NTPC		Project/ परियोजना : SIPAT-III (1X800MW) Package/ पैकेज: EPC PACKAGES Supplier/ आपूर्तिकर्ता: Contract No./ अनुबंध सं.:				LIST OF ITEMS REQUIRING QUALITY PLAN AND SUB-SUPPLIER APPROVAL क्वालिटी प्लान तथा सब –वेंडर के अनुमोदन सहित मदों की सूची			DOC. NO./ दस्तावेज सं.: REVISION NO : 00 DATE/ तिथि : 09.05.2023 SUB-SYSTEM उप-प्रणाली: QA-ELEC	
S. N. क्र.सं.	Item / मद	QP/ Insp. Cat. क्यूपी/ निरी. श्रेणी.	QP No. / क्यूपी. सं.	QP Sub. Schedule क्यूपी उप.अनुसूचि	Proposed sub-supplier/ प्रस्तावित उप आपूर्तिकर्ता	Place/ स्थान	Sub-suppliers approval status / category उप आपूर्तिकर्ता के अनुमोदन की स्थिति /श्रेणी	Sub-supplier Details submission schedule/ उप आपूर्तिकर्ता के विवरण प्रस्तुतीकरण की सूची	Remarks/ टिप्पणी	
Note - 7:	i) For Motors less than 50 KW: CAT-III. Acceptance of Motor less than 50 KW is based on COC of the Manufacturer and the Main Contractor confirming as follows: "It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate and tested in accordance with approved drawing /data sheets". ii) For Motors 50 KW and less than 75 KW : CAT-II. Acceptance of Motor is based on NTPC review of Routine Test inspection report as per IS: 12615 / applicable standards duly witnessed by main contractor along with COC of the Manufacturer and the Main Contractor confirming as follows: "It is hereby confirmed that the above mentioned motor /motors was/ were manufactured taking care of NTPC specific requirements regarding ambient temp., voltage & frequency variation, hot starts, pull out torque, starting KVA/KW, temp. rise, distance between centre of stud & gland plate, space heater and tested in accordance with approved drawing /data sheets". iii) For Motors 75 KW & above : CAT-I . AS PER NTPC APPROVED QUALITY PLAN (To be submitted seperately for NTPC review & approval).									

GI CONDUITS	BIS APPROVED MAKE				
GI CONDUIT (EPOXY PAINTED)	BIS APPROVED MAKE				
FLEXIBLE CONDUITS (LEAD COATED)	1	PLICA INDIA PVT. LTD.	V.P.AGARWAL MANAGING DIRECTOR, PLICA INDIA PVT. LTD. 149, MODEL TOWN EAST GHAZIABAD - 201009	M - 9810052131 / 0120-4563979 / 9810557567 Mail: agr@plicaindia.com	
FLEXIBLE CONDUIT (PVC COATED)	REPUTED MAKE				
CABLE GLANDS	1	ALLIED TRADERS & EXPORTERS	C-124 A, SECTOR-2, NOIDA -201 301, UTTAR PRADESH, INDIA	Mr. Vijay Mohan Sood +(91)-(120)-2525694 +(91)-(120)-3052594 +(91)-(11)-23287156 vijay_mohansood@yahoo.com	
CABLE GLANDS	2	ARUP ENGG & FOUNDARY WORKS	391/119,PRINCE ANWAR SHAH ROAD, CALCUTTA-700068	033 2473 0850	
CABLE GLANDS	3	BALIGA LIGHTING EQPT.PVT.LTD.	63A,CP RAMASWAMY ROAD, ALWARPET,P.B.No 6910, CHENNAI-600018	44-24995505,22680990-4	
CABLE GLANDS	4	COMMET BRASS PRODUCTS	NUTAN CHEMICAL COMPOUND, WALBHAT ROAD, GOREGAON, MUMBAI-400063	91-022-26852961/62/63 comet@vsnl.net	
CABLE GLANDS	5	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST). MUMBAI 400 063.	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/ 022-29270878.	
CABLE GLANDS	6	ELECTROMAC INDUSTRIES	27/28AF NEW EMPIRE IND.ESTT., R.KRISHNA MANDIR RD.JB NGR ,ANDHERI(E),MUMBAI-400059	91-22-28324829 / 66919034 devang@electromacglands.com	
CABLE GLANDS	7	INCAB	HARE STREET,KOLKATA,WEST BENGAL-700001	91-33-2480161/62/63/64 Fax : 91-33-2485766	
CABLE LUGS	1	DOWELLS	M/S. DOWELLS ELECTRICALS 47/47A, SATGURU INDUSTRIAL ESTATE. OFF AAREY ROAD, GOREGOAN (EAST). MUMBAI 400 063.	CEO : Mr. Jayantibhai S. Patel TEL: 022-32504770./022-29270876/ 022-29270878.	
CABLE LUGS	2	UNIVERSAL MACHINES LTD.	4,B.B.D.BAG (EAST) 90,STEPHEN HOUSE,5TH FLR CALCUTTA-700001	033 2282 2540	

SECTION-I
SUB SECTION –C6

ANNEXURE-II

MANDATORY SPARE IS NOT APPLICABLE

SECTION-I

SUB SECTION E

ANNEXURE-III

PAINTING & COLOUR SCHEME
(PLEASE REFER SECTION C2-C)

ANNEXURE-IV

LIST OF TOOLS & TACKLES

(REFER SUGGESTIVE PRICE FORMAT)

SECTION-I

SUB-SECTION-E

ANNEXURE-V

DRAWINGS / DOCUMENTS SUBMISSION PROCEDURE (COVERED UNDER SUB-SECTION C2-B)

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

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

MASTER DRAWING LIST

MASTER DRAWING LIST FOR AIR CONDITIONING SYSTEM				
S. No.	BHEL DOCUMENT NO.	Title	Schedule submission from LOA (No. of days)	Type of Document
1	PE-V0-520-553-A001	INSPECTION CATEGORISATION PLAN CUM SUB VENDOR LIST FOR AC SYSTEM	25	PRIMARY
2	PE-V0-520-553-A002	MQP SCREW CHILLER	75	PRIMARY
3	PE-V0-520-553-A003	MQP BALANCING VALVES	100	SECONDARY
4	PE-V0-520-553-A004	MQP 2/3 WAY VALVES	85	PRIMARY
5	PE-V0-520-553-A005	MQP CENTRIFUGAL FAN -HVAC	80	PRIMARY
6	PE-V0-520-553-A006	MQP MS ERW PIPE (BLACK/GI) -HVAC	50	SECONDARY
7	PE-V0-520-553-A007	MQP HORIZONATAL CENTRIFUGAL PUMPS-HVAC	80	PRIMARY
8	PE-V0-520-553-A008	MQP AXIAL FAN	75	PRIMARY
9	PE-V0-520-553-A009	MQP BUTTERFLY VALVES-HVAC	100	SECONDARY
10	PE-V0-520-553-A011	HEAT LOAD CALCULATION FOR MAIN PLANT, ESP CONTROL ROOM, WATER SYSTEM CONTROL ROOM ETC FOR AIR CONDITIONING SYSTEM	25	Primary
11	PE-V0-520-553-A012	OPERATION & CONTROL PHILOSPHY FOR AIR CONDITIONING SYSTEM	70	PRIMARY
12	PE-V0-520-553-A013	PRESSURE DROP CALCULATIONS FOR CHILLED AND CONDENSER WATER PIPING FOR AIR CONDITIONING SYSTEM	40	PRIMARY
13	PE-V0-520-553-A014	TDS AND GA OF SCREW CHILLER (FOR MAIN PLANT A/C SYSTEM, ESP A/C SYSTEM) ALONG WITH FOUNDATION DETAILS FOR AIR CONDITIONING SYSTEM	75	PRIMARY
14	PE-V0-520-553-A017	TDS AND GA OF CONDENSING UNIT ALONG WITH FOUNDATION DETAILS FOR AIR CONDITIONING SYSTEM	75	PRIMARY
15	PE-V0-520-553-A018	TDS AND GA OF COOLING TOWER ALONG WITH FOUNDATION DETAILS FOR AIR CONDITIONING SYSTEM	75	PRIMARY
16	PE-V0-520-553-A019	TDS AND GA OF AIR HANDLING UNITS WITH COOLING COIL AND CENTRIFUGAL FANS ALONG WITH FOUNDATION DETAILS FOR AIR CONDITIONING SYSTEM	75	PRIMARY
17	PE-V0-520-553-A020	TDS AND GA OF CONDENSER AND CHILLEDWATER PUMPS ALONG WITH FOUNDATION DETAILS FOR AIR CONDITIONING SYSTEM	75	PRIMARY

18	PE-V0-520-553-A021	TDS AND GA OF PAC / SPLIT AIR CONDITIONERs / CASSETTE AC	90	SECONDARY
19	PE-V0-520-553-A022	TDS AND GA OF MOTOR (PUMP, COOLING TOWER, AHU)	105	SECONDARY
20	PE-V0-520-553-A023	TDS OF INSULATION MATERIAL THERMAL & ACCOUSTIC INSULATION FOR DUCTING/PIPES (DUCT INSULATION, DUCT LINING, PIPE INSULATION) FOR AIR CONDITIONING SYSTEM	50	SECONDARY
21	PE-V0-520-553-A024	TDS AND GA OF FRESH AIR FANS FOR AIR CONDITIONING SYSTEM	70	PRIMARY
22	PE-V0-520-553-A025	TDS AND GA OF WATER SOFTENING PLANT ALONG WITH FOUNDATION DETAILS FOR AIR CONDITIONING SYSTEM	100	SECONDARY
23	PE-V0-520-553-A027	TDS AND GA OF FOR 3-WAY & 2 WAY MIXING VALVE FOR AIR CONDITIONING SYSTEM	85	SECONDARY
24	PE-V0-520-553-A028	TDS AND GA OF HEATERS AND HUMIDIFIER FOR AIR CONDITIONING SYSTEM	80	SECONDARY
25	PE-V0-520-553-A029	TDS AND GA OF FIRE DAMPER WITH ACTUATOR FOR AIR CONDITIONING SYSTEM	70	SECONDARY
26	PE-V0-520-553-A030	TDS AND GA OF VALVES (BALANCING VALVE, GATE VALVE, CHECK VALVE ,GLOBE VALVE,BUTTER FLY VALVE (MANUAL & MOTORIZED) , Y STRAINER) FOR AIR CONDITIONING SYSTEM	90	SECONDARY
27	PE-V0-520-553-A031	TDS AND GA OF AIR TERMINALS SUPPLY / RETURN AIR DIFFUSER/GRILL, NRD,VCD ETC. FOR AIR CONDITIONING SYSTEM	60	SECONDARY
28	PE-V0-520-553-A032	TDS OF GI SHEET FOR AIR CONDITIONING SYSTEM	40	SECONDARY
29	PE-V0-520-553-A033	TDS OF PIPES FOR AIR CONDITIONING SYSTEM	40	SECONDARY
30	PE-V0-520-553-A034	TDS AND GA OF EXPANSION TANK, MAKEUP WATER TANK AND STORAGE WATER TANK FOR AIR CONDITIONING SYSTEM	40	SECONDARY
31	PE-V0-520-553-A035	TDS AND GA OF FILTERS FOR AIR CONDITIONING SYSTEM	65	SECONDARY
32	PE-V0-520-553-A036	TDS FOR INSTRUMENTS (GAUGES-TEM, PR, LVL, PRES: SWITCH-TEMP,LVL, DP: SENSORS-TEMP, HUM ETC) FOR AIR	120	SECONDARY

		CONDITIONING SYSTEM		
33	PE-V0-520-553-A037	P&ID FOR MAIN PLANT, ESP CONTROL ROOM, WATER SYSTEM CONTROL ROOM FOR AIR CONDITIONING SYSTEM	40	PRIMARY
34	PE-V0-520-553-A038	TYPICAL DETAILS / DRAWINGS DUCT FABRICATION/ SUPPORT / ERECT. FOR AIR CONDITIONING SYSTEM INSUL-DUCT/ PIPG & EQP CHD & COND WATR PIPE ERECT	45	SECONDARY
35	PE-V0-520-553-A039	AC DUCT & AHU RMLAYOUT WITH FOUNDATION DETAIL FOR UPS BATTERY CHARGER RM AT 8.5M & SWAS RM & CEP VFD AT 0 M	110	PRIMARY
36	PE-V0-520-553-A040	AC DUCT LAYOUT DRAWING FOR CONTROL RM ARES AT 17M ALONG WITH AHU RM LAYOUT WITH FOUNDATION DETAILS	100	PRIMARY
37	PE-V0-520-553-A040A	AHU ROOM LAYOUT WITH FOUNDATION DETAIL FOR MAIN POWER HOUSE	95	PRIMARY
38	PE-V0-520-553-A041	AC DUCT LAYOUT DRAWING FOR ESP, WITH AHU/PU RM LAYOUT WITH FOUNDATION DETAILS FOR INDR & OUTDR UNITS	125	PRIMARY
39	PE-V0-520-553-A045	CHD & COND WATER PIPING LAYOUT WITHIN PLANT ROON & UPTO VARIOUS AHU ROOMS, & COOLING TOWER AREA FOR POWER HOUSE	95	PRIMARY
40	PE-V0-520-553-A046	AC PLANT ROOM LAYOUT & COOLING TOWER AREA LAYOUT WITH COMPLETE FOUNDATION DETAIL ALONGWITH PIPING LAYOUT OF ALL EQUIPMENT FOR POWER HOUSE	95	PRIMARY
41	PE-V0-520-553-A051	AC PLANT ROOM LAYOUT & COOLING TOWER LAYOUT WITH COMPLETE FOUNDATION DETAIL ALONGWITH PIPING LAYOUT FOR ESP CONTROL ROOM	125	PRIMARY
42	PE-V0-520-553-A052	SPLIT AC SCHEDULE ALONGWITH HEAT LOAD CALCULATION FOR AUXILIARY BUILDING	135	SECONDARY
43	PE-V0-520-553-A057	PG/ DEMONSTRATION TEST PROCEDURE FOR AIR CONDITIONING SYSTEM	120	SECONDARY
44	PE-V0-520-553-A058	O&M MANUAL FOR AIR CONDITIONING SYSTEM	180	SECONDARY
45	PE-V0-520-553-A059	A/C EQUIPMENT LAYOUT WITH	130	PRIMARY

		FOUNDATION DETAILS & DUCTING LAYOUT FOR WATER SYSTEM CONTROL BUILDING		
46	PE-V0-520-553-A060	AC DUCT & AHU RM LAYOUT WITH FOUNDATION DETAIL FOR OFFICE SPACE AT 24.0M	110	PRIMARY
47	PE-V0-520-553-A062	DRIVE LIST & IO LIST FOR AC SYSTEM	135	SECONDARY
48	PE-V0-520-553-A063	LIST OF INSTRUMENTS / INSTRUMENT SCHEDULE FOR AC SYSTEM	125	SECONDARY
49	PE-V0-520-553-A064	CABLE INTER CONNECTION SCHEDULE FOR AC SYSTEM	150	SECONDARY
50	PE-V0-520-553-A067	LOGIC DRAWING FOR AC SYSTEM	150	SECONDARY
51	PE-V0-520-553-A068	TECHNICAL DATASHEET, GA & TYPE TEST OF JUNCTION BOX	135	SECONDARY
52	PE-V0-520-553-A069	TDS AND GA OF LOCAL CONTROL PANEL FOR AHU	100	SECONDARY
53	PE-V0-520-553-A070	CABLE SCHEDULE FOR AC SYSTEM	130	SECONDARY
54	PE-V0-520-553-A071	ELECTRICAL FEEDER LIST FOR AIR CONDITIONING SYSTEM	100	SECONDARY
55	PE-V0-520-553-A073	VALVE SCHEDULE FOR AC SYSTEM	60	SECONDARY
56	PE-V0-520-553-A074	TDS AND GA OF VARIABLE AIR VOLUME (VAV) ALONGWITH OCCUPANCY SENSORS & TEMPERATURE SENSOR FOR WORKING OF VAV	130	SECONDARY

MASTER DRAWING LIST FOR VENTILATION SYSTEM

S. No.	BHEL DOCUMENT NO.	Title	Schedule submission date (No. of days)	Type of Document
1	PE-V0-520-554-A001	INSPECTION CATEGORISATION PLAN CUM SUB VENDOR LIST FOR VENTILATION SYSTEM	25	PRIMARY
2	PE-V0-520-554-A002	MQP AIR WASHER / UAF	65	PRIMARY
3	PE-V0-520-554-A003	MQP CENTRIFUGAL FAN	75	PRIMARY
4	PE-V0-520-554-A004	MQP AXIAL/RE FAN	75	PRIMARY
5	PE-V0-520-554-A005	MQP BUTTERFLY VALVES	85	SECONDARY
6	PE-V0-520-554-A006	WRITE UP & CONTROL PHILOSOPHY FOR VENTILATION SYSTEM	60	PRIMARY

7	PE-V0-520-554-A007	HEAT LOAD CALCULATION FOR VENTILATION SYSTEM	30	PRIMARY
8	PE-V0-520-554-A008	VENTILATION DUCT LAYOUT (including UAF Unit) FOR ESP CONTROL BUILDINGS	60	PRIMARY
9	PE-V0-520-554-A009	DATA SHEET & GA FOR AIR WASHER & UAF (PRE-FILTER,FINE FILTER&WATER REPELLANT FILTER) ALONGWITH FAN AND PUMP FOUNDATION DETAILS FOR VENTILATION SYSTEM	80	PRIMARY
10	PE-V0-520-554-A010	DATA SHEET & GA FOR ROOF EXTRACTOR, AXIAL (EXHAUST AND SUPPLY AIR) FANS WITH FIXING ARRANGEMENT FOR VENTILATION SYSTEM	85	PRIMARY
11	PE-V0-520-554-A011	DATA SHEET & GA FOR VALVES (GATE VALVE,CHECK VALVE, GLOBE VALVE ETC.) AND STRAINER (Y type) FOR VENTILATION SYSTEM	90	SECONDARY
12	PE-V0-520-554-A012	DATA SHEET FOR INSULATION (THERMAL & ACCOUSTIC) FOR VENTILATION SYSTEM	45	SECONDARY
13	PE-V0-520-554-A013	DATA SHEET & GA FIRE DAMPER WITH ACTUATOR FOR VENTILLATION SYSTEM	50	SECONDARY
14	PE-V0-520-554-A014	DATA SHEET FOR INSTRUMENTS (PRESSURE GAUGE, TEMP GAUGE, LEVEL GAUGE, PRESSURE SWITCH, LEVEL SWITCH) FOR VENTILLATION SYSTEM	110	SECONDARY
15	PE-V0-520-554-A015	DATA SHEET OF PIPE FOR VENTILLATION SYSTEM	40	SECONDARY
16	PE-V0-520-554-A016	DATA SHEET OF GI AND MS SHEET FOR VENTILLATION SYSTEM	40	SECONDARY
17	PE-V0-520-554-A017	DATA SHEET & GA FOR PRE AND FINE FILTERS, &WATER REPELLANT FILTER FOR VENTILATION SYSTEM	45	SECONDARY
18	PE-V0-520-554-A018	DATA SHEET FOR MOTORS (A/W FAN, A/W PUMPS, UAF FAN, UAF PUMP, RE UNIT, SUPPLY AND EXHAUST AXIAL FAN) FOR VENTILLATION SYSTEM	90	SECONDARY
19	PE-V0-520-554-A019	SIZING CALCULATIONS FOR VENTILATION FANS FOR ALL BUILDING	110	SECONDARY
20	PE-V0-520-554-A020	TYPICAL DETAILS/DRAWINGS OF DUCT FABRC / SUPPORT ARRANGMENT/ EREC.FOR VENTILATION SYSTEM INSUL	45	SECONDARY

		OF DUCT / PIPING & EQUIPMENTS PIPE ERECTION		
21	PE-V0-520-554-A021	P&ID & SCHEME OF AIR DISTRIBUTION FOR AIRWASHER SYSTEM AND UAF UNIT/SYSTEM FOR VENTILLATION SYSTEM	30	PRIMARY
22	PE-V0-520-554-A022	VENTILATION DUCT LAYOUT FORTG BUILDING - 'BC BAY & BOILER MCC ROOM' SIDE AIR WASHER	95	PRIMARY
23	PE-V0-520-554-A023	AIR WASHER LAYOUT OUTSIDE "A ROW" SIDEALONGWITH FOUNDATION DETAILS - TG BUILDING	65	PRIMARY
24	PE-V0-520-554-A024	AIR WASHER LAYOUT FOR"B-C BAY & BOILER MCC ROOM" SIDEALONGWITH FOUNDATION DETAILS - TG BUILDING	80	PRIMARY
25	PE-V0-520-554-A025	GA OF PROPELLER FAN FOR VENTILLATION SYSTEM	50	SECONDARY
26	PE-V0-520-554-A026	VENTILATION DUCT LAYOUT FORTG BUILDING - 'A' ROW SIDE AIR WASHER	80	PRIMARY
27	PE-V0-520-554-A027	UAF LAYOUT ALONGWITH FOUNDATION DETAILS - ESP BUILDING.	90	PRIMARY
28	PE-V0-520-554-A028	DRIVE LIST & IO LIST VENTILATION SYSTEM	100	SECONDARY
29	PE-V0-520-554-A029	STAIRCASE PRESSURIZATION CALCULATION FOR C ROW SIDE STAIRCASE WELL OF MAIN POWER HOUSE	45	PRIMARY
30	PE-V0-520-554-A030	TDS & GA OF FAN FILTRATION UNIT EQUIPMENT LAYOUT WITH DUCTING	70	SECONDARY
31	PE-V0-520-554-A031	TECHNICAL DATASHEET FOR GRILLS/DIFFUSER/VOLUME CONTROL DAMPER	55	PRIMARY
32	PE-V0-520-554-A032	TDS OF AIR CURTAIN	100	SECONDARY
33	PE-V0-520-554-A033	P.G/ DEMONSTRATION TEST PROCEDUREFOR VENTILLATION SYSTEM	110	SECONDARY
34	PE-V0-520-554-A034	O & M MANUAL FOR VENTILATION SYSTEM	150	SECONDARY
35	PE-V0-520-554-A035	LIST OF INSTRUMENTS / INSTRUMENT SCHEDULE FOR VENTILATION SYSTEM	125	SECONDARY

36	PE-V0-520-554-A036	CABLE INTER CONNECTION SCHEDULE FOR VENTILATION SYSTEM	150	SECONDARY
37	PE-V0-520-554-A037	LOGIC DRAWING FOR VENTILATION SYSTEM	150	SECONDARY
38	PE-V0-520-554-A038	VENTILATION FAN SCHEDULE.	110	SECONDARY
39	PE-V0-520-554-A039	TECHNICAL DATASHEET, GA & TYPE TEST OF JUNCTION BOX	135	SECONDARY
40	PE-V0-520-554-A040	TDS & GA OF LOCAL CONTROL PANEL FOR AIR WASHERS & UAF	100	SECONDARY
41	PE-V0-520-554-A041	CABLE SCHEDULE FOR AC SYSTEM	130	SECONDARY
42	PE-V0-520-554-A042	ELECTRICAL FEEDER LIST FOR VENTILATION SYSTEM	100	SECONDARY
43	PE-V0-520-554-A043	VALVE SCHEDULE FOR VENTILATION SYSTEM	60	SECONDARY
44	PE-V0-520-554-A044	MQP HORIZONATAL CENTRIFUGAL PUMPS	80	SECONDARY
45	PE-V0-520-554-A045	MQP MS ERW PIPE (BLACK/GI)	50	SECONDARY
46	PE-V0-520-554-A046	QAP FOR ELECTRONIC TRANSMITTER (FIELD BUS BASED) FOR VENTILATION SYSTEM	110	SECONDARY

Note:

1. Bidder to furnish hard copies/soft copies for above drawings / documents as per the dwg. / documents distribution as per project requirement.
2. Drawings shall be prepared in Auto CAD and shall be shared with BHEL during detail engineering of review.
3. Bidder to follow the drawing submission schedule. The successful bidder shall depute his design personnel to BHEL's/ Customer's/ Consultant's office for across the table discussion for resolution of issues and to get documents approved within the stipulated time.
4. Every revised submission incorporating comments – within 7 days. The drawings/ documents submitted by vendor shall be complete in all respects with revised drawing submitted incorporating all comments along with Customer Response Sheet (CRS). Any incomplete drawing submitted shall be treated as non- submission with delays attributable to vendor's account.
5. Revision made by the bidder in any drawings and documents shall be highlighted by indicating the no. of revisions in a triangle without fail so that the minimum time is required by BHEL to review the drawings and documents. Drawings/ documents to be submitted for BHEL review / approval shall be under Revision A, B, C… etc. while drawings /documents to be submitted thereafter for customer's approval after purchaser's approval shall be under R-0, 1, 2, 3 …. etc.

6. Any other drawings and documents as required by BHEL / Customer / Consultant shall be furnished by the successful bidder during detail engineering stage for which no commercial implication shall be entertained by BHEL.

7. Detailed erection manual for each of the equipment as well as complete system supplied under this contract shall be submitted at least 3 months before the scheduled erection of the concerned equipment / component or along with supply of concerned equipment / component whichever is earlier.

8. The Field Quality Plan of bidder shall also be submitted by the successful bidder during detail engineering for customer's / consultant's approval. All comments made by customer/ consultant shall be incorporated by the successful bidder without any commercial and delivery implication.

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

10. Primary documents shall be treated as basic Engineering documents for contractual purpose.

11. All drawings and documents including general arrangement drawing, data sheet, calculation etc. shall be furnished to BHEL during detailed engineering stage and shall include / indicate the following details for clarity w.r.t. inspection, construction, erection and maintenance etc.: -

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

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

    - All drawings shall include / show plan, elevation, side view, cross - section, skin section, blow - up view, all major self-manufactured and bought out items shall be labelled and included in BOQ / BOM in tabular form.

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

SECTION-II

ANNEXURE-I

FORMAT FOR OPERATION AND MAINTENANCE MANUAL

Project name :
Project number :
Package Name :
PO reference :
Document number :
Revision number :

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

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
4.0	**COMMISSIONING ACTIVITIES (IF NOT COVERED IN SEPARATE DOCUMENT I.E. ERECTION MANUAL, COMMISSIONING MANUAL)**				
4.1	Pre-Commissioning Checks				
4.2	handling of items at site				
4.3	Storage at site				
4.4	Unpacking & Installation procedure				
5.0	**OPERATION GUIDELINES FOR PLANT PERSONAL/USER/OPERATOR**				
5. 1	Interlock & Protection logic along with the limiting values of protection settings for the equipment along with brief philosophy behind the logic, drawings etc. to be provided.				
5. 2	Start up, normal operation and shut down procedure for equipment's along with the associated systems in step by step mode. Valve sequence chart, step list, interlocks etc. with Equipment isolating procedures to be mentioned.				
5. 3	Do's & Don't of the equipment's.				
5. 4	Safety precautions to be taken during normal operation. Safety symbols, Emergency instructions on total power failure condition/lubrication failure/any other condition				
5. 5	Parameters to be monitored with normal values and limiting values				
5. 6	Trouble shooting with causes and remedial measures				
5. 7	Routine operational checks, recommended logs & records				
5. 8	Changeover schedule if more than one auxiliary for the same purpose is given				
5. 9	Painting requirement and schedule				
5. 10	Inspection, repair, Testing and calibration procedures				
6.0	**MAINTENANCE GUIDELINES FOR PLANT PERSONAL**				

Sl.no. & Sections	Description	Tick (√)if included in Manual			Remarks
		Yes	No	Not Applicable	
6.1	List of Special Tools and Tackles required for Overhaul/Trouble shooting including special testing equipment required for calibration etc.				
6.2	Stepwise dismantling and re-assembly procedure clearly specifying the tools to be used, checks to be made, records to be maintained, clearances etc. to be mentioned. Tolerances for fitment of various components to be given.				
6.3	Preventive Maintenance & Overhauling schedules linked with running hours/calendar period along with checks to be given				
6.4	Long term maintenance schedules especially for structural, foundations etc.				
6.5	Consumable list along with the estimated quantity required during commissioning, normal running and during maintenance like Preventive Maintenances and Overhaul. Storage/handling requirement of consumables/self-life.				
6.6	List of lubricants with their Indian equivalent, Lubrication Schedule, Quantity required for each equipment for complete replacement is to be given				
6.7	List of vendors & Sub-vendors with their latest addresses, service centers ,Telephone Nos., Fax Nos., Mobile Nos., e-mail IDs etc.				
6.8	List of mandatory and recommended spare parts list				
6.9	Tentative Lead time required for ordering of spares from the equipment supplier				
6.10	Guarantee and warranty clauses				
7.0	**Statutory and other specific requirements considerations.**				
8.0	**List of reference documents**				
9.0	**Binding as per requirement**				

ANNEXURE-VIII

SITE STORAGE AND PRESERVATION

SITE STORAGE AND PRESERVATION GUIDELINES

FOR

MECHNANICAL BOPs

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

PROJECT ENGINEERING MANAGEMENT, POWER SECTOR

BHARAT HEAVY ELECTRICALS LIMITED-NOIDA

CONTENT

1. SCOPE OF THE DOCUMENT

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

2. PURPOSE OF STORAGE & PRESERVATION

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

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

A. GENERAL STORAGE REQUIREMENTS

1) To the extent feasible, materials should be stored near the point of erection. The storage areas should have adequate unloading and handling facilities with adequate passage space for movement of material handling equipment such as cranes, fork lift trucks, etc. The storage of materials shall be properly planned to minimise time loss during retrieval of items required for erection.
2) The outdoor storage areas as well as semi-closed stores shall be provided with adequate drainage facilities to prevent water logging. Adequacy of these facilities shall be checked prior to monsoon.
3) The storage sheds shall be built in conformity with fire safety requirements. The stores shall be provided with adequate lights and fire extinguishers. 'No smoking' signs shall be placed at strategic locations. Safety precautions shall be strictly enforced.
4) Adequate lighting facility shall be provided in storage areas and storage sheds and security personnel positioned to ensure enforcement of security measures to prevent theft and loss of materials.
5) Adequate number of competent stores personnel and security staff shall be deployed to efficiently store and maintain the equipment / material.
6) Vendor shall compulsory make covered storage shed of minimum size of 15 feet x 15 feet for storage of valuable electrical/electronic items/instruments etc.
7) Vendor shall compulsory make office of size 10 feet x 10 feet for site engineer/staff along with facility of computer/laptop/printer for protocol preparation and submission to BHEL.
8) Alternately vendor can provide container of suitable size for sr no-06 and 07 purpose.
9) Vendor shall deploy one number Safety officer and one number Quality engineer during total E&C period. Failure for above BHEL shall deploy it and appropriate charges shall be deducted from

vendor due payments.

10. The equipment shall be stored in an orderly manner, preserving their identification slips, tags and instruction booklets, etc., required during erection. The storage of materials shall be equipment-wise. Loose parts shall be stored in sheds on racks, preserving the identification marks and tags in good condition. The group codes shall be displayed on the racks

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

b) GENERAL PRESERVATION REQUIREMENTS

1. All special measures to prevent corrosion shall be taken like keeping material in dry condition, avoiding the equipment coming in contact with corrosive fluid like water, acid etc.

2. Materials which carry protective coating shall not be wrapped in paper, cloth, etc., as these are liable to absorb and retain moisture. The material shall be inspected and in case of signs of wear or damages to protective coating, that portion shall be cleaned with approved solution and coated with an approved protective paint. Complete record of all such observations and protective measures taken shall be maintained.

3. Generally equipment supplied at site are properly greased or rust protective oil is applied on machined/ fabricated components. However periodic inspection shall be carried out to ensure that protection offered is intact.

4. While handling the equipment, no dragging on the ground is permitted. Avoid using wire rope for lifting coated components. Use polyester slings (if possible) otherwise protective material (e.g. clothes, wood block etc.) should be used while handling the components with rope / slings

5. For Equipment supplied with finished paint, touch paint shall be done in case any surface paint gets peeled off during handling. Otherwise such surfaces shall necessarily be wrapped with polythene to avoid any corrosion. Further for equipment wherein finish coat is to be applied at site, site to ensure that equipment is received with primer coat applied.

6. It shall be ensured by periodic inspection that plastic inserts are intact in tapped holes, wherever applicable.

7. Pipes shall be blown with air periodically and it shall be ensured that there is no obstruction.

8. Silica gel or approved equivalent moisture absorbing material in small cotton bags shall be placed and tied at various points on the equipment, wherever necessary.

9. Heavy rotating parts in assembled conditions shall be periodically rotated to prevent corrosion/jamming due to prolonged storage.

10. All the electrical equipment such as motors, generators, etc. shall be tested for insulation resistance at least once in three months and a record of such measured insulation values shall be maintained.
11. Following preservatives/preservation methods can be used depending upon type of equipment

a. Rust preventive fluid (RPF)

b. Rust protective paints

c. Tarpaulin covers, in case of outdoor storage

d. De-oxy aluminate for weld-ments

c) GENERAL INSPECTION REQUIREMENTS

1. Period inspection of materials with specific reference to –

- Ingress of moisture and corrosion damages.

  Damage to protective coating.

- Open ends in pipes, vessels and equipment –
  - In case any open ends are noticed, same shall be capped.

2. Any damages to equipment / materials.

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

4. TYPE OF STORAGE FOR VARIOUS EQUIPMENT

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

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

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

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

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

iii Open storage (O)

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

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

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

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

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

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

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

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

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

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

5. CONCLUSION

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

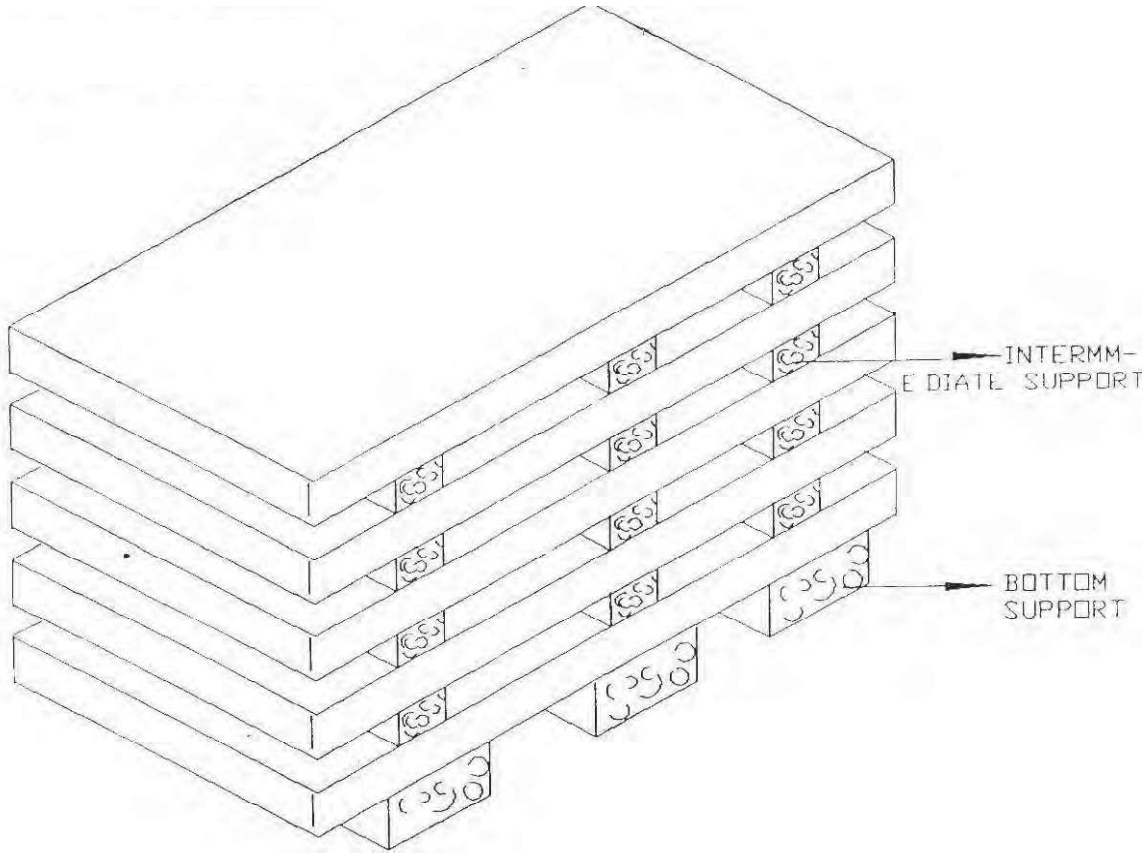


Figure – 1 – PLATE STACKING ARRANGEMENT

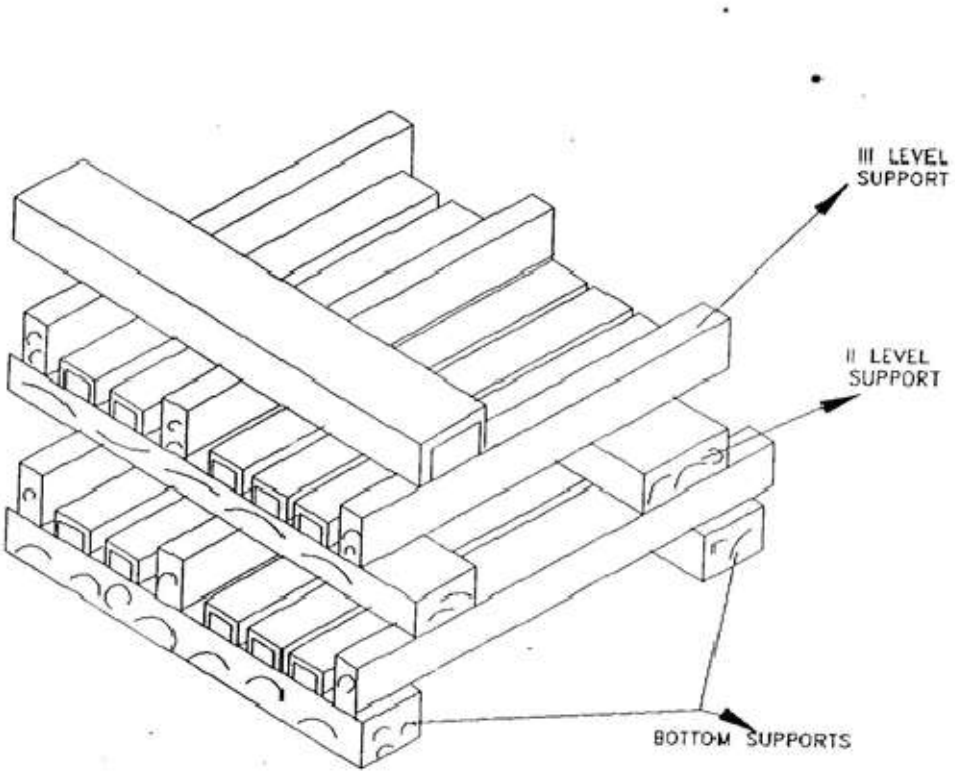


Figure – 2 – STRUCTURAL STEEL STACKING ARRANGEMENT

ANNEXURE-IX

PACKING PROCEDURE

(REFER SUB-SECTION C2-B)

SECTION-I

SUB-SECTION-E

ANNEXURE-X

CUSTOMER SPECIFICATION
ERECTION CONDITIONS OF CONTRACT

39.00.00 PROTECTION OF PROPERTY AND CONTRACTOR'S LIABILITY

39.01.00 The Contractor shall be responsible for any damage resulting from his operations. He shall also be re-sponsible for protection of all persons including members of public and employees of the Employer and the employees of other Contractors and Sub- Contractors and all public and private property including structures, building, other plants and equipments and utilities either above or below the ground.

39.02.00 The Contractor will ensure provision of necessary safety equipment such as barriers, sign - boards, warning lights and alarms, etc. to provide adequate protection to persons and property. The Contractor shall be responsible to give reasonable notice to the Employer and the Employers of public or private property and utili-ties when such property and utilities are likely to get damaged or injured during the performance of his Works and shall make all necessary arrangements with such Employers, related to removal and/or replacement or protection of such property and utilities.

40.00.00 PAINTING

For painting refer Part-A, sub section-III, Section VI of Technical specification.

Painting for structures shall conform to the painting specification specified in Part-B under Civil.

Painting for piping shall conform to the painting specification given in Part-B of the respective chapter.

Painting for Electrical equipments/systems shall conform to the painting specification given in Electrical portion of Part-A and Part-B of technical specifications.

41.00.00 INSURANCE

41.01.00 In addition to the conditions covered under the Clause entitled "Insurance" in Section General Conditions of Contract (GCC), the following provisions will also apply to the portion of works to be done beyond the Contractor's own or his Sub-Contractor's manufacturing Works.

41.02.00 **Workmen's Compensation Insurance**

This insurance shall protect the Contractor against all claims applicable under the Workmen's Compensation Act, 1948 (Government of India). This policy shall also cover the Contractor against claims for injury, disability disease or death of his or his

42.00.00 UNFAVOURABLE WORKING CONDITIONS

The Contractor shall confine all his field operations to those works which can be performed without subjecting the equipment and materials to adverse effects during inclement weather conditions, like monsoon, storms, etc. and during other unfavorable construction conditions. No field activities shall be performed by the Contractor under conditions which might adversely affect the quality and efficiency thereof, unless special precautions or measures are taken by the Contractor in a proper and satisfactory manner in the performance of such Works and with the concurrence of the Employer. Such unfavorable construction conditions will in no way relieve the Contractor of his responsibility to perform the Works as per the schedule.

43.00.00 PROTECTION OF MONUMENTS AND REFERENCE POINTS

The Contractor shall ensure that any finds such as relic, antiquity, coins, fossils, etc. which he may come across during the course of performance of his Works either during excavation or elsewhere, are properly protected and handed over to the

Employer. Similarly the Contractor shall ensure that the bench marks, reference points, etc., which are marked either with the help of Employer or by the Employer shall not be disturbed in any way during the performance of his Works. If, any work is to be performed which disturb such reference, the same shall be done only after these are transferred to other suitable locations under the direction of the Employer. The Contractor shall provide all necessary materials and assistance for such relocation of reference points etc.

44.00.00 WORK & SAFETY REGULATIONS

44.01.00 General

i) The contractor shall comply with all the requirements of "The Building and Other Construction Workers (Regulation of Employment & Conditions of Service) Act," 1996 and its Central Rule 1998 / State Rules and any other statutory requirements as applicable.

ii) The Contractor shall follow NTPC Safety Rules as specified in GCC with respect to safety in construction & erection.

iii) The contractor shall have the approved Safety, Health and Environment (SHE) Policy in respect of Safety and health of Building Workers and it shall be circulated widely and displayed at conspicuous place in Hindi and local language understood by the majority of the workers. A copy of the safety policy should be submitted to Engineer in charge.

iv) Thecontractor shall submit the safety plan comprising of methods to implement the Safety Policy/ Rules, Risk assessment and ensuring Safety at work areas, Safety audits, inspections and its compliance, Supervision and responsibility to ensure Safety at various levels, Safety training to employees and workers, review of Safety and accident analysis, ensure Health and Safety Procedures to prevent accidents for approval as per the format of Safety plan as annexed at Annexure - III.

Bidder shall furnish the Safety Plan, duly filled in as per EMPLOYER's Format.

The above proposed "Safety Plan" shall be further discussed/ finalized at Site, in line with the NTPC safety rules, and shall be approved by Project Manager/ Head of Project before start of work at Site.

v) The Contractors shall ensure proper safety of all the workmen, materials, plant and equipment belonging to him or to the Employer or to others, working at the Site.

vi) All equipments used in construction and erection by the contractor shall meet BIS / International Standards and where such standards do not exist, the Contractor shall ensure these to be absolutely safe. All equipments shall be strictly operated and maintained by the contractor in accordance with manufacturer's operation manual. The contractor should also follow Guidelines / Rules of the Employer in this regard.

vii) The Contractors shall provide suitable latest Personal Protective Equipments of prescribed standard to all their employees and workmen according to the need. The Engineer I/c shall have the right to examine these safety equipments to determine their suitability, reliability, acceptability and

adaptability. The contractor should also ensure these before their use at worksite.

viii) The Contractor shall provide safe working conditions to all workmen and employees at his workplace including safe means of access, railings, stairs, and ladders, scaffolding, work platforms, toe boards etc. The scaffoldings shall be erected under the control and supervision of an experienced and competent person. For erection of scaffolds, access, work platforms etc. shall be good and the contractor shall use standard quality of material.

ix) The Contractor shall follow and comply with all the Safety Rules, standards, code of practices of NTPC and relevant provisions of applicable laws pertaining to the safety of workmen, employees, plant and equipment as may be prescribed from time to time without any protest or contest or reservation. In case of any unconformity between statutory requirement and the Safety Rules of the Employer referred above, the latter shall be binding on the Contractor unless the statutory provisions are more stringent. As and when required he can refer / obtain copy of NTPC safety documents as stated above.

x) The contractor shall have his own arrangements with nearby hospitals for shifting and treatment of sick and injured.

The medical examination of the workers employed in hazardous areas shall be conducted as per Rule 223 0f The Building and Other Construction Worker (Regulation of Employment and Condition of Service) Central Rule 1998 Their health records shall be maintained accordingly and to be submitted to Engineer I/c when asked for. If any worker found suffering from occupational health hazard, the worker should be shifted to suitable place of working and properly treated under intimation to Engineer I/c. The medical fitness certificate to be submitted to Engineer (I/c).

xi) First Aid boxes equipped with requisite articles as specified in the Rule 231 of The Building and Other Construction Worker (Regulation of Employment and Condition of Service) Central Rule 1998 shall be provided at construction sites for the use of workers. Training has to be provided on first aid to workmen & office bearers working at site.

44.01.01 **Emergency Action Plan**

The contractor shall prepare an emergency action plan approved by his competent authority to handle any emergency occurred during construction work. Regular mock drills shall be organized to practice this emergency plan. The Emergency Action Plan should be widely circulated to all the employees and suitable infrastructure shall be provided to handle the emergencies.

44.01.02 **Scaffolding**

The contractor shall take all precautions to prevent any accidental collapse of scaffolding or fall of persons from scaffolding. The contractor should ensure that scaffolding are designed by a competent person and it erection and repairs should be done under the expert supervision. The scaffolding shall meet the required strength and other requirements for the purpose for which the scaffold is erected. The material used for scaffold should conform to the BIS / International standards.

44.01.03 **Opening**

The contractor shall ensure that there is no opening in any working platform/any floor of the building, which may cause fall of workers or material. Whenever an opening on a platform/any floor of the building is unavoidable, the opening should be suitably fenced and necessary measures for protection against falling objects or building workers from such platform are taken by providing suitable safety nets, safety belts or other similar means.

44.01.04 **Explosives**

The contractor shall take all precautions while handling, using, storing or transporting of all explosives. Before usage of any explosive necessary warning / danger signals be erected at conspicuous places to warn the workers and general public. The contractor should strictly ensure that all measures and precautions required to be complied for use, handling, storing or transportation of explosives under the rules framed under the Explosives Act, 1884.

44.02.00 **Fencing of Machinery**

The contractor shall provide suitable fencing or guard to all dangerous and moving parts of machinery.

The contractor shall not allow any of the employees to clean, lubricate, repair, adjust or examine during machinery in motion, which may cause injury to the person.

44.03.00 **Carrying of Excessive Weight by a Worker**

The worker shall not be allowed to lift by hand or carry over his head, back or shoulder more than the maximum limit set by the prescribed rules for the construction Workers.

44.04.00 **Dangerous and Harmful Gases / Equipment**

The contractor shall ensure that the workers are not exposed to any harmful gases during any construction activity including excavation, tunneling, confined spaces etc.

The contractor should not allow any worker to go into the confined space unless it is certified by Engineer (I/c) to be safe and fit for the entry to such work place. Proper record and work permits should be followed to carry out such works.

44.05.00 **Overhead Protection**

The contractor shall ensure that any area exposed to risk of falling materials, articles or objects is roped off or cordoned off or otherwise suitably guarded from inadvertent entry of any person.

Wherever there is a possibility of falling of any material, equipment or construction workers while working at heights, a suitable and adequate safety net should be provided. The safety net should be in accordance with BIS Standards.

44.06.00 **Working at Heights**

All working platforms, ways and other places of construction work shall be free from accumulations of debris or any other material causing obstructions and tripping.

Wherever workers are exposed to the hazard of falling into water, the contractor shall provide adequate equipment for saving the employees from drowning and rescuing from such hazards. The contractor shall provide boat or launch equipped with sufficient number of life buoys, life jackets etc. manned with trained personnel at the site of such work.

Every opening at elevation from ground level through which a building worker, vehicle, material equipment etc. may fall at a construction work shall be covered and/or guarded suitably by the contractor to prevent such falls.

Wherever the workers are exposed to the hazards of falling from height, the contractor shall provide full harness safety belts fitted with fall arresting systems to all the employees working at higher elevations and life line of 8 mm diameter wire rope with turn buckles for anchoring the safety belts while working or moving at higher elevations. Safety nets shall also be provided for saving them from fall from heights and such equipment should be in accordance with BIS standards. Wherever there is a possibility of falling of any material, equipment or construction workers while working at heights, a suitable and adequate safety net should be provided. The safety net should be in accordance with BIS Standards.

The contractor shall provide standard prefabricated ladders on the columns where the workers are required to use them as an access for higher elevations till permanent staircase is provided. The workers shall be provided with safety belts fitted with suitable fall arresting system (fall arrestors) for climbing/getting down through ladders to prevent fall from height.

44.07.00 **Handling of Hazardous Chemicals**

The Contractor will notify well in advance to the Engineer I/c of his intention to bring to the Site any container filled with liquid or gaseous fuel or explosive or petroleum substance or such chemicals which may involve hazards. NTPC shall have the right to prescribe the conditions, under which such container is to be stored, handled and used during the performance of the works and the Contract shall strictly adhere to and comply with such instructions. The Engineer I/c shall have the right at his sole discretion to inspect any such container or such construction plant / equipment for which material in the container is required to be used and if in his opinion, its use is not safe, he may forbid its use. No claim due to such prohibition shall be entertained by NTPC and NTPC shall not entertain any claim of the Contractor towards additional safety provisions / conditions to be provided for / constructed.

Further, any such decision of the Engineer I/c shall not, in any way, absolve the Contractor of his responsibilities and in case, use of such a container or entry thereof into the Site area is forbidden by NTPC, the Contractor shall use alternative methods with the approval of the NTPC without any cost implication to the NTPC or extension of work schedule.

Where it is necessary to provide and / or store petroleum products or petroleum mixtures and explosives, the Contractor shall be responsible for carrying-out such provision and / or storage in accordance with the rules and regulations laid down in Petroleum Act 1934, Explosives Act 1948, and Petroleum and Carbide of Calcium Manual published by the Chief Inspector of Explosives of India. All such storage shall have prior approval of the Engineer I/c. In case any approvals are necessary from the Chief Inspector (Explosives) or any statutory authorities, the Contractor shall be responsible for obtaining the same.

The Contractor shall be fully responsible for the safe storage of his and his Sub-contractor's radio-active sources in accordance with BARC/DAE (Bhabha Atomic Research Centre/ Department of Atomic Energy, Govt. of India) Rules and other applicable provisions. All precautionary measures stipulated by BARC/DAE in connection with use, the contractor would take storage and handling of such material.

The contractor shall provide suitable personal protective equipments to the workers who are handling the hazardous and corrosive substances including alkalis and acids.

As a precautionary measure the contractor should keep the bottles filled with distilled water in cupboard / Boxes near work place for emergency eye wash by worker exposed to such hazardous chemicals.

44.08.00 **Eye Protection**

The contractor shall provide suitable personal protective equipment to his workmen depending upon the nature of hazards and ensure their usage by the workers engaged in operations like welding, cutting, chipping, grinding or similar operations which may cause injuries to his eyes.

44.09.00 **Excavation**

The contractor shall take all necessary measures during excavation to prevent the hazards of falling or sliding material or article from any bank or side of such excavation which is more than one and a half meter above his footing by providing adequate piling, shoring, bracing etc. against such bank or sides.

Adequate and suitable warning signs shall be put up at conspicuous places at the excavation work to prevent any persons or vehicles falling into the excavation trench. No worker should be allowed to work where he may be stuck or endangered by excavation machinery or collapse of excavations or trenches.

44.10.00 **Electrical Hazards**

The contractor should ensure that all electrical installations at the construction work comply with the requirements of latest electricity acts / rules.

The contractor shall take all adequate measures to prevent any worker from coming into physical contact with any electrical equipment or apparatus, machines or live electrical circuits which may cause electrical hazards during the construction work. The contractor shall provide the sufficient ELCBs / RCCBs for all the portable equipments, electrical switchboards, distribution panels etc. to prevent electrical shocks.

The contractor should ensure use of single / double insulated hand tools or low voltage i.e., 110 volts hand tools.

The contractor should also ensure that all temporary electrical installations at the

construction works are provided with earth leakage circuit breakers.

44.11.00 **Vehicular Traffic**

The contractor should employ vehicle drivers who hold a valid driving license under the Motor Vehicles Act, 1988.

44.12.00 **Lifting Appliances, Tools & Tackles, Lifting Gear And Pressure Plant & Equipment etc.**

The contractor shall ensure all the lifting appliances, tools & tackles including cranes etc., lifting gear including fixed or movable and any plant or gear, hoists, Pressure Plant and equipment etc. are in good condition and shall be examined by competent person and only certified shall be used at sites. Periodical Examination and the tests for all lifting / hoisting equipment & tackles shall be carried out. A register of such examinations and tests shall be properly maintained by the Contractor and will

be promptly produced as and when desired by the Engineer I/c or by the person authorized by him.

44.13.00 **Excessive Noise, Vibration**

The contractor shall take adequate measures to protect the workers against the harmful effect of excessive noise or vibration. The ambient noise should not exceed the limits prescribed under the concerned rules, Noise Pollution (Regulation and Control) Rules, 2000. Generally for brownfield projects background noise is in the range of 58-60 DB, however it shall be responsibility of contractor to collect and measure the latest noise data at site.

44.14.00 **Electrical Installations**

44.14.01 The Contractor shall not interfere or disturb electric fuses, wiring and other electrical equipment belonging to the Employer or other contractors under any circumstances, whatsoever, unless expressly permitted in writing by the Engineer I/c to handle such fuses, wiring or electrical equipment.

Before the Contractor connects any electrical appliances to any plug or socket belonging to the other contractor or the NTPC, he shall

i) Satisfy the Engineer I/C that the appliance is in good working condition;

ii) Inform the Engineer I/C of the maximum current rating, voltage and phases of the appliances;

iii) Obtain permission of the Engineer I/C detailing the sockets to which the appliances may be connected.

The Engineer I/C will not grant permission to connect until he is satisfied that:

The appliance is in good condition and is fitted with suitable plug; having earth connection with the body.

Wherever armored / metallic sheathed multi core cable is used, the same armored / sheathed should be connected to earth.

iv) No repair work shall be carried out on any live equipment. The Engineer I/c must declare the equipment safe and a permit to work shall be issued by the NTPC / contractor as the case may be to carry out any repair / maintenance work. While working on electric lines / equipments whether live or dead, suitable type and sufficient quantity of tools will have to be provided by the contractor to electricians / workmen / Officers.

v) The contractor shall employ necessary number of qualified, full time Electricians / Electrical Supervisors to maintain his temporary electrical installation. The installations are provided with suitable ELCBs and RCCBs wherever required.

44.15.00 **Safety Organisation**

44.15.01 The contractor shall employ full time safety officer(s) as per requirement stipulated in NTPC Safety Rules, exclusively to supervise safety aspects of the equipments and workmen, who will coordinate with the NTPC Safety Officer. Further requirement of safety officers, if any, shall be guided by Rule 209 of The Building and Other Construction Worker (Regulation of Employment and Conditions of Service) Central Rule 1998. In case the work is being carried out through subcontractor, the employees / workmen of the sub-contractor shall also be considered as the contractor's employees/workmen for the above purpose.

44.15.02 The name and address of such Safety Officer of the Contractor will be promptly informed in writing to the EIC with a copy to the Project Safety Officer before he starts work or immediately after any change of the incumbent is made during currency of the Contract.

44.16.00 **Reporting of Accident and Investigation**

In case any accident occurs during the construction / erection or other associated activities undertaken by the Contractor thereby causing any near miss, minor or major or fatal injury to his employees due to any reason, whatsoever, it shall be the responsibility of the Contractor to promptly inform the same to the Engineer I/C, NTPC Safety Officer with a copy to NTPC Head of Project in the prescribed form and also to all the authorities envisaged under the applicable laws.

44.17.00 **Right to stop Work**

44.17.01 The Engineer I/C shall have the right at his sole discretion to stop the work, if in his opinion the work is being carried out in such a way that it may cause accidents and endanger the safety of the persons and / or property, and / or equipments. In such cases, the contractor shall be informed in writing about the nature of hazards and possible injury / accident and he shall comply to remove shortcomings promptly. The Contractor after stopping the specific work can, if felt necessary appeal against the order of stoppage of work to the Project Manager within 3 days of such stoppage of work and decision of the Project Manager in this respect shall be conclusive and binding on the Contractor.

44.17.02 The Contractor shall not be entitled for any damages / compensation for stoppage of work, {Sub-Clause XVIII (I)} due to safety reasons and the period of such stoppage of work shall not be taken as an extension of time for Completion of the Facilities and will not be the ground for waiver of levy of liquidated damages.

44.18.00 **Fire Protection**

The contractor shall provide sufficient fire extinguishers at place /s of work. The fire

extinguishers shall be properly maintained as per relevant BIS Standards. The employees shall be trained to operate the fire extinguishers / equipment.

44.19.00 **Penalties**

I If any contractor worker found working without using the safety equipment like safety helmet, safety shoes, safety belts, etc. or without anchoring the safety belts while working at height the Engineer I/c shall have the right to regulate the payment in accordance with provisions of GCC. Further such defaulting worker shall be sent out of the workplace immediately and shall not be allowed to work on that day. Engineer I/c / Safety Officer of NTPC will also issue a notice in this regard to the contractor.

II If two or more fatal accidents occur at same NTPC site under the control of contractor during the period of contract and he has

(1) not complied with keeping adequate PPEs in stock or

(2) defaulted in providing PPEs to his workmen

(3) not followed statutory requirements / NTPC safety rules

(4) been issued warning notice/s by NTPC head of the project on nonobservance of safety norms

(5) not provided safety training to all his workmen, the contractor can be debarred from getting tender documents in NTPC for two years from the date of last accident.

The contractor shall submit the accident data including fatal / non-fatal accidents for the last 3 years where he has undertaken the construction activities Projects-wise along with the tender documents. If the information given by the contractor found incorrect, his contract will be liable to be terminated.

44.20.00 The Contractor will make available minimum quantity of all safety equipments and safety PPEs of required specifications as per suggestive list included bidding documents as a part of "List of minimum T & P". Further Contractor will ensure availabilitty of additional requirement for individual worker and safety equipment as per site requirement during execution of the contract till its completion.

44.21.00 The Contractor shall abide by the following during Construction and Erection activities:

I. Chain pulley block shall not be used for loads more than 2 (Two) tonne.

II. Hydra shall not be used for material transport.

III. Cage shall necessarily be provided to Monkey ladders of height more than 4 m.

IV. Fencing shall be provided to all Electrical Distribution boards and transformers etc.

44.22.00 Contractor shall ensure following regarding implementation of Safety:

a) Two Tier Safety Monitoring System:
Separate Safety Consultancy contract shall be awarded by NTPC for assisting and guiding overall Plant Safety during Construction. The safety consultant shall induct and engage manpower required as per specific requirements of project.
For Construction safety, Contractor shall engage certified safety team in consultation with NTPC Safety team /safety Consultant for each package/area.

b) Risk level of different area of plant shall be evaluated by NTPC Safety & Safety consultant. Based on the severity of risk level, total project area shall be categorized into different safety zones and each zone will be identified with different color coding.

c) Dedicated Project Safety Manager of Safety Consultant will be deployed. Contractor to deploy area/ system wise safety representative for each system/ area of project e.g. SG area, TG Main Power House area and similarly in other BOP Systems.

d) The Safety Officer can stop work of any contractor if safety rules are violated.

e) There should also be safety clearance in Quarterly RA bills in addition to the clearances being presently taken from HR and Quality dept.

f)	PPEs, scaffoldings, safety nets, testing tools etc. should be monitored by NTPC Safety Manager to control and maintain the uniformity of Quality for Safety equipment/ PPEs.
g)	There should be 24/7 Safety Control room equipped with IP Camera, AI Input alarms and proper communication system for monitoring safety. All CCTV footage shall be available to control room. Drone based safety monitoring shall be done during day. The safety control room shall be operated & managed by NTPC through safety consultant.
h)	Safety management plan for the Project must be submitted for approval before start of work.
i)	In line with the Project Planning, Safety planning will be done jointly by Project Team and Consultants.
j)	Availability of Fire Tender shall be ensured by contractor before start of construction work.
k)	**Number of Safety Stewards**: Each area (e.g. SG, TG, etc.) should have minimum 5 safety Stewards from Main Agency and 5 from the sub agency.
l)	Contractor should provide scaffolding material, pipes, clamps, boards and scaffolding of standard quality.
m)	Uses of Safety net, Fire blankets and fall arrester shall be adequate.
n)	Construction Elevators shall be used during erection phase.
o)	Material transport through Hydra shall be avoided.
p)	Good Quality and new PPEs and tools and machinery shall be used.
q)	All Agency /Sub Agency will deploy Safety manpower after getting approval from Head of safety Consultant.
r)	Contractor Safety officer shall take approval of JSA /HIRA of each area from Safety consultant. Before Start of work in a particular area, concerned Safety consultant clearance is must.
s)	Inspect the site to ensure it is a hazard-free environment & promotes safe practices at the job site.
t)	Verifies that injury logs and reports are completed and submitted to NTPC.
u)	Receives reports from and responds to orders issued by NTPC and Labor inspectors.
v)	Serve as primary contact for project site incident and injury notification, investigation, and follow-up.
w)	Organize and maintain necessary project safety documentation.
x)	Training Setup to be created for giving basic education of Safety to workers.
y)	Safety Park and work simulation facility to be created at site.
z)	Health Check Up facility of workers.
aa)	Vendor Safety circle (with max 25 nos person) and monthly safety award to be created.

bb)	24/7 first aid center (common for all agency) and expenditure on contribution basis which is decided by NTPC safety department.
45.00.00	**FOREIGN PERSONNEL**
45.01.00	The Contractor shall submit to the Employer data on all personnel he proposes to bring into India from abroad for the performance of the Works under the Contract, at least sixty (60) days prior to their departure to India. Such data will include for each person the name, his present address, his assignment and responsibility in connection with the works, and a short resume of his qualification, experience etc. in relation to the work to be performed by him.
45.02.00	Any person unsuitable and unacceptable to the Employer shall not be brought to India. Any person brought to India, if found unsuitable or unacceptable by the Employer, the Contractor shall within a reasonable time make alternate arrangements for providing a suitable replacement and repatriation of such unsuitable personnel.
45.03.00	No person brought to India for the purposes of the works shall be repatriated without the consent of the Employer in writing, based on a written request from the Contractor for such repatriation giving reasons for such an action to the Employer. The Employer may give permission for such repatriation provided he is satisfied that the progress of work will not suffer due to such repatriation.
45.04.00	The cost of passports, visas and all other travel expenses to and from India, incurred by the Contractor shall be to his account. The Employer will not provide any residential accommodation and/or furniture for any of the Contractor's personnel including foreign personnel and Contractor shall make his own arrangements for such facilities in the area allotted at Site, to him by the Employer for that purpose.
45.05.00	The Contractor and his expatriate personnel shall respect all Indian Acts, Laws, rules and regulations and shall not in any way interfere with Indian political and religious affairs and shall conform to any other rules and regulations which the Government of India and the Employer may establish from time to time, on them. The Contractor's expatriate personnel shall work and live in close co-operation and coordination with their co-workers and the community and shall not engage themselves in any other employment neither part-time nor full-time nor shall they take part in any local politics.
45.06.00	The Employer shall assist the Contractor, to the extent possible, in obtaining necessary permits to travel to India and back, by issue of necessary certificates and other information needed by the Government agencies.
46.00.00	**FOUNDATION DRESSING & GROUTING FOR EQUIPMENT/ EQUIPMENT BASES**
46.01.00	The surfaces of foundations shall be dressed to bring the top surface of the foundations to the required level, prior to placement of equipment/equipment bases on the foundations.
46.02.00	All the equipment/ equipment bases, shall be grouted and finished by bidder as per these specifications unless otherwise recommended by the equipment manufacturer.
46.03.00	The concrete foundation surfaces shall be properly prepared by bidder by chipping, grinding as required to bring the top of such foundation to the required level, to

provide the necessary roughness for bondage and to assure enough bearing strength.

46.04.00 **Grout**

The grout for equipment foundation shall be high strength grout having a minimum characteristic compressive strength of 60 N/mm2 at 28 days. The grout shall be ready mix non-shrink, chloride - free, cement based, free flowing, non-metallic grout as recommended by equipment manufacturer. The ready mix grout shall be of reputed make as approved by the Employer.

The Grout shall have good flowability even at very low water/ grout powder ratio.

The Grout shall have characteristics of controlled expansion to be able to occupy its original volume to fill the voids and to compensate for shrinkage. Grout shall be of pre-mix variety so that only water needs to be added before use.

The mixing of the Grout shall conform to the recommendations of the manufacturer of the Grout.

46.05.00 **Placing of Grout**

46.05.01 After the base has been prepared, its alignment and level has been checked and approved and before actually placing the grout, a low dam shall be set around the base at a distance that will permit pouring and manipu-lation of the grout. The height of such dam shall be at least 25mm above the bottom of the base. Suitable size and number of chains shall be introduced under the base before placing the grout, so that such chains can be moved back & forth to push the grout into every part of the space under the base.

46.05.02 The grout shall be poured either through grout holes if provided or shall be poured at one side or at two adjacent sides to make the grout move in a solid mass under the base and out in the opposite side. Pouring shall be continued until the entire space below the base is thoroughly filled and the grout stands at least 25 mm higher all around than the bottom of the base. Enough care should be taken to avoid any air or water pockets beneath the bases.

46.05.03 In addition to the above, recommendations of Grout manufacturer shall also be followed.

46.06.00 **Finishing of the Edges of the Grout**

The poured grout should be allowed to stand undisturbed until it is well set. Immediately thereafter, the dam shall be removed and grout which extends beyond the edges of the structural or equipment base plates shall be cut off, flushed and removed. The edges of the grout shall then be pointed and finished with 1:2 cement mortar pressed firmly to bond with the body of the grout and smoothened with a tool to present a smooth vertical surface. The work shall be done in a clean and scientific manner and the adjacent floor spaces, exposed edges of the foundations, and structural steel and equipment base plates shall be thoroughly cleaned of any spillage of the grout.

46.07.00 **Checking of Equipment After Grouting**

After the grout is set and cured, the Contractor shall check and verify the alignment of equipments, alignment of shafts of rotating machinery, the slopes of all bearing pedestals, centering of rotors with respect to their sealing bores, couplings, etc. as applicable and the like items to ensure that no displacement had taken place

ANNEXURE-XI

E-LEARNING MODULE

(REFER GENERAL TECHNICAL REQUIREMENTS CLAUSE NO. 8.03.05)

SECTION II

SECTION-II

SUB-SECTION-1

INSPECTION AND TESTING

1.01.00 Inspection and Tests during Manufacture.

1.01.01 The method and techniques to be used by the Bidder for the control of quality during manufacture of all plant and equipment shall be agreed with the Owner.

1.01.02 The Owner's general requirements with respect to quality control and the required shop tests are set out elsewhere in this specification.

1.01.03 Before any item of plant or equipment leaves its place of manufacture the Owner shall be given the option of witnessing inspections and tests for compliance with the specification and related standards.

1.01.04 Advance notice shall be given to the Owner as agreed in the Contract, prior to the stage of manufacture being reached, and the piece of plant must be held at this stage until the Owner has inspected the piece, or has advised in writing that inspection is waived. If having consulted the Owner and given reasonable notice in writing of the date on which the piece of plant will be available for inspection, the Owner does not attend the Bidder may proceed with manufacture having forwarded to the Owner duly certified copies of his own inspection and test results.

The owner's representative shall have at all reasonable times access to bidder's or his sub-vendor's premises and shall have power to inspect/ examine materials and workmanship or equipment under manufacture.

The Bidder shall forthwith forward to the engineer duly certified copies of the Test Certificates in six copies (one to the Purchaser and five to the Consulting Engineer) for approval. Further nine (9) copies of Shop Test Certificates shall be bound with Instruction Manuals referred to elsewhere.

For electrical equipment, routine tests as per relevant IS spec are to be carried out on all equipment. Type tests are also to be carried out on selected equipment as detailed in the specs of concerned electrical equipment.

1.01.05 Under no circumstances any repair or welding of castings be carried out without the consent of the Engineer. Proof of the effectiveness of each repair by radiographic and/or other non-destructive testing technique, shall be provided to the Engineer.

1.01.06 All the individual and assembled rotating parts shall be statically and dynamically balanced in the works.
Where accurate alignment is necessary for component parts of machinery normally assembled on site, the Bidder shall allow for trial assembly prior to dispatch from place of manufacture.

1.01.07 All materials used for the manufacture of equipment covered under this specification shall be of tested quality. Relevant test certificates shall be made available to the

Purchaser. The certificates shall include tests for mechanical properties and chemical analysis of representative material. Equipment or parts coming under any statutory Regulations shall be certified by a Competent Authority under the regulations in the specified format.

1.01.08 All pressure parts connected to pumping main shall be subjected to hydraulic testing at a pressure of 150% of shut-off head for a period not less than one hour. Other parts shall be tested for one and half times the maximum operating pressure, for a period not less than one hour.

1.01.09 All necessary non-destructive examinations shall be performed to meet the applicable code requirements.

1.01.10 All welding procedures adopted for performing welding work shall be qualified in accordance with the requirements of Section-IX of ASME code or IBR as applicable. All welded joints for pressure parts shall be tested by liquid penetrant examination according to the method outlined in ASME Boiler and Pressure Vessel code. Radiography, magnetic particle examination magnuflux and ultrasonic testing shall be employed wherever necessary/ recommended by the applicable code. At least 10% of all major but welding joints shall be radiographed unless otherwise stipulated.

Statutory payments in respect of IBR approvals including inspection shall be made by the bidder. Bidder's scope shall include to preparation of all necessary documents, co-ordination and follow-up for above approval. Owner shall only forward assistance/endorsement of documents /design /drawings /reports/records to be submitted for approval as stipulated/ required by Statutory Authorities till registration of the unit and clearance for commercial operation.

1.02.00 Performance Tests at Site

1.02.01 The full requirements for testing the system shall be agreed between the Owner and the Bidder prior to Award of Contract. The completely erected System shall be tested by the Bidder on site under normal operating conditions. The Bidder shall also ensure the correct performance of the System under abnormal conditions, i.e. the correct working of the various emergency and safety devices, interlocks, etc.

1.02.02 The Bidder shall provide complete details of his normal procedures for testing, for the quality of erection and for the performance of the erected plant. These tests shall include site pressure test on all erected pipe work to demonstrate the quality of the piping and the adequacy of joints made at site.

1.02.03 The Bidder shall furnish the quality procedures to be adopted for assuring quality from the receipt of material at site, during storage, erection, pre-commissioning to tests on completion and commissioning of the complete system/equipment.

1.03.00 For details of specific tests required on individual equipment refer to respective section of this specification.

All Statutory testing / clearance is in Bidder's scope including payment of all fees, etc. as required

QAP FORMAT

BHARAT HEAVY ELECTRICALS LIMITED

CORPORATE QUALITY ASSURANCE

PROJECT: SYSTEM :

VENDOR : ITEM :

SL NO	COMPONENT /OPERATION OPERATIONS	CHARACTERISTICS CHECKED	CATEGORY	TYPE /METHOD OF CHECK	EXTENT OF CHECK	REFERENCE DOCUMENTS	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY P	AGENCY W	AGENCY V	REMARKS
1	2	3	4	5	6	7	8	9	10			11

Legend: 1. BHEL 2. Vendor 3. Sub-Vendor

QP No	CQS/SQP/31	Signature	Date			
	Rev		Name			
Page No	1 of 1		Party	Customer/Consultant	Bhel	Vendor

COMPLIANCE CUM CONFIRMATION CERTIFICATE

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

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

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

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

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

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

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

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

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

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

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

commissioning, additional requirements emerges due to customer and / or consultant's comments. No extra claims shall be put on this account

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

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

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

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

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

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

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

1. Compliance cum confirmation certificate
2. Guaranteed power consumption
3. Un priced format for HVAC package
4. Deviation schedule /No deviation certificate in attached format 'Deviation sheet (Cost of withdrawal)'.
5. Pre-bid clarification schedule, if applicable.

PRE-BID CLARIFICATION SCHEDULE

S. NO.	SECTION/CLAUSE/PAGE NO.	STATEMENT OF THE REFERRED CLAUSE	CLARIFICATION REQUIRED

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

Signature: _____

Name: _____

Designation: _____

Company: _____

Date: _____

Company Seal

NO DEVIATION CERTIFICATE

SL NO	VOULME / SECTION	PAGE NO.	CLAUSE NO.	TECHNICAL SPECIFICATION/ TENDER DOCUMENT	COMPLETE DESCRIPTION OF DEVIATION	COST OF DEVIATION	PORTION OF PRICE SCHEDULE ON WHICH COST OF DEVIATION IS APPLICABLE	NATURE OF COST OF DEVIATION (POSITIVE/ NEGATIVE)	WHETHER COST OF DEVIATION INCLUDED/ EXCLUDED IN PRICE BID	REMARKS
TECHNICAL DEVIATIONS										
COMMERCIAL DEVIATIONS										

PARTICULARS OF BIDDERS/ AUTHORISED REPRESENTATIVE			
NAME	**DESIGNATIONS**	**SIGN & DATE**	**COMPANY SEAL**

NOTES:

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

	1X800 MW SIPAT STPP (STAGE-III) AC SYSTEM GPC FORMAT	SPECIFICATION No: PE-TS-520-553-002-A001 REV. NO. 00 | OCT 2025 SHEET: 1 OF 1

S.NO.	DESCRIPTION OF EQUIPMENT	NO OF EQUIPMENT		TOTAL GUARANTEED POWER CONSUMPTION FOR EACH EQUIPMENT AT MOTOR INPUT TERMINAL AND CONTROL PANEL	DUTY FACTOR	TOTAL KW
		WORKING	STANDBY			
1	2	3A	3B	4	5	6=3Ax4 x5
1	AC PLANT-1 FOR MAIN POWER HOUSE AREA					
1.1	Water Cooled Screw Compressor motor	2	1		1	
1.2	Condenser water pump	2	1		1	
1.3	Chilled water pump	2	1		1	
1.4	AHU at 28.0 m	2	1		1	
1.5	AHU AT 9.0 m	2	1		1	
2	AC PLANT-2 FOR ESP CONTROL ROOM AREA					
2.1	Air Cooled Condensing Unit	1	1		1	
2.2	AHU in AHU Room for ESP Cum FGD Control Room	1	1		1	

Note:

Estimated power consumption (EPC) figure for the system (for working drives only) has been considered as **450 KW.** So long bidder's quoted guaranteed power consumption (GPC) above remains within this EPC, there will be no technical loading of bid on power consumption for evaluation. However, if bidder's quoted GPC exceeds EPC, there shall be technical loading of bid for evaluation **@ USD 4,661 per kW** of additional power over EPC.

Bidder’s guaranteed power consumption at motor input terminals (not shaft power) as furnished in relevant schedule shall be demonstrated by the successful bidder during performance testing at works/ site. In case power consumption is noted higher than EPC / bidder's quoted GPC whichever is higher, during inspection/ PG test, penalty **@ USD 4,661 per KW** shall be levied on vendor.

Conversion rate of USD to INR shall be Bill selling exchange rate of State Bank of India prevailing on 10.07.2024

1X800 MW SIPAT STPP (STAGE-III)
VENTILATION SYSTEM
GUARANTEED POWER CONSUMPTION FIGURES

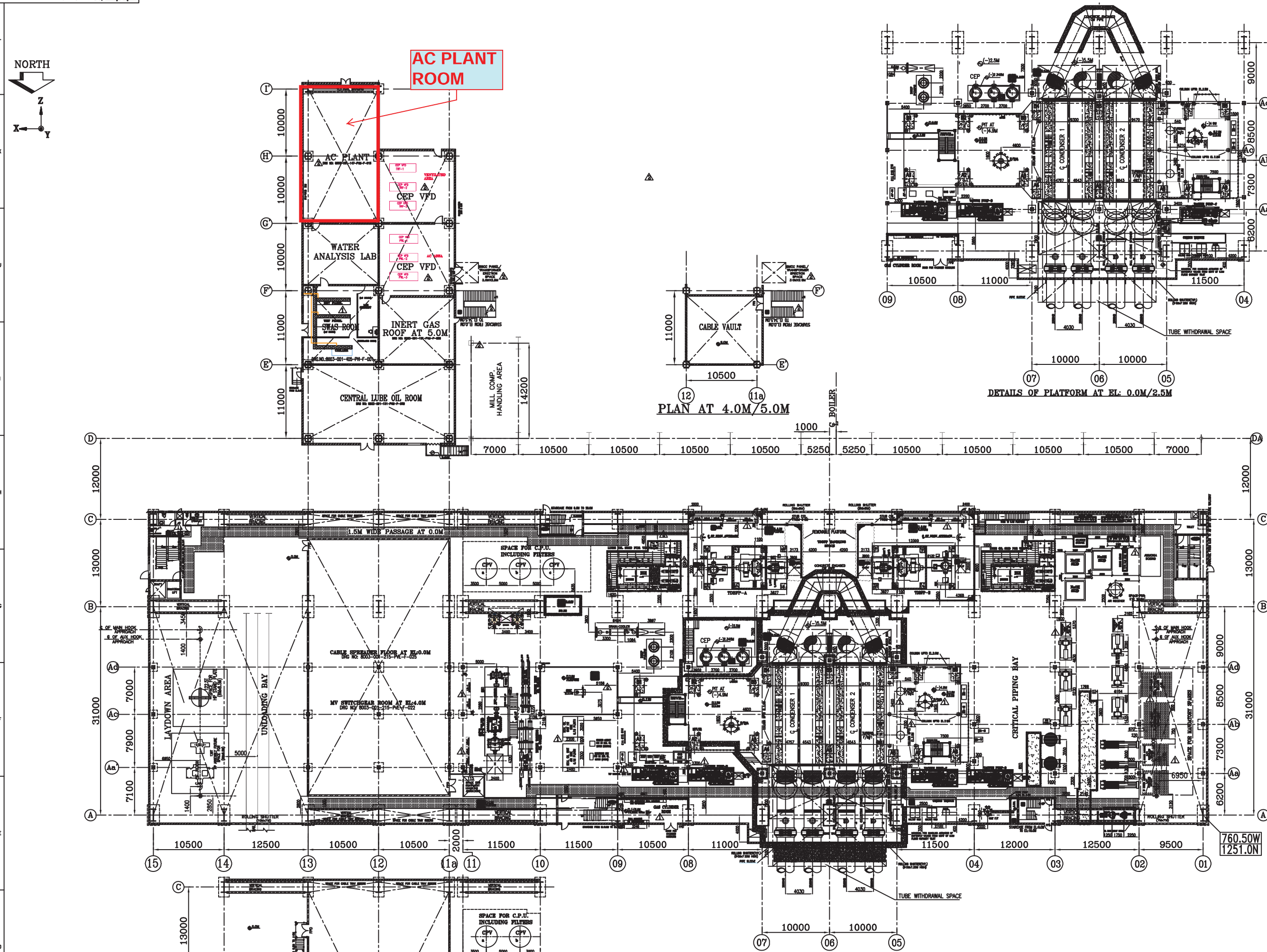
S.NO.	DESCRIPTION OF EQUIPMENT	NO OF EQUIPMENT		TOTAL GUARANTEED POWER CONSUMPTION FOR EACH EQUIPMENT AT MOTOR INPUT TERMINAL AND CONTROL PANEL	DUTY FACTOR	TOTAL KW
		WORKING	STAND BY			
1	2	3A	3B	4	5	6=3Ax4 x5
1.0	**VENTILATION SYSTEM FOR POWER HOUSE BLDG.**					
a)	Centrifugal Fan of cap. 1,00,000 CMH at 60 mmwc static pr for air washers.	10	0		1	
b)	Centrifugal Fan of cap. 50,000 CMH at 60 mmwc static pr. for air washers.	1	0		1	
2	**VENTILATION SYSTEM FOR ESP BUILDING**					
a)	Centrifugal Fan of cap. 90,000 CMH at 50 mmwc static pr for UAF.	1	0		1	

	Estimated power consumption (EPC) figure for the system (for working drives only) has been considered as **310 KW.** So long bidder's quoted guaranteed power consumption (GPC) above remains within this EPC, there will be no technical loading of bid on power consumption for evaluation. However, if bidder's quoted GPC exceeds EPC, there shall be technical loading of bid for evaluation **@ USD 4,661 per kW** of additional power over EPC.
Note:	Bidder’s guaranteed power consumption at motor input terminals (not shaft power) as furnished in relevant schedule shall be demonstrated by the successful bidder during performance testing at works/ site. In case power consumption is noted higher than EPC / bidder's quoted GPC whichever is higher, during inspection/ PG test, penalty **@ USD 4,661 per KW** shall be levied on vendor. Conversion rate of USD to INR shall be Bill selling exchange rate of State Bank of India prevailing on 10.07.2024

APPENDIX-1

TENDER DRAWINGS / DOCUMENTS

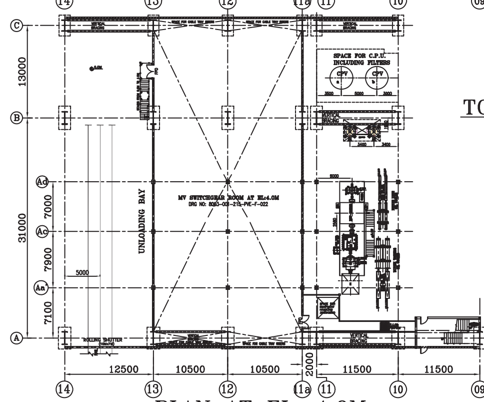
FIRST ANGLE PROJECTION — ALL DIMENSIONS ARE IN MM



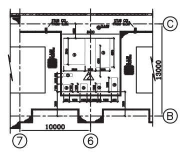
PLAN AT 4.0M/5.0M

DETAILS OF PLATFORM AT EL: 0.0M/2.5M

TG EQUIPMENT PLAN LAYOUT AT 0.0M



PLAN AT EL. 4.0M



REFERENCE DRGS. ⚠					
SL NO	TITLE	NUMBER	NTPC DRG. NUMBER	UNIT	HANDLING ARRANGEMENT
1	TG EQUIPMENT PLAN AT EL 9.0 M	PE-DG-520-100-M004	8003-001-110-PVM-F-050	PEM	–
2	TG EQUIPMENT PLAN AT EL18.0 M	PE-DG-520-100-M005	8003-001-110-PVM-F-051	PEM	–
3	TG EQUIPMENT PLAN AT MISCELLANEOUS FLOORS	PE-DG-520-100-M006	8003-001-110-PVM-F-052	PEM	–
4	T.G. HALL CROSS SECTION	PE-DG-520-100-M007	8003-001-110-PVM-F-053	PEM	–
5	GA OF UNIT AIR RECEIVER	--	8003-001-102-PVM-Y-021	PEM	–
6	CONDENSER	01601070073C246	8003-001-110-PVM-B-084	HWR	–
7	GA OF DRAIN COOLER	--	8003-001-110-PVM-B-032D	HYD	–
8	GENERAL ARRANGEMENT F/T-A	BP-DG-520-102-001	8003-001-110-PVM-B-625	BPL	–
9	GENERAL ARRANGEMENT F/T-B	BP-DG-520-102-002	8003-001-110-PVM-B-626	BPL	–
10	GENERAL ARRANGEMENT UFT	BP-DG-520-102-003	8003-001-110-PVM-B-627	BPL	–
11	FOUNDATION DETAILS OF GENERATOR AUXILIARY EQUIPMENTS	--	8003-001-110-PVM-V-002	HWR	–
12	TDBFP AUXILIARY EQUIPMENT FOUNDATIONS	--	--	HYD	–
13	DRIP PUMPS GA	--	8003-001-110-PVM-B-052	HYD	EOT
14	GA OF ACW PUMPS	--	8003-001-110-PVM-B-087	PEM	HOIST
15	GA OF TG PHE	--	8003-001-110-PVM-Y-065	PEM	–
16	GA DMCW PUMP	--	8003-001-110-PVM-B-087	PEM	HOIST
17	LEAKAGE OIL TANK AND PUMP	--	8003-001-110-PVM-B-017	HWR	–
18	GA WASTE OIL TANK	--	8003-001-110-PVM-B-118B	HWR	–
19	GA VACUUM PUMPS	--	8003-001-109-PVM-Y-021	HWR	HOIST
20	EQUIPMENT LAYOUT FOR CPU SV	PE-V0-520-155-W001	8003-001-110-PVM-U-003	PEM	–
21	GA NaOH DOSING SKID	--	8003-001-102-PVM-B-004	PEM	–
22	GA AMMONIA DOSING SKID	--	8003-001-102-PVM-B-004	PEM	–
23	GA OF OXYGEN DOSING	--	8003-001-102-PVM-B-004	PEM	–
24	GA OF GLAND STEAM CONDENSER	01620570014C240	8003-001-110-PVM-B-034	HWR	–
25	GA OF TDBFP	--	8003-001-110-PVM-B-044	HYD	EOT
26	GA OF MDBFP	--	8003-001-110-PVM-B-044A	HYD	EOT
27	FOUNDATION ARRG. OF TDBFP	--	8003-001-110-PVM-B-044	HYD	–
28	FOUNDATION ARRG. OF MDBFP	--	8003-001-110-PVM-B-044A	HYD	–
29	AC PLANT ROOM LAYOUT & COOLING TOWER AREA LAYOUT	PE-V0-520-553-A046	8003-001-147-PVM-F-015	PEM	–
30	AIR WASHER LAYOUT ALONG "A ROW" SIDE – TG BUILDING	PE-V0-520-554-A023	8003-001-148-PVM-F-004	PEM	–
⚠ 31	GAS CYLINDER ROOM	PE-V0-520-554-A023	8003-001-148-PVM-F-004	HWR	–
⚠ 32	PH BLDG.-DESIGN OF MISC. PLATFORMS	PE-DC-520-612-C056	8003-001-315-PVC-U-0623	PEM	–

LEGEND

- PIPE HATCH
- VERTICAL BRACING
- FPD — FIRE PROOF DOOR
- GRATING
- CHEQUERED PLATE
- Ⓡ — REMOVABLE HAND RAILING
- CABLE TRAY
- FIRE BARRIER WALL
- INDICATES PIPES/CABLE TRESTLE.
- RS — ROLLING SHUTTER
- RAIL TRACK
- PIPE TRENCH WITH PCC COVERED SAND FILLED
- BRICK WALL
- BUS DUCT
- WALK WAY
- CONCRETE
- CPB — CHAIN PULLEY BLOCK
- FIRE WALL
- CLADDING

⚠ SPACE FOR MANDATORY SPARES (FOR FUTURE) IN TURBINE HALL:–

1. Complete assembly of HPT module (at 0.0M)
2. ⚠ IP inner casing (L/H & U/H) (at 0.0M)
3. MD BFP Motor (at 0.0M)
4. Generator rotor (at 18.0M)
5. LP Turbine bladed rotor assembly (at 18.0M)
6. TD BFP drive turbine rotor (at 18.0M)
7. Exciter (at 18.0M)
8. ⚠ Bladed IP rotor (at 18.0M)

NOTES:–

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATION MARKED ARE W.R.T. TG HALL FINISHED FLOOR ELEVATION OF EL 0.0M WHICH CORRESPONDS TO RL 282.50 M.
3. FOR CABLE TRAY/BUS DUCT/TRENCH/SLIT LAYOUT, ELECTRICAL DRAWING TO BE REFERRED.
4. LUBE OIL PIPING BETWEEN COOLERS AND MDBFP TO BE ROUTED BELOW WALKOVER PLATFORM.

⚠ DETAIL OF LAYDOWN SPACE FOR TDBFP COMPONENTS

S.No.	DESCRIPTION	LENGTH (MM)	BREADTH (MM)	HEIGHT (MM)	WEIGHT (Kg)
01	OUTER CASING (UP) + EXHAUST HOOD (UP)	3000	3700	2500	12000+9000
02	ROTOR	4070	2000	2000	5500
03	FRONT BEARING PEDESTAL (UP)	800	1100	400	300
04	REAR BEARING HOUSING (UP)	1000	1120	500	300
05	GUIDE BLADE CARRIER-I (UP)	400	1205	600	600
06	GUIDE BLADE CARRIER-II (UP)	920	2000	1000	2050
07	STEAM CHAMBER (UP)	480	1200	600	1110

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

ग्राहक ड्राइंग संख्या / CUSTOMER DRAWING NO.: 8003-001-110-PVM-F-049

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

कार्य संख्या / JOB NO.: 520

स्थिति / STATUS: CONTRACT

परियोजना / PROJECT: 1X800 esxAoAV Ihir Iqij FAeZy iAoj ifj;AstuA, pj.k-II
1X800 MW NTPC SIPAT STPP, STAGE-III

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

मुद्रण स्केल मीटर मे / PRINT SCALE IN METRE

DEPT CODE		नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
M	तैयारकर्ता/DRN	VKS	-sd-	13.11.2024
	डिजाइनकर्ता/DESN	RA/AA	-sd-	13.11.2024
	जांचकर्ता/CHD	PM	-sd-	13.11.2024
	अनुमोदनकर्ता/APPD	BKA	-sd-	13.11.2024

REV.	DATE	ALTD	CHD	APPD
1	26.03.25	RA/AA	PM	BKA

1. DRG. REVISED INLINE WITH NTPC COMMENTS RCVD. LETTER NO. CC-ENGG-8003-001-110-PVM-F-049 RCVD. DTD. 02/12/2024.
2. REVISION MARKED ⚠

शीर्षक/TITLE: TG EQUIPMENT LAYOUT DRAWING AT 0.0 M

MPL | CIVIL | ELEC | S&CE | WSE | MAX | DEPT. | SCALE- 1:250

ड्राइंग संख्या / DRAWING NO.: PE-DG-520-100-M003

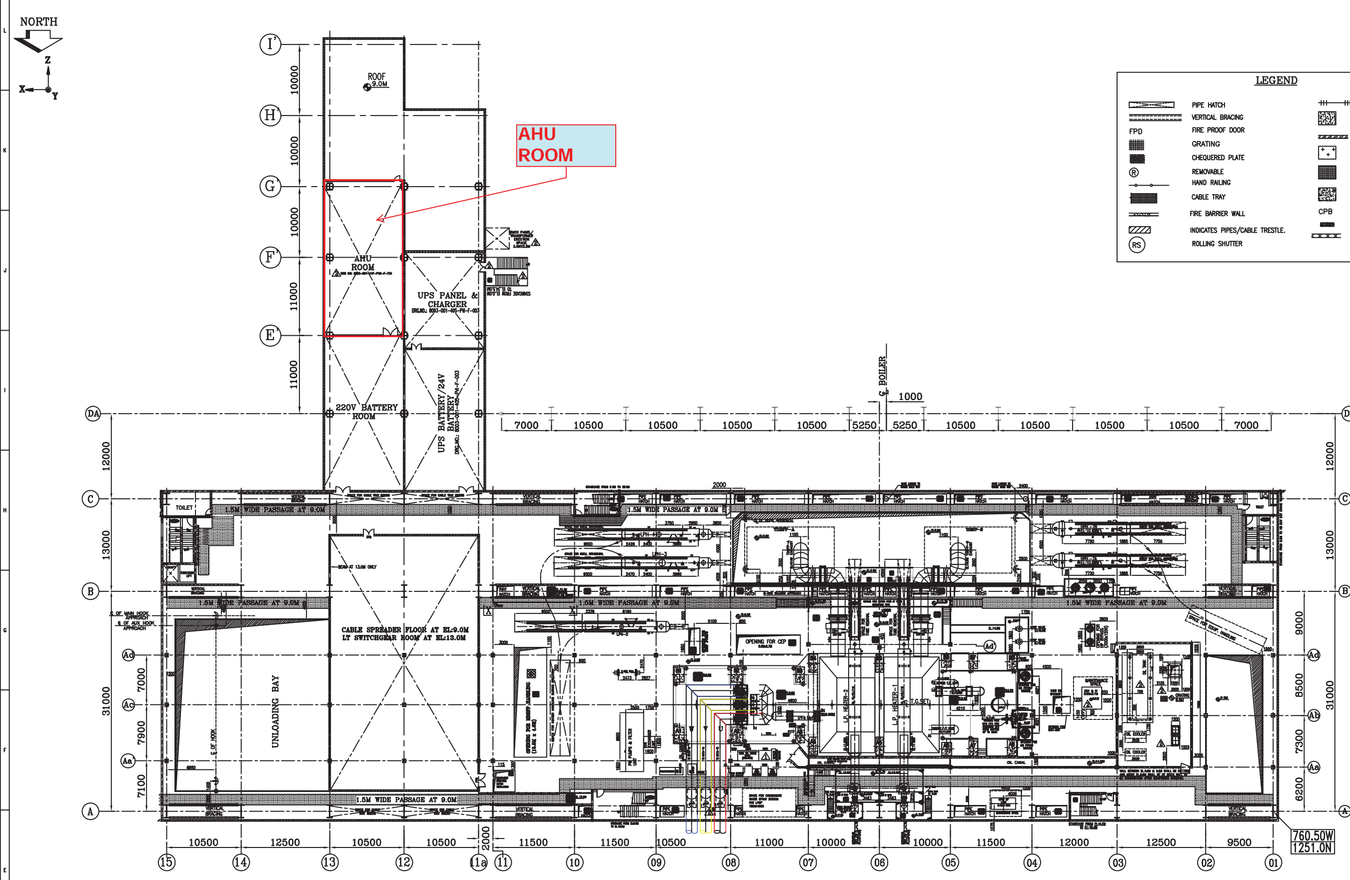
शीट SHEET 1 OF 1 — पुनरीक्षण REV. 01

फार्मेट साइज A0 / FORMAT SIZE A0

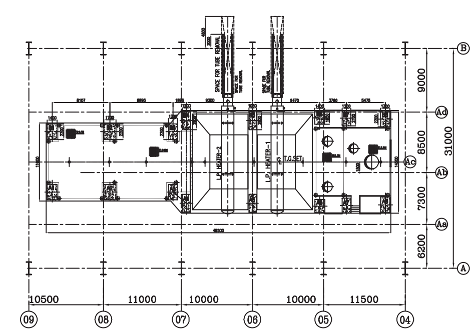
ELECTRONIC FILE NAME : 520_100_M0_03_04_05_06_07_R2p.dwg

फर्स्ट ऐंगल प्रोजेक्शन/FIRST ANGLE PROJECTION

सभी माप मि मी मे है/ALL DIMENSIONS ARE IN MM



TG EQUIPMENT PLAN LAYOUT AT 9.0M



PLATFORM AT EL:8.5M/EL:9.0M LEVEL

LEGEND

PIPE HATCH	RAIL TRACK
VERTICAL BRACING	PIPE TRENCH WITH PCC COVERED SAND FILLED
FIRE PROOF DOOR (FPD)	BRICK WALL
GRATING	BUS DUCT
CHEQUERED PLATE	WALK WAY
REMOVABLE	CONCRETE
HAND RAILING	CHAIN PULLEY BLOCK (CPB)
CABLE TRAY	FIRE WALL
FIRE BARRIER WALL	CLADDING
INDICATES PIPES/CABLE TRESTLE.	
ROLLING SHUTTER (RS)	

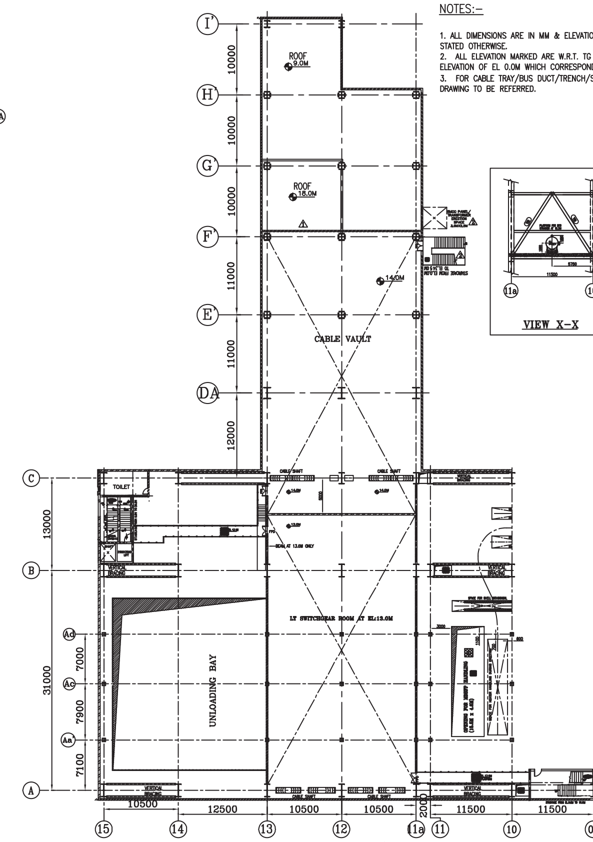
REFERENCE DRGS: ⚠

SL NO	TITLE	NUMBER	NTPC DRG. NUMBER	UNIT	HANDLING ARRANGEMENT
1	TG EQUIPMENT PLAN AT EL 0.0 M	PE-DG-520-100-M003	8003-001-110-PVM-F-049	PEM	-
2	TG EQUIPMENT PLAN AT EL18.0 M	PE-DG-520-100-M005	8003-001-110-PVM-F-051	PEM	-
3	TG EQUIPMENT PLAN AT MISCELLANEOUS FLOORS IN BC BAY	PE-DG-520-100-M006	8003-001-110-PVM-F-052	PEM	-
4	T.G. HALL CROSS SECTION	PE-DG-520-100-M007	8003-001-110-PVM-F-053	PEM	-
5	OIL ROOM ARRANGEMENT	013100K4010	8003-001-110-PVM-B-118	HWR	-
6	LP BYPASS VALVE ARRANGEMENT	10878-STE-TL-807	8003-001-110-PVM-Y-026B	HWR	EOT
7	OIL CANAL DETAILS	1-13100-S5001	–	HWR	-
8	GA LP HEATER-1	--	8003-001-110-PVM-B-032E	HWR	EOT
9	GA LP HEATER-2	--	8003-001-110-PVM-B-032E	HWR	EOT
10	GA LP HEATER-3	--	8003-001-110-PVM-B-032A	HYD	EOT
11	GA LP HEATER-4	--	8003-001-110-PVM-B-032B	HYD	EOT
12	GA LP HEATER-5	--	8003-001-110-PVM-B-032C	HYD	EOT
13	GA HP HEATER 7A	--	8003-001-110-PVM-B-033A	HYD	EOT
14	GA HP HEATER 7B	--	8003-001-110-PVM-B-033A	HYD	EOT
15	HPSU FOR TURBINE VALVE	--	--	HWR	-
16	HPSU FOR LPBP	--	--	HWR	-
17	GA OF OLV	10878-STE-TG-409	8003-001-110-PVM-Y-002	HWR/SAG	HOIST
18	GA OF HP BP VALVE	--	8003-001-110-PVM-Y-003	TRY	EOT
19	FOUNDATION DETAILS OF GENERATOR AUXILIARY EQUIPMENTS	--	8003-001-110-PVM-V-002	HWR	-
20	CRANE CLEARANCE DIAGRAM	PE-DG-520-501-A001	8003-001-110-PVM-F-053	PEM	-
21	AHU ROOM LAYOUT	PE-V0-520-553-A039	8003-001-147-PVM-F-724	PEM	-

NOTES:-

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATION MARKED ARE W.R.T. TG HALL FINISHED FLOOR ELEVATION OF EL 0.0M WHICH CORRESPONDS TO RL 282.50 M.
3. FOR CABLE TRAY/BUS DUCT/TRENCH/SLIT LAYOUT, ELECTRICAL DRAWING TO BE REFERRED.

VIEW X-X



PLAN AT 13.0M/14.0M

NOTE:- SCAN QR CODE FOR CHECKING THE LATEST REV. STATUS OF DRAWING.	
ग्राहक ड्राइंग संख्या / CUSTOMER DRAWING NO.	8003-001-110-PVM-F-050
ग्राहक/CUSTOMER	एन टी पी सी लिमिटेड N T P C LIMITED
कार्य संख्या- JOB NO.	520
स्थिति STATUS	CONTRACT
परियोजना PROJECT	1X800 esxAoAV lhir lqij FAeZy iAoj ifj;AstuA, pj.k-II 1X800 MW NTPC SIPAT STPP, STAGE-III
	भारत हेवी इलेक्ट्रिकल्स लिमिटेड BHARAT HEAVY ELECTRICALS LTD पावर सेक्टर/POWER SECTOR परियोजना अभियांत्रिकी प्रबंधन PROJECT ENGINEERING MANAGEMENT नोएडा (उ-प्र-)/NOIDA (U.P.)
DEPT CODE	M

	नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
तैयारकर्ता/DRN	VKS	-sd-	13.11.2024
डिज़ाइनकर्ता/DESN	RA/AA	-sd-	13.11.2024
जांचकर्ता/CHD	PM	-sd-	13.11.2024
अनुमोदनकर्ता/APPD	BKA	-sd-	13.11.2024

प्रतिरूप REV.	दिनांक DATE	परिवर्तितकर्ता ALTD	जांचकर्ता CHD	अनुमोदनकर्ता APPD
1	26.03.25	RA/AA	PM	BKA

1. DRG. REVISED INLINE WITH NTPC COMMENTS RCVD. LETTER NO. CC-ENGG-8003-001-110-PVM-F-050 RCVD. DTD. 02/12/2024.
2. REVISION MARKED ⚠

शीर्षक/TITLE: TG EQUIPMENT LAYOUT DRAWING AT MEZZANINE FLOOR 9.0 M

स्केल - SCALE- 1:250

ड्राइंग संख्या/ DRAWING NO. PE-DG-520-100-M004

शीट SHEET 1 OF 1 — पुनरीक्षण REV. 01

फार्मेट साइज A0 / FORMAT SIZE A0

ELECTRONIC FILE NAME : 520_100_M0_03_04_05_06_07_82p.dwg

NORTH

DETAIL OF Air Washer Layout AT 18.0M FLOOR

S.No.	DESCRIPTION	LOCATION	AREA TO BE CATERED
01	Air Washer -1A	A Row grid 11-12	0 Mtr floor, Mezzanine floor, Operating Floor,HT Switch Gear & its Cable vault, LT Switch Gear & its Cable vault
02	Air Washer -1B	A Row grid 08-09	
03	Air Washer -1C	A Row grid 07-08	
04	Air Washer -1D	A Row grid 04-05	
05	Air Washer -1E	A Row grid 02-03	

REFERENCE DRGS:⚠

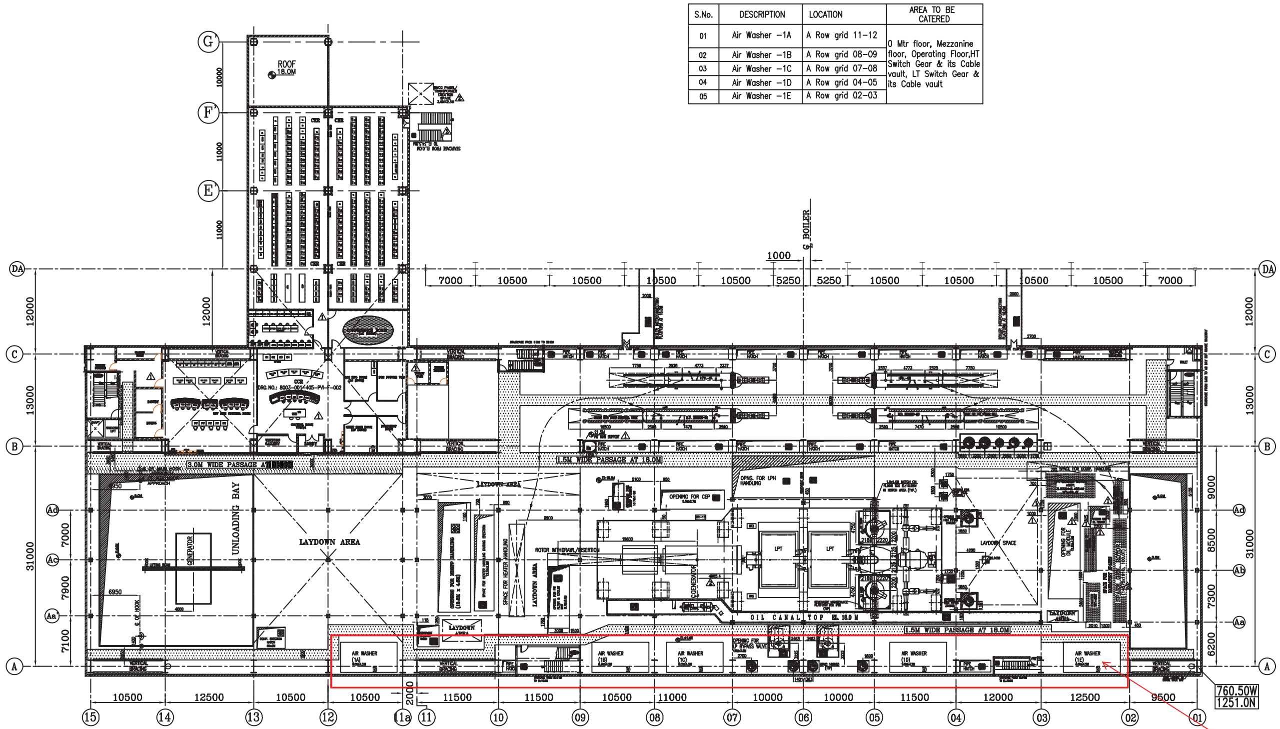
SL NO	TITLE	DRG. NUMBER	NTPC DRG. NUMBER	UNIT
1	TG EQUIPMENT PLAN AT EL 0.0 M	PE-DG-520-100-M003	8003-001-110-PVM-F-049	PEM
2	TG EQUIPMENT PLAN AT EL 9.0 M	PE-DG-520-100-M004	8003-001-110-PVM-F-050	PEM
3	TG EQUIPMENT PLAN AT MISCELLANEOUS FLOORS IN BC BAY	PE-DG-520-100-M006	8003-001-110-PVM-F-052	PEM
4	T.G. HALL CROSS SECTION	PE-DG-520-100-M007	8003-001-110-PVM-F-053	PEM
5	GA HP HEATER 8A	--	8003-001-110-PVM-B-033C	HYD
6	GA HP HEATER 8B	--	8003-001-110-PVM-B-033C	HYD
7	GA HP HEATER 9A	--	8003-001-110-PVM-B-033E	HYD
8	GA HP HEATER 9B	--	8003-001-110-PVM-B-033E	HYD
9	TG DECK FOUNDATION PLAN	--	8003-001-315-PVC-C-0308	PEM
10	LAYDOWN SPACE OF STEAM TURBINE COMPONENTS	113100K4016	8003-001-110-PVM-F-068	HWR
11	OIL CANAL DETAILS	1-13100-S5001	-	HWR
12	LAYDOWN SPACE OF GENERATOR COMPONENTS	--	8003-001-110-PVM-F-069	HWR
13	AC PLANT ROOM LAYOUT & COOLING TOWER AREA LAYOUT WITH COMPLETE FOUNDATION DETAIL OF ALL EQUIPMENT FOR POWER HOUSE	PE-V0-520-553-A046	8003-001-147-PVM-F-015	PEM
14 ⚠	AIR WASHER LAYOUT OUTSIDE "A ROW" SIDE ALONG WITH FOUNDATION DETAILS - TG BUILDING	PE-V0-520-554-A023	8003-001-147-PVM-F-004	PEM
15	AC DUCT LAYOUT DRAWING FOR CONTROL ROOM AREA AT 17M ALONG WITH AHU RM LAYOUT WITH FOUNDATION DETAILS	PE-V0-520-553-A040	8003-001-147-PVM-F-014	PEM
16 ⚠	VENTIALTION DUCT LAYOUT FOR TG BUILDING -"A ROW" SIDE AIR WASHER	PE-V0-520-554-A026	8003-001-148-PVM-F-002	PEM
17 ⚠	VENTILATION DUCT LAYOUT FOR TG BUILDING- "BC BAY & BOILER MCC ROOM" SIDE AIR WASHER	PE-V0-520-554-A022	8003-001-148-PVM-F-003	PEM

LEGEND

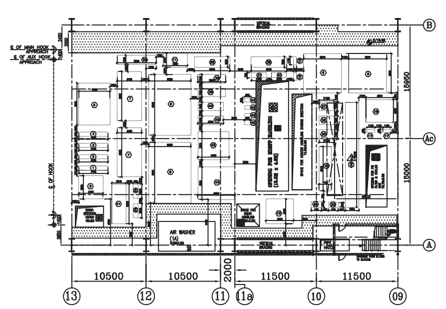
- PIPE HATCH
- VERTICAL BRACING
- FPD — FIRE PROOF DOOR
- GRATING
- CHEQUERED PLATE
- Ⓡ — REMOVABLE HAND RAILING
- CABLE TRAY
- FIRE BARRIER WALL
- INDICATES PIPES/CABLE TRESTLE.
- RS — ROLLING SHUTTER
- RAIL TRACK
- PIPE TRENCH WITH PCC COVERED SAND FILLED
- BRICK WALL
- BUS DUCT
- WALK WAY
- CONCRETE
- CPB — CHAIN PULLEY BLOCK
- FIRE WALL
- CLADDING

NOTES:-

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATION MARKED ARE W.R.T. TG HALL FINISHED FLOOR ELEVATION OF EL 0.0M WHICH CORRESPONDS TO RL 282.50 M.
3. FOR CABLE TRAY/BUS DUCT/TRENCH/SLIT LAYOUT, ELECTRICAL DRAWING TO BE REFERRED.



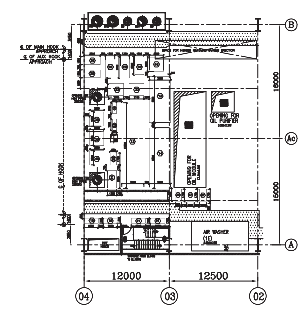
TG EQUIPMENT PLAN LAYOUT AT 18.0M



LAYDOWN SPACE FOR TURBINE & GENERATOR COMPONENTS

DETAIL OF LAY-DOWN SPACE FOR TG COMPONENTS

S.No	DESCRIPTION	WT. IN (T)	AREA M x M
01	ASSEMBLY OF GUIDE BLADE CARRIER (UPPER PART LEFT)	3.55	4.1x0.6
02	ASSEMBLY OF GUIDE BLADE CARRIER (UPPER PART RIGHT)	3.55	4.1x0.6
03	ASSEMBLY OF GUIDE BLADE CARRIER (UPPER PART LEFT)	3.55	4.1x0.6
04	ASSEMBLY OF GUIDE BLADE CARRIER (UPPER PART RIGHT)	3.55	4.1x0.6
05	IP OUTER CASING (U/H)	41	5.89x4.4
06	LP INNER CASING (U/H) 2NOS.	26	5.36x5.56
07	LP SHAFT 2NOS.	76	6.932x3.46
08	LP OUTER CASING 2NOS.	29	8.54x5.035
09	HP OUTER CASING - EXHAUST PART	25	3.4x3.3
10	IP SHAFT	40	6.232x1.73
11	HP INNER CASING (U/H)	17	3.4x2.0
12	CROSS OVER PIPE (PART-1)	30	12.0x3.1
13	CROSS OVER PIPE (PART-2)	22	6.5x3.0
14	LIFTING BEAM	8	8.5x3
15	IP INNER CASING (L/H)	37	3.8x3.5
16	LPSSC (U/H) (TE) 2 NOS.	0.5	1.12x0.405
17	LPSSC (U/H) (GE) 2 NOS	0.5	1.12x0.405
18	IP INNER CASING (U/H)	32	3.8x3.2
19	LP BYPASS STOP VALVE ACTUATOR 2NOS	0.5	2x0.7
20	HP SHAFT	20	5.5x1.3
21	LP BYPASS CONTROL VALVE ACTUATOR 2NOS.	0.6	2x0.7
22	OVERLOAD CONTROL VALVE	0.9	1.8x0.6
23	OVERLOAD CONTROL VALVE ACTUATOR	1.0	1.6x0.6
24	IP CONTROL VALVE ACTUATOR 2NOS.	1.6	2.0x0.7
25	HP STOP VALVE ACTUATOR 2NOS.	1.5	1.7x0.9
26	HP CONTROL VALVE 2NOS.	3	2.3x1.1
27	HP CONTROL VALVE ACTUATOR 2NOS.	2	1.7x1
28	IP CONTROL VALVE 2NOS	6.5	3.0x1.3
29	HP STOP VALVE 2NOS.	4.6	2.8x1.3
30	LP BYPASS CONTROL VALVE 2NOS.	2.2	2.0x2.0
31	IP STOP VALVE ACTUATOR 2NOS.	1.4	2.1x0.7
32	IP STOP VALVE 2NOS.	7	2.1x1.7
33	PEDESTAL COVER - HP FRONT	0.6	1.35x0.65
34	PEDESTAL COVER - HP-REAR	0.9	1.45x0.8
35	PEDESTAL COVER - IP-REAR	2.3	2.1x1.218
36	PEDESTAL COVER - LP-REAR 1	2.3	2.1x1.278
37	PEDESTAL COVER - LP-REAR 2	2.3	2.1x1.235
38	H2 COOLERS 2NOS.	4.5	5.0x1.5
39	END SHIELD [ES] 2NOS. (U/H) & (L/H)	9	3.8x1.2
40	END SHIELD [TS] 2NOS. (U/H) & (L/H)	8	3.6x1.2
41	EXCITER	30	6.8x2.01
42	BEARING SHELLS 4NOS.	0.6	0.8x0.8
43	EXCITER HOUSING	3.5	4.4x3.97
44	H2 COOLER HOUSING	26	5.2x4.6
45 ⚠	GENERATOR ROTOR WITH COMPLETE PACKING BOX	100	14.755x1.81
46	LP BYPASS STOP VALVE 2NOS.	2.5	2.0x2.0



LAYDOWN SPACE FOR TURBINE & GENERATOR COMPONENTS

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

ग्राहक ड्राइंग संख्या CUSTOMER DRAWING NO.	8003-001-110-PVM-F-051
ग्राहक/CUSTOMER	एन टी पी सी लिमिटेड N T P C LIMITED
कार्य संख्या- JOB NO.	520
स्थिति STATUS	CONTRACT
परियोजना PROJECT	1X800 esxAoAV lhir Iqij FAeZy iAoj ifj;AstuA, pj.k-II 1X800 MW NTPC SIPAT STPP, STAGE-III
	भारत हेवी इलेक्ट्रिकल्स लिमिटेड BHARAT HEAVY ELECTRICALS LTD पावर सेक्टर/POWER SECTOR परियोजना अभियांत्रिकी प्रबंधन PROJECT ENGINEERING MANAGEMENT नोएडा (उ॰प्र॰)/NOIDA (U.P.)
DEPT CODE	M
शीर्षक/TITLE	TG EQUIPMENT LAYOUT DRAWING AT OPERATING FLOOR 18.0 M
स्केल - SCALE-	1:250
ड्राइंग संख्या/ DRAWING NO.	PE-DG-520-100-M005
शीट SHEET	1 OF 1
पुनरीक्षण REV.	01

मुद्रण स्केल मीटर में PRINT SCALE IN METRE

	नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
तैयारकर्ता/DRN	VKS	-sd-	13.11.2024
डिजाइनकर्ता/DESN	RA/AA	-sd-	13.11.2024
जांचकर्ता/CHD	PM	-sd-	13.11.2024
अनुमोदनकर्ता/APPD	BKA	-sd-	13.11.2024

पुनरीक्षण REV.	दिनांक DATE	परिवर्तितकर्ता ALTD	जांचकर्ता CHD	अनुमोदनकर्ता APPD
1	26.03.25	RA/AA	PM	BKA

1. DRG. REVISED INLINE WITH NTPC COMMENTS RCVD. LETTER NO. CC-ENGG-8003-001-110-PVM-F-051 RCVD. DTD. 02/12/2024.
2. REVISION MARKED ⚠

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

ELECTRONIC FILE NAME : 520_100_M0_03_04_05_06_07_R2p.dwg

फार्मेट साइज A0 FORMAT SIZE A0

फर्स्ट ऐंगल प्रोजेक्शन/FIRST ANGLE PROJECTION

सभी माप मि मी में हैं/ALL DIMENSIONS ARE IN MM

NORTH

REFERENCE DRAWINGS ⚠				
SL NO	TITLE	DRG. NUMBER	NTPC DRG. NUMBER	UNIT
1	TG EQUIPMENT PLAN AT EL 0.0 M	PE-DG-520-100-M003	8003-001-110-PVM-F-049	PEM
2	TG EQUIPMENT PLAN AT EL 9.0 M	PE-DG-520-100-M004	8003-001-110-PVM-F-050	PEM
3	TG EQUIPMENT PLAN AT 18.0 M	PE-DG-520-100-M005	8003-001-110-PVM-F-051	PEM
4	T.G. HALL CROSS SECTION	PE-DG-520-100-M007	8003-001-110-PVM-F-053	PEM
5	GA OF DEAERATOR	HY-DG-1-26310-04301	8003-001-110-PVM-B-040	HYD
6	GA OF DMCW TANK	--	8003-001-110-PVM-B-007	BPL
7	GA D/A PLATFORM	--	4540-001-110-PVM-B-040A	HYD
8	AC PLANT ROOM LAYOUT & COOLING TOWER AREA LAYOUT WITH COMPLETE FOUNDATION DETAIL OF ALL EQUIPMENT FOR POWER HOUSE	PE-VO-520-553-A046	8003-001-147-PVM-F-015	PEM
9	AIR WASHER LAYOUT FOR"B-C BAY" SIDEALONGWITH FOUNDATION DETAILS - TG BUILDING	PE-VO-520-554-A023	8003-001-147-PVM-F-004	PEM
10	AC DUCT LAYOUT DRAWING FOR CONTROL ROOM AREA AT 17M ALONG WITH AHU RM LAYOUT WITH FOUNDATION DETAILS	PE-VO-520-553-A040	8003-001-147-PVM-F-014	PEM

DETAIL OF Air Washer Layout AT 36.5 M ROOF

S.No.	DESCRIPTION	LOCATION	AREA TO BE CATERED
01	Air Washer -1F	BC Bay grid 13-14	0 Mtr floor, Mezzanine floor, Operating Floor
02	Air Washer -1G	BC Bay grid 13-14	
03	Air Washer -1H	BC Bay grid 12-13	
04	Air Washer -1I	BC Bay grid 11-12	
05	Air Washer -1J	BC Bay grid 11-12	

DETAIL OF Air Washer Layout AT 34.5 M FLOOR

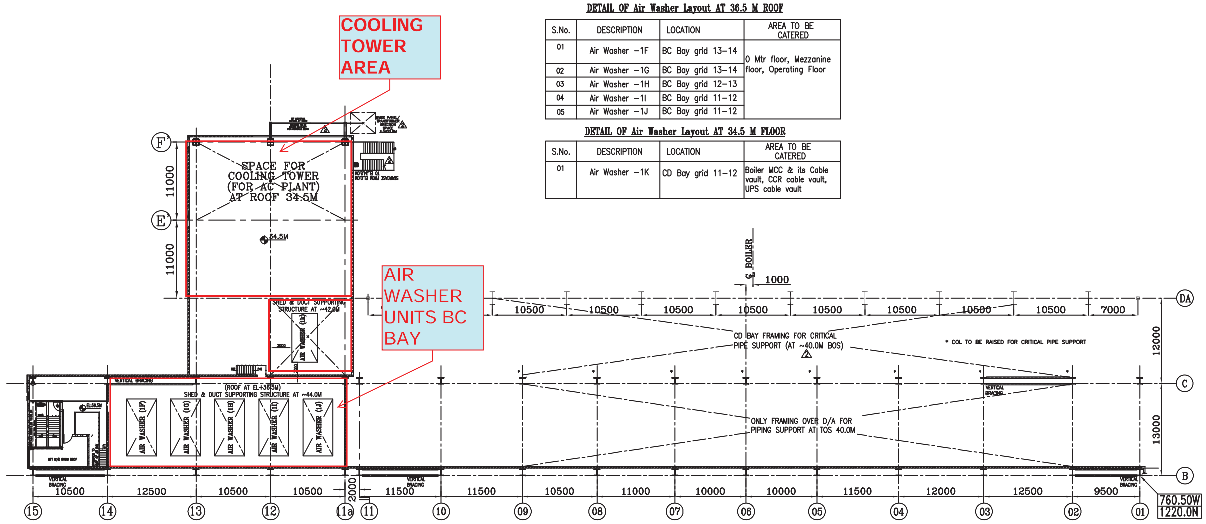
S.No.	DESCRIPTION	LOCATION	AREA TO BE CATERED
01	Air Washer -1K	CD Bay grid 11-12	Boiler MCC & its Cable vault, CCR cable vault, UPS cable vault

LEGEND

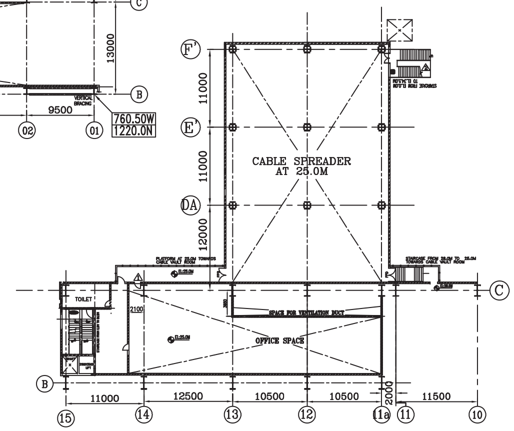
- PIPE HATCH
- VERTICAL BRACING
- FPD — FIRE PROOF DOOR
- GRATING
- CHEQUERED PLATE
- ® — REMOVABLE HAND RAILING
- CABLE TRAY
- FIRE BARRIER WALL
- INDICATES PIPES/CABLE TRESTLE.
- RS — ROLLING SHUTTER
- RAIL TRACK
- PIPE TRENCH WITH PCC COVERED SAND FILLED
- BRICK WALL
- BUS DUCT
- WALK WAY
- CONCRETE
- CPB — CHAIN PULLEY BLOCK
- FIRE WALL
- CLADDING

NOTES:-

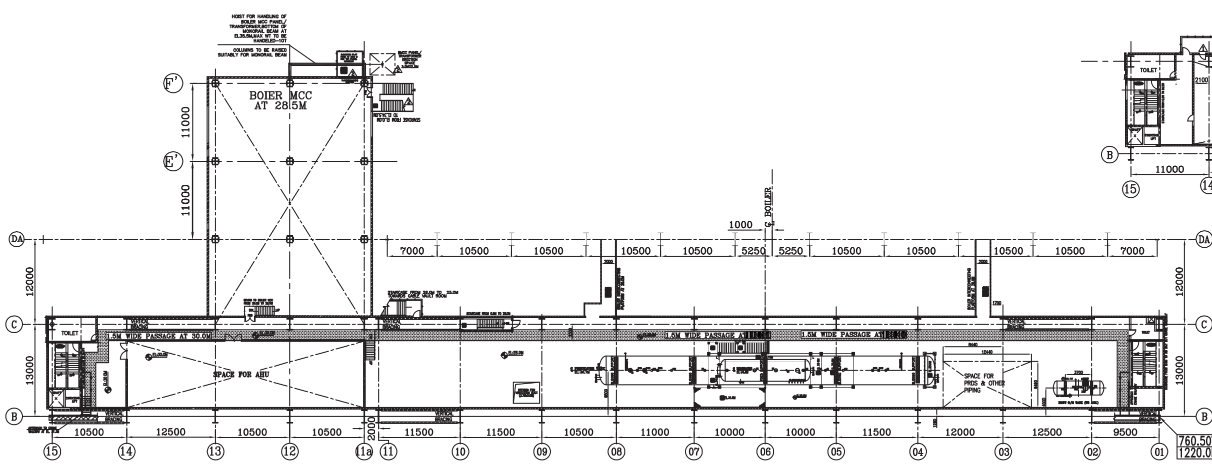
1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATION MARKED ARE W.R.T. TG HALL FINISHED FLOOR ELEVATION OF EL 0.0M WHICH CORRESPONDS TO RL 282.50 M.
3. FOR CABLE TRAY/BUS DUCT/TRENCH/SLIT LAYOUT, ELECTRICAL DRAWING TO BE REFERRED.



TG EQUIPMENT PLAN LAYOUT AT 34.5M/36.5M



PLAN AT 25.0M



TG EQUIPMENT PLAN LAYOUT AT 28.0M/28.5M/30.0M

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

ग्राहक ड्राइंग संख्या / CUSTOMER DRAWING NO.	8003-001-110-PVM-F-052
ग्राहक/CUSTOMER	एन टी पी सी लिमिटेड N T P C LIMITED
कार्य संख्या- JOB NO.	520
स्थिति STATUS	CONTRACT
परियोजना PROJECT	1X800 esxAoAV lhir lqij FAeZy iAoj ifj;AstuA, pj.k-II 1X800 MW NTPC SIPAT STPP, STAGE-III
	भारत हेवी इलेक्ट्रिकल्स लिमिटेड BHARAT HEAVY ELECTRICALS LTD पावर सेक्टर/POWER SECTOR परियोजना अभियांत्रिकी प्रबंधन PROJECT ENGINEERING MANAGEMENT नोएडा (उ॰प्र॰)/NOIDA (U.P.)
DEPT CODE	M

	नाम NAME	हस्ताक्षर SIGNATURE	दिनांक DATE
तैयारकर्ता/DRN	VKS	-sd-	13.11.2024
डिजाइनकर्ता/DESN	RA/AA	-sd-	13.11.2024
जांचकर्ता/CHD	PM	-sd-	13.11.2024
अनुमोदनकर्ता/APPD	BKA	-sd-	13.11.2024

प्रतिशोधन REV.	दिनांक DATE	परिवर्तित ALTD	जांचकर्ता CHD	अनुमोदनकर्ता APPD
1	26.03.25	RA/AA	PM	BKA

1. DRG. REVISED INLINE WITH NTPC COMMENTS RCVD. LETTER NO. CC-ENGG-8003-001-110-PVM-F-052 RCVD. DTD. 02/12/2024.
2. REVISION MARKED ⚠

शीर्षक/TITLE: TG EQUIPMENT PLAN AT UPPER FLOORS IN B-C BAY

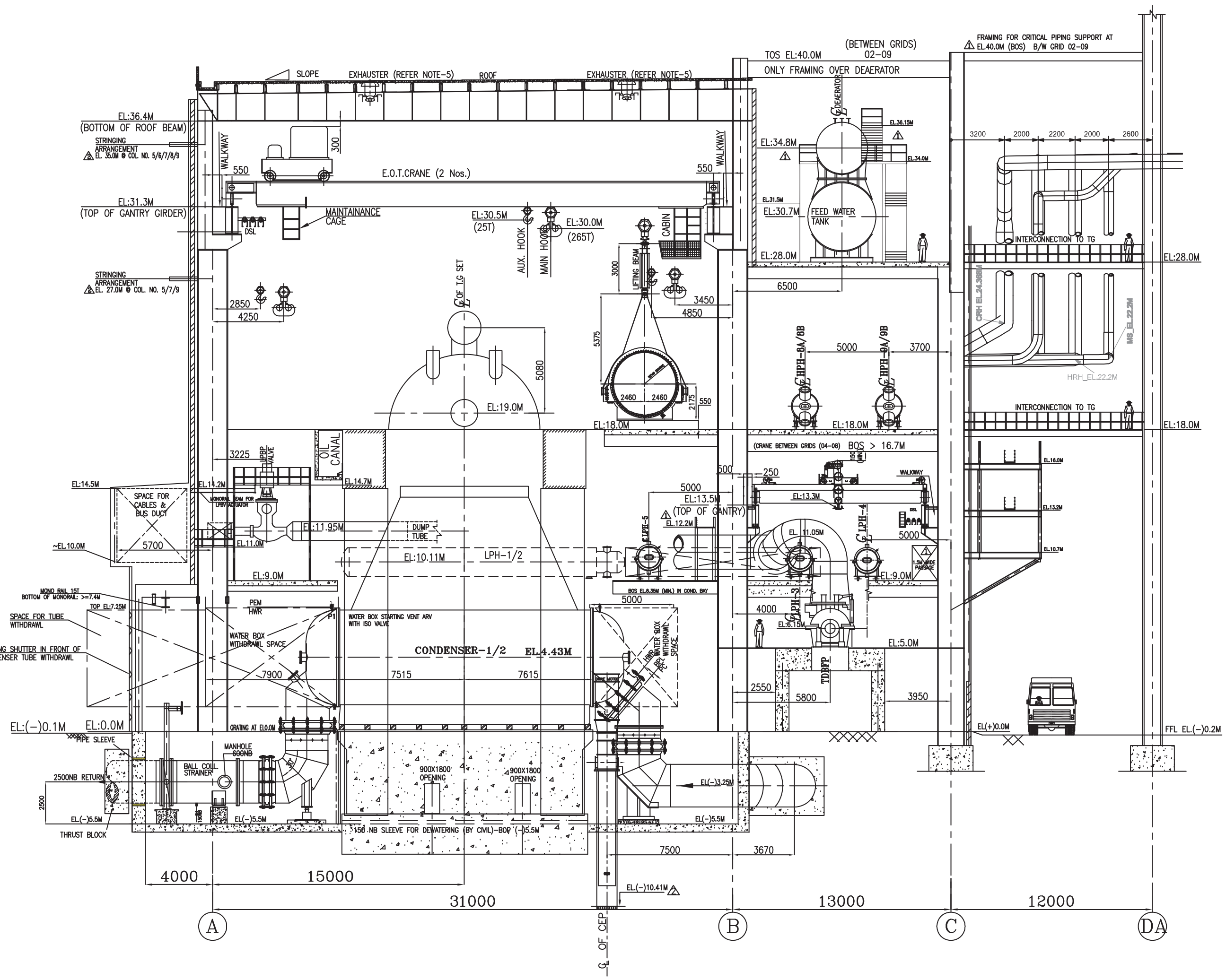
स्केल - SCALE- 1:250

ड्राइंग संख्या / DRAWING NO.: PE-DG-520-100-M006

शीट SHEET 1 OF 1 — पुनरीक्षण REV. 01

फार्मेट साइज A0 FORMAT SIZE A0

PE-DG-520-100-M007
ड्राइंग संख्या/DRAWING NO.



REFERENCE DRAWINGS:				
SL NO	TITLE	DRG. NUMBER	NTPC DRG. NUMBER	UNIT
1	TG EQUIPMENT PLAN AT EL 0.0 M	PE-DG-520-100-M003	8003-001-110-PVM-F-049	PEM
2	TG EQUIPMENT PLAN AT EL 9.0 M	PE-DG-520-100-M004	8003-001-110-PVM-F-050	PEM
3	TG EQUIPMENT PLAN AT 18.0 M	PE-DG-520-100-M005	8003-001-110-PVM-F-051	PEM
4	TG EQUIPMENT PLAN AT MISCELLANEOUS FLOORS IN BC BAY	PE-DG-520-100-M006	8003-001-110-PVM-F-052	PEM

LEGEND

- PIPE HATCH
- VERTICAL BRACING
- FPD — FIRE PROOF DOOR
- GRATING
- CHEQUERED PLATE
- ® — REMOVABLE
- HAND RAILING
- CABLE TRAY
- FIRE BARRIER WALL
- INDICATES PIPES/CABLE TRESTLE.
- RS — ROLLING SHUTTER
- RAIL TRACK
- PIPE TRENCH WITH PCC COVERED SAND FILLED
- BRICK WALL
- BUS DUCT
- WALK WAY
- CONCRETE
- CPB — CHAIN PULLEY BLOCK
- FIRE WALL

NOTES:-

1. ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METERS UNLESS STATED OTHERWISE.
2. ALL ELEVATION MARKED ARE W.R.T. TG HALL FINISHED FLOOR ELEVATION OF EL 0.0M WHICH CORRESPONDS TO RL 282.50 M.
3. FOR CABLE TRAY/BUS DUCT/TRENCH/SLIT LAYOUT, ELECTRICAL DRAWING TO BE REFERRED.
4. LOADS TO BE CONSIDERED BY CIVIL FOR PROVISION OF SOLAR PHOTOVOLTAIC POWER PLANT ON ROOF OF AB BAY.
5. DETAILS OF TG BUILDING ROOF EXHAUSTERS ARE INDICATIVE. FOR DETAILS REFER RESPECTIVE VENTILATION AREA DRAWING.

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

ग्राहक ड्राइंग संख्या / CUSTOMER DRAWING NO.: 8003-001-110-PVM-F-053

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

कार्य संख्या / JOB NO.: 520
स्थिति / STATUS: CONTRACT

परियोजना / PROJECT: 1X800 MW NTPC SIPAT STPP, STAGE-III

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

	NAME	SIGNATURE	DATE
DRN	VKS	-sd-	13.11.2024
DESN	RA/AA	-sd-	13.11.2024
CHD	PM	-sd-	13.11.2024
APPD	BKA	-sd-	13.11.2024

DEPT CODE: M

REV	DATE	ALTD	CHD	APPD
1	26.03.25	RA/AA	PM	BKA

1. DRG. REVISED INLINE WITH NTPC COMMENTS RCVD. LETTER NO. CC-ENGG-8003-001-110-PVM-F-053 RCVD. DTD. 02/12/2024.
2. REVISION MARKED ⚠1

शीर्षक/TITLE: MAIN PLANT TG HALL CROSS SECTION

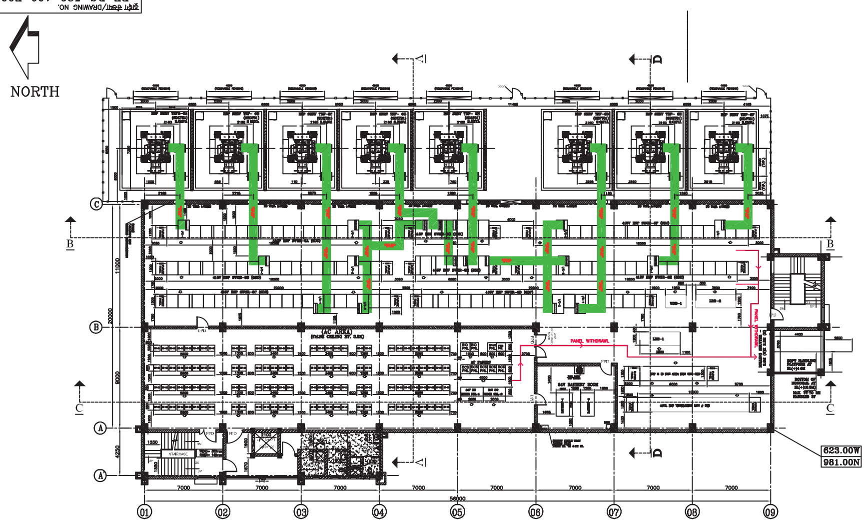
SCALE- 1:100
ड्राइंग संख्या / DRAWING NO.: PE-DG-520-100-M007
SHEET 1 OF 1 — REV. 01

ELECTRONIC FILE NAME : 520_100_M0_03_04_05_06_07_R2p.dwg

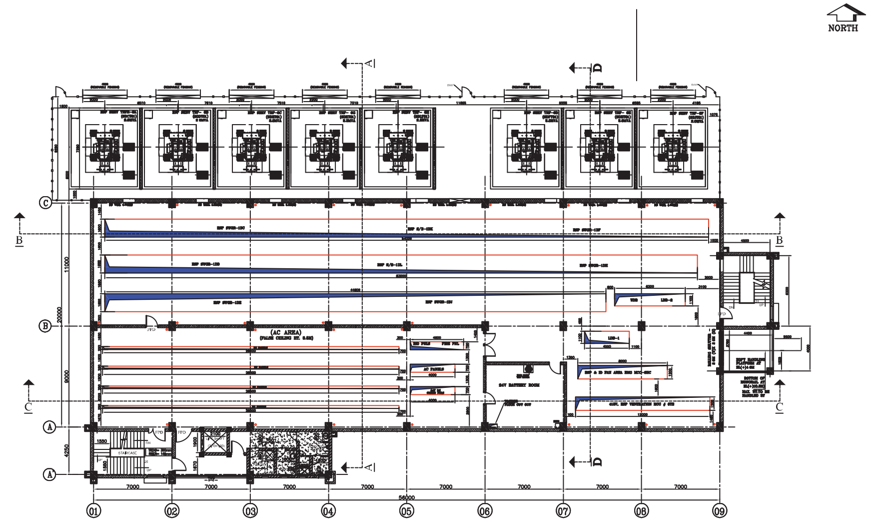
FORMAT SIZE A0

फर्स्ट ऐंगल प्रोजेक्शन/FIRST ANGLE PROJECTION

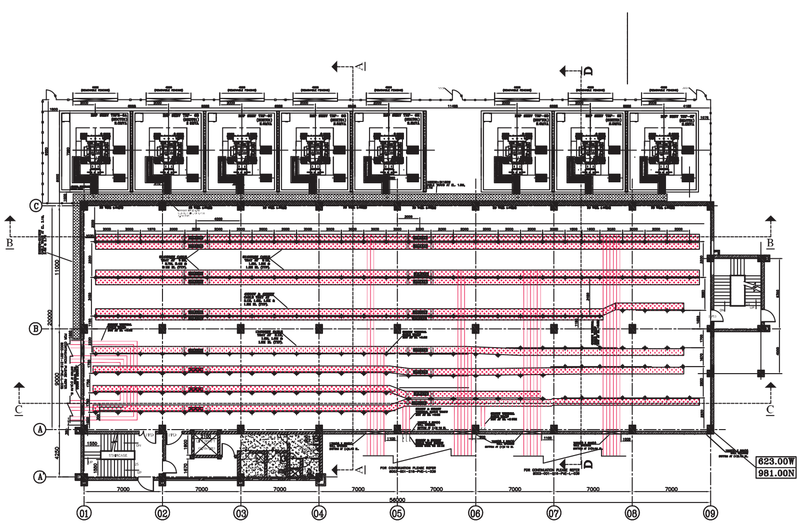
सभी माप मि मी में है/ALL DIMENSIONS ARE IN MM



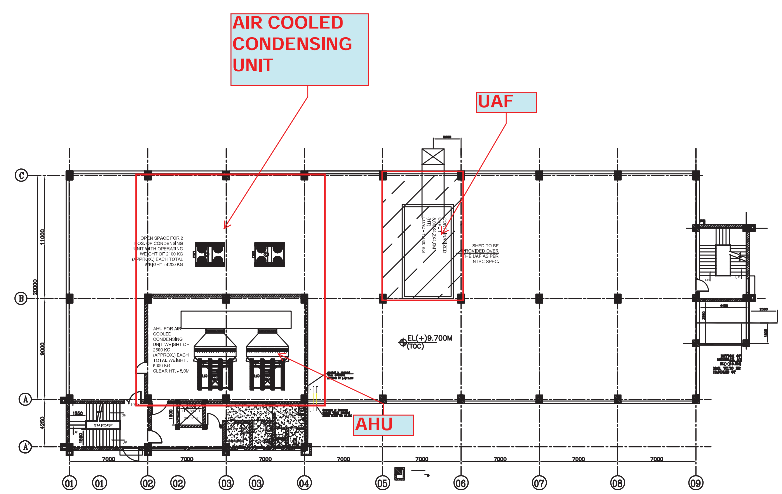
ESP CONTROL ROOM LAYOUT AT 4.0M FLOOR



CUT OUT DETAILS AT 4.0M FLOOR



CABLE VAULT AT 0.0M FLOOR



ROOF PLAN AT 9.7M

ग्राहक ड्राइंग संख्या / CUSTOMER DRAWING NO.	8003-001-215-PVE-F-027
ग्राहक/CUSTOMER	एन टी पी सी लिमिटेड N T P C LIMITED
परियोजना PROJECT	1x800 MW SIPAT STG-III EPC
	भारत हेवी इलेक्ट्रिकल्स लिमिटेड BHARAT HEAVY ELECTRICALS LTD पावर सेक्टर/POWER SECTOR परियोजना अभियांत्रिकी प्रबंधन PROJECT ENGINEERING MANAGEMENT नोएडा (उ.प्र.)/NOIDA (U.P.)
शीर्षक/TITLE	ELECTRICAL EQUIPMENT & CABLING LAYOUT IN ESP CONTROL ROOM BUILDING
ड्राइंग संख्या/DRAWING NO.	PE-DG-520-100-E008
स्केल/SCALE	1:205
शीट/SHEET	01 OF 02
संशोधन/REV.	02

कार्य संख्या/JOB NO. 520

स्थिति/STATUS CONTRACT

DEPT CODE E

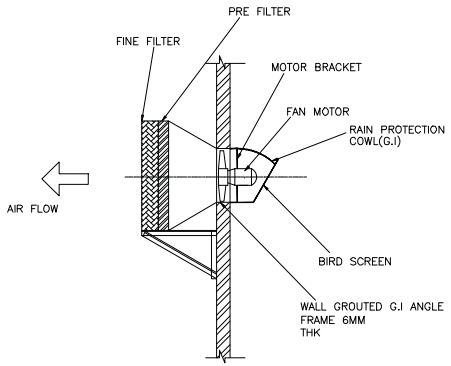
1. DRAWING REVISED AS PER CUSTOMER COMMENTS DTD. 26.05.2025
2. AS PER NTPC LETTER DTD. 18.07.2025 ESP CONTROL ROOM REVISED AFTER EXCLUSION OF FGD SYSTEM

DRAWING REVISED AS PER CUSTOMER COMMENTS DTD. 07.04.2025. REVISION MARKED AS

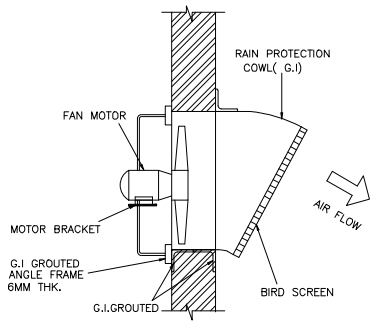
ELECTRONIC FILE NAME : 8003-001-215-PVE-F-027_22.09.25.dwg

प्रारूप साइज़ A0 FORMAT SIZE A0

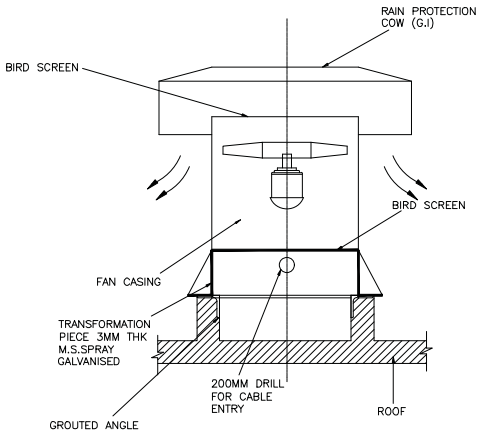
PE-DG-520-100-E008



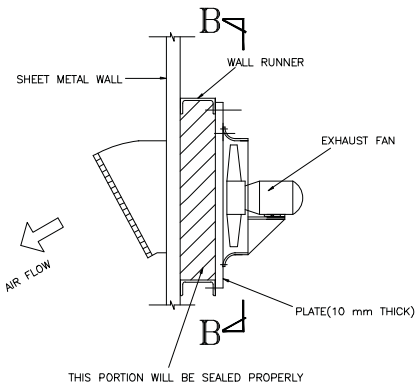
WALL MOUNTED SUPPLY AIR FAN



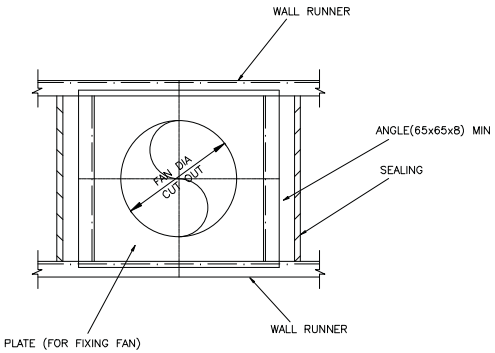
WALL MOUNTED EXHAUST AIR FAN



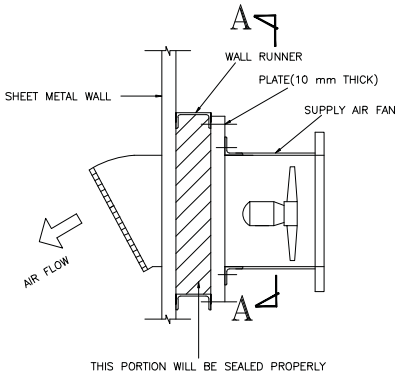
SECTION ELEVATION OF ROOF EXHAUSTER



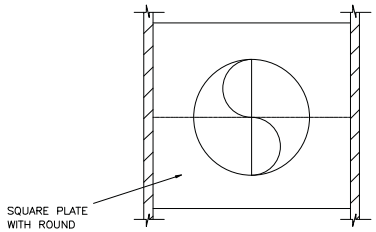
EXHAUST AIR FAN FIXED ON METAL WALL/CLADDING



SECTION B-B



SUPPLY AIR FAN FIXED ON METAL WALL/CLADDING



SECTION A-A

NOTES :

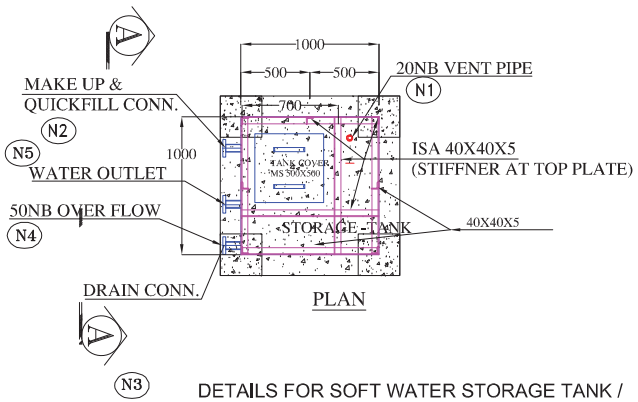
1. ALL DIMENSIONS ARE IN mm.
2. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH TECHNICAL SPECIFICATION.

FOR TENDER PURPOSE ONLY

REV.	DESCRIPTION	DRAWN	DESIGN	CHKD	L/O	TG	SG	LP	MH	WS	E	C	C&I	APPD	DATE
					CLEARED BY										
A	RELEASED FOR TENDER PURPOSE														

NTPC Limited
(A GOVT. OF INDIA ENTERPRISE)

PROJECT	SIPAT SUPER THERMAL POWER PROJECT STAGE - III (1X800 MW)
TITLE	FIXING DETAIL OF WALL MOUNTED AXIAL FANS AND ROOF EXTRACTOR FAN
SIZE A1 / SCALE	DRG.NO. 0000-000-POM-A-058 / REV. A



DETAILS FOR SOFT WATER STORAGE TANK /
MAKE UP WATER TANK
SIZE-1000(L)X1000(W)X1400(H)
EFFECTIVE VOLUME OF TANK-1 CUM

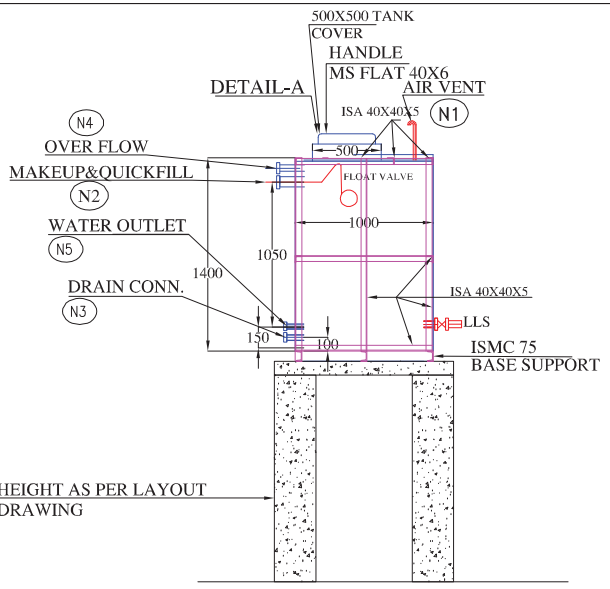
NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. PROJECTION OF PIPE CONN. FROM TANK SURFACE=100mm(TYP.)
   PROJECTION OF SOCKET CONN. FROM TANK SURFACE=60mm(TYP.)
3. MATERIAL OF CONSTRUCTION:–4.0THK.
4. WEIGHT OF TANK WITH WATER ~ 1700.00 KGS(APPROX.)
5. WEIGHT OF TANK WITHOUT WATER ~ 300.00 KGS(APPROX.)
6. NOZZLES ON THE TANK SHALL BE CUT AT SITE TO MATCH THE PIPING LAYOUT
7. MINIMUM TANK FOUNDATION REQUIRED IS SHOWN IN THE DRAWING.
   FOUNDATION SHALL BE PROVIDED AS PER APPROVED LAYOUT ONLY.
8. NOZZLES SHALL BE CUT AT SITE AS PER LAYOUT DRAWING.
9. REINFORCEMENT SHALL BE PROVIDED WHEREVER NOZZLES HAS BEEN PROVIDED.

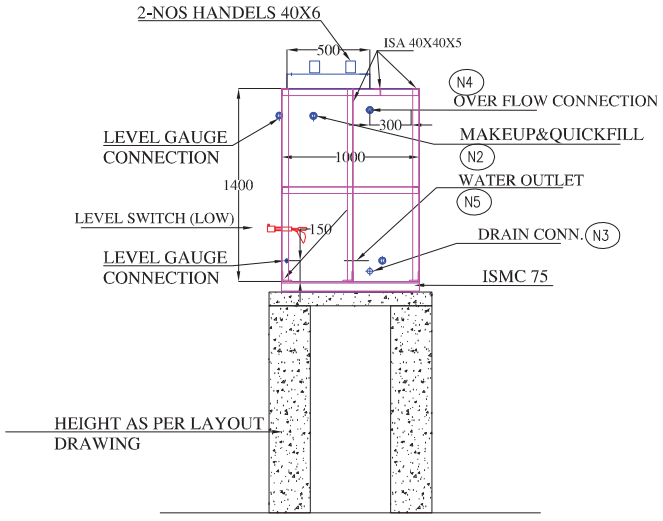
LIST OF NOZZLES OF EACH TANK

	DESCRIPTION	SIZE	QTY
N1	VENT	20 NB	
N2	MAKE UP	50 NB	01 NO
N2	QUICK FILL	50 NB	01 NO
N3	DRAIN	40 NB	01 NO
N4	OVER FLOW	65 NB	01 NO
N5	OUTLET	65 NB	01 NO

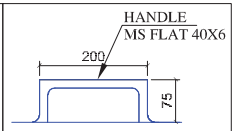
S.NO.	LOCATION	QTY
01	LOCATION – 1	02
02	LOCATION – 1	02
03	LOCATION – 1	02



ELEVATION



VIEW-A-A



DETAIL-A

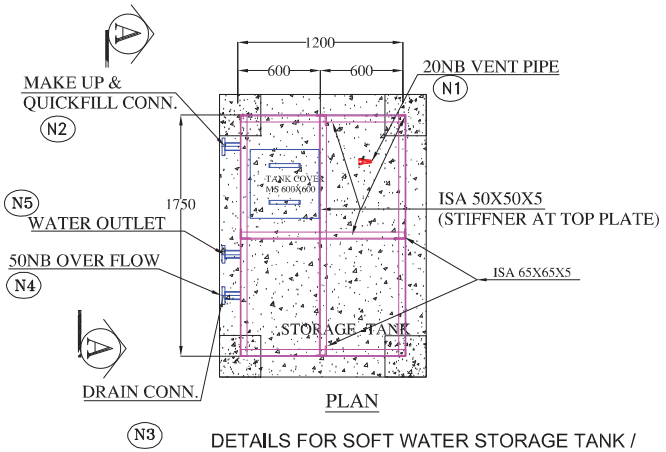
PAINTING DETAILS (BOTH INSIDE & OUTSIDE):

1. SURFACE PREPARATION : BLAST CLEANING TO SA 2.5
2. PRIMER COAT: ONE (1) COAT OF EPOXY RAISIN BASED ZINC PHOSPHATE HIGH BUILD PRIMER (2 PACK), DFT – 75 MICRONS
3. INTERMEDIATE COAT : ONE (1) COAT OF HIGH BUILD AMINE CURED EPOXY (2 PACK), DFT – 100 MICRONS
4. FINISH COAT: ONE (1) COAT OF POLYAMIDE CURED EPOXY (2 PACK), DFT – 150 MICRONS
5. TOTAL DFT: 325 MICRONS

MS TANK- SITE FABRICATED

DRG. No. XXXXX
CUSTOMER: NTPC LIMITED
1X800 MW SIPAT TPS
CONSULTANT:
CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD
PROJECT ENGINEERING MANAGEMENT
JOB NO. 520
STATUS CONTRACT
DISTRIBUTION
VENDOR NAME & ADDRESS
TITLE: TDS & GA OF EXPANSION TANK,MAKE WATER TANK AND SOFT WATER TANK FOR AIR CONDITIONING SYSTEM
DRAWING NO. PE-DG-520-553-002-A004
REV. 00

DRAWING IS PART OF TECHNICAL SPECIFICATION -PE-TS-520-553-002-A001



DETAILS FOR SOFT WATER STORAGE TANK /
MAKE UP WATER TANK
SIZE-1750(L)X1200(W)X1400(H)
EFFECTIVE VOLUME OF TANK-2 CUM

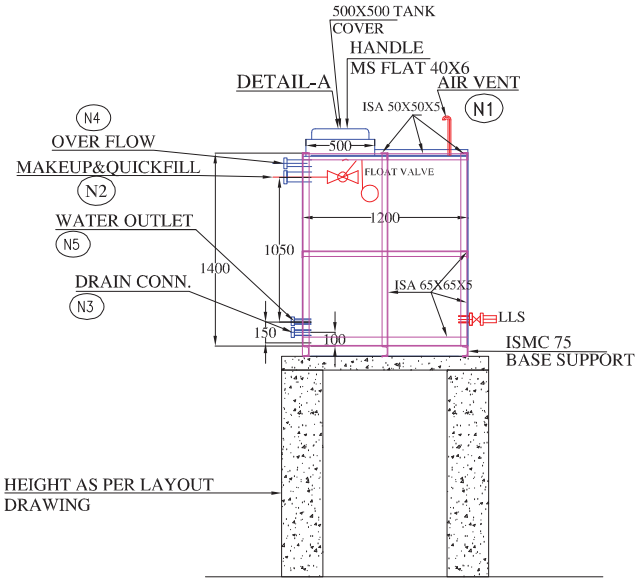
NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. PROJECTION OF PIPE CONN. FROM TANK SURFACE=100mm(TYP.)
   PROJECTION OF SOCKET CONN. FROM TANK SURFACE=60mm(TYP.)
3. MATERIAL OF CONSTRUCTION:–4.0THK.
4. WEIGHT OF TANK WITH WATER ~ 2800.00 KGS(APPROX.)
5. WEIGHT OF TANK WITHOUT WATER ~ 350.00 KGS(APPROX.)
6. NOZZLES ON THE TANK SHALL BE CUT AT SITE TO MATCH THE PIPING LAYOUT
7. MINIMUM TANK FOUNDATION REQUIRED IS SHOWN IN THE DRAWING.
   FOUNDATION SHALL BE PROVIDED AS PER APPROVED LAYOUT ONLY.
8. NOZZLES SHALL BE CUT AT SITE AS PER LAYOUT DRAWING.
9. REINFORCEMENT SHALL BE PROVIDED WHEREVER NOZZLES HAS BEEN PROVIDED.

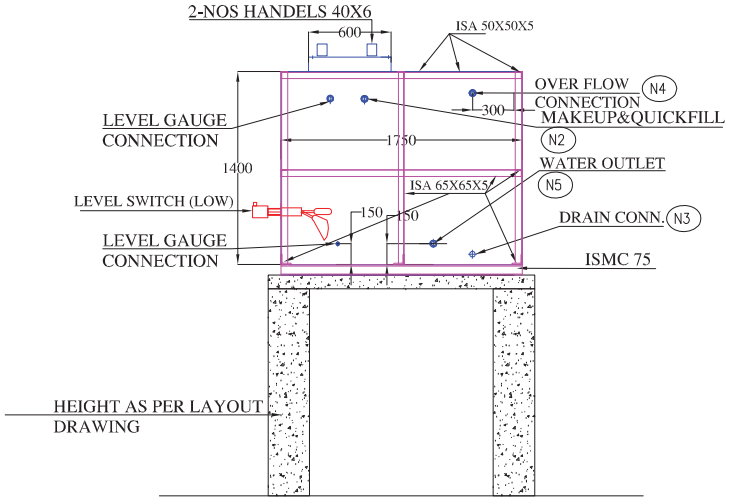
LIST OF NOZZLES OF EACH TANK

	DESCRIPTION	SIZE	QTY
N1	VENT	20 NB	
N2	MAKE UP	50 NB	01 NO
N2	QUICK FILL	50 NB	01 NO
N3	DRAIN	40 NB	01 NO
N4	OVER FLOW	65 NB	01 NO
N5	OUTLET	65 NB	01 NO

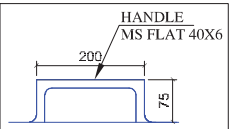
S.NO.	LOCATION	QTY
01	LOCATION – 1	02
02	LOCATION – 1	02
03	LOCATION – 1	02



ELEVATION



VIEW-A-A



DETAIL-A

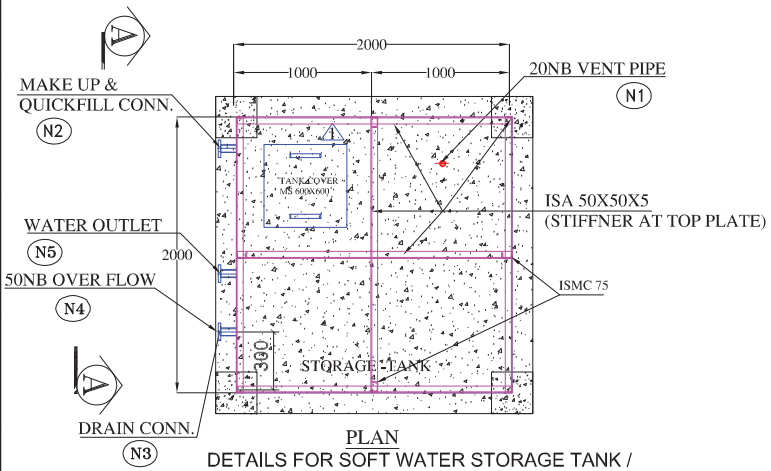
PAINTING DETAILS (BOTH INSIDE & OUTSIDE):

1. SURFACE PREPARATION : BLAST CLEANING TO SA 2.5
2. PRIMER COAT: ONE (1) COAT OF EPOXY RAISIN BASED ZINC PHOSPHATE HIGH BUILD PRIMER (2 PACK), DFT – 75 MICRONS
3. INTERMEDIATE COAT : ONE (1) COAT OF HIGH BUILD AMINE CURED EPOXY (2 PACK), DFT – 100 MICRONS
4. FINISH COAT: ONE (1) COAT OF POLYAMIDE CURED EPOXY (2 PACK), DFT – 150 MICRONS
5. TOTAL DFT: 325 MICRONS

MS TANK- SITE FABRICATED

DRG. No. XXXXX
CUSTOMER: NTPC LIMITED
1X800 MW SIPAT TPS
CONSULTANT:
CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD
PROJECT ENGINEERING MANAGEMENT
JOB NO. 520
STATUS CONTRACT
DISTRIBUTION
VENDOR NAME & ADDRESS
TITLE: TDS & GA OF EXPANSION TANK,MAKE WATER TANK AND SOFT WATER TANK FOR AIR CONDITIONING SYSTEM
DRAWING NO. PE-DG-520-553-002-A004
REV. 00

DRAWING IS PART OF TECHNICAL SPECIFICATION -PE-TS-520-553-002-A001



PLAN

DETAILS FOR SOFT WATER STORAGE TANK / MAKE UP WATER TANK
SIZE-2000(L)X2000(W)X2350(H)
EFFECTIVE VOLUME OF TANK-8 CUM

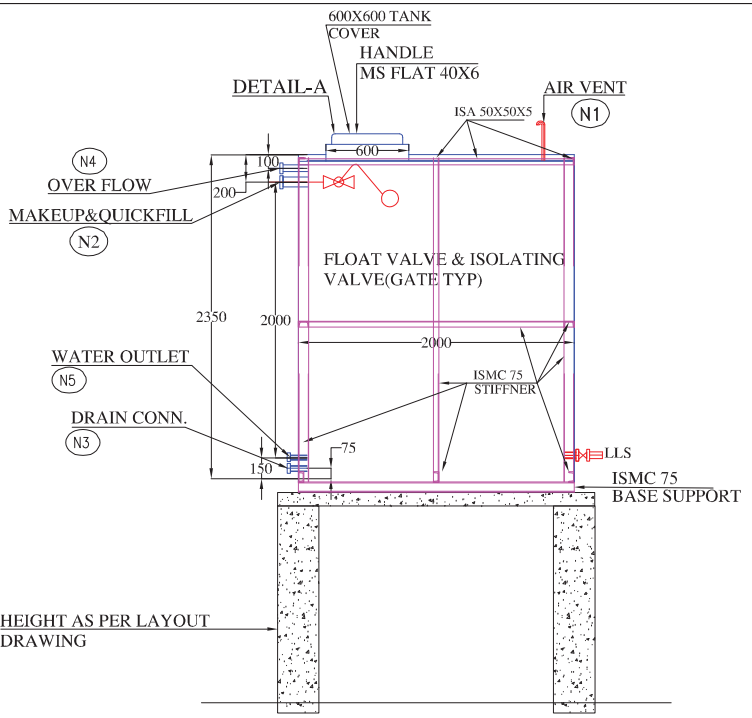
NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. PROJECTION OF PIPE CONN. FROM TANK SURFACE=100mm(TYP.)
   PROJECTION OF SOCKET CONN. FROM TANK SURFACE=60mm(TYP.)
3. MATERIAL OF CONSTRUCTION:-4.0THK.
4. WEIGHT OF TANK WITH WATER ~ 8840.00 KGS(APPROX.)
5. WEIGHT OF TANK WITHOUT WATER ~ 840.00 KGS(APPROX.)
6. NOZZLES ON THE TANK SHALL BE CUT AT SITE TO MATCH THE PIPING LAYOUT
7. MINIMUM TANK FOUNDATION REQUIRED IS SHOWN IN THE DRAWING. FOUNDATION SHALL BE PROVIDED AS PER APPROVED LAYOUT ONLY.
8. NOZZLES SHALL BE CUT AT SITE AS PER LAYOUT DRAWING.
9. REINFORCEMENT SHALL BE PROVIDED WHEREVER NOZZLES HAS BEEN PROVIDED.

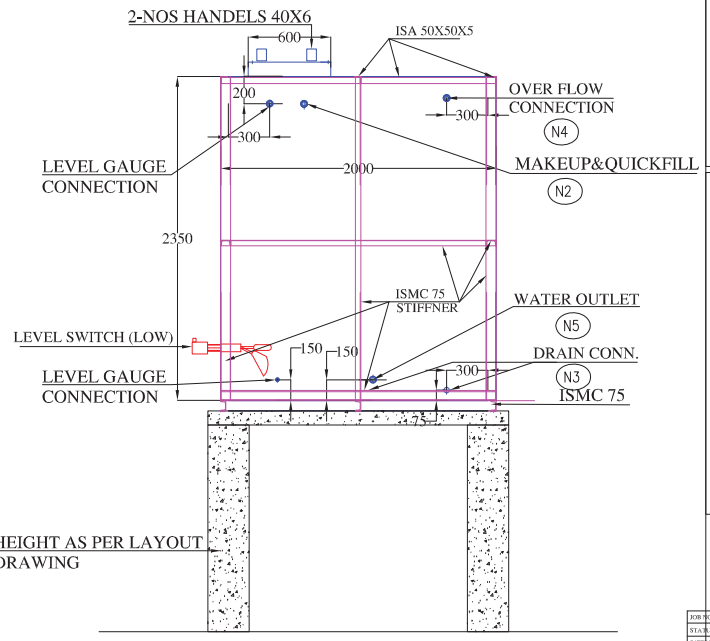
LIST OF NOZZLES OF EACH TANK

	DESCRIPTION	SIZE	QTY
N1	VENT	20 NB	
N2	MAKE UP	50 NB	01 NO
N2	QUICK FILL	50 NB	01 NO
N3	DRAIN	40 NB	01 NO
N4	OVER FLOW	65 NB	01 NO
N5	OUTLET	65 NB	01 NO

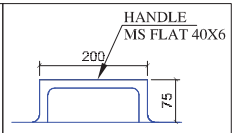
S.NO.	LOCATION	QTY
01	LOCATION – 1	02
02	LOCATION – 1	02
03	LOCATION – 1	02



ELEVATION



VIEW-A-A



DETAIL-A

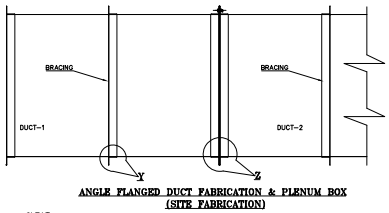
PAINTING DETAILS (BOTH INSIDE & OUTSIDE):

1. SURFACE PREPARATION : BLAST CLEANING TO SA 2.5
2. PRIMER COAT: ONE (1) COAT OF EPOXY RAISIN BASED ZINC PHOSPHATE HIGH BUILD PRIMER (2 PACK), DFT – 75 MICRONS
3. INTERMEDIATE COAT : ONE (1) COAT OF HIGH BUILD AMINE CURED EPOXY (2 PACK), DFT – 100 MICRONS
4. FINISH COAT: ONE (1) COAT OF POLYAMIDE CURED EPOXY (2 PACK), DFT – 150 MICRONS
5. TOTAL DFT: 325 MICRONS

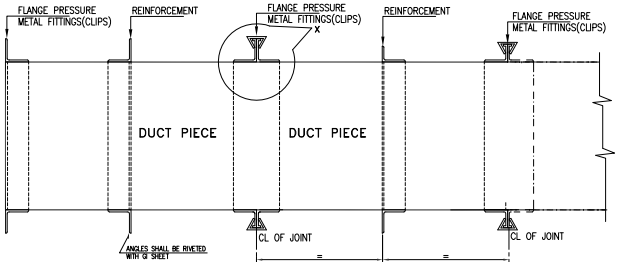
MS TANK- SITE FABRICATED

DRG. No. XXXXX
CUSTOMER: NTPC LIMITED
1X800 MW SIPAT TPS
CONSULTANT:
CONTRACTOR: BHARAT HEAVY ELECTRICALS LTD
JOB NO. 520
STATUS CONTRACT
DISTRIBUTION
VENDOR NAME & ADDRESS
TITLE: TDS & GA OF EXPANSION TANK,MAKE WATER TANK AND SOFT WATER TANK FOR AIR CONDITIONING SYSTEM
DRAWING NO. PE-DG-520-553-002-A004
REV. 00

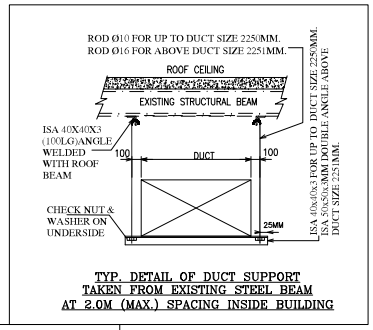
DRAWING IS PART OF TECHNICAL SPECIFICATION -PE-TS-520-553-002-A001



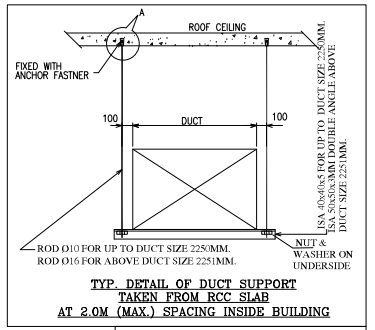
ANGLE FLANGED DUCT FABRICATION & PLENUM BOX (SITE FABRICATION)



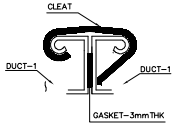
DUCT JOINT



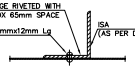
TYP. DETAIL OF DUCT SUPPORT TAKEN FROM EXISTING STEEL BEAM AT 2.0M (MAX.) SPACING INSIDE BUILDING



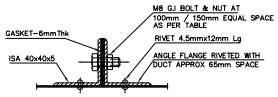
TYP. DETAIL OF DUCT SUPPORT TAKEN FROM RCC SLAB AT 2.0M (MAX.) SPACING INSIDE BUILDING



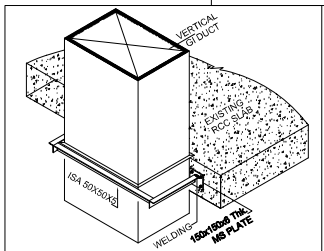
DETAIL-X TDF FLANGE JOINT



DETAIL-Y
FLANGE & BRACING CONNECTION

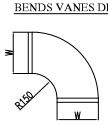


DETAIL-Z
ANGLE FLANGE CONNECTIONS

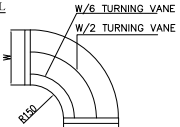


TYPICAL VERTICAL DUCT SUPPORT

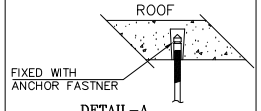
BENDS VANES DETAIL



'W' UPTO 500MM

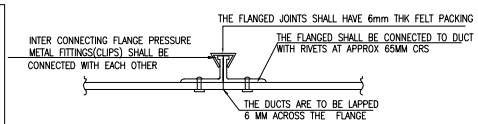


'W' OVER 500 MM



DETAIL-A

THICKNESS OF DUCT SHEET	
LONG SIDE OF DUCT(MM)	THICKNESS
UPTO 750	24G (0.63 mm)
751 TO 1500	22G (0.8 mm)
1501 TO 2200	20G (1.0 mm)
2201 AND ABOVE	18G (1.25 mm)



DETAIL- SAME SHEET CLIP JOINT

SAME SHEET TECHNIQUE FOR BELOW 2200 MM SIZES

LONG SIDE OF DUCT(MM)	MINIMUM SIZE OF SAME SHEET FLANGE (MM), LOW PRESSURE			MINIMUM SIZE / THICKNESS OF CORNER METAL FLANGE (MM)		MINIMUM THICK. OF SHEET OF FLANGE PRESS. METAL FITTINGS	MAX.SPACING OF JOINTS) (MM)
	HEIGHT	WIDTH	GI SHEET THICKNESS	LOW PRESSURE	NOMINAL DIA. OF BOLT	LOW PRESSURE	
0 – 450	30	10	0.5	1.2	M8	1.0	3480
451 – 750	30	10	0.6	1.2	M8	1.0	3480
751 – 1200	30	10	0.8	1.2	M8	1.0	2610
1201– 1500	30	10	0.8	1.6	M8	1.0	2610
1501– 2200	30	10	1.0	1.6	M8	1.2	1740

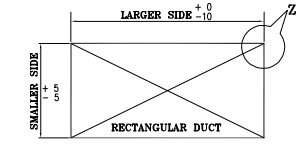
NOTE– THE DIA OF THE BOLTS FOR CORNER METAL FITTING SHALL NOT EXCEED AS CERTAIN DIAMETER WHICH ENSURES ENOUGH EDGE DISTANCE OF FLANGE

ANGLE FLANGE TECHNIQUE

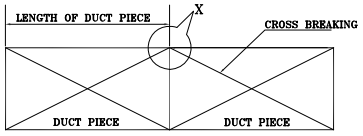
LONG SIDE OF DUCT (L) MM	JOINT FLANGE		CONNECTING BOLT			FLANGE MOUNTING RIVET	
	ANGLE MIN. SIZE (MM)	MAX. SPACING (MM)	MIN. NOM. DIA. (MM)	MAX. SPACING (MM) CORNER	MAX. SPACING (MM) NON CORNER	MIN. DIA OF RIVET (MM)	MAX.SPACING OF RIVETS (MM)
0 – 750	25X25X3	3640	M8	100	150	4.5	65
751 – 1500	30X30X3	2730	M8	100	150	4.5	65
1501– 2200	40X40X3	1820	M8	100	150	4.5	65
2201–ABOVE	40X40X5	1820	M8	100	150	4.5	65

NOTE–
1. THE BOLTS SHALL BE LOCATED SYMMETRICALLY AT THE CENTRAL PORTION OF FLANGE
2. ELECTRICAL SPOT WELDING MAY BE EMPLOYED OTHER THAN RIVETING. SPACING SHALL WITHING 100MM.
3. THE DIA OF THE BOLTS FOR CORNER METAL FITTING SHALL NOT EXCEED AS CERTAIN DIAMETER WHICH ENSURES ENOUGH EDGE DISTANCE OF FLANGE

DUCT SEAM & JOINTS

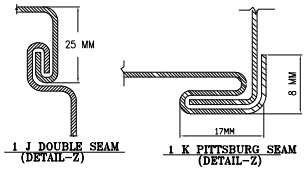


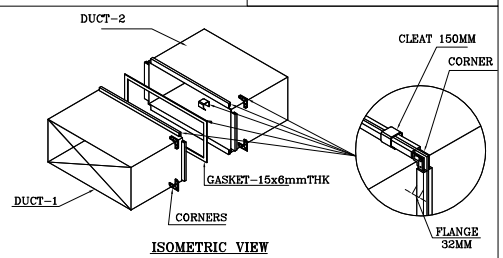
DUCT JOINT (CORNER DETAILS) (FOR ALL DUCTS – TYPE-B)



DUCT JOINT (TYPE A)

NOTE:–
ALL RECTANGULAR DUCT SHALL BE FLAT ON FACE AND DOUBLE SEAM JOINT (DETAIL – Z) ON CORNER OF DUCT





ISOMETRIC VIEW

SITE FABRICATED SAME SHEET TECHNIQUE(MM) L-SHAPE DUCT JOINTS TYPICAL DETAIL

LONG SIDE OF DUCT(MM)	TYPE AND SPACING OF LATERAL REINFORCEMENT			
	MINIMUM SIZE OF STEEL ANGLE REINFORCEMENT(MM)	MAXIMUM SPACEING SAME SHEET TECHNIQUE(MM)	ANGLE FLANGE TECHNIQUE(MM)	TYPE OF LONG JOINT
251 – 750	25x25x3	1840	1840	1A OR 1D OR 1J
751 – 1500	30x30x3	925	925	1A OR 1D OR 1J
1501– 2200	40x40x3	925+TIE ROD	925	1A OR 1D OR 1J
2201–ABOVE	40x40x5(3)	–	925	1A OR 1D OR 1J

* NOTE– THE VALUE GIVEN IN PARENTHESIS SHOW THAT WHEN TIE RODS ARE ALSO USED.

LONG SIDE OF DUCT(MM)	TYPE AND SPACING OF LONGITUDNAL REINFORCEMENT	
	MINIMUM SIZE OF STEEL ANGLE REINFORCEMENT(MM)	POSITION OF REINFORCEMENT
1501– 2200	40x40x3	ONE POINT OR MORE
2201–ABOVE	40x40x5(3)	TWO POINT OR MORE

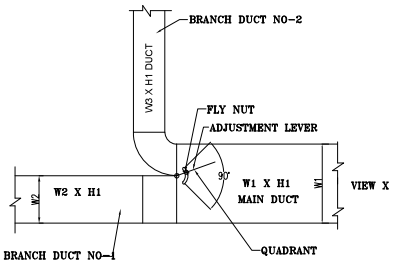
DETAILS OF DUCT SUPPORT		
LONG SIDE OF DUCT(MM)	ANGLE	ROD (MS) øD
UPTO 2250	L 40X40X3	10
2251–ABOVE	L 50X50X3 DOUBLE ANGLE	16

* NOTE– 1. THE VALUE GIVEN IN PARENTHESIS SHOW THAT WHEN TIE RODS ARE ALSO USED.
2. ANGLE REINFORCEMENT CAN BE INSIDE OR OUTSIDE THE DUCT

NOTES:

1. ALL RECTANGULAR DUCTS OVER 450mm IN EITHER DIMENSION SHALL BE CROSS BROKEN IT IS NOT NECESSARY TO HAVE CROSS BREAKING THE AIR OUTLET CONNECTION OF DUCTS (COLLAR & DIFFUSERS) DEPENDING UPON THE LENGTH OF COLLAR/DIFFUSER.
2. ALL FLANGED JOINTS SHALL HAVE 6mm THK. FRLT PACKING STUCK TO THE FLANGES WITH SHELIAC VANISH OR APPROVED EQUIVALENT ADHESIVE HOLES IN THE FELT PACKING SHALL BE BURNT THROUGH.
3. DUCT SUPPORT TO BE TAKEN PREFERABLY FROM EXISTING STEEL BEAM. ONLY WHEN STEEL BEAM ARE NOT AVAILABLE SUPPORT MAY BE TAKEN FROM RCC SLAB.
4. DUCT FABRICATION IS AS PER THE IS655.

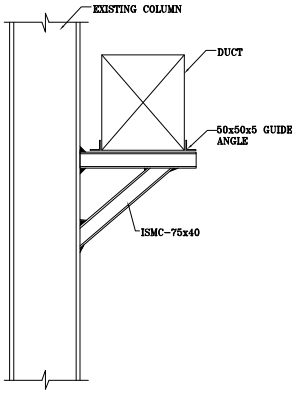
PROJECT	IX800 MW SIPAT TPS
CUSTOMER :	NTPC LIMITED
EPC SUPPLIER	BHARAT HEAVY ELECTRICALS LTD PS–PEM, BHEL SADAN, SECTOR–16A, PLOT NO. 25, NOIDA–201301
JOB NO. XXX	
STATUS CONTRACT	BHEL Doc. No: PE-DG-520-553-002-A005 REV: 00
PACKAGE	AC & VENTILATION SYSTEM SHEET NO. OF 2
TITLE	TYPICAL DETAILS OF DUCT FABRICATION DRAWING / SUPPORT / ERECTION
PREPARED BY	VN –SD– 15/10/2025
CHECKED BY	VN –SD– 15/10/2025
APPROVED BY	VN –SD– 15/10/2025
	A1 SIZE



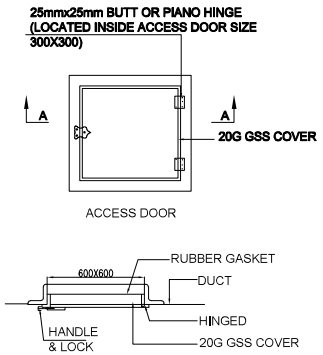
WHERE

(1) W1 = WIDTH OF THE MAIN DUCT.
(2) W2 = WIDTH OF BRANCH DUCT NO.-1
(3) W3 = WIDTH OF BRANCH DUCT NO.-2
(4) H1 = HEIGHT OF THE MAIN DUCT.
= HEIGHT OF BRANCH DUCT NO.-1
= HEIGHT OF BRANCH DUCT NO.-2
= 600
(5) W1 = W2 + W3

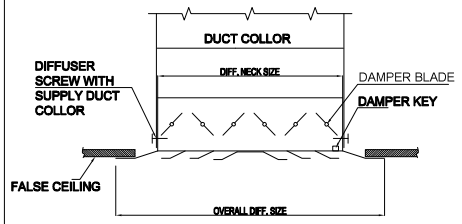
TYPICAL INSTALLATION ARRANGEMENT OF SPLITTER DAMPER



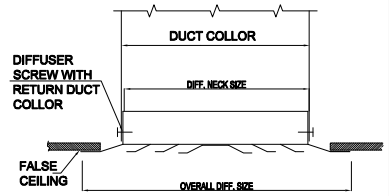
DUCT SUPPORT FORM BUILDING COLUMN



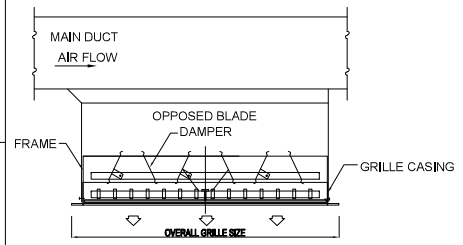
ACCESS DOOR DETAILS



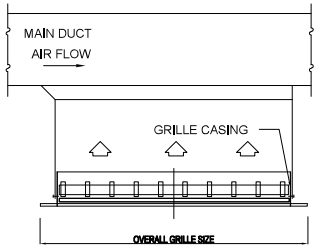
SUPPLY AIR DIFFUSER FIXING ARRANGEMENT(TYP)



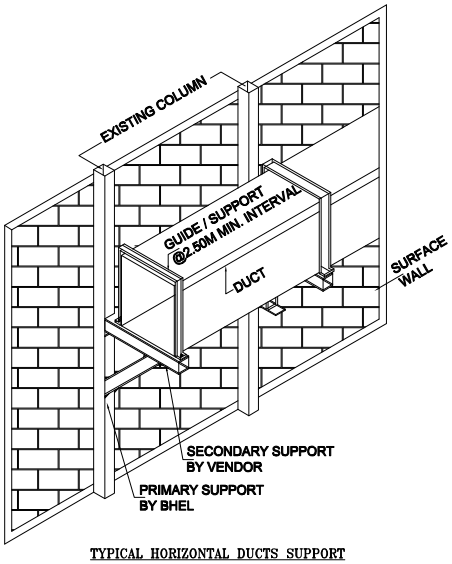
RETURN AIR DIFFUSER FIXING ARRANGEMENT(TYP)



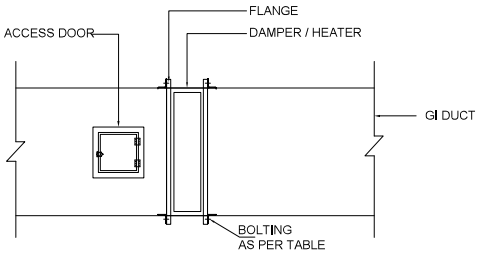
SUPPLY AIR GRILLE FIXING ARRANGEMENT(TYP)



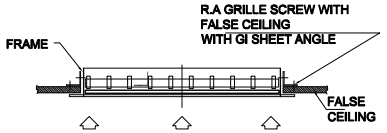
RETURN AIR GRILLE FIXING ARRANGEMENT WITH RA DUCT (TYP)



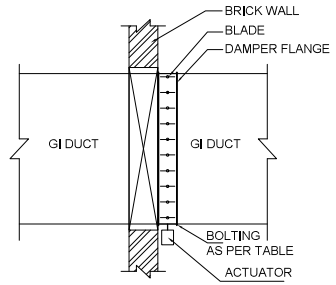
TYPICAL HORIZONTAL DUCTS SUPPORT



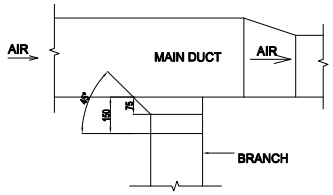
FIXING DETAIL VOLUME CONTROL DAMPER, HEATER OF DUCT (TYP)



RETURN AIR GRILLE FIXING ARRANGEMENT WITHOUT RA DUCT (TYP)



FIRE DAMPER FIXING DETAILS



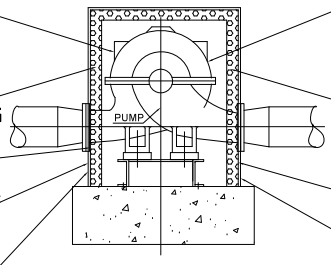
90° BRANCH CONNECTION

NOTES:

1. ALL RECTANGULAR DUCTS OVER 450mm IN EITHER DIMENSION SHALL BE CROSS BROKEN IT IS NOT NECESSARY TO HAVE CROSS BREAKING THE AIR OUTLET CONNECTION OF DUCTS (COLLAR & DIFFUSERS) DEPENDING UPON THE LENGTH OF COLLAR/DIFFUSER.
2. ALL FLANGED JOINTS SHALL HAVE 6mm THK. FRLT PACKING STUCK TO THE FLANGES WITH SHELIAC VANISH OR APPROVED EQUIVALENT ADHESIVE HOLES IN THE FELT PACKING SHALL BE BURNT THROUGH.
3. DUCT SUPPORT TO BE TAKEN PREFERABLY FROM EXISTING STEEL BEAM. ONLY WHEN STEEL BEAM ARE NOT AVAILABLE SUPPORT MAY BE TAKEN FROM RCC SLAB.
4. DUCT FABRICATION IS AS PER THE IS655.
5. DUCTS WITH LONGER SIDES OF 500MM AND OVER SHALL HAVE ANGLE FLANGED JOINT

PROJECT	IX800 MW SIPAT TPS		
	CUSTOMER: NTPC LIMITED		
	EPC SUPPLIER: BHARAT HEAVY ELECTRICALS LTD PS-PEM, BHEL SADAN, SECTOR-16A, PLOT NO. 25, NOIDA-201301		
JOB NO. XXX	STATUS CONTRACT	BHEL Doc. No: PE-DG-520-553-002-A005	REV: 00
PACKAGE	AC & VENTILATION SYSTEM		SHEET NO. OF 2
TITLE	TYPICAL DETAILS OF DUCT FABRICATION DRAWING / SUPPORT / ERECTION		
PREPARED BY	VN	-SD-	15/10/2025
CHECKED BY	VN	-SD-	15/10/2025
APPROVED BY	VN	-SD-	15/10/2025
			A1 SIZE

1. PUMP OUTER SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUND OF SHALIMAR TAR PRODUCT OR LOID BOND 83 OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. 50MM THK. RIGID POLYURETHANE FOAM (SLAB) WITH ALUMINUM FOIL SHALL BE APPLIED ON THE SURFACE. JOINTS TO BE SEALED WITH BITUMEN
3. TWO LAYERS OF GLASS CLOTH WITH A SUITABLE ADHESIVE AS LOID BOND 130 SHALL BE PASTED OVER THE INSULATING MATERIAL
4. COVER INSULATION WITH 500G POLYTHENE WITH 50MM OVERLAP. SEALING OF OVERLAP WITH SYNTHETIC ADHESIVE LIKE CPRX/ LOID BOND 83 OR EQUIVALENT COMPOUND
5. 26G ALUMINUM SHEET AND LOCKING OF JOINTS WITH SELF LOCKING SCREW AT PITCH OF 100MM.



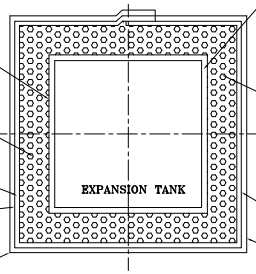
1. TANK OUTER SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUND OF SHALIMAR TAR PRODUCT OR LOID BOND 83 OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. 75MM THK. RESIN BONDED ROCKWOOL / GLASSWOOL (SLAB) TO BE APPLIED ON THE SURFACE. JOINTS TO BE SEALED WITH BITUMEN
3. COVER INSULATION WITH 500G POLYTHENE WITH 50MM OVERLAP. SEALING OF OVERLAP WITH SYNTHETIC ADHESIVE LIKE CPRX/ LOID BOND 83 OR EQUIVALENT COMPOUND
4. 26G ALUMINUM SHEET AND LOCKING OF JOINTS WITH SELF LOCKING SCREW AT PITCH OF 100MM.

INSULATION WITH POLYURETHANE FOAM

INSULATION WITH RESIN BONDED GLASSWOOL OR ROCKWOOL

DETAIL OF PUMP INSULATION
(FOR CHILLED WATER PUMPS ONLY)

1. TANK OUTER SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUND OF SHALIMAR TAR PRODUCT OR LOID BOND 83 OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. 50MM THK. RIGID POLYURETHANE FOAM (SLAB) WITH ALUMINUM FOIL SHALL BE APPLIED ON THE SURFACE. JOINTS TO BE SEALED WITH BITUMEN
3. TWO LAYERS OF GLASS CLOTH WITH A SUITABLE ADHESIVE AS LOID BOND 130 SHALL BE PASTED OVER THE INSULATING MATERIAL
4. COVER INSULATION WITH 500G POLYTHENE WITH 50MM OVERLAP. SEALING OF OVERLAP WITH SYNTHETIC ADHESIVE LIKE CPRX/ LOID BOND 83 OR EQUIVALENT COMPOUND
5. 26G ALUMINUM SHEET AND LOCKING OF JOINTS WITH SELF LOCKING SCREW AT PITCH OF 100MM.



1. TANK OUTER SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUND OF SHALIMAR TAR PRODUCT OR LOID BOND 83 OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. 75MM THK. RESIN BONDED ROCKWOOL / GLASSWOOL (SLAB) TO BE APPLIED ON THE SURFACE. JOINTS TO BE SEALED WITH BITUMEN
3. COVER INSULATION WITH 500G POLYTHENE WITH 50MM OVERLAP. SEALING OF OVERLAP WITH SYNTHETIC ADHESIVE LIKE CPRX/ LOID BOND 83 OR EQUIVALENT COMPOUND
4. 26G ALUMINUM SHEET AND LOCKING OF JOINTS WITH SELF LOCKING SCREW AT PITCH OF 100MM.

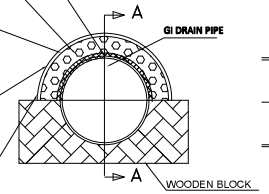
INSULATION WITH POLYURETHANE FOAM

INSULATION WITH RESIN BONDED GLASSWOOL OR ROCKWOOL

DETAIL OF MS OPEN TYPE EXPANSION TANK INSULATION
(INSULATION & CLADDING TO BE DONE IN SUCH AWAY SO THAT MANHOLE COVER CAN BE OPENED AT ANY POINT OF TIME)

APPLICATION OF INSULATION ON CHILLED WATER PIPE

1. TANK OUTER SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUND OF SHALIMAR TAR PRODUCT OR LOID BOND 83 OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. 50MM THK. RIGID POLYURETHANE FOAM (PIPE SECTION) WITH ALUMINUM FOIL SHALL BE APPLIED ON THE SURFACE. JOINTS TO BE SEALED WITH BITUMEN
3. TWO LAYERS OF GLASS CLOTH WITH A SUITABLE ADHESIVE AS LOID BOND 130 SHALL BE PASTED OVER THE INSULATING MATERIAL
4. COVER INSULATION WITH 500G POLYTHENE WITH 50MM OVERLAP. SEALING OF OVERLAP WITH SYNTHETIC ADHESIVE LIKE CPRX/ LOID BOND 83 OR EQUIVALENT COMPOUND
5. 26G ALUMINUM SHEET AND LOCKING OF JOINTS WITH SELF LOCKING SCREW AT PITCH OF 100MM.



INSULATION WITH POLYURETHANE FOAM

1. TANK OUTER SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUND OF SHALIMAR TAR PRODUCT OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. 75MM THK. RESIN BONDED ROCKWOOL / GLASSWOOL (PIPE SECTION) TO BE APPLIED ON THE SURFACE. JOINTS TO BE SEALED WITH BITUMEN
3. COVER INSULATION WITH 500G POLYTHENE WITH 50MM OVERLAP. SEALING OF OVERLAP WITH SYNTHETIC ADHESIVE LIKE CPRX/ LOID BOND 83 OR EQUIVALENT COMPOUND
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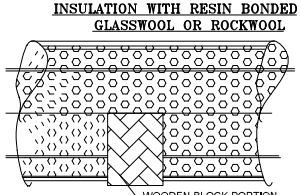
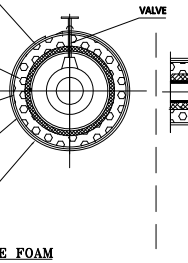


INSULATION WITH RESIN BONDED GLASSWOOL OR ROCKWOOL

VIEW A–A

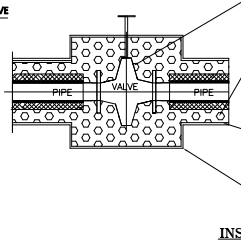
APPLICATION OF INSULATION ON CHILLED WATER PIPE WHERE EVER SUPPORT IS COMING

1. VALVE / STRAINER ETC. OUTER SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUND OF SHALIMAR TAR PRODUCT OR LOID BOND 83 OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. 50MM THK. RIGID POLYURETHANE FOAM (PIPE SECTION) WITH ALUMINUM FOIL SHALL BE APPLIED ON THE SURFACE. JOINTS TO BE SEALED WITH BITUMEN
3. TWO LAYERS OF GLASS CLOTH WITH A SUITABLE ADHESIVE AS LOID BOND 130 SHALL BE PASTED OVER THE INSULATING MATERIAL
4. COVER INSULATION WITH 500G POLYTHENE WITH 50MM OVERLAP. SEALING OF OVERLAP WITH SYNTHETIC ADHESIVE LIKE CPRX/ LOID BOND 83 OR EQUIVALENT COMPOUND
5. 26G ALUMINUM SHEET AND LOCKING OF JOINTS WITH SELF LOCKING SCREW AT PITCH OF 100MM.



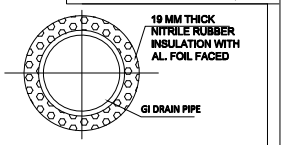
INSULATION WITH POLYURETHANE FOAM

1. VALVE / STRAINER ETC. OUTER SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUND OF SHALIMAR TAR PRODUCT OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. 75MM THK. RESIN BONDED ROCKWOOL / GLASSWOOL (PIPE SECTION) TO BE APPLIED ON THE SURFACE. JOINTS TO BE SEALED WITH BITUMEN
3. COVER INSULATION WITH 500G POLYTHENE WITH 50MM OVERLAP. SEALING OF OVERLAP WITH SYNTHETIC ADHESIVE LIKE CPRX/ LOID BOND 83 OR EQUIVALENT COMPOUND
4. 26G ALUMINUM SHEET AND LOCKING OF JOINTS WITH SELF LOCKING SCREW AT PITCH OF 100MM.

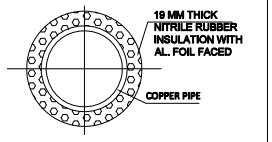


INSULATION WITH RESIN BONDED GLASSWOOL OR ROCKWOOL

DETAIL OF VALVE INSULATION FOR CHILLED WATER LINE VALVES ONLY
(THE DETAILS SHOWN IS FOR GATE VALVE. THE SAME TO BE APPLIED FOR OTHER TYPES OF VALVES / STRAINER / SPECIALITIES)

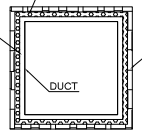


DETAIL OF AHU DRAIN PIPE



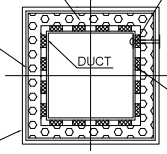
REFRIGERANT PIPES
(SUCTION AND LIQUID LINES)

1. O/S DUCT SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND SUITABLE ADHESIVE I.E. SR-998 OR EQUIVALENT SHALL BE APPLIED OVER THE SURFACE TO BE INSULATED & INSULATION MATERIAL SURFACES
2. 19mm THICK NITRILE RUBBER INSULATION (SHEET) WITH ALUMINUM FOIL FACED
3. TWO LAYERS OF GLASS CLOTH WITH A SUITABLE ADHESIVE AS SR 998 OR EQUIVALENT SHALL BE THEN APPLIED OVER THE INSULATING MATERIAL



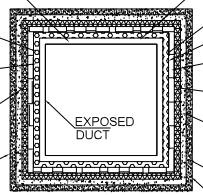
APPLICATION OF THERMAL INSULATION ON SUPPLY AIR DUCT & RETURN AIR DUCT
(FOR AC DUCT INDOOR APPLICATION)

1. I/S DUCT SURFACE SHALL BE THROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUNT OF SHALIMAR TAR PRODUCT OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. APPLY 25 MM THK. RESIN BONDED GLASS WOOL SLAB (DENSITY 48 KG/CUM), INSULATION SHALL BE FIXED ON 600X600MM WOODEN FRAME
3. APPLY FIBER GLASS TISSUE SHEET OVER THE INSULATION
4. APPLY 30G PERFORATED ALUMINUM SHEET HAVING 5MM DIA PERFORATION @8 TO 10MM CENTER TO CENTER DISTANCE



DETAIL OF ACOUSTIC INSULATION FOR DUCTING.
(TO BE PROVIDED FROM INSIDE OF DUCT)

1. TANK OUTER SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUND OF SHALIMAR TAR PRODUCT OR LOID BOND 83 OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. 50MM THK. RIGID POLYISOCYANURATE FOAM SHALL BE APPLIED ON THE SURFACE. JOINTS TO BE SEALED WITH BITUMEN
3. TWO LAYERS OF GLASS CLOTH WITH A SUITABLE ADHESIVE AS LOID BOND 130 SHALL BE PASTED OVER THE INSULATING MATERIAL
4. COVER INSULATION WITH 500G POLYTHENE WITH 50MM OVERLAP. SEALING OF OVERLAP WITH SYNTHETIC ADHESIVE LIKE CPRX/ LOID BOND 83 OR EQUIVALENT COMPOUND
5. 22G ALUMINIUM SHEET CLADDING, PROPERLY STICHED AT ALL JOINTS SHALL BE PROVIDED OVER THE EXTERNAL SURFACE. CLADDING IS HELD IN ITS POSITION WITH SDST SCREWS @150MM C/C OVER TOUNGE IN GROOVE JOINTS APPLIED WITH A FELT.



INSULATION WITH POLYISOCYANURATE FOAM

1. DUCT OUTER SURFACE SHALL BE THOROUGHLY CLEANED, DRIED AND AN ADHESIVE (CPRX COMPOUND OF SHALIMAR TAR PRODUCT OR EQUIVALENT SHALL BE APPLIED @ 1.5 KG/SQ.M ON THE SURFACE
2. 50 MM THK. RESIN BONDED ROCKWOOL / GLASSWOOL TO BE APPLIED ON THE SURFACE. JOINTS TO BE SEALED WITH BITUMEN
3. COVER INSULATION WITH 500G POLYTHENE WITH 50MM OVERLAP & SEALING ALL JOINT ON HOT SIDE
4. WRAPPING OF POLY BONDED HESSAIAN OVER INSULATION WITH 50MM OVERLAP, STICHING & SEALING OF OVERLAP WITH CPRX OR EQ. COMPOUND.
5. THE SURFACE SHALL BE WRAPPED WITH 19mm MESH 24 SWG.G.I WIRE NETTING,BUTTING ALL THE JOINTS & LACED DOWN WITH 22 SWG LACKING WIRE.
6. SAND CEMENT (4:1) PLASTER SHALL BE APPLIED IN TWO LAYERS TOTALING TO 12.5 MM THK(APPRX.) ,THE SECOND LAYER BEING BROUGHT TO A SMOOTH FINISH. A WATER PROOFING COMPOUND SHALL BE ADDED TO THE CEMENT BEFORE ITS APPLICATION.
7. APPLICATION OF 3 MM THICK COAT OF SUITABLE WATER PROOFING COMPOUND AND WRAPPED WITH FIBRE GLASS RP TISSUE FOLLOWED BY FINAL COAT OF 3 MM THICK WATER PROOFING COMPOUND OVER THE RP TISSUE
8. 22G ALUMINUM SHEET CLADDING, PROPERLY STICHED AT ALL JOINTS SHALL BE PROVIDED OVER THE EXTERNAL SURFACE. CLADDING IS HELD IN ITS POSITION WITH SDST SCREWS @150MM C/C OVER TOUNGE IN GROOVE JOINTS APPLIED WITH A FELT.

INSULATION WITH RESIN BONDED GLASSWOOL OR ROCKWOOL

APPLICATION OF THERMAL INSULATION ON EXPOSED AIR DUCT
(FOR OUTDOOR APPLICATION)

SPECIFICATION FOR INSULATION MATERIAL

MATERIAL	CODE	THERMAL CONDU. (w/m,°C)	DENSITY(KG/M³)
RESIN BONDED GLASSWOOL / ROCKWOOL	IS:8183	0.049 at 50°C 0.043 at 50°C	24 (FOR THERMAL INSULATION) 48 (FOR ROCKWOOL INSULATION) 48 (FOR ACOUSTIC INSULATION)
MINERAL WOOL PIPE SECTION. MIN. GR. 2	IS:9842	0.043 at 50°C	144
CLOSED CELL ELASTOMERIC NITRILE RUBBER		0.036 at 20°C	40 – 60
POLYURETHANE FOAM		0.03 at 50°C	34 + 2
POLYISOCYANURATE FOAM	IS:12436	0.03 at 50°C	34 + 2
ALL INSULATION SHALL BE CFC/HCFC FREE			

PROJECT	IX800 MW SIPAT TPS		
CUSTOMER :	NTPC LIMITED		
EPC SUPPLIER	BHARAT HEAVY ELECTRICALS LTD PS–PEM, BHEL SADAN, SECTOR–16A, PLOT NO. 25, NOIDA–201301		
JOB NO. XXX			
STATUS CONTRACT	BHEL Doc. No: PE-DG-520-553-002-A005		REV: 00
PACKAGE	AC & VENTILATION SYSTEM		SHEET NO. OF 2
TITLE	TYPICAL DETAILS OF DUCT FABRICATION DRAWING / SUPPORT / ERECTION		
PREPARED BY	VN	–SD–	15/10/2025
CHECKED BY	VN	–SD–	15/10/2025
APPROVED BY	VN	–SD–	15/10/2025
			A1 SIZE