAST /STREET LIGHT TO COVER THE ENTIRE STORAGE AREA), ROADS & DRAINS ETC.		
24	OPEN STORAGE YARD CUM OFFICE SPACE OF 7500 SQ. METERS IN THE LOCATION OF LHP & GHP WITH YARD DEVELOPMENT / HARD SURFACING ALONG WITH APPROACH ROAD FOR VEHICLE MOVEMENT (TRAILER, HYDRA, CRANE, ETC)		

ANNEXURE-D

1	ABSORBER TOWER & TANK FOUNDATION (2 NOS)	Refer Annexure –D1	Y
2	FOUNDATION FOR ELEVATOR AND STAIRCASE OF ABSORBER TOWER & TANK (2 NOS)	Refer Annexure –D2	Y
3	FOUNDATION FOR RC PUMP & OXIDATION BLOWER SHED (2 NOS)	Refer Annexure –D3	Y
4	SO2 ANALYSER ROOM (2 NOS)	Refer Annexure –D4	Y
5	FOUNDATIONS FOR RC PUMP AND OXIDATION BLOWER (2 NOS)	Refer Annexure –D5	
6	FOUNDATIONS FOR BOOSTER FAN (4 NOS), SA FAN & LUBE OIL SYSTEM	Refer Annexure –D6	Y
7	FOUNDATION FOR FLUE GAS DUCTS SUPPORT STRUCTURE UNIT-1	Refer Annexure –D7	Y
8	FOUNDATION FOR FLUE GAS DUCTS SUPPORT STRUCTURE UNIT-2	Refer Annexure –D7	Y



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9	FOUNDATION FOR MISC PUMPS	Refer Annexure –D8	Y
10	FOUNDATIONS FOR PIPE & CABLE RACK	Refer Annexure –D9	Y
ANNEXURE-E			
1	ROADS	Refer Annexure-E (Plot Plan)	Y
2	CULVERT		
3	STORM WATER DRAINS		
4	PIPE TRENCH, CABLE TRENCH, EARTHING MAT, EARTH PITS (15 nos.)		
5	PAVING		
6	STP AND ETP NETWORK AND SUMPS		
7	RAIN WATER HARVESTING SCHEME		

NOTE: Any other building/facility/structure that would be required as per system design requirements but not covered in TABLE-1 above is also in the scope of the bidder.



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1.2 MISCELLANEOUS WORKS

The following miscellaneous civil works are part of the above-mentioned buildings/structures/facilities as applicable. The quoted price of building/structure/facility shall include the cost of such miscellaneous works in the respective areas and there will be no separate/extra payment on account of the same.

1. Miscellaneous foundations, pedestals, anchors, pockets, cut outs, trenches, precast covers etc.
2. Supply and fixing of embedment's, rails, rail fixing accessories inserts, bolts, pipe sleeves etc.
3. Quality testing of all materials and works, preparation of bar bending schedules, preparation of fabrication drawings and bill of materials etc.
4. Dewatering, sheet piling/slope protection works, temporary drainage system during execution etc. all complete as per work requirement.
5. Breaking the existing facilities for enabling the civil work under this package if required and making good after completion.
6. Providing openings in walls/floor/slab etc. as requirements.
7. Removal of all debris, underground obstacles (if any) and disposal of surplus materials to approved locations.
8. Dismantling of existing facilities/structures, wherever so required as per system requirement and their relocation at new area as indicated by the BHEL & NSPCL /NTPC, associated repair work above/below ground level, rerouting of over ground and underground pipes, cables, ducts, etc. as necessary. Further any rework required due to change in mechanical/electrical inputs /design or any other reason during engineering/construction.
9. Any mismatch during fixing of tank/equipment with pedestal/foundation during erection stage shall be taken care by grouting, rebaring, chipping etc. as required.
10. Micro grading
11. Any other civil works as required for completion of the system but not mentioned.

1.3 CONSTRUCTION FACILITIES

The following facilities shall be taken care by the bidder at their own end.

1. All civil and structural works associated with drinking and service water facilities for bidder's labour and other personnel at the work site/staff colony.
2. Development of temporary staff colony and labour colony as required along with fencing etc.
3. Making all arrangements for distribution of construction power at various locations as per requirements.
4. Making all arrangements for the supply of construction water.
5. Construction of bidder's site office, stores (open/covered as applicable), workshops, material/field testing laboratory and any other temporary facilities as required.
6. Providing all necessary firefighting devices/equipment/fire tender etc. as required during construction stage.
7. Providing all tools and plans (T & P) required for completion of the work.
8. Providing skilled/semiskilled/unskilled labours and supervisory staff for quality control and execution.
9. The connection of sewer pipe line for the associated buildings of FGD and Lime and gypsum handling area.
10. Development of fabrication yard for structural steel as required and specified elsewhere in the specification.
11. Meeting occupational health and safety requirements.
12. Temporary illumination and lighting as required for execution of work.
13. Development of temporary approach roads, temporary drains as required for the execution.
14. Any other civil, mechanical, electrical works as required by the bidder enabling smooth execution of work.



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1.4 ADDITIONAL REQUIREMENTS

1. All work including material shall be as per technical specification and approved drawings. The approval shall be obtained from BHEL & NSPCL/NTPC.
2. Bidder has to obtain approval of BHEL & NSPCL/NTPC for all works including design, drawing, construction methodology, construction materials, schedule etc.
3. All necessary statutory clearances shall be obtained by the bidder.
4. All the quality standards, tolerances, bolting and welding standards and other technical requirements shall be strictly adhered to.
5. Works shall be carried out as per approved design/drawings, specifications and field quality plans (FQP). The FQP shall be prepared by bidder and approved by BHEL & NSPCL/NTPC.
6. The bidder should visit the site and fully apprise himself of the prevailing conditions at the site.
7. The existing structures/buildings/facilities shall not be damaged /disturbed during execution. In case for construction of existing works any breaking/modification of the existing facilities is required, the same shall be made good after completion. It is also to be noted that in case any other works are in progress or under execution nearby the FGD area, the work shall be planned and executed in such a way that the same shall not affect others work. No claim will be entertained by BHEL & NSPCL/NTPC on ground of lack of knowledge on this account.
8. Necessary precaution and arrangements including sprinkling of water as required during work as acceptable to BHEL & NSPCL/NTPC for safety, security and dust suppression etc. have to be made by the bidder.
9. Any other measures as required for safety of the adjacent existing structures/buildings/facilities during execution shall also be taken care by the bidder.
10. Bidder shall note that the analysis, and drawings will be reviewed by BHEL; after incorporating BHEL comments/observations the same shall be further forwarded to NSPCL/NTPC for their review and approval. It is the responsibility of the bidder to get things approved by BHEL & NSPCL/NTPC.
11. The analysis/design and drawings shall be submitted in soft copy for review/approval by BHEL & NSPCL/NTPC. All files on analysis, design and drawing in editable as well as non-editable form shall be submitted to BHEL & NSPCL/NTPC.



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12. Bidder shall submit “as built drawings” after completion of construction of respective structure/building/facility in soft as well as in hard copies (2 nos.).

13. Fabrication drawings shall be prepared by the bidder and shall be vetted by engaging a third-party independent consultant by the bidder. The third-party consultant shall be approved by BHEL.

14. It is the essence of contract that all documents and drawings shall be submitted and get approved for scheduled completion of project. The project schedule shall be discussed with the successful bidder during detailed engineering stage and the bidder shall adhere to the project L2 schedule.

15. Foundation system and Geotechnical investigation:

15.1	Owner (NSPCL) had carried out geotechnical investigation in the vicinity of the proposed FGD area. The geotechnical data is attached as Annexure-F is solely for the purpose of guidance to the bidder. BHEL/Owner does not take any responsibility about the accuracy and applicability of the geo-technical data furnished herewith. The onus of correct assessment/interpretation and understanding of the existing sub-strata conditions is on the bidder. Any variation in the data between the one furnished and to that found during execution of the work at site shall not constitute a valid reason in affecting the terms & conditions of this bid and the bidder shall note that nothing extra will be payable on this account. The bidder shall fully satisfy himself about the nature of sub-strata expected to be encountered including the type of foundation, ground water table and construction methodology to be adopted etc. prior to the submission of the bid.
15.2	BHEL is carrying out detailed geo-technical investigation in the proposed project site. Detailed geo-technical Investigation report shall be made available to the successful bidder. Any variation in the data between the one furnished and to that found during execution of the work at site shall not constitute a valid reason in affecting the terms & conditions of this bid and the bidder shall note that nothing extra will be payable on this account. The bidder shall ensure that the safe foundation system is adopted. If the bidder desires to carry out additional geo-technical investigation, he/she may do so with prior information/permission of BHEL/Owner at no extra cost to BHEL/Owner. No extension in time schedule shall be permitted on this account. The bidder shall obtain approval on the agency for conducting geo-technical investigation work if it desires to do so. Field and laboratory testing schedule proposed by the bidder shall be got approved by BHEL /Owner before undertaking the geo-technical investigation work. Design of foundation system shall be as specified in Annexure-F . Bidder shall note that the net safe bearing capacity and foundation depth/ safe load carrying capacity of pile to be adopted for design during detailed engineering stage shall be got approved by BHEL/Owner.



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1.5 EXCLUSIONS

The following shall be excluded from the scope of work under this package.

1. Mechanical, Electrical and Control & Instrumentation supplies and works unless noted otherwise.
2. Second stage concreting by grouting the pockets for fixing of equipment's.

1.6 TERMINAL POINTS FOR CHIMNEY FLUE DUCT

The terminal points for the chimney flue duct under this package shall be as per Annexure-G.

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1.7 SIZE OF STRUCTURES/BUILDINGS

Tentative size of structures / buildings are given in **Table-2 i.e. (Table 2A to 2C)**.
Details are furnished in **Annexures-A, B, C, D & E**.

TABLE-2A

S.No.	Building/Facility/Structure	Qty./Lot (N)	Length,L (m)	Width,W (m)	Height,H (m)	Volume (V*=N.L.W.H)	Remarks
1	FGD compressor house	1	12	12	5.7		
2	FGD control room building	1	51.8	15	8.5		
3	ACW-DMCW pump shed	1	14	13	5		
4	Gypsum dewatering building including gypsum conveyor tail pully platform & gallery supporting structures.	1	30	16	15		
5	Ball mill building	1					Refer Annexure-B1
6	Deluge valve bricks shed	1					Refer Annexure-B4
7	Limestone day silos & building, elevator, bucket elevator and staircase excluding supply of bucket elevators & elevator.	1					
a	Limestone day silos & building, elevator & staircase	1					Refer Annexure-B5
b	bucket elevator 3 & 4	1	10.5	4	43		
8	Gypsum storage shed						
a	Civil Works	1	52	27	7.7	16689.40	
b	Structural Shed Portion	1	52	11.9	9.5		
9	Limestone crusher house excluding supply of elevator.	1	19.6	15	28.10	8,261.4	
10	Dust Extractor system structure at crusher house	1	12	7	3.8	319.2	
11	Pump house including equipment foundation for LHP and GHP	1	12	8.6	5	516	
12	MCC Room for LHP and GHP	1	48	23	5.5	6072	
13	LTP-1	1	16.5	7	10.5	1212.75	
14	Dust Extractor system structure at LTP-1	1	12	8	7	672	



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15	Limestone intermediate storage silos & building, bucket elevators and staircase excluding supply of elevators						
a	Limestone intermediate storage silo & building	1	23	10.5	31.75	10,051.125	
b	bucket elevator 1 & 2	1	10.5	5	45.4		
16	Utility room cum office	2	8	3.5	3.5	196	
17	So2 analyzer room	2					Refer Annexure-D4
18	Closed Storage Shed with seating facility for 2 to 3 persons	1	30	10	5.5	1650	
19	Control Room including equipment Fdn. For Truck Unloading	2	4.5	3	4	108	

TABLE-2B

S.No.	Building/Facility/Structure	Qty./Lot (N)	Length,L (m)	Width/Diameter,W (m)	Area (A*=N.L.W)	Remarks
1	ACW-DMCW pump equipment foundation	1				Refer Annexure -A4
2	Foundation for limestone slurry storage tanks	2		9		
3	Foundation for process water tanks	2		4.5		
4	Foundation for auxiliary absorbent tank	1		10		
5	Foundation for filtrate water tank	1		4		
6	Foundation for secondary hydro cyclone feed tank	1		4		
7	Foundation for primary hydro cyclone feed tank	1		5		
8	Foundation for waste water tank	1		5.5		
9	Foundation for clarified (cake wash) water tank	2		3.5		
10	Foundation for belt filter wash tank	2		3.5		
11	Paving, drain, sump for tank areas	1		4X4 (5 nos. Sump)		Refer Annexure -E
12	Foundation for wet limestone ball mills	2				Refer Annexure



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13	Gypsum parking area	1	47	16	752	
14	Limestone unloading area & parking					
a	Truck Unloading Platform	1			1413	
b	Platform	1	24	20		
c	ramp	1	89	8		
15	Weigh bridge for lime stone	1	21.22	3.76	79.787	
16	Weigh bridge for gypsum	1	21.22	3.76	79.787	
17	Foundations for air receiver	2				Refer Annexure -C17
18	Foundation for Absorber tower & tank	2				Refer Annexure -D1
19	Foundation for elevator and staircase of absorber tower	2				Refer Annexure -D2
20	Foundation for RC pump & oxidation blower shed	2				Refer Annexure D3
21	Foundation for RC pump and oxidation blower	2				Refer Annexure -D5
22	Foundation for booster fan, sa fan & lube oil system	4				Refer Annexure -D6
23	Foundation for miscellaneous pumps	1				Refer Annexure -D8
24	Paving	1				Refer Annexure -E
25	Open storage yard 1000 Sq. Meters with fencing, Yard development / Hard surfacing, Fencing, lighting (High Mast /Street light to cover the entire storage area), roads & drains etc.	1	50	20	1000	
26	Open storage yard cum office space of 7500 Sq. Meters in the location of LHP & GHP with yard development / Hard surfacing along with approach road for vehicle movement (Trailer, Hydra, Crane, etc)	1	150	50	7500	
27	STP and ETP network and sumps					Refer Annexure -E (Plot Plan)
28	Rain water harvesting scheme					



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TABLE-2C

S.No.	Building/Facility/Structure	Qty.(N)	Length/Height, L(m)	Total Length (Le*=N. L)	Remarks
1	RCC Chimney	2	150	300	
2	Firefighting system & misc. (fire water trench, pipe sleeves, hume pipe etc.)	1			Refer Annexure-B3
3	Surface feeders from truck unloading to LTP-1	1	16.4		
4	Cable racks	1	170		
5	Gypsum Conveyor gallery (GBC 1A/1B)	1	15		
6	Limestone Conveyor gallery (LBC-1A & 1B)	1	119		
7	Conveyor Gallery LBF 1& 2	1	7.2		
8	Conveyor Gallery LBF 3 & 4	1	8.5		
9	Foundation for flue gas ducts support structure (Unit-1)	1			Refer Annexure-D7
10	Foundation for flue gas ducts support structure (Unit-2)	1			
11	Foundations for Pipe & cable rack	1			Refer Annexure-D9
12	Roads	1			Refer Annexure- E
13	Culverts	1			
14	Storm water drains	1			
15	Pipe trench,cable trench, Earthing Mat, Earth pits (15 Nos.)	1			

1.8 LOADING

The details of loading on building/structure/facility to be considered for design shall be as specified elsewhere in the specification, Annexures and considering relevant Indian Standards. In case any other/additional loads over and above the one specified is required, the same shall also be considered during detailed engineering.



**2 X 250 MW NSPCL BHILAI TPP-FGD
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1.9 VARIATION

The contract is on EPC basis and the prices quoted are on lumpsum basis. The size of buildings/facilities/structures are given in Table-2. The details of loading to be considered for design are specified elsewhere. Bidder shall prepare and submit the offer based on the tender requirements. The specified sizes may vary during contract stage considering mechanical/electrical system requirements. The prices quoted shall remain firm for a variation in size of buildings/facilities/structures up to $(\pm)10\%$ in volume/area/length over the specified as applicable; however, in case of variation beyond $(\pm)10\%$ over the specified, compensation/rebate as applicable shall be charged as per Table-3 (Table 3A to 3C). The variation clause shall be admissible only for the buildings/facilities/structures as listed in Table-2 (Table 2A to 2C). Compensation/rebate shall not be applicable at contract stage for change in loading up to any extent over the specified. No other compensation/rebate shall be admissible. No time compensation shall be admissible for variation in input as per table 2, even beyond $(\pm)10\%$.

Any other building/facility/structure required additionally that would be required as per system design requirements but not covered in TABLE-1 above is also in the scope of the bidder and shall be compensated for the same on pro-rata basis of similar structure. Similar structure shall be decided by BHEL Engineer-in-charge.

Notation:

For estimation of size of buildings/structure/facility, dimensions are to be measured from grid to grid spacing for plan dimensions.

Parapet height shall be excluded in height measurement.

V-Quantity mentioned in Table-2A stands for volume

A-Quantity mentioned in Table-2B stands for area

Le-Quantity mentioned in Table-2C stands for total length

Y-Quantity executed as per Civil Drawing in contract stage. The unit of measurement will be same that of 'V', 'A', 'Le' as applicable.

p-Weightage percentage of an item (**Building/Facility/Structure**) in VOLUME- 3.

Q=Total bid price quoted by successful bidder.

q-Quoted price derived from weighted percentage of an item (**Building/Facility/Structure**) in VOLUME- 3, **q= Q*p/100**



**2 X 250 MW NSPCL BHILAI TPP-FGD
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Table-3 i.e. (Table 3A to 3C)

TABLE-3A

S.No.	Building/Facility/Structure	Compensation for variation above 10% $\{q/(V)\} * \{Y-1.1V\}$	Rebate for variation below 10% $\{q/V\} * \{0.9V-Y\}$
1	FGD compressor house		
2	FGD control room building		
3	ACW-DMCW pump shed		
4	Gypsum dewatering building including gypsum conveyor tail pully platform & gallery supporting structures.		
5	Ball mill building		
6	Deluge valve bricks shed		
7	Limestone day silos & building, elevator, bucket elevator and staircase excluding supply of bucket elevators & elevator.		
a	Limestone day silos & building, elevator & staircase		
b	bucket elevator 3 & 4		
8	Gypsum storage shed		
a	Civil Works		
b	Structural Shed Portion		
9	Limestone crusher house excluding supply of elevator.		
10	Dust Extractor system structure at crusher house		
11	Pump house including equipment foundation for LHP and GHP		
12	MCC Room for LHP and GHP		
13	LTP-1		
14	Dust Extractor system structure at LTP-1		
15	Limestone intermediate storage silos & building, bucket elevators and staircase excluding supply of elevators		
a	Limestone intermediate storage silo & building		



**2 X 250 MW NSPCL BHILAI TPP-FGD
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b	bucket elevator 1 & 2		
16	Utility room cum office		
17	So2 analyzer room		
18	Closed Storage Shed with seating facility for 2 to 3 persons		
19	Control Room including equipment Fdn. For Truck Unloading		

TABLE-3B

S.No.	Building/Facility/Structure	Compensation for variation above 10% $\{q/(A)\} * \{Y-1.1A\}$	Rebate for variation below 10% $\{q/A\} * \{0.9A-Y\}$
1	ACW-DMCW pump equipment foundation		
2	Foundation for limestone slurry storage tanks		
3	Foundation for process water tanks		
4	Foundation for auxiliary absorbent tank		
5	Foundation for filtrate water tank		
6	Foundation for secondary hydro cyclone feed tank		
7	Foundation for primary hydro cyclone feed tank		
8	Foundation for waste water tank		
9	Foundation for clarified (cake wash) water tank		
10	Foundation for belt filter wash tank		
11	Paving, drain, sump for tank areas		
12	Foundation for wet limestone ball mills		
13	Gypsum parking area		
14	Limestone unloading area & parking		
a	Truck Unloading Platform		
b	Platform		
c	ramp		
15	Weigh bridge for lime stone		
16	Weigh bridge for gypsum		
17	Foundations for air receiver		



**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

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18	Foundation for Absorber tower & tank		
19	Foundation for elevator and staircase of absorber tower		
20	Foundation for RC pump & oxidation blower shed		
21	Foundation for RC pump and oxidation blower		
22	Foundation for booster fan, sa fan & lube oil system		
23	Foundation for miscellaneous pumps		
24	Paving		
25	Open storage yard 1000 Sq. Meters with fencing, Yard development / Hard surfacing, Fencing, lighting (High Mast /Street light to cover the entire storage area), roads & drains etc.		
26	Open storage yard cum office space of 7500 Sq. Meters in the location of LHP & GHP with yard development / Hard surfacing along with approach road for vehicle movement (Trailer, Hydra, Crane, etc)		

TABLE-3C

S.No.	Building/Facility/Structure	Compensation for variation above 10% $\{q/(Le)\} * \{Y-1.1 Le\}$	Rebate for variation below 10% $\{q/ Le\} * \{0.9 Le - Y\}$
1	RCC Chimney		
2	Firefighting system & misc. (fire water trench, pipe sleeves, hume pipe etc.)		
3	Surface feeders from truck unloading to LTP-1		
4	Cable racks		
5	Gypsum Conveyor gallery (GBC 1A/1B)		
6	Limestone Conveyor gallery (LBC-1A & 1B)		
7	Conveyor Gallery LBF 1& 2		
8	Conveyor Gallery LBF 3 & 4		
9	Foundation for flue gas ducts support structure (Unit-1)		
10	Foundation for flue gas ducts support structure (Unit-2)		
11	Foundations for Pipe & cable		



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	rack		
12	Roads		
13	Culverts		
14	Storm water drains		
15	Pipe trench, cable trench, Earthing Mat, Earth Pits (15 nos.)		
16	STP and ETP network and sumps		
17	Rain water harvesting scheme		



**2 X 250 MW NSPCL BHILAI TPP-FGD
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**VOLUME -3
PRICE SCHEDULE**

Item No.	Description	Quantity	Unit	Rate (INR)	Amount (INR)
1	Engineering, Procurement and Construction (EPC) of Civil, Structural and Architectural works for 2 X 250 MW NSPCL BHILAI TPP-FGD Project in line with the scope of work and specification all complete.	1	Lump Sum		
			TOTAL:		
	Amount in Words:				
NOTE:					
1	The total lump Sum amount quoted in the price schedule shall be apportioned to workout the engineering, procurement and construction price of individual building/facility/structure as listed in Table -4.				
2	The price of individual building/facility/structure thus arrived shall be further apportioned in the following heads.				
			Percentage (%) weightage		
	Engineering		1.43		
	Procurement & Construction		98.57		
			Signature of bidder with seal		

**2 X 250 MW NSPCL BHILAI TPP-FGD
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TABLE-4

S.No.	Building/Facility/Structure	Percentage (%) (p) weightage of Total Price in the price schedule
1	FGD compressor house	0.66
2	FGD control room building	4.78
3	ACW-DMCW pump shed	0.51
4	Gypsum dewatering building including gypsum conveyor tail pully platform & gallery supporting structures.	3.44
5	Ball mill building	2.6
6	Deluge valve bricks shed	0.14
7	Limestone day silos & building, elevator, bucket elevator and staircase excluding supply of bucket elevators & elevator.	
a	Limestone day silos & building, elevator & staircase	2.87
b	bucket elevator 3 & 4	0.63
8	Gypsum storage shed	
a	Civil Works	1.44
b	Structural Shed Portion	2.09
9	Limestone crusher house excluding supply of elevator.	10.45
10	Dust Extractor system structure at crusher house	0.01
11	Pump house including equipment foundation for LHP and GHP	0.56
12	MCC Room for LHP and GHP	0.76
13	LTP-1	1.01
14	Dust Extractor system structure at LTP-1	0.19
15	Limestone intermediate storage silos & building, bucket elevators and staircase excluding supply of elevators	
a	Limestone intermediate storage silo & building	6.67
b	bucket elevator 1 & 2	0.62
16	Utility room cum office	0.24
17	So2 analyzer room	0.09
18	Closed Storage Shed with seating facility for 2 to 3 persons	0.17
19	Control Room including equipment Fdn. For Truck Unloading	0.67
20	ACW-DMCW pump equipment foundation	0.13
21	Foundation for limestone slurry storage tanks	0.3
22	Foundation for process water tanks	0.08
23	Foundation for auxiliary absorbent tank	0.19
24	Foundation for filtrate water tank	0.03
25	Foundation for secondary hydro cyclone feed tank	0.03
26	Foundation for primary hydro cyclone feed tank	0.05
27	Foundation for waste water tank	0.06
28	Foundation for clarified (cake wash) water tank	0.05
29	Foundation for belt filter wash tank	0.05



**2 X 250 MW NSPCL BHILAI TPP-FGD
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30	Paving, drain, sump for tank areas	0.25
31	Foundation for wet limestone ball mills	0.87
32	Gypsum parking area	0.1
33	Limestone unloading area & parking	
a	Truck Unloading Platform	0.31
b	Platform	0.56
c	ramp	0.48
34	Weigh bridge for lime stone	0.11
35	Weigh bridge for gypsum	0.11
36	Foundations for air receiver	0.02
37	Foundation for Absorber tower & tank	1.14
38	Foundation for elevator and staircase of absorber tower	0.29
39	Foundation for RC pump & oxidation blower shed	0.66
40	Foundation for RC pump and oxidation blower	0.29
41	Foundation for booster fan, sa fan & lube oil system	1.66
42	Foundation for miscellaneous pumps	0.11
43	Paving	2.56
44	Open storage yard 1000 Sq. Meters with fencing, Yard development / Hard surfacing, Fencing, lighting (High Mast /Street light to cover the entire storage area), roads & drains etc.	0.06
45	Open storage yard cum office space of 7500 Sq. Meters in the location of LHP & GHP with yard development / Hard surfacing along with approach road for vehicle movement (Trailer, Hydra, Crane, etc)	0.28
46	RCC Chimney	35.63
47	Firefighting system & misc. (fire water trench, pipe sleeves, hume pipe etc.)	1.85
48	Surface feeders from truck unloading to LTP-1	0.01
49	Cable racks	0.71
50	Gypsum Conveyor gallery (GBC 1A/1B)	0.73
51	Limestone Conveyor gallery (LBC-1A & 1B)	4.02
52	Conveyor Gallery LBF 1& 2	0.36
53	Conveyor Gallery LBF 3 & 4	0.37
54	Foundation for flue gas ducts support structure (Unit-1)	0.78
55	Foundation for flue gas ducts support structure (Unit-2)	0.78
56	Foundations for Pipe & cable rack	1.95
57	Roads	0.38
58	Culverts	0.05
59	Storm water drains	0.26
60	Pipe trench, cable trench, Earth mat, Earth pits (15 nos.)	0.14
61	STP and ETP network and sumps	0.42
62	Rain water harvesting scheme	0.13
	Total percentage of quoted price of all building/facility/structure a listed in table-2A to table-2C.	100.00

Note: Amount in Rupees arrived as above shall be limited to two decimal place.
Sum total arrived at distribution shall be adjusted during the closure of the contract.



**2 X 250 MW NSPCL BHILAI TPP-FGD
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2.0 REFERENCE INPUT DRAWINGS / DOCUMENTS

Reference input drawings are attached in Annexures (Annexures A to G) below:

38826/2020/PS-PEM-CIV



**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

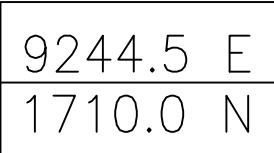
VOLUME - II B

SECTION - A

REV.NO. 00 DATE 11-02-2020

SHEET

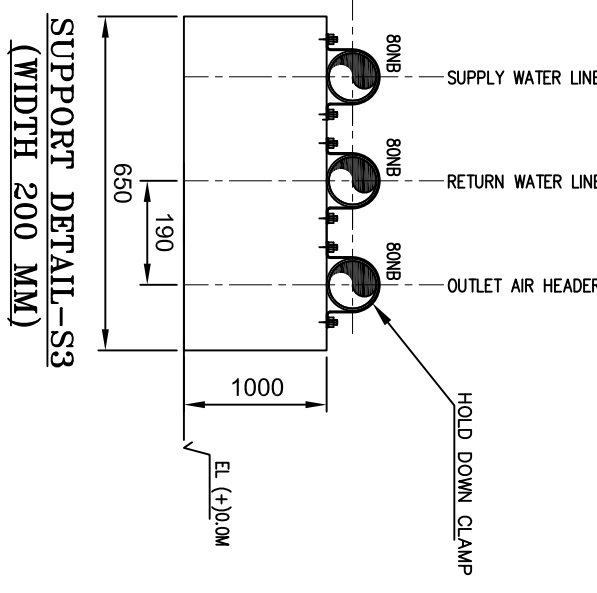
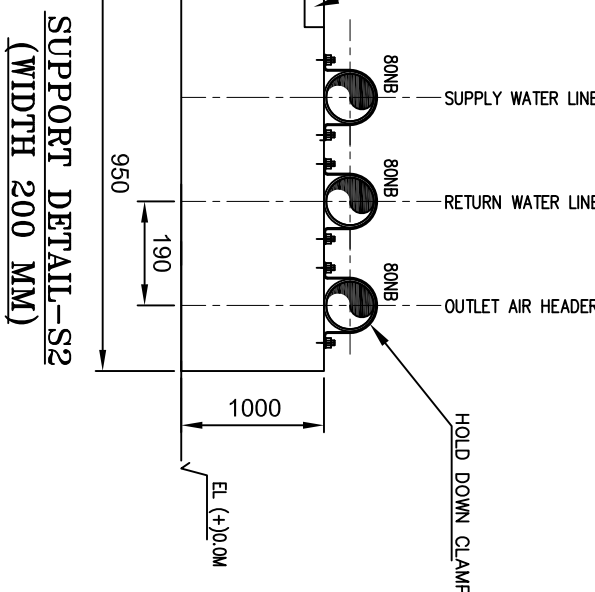
Annexure-A1



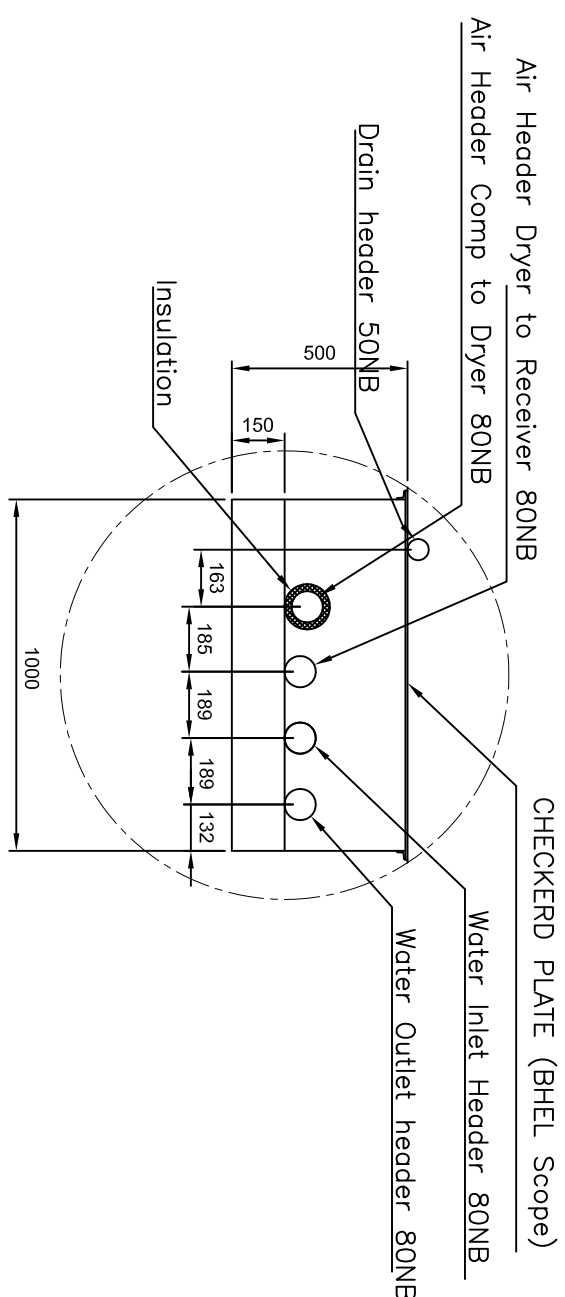
EQUIPMENT DETAILS:

- NOTES :-

- 1) NO ANCHOR BOLTS REQUIRED FOR FIXING THE COMPRESSOR COMPRESSOR TO BE SIMPLY PLACED ON THE FOUNDATION.
- 2) NO UNBALANCED FORCES ARE BEING TRANSFERRED DOWN TO THE FOUNDATION BECAUSE OF NO DYNAMIC UNBALANCED FORCES FOR COMPRESSOR & DRYER.
- 3) FLANGES, COUNTER FLANGES WITH GASKET, NUTS & BOLTS AT ALL TERMINATING POINTS ARE IN CAS SUPPLIER SCOPE
- 4) CIVIL WORK, FABRICATION & PLACEMENT OF CHECKERED PLATE ETC. SHALL BE IN BHEL'S SCOPE.
- 5) ALL DIMENSIONS ARE IN MM & LEVELS ARE IN METERS, FFL(+ 0.000 M CORRESPONDS TO RL(+ 294.4 M).
- 6) ALL CABLE SLITS SHALL BE SAND FILLED & PROVIDED WITH SUITABLE CONCRETE COVER AFTER COMPLETION OF CABLE LAYING.
- 7) GROUTING OF EQUIPMENT WILL BE IN CAS SUPPLIER SCOPE.
- 8) PIPE SUPPORT STRUCTURE IS IN CAS SUPPLIER SCOPE.
- 9) WEIGHT OF HEAVIEST COMPONENT TO BE LIFTED IS MOTOR: 1150KG.
- 10) THE FLOOR PLAN DETAILS ARE TENTATIVE & SHALL BE CONFIRMED AFTER PLACEMENT OF ORDER.
- 11) THE MONORAIL LOCATION IS TENTATIVE & SHALL BE CONFIRMED AFTER PLACEMENT OF ORDER.



COMPRESSOR HOUSE LAYOUT



38826/2020/PS-PEM-CIV

**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 11-02-2020

SHEET

Annexure-A2

38826/2020/PS-PEM-CIV



**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 11-02-2020

SHEET

Annexure-A3

38826/2020/PS-PEM-CIV

**2 X 250 MW NSPCL BHILAI TPP-FGD
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SECTION - A

REV.NO. 00 DATE 11-02-2020

SHEET

Annexure-A4

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PHE type: S62-IS10-90-TK-LIQUID	Hot Side	Cold Side
FLUID	ECW	ACW
Flow rate (l/h)	42000	125000
Inlet temp (°C)	47.22	36.00
Outlet temp. (°C)	38.00	39.10
Max Pressure Drop (mWC)	0.50	3.50
Heat Exchanged (Kcal/h)	387500	
Effective heat surface (m²)	59.84	
Design/test pressure (bar)	10.00 / 15.00	
Design temp (°C)	60.00	
Weight / PHE (kg)	1281	

Notes:-

- 1) ALL DIMENSION ARE IN MM UNLESS SPECIFIED OTHERWISE.
- 2) BOM IS FOR 1 No ONLY. ORDER QTY:- 3 No.
- 3) IN BOM 28 & 29 Sr. NO. ARE COUNTER FLANGES, AS PER ANSI B16.5 150# (SORF).
- 4) PAINTING SHOULD BE AS PER BHEL STANDARD. **As per NTPC Spec**

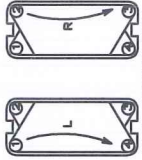
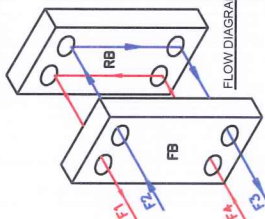


PLATE DESIGNATION

- 1 1234R MEANS ALL PORT ARE OPEN ON RIGHT HAND PLATE
- 2 1234L MEANS ALL PORT ARE OPEN ON LEFT HAND PLATE
- 3 0000L MEANS ALL PORT ARE CLOSE ON LEFT HAND PLATE



FLOW DIAGRAM

34	FOUNDATION BOLT	M16 X 300L	3	IS 1367 GR 8.8
33	PAINT	AS PER BHEL	4	lit.
32	STUD-NUIT FOR FLANGE	M16 X 100L	8	SA 193 Gr. B7 + SA 194 Gr.2H
31	STUD-NUIT FOR FLANGE	M20 X 100L	16	SA 193 Gr. B7 + SA 194 Gr.2H
30	FLANGE GASKET	80NB + 150NB	2+2	3mm WIRE INSERTED RED RUBBER
29	COUNTER FLANGE (SORF)	150 NB ANSI B16.5 150#	2	IS 2082 GR. B
28	COUNTER FLANGE (SORF)	80 NB ANSI B16.5 150#	2	IS 2082 GR. B
27	LINERS	DN150 X 45 WIDTH	4	SS 304
26	ROLLER PIPE	OD20 X ID 17 X 104L	1	SS 304
25	ROLLER PIN WITH 2NUTS	M16 X 160L	1	SS 304
24	ROLLER	#100 X 102L	1	NYLON
23	BOLT FOR FOOT ANGLE	M16X30 + M12X40L	4+2	IS 1367 GR 8.8
22	FOOT ANGLE FOR HEAD	50 X 50 X 100L	2	IS 2082 GR. B
21	BOLT FOR SUSPENSION ANGLE	M12 X 50L	4	IS 1367 GR 8.8
20	SUSPENSION ANGLE	50 X 50 X 210L	2	IS 2082 GR. B
19	FOOT ANGLE FOR COLUMN	50 X 50 X 100L	1	IS 2082 GR. B
18	COLUMN	100 X 50 X 1852L	1	IS 2082 GR. B
17	PLATE GASKET'S	S62	91	NITRILE HT SONDER LOCK
16	PHE PLATE'S	S62 (0.6mm)	90	ASTM A216
15	WASHER	M36	8	IS 2082 GR. B
14	LOCKING NUT	M36	8	ASTM A216 Gr. WCB
13	HAX NUT	M36	16	IS 1367 GR B
12	LOCKING BUSH	M36	8	ASTM A216 Gr. WCB
11	TIE ROD	M36 X 800L	4	IS 1367 GR 8.8
10	TIE ROD	M36 X 1000L	4	IS 1367 GR 8.8
9	BOLT FOR GUIDING BAR	M12 X 75L	4	IS 1367 GR 8.8
8	SIDE PIECE FOR GUIDING BAR	75 X 35 X 25 THK	2	IS 2082 GR. B
7	GUIDING BAR	80 X 40 X 1000L	1	SS 304
6	SIDE PIECE FOR CARRYING BAR	136 X 86 X 25 THK	2	IS 2082 GR. B
5	T-ANGLE FOR CARRYING BAR	50 X 50 X 1000L	1	SS 304
4	BOLT FOR CARRYING BAR	M20 X 85L	4	IS 1367 GR 8.8
3	CARRYING BAR	150 X 100 X 1000L	1	IS 2082 GR. B
2	FOLLOWER (PRESSURE PLATE)	1786 X 640 X 45 THK	1	IS 2082 GR B WITH EPOXY PAINTED
1	HEAD (FIXED PLATE)	1852 X 640 X 45 THK	1	IS 2082 GR B WITH EPOXY PAINTED



by Danfoss

E/1 GIDC Savi, PO Manjisar, Vadodra, Gujarat

Tel. : +91 2667 267000, Fax : +91 2667 264133

Description : S62

GA. DRAWING OF PHE

Clients Name : BHARAT HEAVY ELECTRICLAS LTD

Project : 2x490 MW NTPC DADRI

STAGE-II-FGD System

PO No. : PW/PE/PG/NT/TP-215/18

PO Date : 13.08.2018

SCALE : NTS

ISO projection

ISO projection

ISO projection

ISO projection

ISO projection

ISO projection

ISO projection

ISO projection

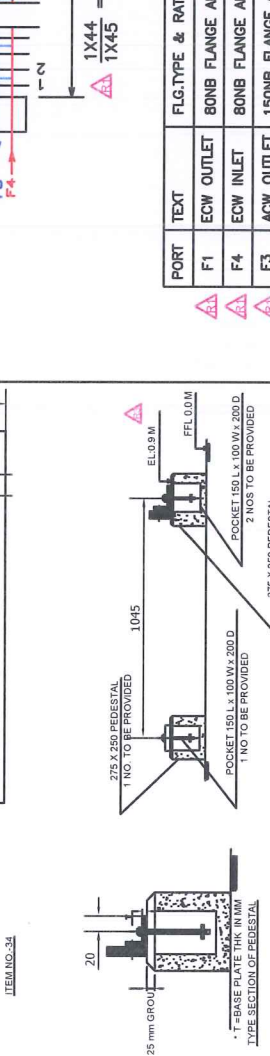
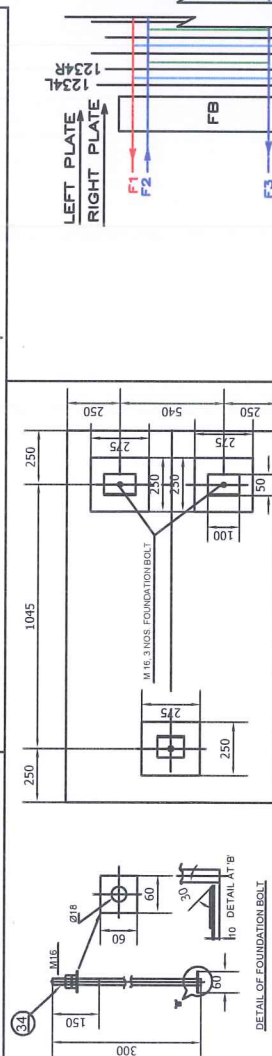
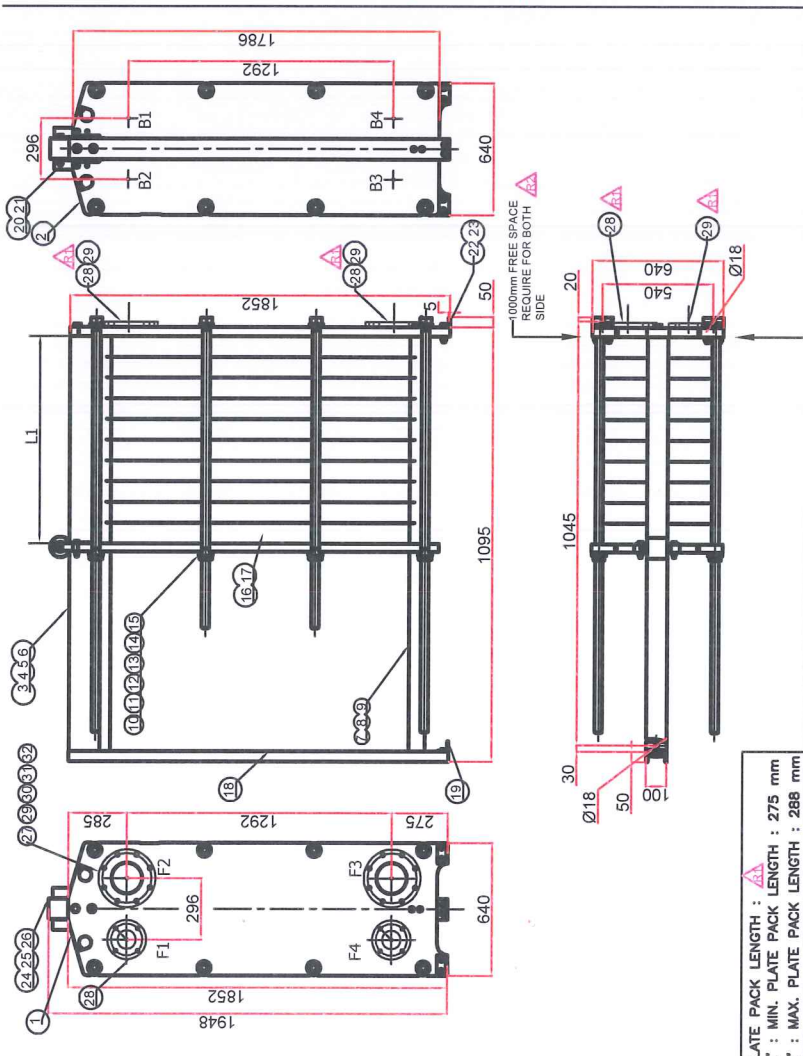
ISO projection

ISO projection

ISO projection

ISO projection

ISO projection

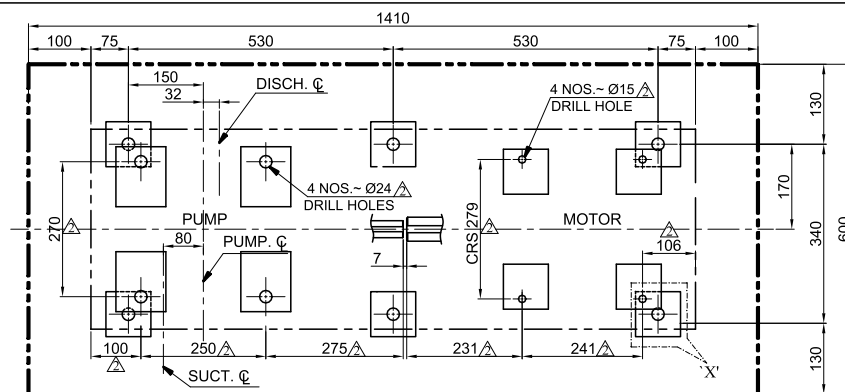


PORT	TEXT	FLG. TYPE & RATING	TK/TL 0000-01 NOS.
F1	ECW OUTLET	80NB FLANGE ANSI B16.5 150#, STUDDED END CONNECTION	
F4	ECW INLET	80NB FLANGE ANSI B16.5 150#, STUDDED END CONNECTION	
F3	ACW OUTLET	150NB FLANGE ANSI B16.5 150#, STUDDED END CONNECTION	
F2	ACW INLET	150NB FLANGE ANSI B16.5 150#, STUDDED END CONNECTION	

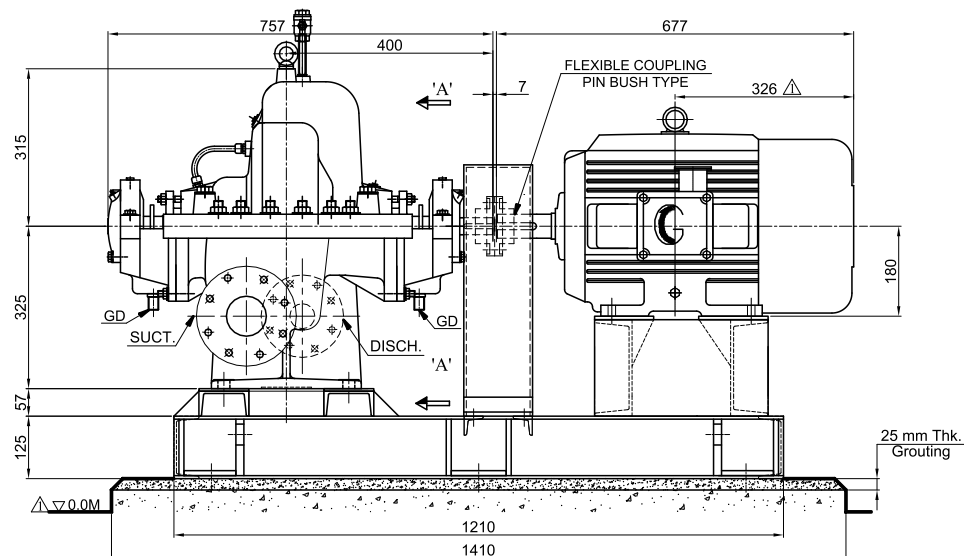
DRN BY	CHKD BY	APPED BY	DATE	Rev Date	Rev no.	Mfg. Sr. No. :	Drawing No. :
AC	AC	MM	27.08.2018	05.11.2018	R3	201808719 TO 201808721	447/562/2018

ECW PUMPS FOR FGD AUXS AND ACW PUMPS FOR FGD AUXS		
SR.N	NTPC/BHEL COMMENT	FLOWMORE REPLY - 28.12.18
1	It shall be mechanical seal only as commented on cross-sectional drawing. Requirement of specific packing/ packaging for despatch is not understood and need not be included in the pump drawing here.	PI note the Pump is envisaged with Mech Seal Only as per specification. However, Pumps will be sent to site with glandpacking , as there are chances of dirt/debris during flushing/commissioning, which may result in damage of mechanical seal and leakage from seal. To avoid this problem, The pumps are being supplied with additional gland packing arrangement and after commissioning of ECW system, gland packing shall be replaced by mechanical seal.
2	The foundation drawing & foundation frame drawings may please be separately shown to bring clarity.	Noted & Incorporated
3	Mechanical seal is envisaged in DMCW(ECW) pump in stead of gland packing to reduce leakage and to avoid contamination of DM cooling water from gland packing. Therefore, use of gland packing is not advisable. Please review.	PI refer reply at sl no. 1 above.
4	Not legible. Please make the document legible & clear.	Noted& Incorporated in the CSD

COPYRIGHT AND CONFIDENTIAL - The information in this document is the property of BHARAT HE ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the	REV	DATE	ALTD	CHKD	APPD	REV	DATE	ALTD	CHKD	APPD	REV	DATE	ALTD	CHKD	APPD																																																																																																																																																																																																																																		
<table border="1"> <tr> <td colspan="16">NTPC DRG NO:</td> </tr> <tr> <td colspan="2">PROJECT</td> <td colspan="14">FGD SYSTEM PACKAGE FOR NCTPP DADRI STAGE-II (2X490 MW)</td> </tr> <tr> <td colspan="2">JOB NO.</td> <td colspan="4">436</td> <td colspan="2">OWNER</td> <td colspan="8">NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE)</td> </tr> <tr> <td colspan="2">STATUS</td> <td colspan="4">CONTRACT</td> <td colspan="2" rowspan="4">  </td> <td colspan="4" rowspan="4"> BHARAT HEAVY ELECTRICALS LTD. POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA </td> <td colspan="2">DEPTT</td> <td colspan="2">NAME</td> <td colspan="2">SIGN</td> <td colspan="2">DATE</td> </tr> <tr> <td colspan="2">DISTRIBUTION</td> <td colspan="4"></td> <td colspan="2">CODE</td> <td colspan="2">DESN.</td> <td colspan="2">RAHUL</td> <td colspan="2">05.11.18</td> </tr> <tr> <td colspan="2">TO</td> <td colspan="4"></td> <td colspan="2">N</td> <td colspan="2">CHD.</td> <td colspan="2">RS</td> <td colspan="2">05.11.18</td> </tr> <tr> <td colspan="2">NO</td> <td colspan="4"></td> <td colspan="2"></td> <td colspan="2">APPD.</td> <td colspan="2">PS</td> <td colspan="2">05.11.18</td> </tr> <tr> <td>REV</td><td>DATE</td><td>ALTD</td><td>CHKD</td><td>APPD</td> <td colspan="11">TITLE: GA & CROSS_SECTIONAL DRAWING OF ECW SYSTEM PUMPS</td> </tr> <tr> <td>R0</td><td>05.11.18</td><td>RAHUL</td><td>RS</td><td>PS</td> <td colspan="11"></td> </tr> <tr> <td>R1</td><td>14.12.18</td><td>RAHUL</td><td>RS</td><td>PS</td> <td colspan="11"></td> </tr> <tr> <td>R2</td><td>28.12.18</td><td>RAHUL</td><td>RS</td><td>PS</td> <td colspan="11"></td> </tr> <tr> <td colspan="5"></td> <td colspan="5"></td> <td colspan="2">DEPTT</td> <td colspan="2">DOCUMENT NO:</td> <td colspan="4">6130-109-ECW-PVM-B-003</td> </tr> <tr> <td colspan="5"></td> <td colspan="5"></td> <td colspan="2">SIGN</td> <td colspan="4">PE-V7-436-100-N052</td> </tr> <tr> <td colspan="5"></td> <td colspan="5"></td> <td colspan="2">DATE</td> <td colspan="2">Page 1 of 5</td> <td colspan="4">REV - 02</td> </tr> </table>																NTPC DRG NO:																PROJECT		FGD SYSTEM PACKAGE FOR NCTPP DADRI STAGE-II (2X490 MW)														JOB NO.		436				OWNER		NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE)								STATUS		CONTRACT						BHARAT HEAVY ELECTRICALS LTD. POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA				DEPTT		NAME		SIGN		DATE		DISTRIBUTION						CODE		DESN.		RAHUL		05.11.18		TO						N		CHD.		RS		05.11.18		NO								APPD.		PS		05.11.18		REV	DATE	ALTD	CHKD	APPD	TITLE: GA & CROSS_SECTIONAL DRAWING OF ECW SYSTEM PUMPS											R0	05.11.18	RAHUL	RS	PS												R1	14.12.18	RAHUL	RS	PS												R2	28.12.18	RAHUL	RS	PS																						DEPTT		DOCUMENT NO:		6130-109-ECW-PVM-B-003														SIGN		PE-V7-436-100-N052														DATE		Page 1 of 5		REV - 02			
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FOUNDATION PLAN



NOTE:-

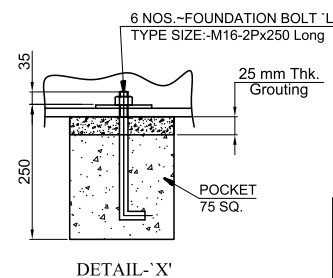
1. DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. DIRECTION OF PUMP ROTATION:- **COUNTER CLOCKWISE**, WHEN LOOKING FROM DRIVING END.
3. STATIC LOAD (PUMP SET WITH MOTOR) = 360 KGS. (APPROX.)
4. DYNAMIC LOAD (PUMP SET WITH MOTOR) = 480 KGS. (APPROX.)
5. WEIGHT OF PUMP = 120 Kg.(APPROX). Δ
6. WEIGHT OF MOTOR = 160 Kg.(APPROX). Δ
7. COUNTER FLANGE, NUT AND BOLTS AT SUCTION & DISCHARGE TO BE PROVIDED BY FLOWMORE. Δ
8. KEY PLAN WILL BE AS PER LAYOUT DRAWING NO. PE-DG-436-181-M001. Δ

MOTOR PARTICULARS		PUMP PARTICULARS (QTY:- 03 Nos.)	
MAKE	— CGL	FIG.	— P5922
FRAME	— ND 180M	SIZE	— 80x50 (3"x2")
RATING	— 18.5 KW	STAGE	— DOUBLE
SPEED	— 1470 R.P.M.	SPEED	— 1470 R.P.M.
VOLTS	— 415±10%	CAPACITY	— 50 Cu.M/Hr.
PHASES	— THREE	HEAD	— 55 Mtrs.
FREQUENCY	— 50 Hz.	PUMP INPUT	— 12.48 KW
TYPE OF CONS.	— H.S.S.	(Sp. Gr. 1.0)	
		EFFICIENCY	— 60 %

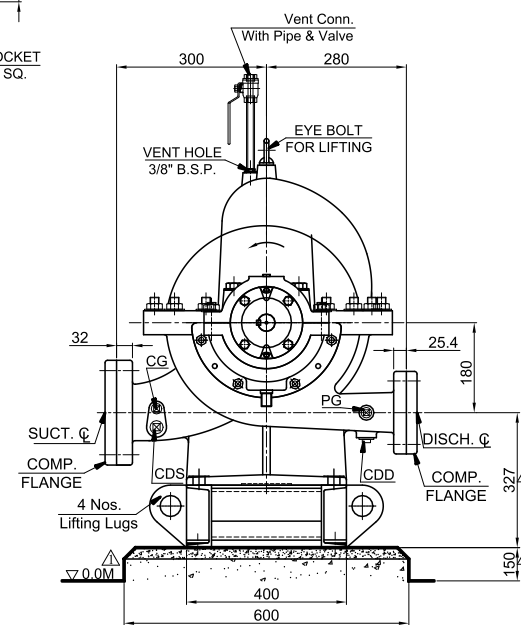
FLANGE DETAIL AS PER ANSI B16.5, 600 LBS

SUCTION:----	80 N.B.	DISCHARGE:---	50 N.B.
FLANGE O.D.:--	209.6	FLANGE O.D.:--	165.1
P.C.D.:-----	168.3	P.C.D.:-----	127
NO. OF. HOLES:-	8	NO. OF. HOLES:-	8
DIA OF BOLTS:-	M20	DIA OF BOLTS:-	M16

CDD	CASING DRAIN DISCH.	1/2" B.S.P.
CDS	CASING DRAIN SUCT.	1/2" B.S.P.
GD	GLAND DRAIN	1/2" B.S.P.
CG	COMPOUND GAUGE	3/8" B.S.P.
PG	PRESSURE GAUGE	3/8" B.S.P.



DETAIL 'X'



VIEW 'AA'

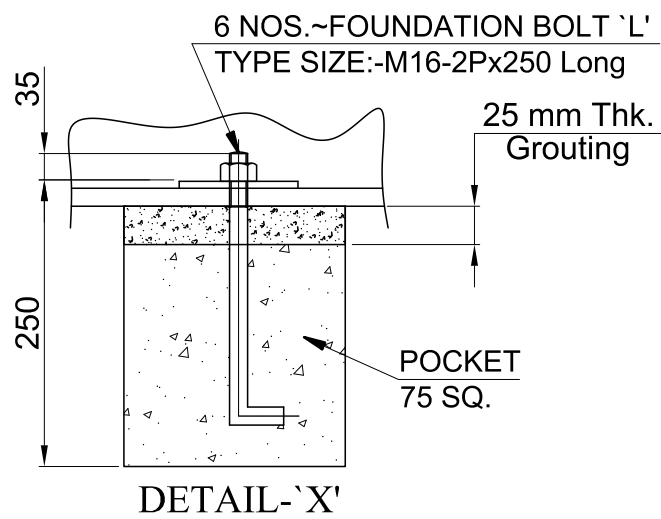
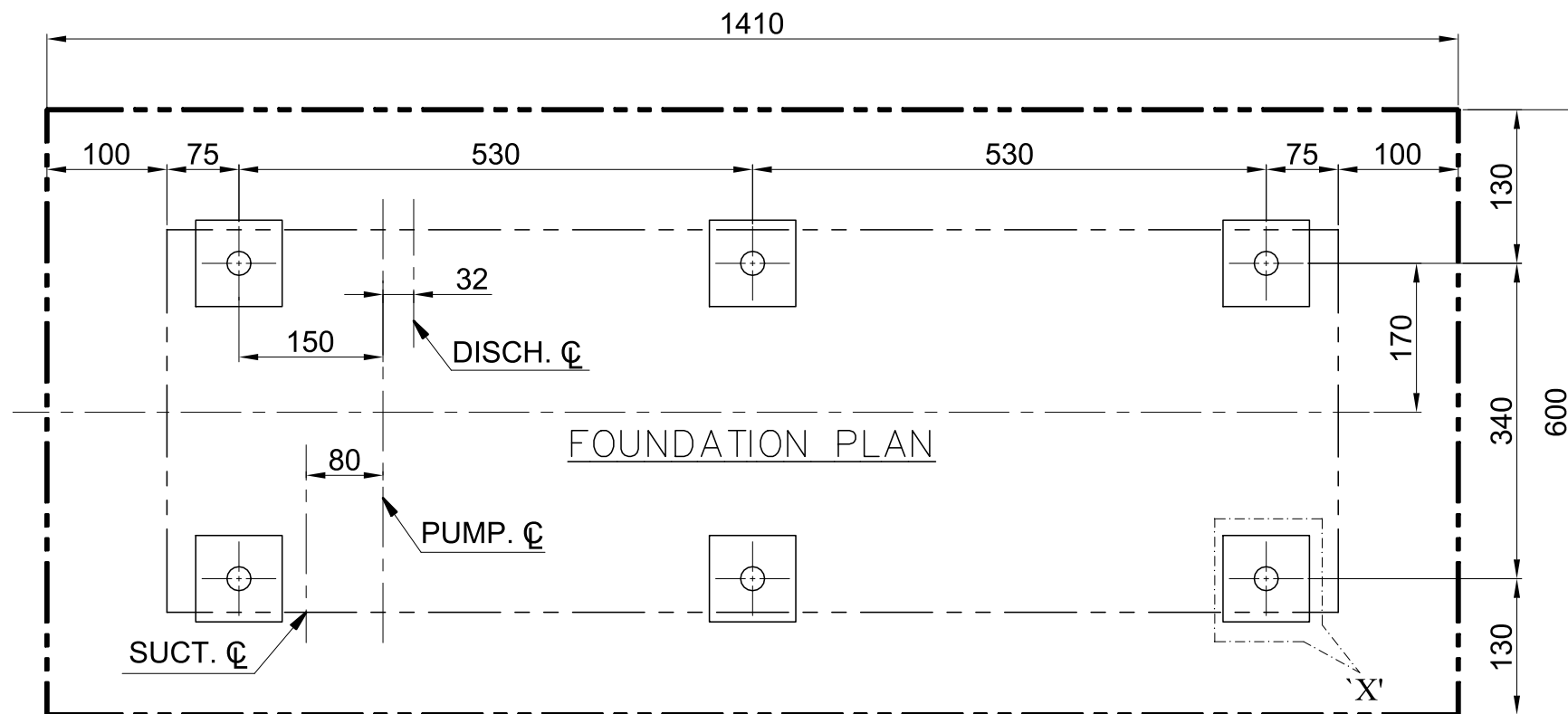
Δ	CHANGE & ADDED AS MARKS	Saurabh	13.12.2018
Δ	CHANGE & ADDED AS MARKS	Saurabh	05.11.2018
Rev.No.	REVISION	SIGN	DATE

JOB NAME :- ECW PUMPS FOR FGD AUXS.,
 CUSTOMER :- M/S. BHARAT HEAVY ELECTRICALS LIMITED.,
 PROJECT :- A/C. N.T.P.C. - DADRI.,
 ORDER NO. :- PW/PE/PG/NTP/P-296/18.,
 DT.:- 24.09.2018

GENERAL ARRANGEMENT DRAWING
 FOR
 HORIZONTAL SPLIT CASE PUMP

FLOWMORE LIMITED
 NEW DELHI

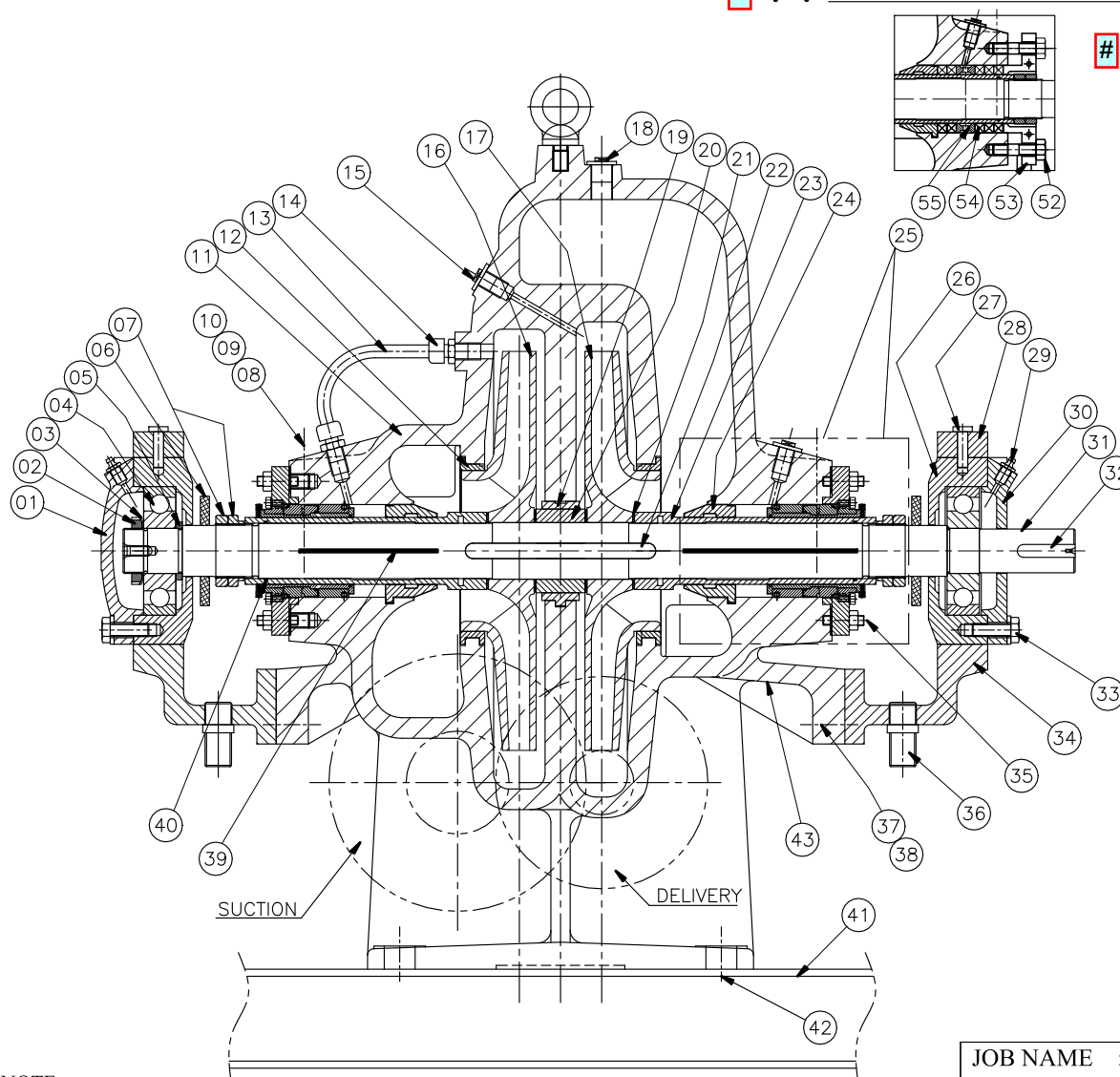
DRAWING NO. GA-SALE18093714 10	NAME	DATE
	DRN.	12.10.2018
	CHD.	12.10.2018
	APPD.	12.10.2018
	REV.	02



JOB NAME :- ECW PUMPS FOR FGD AUXS.,
 CUSTOMER :- M/S. BHARAT HEAVY ELECTRICALS LIMITED.,
 PROJECT :- A/C. N.T.P.C. - DADRI.,
 ORDER NO. :- PW/PE/PG/NTP/P-296/18., DT:- 24.09.2018

FOUNDATION DRAWING FOR HORIZONTAL SPLIT CASE PUMP		NAME	DATE
		DRN. SAURABH	25.12.2018
		CHD. D.K.S.	25.12.2018
FLOWMORE LIMITED NEW DELHI	SCALE N.T.S.	APPD. P.K.S.	25.12.2018
	DRAWING NO.	REV.	
	FD-SALE18093714 10	0	

*** OPTIONAL GLAND DESIGN



55	WATER SEAL RING	02	S.S.-316
54	PACKING PCS.(CHAMPION MAKE,STYLE NO:- 6094)	10	Braided Impregnated Teflon (Non Asbestos)
53	GLAND HALF	04	ASTM, A351, S.S. (CF 8M)
52	STUD BOLT WITH NUT & WASHER (Gland)	04	S.S.-304
51	HEX. HD. BOLT WITH NUT	08	S.S.-304
50	GASKET	01	RUBBER
49	COMPANION FLANGE (For Discharge Side)	01	M.S. (IS-2062)
48	HEX. HD. BOLT WITH NUT	08	S.S.-304
47	GASKET	01	RUBBER
46	COMPANION FLANGE (For Suction Side)	01	M.S. (IS-2062)
45	FLEXIBLE COUPLING (PIN BUSH TYPE)	01	S.S.
44	COUPLING GUARD	01	M.S. (FAB.)
43	LOWER HALF CASING	01	ASTM, A351, S.S. (CF 8M)
42	HEX. HD. CAP SCREW (For Casing to S. Base)	04	S.S.-304
41	SKID BASE (FABRICATED)	01	***
40	"O"-RING (For Shaft to S. Sleeve)	02	NITRILE RUBBER
39	GASKET (For Casing)	01	CHAMPION (Style No. 20)
38	DOWEL PIN (For Casing to Brg. Bracket)	04	S.S.-304
37	STUD BOLT WITH NUT & WASHER	08	S.S.-304
36	PIPE NIPPLE (Casing gland drain)	02	S.S.-304
35	STUD BOLT WITH NUT & WASHER	04	S.S.-304
34	BEARING BECKET (DE & NDE)	02	C.I. (IS-210, FG. 260)
33	HEX. HD. CAP SCREW	08	S.S.-304
32	KEY (Pump Half Coup.)	01	S.S.-304
31	PUMP SHAFT	01	UNS S31803 DUPLEX S.S.
30	BRG. COVER (D.E.)	01	C.I. (IS-210, FG. 260)
29	GREASE RELEASE FITTING	02	STEEL
28	CAP (For Brg. Housing)	02	ASTM, A351, S.S. (CF 8M)
27	STUD BOLT WITH NUT & WASHER	04	S.S.-304
26	BRG. HOUSING (D.E. & N.D.E.)	02	C.I. (IS-210, FG. 260)
25	MECH. SEAL ASSLY. (Cartridge Type)	02	FACES Carbon v/s Si.c
24	STUFFING BOX BUSH	02	ASTM, A351, S.S. (CF 8M)
23	SHAFT SLEEVE	02	S.S.-410 (H) (250-300 BHN)
22	KEY (For Impeller)	01	S.S.-304
21	GASKET (Shaft Sleeve)	02	TEFLON
20	INTER STAGE COLLAR	01	S.S.-316
19	INTER STAGE BUSH	01	ASTM, A351, S.S. (CF 8M)
18	AIR VENT HOLE	01	S.S.-304
17	IMPELLER (2nd Stage)	01	ASTM, A351, S.S. (CF 8M)
16	IMPELLER (1st Stage)	01	ASTM, A351, S.S. (CF 8M)
15	PIPE PLUG	02	S.S.-304
14	CINCH FITTING	02	S.S.-304
13	WATER SEAL TUBE	01	S.S. FLEXIBLE BRAIDED PIPE
12	WEARING RING CASING	02	ASTM, A351, S.S. (CF 8)
11	UPPER HALF CASING	01	ASTM, A351, S.S. (CF 8M)
10	STUD BOLT WITH NUT & WASHER (Casing)	12	S.S.-304
09	HEX. HD. CAP SCREW WITH WASHER (Casing)	04	S.S.-304
08	SPR. DOWEL SLEEVE (Casing)	02	S.S.-304
07	SLEEVE NUT & LOCK NUT	02	S.S.-304
06	WATER DEFLECTOR	02	RUBBER
05	SHAFT COLLAR	01	S.S.-410
04	ANTI-FRICTION BEARING (6407-C3)	02	BRG. STEEL (SKF/FAG)
03	LOCK WASHER (For Bearing)	01	STEEL
02	LOCK NUT (For Bearing)	01	STEEL
01	BRG. COVER (N.D.E.)	02	C.I. (IS-210, FG. 260)
S.NO.	DESCRIPTION	QTY.	MATERIAL

NOTE:-
DIRECTION OF PUMP ROTATION:- **COUNTER CLOCKWISE** WHEN LOOKING FROM DRIVING END.

*** THESE ITEMS ARE NOT SHOWN IN THIS DRAWING.

*** M.S. (Fab) (IS-2062)(Epoxy Coated)(Min.Thickness 10mm)

Optional gland design with item sl no. 52-55 are temporary & intended to be used during transportation. Glands shall be replaced with mechanical seal at Site on commissioning.

Rev.No.	CHANGE & ADDED AS MARKS	Saurabh	14.12.2018
	REVISION	SIGN	DATE

PUMP PARTICULARS (QTY:- 03 Nos.)

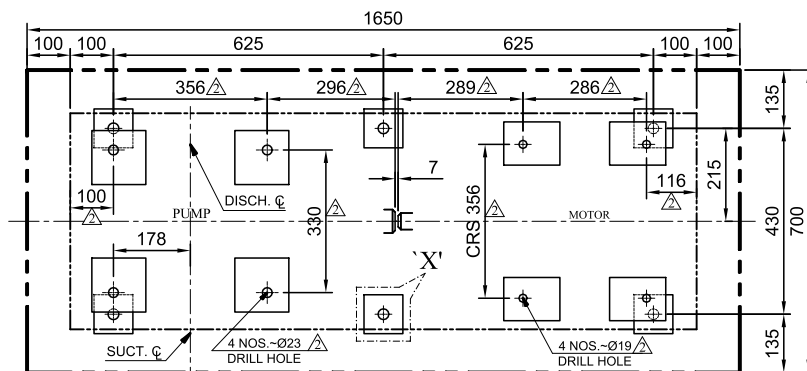
FIG.	-- P 5922
SIZE	-- 80x50 (3"x2")
STAGE	-- DOUBLE
LUB.	-- GREASE

JOB NAME :- ECW PUMPS FOR FGD AUXS.,
CUSTOMER :- M/S. BHARAT HEAVY ELECTRICALS LIMITED.,
PROJECT :- A/C. N.T.P.C. - DADRI.,
ORDER NO. :- PW/PE/PG/NTP/P-296/18., DT:- 24.09.2018

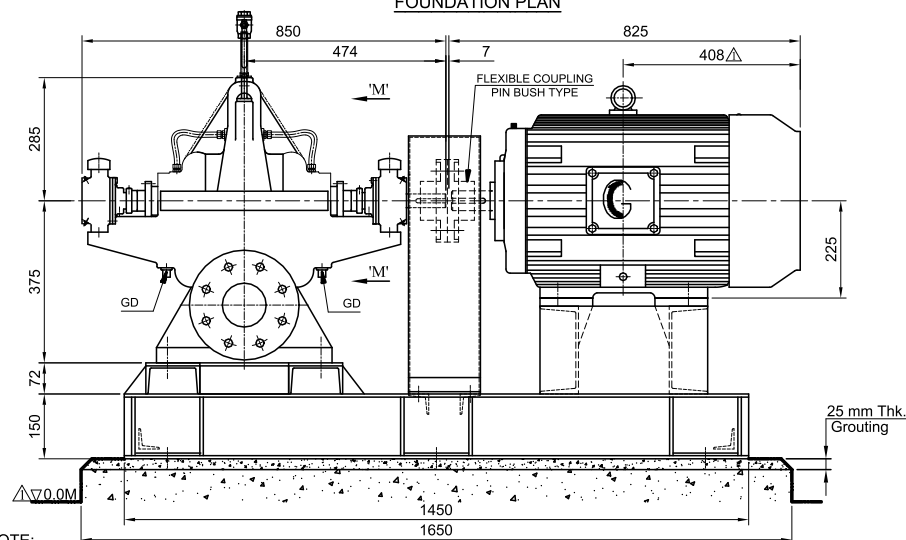
CROSS SECTIONAL DRAWING
FOR
HORIZONTAL SPLIT CASE PUMP

FLOWMORE LIMITED
NEW DELHI

		NAME	DATE
	DRN.	SAURABH	12.10.2018
	SCALE	CHD.	D.K.S.
N.T.S.	APPD.	P.K.S.	12.10.2018
DRAWING NO.			REV.
CSD-SALE18093714 10			01



FOUNDATION PLAN

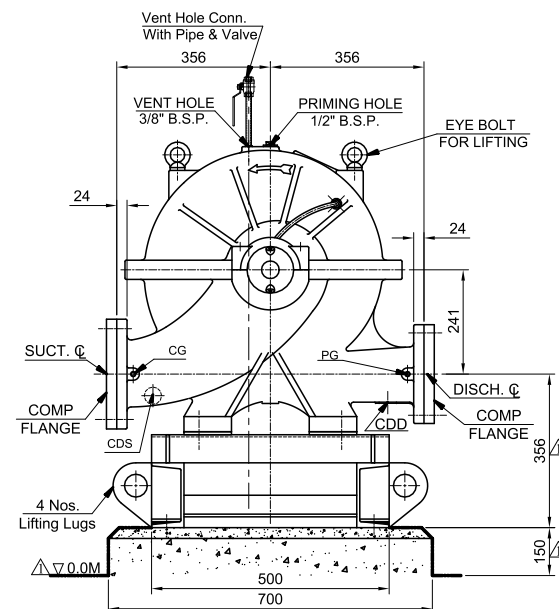
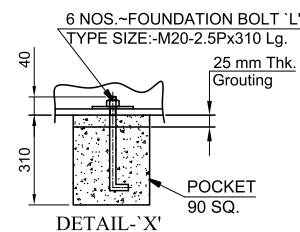


NOTE:-

1. DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. DIRECTION OF PUMP ROTATION:- **COUNTER CLOCKWISE** WHEN LOOKING FROM DRIVING END.
3. STATIC LOAD (PUMP SET WITH MOTOR) = 820 KGS. (APPROX.)
4. DYNAMIC LOAD (PUMP SET WITH MOTOR) = 1050 KGS. (APPROX.)
5. WEIGHT OF PUMP = 300 Kg.(APPROX.)
6. WEIGHT OF MOTOR = 325 Kg.(APPROX.)
7. COUNTER FLANGE, NUT AND BOLTS AT SUCTION & DISCHARGE TO BE PROVIDED BY FLOWMORE.
8. KEY PLAN WILL BE AS PER LAYOUT DRAWING NO. PE-DG-436-181-M001.

MOTOR PARTICULARS		PUMP PARTICULARS (QTY:- 04 Nos.)	
MAKE	-- CGL	FIG.	-- 5824
FRAME	-- ND 225 S	SIZE	-- 125x100 (5"x4")
RATING	-- 37 K.W.	STAGE	-- SINGLE
SPEED	-- 1475 R.P.M.	SPEED	-- 1475 R.P.M.
VOLTS	-- 415±10%	CAPACITY	-- 150 Cu.M/Hr.
PHASES	-- THREE	HEAD	-- 45 Mtrs.
FREQUENCY	-- 50 Hz.	PUMP INPUT	-- 22.98 KW
TYPE OF CONS.	-- H.S.S.	(Sp. Gr. 1.0)	
		EFFICIENCY	-- 80%

FLANGE DETAIL AS PER ANSI B16.5, 150 LBS.			
SUCTION:-----	125 N.B.	DISCHARGE:----	100 N.B.
FLANGE O.D.:---	254	FLANGE O.D.:---	228.6
P.C.D.:-----	215.9	P.C.D.:-----	190.5
NO. OF. HOLES:-	8	NO. OF. HOLES:-	8
DIA OF BOLTS:-	M20	DIA OF BOLTS:-	M16
		CDD CASING DRAIN DISCH.	1/2" B.S.P.
		CDS CASING DRAIN SUCT.	1/2" B.S.P.
		GD GLAND DRAIN	1/2" B.S.P.
		CG COMPOUND GAUGE	1/4" B.S.P.
		PG PRESSURE GAUGE	1/4" B.S.P.

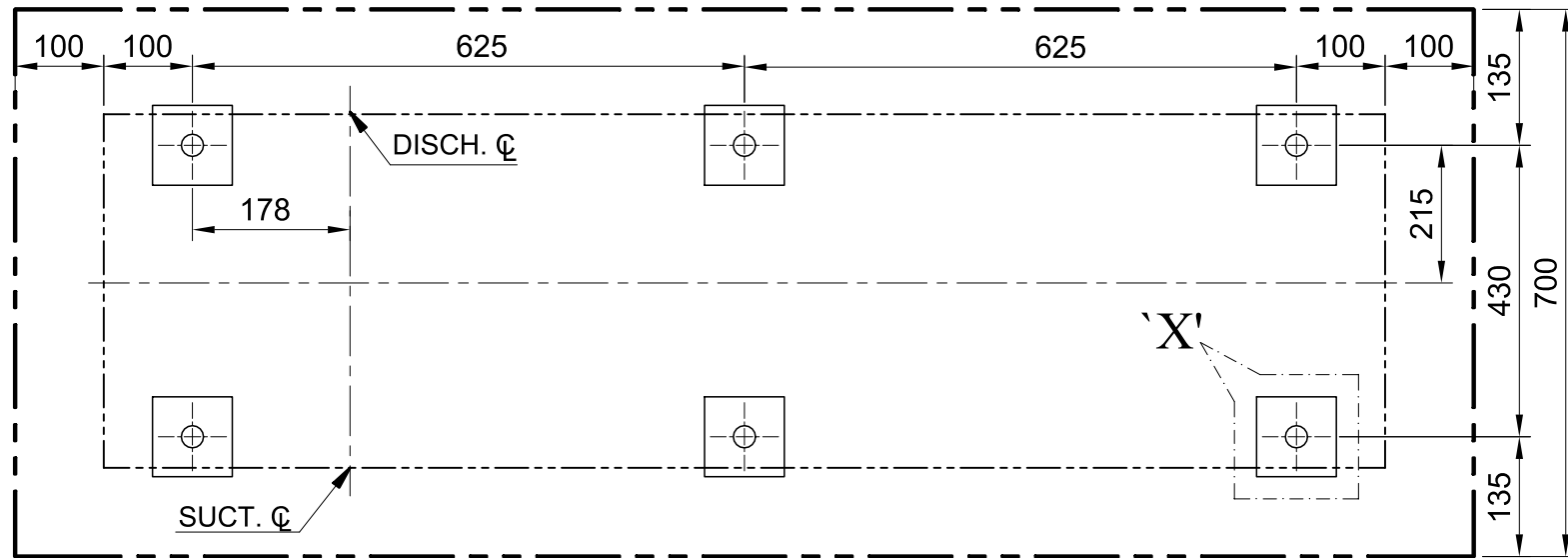


VIEW 'M'-M'

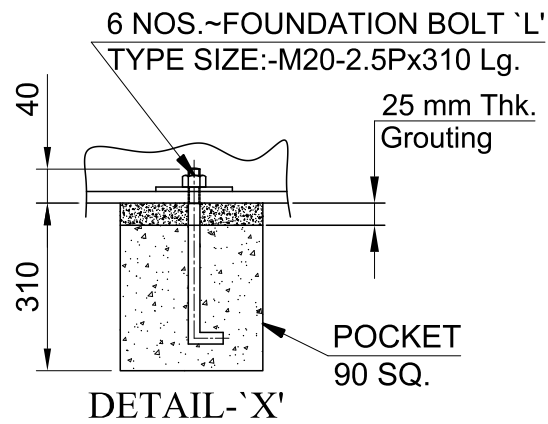
2	CHANGE & ADDED AS MARKS	Saurabh	13.12.2018
1	CHANGE & ADDED AS MARKS	Saurabh	05.10.2018
Rev.No.	REVISION	SIGN	DATE

JOB NAME :- ACW PUMPS FOR FGD AUXS.,
 CUSTOMER :- M/s. BHARAT HEAVY ELECTRICALS LIMITED.,
 PROJECT :- A/c. N.T.P.C - DADRI.,
 ORDER NO. :- PW/PE/PG/NTP/P-296/18., Dt:- 24.09.2018.

GENERAL ARRANGEMENT DRAWING FOR HORIZONTAL SPLIT CASE PUMP		NAME	DATE
SCALE N.T.S.	DRN.	Saurabh	23.10.2018
	CHD.	D.K.S.	23.10.2018
	APPD.	P.K.S.	23.10.2018
FLOWMORE LIMITED NEW DELHI		DRAWING NO. GA-SALE18093714 20	REV. 02



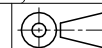
FOUNDATION PLAN



DETAIL-'X'

JOB NAME :- ACW PUMPS FOR FGD AUXS.,
 CUSTOMER :- M/s. BHARAT HEAVY ELECTRICALS LIMITED.,
 PROJECT :- A/c. N.T.P.C - DADRI.,
 ORDER NO. :- PW/PE/PG/NTP/P-296/18., Dt.:- 24.09.2018.

FOUNDATION DRAWING
 FOR
 HORIZONTAL SPLIT CASE PUMP



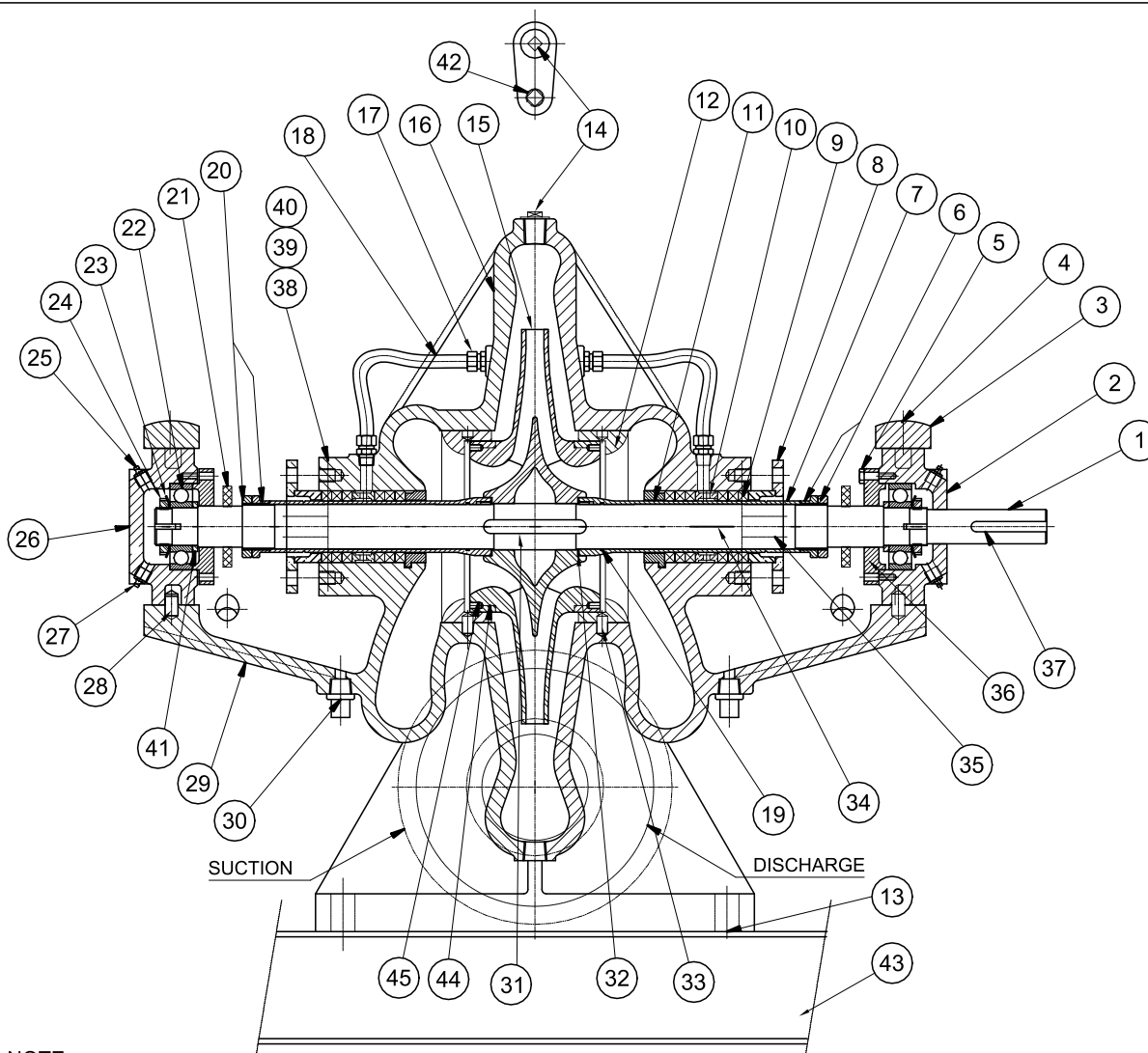
SCALE
 N.T.S.

NAME	DATE
DRN. Saurabh	25.12.2018
CHD. D.K.S.	25.12.2018
APPD. P.K.S.	25.12.2018

FLOWMORE LIMITED
 NEW DELHI

DRAWING NO.
 FD-SALE18093714 20

REV.
 0



NOTE:-
DIRECTION OF PUMP ROTATION:- **COUNTER CLOCKWISE**, WHEN LOOKING FROM DRIVING END.

* THESE ITEM ARE NOT SHOWN IN THIS DRAWING.

** M.S. (Fab) (IS-2062)(Epoxy Coated)(Min.Thickness 10mm)

53	COUPLING GUARD	1	M.S. (FAB.)
52	FLEXIBLE COUPLING (PIN BUSH TYPE)	1	S.S.
51	HX. HD. BOLT WITH NUT	8	S.S.-304
50	GASKET	1	RUBBER
49	COMPANION FLANGE (For discharge side)	1	M.S. (IS-2062)
48	HX. HD. BOLT WITH NUT	8	S.S.-304
47	GASKET	1	RUBBER
46	COMPANION FLANGE (For suction side)	1	M.S. (IS-2062)
45	GRUB SCREW (I/W Ring to Impeller)	4	S.S.-304
44	WEARING RING (For Impeller)	2	ASTM, A351, S.S.-(CF 8 M)
43	SKID BASE (BASE PLATE)	1	**
42	PIPE PLUG (Vent Hole)	1	S.S.-304
41	SHAFT COLLAR	2	STEEL
40	STUD BOLT WITH NUT & WASHER (Casing)	17	S.S.-304
39	HEX. HD. CAP SCREW WITH WASHER (Casing)	4	S.S.-304
38	SPR. DOWEL SLEEVE (For Lower to Upper Casing)	2	SPR. STEEL
37	KEY (For Pump Half Coupling)	1	S.S.-304
36	COVER (For Brg. Housing)	2	C.I. (IS: 210, FG. 260)
35	STUD BOLT WITH NUT (Casing to Gland)	8	S.S.-304
34	GASKET (Lower To Upper Casing)	1	CHAMPION (Style No. 20)
33	DOWEL PIN	2	S.S.-304
32	GASKET (For Shaft Sleeve)	2	TEFLON
31	KEY (For Impeller)	1	S.S.-304
30	PIPE NIPPLE	2	STEEL
29	LOWER HALF CASING	1	2.5% NI. C.I. (IS-210, FG. 260)
28	DOWEL PIN	2	S.S.-304
27	GREASE RELIEF FITTING	2	STEEL
26	BEARING HOUSING (Out Board)	1	C.I. (IS:210, FG-260)
25	GREASE RELEASE FITTING	2	STEEL
24	LOCK NUT (For Bearing)	2	STEEL
23	LOCK WASHER (For Bearing)	2	STEEL
22	ANTI FRICTION BEARING (D.E. & N.D.E.) (6307-C3)	2	BRG. STEEL (SKF/FAG)
21	WATER DEFELECTOR	2	RUBBER
20	SLEEVE NUT & LOCK NUT (For Sleeve)	1Set	STEEL (Oil Quenched)
19	"O"-RING (Shaft to Shaft Sleeve)	2	NITRILE RUBBER
18	WATER SEAL TUBE	2	FLEXIBLE BRAIDED PIPE
17	CINCH FITTING	4	STEEL
16	UPPER HALF CASING	1	2.5% NI. C.I. (IS-210, FG. 260)
15	IMPELLER	1	ASTM, A351, S.S.-(CF 8 M)
14	PIPE PLUG (Priming)	1	S.S.-304
13	HEX. HD. BOLT WITH NUT & WASHER	4	S.S.-304
12	WEARING RING (For Casing)	2	ASTM, A351, S.S.-(CF 8 M)
11	STUFFING BOX BUSHING	2	2.5% NI. C.I. (IS-210, FG. 260)
10	WATER SEAL RING	2	BRONZE (IS-318, LTB-II)
09	PACKING PCS.(Champion Make,Style No:- 6094)	12	Braided Impregnated Teflon (Non Asbestos)
08	GLAND ASSY.	2	2.5% NI. C.I. (IS-210, FG. 260)
07	SHAFT SLEEVE	2	S.S.-410 (H) (250-300 BHN)
06	SLEEVE NUT & LOCK NUT (For Sleeve)	1Set	STEEL (Oil Quenched)
05	HEX. HD. CAP SCREW WITH WASHER	8	S.S.-304
04	STUD BOLT WITH NUT & WASHER (Cap)	4	S.S.-304
03	CAP (For Brg. Housing)	2	2.5% NI. C.I. (IS-210, FG. 260)
02	BEARING HOUSING (In Board)	1	C.I. (IS: 210, FG. 260)
01	PUMP SHAFT	1	UNS S31803 DUPLEX SS
S.NO	PART DESCRIPTION	QTY.	MATERIAL SPEC.

JOB NAME :- ACW PUMPS FOR FGD AUXS.,
CUSTOMER :- M/s. BHARAT HEAVY ELECTRICALS LIMITED.,
PROJECT :- A/c. N.T.P.C - DADRI.,
ORDER NO. :- PW/PE/PG/NTP/P-296/18., Dt.- 24.09.2018.

CROSS SECTIONAL DRAWING
FOR
HORZ. SPLIT CASE PUMP

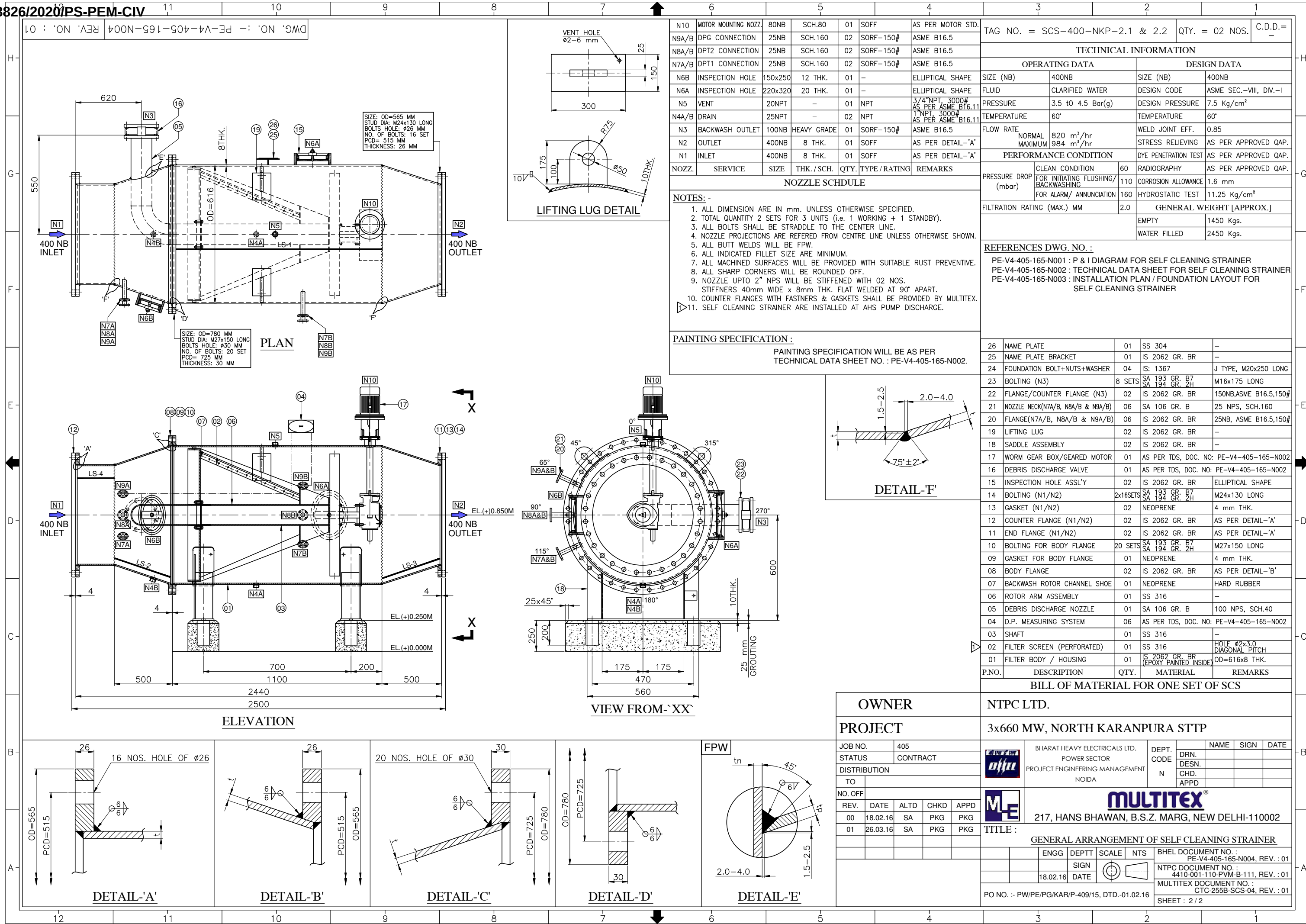
FLOWMORE LIMITED
NEW DELHI

NAME	DATE
DRN. SAURABH	12.10.2018
CHD. D.K.S.	12.10.2018
APPD. P.K.S.	12.10.2018
DRAWING NO.	REV.
CSD-SALE18093714 20	01

PUMP PARTICULARS (QTY:-04 Nos.)

FIG. -- 5824
SIZE -- 125x100 (5"x4")
STAGE -- SINGLE
LUB. -- GREASE

Rev.No.	CHANGE & ADDED AS MARKS	Saurabh	14.12.2018
	REVISION	SIGN	DATE



**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

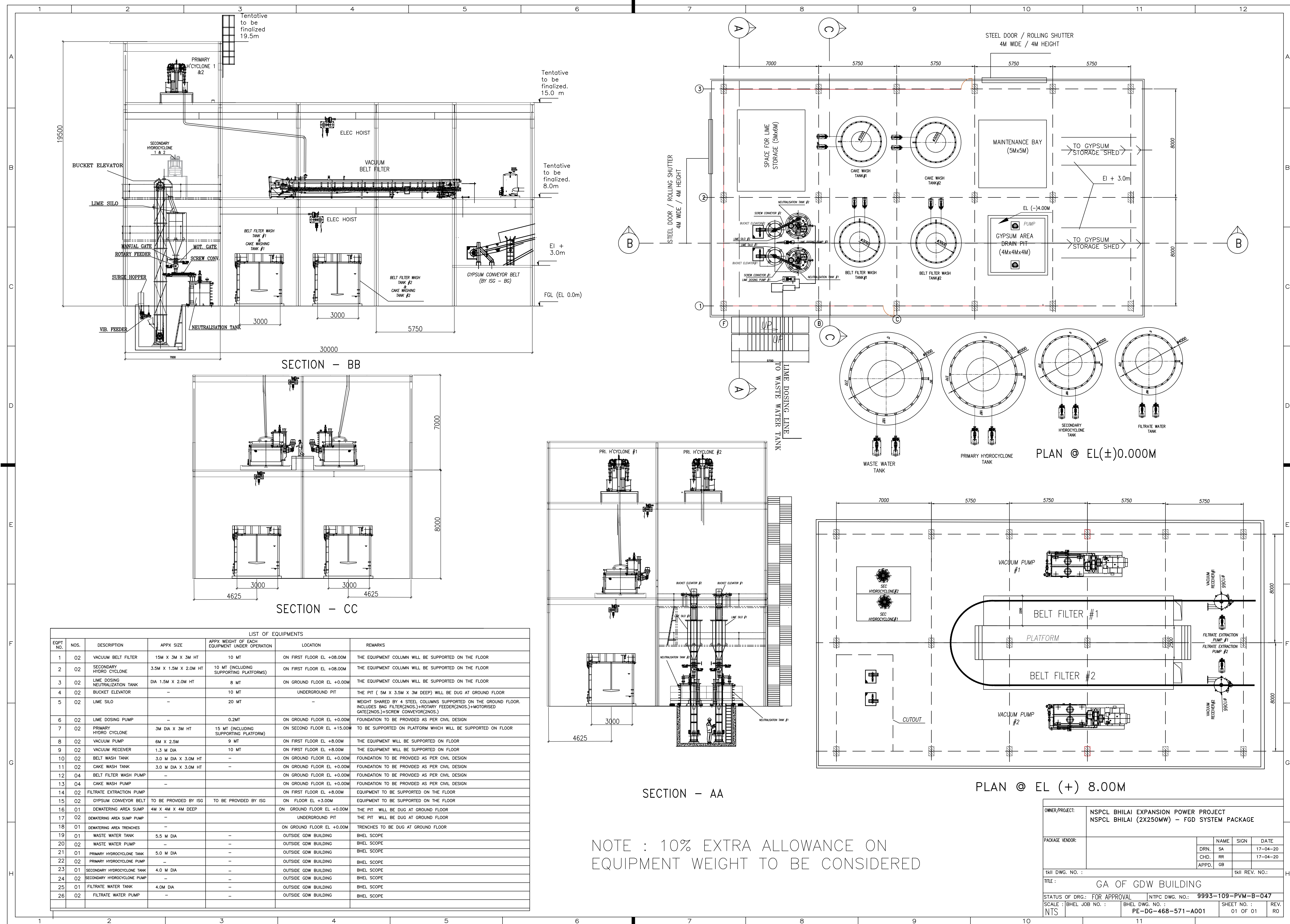
VOLUME - II B

SECTION - A

REV.NO. 00 DATE 11-02-2020

SHEET

Annexure-A5



**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 11-02-2020

SHEET

Annexure-A6



**2 X 250 MW NSPCL BHILAI TPP-FGD
ANNEXURE- A6 (CHIMNEY)**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 19-04-20

SHEET 1 OF 6

2 X 250 MW NSPCL BHILAI TPP-FGD

**CONSULTANT-NTPC LIMITED
(A Government of India Enterprises)**

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS

SPECIFICATION NO. PE-TS-468-600-C001



**Bharat Heavy Electricals Limited
Project Engineering Management
PPEI Building, Power Sector,
Plot No. 25, Sector 16A,
Noida (U.P.)-201301**



**2 X 250 MW NSPCL BHILAI TPP-FGD
ANNEXURE- A6 (CHIMNEY)**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 19-04-20

SHEET 2 OF 6

PREAMBLE

This volume is sub-divided into following sections:

- Section A : This section outlines the scope of work
- Section B : This section provides 'Project Information'
- Section C : This section indicates the technical requirements specific to the contract
- Section D : This section comprises of technical specification(s)

Note: In case of any conflict between Section–C and Section-D, Section C of specification prevails.



**2 X 250 MW NSPCL BHILAI TPP-FGD
ANNEXURE- A6 (CHIMNEY)**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 19-04-20

SHEET 3 OF 6

2 X 250 MW NSPCL BHILAI TPP-FGD

**CONSULTANT-NTPC LIMITED
(A Government of India Enterprise)**

CIVIL, STRUCTURAL & ARCHITECTURAL WORKS

SPECIFICATION NO. PE-TS-468-600-C001

**SECTION - A
SCOPE OF WORK**



**Bharat Heavy Electricals Limited
Project Engineering Management
PPEI Building, Power Sector,
Plot No. 25, Sector 16A,
Noida (U.P.)-201301**



**2 X 250 MW NSPCL BHILAI TPP-FGD
ANNEXURE- A6 (CHIMNEY)**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 19-04-20

SHEET 4 OF 6

**ANNEXURE- A6
(CHIMNEY)**



**2 X 250 MW NSPCL BHILAI TPP-FGD
ANNEXURE- A6 (CHIMNEY)**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 19-04-20

SHEET 5 OF 6

R00, 05.02.2020

2x250MW BHILAI-FGD SYSTEM

CHIMNEY FLUE ID CALCULATION WITH SINGLE FLUE CAN & BOROSILICATE LINER

Parameter	Units	Design Point-VWO	Guarantee Point-TMCR
Flue gas quantity per boiler	T/Hr	1568.18	1391.66
Temp. of flue gas at stack inlet	°C	61.1	57.2
Flue gas density at stack inlet	Kg/m ³	1.01246	1.03965
Volumetric flow per boiler	M ³ /s	430.24	371.83
Stack Height	M	150	150
Breeching level	M	32.3	32.3
Ambient air temp.	°C	45	27
Relative Humidity	%	60	60
Effective Stack Height	M	117.7	117.7
Draft created	mmWC	4.30	10.35
Internal flue dia	M	5.1	5.1
Flue gas velocity at stack exit	m/sec	21.05	18.19
Total Loss	mmWC	32.90	25.24
Net draft available	mmWC	-28.60	-14.89
Minimum Flue gas pressure required at Chimney inlet for positive draft	mmWC	29.00	15.00
Selected Flue gas pressure required at Chimney inlet for positive draft	mmWC	30.00	

Reference: 1. NTPC Doc. No.: 9993-109-PVM-W-002

2. Technical Specification Cl. 3.00.00A & Cl. 4.01.08 of Section-VI, Part-A & Sub Section -V

Chimney Flue ID for different liner materials are given below:-

Liner Material	Borosilicate Liner	Titanium/C-276 liner
Chimney flue ID	5.1m	5.32m
Remarks	Single flue chimney of 150m Height.	Single flue chimney of 150m Height.



**2 X 250 MW NSPCL BHILAI TPP-FGD
ANNEXURE- A6 (CHIMNEY)**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 19-04-20

SHEET 6 OF 6

The breaching level of CL for duct, cut-out in the shell and Terminal point inside the chimney:-

The breaching level is Ele+32.68M(elevation at CL of duct) and the cut-out in the shell at the breaching level is 4700Wx8800H(mm).

The Terminal Point(TP) level inside the chimney shall be EL(+) 42.50M . Chimney flue cans above the TP level inside the chimney shall be in the bidder's scope and below the TP, flue duct shall be in the scope of BHEL-Ranipet.

38826/2020/PS-PEM-CIV



**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

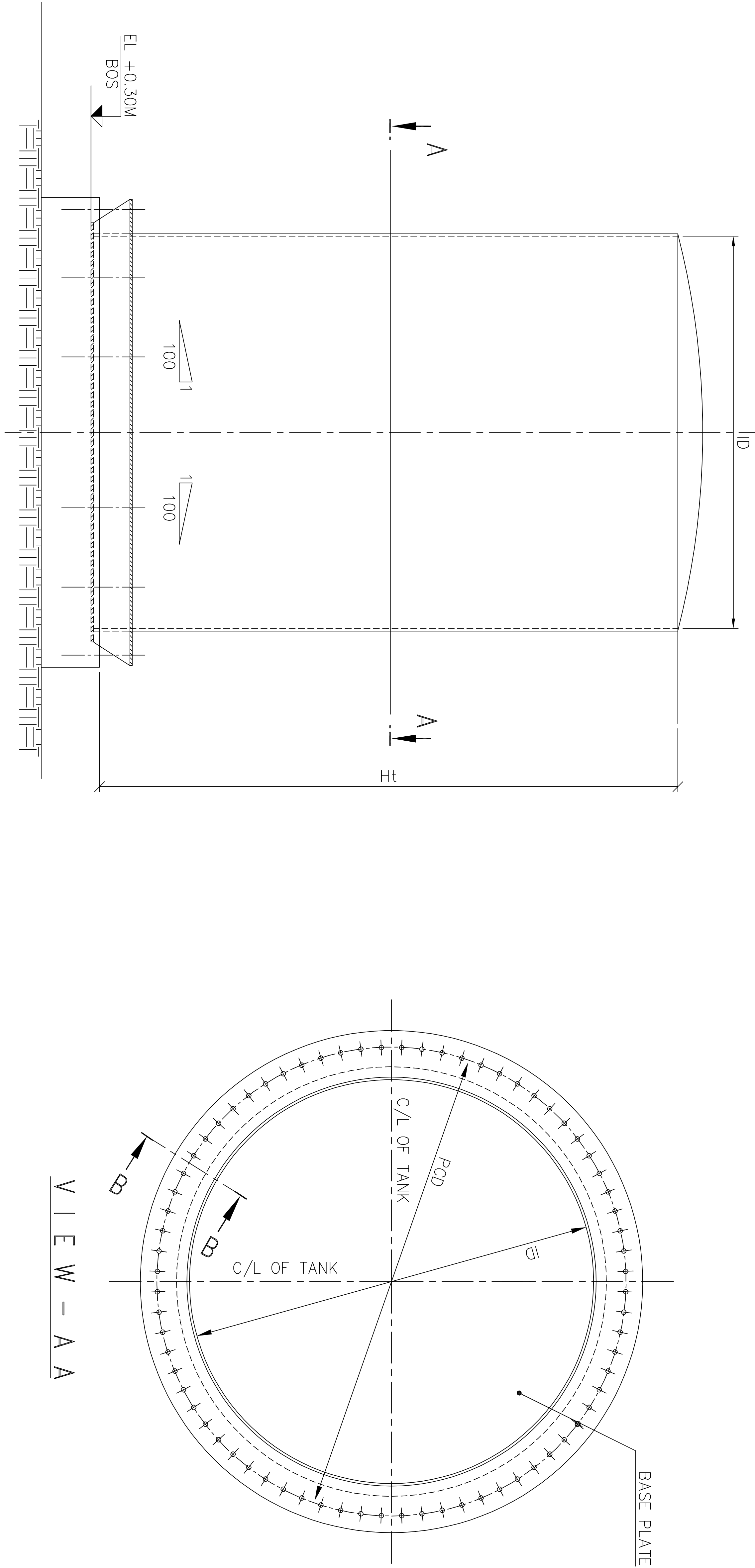
VOLUME - II B

SECTION - A

REV.NO. 00 DATE 11-02-2020

SHEET

Annexure-A7



SECTION - B B

NOTES

- 01. NON SHRINKABLE CEMENTITIOUS FLOWABLE GROUT SHALL BE USED FOR GROUTING OF POCKETS AND SHALL BE ONE GRADE HIGHER THAN GRADE OF CONCRETE USED IN FOUNDATION.
- 02. MINIMUM GRADE OF CONCRETE USED FOR FOUNDATION SHALL BE AS PER TENDER SPECIFICATION.
- 03. TYPE OF FOUNDATION (RING OR RIGID) SHALL BE DECIDED BY FOUNDATION DESIGNER

NOTES

01. Above mentioned loading details are for estimation purpose only

LOADS DATA

Weight (MT)	We
Weight (MT)	Wo
Max Horizontal Force-H(T)	
Due to Wind	Hw
Due to Seismic	HS
Max Moment-M(T-M)	
Due to Wind	Mw
Due to Seismic	Ms

We : Weight of Tank in Empty condition

Wo : Weight of Tank during Operating condition



BHARAT HEAVY ELECTRICALS LTD.
UNIT: BOILER AUXILIARIES PLANT.
RANIPET - 632 406.

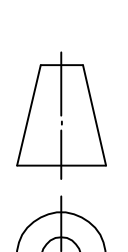
DEPT	NAME	SIGN	DATE
DESIGN	FELIX	-sd-	17.10.18
CHD	K B PADHI	-sd-	17.10.18
APPD	K B PADHI	-sd-	17.10.18

TITLE
FOUNDATION LOADING FOR ALL TANKS RELATED TO FGD

DRAWING NO.

SCALE : NTS

BHEL DRAWING NO.



SHEET 1 OF 1 REV 00

2 x 250 MW BHILAI FGD TANK INPUT

Sl. No.	Tank Description	Type	Qty.	Dimensions	Tank Loading		Wind Loading		Seismic Loading	
					We (T)	Wo (T)	Hw (T)	Mw (T)	Hs (T)	Ms (T)
1	AUXILIARY ABSORBENT TANK	Cylindrical	1 no.	10 Dia X10 H	48	1228	30	176	269	1593
2	LIMESTONE SLURRY STORAGE TANK	Cylindrical	2 nos.	9 Dia X10 H	47	1220	30	175	269	1590
3	PRIMARY HYDROCYCLONE FEED TANK	Cylindrical	1 no.	5 Dia X 5 H	13	163	8	31	36	129
4	SECONDARY HYDROCYCLONE FEED TANK	Cylindrical	1 no.	4.0 Dia X 4.5 H	10	85	6	16	21	52
5	FILTRATE WATER TANK	Cylindrical	1 no.	4.0 Dia X 4.0 H	10	63	6	14	15	36
6	WASTE WATER TANK	Cylindrical	1 no.	5.5 Dia X5.5 H	14	173	10	35	41	139
7	PROCESS WATER TANK	Cylindrical	2 nos.	4.5 Dia X 4.5 H	12	167	9	33	38	135
8	BELT FILTER WASH TANK	Cylindrical	2 nos.	3.5 D X 4.2 H	8	70	5	12	17	40
9	CLARIFIED (CAKE WASH) WATER TANK	Cylindrical	2 nos.	3.5 D X 4.2 H	8	70	5	12	17	40
10	ABSORBER AREA DRAIN SUMP	Rectangular	2 nos.	4.0 W X 4.0 L X 4.0 H	-	-	-	-	-	-
11	GYPSUM AREA DRAIN SUMP	Rectangular	1 no.	4.0 W X 4.0 L X 4.0 H	-	-	-	-	-	-
12	LIMESTONE AREA DRAIN SUMP	Rectangular	1 no.	4.0 W X 4.0 L X 4.0 H	-	-	-	-	-	-

38826/2020/PS-PEM-CIV



**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 11-02-2020

SHEET

Annexure-B1

38826/2020/PS-PEM-CIV

Search

Akshay Kapoor...V/PS-PEM)

Mail

Contacts

Calendar

Tasks

Briefcase

Preferences

Search

FW: Critical ba

Close

Reply

Reply to All

Forward

Archive

Delete

Spam

Actions

**FW: Critical balance input for Bhilai FGD: Civil vertical package.**

From: Abul Kalam Azad, Dy Manager/446_PULENGG/HPEP

To: AKSHAY KAPOOR, PEM

Cc: Satish Ghatge, Addl GM/446_PULENGG/HPEP AMAN SURIN Rohit Kumar rajasree

NSPCL-Bhilai FG... on 07-03-2020.dwg (10.7 MB) [Download](#) | [Briefcase](#) | [Remove](#) 9993-109-PVM-B-176.pdf (627.4 KB) [Download](#) | [Briefcase](#) | [Remove](#)
general arrange...e day silo-Reg. (6.1 MB)

[Download all attachments](#)[Remove all attachments](#)

Due to the size of the message, email addresses, URLs and other action text have not been changed into hyperlinks. [Highlight objects.](#)

Dear Sir,

Please ignore mail date 21.04.2020.

Please refer technical discussion vide VC on 18.04.2020, the input furnished vide mail dated 13.04.2020 is relevant for floating the tender(technical aspects).

Note: Please see the attached input received from -ISG for conveyor belt system at LS day silo top.

The tentative bay dimension up to 11.0 x 8.5 m.

For reference rev 01 plot plan attached herewith.

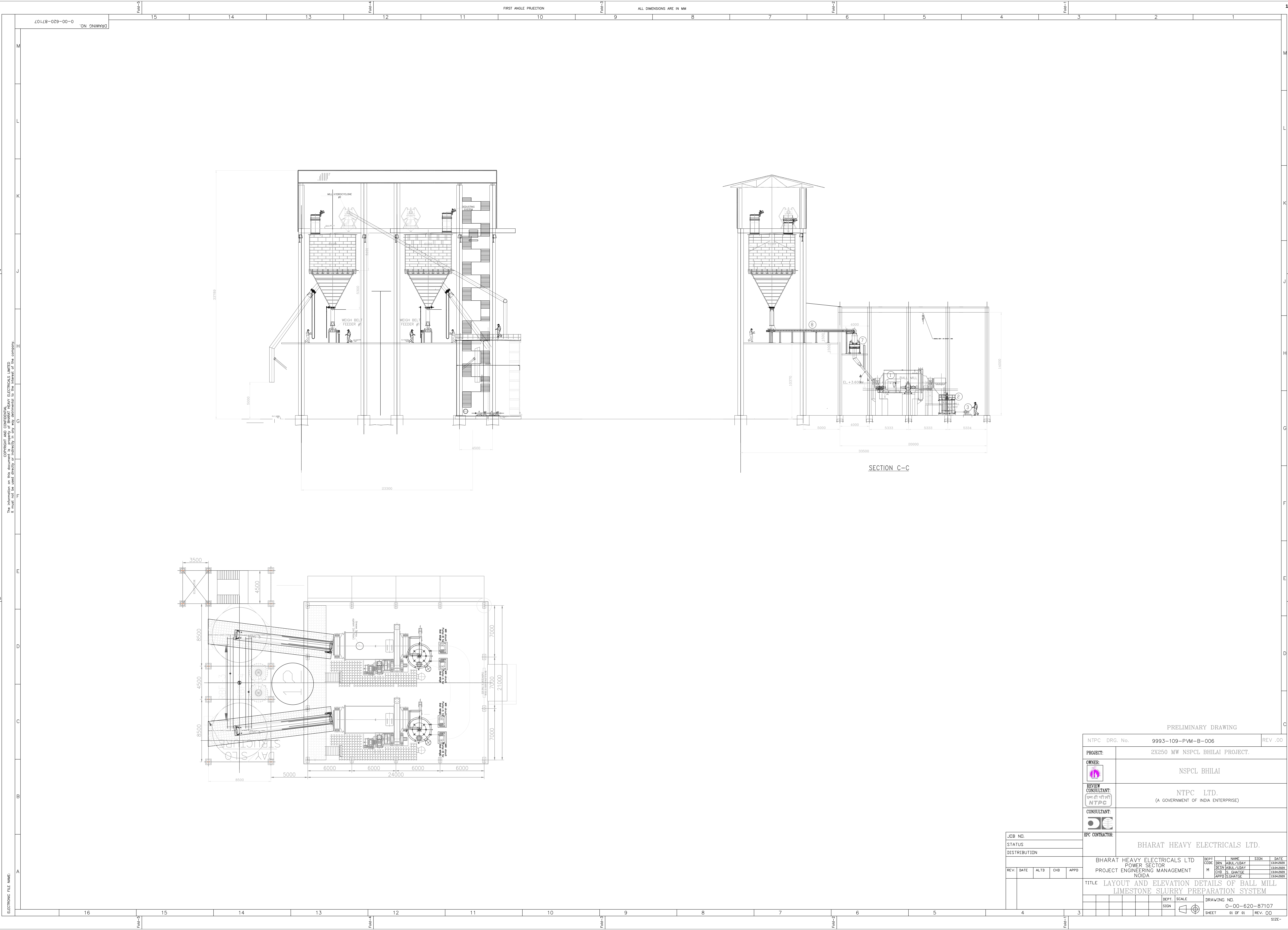
Regards,

Abul Kalam Azad

Deputy Manager/Pulv-Engineering

BHEL-Hyderabad

Ph No. 040-2318-4968



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ELECTRONIC FILE NAME

JOB NO.				
STATUS				
DISTRIBUTION				
REV.	DATE	ALTD	CHD	APPD

PRELIMINARY DRAWING									
NTPC DRG. No. 9993-109-PVM-B-006					REV. 00				
PROJECT:					2X250 MW NSPCL BHILAI PROJECT.				
OWNER:					NSPCL BHILAI				
REVIEW CONSULTANT:					NTPC LTD.				
CONSULTANT:					(A GOVERNMENT OF INDIA ENTERPRISE)				
EPC CONTRACTOR:					BHARAT HEAVY ELECTRICALS LTD.				
BHARAT HEAVY ELECTRICALS LTD					DEPT	NAME	SIGN	DATE	
POWER SECTOR					CODE	DRN. ABUL AJDAR		13/04/2020	
PROJECT ENGINEERING MANAGEMENT						DESIGN ABUL AJDAR		13/04/2020	
NOIDA						CHD. S. GHATGE		13/04/2020	
TITLE					LAYOUT AND ELEVATION DETAILS OF BALL MILL LIMESTONE SLURRY PREPARATION SYSTEM				
					DEPT.	SCALE	DRAWING NO.		
					SIGN		0-00-620-87107		
							SHEET	01 OF 01	REV. 00

38826/2020/PS-PEM-CIV

**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

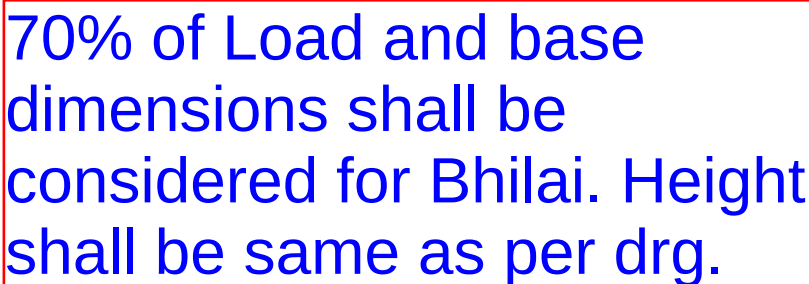
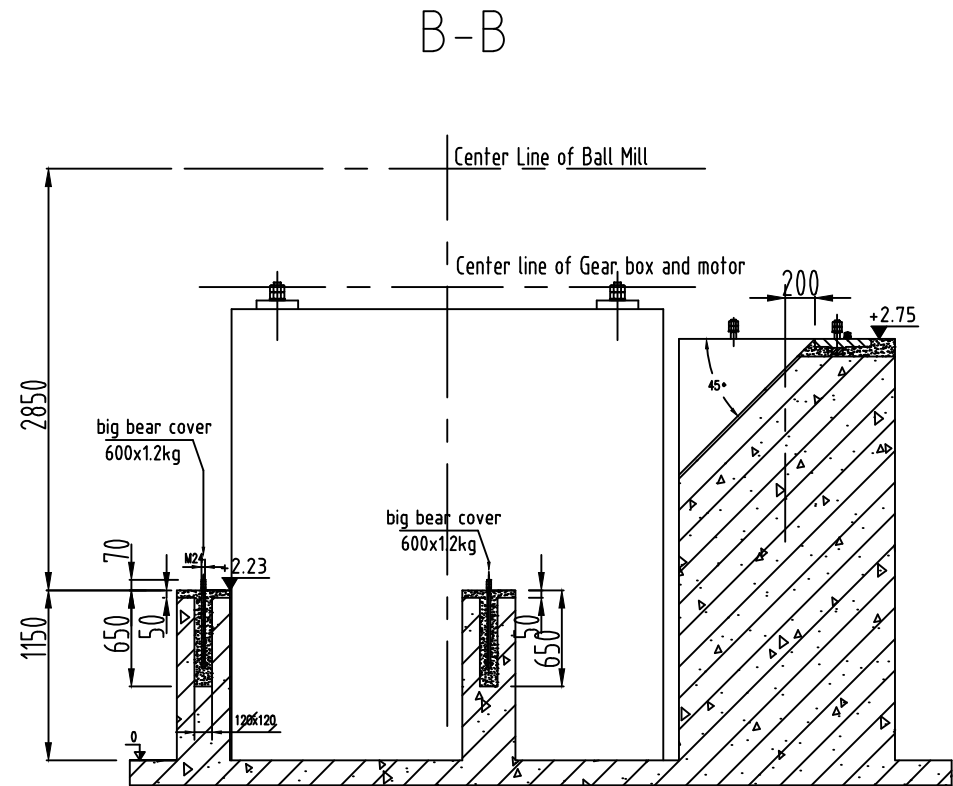
VOLUME - II B

SECTION - A

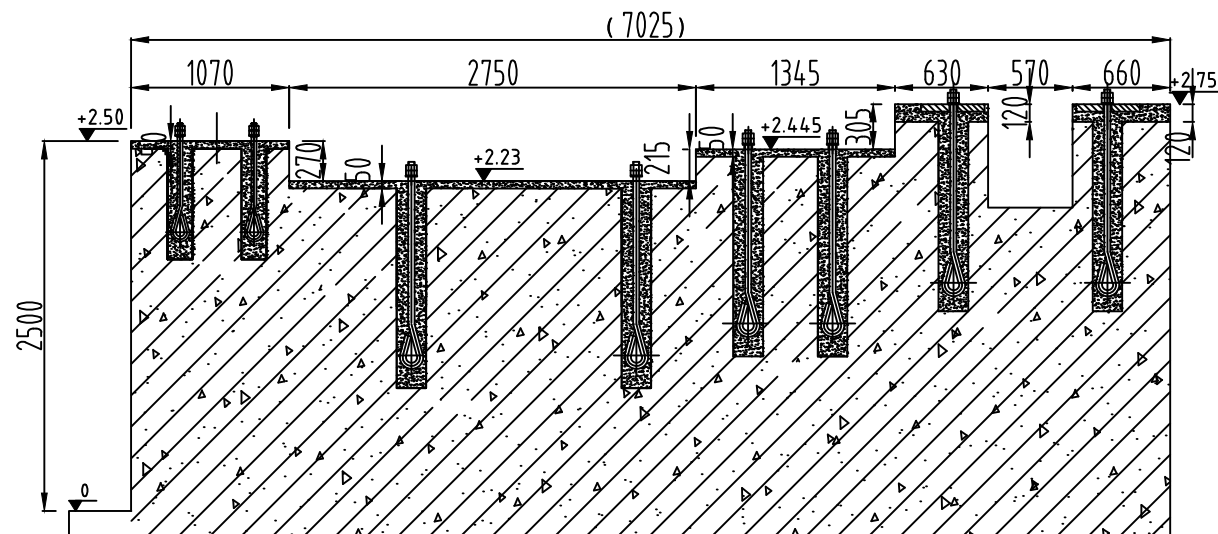
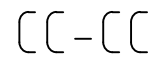
REV.NO. 00 DATE 11-02-2020

SHEET

Annexure-B2



AA-AA
(11710)

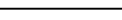


25	235A(ASTM A283)	Washer 24	12	
24	235A(ASTM A283)	Nut M24	24	
23	235A(ASTM A283)	Bolt M24X600	12	
22	235A(ASTM A283)	Padestal of Pinion	1	
21	235A(ASTM A283)	Washer 36	16	
20	235A(ASTM A283)	Nut M36	16	
19	235A(ASTM A283)	Bolt M36X200	8	
18	235A(ASTM A283)	Padestal of gear box	1	
17	235A(ASTM A283)	Washer 42	28	
16	235A(ASTM A283)	Bolt M42	28	
15	235A(ASTM A283)	Bolt M42X1400	14	
14	235A(ASTM A283)	Padestal of Motor	1	
13	235A(ASTM A283)	Washer 42	8	
12	235A(ASTM A283)	Bolt M42	8	
11	235A(ASTM A283)	Bolt M42X180	4	
10	235A(ASTM A283)	Washer 36	4	
9	235A(ASTM A283)	Bolt M36	8	
8	235A(ASTM A283)	Bolt M36X800	4	
7	235A(ASTM A283)	Main bearing padestal	2	
6	235A(ASTM A283)	Washer 48	8	
5	235A(ASTM A283)	Nut M48	8	
4	235A(ASTM A283)	Bolt M48X1500	4	
3	235A(ASTM A283)	Washer 30	4	
2	235A(ASTM A283)	Nut M30	8	
1	235A(ASTM A283)	Bolt M30X600	4	
No.	material	Item	Qts	Remark

BHEL PO NO : R3880022

CUSTOMER: NTPC LIMITED.

PROJECT: NCTPP (2X490MW) DADRI STAGE-II
FGD SYSTEM PACKAGE

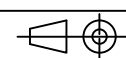
		NAME (SUNNY)	SIGN	DATE
	D/N	WANG LI FENG	Sd	31.12.2018
	CHD	FENG ZHILUN(eric)	Sd	31.12.2018
	APPD	LU YUEGANG	Sd	31.12.2018



CLIENT
BHARAT HEAVY ELECTRICALS LIMITED,
BOILER AUXILIARIES PLANT,
RANIPET-632 405.

NTPC DRG NO. 6130-109-PVM-B-004

SCALE :



TITLE: Anchor Plan and Civil Foundation loading detail

DRG NO: TUNA-BHEL-DADRI-BM-J3001	SHNO	OF	REV NO 02
	01	01	

38826/2020/PS-PEM-CIV

**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 11-02-2020

SHEET

Annexure-B3

From: "Manoj Kumar Joshi(Dy GM/450_PE&SD/PE&SD)" <manojkumarj@bhel.in>
To: "SOMNATH MISHRA, PEM" <somnathmishra@bhel.in>
Cc: "V V Sundar(Addl GM/==9762_AITSS/BAP)" <sundarvv@bhel.in>, "Abul Kalam Azad, Dy Manager/446_PULENGG/HPEP" <akazad@bhel.in>, "Tripurari Kumar, Manager/PCSG- FGD/PS-HQ" <tripurari@bhel.in>, "C Pushpakaran, Addl GM/CIV/PS-PEM" <cpushpakaran@bhel.in>, "ANAND NARAYAN, PEM" <anarayan@bhel.in>, "Sayan Roy, Manager/MAX/PS-PEM" <sayanroy@bhel.in>, "M Arunmozhi Devan, General Manager/PCSG- FGD/PS-HQ" <amdevan@bhel.in>, "R P Das" <rpdas@bhel.in>, "AKSHAY KAPOOR, PEM" <akshaykapoor@bhel.in>, "Abhilash Kumar Balla(Engineer/450_PE&SD/PE&SD)" <abhilashkumarballa@bhel.in>, "Narasimham K V-PE, SD" <narasimham@bhel.in>, "Srikanth" <srikanthg@bhel.in>, "V V S S Sundar, Addl GM/450_PE&SD/PE&SD" <vedantam@bhel.in>
Sent: Saturday, April 4, 2020 1:30:13 PM
Subject: Re: Critical balance input for Bhilai FGD: Civil vertical package.

Dear Sir,

With reference to the trailing mail, please find replies for civil inputs against pt 4 and 5 related to PE&SD.

4.fire fighting layout and section detail of trench.

Details required for civil inputs are as follows.

- a) For Fire fighting trench : Pls consider a trench length of 60 meters with a width of 1200 mm and depth of 1000 mm.
- b) Civil pedestal details- Refer Annexure-02 (Pedestal details for Above Ground piping) in the attachment.
- c) Hume pipe details- Size 300 NB, Length -120 m with bottom of hume pipe at EL(-)1.5m from FGL. (Hume pipes will be required to be laid at various locations at road crossing, total length is provided here.)

5.Deluge Valve

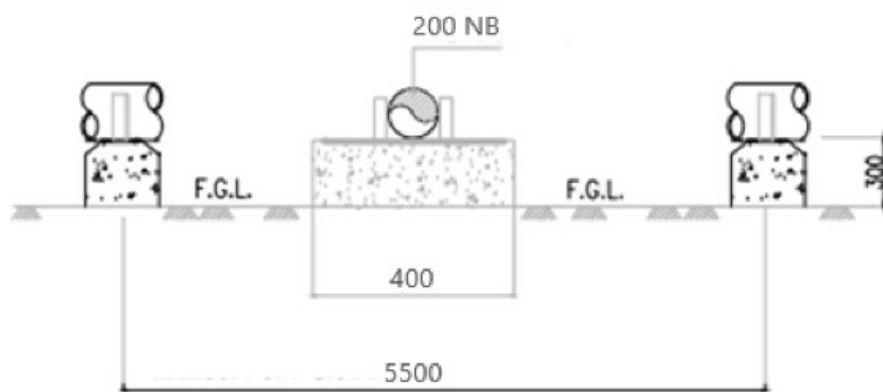
The total no of deluge valves sheds required are 5. For typical civil input details for DV shed refer Annexure-01

Regards,

M K Joshi
Engg Coordination
PE&SD

ANNEXURE-02

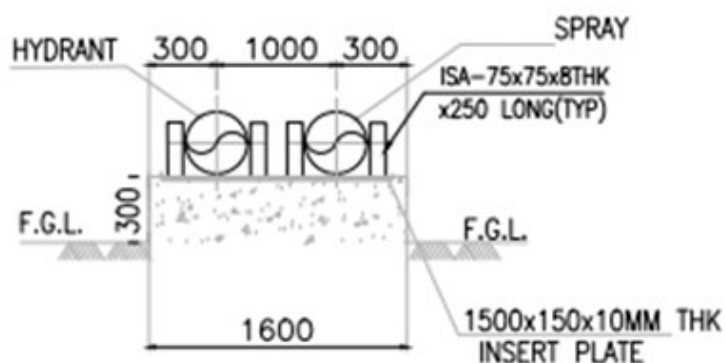
TYPICAL SUPPORT DETAIL FOR A.G PIPING



NOTE: EVERY 3rd SUPPORT SHALL BE PROVIDED WITH A GUIDE
OTHER 1st & 2nd SHALL BE RESTING

SKETCH-01

TYPICAL SUPPORT DETAIL FOR A.G PIPING



NOTE: EVERY 3rd SUPPORT SHALL BE PROVIDED WITH A GUIDE
OTHER 1st & 2nd SHALL BE RESTING

SKETCH-02

PEDESTAL SUPPORT DETAILS			
S.NO	SKETCH NO.	QTY	LOAD/PEDESTAL
1	SKETCH-01	25	600 Kg
2	SKETCH-02	75	1200 Kg

**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

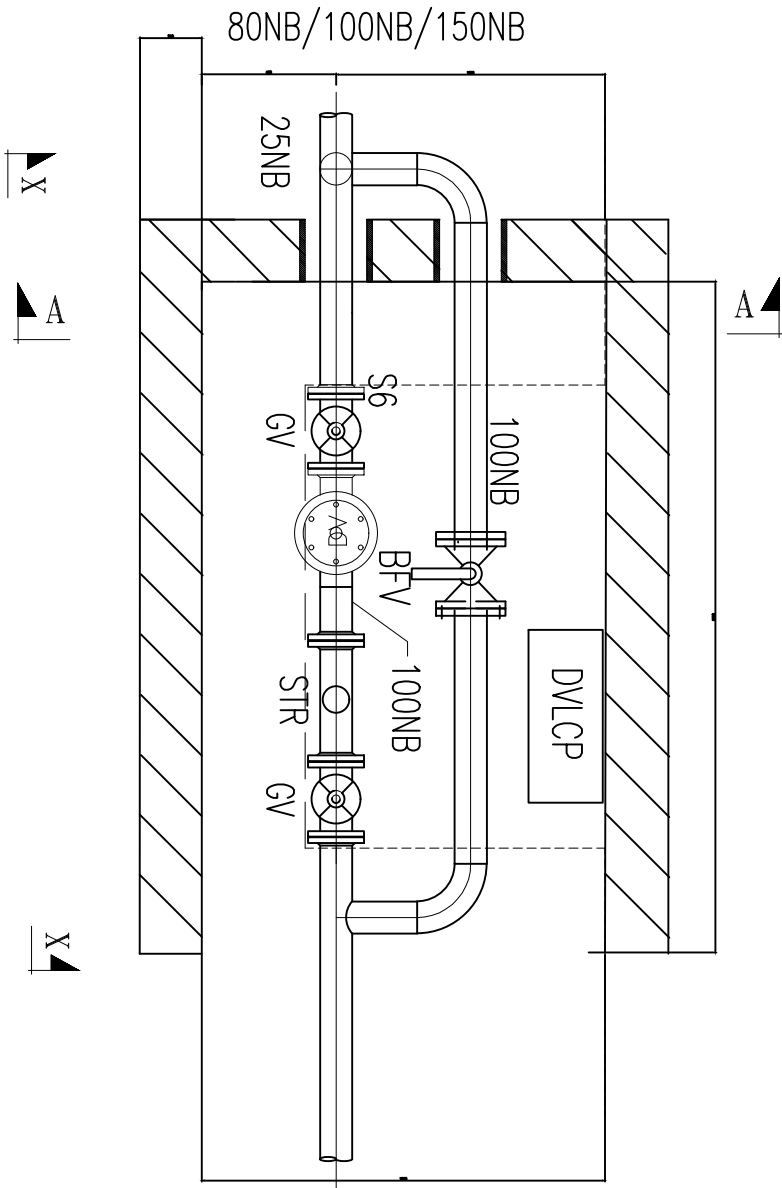
SECTION - A

REV.NO. 00 DATE 11-02-2020

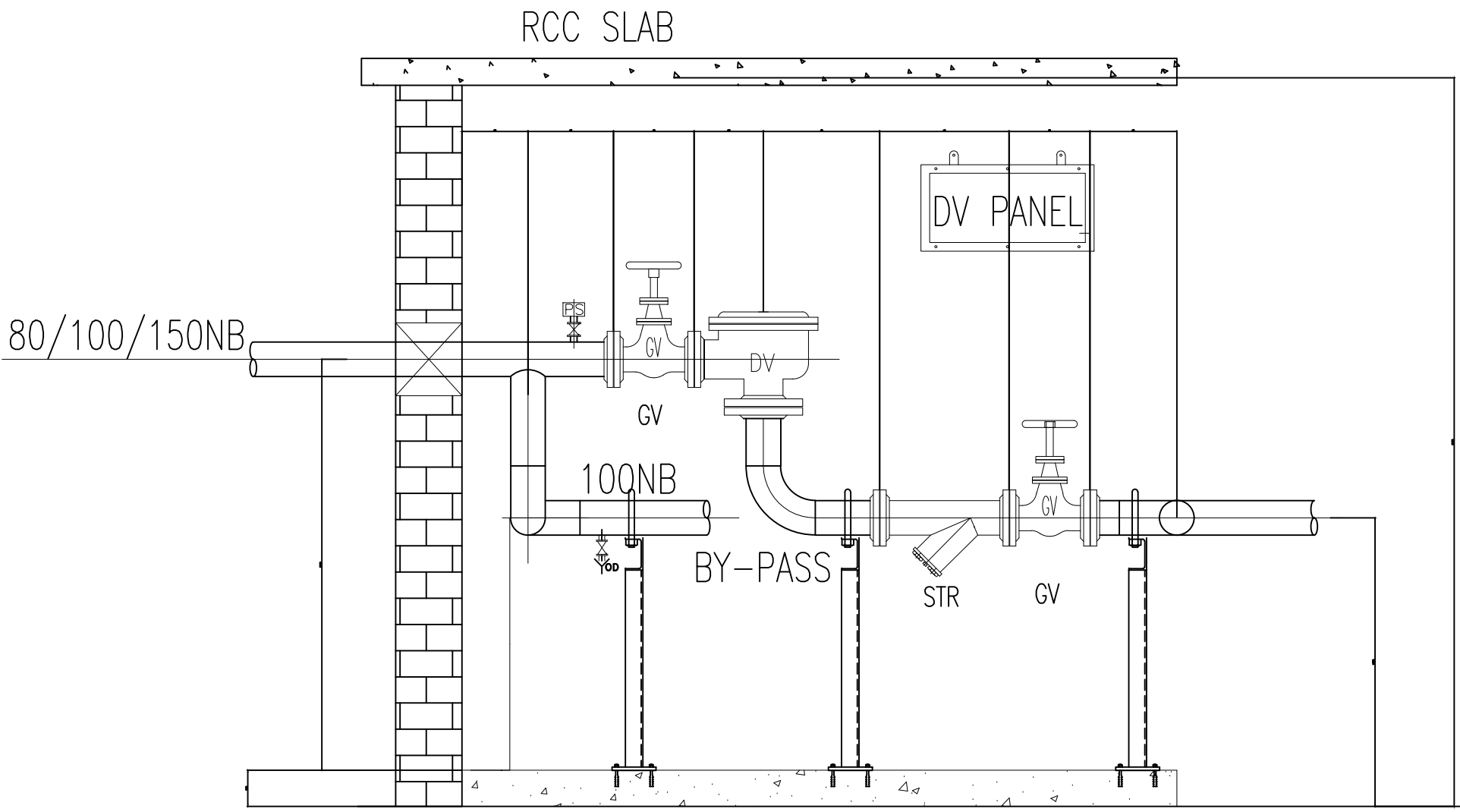
SHEET

Annexure-B4

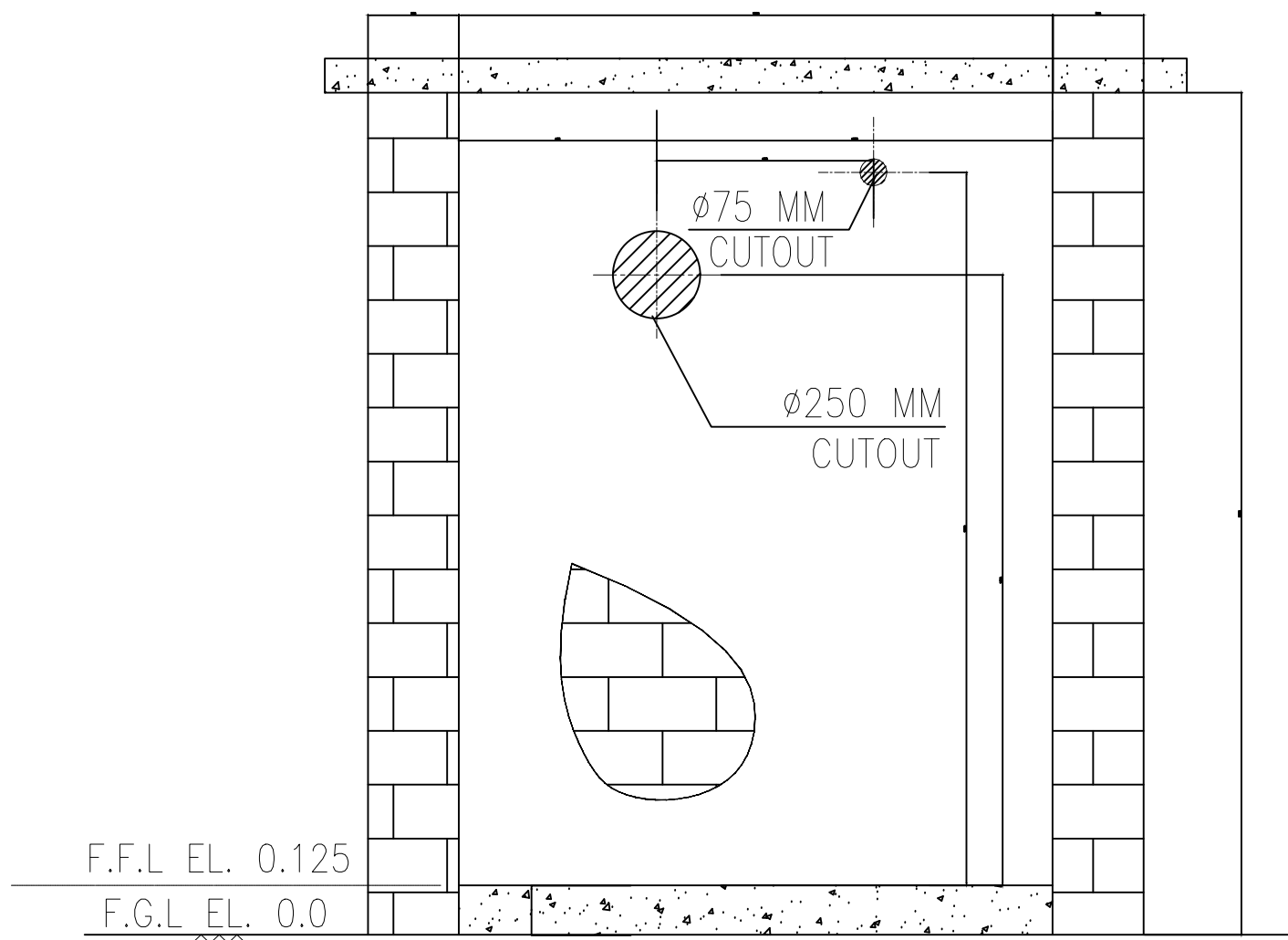
ANNEXURE-01



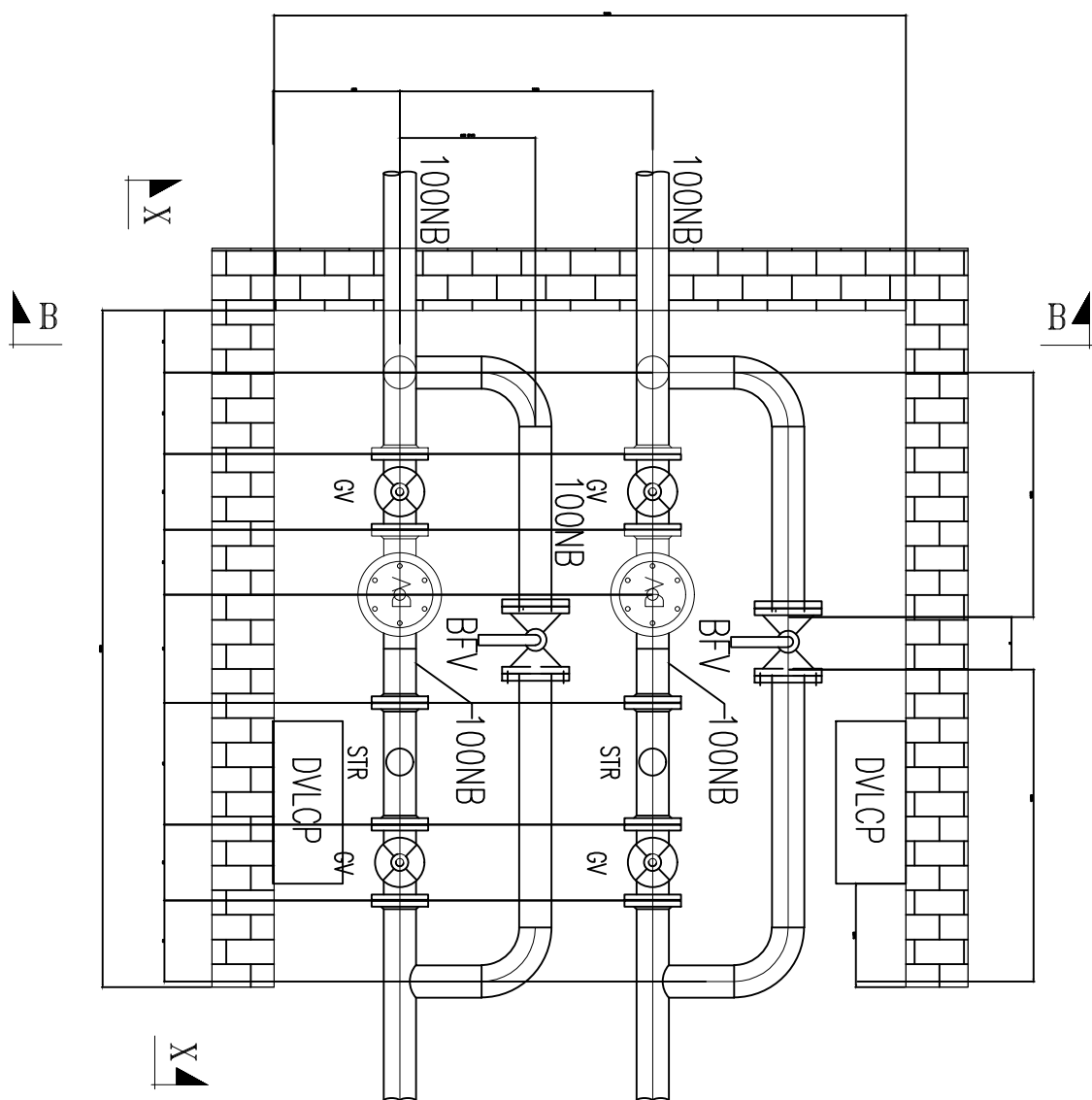
SKETCH-01 TYPICAL PLAN - SINGLE DV



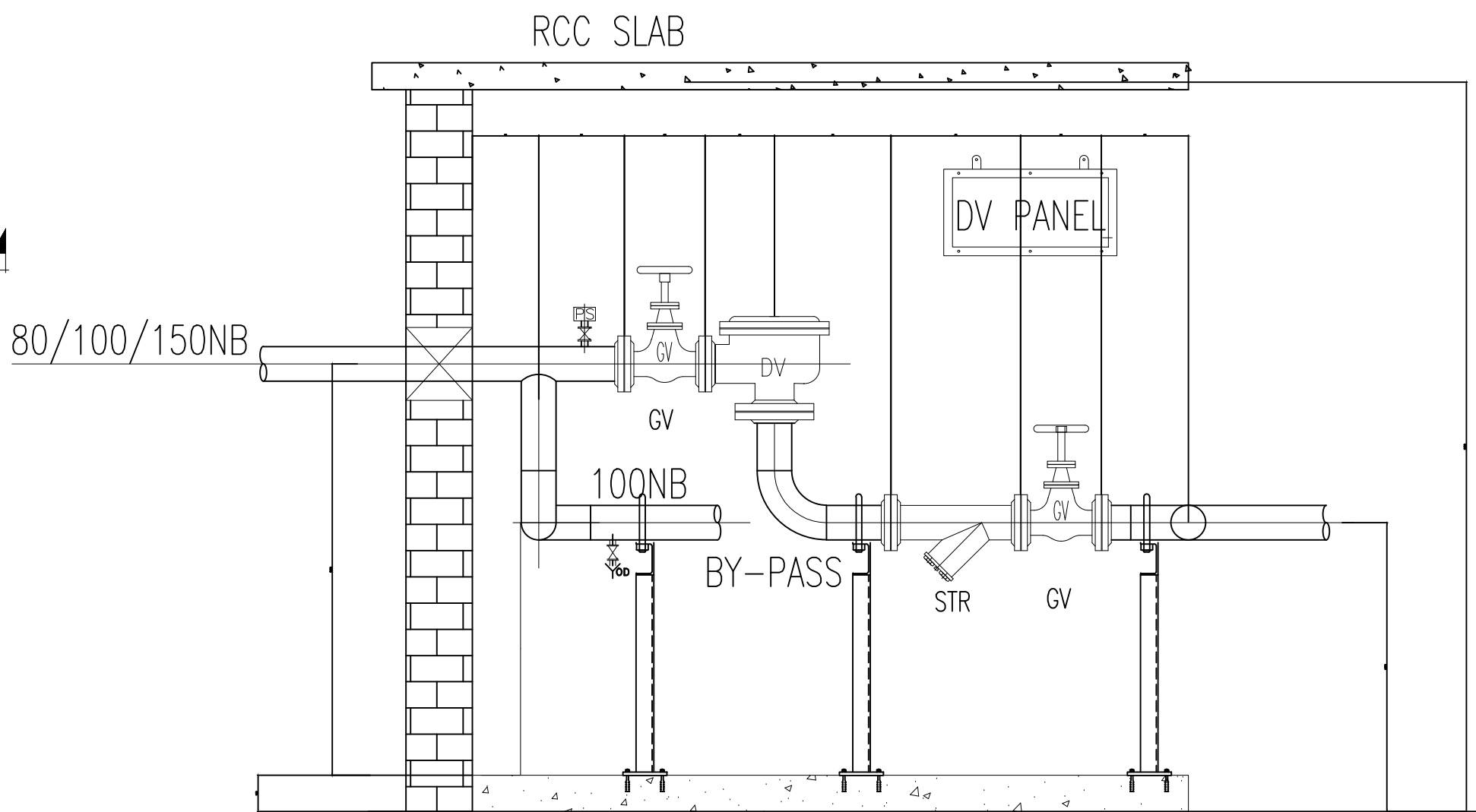
TYPICAL ELEVATION - DV SHED



SECTION A-A ELEVATION VIEW

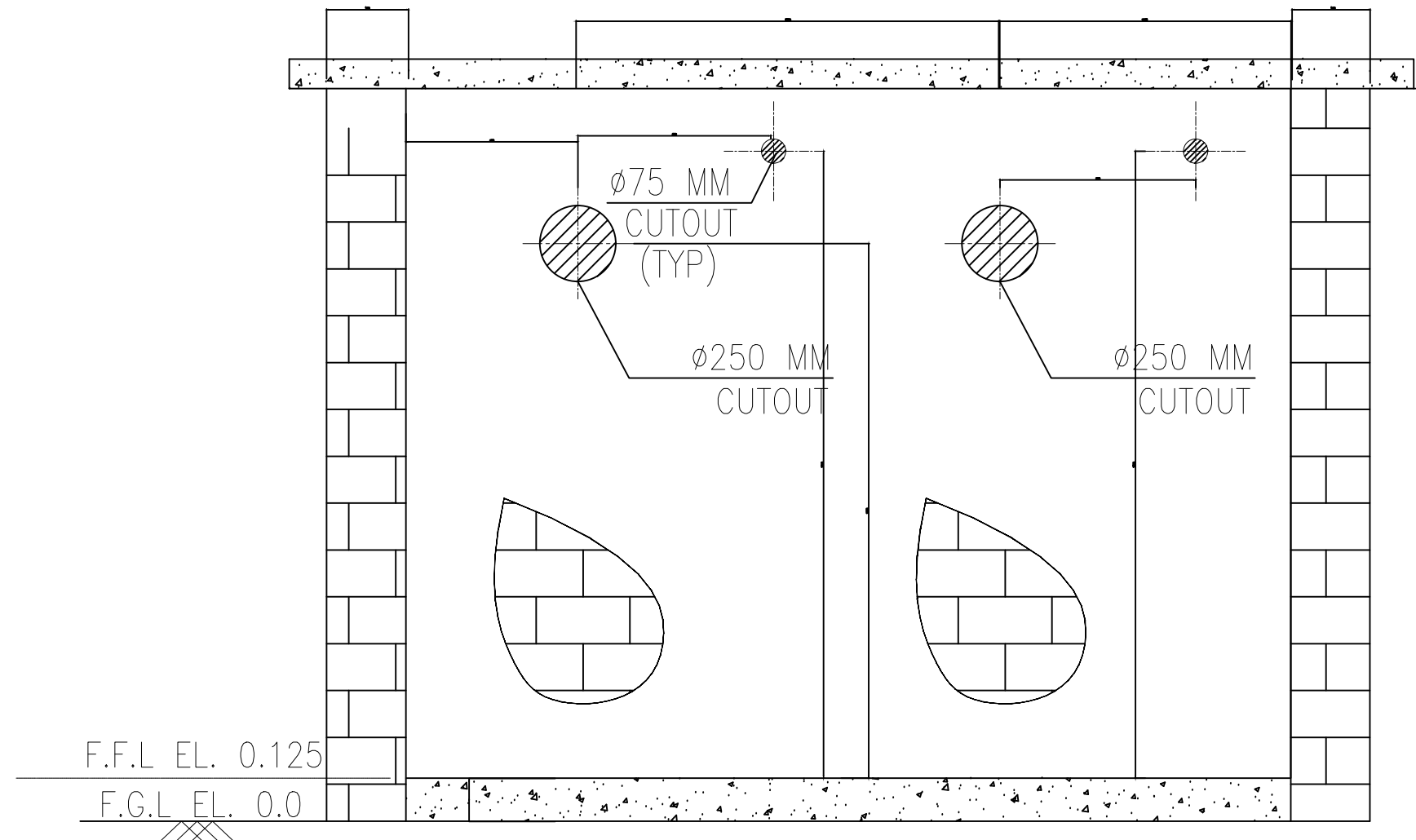


SKETCH-02 TYPICAL PLAN - DOUBLE DV

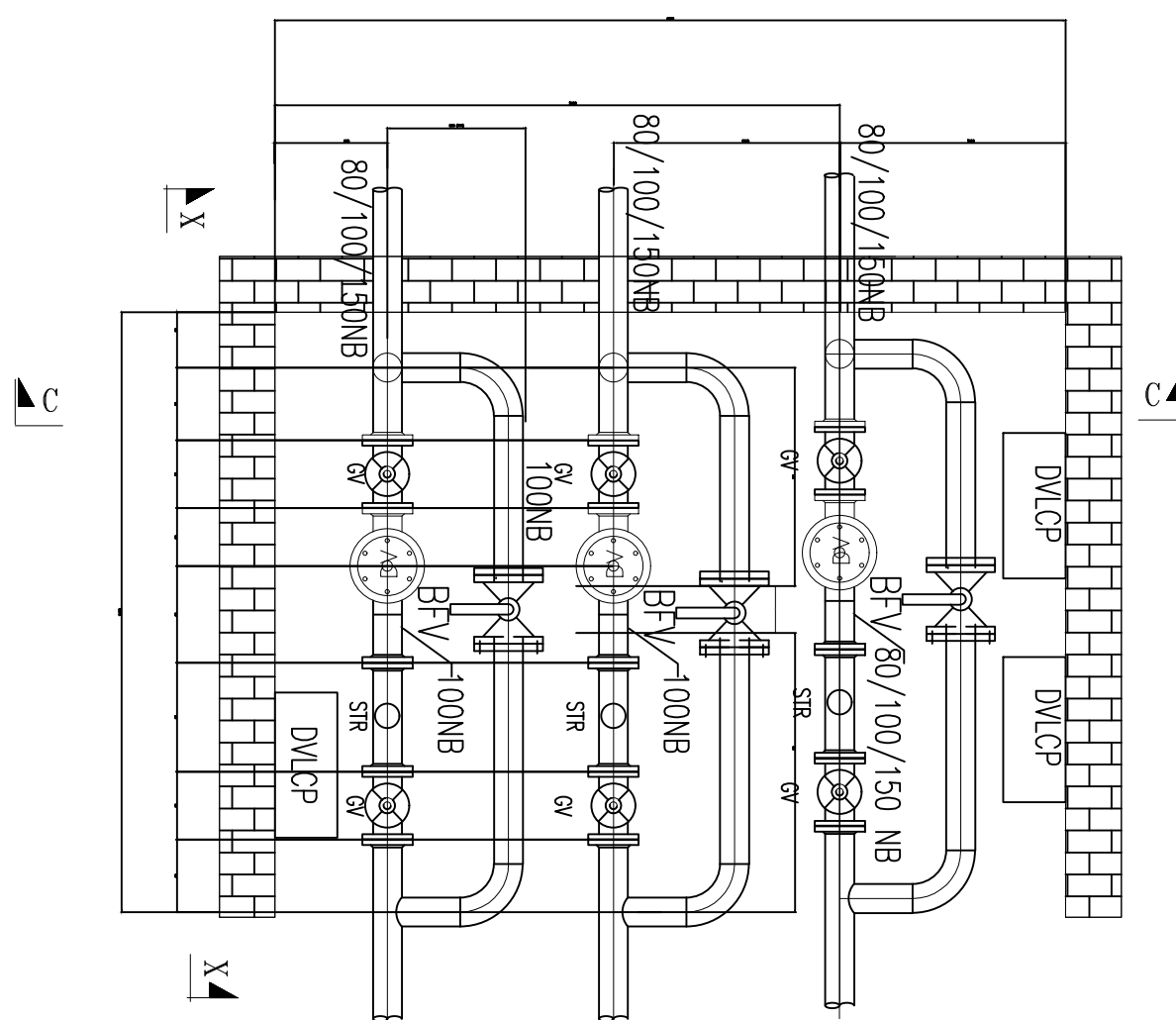


TYPICAL ELEVATION - DV SHED

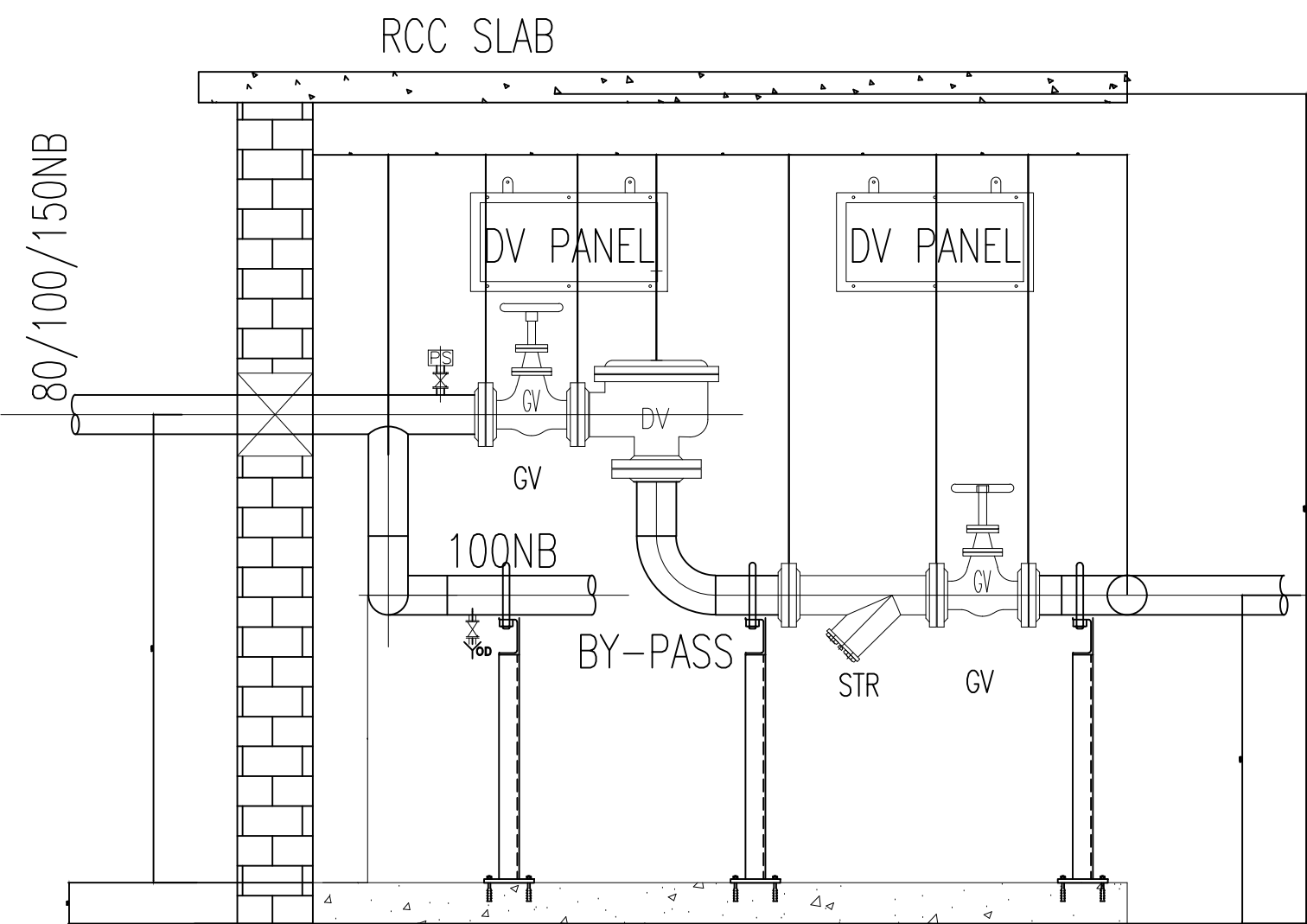
SECTION X-X



SECTION B-B ELEVATION VIEW

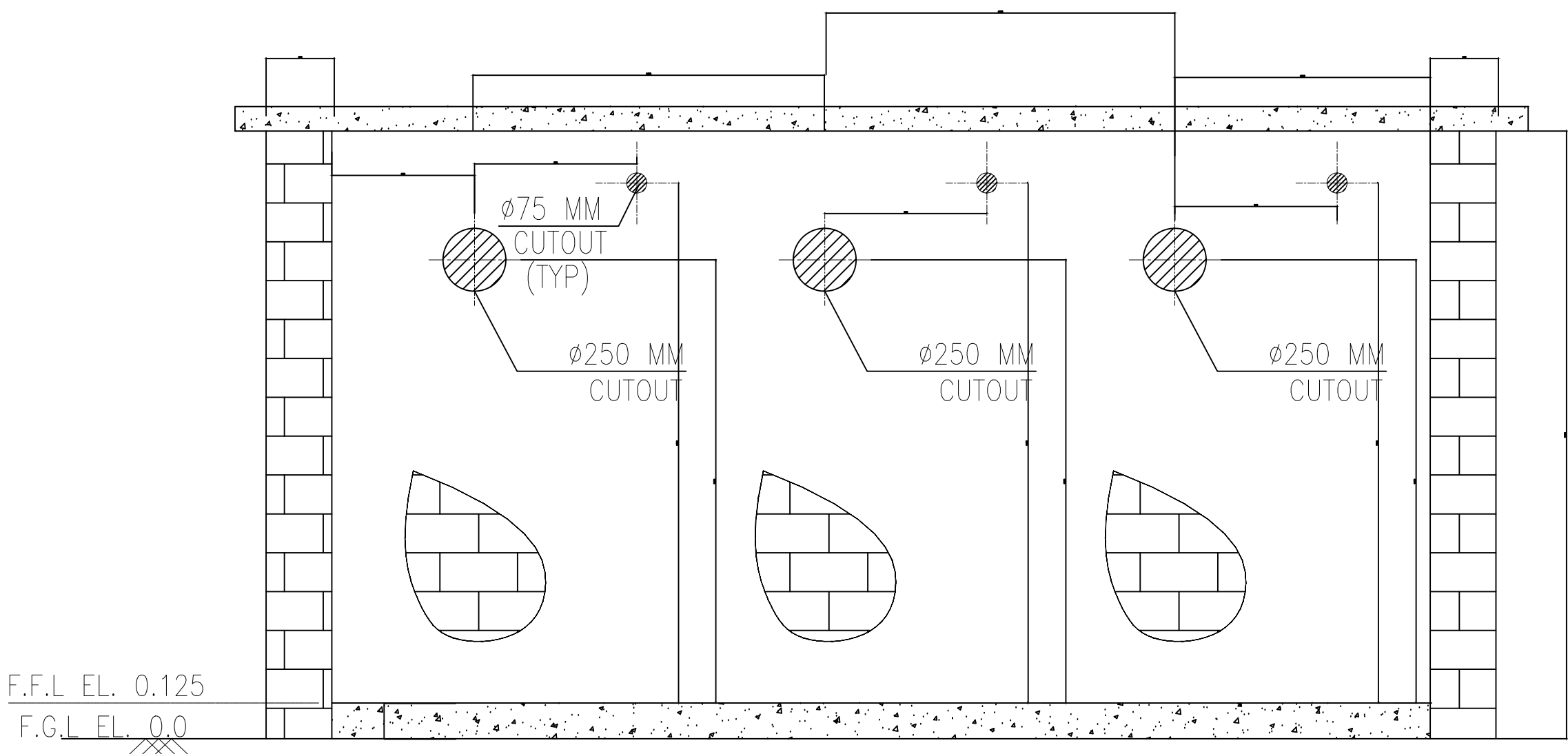


SKETCH-03 TYPICAL PLAN - TRIPPLE DV



TYPICAL ELEVATION - DV SHED

SECTION X-X



SECTION C-C ELEVATION VIEW

DV SHED DETAILS		
S.NO	SKETCH NO.	QTY
1	SKETCH-01	1
2	SKETCH-02	4
3	SKETCH-03	0

**2 X 250 MW NSPCL BHILAI TPP-FGD
SCOPE OF WORK**

SPECIFICATION NO. PE-TS-468-600-C001

VOLUME - II B

SECTION - A

REV.NO. 00 DATE 11-02-2020

SHEET

Annexure-B5

38826/2020/PS-PEM-CIV

Search

Akshay Kapoor...V/PS-PEM)

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FW: Critical ba

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Actions

**FW: Critical balance input for Bhilai FGD: Civil vertical package.**

From: Abul Kalam Azad, Dy Manager/446_PULENGG/HPEP

To: AKSHAY KAPOOR, PEM

Cc: Satish Ghatge, Addl GM/446_PULENGG/HPEP AMAN SURIN Rohit Kumar rajasree

NSPCL-Bhilai FG... on 07-03-2020.dwg (10.7 MB) [Download](#) | [Briefcase](#) | [Remove](#) 9993-109-PVM-B-176.pdf (627.4 KB) [Download](#) | [Briefcase](#) | [Remove](#)
general arrange...e day silo-Reg. (6.1 MB)

[Download all attachments](#)[Remove all attachments](#)

Due to the size of the message, email addresses, URLs and other action text have not been changed into hyperlinks. [Highlight objects.](#)

Dear Sir,

Please ignore mail date 21.04.2020.

Please refer technical discussion vide VC on 18.04.2020, the input furnished vide mail dated 13.04.2020 is relevant for floating the tender(technical aspects).

Note: Please see the attached input received from -ISG for conveyor belt system at LS day silo top.

The tentative bay dimension up to 11.0 x 8.5 m.

For reference rev 01 plot plan attached herewith.

Regards,
Abul Kalam Azad
Deputy Manager/Pulv-Engineering
BHEL-Hyderabad
Ph No. 040-2318-4968

30826/2020/PS-PEM-CIV

00	23.12.2019	Fresh Issue	VV	PR	RSB
REV	DATE	DESCRIPTION / NOTE	PRD	CHD	APD

REVISIONS

TITLE:

Sizing Calculation of Limestone Storage Silos

OWNER/PROJECT: NTPC LIMITED



NSPCL BHILAI EXPANSION POWER PROJECT
2X250 MW – FGD SYSTEM PACKAGE

EPC CONTRACTOR:



BHARAT HEAVY ELECTRICALS LTD.
BOILER AUXILIARIES PLANT, RANIPET

COLLABORATOR & QFGDM



MITSUBISHI HITACHI POWER SYSTEMS, LTD
AIR QUALITY CONTROL SYSTEMS TECHNOLOGY DIVISION, JAPAN

	BHEL	
PREPARED BY	Vidya V	STATUS : FOR APPROVAL
CHECKED BY	P Raju	BHEL CUST NO : G211, G212
APPROVED BY	RS Balaji	BHEL DOC NO : 4-FW-000-00934
		REV NO : 00
NTPC DRG./DOC NO. : 9993-109-PVM-B-176		



SIZING CALCULATION OF LIMESTONE DAY SILO

BHEL Document No.

4-FW-000-00934

Customer Document No.

9993-109-PVM-B-176

1. Gas condition for Limestone Silo Sizing:

S.No	Gas Condition	Feature
1	Worst coal design point	Maximum Absorbed SO ₂ Condition Maximum Inlet Gas flow condition

2. Limestone Storage Silo

Limestone storage silo is used for storing crushed limestone. 2 Nos. of limestone silo common for two units are provided. Each silo is sized for 24 hours maximum limestone requirement of two units. Design of Silo shall be as per IS 9178 (Part 1 to 3).

Referring to Mass Flow balance (Design Point) Data – 9993-109-PVM-W-002

Limestone consumption = 4.662 TPH per unit (stream no. <501>)

For two (2) units = 4.662 x 2 = 9.324 TPH

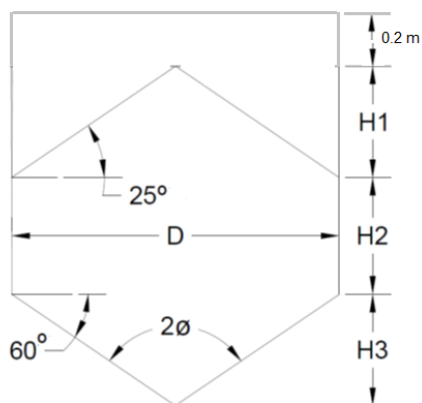
Storage hrs = 24 hrs

Limestone quantity in Tons = 9.324 x 24 = 223.78 Tons

Silo effective volume = 223.78 / bulk density

= 223.78 / 1.4

= 159.8 m³ ~ 160 m³



Silo Dia = 6.2 m

Silo Height = 10.6 m (0.2+H1+H2+H3)

Top Cone

Height, H1 = 1.4 m

Volume = $\frac{1}{3} \times 3.14 \times (6.2(\text{dia})/2)^2 \times 1.4 (\text{ht})$
= 14.082 m³ ----- (1)

Cylinder volume

Height, H2 = 3.7 m

Volume = $3.14/4 \times (6.2 (\text{dia}))^2 \times 3.7$
= 111.65 m³ ----- (2)

Bottom cone volume

Height, H3 = 5.3 m



SIZING CALCULATION OF LIMESTONE DAY SILO

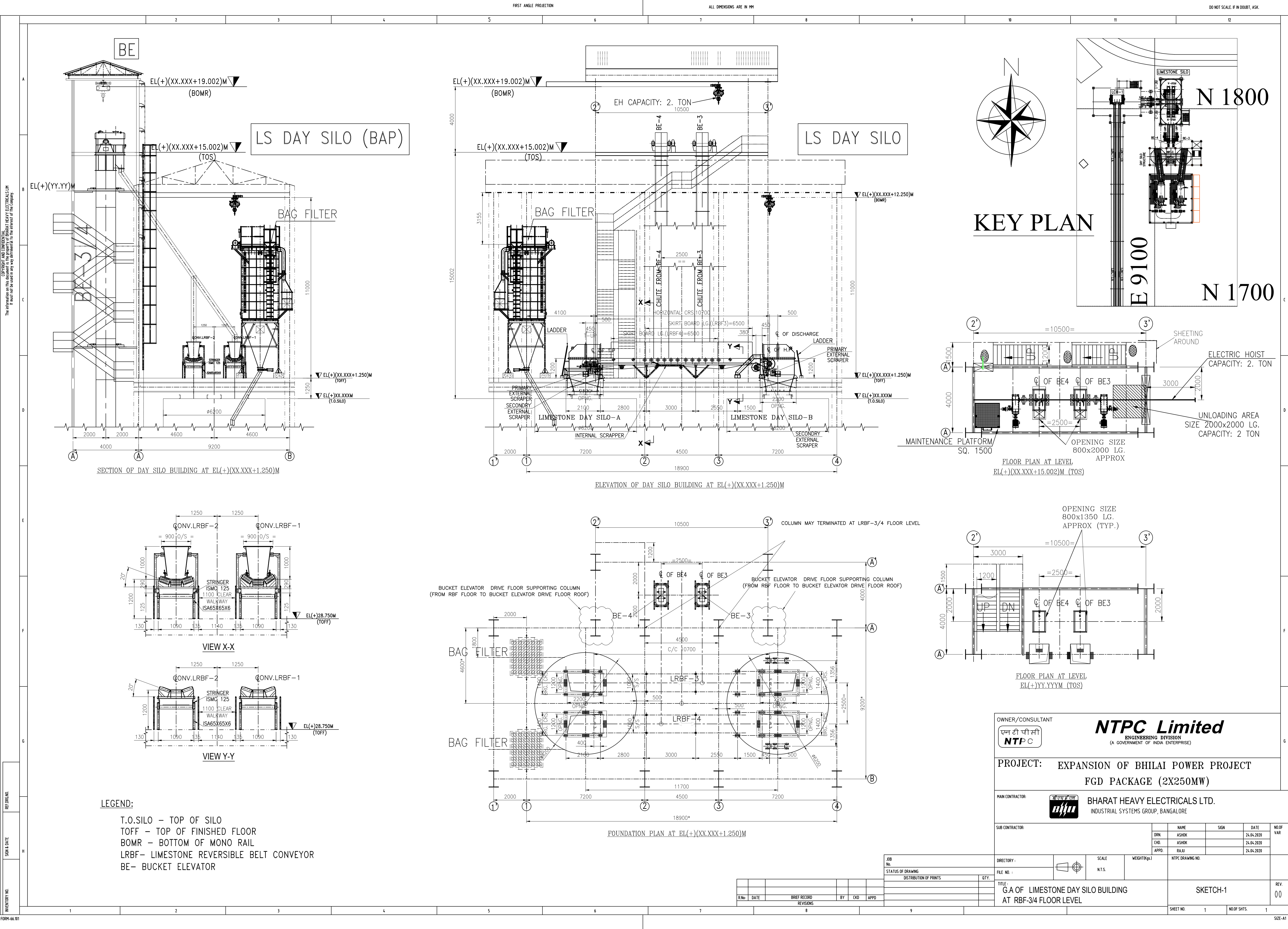
BHEL Document No.	4-FW-000-00934
Customer Document No.	9993-109-PVM-B-176

$$\begin{aligned}\text{Volume} &= 1/3 \times 3.14 \times (6.2(\text{dia})/2)^2 \times 5.3 (\text{ht}) \\ &= 53.31 \text{ m}^3 \quad \text{----- (3)}\end{aligned}$$

Effective volume

$$\begin{aligned}&= (1) + (2) + (3) \\ &= 14.082 + 111.65 + 53.31 \\ &= 179.04 \text{ m}^3 > 160 \text{ m}^3\end{aligned}$$

- 3. Material of Construction:** 1) Carbon steel (Thickness 10 mm)
2) 4 mm thickness SS 304 lining in cone area



NOTES:

- ALL LOADS ARE IN TONS. MOMENTS ARE IN TONNE METER.
- THE BASIC WIND SPEED FOR HE REGION IS 44 M/S. TERRAIN CATEGORY "2" CONSIDERED.
- SEISMIC FORCES ARE BASED ON RESPONSE SPECTRUM ANALYSIS USING SITE. ACCELERATION SPECTRA AS PER SPECIFICATION.
- THE DENSITY OF LIMESTONE CONSIDERED FOR LOAD CALCULATIONS IS 1700KG/CUM
- MINIMUM GRADE OF CONCRETE USED FOR FOUNDATION SHALL BE M25.
- *** THIS PORTION SHALL BE GROUTED AND FILLED WITH CONCRETE AFTER ALIGNMENT OF ALL COLUMNS.
- GRADE OF CONCRETE MIX USED FOR GROUTING SHALL BE ONE GRADE HIGHER THAN THE CONCRETE USED FOR FOUNDATION. NON-SHRINK FREE FLOW CEMENT OR ADMIXTURE SHALL BE USED FOR GROUTING.
- CLEAR OR REMOVE THE RUST AND DUST OF THE FOUNDATION MATERIALS BEFORE EMBEDMENT, IF ANY.
- TEMP PLATES SHALL BE USED FOR MAINTAINING EXACT LOCATION & VERTICAL ALIGNMENT OF FOUNDATION BOLTS.
- ENSURE PROPER CONTACT BETWEEN GROUT MIX & BOTTOM OF BASE PLATE.

LEGEND:-

- H - HORIZONTAL SHEAR
V - VERTICAL LOAD
V(+) - LOAD ACTING DOWNWARDS
V(-) - LOAD ACTING UPWARDS
Mx - MOMENT ABOUT X-AXIS
My - MOMENT ABOUT Y-AXIS
BOB - BOTTOM OF BASE PLATE
FFL - FINISHED FLOOR LEVEL

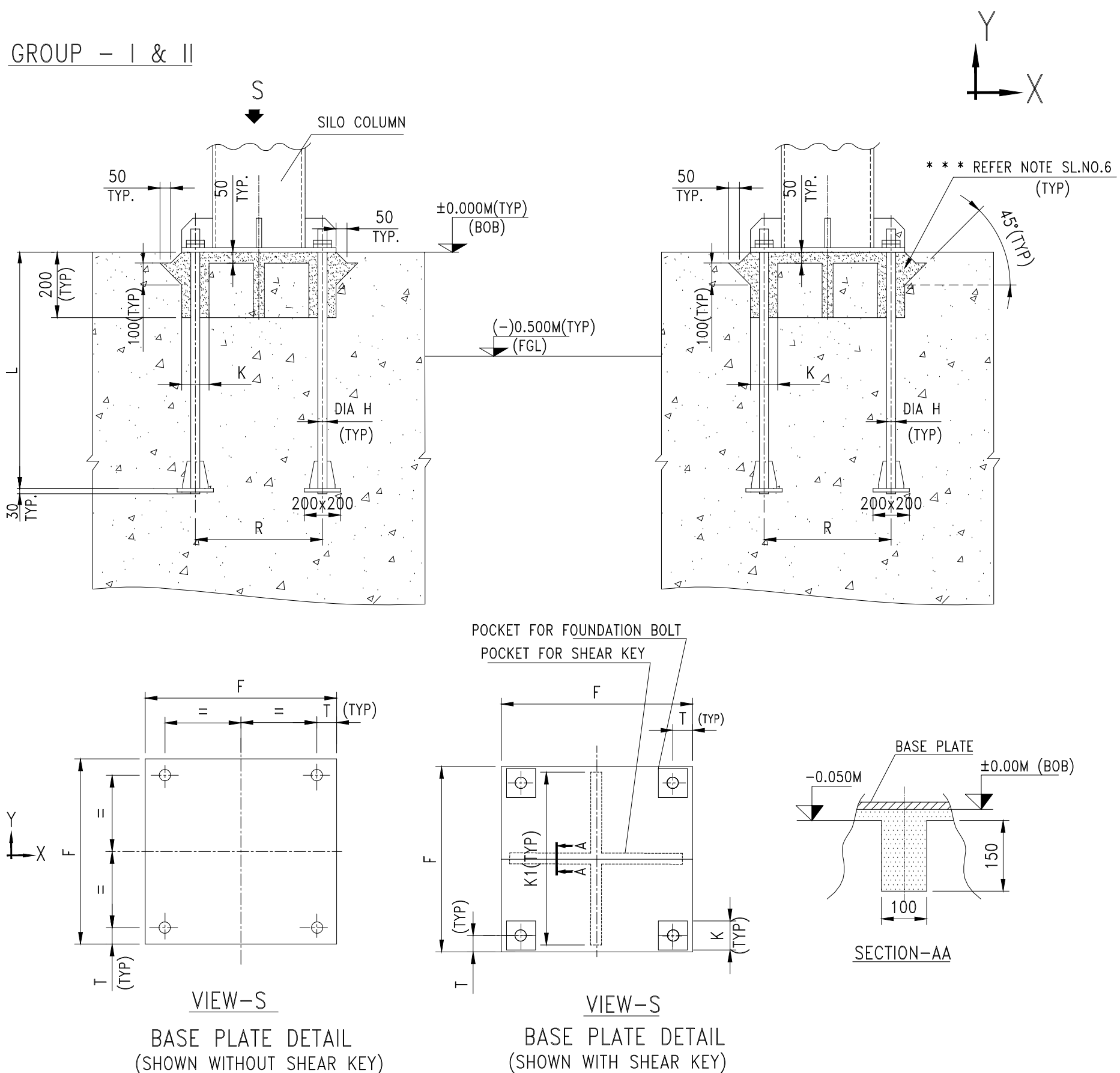
FOUNDATION BOLT DETAILS

GROUP OF COLUMNS	F	R	H	K	L	T	K1	K2	COLUMNS
I	1050	850	50	150	1000	100	1050	-	LSC-1 TO LSC-8
II	850	600	63	150	1270	125	850	-	ESC-1,ESC-2&BSC-1

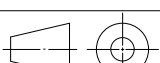
BOLT SIZE	COLUMNS	QTY/ COLUMN	TOTAL QTY COMMON SYSTEM
D50-1175 (38-087-950-1175)	LSC-1 TO LSC-8	04	32
D63-1490	ESC-1,ESC-2&BSC-1	04	12

COLUMN LAYOUT OF LIMESTONE STORAGE SILOS & ELEVATOR

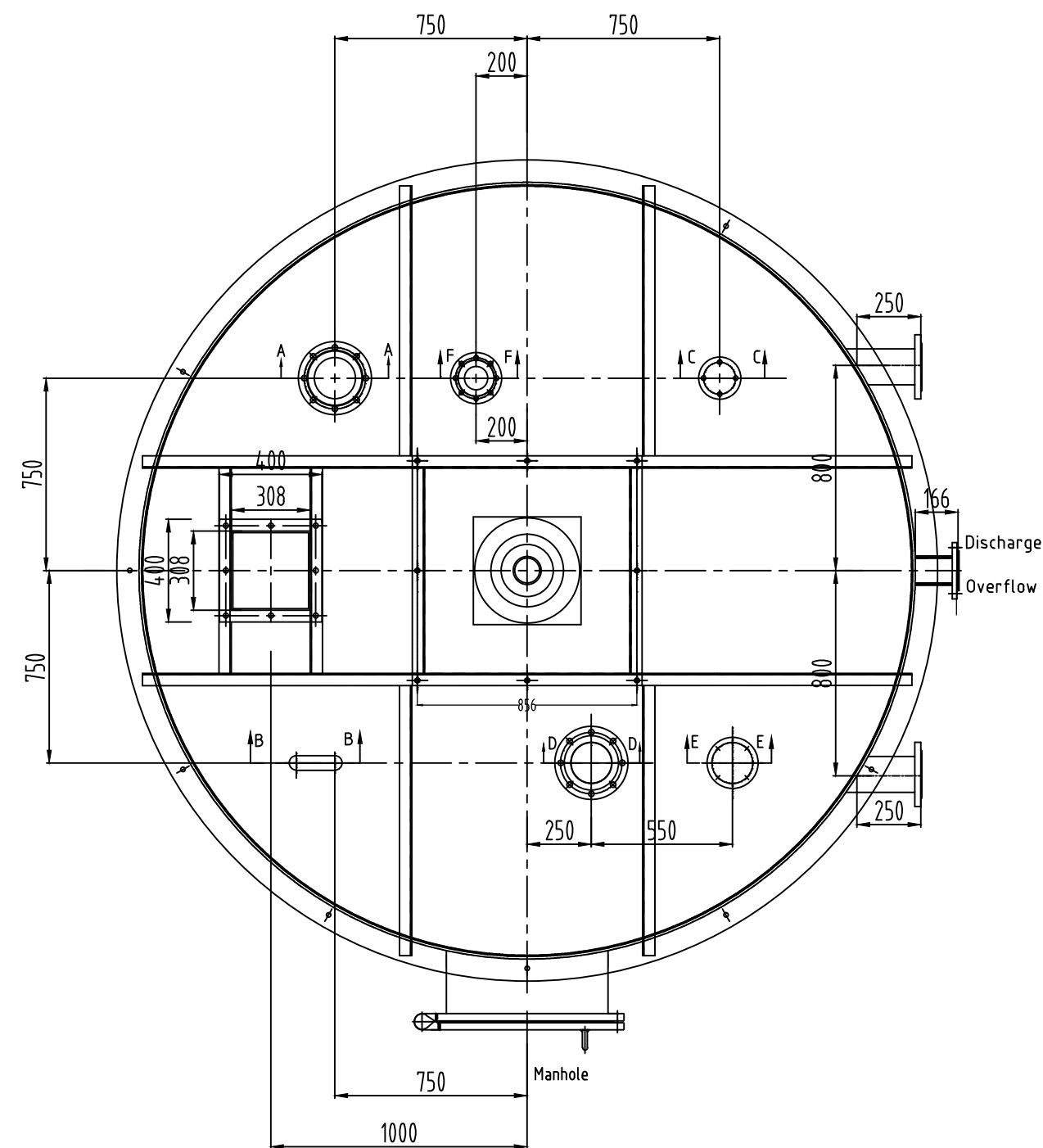
LOAD CASE	DEAD LOAD (Empty Condition)					LIMESTONE LOAD					LIVE LOAD					WIND LOAD ALONG X			WIND LOAD ALONG Y			SEISMIC LOAD ALONG X			SEISMIC LOAD ALONG Y			Group
COLUMN	V	Hx	Hy	Mx	My	V	Hx	Hy	Mx	My	V	Hx	Hy	Mx	My	H	V	MY	H	V	MX	H	V	MY	H	V	MX	
LSC-1	50	3	3	2	3	87	2	1	3	5	23	3	2	1	1	8	-/+44	2	9	-/+54	1	12	-/+51	6	11	+/-53	3	I
LSC-2	44	3	-2	2	3	87	2	-1	3	5	16	2	-2	1	1	5	-/+31	1	9	-/+58	1	11	-/+38	6	11	+/-53	3	I
LSC-3	70	-4	3	3	2	86	-4	1	3	2	34	-3	4	1	1	9	-/+33	5	13	-/+65	3	13	-/+33	5	14	+/-63	3	I
LSC-4	50	-2	-3	3	4	86	1	-1	3	6	22	-2	-4	1	1	5	-/+22	2	12	-/+71	2	11	-/+44	5	14	+/-63	3	I
LSC-5	79	7	3	2	1	86	6	3	3	2	34	3	4	1	1	9	-/+20	5	16	-/+40	3	12	-/+33	5	14	+/-63	3	I
LSC-6	50	1	-3	3	4	86	-1	-1	3	6	21	2	-4	1	1	5	-/+26	2	13	-/+80	2	11	-/+44	5	14	+/-63	3	I
LSC-7	63	-5	2	3	2	87	-2	1	3	5	21	-2	2	1	1	10	-/+41	5	12	-/+54	4	14	-/+51	6	11	+/-53	3	I
LSC-8	45	-3	-2	2	3	87	-2	-1	3	6	17	-2	-2	1	1	5	-/+32	1	12	-/+70	2	11	-/+38	6	11	+/-53	3	I
ESC-1	30	2	-2	1	1	1	1	-1	1	1	12	-1	-1	1	1	6	-/+32	1	1	-/+19	1	4	-/+39	1	1	+/-20	1	II
ESC-2	30	-2	-2	1	1	1	-1	-1	1	1	12	-1	-1	1	1	5	-/+27	1	5	-/+35	1	4	-/+39	1	1	+/-20	1	II
BSC-1	21	1	-1	1	1	1	-1	-1	1	1	6	-1	-1	1	1	2	-/+5	1	1	-/+15	1	2	-/+39	1	2	+/-20	1	II



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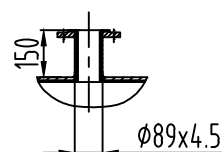
		NTPC LTD. BHILAI 2X250MW FGD SYSTEM PACKAGE					
	BHARAT HEAVY ELECTRICALS LIMITED, UNIT: BOILER AUXILIARIES PLANT, RANIPET: 632 406.		DEPT CODE	NAME	SIGN	DATE	
			M	DRN	--sd--		
				CHD	K.B.PADHI	--sd--	13.04.2020
				APPD	K.B.PADHI	--sd--	13.04.2020
TITLE: COLUMN LAYOUT AND FOUNDATION LOADING OF LIMESTONE STORAGE SILOS							
DRAWING NO.		SCALE : NTS		SHEET 1 OF 1		00	
							

26/2020/PS-PEM-CIV



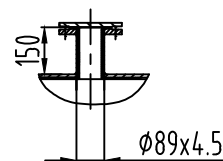
(Dilution water hole)
C-C

DN80,PN1.0



(Standby hole)
F-F

DN80,PN1.0

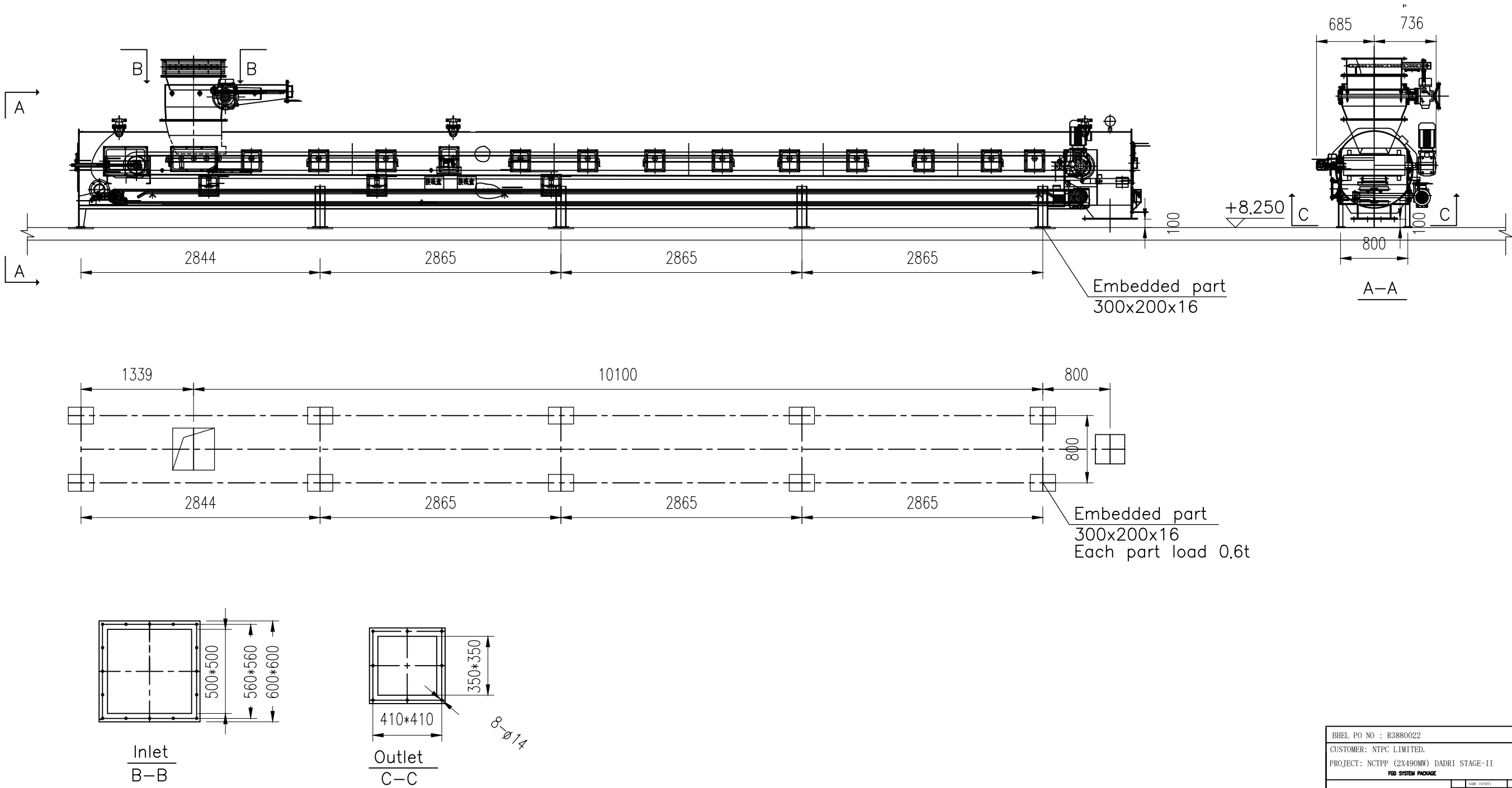


BHEL PO NO : R3880022			
CUSTOMER: NTPC LIMITED.			
PROJECT: NCTPP (2X490MW) DADRI STAGE-II			
FGD SYSTEM PACKAGE			
	ZHEJIANG TUNA ENVIRONMENTAL SCIENCE & TECHNOLOGY CO., LTD. CHINA		
	NAME (SUNNY)	SIGN	DATE
	DRN	PENG ZHJUN(Eric)	Sd 24.12.18
	CHD	WANG LIFENG	Sd 24.12.18
	APPD	XU YUEHA	Sd 24.12.18
	CLIENT BARAT HEAVY ELECTRICALS LIMITED, BOILER AUXILIARIES PLANT, KUNTER COT. IND.		
NTPC DRG NO. 6130-109-PVM-B-004			SCALE : 
TITLE: Detail of Mill Circuit Tank			
DRG NO: TUNA-BHEL-DADRI-BM-J4001	SHNO	OF	REV NO
	03	06	01

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Data sheet

1	Capacity	0~21.35t/h	
2	Width of belt	500mm	
3	Speed of belt	0.02~0.2m/s	
4	Power of main motor	4Kw	Frequency control
5	Power of sweep motor	1.1Kw	
6	Medium	Limestone	
7	Input limestone size	<25mm	
8	Qts	2	



BHEL PO NO : R3880022			
CUSTOMER: NTPC LIMITED.			
PROJECT: NCTPP (2X490MW) DADRI STAGE-II			
FOD SYSTEM PACKAGE			
	NAME (SHEETS)	DATE	DATE
	DESIGN (TUNA-BM-J4001-01)	S-4	20.11.19
	DWG (TUNA)	S-4	20.11.19
	TYPE (TUNA)	S-4	20.11.19
	CHINA		
NTPC DRG NO. 6130-109-PVM-B-004			
TITLE: Detail of Gravimetric Feeder			
DESIGN NO: TUNA-BHEL-DADRI-BM-J4001			
SHEET NO		OF	REV NO
04		06	01