CONTENTS

ENCLOSURES:

1.00.00 INTENT OF SPECIFICATION:

The intent of this enquiry/ specification is to carry out the Wet stack flow model study of PVUNL-3X800MW PATRATU STPP EXPANSION PHASE-1 project for complete duct system from absorber outlet to the top of the stack, design and optimization of gas flow and liquid collection system to mitigate stack liquid discharge (SLD) and shell corrosion, Preparation of final report and recommendations, preparation of drawings/ documents for execution of collection system, obtaining approval on documents from BHEL/ Customer/ customer's consultant, Preparation of BOQ, preparation of bought out item specification, procurement assistance for specialized items, site visit as specified later in the specification & as necessary for completeness in all respects and for efficient & trouble free operation of chimney and liquid collection system for project.

2.00.00 SCOPE OF WORK:

Wet stack model study shall consist of the following:

- Condensation calculations & design of condensate collection system
- A scale physical flow model (Min. 1:12 scale) for liquid collector system (LCS) design.
- A computational flow model for plume downwash analysis.
- A physical or computational flow model for CEMS elevation flow performance.
- Design of optimum choke geometry if required.
- Review & Approval of liquid collector system construction drawings.
- Site inspection & supervision for 7 days to verify and evaluate LCS system performance prior to commissioning.

Wet stack study shall be performed for each unit with a wet stack installation where there does not exist an identical or mirror image installation. The objective of the wet stack study shall be to maximize liquid collection downstream of the mist eliminators and to preclude ground level rainout from the stack by recommending experimentally developed, tested, and optimized liquid collection devices and drainage systems to return collected liquid to the absorber with minimum re-entrainment.

The following codes and standard shall be followed for the conductance of this study:

- Revised wet stack design guidelines, 2012 by EPRI
- ACI 307 (American concrete institute code requirement for RC chimney
- EPRI report CS-2520 Entrainment in wet stack 1982
- EPRI report TR 107099 Wet stack deign guide 1996
- EPRI report TR-109380 guidelines for fluid dynamic design of power plant ducts, 1998
- EPRI report GS-6984 FGD mist eliminator system design and specification guide
- CICIND, ICAC, US EPA and other international and other latest codes and standards.

The study shall be carried out by design methods and tools:

- Preliminary design review based on experience
- Laboratory flow modeling -3-D
- Computer flow modelling -3-D
- Computer program calculations – 2-D

2.01.01 Preliminary design review based on experience

Based on the inputs furnished as per enclosed Annexure with this specification for the duct work and stack, preliminary design review need to be carried out to estimate the liquid collection requirements, predict the condensation rate in the duct & stack and perform the preliminary system design.

2.01.02 Condensation calculations using analytical / numerical tools

Gas flow study should include the calculation for the condensate formed and / or condensate carry over. The condensate flow study should include condensate quantity formed due to:

i) Thermal condensation on the liners
ii) Adiabatic condensation
iii) Turbulence of flue gas flow near entry of the stack
iv) At the outlet duct from absorber mist eliminator outlet
v) Contribution from mist eliminator carryover in case of normal wash cycle or mist eliminator become fouled with time.

Detailed calculations along with the design basis for condensation rate in the duct from absorber outlet to the top of the chimney for the worst operating case, minimum boiler load and design conditions shall be furnished as a function of ambient air temperature, wind velocity and liner design variables in the report with an accuracy of ±10%.

2.01.03 Design of Condensate collection & drainage system

(i) Size of gutter(s) along with inner surface of Chimney flue can and inlet duct from absorber outlet to inlet of chimney flue can, such that condensate is collected efficiently and drained to FGD system.
(ii) As the gutter shall be made of Titanium/C-276 as compatible with inner surface, suitable shape, size and thickness is to be recommended so that gas flow occurs efficiently.

(iii) The size, thickness, location and material of condensate drainage pipe shall be included in recommendation. It is envisaged that pipe from gutter to outside of Chimney liner shall be of Titanium/C-276 and thereafter the drainage pipe shall be of FRP leading to FGD system. Routing of the drain pipes shall be provided.

After the flow-model study is performed, accordingly design of liquid-collection devices for the full scale Wet Stack is to be carried out and detailed drawings, design basis and calculations shall be submitted.

2.01.04 Computational 3-D fluid-dynamic-model study (CFD Analysis)

Performance of a computational 3-D fluid-dynamic-model study of the minimum upper one third of the stack liner and shell to evaluate downwash of the wet plume. CFD model shall include the surrounding structure which are significant to wind/ plume flow patterns preferably minishell, external handrails and floor at the stack outlet.

A computational model of the stack shell and liner(s) shall be constructed for the plume downwash study. The plume downwash study shall include analysis of the local wind/temperature data to identify the occurrence of critical wind and temperature conditions. The plume downwash study shall identify the stack velocity and ambient wind conditions that produce downwash and the maximum extent of expected downwash throughout the year for shell corrosion protection. For sites where ambient temperatures reach freezing, a "winter" period shall be simulated to evaluate icing potential on the stack.

Depending on the results of the downwash study, there may be a need to develop an optimum choke geometry, if required, to minimize the plume downwash & liquid impingement of the shell. This includes evaluation of liquid collectors and drains to prevent re-entrainment and discharge of large droplets from the top of the choke.

Bidder to use the latest software for the CFD modelling and shall submit the model along with results in form of contours and vector plots of velocity, pressure, concentration and temperature at various test locations and summarized in tabular format. The model shall be tested with various simulated operating, minimum and design flow conditions, maximum wind speed, wind orientations, to evaluate the potential of the downwash.
The Bidder shall review Minishell details (Liner extension above roof) enclosed as an Annexure and confirm the liner-extension design with their recommendation.

In case of the excessive downwash or reversed flow at stack exit or liquid exiting the stack liner and forming on the top of the concrete shell, bidder to provide the corrective actions, design modifications and evaluate the modified geometry.

2.02.00 Physical model of the system

An experimental gas-flow-model study to design and develop liquid collectors for the duct and stack downstream of the mist eliminator that will collect and drain liquid from the walls to prevent re-entrainment.

Laboratory Physical model study shall include the following details for wet stack design:

i. Estimation of the total liquid load on the liner surface as a result of thermal and adiabatic condensation. This estimate shall be based on the liner and shell geometry, thickness, materials of construction and the flue gas–flow rate and properties over a range of expected plant-operating conditions and worst-case ambient weather conditions considering the mist eliminator fouling / wash cycles.

ii. Design and optimization of liquid collectors in the absorber-outlet hood, absorber-outlet ducts, stack-liner entrance region and stack liner outlet to prevent SLD. The collectors will collect liquid from surfaces, re-entrainment, and guide the liquid to locations where it can be drained out of the system. This development work shall be conducted on a scale model of the wet duct and stack system, from the outlet of each absorber's mist eliminator include the absorber outlet and ducting, the stack breaching duct and a minimum of three (3) diameters of the stack liner above the top of the stack breaching duct. Model scales shall be minimum 1:12 and to be selected to ensure accurate modeling results for all tested parameters. The same shall be finalized after the award of the contract. The design should be of integrated complete system of liquid collectors from absorber outlet to chimney top for each unit.

iii. The laboratory test includes details of liquid re-entrainment and drainage behavior over the expected range of unit operating conditions and confirm the stack-liner design velocity.

iv. Physical model shall include any internal devices that may affect the gas flow, such as structural members, internal dampers, flow controls, and expansion joints. The model shall be mainly constructed from transparent acrylic or plastic, sheet metal, or coated rigid tubing such that it is suitable for wet testing. Modeled flow control and liquid collection devices may be constructed with sheet metal, or other suitable

construction materials, so long as the scaled liquid flow performance is not adversely modified.

v. The physical model shall be tested for pressure and velocity profiles at selected cross sections through the ducts and liner. A velocity traverse shall be conducted within the modeled liner to ensure that the cyclonic flow levels are within the U.S. EPA Method 1 recommended limitations for CEMS operation. In the event testing indicates that cyclonic flow could be a concern at the continuous emissions monitoring system (CEMS) elevation, a simulation, either by extension to the physical model or using a computational fluid dynamic model, shall be performed to evaluate this flow at the CEMS level. If needed, corrective devices shall be designed and tested to reduce stack swirl at the CEMS elevation.

vi. The physical model shall be tested by introducing liquid in a size and quantity such that the model shall approximately match the two-phase flow modeling requirements for droplet trajectory and loading. This testing shall be used to locate and design the liquid collection devices and drains.

vii. Evaluation of re-entrainment at liner-expansion joints in the laboratory test rig and development of a unit-specific liquid-collector geometry to collect and drain the liquid from the liner-expansion joints.

viii. Using this model effective internal liquid collection devices shall be developed and optimized to improve the droplet deposition and liquid collection in the stack as well as to prevent the re-entrainment of droplets from liquid pools and films.

ix. Bidder shall submit the detailed standard procedure for carrying out the physical model study at vendor lab for customer information / approval before the conductance of physical model study at lab.

2.03.00 <u>Site inspection & supervision</u>

Bidder to perform an onsite inspection as per the EPRI Revised Wet Stack Design Guideline, 2012. Site visit should occur for 7 days time during the construction phase, when liquid collection system is nearing completion, to inspect the liquid collection system as installed to ensure that the designed flow controls, liquid collectors, drains, and drain protection are installed properly and shall perform as intended. Bidder to provide the site inspection report to validate the design and installation.

The onsite inspection should confirm that the liquid-collection system has been fabricated and installed correctly and to identify any deviations to the recommended

design as a result of field modifications made to ease installation. The bidder shall also ensure the liquid collection system is installed properly.

The key deliverables from this study are:

a) Bidder to furnish the total quantity of condensate formed from absorber mist eliminator outlet to top of the stack.
b) Bidder to furnish the number, sizing and location of required various liquid collectors/ gutters, their shape, design of its evacuation piping from inside the chimney to outside and their Influence on the flow in the chimney liner.
c) Flow model study shall minimize system pressure losses and optimize collection and drainage and provide expected field wet stack system pressure loss across expected load range.
d) Bidder to achieve minimum stack liquid discharge. In case of excessive stack liquid discharge, possible means of modification to duct and stack geometry need to be proposed by bidder for improvement.
e) Bidder to ensure the design of effective liquid collection system for various plant load operating conditions and absorber combinations.
f) Bidder to furnish the comparison of the experimental and computer modelling.
g) Bidder to recommend modifications to prevent the chimney liquid discharge issues and to make the geometry more favorable for liquid collection.
h) Bidder to furnish the fabrication/installation drawings after the completion of model study for fabrication.
i) Bidder to identify appropriate liner system and gas inlet geometries (including flow control devices) to ensure homogeneous gas flow conditions and achieve cyclonic free flow distribution at the CEMS location.
j) Bidder to provide recommendations and design for sealing drain piping/ seal pots to inhibit backflow.
k) Bidder to recommend drain protection devices to minimize pluggage occurrences an flow and recommend method for monitoring liquid collection drainage flow in case of liquid collection system pluggage and SLD problems.
l) Bidder to provide stack outlet modifications, such as liner extensions or chokes, to minimize stack icing occurrences and to provide Stack shell coating requirements to protect concrete shells from corrosion due to plume downwash.
m) Bidder to evaluate the plume downwash and recommend modifications to minimize downwash using CFD model preferably at reduced unit load operation and high wind speed conditions.
n) Bidder to provide the drawings/documents for the necessary provisions in Chimney during the course of this study, if applicable, to carry out the performance test for wet stack at site in future.

2.04.00 Specific Technical Requirements

Wet stack sizing criteria:

a) A "wet Chimney" shall be installed downstream of Wet Flue Gas Desulfurization (FGD) system. Clean gas from the absorber shall be taken to the Chimney through three stage mist eliminators. Treated flue gas from the absorber shall be discharged through a wet stack without reheating of the flue gas. In such a case the flue gas will be saturated. However, provision has also been made for isolation of the flue gas flow through the absorber and also for bypass of the absorber, to allow maintenance of the absorber with the unit in operation. In such a case flue gas will directly go to the Chimney after ID Fans through bypass duct.
The Contractor, shall take into account the entire characteristics of expected combination of fuels to be fired, for the complete load range of operation and the expected numbers of Steam Generator start-ups while designing the Chimney flue liner considering Steam Generator in operation both with & without FGD system in operation. The chimney flue liner cladding shall be made of 2 mm thick Titanium (Grade 2 as per ASME SB265) or C-276 alloy over 8 mm thick (minimum) mild steel base metal of flue liner. Cladding shall be done to achieve the required quality as per ASTM B 898-11. External surface of chimney flue liner projecting over the chimney roof shall be wrapped with 2 mm thick Titanium / C-276 sheet over insulation. The stack shall be designed as per the latest guidelines of EPRI Wet Stack Design Guide. The design of wet ducts and stacks system shall consider the Stack liquid discharge (SLD), Corrosion/chemical attack, Condensate collection system and its drainage etc.

Parameter	Units	Design point - Normal Operation with FGD in Operation	Design point- Operation with Bypass Operation
Flue gas quantity per boiler	T/Hr	4705.94	4338
Temp. of flue gas at stack inlet	^{o}C	61.8	147
Flue gas density at stack inlet	Kg/m^3	1.00487	0.793
Volumetric flow per boiler	M^3/s	1300.87	1519.55
Stack Height	M	275	275
Ambient air temp.	^{o}C	45	45
Relative Humidity	%	60	60
Internal flue dia	**M**	9.9	9.9
Flue gas velocity at stack exit	**m/sec**	**16.8**	**19.7**

b) A wet stack study shall be performed by the Contractor for each unit with a wet stack installation where there does not exist an identical or mirror image installation that has already had a wet stack study performed. A wet stack model study shall consist of the following:

(i) Condensation calculations
(ii) Minimum 1:12 scale physical flow model for liquid collector design
(iii) Computation flow model for plume downwash analysis
(iv) Physical or computation flow model for CEMS elevation flow performance

c) Liquid collectors shall be designed and developed experimentally using a physical model. The model shall begin at the outlet of the absorber mist eliminator(s), include the absorber outlet and ducting, the stack breaching duct and a minimum of three (3) diameters of the stack liner above the top of the stack breaching duct. Physical model shall include any internal devices that may affect the gas flow, such as structural members, flow controls, and expansion joints. Liquid collectors shall be located where needed in the absorber outlet, the ductwork between the absorber outlet and the wet stack liner, in the wet stack liner, and in the exit nozzle. These collectors shall collect liquid from surfaces, prevent re-entrainment, and guide the liquid to location where it can be drained out of the system and prevent the discharge of droplets from the top of the stack that are large enough to rain out to the ground before evaporation.

2.05.00 GENERAL

a) Bidder to furnish the detailed Master drawing list for wet stack flow model study for BHEL and customer approval.

b) Bidder to provide technical advice/ recommendations/ assistance & solutions regarding site related construction problems related to condensate collection and drainage system in the duct and chimney as and when required including site visits, participation in meetings through VC/WEB with BHEL/ customer/ customer's consultant.

c) The physical model study may be witnessed by BHEL / Plant Owner for approximately 3 days. Intimation for the witnessing shall be provided by the bidder 4 weeks prior to conductance of physical model test at vendor lab. Video streaming facility shall also be provided for witnessing the physical model test from India. In addition, complete physical model test including the flow patterns and droplets trajectory shall be recorded on video CD which shall be provided after the physical model study.

d) The physical model shall be stored at the vendor lab at no cost for a period of 1 year after the submission of final report and completion of the study. Thereafter its further disposal or storage shall be decided after the award of the contract on the cost basis. Optional prices may be quoted for the same and this shall not be considered for the evaluation of bid.

e) The bidder is advised to take care all information that may be necessary for preparing the bid and entering into the contract. Claims of any kind due to variation or ignorance of site conditions and environmental conditions after award of works will not be entertained.

f) All revisions/changes required as per BHEL/ Project owners, comments/ requirements, site requirement etc. shall be carried out by the bidder.

g) Three hard copies of approved reports/documents/drawings shall be submitted by the bidder. Electronic copies of the CFD model, analysis and report shall be submitted in primary original format as well as in printable non-proprietary formats (e.g. .pdf).

h) Change in recommendation / design after the analysis shall be taken care by bidder without any commercial implication in this contract value.

i) Bidder shall furnish detailed activity schedule, report generation schedule and list of inputs required for successful execution of Wet stack flow model study.

j) The Purchaser/ Customer however also reserve the rights to check the detailed calculations in the event of order and their interpretation shall be final in the event of any conflict.

k) Bidder shall furnish all the documents in English and SI units shall also be followed in the calculations and reports wherever used.

3.00.00 DELIVERY SCHEDULE

Bidder has to carry out the complete activity including physical model, CFD, drawing /documents and final report approval by BHEL and plant owner within 15 weeks from the date of purchase order.

4.00.00 SUGGESTIVE DRAWINGS/ DOCUMENTS SUBMISSION:

Following Basic drawings/documents to be submitted within 2 weeks from LOI date.

1. MASTER DRAWING /DOCUMENT LIST. (to be finalized after order)
2. WET STACK STUDY SCHEDULE, PLANNING AND MILESTONES
3. LIST OF CODES AND STANDARDS TO BE FOLLOWED.

4. DETAILED STANDARD PROCEDURE FOR PHYSICAL MODEL & CFD STUDY, DRAWINGS & DOCUMENTS SUBMISSION.
5. DESIGN DRAWINGS OF CONDENSATE COLLECTION AND DRAINAGE SYSTEM
6. THERMAL AND ADIABATIC CONDENSATION CALULATIONS WITH DESIGN BASIS

Following Basic drawings/documents to be submitted and duly approved within 15 weeks from LOI date.

1. TECHNICAL DATASHEETS
2. BILL OF QUANTITIES
3. WET STACK STUDY REPORT WITH RECOMMENDATIONS
4. CFD MODEL, ANALYSIS AND RESULTS

This is not an exhaustive list of drawings/ documents for WET STACK STUDY.

Bidder shall furnish all applicable drawings /documents other than as mentioned above which is/are required for successful execution of condensate collection and drainage system after the absorber outlet to stack outlet.

NOTE:

1. Subsequent revisions of above drgs/docs to be submitted within 7 days of comments received from BHEL/ CUSTOMER.
2. Drawings submitted shall be complete in all respects with revised drawing submitted incorporating all comments. Any incomplete drawing submitted shall be treated as non-submission with delays to bidder's account.

5.00.00 DOCUMENTS TO BE SUBMITTED ALONG WITH BID

a) Detailed procedure adopted for the conductance of the study.
b) Wet stack study planning and scheduling.
c) Computer program to be used for the 3D modelling and analysis.
d) Mathematical tools & codes / programs used for the analytical calculations.
e) Technical deviation schedule (if reqd.) (enclosed herein)

Apart from above no other drawings/documents/data sheets etc. are required to be submitted at bid stage and even if furnished shall not be taken cognizance of.

6.00.00 SALIENT TECHNICAL POINTS:

1. Maximum mist carryover from mist eliminator -20 mg/NM3
2. The droplet size distribution of the mist after the mist eliminator (ME) – 100% Droplet size less than 40 microns.
3. Expected mist carryover from mist eliminator during on load washing cycle – 20 mg/Nm3
4. Layout from absorber outlet to chimney inlet is identical for all the three units. Therefore, study will be conducted for 1 unit only. FGD layout details are provided in Annexure-V for performing the model study

ANNEXURE-I

PVUNL-2X800MW PATRATU STPP

PROJECT INFORMATION

EPC PACKAGE FOR PATRATU SUPER THERMAL POWER STATION EXPANSION PHASE-1 (3x800 MW)	TECHNICAL SPECIFICATION SECTION-VI, PART-A BID DOC NO: CS-9585-001-2

PATRATU STPS EXPANSION PHASE-I (3X800 MW)

1.00.00 BACKGROUND

A Memorandum of Agreement (MOA) has been entered on 29.07.2015 amongst Govt. of Jharkhand (GoJ), Jharkhand Urja Vikash Nigam Limited (JUVNL), Jharkhand UrjaUtpadan Nigam Limited (JUUNL), Jharkhand BijliVitaran Nigam Limited (JBVNL) and NTPC Limited to form a Joint Venture Company of NTPC Limted& JBVNL for transfer of Patratu Thermal Power Station (PTPS) located in Ramgarh District of Jharkhand State to the proposed JV Company for Performance Improvement of existing capacity & 4000 MW Capacity expansion of PTPS.

Further to signing of JV agreement on 29.07.2015, a Joint Venture Company namely Patratu Vidyut Utpadan Nigam Limited (PVUNL) has been incorporated amongst GoJ, JUVNL, JBVNL and NTPC Ltd. on 15.10.2015. The Performance Improvement of existing capacity and 4000 MW Capacity expansion of Patratu STPS will be implemented by the JV Company (JVC). The configuration of expansion of 4000 MW shall consist of 5 units of 800 MW to be implemented in two phases; Phase-I: 3x800 MW and Phase-II: 2x800 MW.

The present proposal is for Patratu STPS Phase-I (3x800 MW). The project is envisaged to be commissioned during XIII Plan period.

2.00.00 CAPACITY

Patratu STPS Phase-I: 3x800 MW - Present proposal

3.00.00 MODE OF OPERATION

Base Load

4.00.00 LOCATION AND APPROACH

4.01.00 Patratu Thermal Power station (PTPS) is located just outside the coal belt of South Karanpura in Ramgarh District of Jharkhand State. The nearest Railway Station is Patratu which is at a distance of about 4 km on Barkakhana-Barwadih Railway line.

4.02.00 **The latitudes and longitudes of the site are as follows:**

Corner name	Latitude	Longitude
Top Corner	23° 38 ‘ 60 `` N	85° 17’ 51.5” E
Bottom Corner	23° 38 ‘12.5 `` N	85° 17’ 27” E
Left Corner	23° 38 ‘ 22.5 ``N	85° 17’ 10.6 ``E
Right Corner	23° 38 ‘ 40 `` N	85° 17’ 57 `` E

4.03.00 **Airport**

The nearest commercial airport is Ranchi at about 45 km by road.

ANNEXURE-II

C

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : रामगढ़ STATION : Ramgarh | अक्षांश LAT 23°38' N | देशांतर LONG 85°30' E | समुद्री तल माध्य से ऊँचाई HEIGHT ABOVE M. S. L. मीटर 335 METRES | 1953 से 1980 तक के प्रेक्षणों पर आधारित BASED ON OBSERVATIONS FROM 1953 TO 1980

माह MONTH		स्टेशन का सतह दाब STATION LEVEL PRESSURE	वायु तापमान AIR TEMPERATURE – माध्य MEAN: शुष्क बल्ब DRY BULB	नम बल्ब WET BULB	दैनिक अधिकतम DAILY MAX	दैनिक न्यूनतम DAILY MIN	माह में उच्चतम HIGHEST IN THE MONTH	माह में निम्नतम LOWEST IN THE MONTH	चरम EXTREMES: उच्चतम HIGHEST	दिनांक और वर्ष DATE AND YEAR	निम्नतम LOWEST	दिनांक और वर्ष DATE AND YEAR	आर्द्रता HUMIDITY: सापेक्ष आर्द्रता RELATIVE HUMIDITY	वाष्प दाब VAPOUR PRESSURE	मेघ की मात्रा CLOUD AMOUNT: समस्त मेघ ALL CLOUDS	निम्न मेघ LOW CLOUDS	वर्षा RAINFALL: मासिक योग MONTHLY TOTAL	वर्षा के दिनों की संख्या NO. OF RAINY DAYS	वर्षासहित सबसे नम महीने का योग TOTAL IN WETTEST MONTH WITH YEAR	वर्षासहित शुष्कतम महीने का योग TOTAL IN DRIEST MONTH WITH YEAR	24 घंटों की सबसे भारी वर्षा HEAVIEST FALL IN 24 HOURS	दिनांक और वर्ष DATE AND YEAR	माध्य पवन गति MEAN WIND SPEED
		एच. पी. ए. hPa	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C	डि.से. °C		डि.से. °C		प्रतिशत %	एच.पी.ए. hPa	आकाश के अष्टमांश Oktas of sky		मि.मि. mm		मि.मि. mm	मि.मि. mm	मि.मि. mm		कि.मी. प्र. घं. Kmph
जनवरी JAN	I		14.6	11.9	24.5	8.2	28.5	3.7	33.4	31 1967	1.2	05 1978	68	11.8	1.2	0.6	16.7	1.7	62.3 1953	0.0	42.0	04 1966	2.0
	II		20.2	15.2									55	13.3	1.3	0.7							
फरवरी FEB	I		17.1	13.3	27.6	10.5	32.7	5.5	37.8	24 1967	3.0	10 1978	62	12.4	1.0	0.5	19.3	1.3	94.0 1961	0.0	54.0	08 1961	2.8
	II		23.5	16.6									48	13.4	1.1	0.6							
मार्च MAR	I		23.5	17.2	33.0	15.1	37.3	10.4	41.4	29 1966	7.0	11 @ 1979	50	14.6	1.1	0.4	11.4	1.2	36.4 1956	0.0	23.2	06 1962	3.3
	II		29.3	18.7									35	14.3	1.5	0.6							
अप्रैल APR	I		30.2	21.3	38.4	21.0	42.3	15.6	45.2	16 1973	13.5	07 1967	42	18.5	1.2	0.4	16.0	1.4	52.7 1952	0.0	41.0	01 1959	4.3
	II		34.5	22.1									34	16.7	1.8	0.8							
मई MAY	I		32.6	24.1	40.8	24.5	44.8	20.0	48.0	11 1973	17.0	06 @ 1979	47	23.2	1.6	0.0	28.7	2.3	136.6 1959	0.0	76.4	28 1959	4.5
	II		36.3	24.3									38	20.7	2.4	1.2							
जून JUN	I		30.9	25.5	37.5	25.5	43.2	21.7	47.6	12 1965	19.5	01 1979	62	28.3	3.5	1.9	129.4	7.4	332.4 1961	13.4 1973	140.0	07 1961	4.9
	II		32.0	25.6									62	27.3	4.4	2.7							
जुलाई JUL	I		28.1	25.4	32.3	24.3	37.3	22.1	46.5	1961	20.0	09 @ 1974	77	30.3	5.5	4.0	289.9	16.5	565.3 1950	131.9 1966	205.2	18 1950	4.2
	II		28.9	25.7									77	30.6	5.8	4.1							
अगस्त AUG	I		27.6	25.3	31.7	24.1	35.3	22.1	38.0	06 1973	18.2	20 1960	79	30.5	5.3	3.5	288.7	15.8	616.0 1953	50.0 1974	169.9	24 1953	3.5
	II		28.3	25.8									81	31.1	5.6	3.7							
सितम्बर SEP	I		27.2	24.8	31.6	23.0	35.0	21.1	38.0	05 1974	18.9	30 1957	79	29.5	4.5	3.0	253.8	11.4	770.8 1957	92.7 1955	198.1	01 1957	3.1
	II		27.8	25.3									81	30.2	5.0	3.4							
अक्तूबर OCT	I		24.9	22.1	31.4	19.1	34.4	14.4	38.0	02 1970	10.6	27 1966	74	24.4	2.4	1.4	91.7	4.2	265.7 1963	2.6 1979	134.4	12 1973	2.0
	II		26.7	23.2									74	25.7	2.8	1.6							
नवम्बर NOV	I		19.6	16.3	28.3	12.4	31.5	8.2	35.1	01 1973	5.4	23 1960	66	15.9	0.9	0.2	3.9	0.5	77.5 1948	0.0	34.3	07 1948	1.6
	II		22.8	18.4									63	17.9	1.1	0.5							
दिसम्बर DEC	I		14.7	12.1	24.5	8.3	28.6	4.0	32.0	01 1971	0.6	24 1961	68	12.0	0.9	0.4	2.7	0.3	56.4 1950	0.0	56.4	28 1950	1.7
	II		19.6	15.3									60	13.9	1.2	0.6							
वार्षिक योग या माध्य ANNUAL TOTAL OR MEAN	I		24.3	19.9	31.8	18.0	44.9	3.0	48.0		0.6		65	21.0	2.4	1.4	1208.2	64.0	1840.1	798.7	205.2		3.2
	II		27.5	21.4									59	21.3	2.8	1.7			1961	1955			
वर्षों की सं. NUMBER OF YEARS	I		23	23	21	21	21	21	22		22		24	23	22	17	26	26	27	27	27		16
	II		24	24									24	24	23	17							

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ANNEXURE-II

जलवायवी सारणी
CLIMATOLOGICAL TABLE

स्टेशन : रामगढ़
STATION : Ramgarh

मौसम परिघटना / WEATHER PHENOMENA — के साथ दिनों की संख्या / No. OF DAYS WITH

माह / MONTH	वर्षा 0.3 मि.मि.या अधिक / PPT 0.3mm or more	ओले / HAIL	गर्जन / THUNDER	कुहरा / FOG	धूल भरी आंधी / DUST STORM	चंडवात / SQUALL
जनवरी JAN	2.0	0.0	0.2	0.2	0.0	0.0
फरवरी FEB	2.1	0.1	0.9	0.1	0.1	0.0
मार्च MAR	1.7	0.1	1.6	0.0	0.5	0.0
अप्रैल APR	2.4	0.0	1.6	0.1	1.3	0.0
मई MAY	3.5	0.1	2.0	0.0	0.8	0.2
जून JUN	10.4	0.1	4.4	0.0	1.4	0.1
जुलाई JUL	19.3	0.6	5.9	0.0	0.9	0.0
अगस्त AUG	17.8	0.5	4.8	0.1	0.0	0.0
सितम्बर SEP	12.9	1.0	3.2	0.2	0.0	0.0
अक्तूबर OCT	5.2	0.0	1.3	0.1	0.0	0.0
नवम्बर NOV	0.7	0.0	0.0	0.7	0.0	0.0
दिसम्बर DEC	0.5	0.1	0.1	0.2	0.0	0.0
वार्षिक योग या माध्य / ANNUAL TOTAL OR MEAN	78.5	2.6	26.0	1.7	5.0	0.3
वर्षों की सं. / NUMBER OF YEARS	21					

पवन / WIND

माह / MONTH		No. OF DAYS WITH WIND SPEED (Km. p. h.) 62 or more	20-61	1-19	0	PERCENTAGE No. OF DAYS WIND FROM N	NE	E	SE	S	SW	W	NW	CALM
JAN	I	0	0	19	12	6	2	14	2	7	8	33	5	23
JAN	II	0	0	13	18	7	2	15	3	5	2	20	7	39
FEB	I	0	0	21	7	5	1	13	3	11	12	33	4	18
FEB	II	0	0	18	10	8	2	13	3	10	6	23	12	23
MAR	I	0	0	22	9	6	3	13	1	10	8	38	5	16
MAR	II	0	0	21	10	11	2	15	1	6	4	28	15	18
APR	I	0	0	21	9	7	2	14	2	9	8	39	6	13
APR	II	0	0	23	7	9	3	15	2	10	6	34	11	10
MAY	I	0	0	23	8	6	5	24	3	7	7	31	6	11
MAY	II	0	0	25	6	9	5	24	3	6	5	31	12	5
JUN	I	0	0	24	6	5	7	34	5	8	7	23	8	3
JUN	II	0	1	23	6	6	8	31	6	8	5	18	8	10
JUL	I	0	0	23	8	6	5	35	5	5	6	21	4	13
JUL	II	0	0	24	7	4	5	36	9	7	7	17	3	12
AUG	I	0	0	21	10	5	7	34	5	6	4	20	4	15
AUG	II	0	0	21	10	6	6	34	6	6	4	19	3	16
SEP	I	0	0	21	9	6	6	26	5	7	6	25	3	16
SEP	II	0	0	19	11	6	5	25	8	8	5	17	4	22
OCT	I	0	0	21	10	5	3	20	2	11	7	31	5	16
OCT	II	0	0	14	17	8	3	24	1	7	2	19	3	33
NOV	I	0	0	18	12	7	2	11	1	9	12	31	4	23
NOV	II	0	0	11	19	8	0	11	0	8	4	21	3	45
DEC	I	0	0	21	10	8	2	9	1	6	10	38	6	20
DEC	II	0	0	12	19	14	0	8	0	6	1	20	6	45
ANNUAL TOTAL OR MEAN	I	0	0	255	110	6	4	21	3	8	8	30	5	15
ANNUAL TOTAL OR MEAN	II	0	1	224	140	8	3	21	4	7	4	22	7	24
NUMBER OF YEARS	I	16				20								
NUMBER OF YEARS	II	16				20								

मेघ / CLOUD

MONTH		No. OF DAYS WITH CLOUD AMOUNT (ALL CLOUDS) OKTAS 0	T-2	3-5	6-7	8	No. OF DAYS WITH LOW CLOUD AMOUNT OKTAS 0	T-2	3-5	6-7	8	FOG 8
JAN	I	25	2	2	1	1	27	1	1	1	1	0
JAN	II	25	2	2	1	1	25	2	2	1	1	0
FEB	I	24	1	1	1	1	25	0	1	1	1	0
FEB	II	23	2	1	1	1	24	1	1	1	1	0
MAR	I	26	1	2	1	1	28	1	1	0	1	0
MAR	II	25	2	2	1	1	28	1	2	0	0	0
APR	I	25	2	2	0	1	27	1	1	0	1	0
APR	II	22	2	2	2	2	26	1	2	0	1	0
MAY	I	24	2	3	2	0	28	2	1	0	0	0
MAY	II	21	2	3	3	2	25	1	3	1	1	0
JUN	I	15	3	5	3	4	20	2	4	1	3	0
JUN	II	14	1	5	4	6	16	2	5	2	5	0
JUL	I	11	0	4	4	12	12	2	5	3	9	0
JUL	II	10	1	4	4	12	10	2	6	3	10	0
AUG	I	11	1	4	4	11	14	1	5	2	9	0
AUG	II	13	0	3	3	12	13	1	5	2	10	0
SEP	I	13	2	3	3	9	16	2	3	2	7	0
SEP	II	12	1	4	3	10	14	3	4	1	8	0
OCT	I	22	2	3	1	3	24	1	2	1	3	0
OCT	II	20	2	4	1	4	22	2	3	1	3	0
NOV	I	25	2	2	1	0	29	1	0	0	0	0
NOV	II	25	2	2	1	0	27	2	1	0	0	0
DEC	I	24	2	2	2	1	28	2	1	0	0	0
DEC	II	24	1	4	1	1	26	2	1	1	1	0
ANNUAL TOTAL OR MEAN	I	245	20	33	23	44	278	16	25	11	35	0
ANNUAL TOTAL OR MEAN	II	234	18	36	25	52	256	20	35	13	41	0
NUMBER OF YEARS	I	15					15					
NUMBER OF YEARS	II	15					15					

दृश्यता / VISIBILITY — दृश्यता सहित दिनों की संख्या / No. OF DAYS WITH VISIBILITY

MONTH		UP TO 1 Km	1-4 Kms	4-10 Kms	10-20 Kms	OVER 20 Kms
JAN	I	0.1	1.9	14.3	9.0	5.7
JAN	II	0.2	3.1	12.4	9.5	5.8
FEB	I	0.1	3.3	10.6	8.4	5.6
FEB	II	0.3	2.6	11.0	7.6	6.5
MAR	I	0.0	1.4	11.1	10.9	7.6
MAR	II	0.0	1.4	10.3	11.9	7.4
APR	I	0.2	2.5	9.4	10.9	7.0
APR	II	0.5	2.9	9.2	10.7	6.7
MAY	I	0.3	0.8	13.1	8.9	7.9
MAY	II	1.2	2.1	10.8	9.6	7.3
JUN	I	0.0	3.7	8.6	9.9	7.8
JUN	II	0.0	4.1	8.4	10.7	6.8
JUL	I	0.0	6.4	10.1	8.4	6.1
JUL	II	0.0	7.6	8.9	8.1	6.4
AUG	I	0.0	6.5	10.8	7.2	6.5
AUG	II	0.0	7.7	9.3	8.6	5.4
SEP	I	0.2	8.8	8.0	6.7	6.3
SEP	II	0.0	9.0	8.7	6.9	5.4
OCT	I	0.0	4.4	10.1	8.6	7.9
OCT	II	0.0	5.0	9.5	9.4	7.1
NOV	I	0.0	0.5	13.9	7.9	7.7
NOV	II	0.0	0.9	14.6	8.1	6.4
DEC	I	0.0	1.6	14.7	3.6	11.1
DEC	II	0.0	1.7	16.1	4.7	8.5
ANNUAL TOTAL OR MEAN	I	0.9	41.8	134.7	100.4	87.2
ANNUAL TOTAL OR MEAN	II	2.2	48.1	129.2	105.8	79.7
NUMBER OF YEARS	I	15				
NUMBER OF YEARS	II	15				

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ANNEXURE-II

DATA FOR CHIMNEY DESIGN

GENERAL DATA			
Boiler Application	Utility	No. of Chimneys	By PEM
Boiler Capacity	800 MW	Type of Chimney	By PEM
No. of Boilers	Three (03)	Chimney Arrangement	By PEM
Fuels Fired	Coal	Height of Chimney	By PEM

OPERATING CONDITIONS (Per Boiler) – FGD Outlet Parameters			
DESCRIPTION / LOAD	**Chimney Design Point**	**FGD Design Point**	**FGD Guarantee Point**
	BMCR 25% EA	**VWO 25% EA**	**TMCR 25% EA**
	Worst Coal	**Worst Coal**	**Worst Coal**
Flue Gas Flow t / h	4705.94	4590.05	4240.01
Flue Gas Volume m^3 / s (wet)	1300.87	1271.10	1141.77
Flue Gas Temperature °C	61.8	62.1	58.1
Flue Gas Density kg /m^3	1.00487	1.00308	1.03154
FGD OUTLET-FLUE GAS COMPOSITION % BY VOLUME – (WET BASIS)			
CO_2	9.26	9.23	9.67
N_2	63.88	63.68	66.62
O_2	5.68	5.67	5.91
SO_2	0.0023	0.0023	0.0021
H_2O	21.18	21.42	17.79

Customer / Plant: NTPC-Patratu (3x800MW)

Prop. No.:	Rev. 0		Rev. 1		Rev. 2		Rev. 3	
	Sign	Date	Sign	Date	Sign	Date	Sign	Date
Engineer : Raju P	RP	10-04-18	YR	07-06-18				
Reviewer : Shaktikanta Dash	SKD	10-04-18	SKD	07-06-18				
Approver : Lakshmanan R	RL	10-04-18	RL	07-06-18				

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DATA FOR CHIMNEY DESIGN AT FGD OUTLET FOR PAR LOADS - PATRATU

GENERAL DATA			
Boiler Application	Utility		
Boiler Capacity	800 MW		
No. of Boilers	Three (03)		
Fuels Fired	Coal		

OPERATING CONDITIONS (Per Boiler)				
DESCRIPTION / LOAD	**40%-TMCR**	**50%-TMCR**	**40%-TMCR**	**50%-TMCR**
	Design Coal	**Design Coal**	**Worst Coal**	**Worst Coal**
Flue Gas Flow t / h	1818.26	2276.10	1846.80	2260.60
Flue Gas Volume m^3 / s (wet)	484.78	608.78	501.69	611.43
Flue Gas Temperature °C	57.10	56.50	59.80	58.90
Flue Gas Density kg /m^3	1.0418	1.043	1.0225	1.027
FGD OUTLET-FLUE GAS COMPOSITION % BY WEIGHT – (WET BASIS)				
CO_2	10.59	10.03	10.22	9.89
N_2	67.06	67.40	65.53	66.10
O_2	5.32	6.06	4.96	5.49
SO_2	0.0022	0.0027	0.0024	0.0027
H_2O	17.02	16.48	19.28	18.49

Customer / Plant: NTPC-Patratu (3x800MW)

Prop. No.:	Rev. 0		Rev. 1		Rev. 2	Rev. 3		
	Sign	Date	Sign	Date	Sign	Date	Sign	Date
Engineer :								
Reviewer :								
Approver :								

ANNEXURE-II

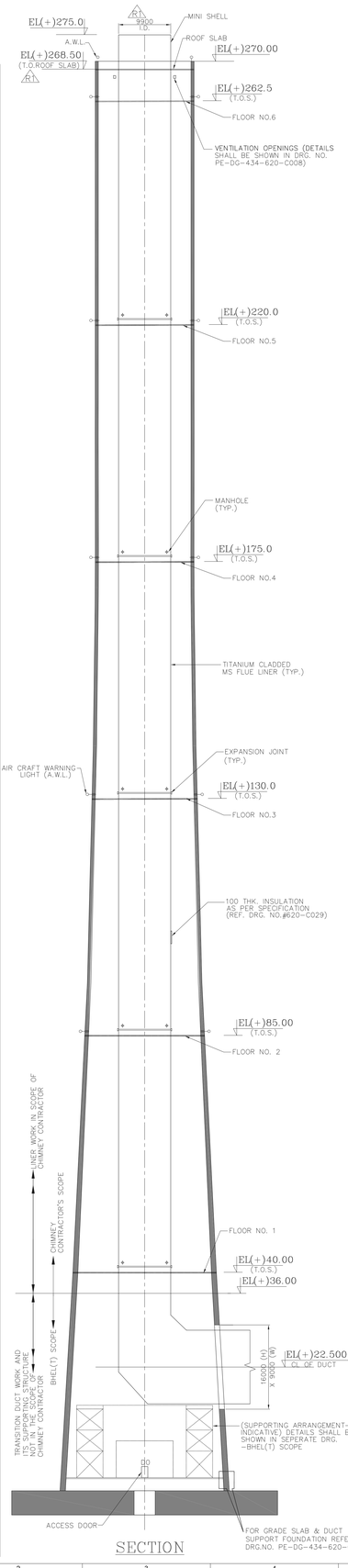
Chimney Selection data

			FGD Bypass
S.No.	**Description**	**Unit**	**BMCR WC, 25%EA, 45degC Design Point**
1	Ambient Temperature	Deg C	45
2	Excess Air	%	25
3	Relative Humidity	%	60
4	Heat Duty	MKcal/kg	1662
5	Efficiency	%	83.97
6	Q Fired	Mkcal/hr	1980
7	Coal Quantity	t/hr	683
8	Air Quantity	t/hr	3365
9	Gas quantity entering APH	t/hr	3759
10	AH leakage	%	12.00
11	AH leakage	t/hr	451
12	Gas quantity Leaving APH	t/hr	4210
13	Gas temperature Leaving APH	Deg C	147
14	Duct Leakage	%	2
15	Gas quantity entering ESP	t/hr	4295
16	ESP leakage	%	1
17	Gas quantity leaving ESP	t/hr	4338
19	Gas quantity entering Chimney	t/hr	4338
20	Gas temperature entering Chimney	Deg C	147
21	Density	kg/m^3	0.793
22	Volume of Gas	m^3/s	1520
23	FLUE GAS ANALYSIS AT CHIMNEY INLET (WET BASIS)		
A	CARBON-DI-OXIDE	%	15.74
B	SULPHUR-DI-OXIDE	%	0.28
C	OXYGEN	%	6.38
D	NITROGEN	%	67.35
E	MOISTURE	%	10.25

COMPUTER FILE NAME:

NORTH

ELEVATION (M)	DIAMETER OF SHELL (mm)	THK (mm)	OUTSIDE PROFILE OF SHELL
270.000	18,750	575	CYLINDRICAL
268.500	18,750	575	
262.500	18,750	575	
250.000	18,750	575	
240.000	18,750	575	
230.000	18,750	575	
220.000	18,750	575	
215.000	18,750	575	
205.000	18,750	575	
195.000	18,750	575	
185.000	18,770	585	
175.000	18,790	595	
170.000	18,800	600	
160.000	19,000	608	UNIFORM LINEAR TAPER(IV) 80 : 1
150.000	19,250	617	
140.000	19,500	625	
130.000	20,000	636	UNIFORM LINEAR TAPER(III) 40 : 1
125.000	20,250	642	
115.000	20,750	653	
105.000	21,250	664	
95.000	21,750	675	
85.000	22,750	725	UNIFORM LINEAR TAPER(II) 20 : 1
75.000	23,750	775	
65.000	24,750	825	
55.000	25,750	875	
45.000	26,750	925	
40.000	27,250	950	
30.500	28,368	967	UNIFORM LINEAR TAPER(I) 17 : 1
22.500	29,309	980	
14.500	30,250	995	
7.000	31,132	1,009	
2.100	31,711	1,018	
0.000	31,958	1,022	
−2.200	32,215	1,025	UNIT#3
−3.700	32,384	1,025	UNIT#2
−5.100	32,560	1,025	UNIT#1



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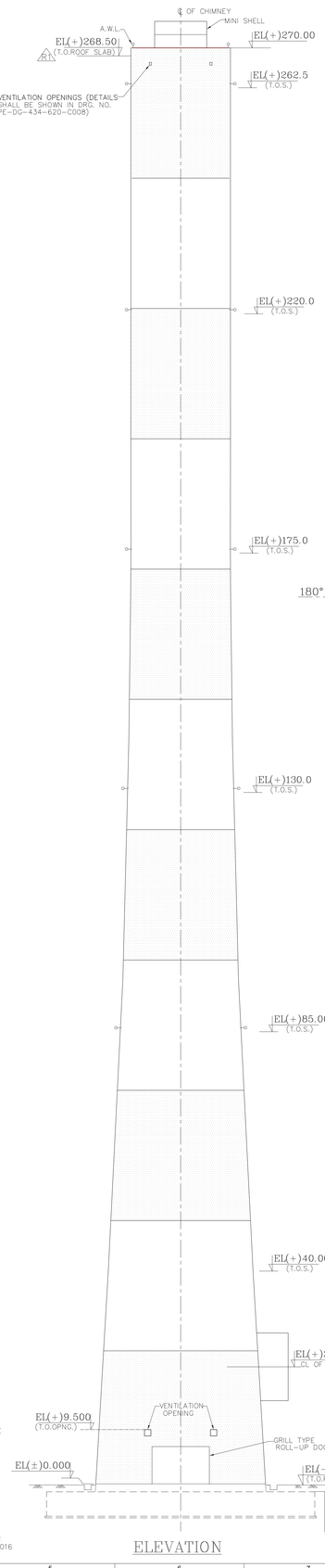
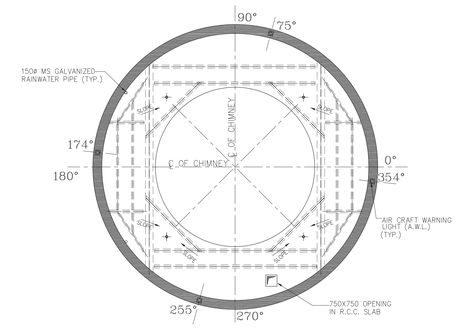
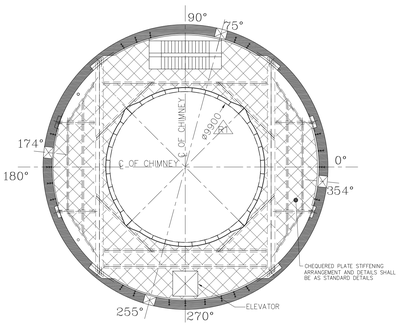


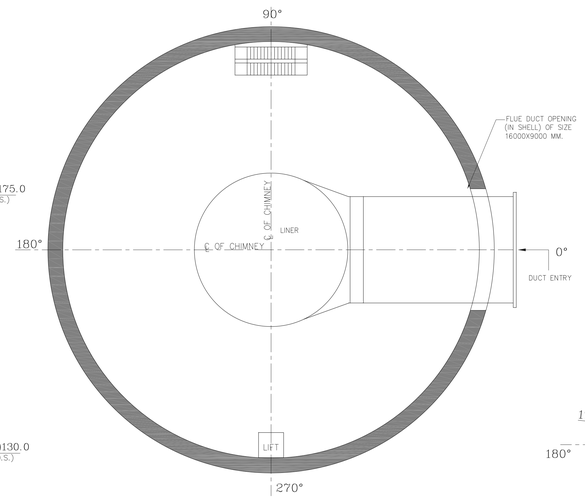
ELEVATION



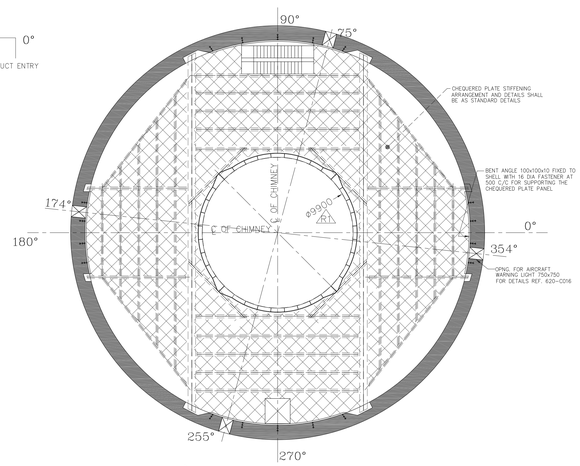
PLAN AT ROOF SLAB
(T.O.C. = EL+268.500M.)
FOR DETAILS OF ROOF SLAB, ROOF FINISHING, RAINWATER PIPE ETC. REFER DRG. NO. PE-DG-415-620-C014.



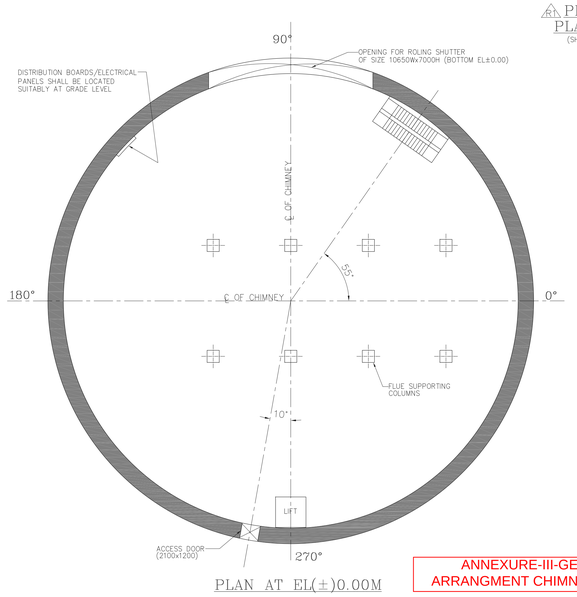
R1 PLAN OF PLATFORM
PLAN AT EL(+)175.0M
(SHOWING ARRANGEMENT OF STEEL BEAMS)



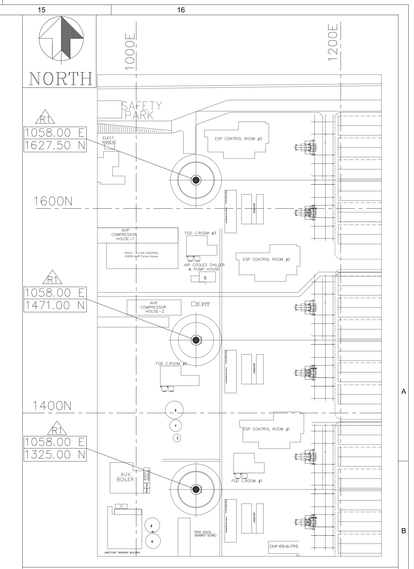
PLAN AT EL(+)22.50M



R1 PLAN OF PLATFORM
PLAN AT EL(+)40.0M
(SHOWING ARRANGEMENT OF STEEL BEAMS)



PLAN AT EL(±)0.00M



DRAWING LIST

S.NO.	DRAWING NO.	DRAWING TITLE
1.	PE-DG-434-620-C001	GENERAL ARRANGEMENT UNIT−1,2&3
2.	PE-DG-434-620-C002	G.A. OF FOUNDATION UNIT#1 & 2
3.	PE-DG-434-620-C003	G.A. OF FOUNDATION UNIT#3
4.	PE-DG-434-620-C004	REINFORCEMENT DETAILS OF FOUNDATION AND STARTER BARS − UNIT#1 & 2
5.	PE-DG-434-620-C005	REINFORCEMENT DETAILS OF FOUNDATION AND STARTER BARS − UNIT#3
6.	PE-DG-434-620-C006	SHUTTERING & R.C. DETAILS OF CHIMNEY SHELL − UNIT#1&2
7.	PE-DG-434-620-C007	SHUTTERING & R.C. DETAILS OF CHIMNEY SHELL − UNIT#3
8.	PE-DG-434-620-C008	DETAILS OF SHELL OPENINGS
9.	PE-DG-434-620-C009	DETAILS OF EXTRA REINFORCEMENT AROUND OPENINGS
10.	PE-DG-434-620-C010	INTERNAL PLATFORM DETAILS SH1
11.	PE-DG-434-620-C011	INTERNAL PLATFORM DETAILS SH2
12.	PE-DG-434-620-C012	DETAILS OF LINER SUPPORT BEAMS
13.	PE-DG-434-620-C013	DETAILS OF LINER RESTRAINT
14.	PE-DG-434-620-C014	DETAILS OF GAS SAMPLING PORTS
15.	PE-DG-434-620-C015	DETAILS OF MANHOLES IN FLUES
16.	PE-DG-434-620-C016	DETAILS OF GRADE SLAB
17.	PE-DG-434-620-C017	G.A. & R.C.C. DETAILS OF ROOF SLAB
18.	PE-DG-434-620-C018	LAYOUT OF STAIRCASE
19.	PE-DG-434-620-C019	TYPICAL DETAILS OF STEEL DOORS & ROLLING SHUTTER
20.	PE-DG-434-620-C020	CHIMNEY LINER DETAILS− CAN TYPE SS1 & SS2
21.	PE-DG-434-620-C021	CHIMNEY LINER DETAILS− CAN TYPE SS1 & SS2
22.	PE-DG-434-620-C022	LINER GENERAL ARRANGEMENT
23.	PE-DG-434-620-C023	CHIMNEY LINER DETAILS− CAN TYPE A
24.	PE-DG-434-620-C024	CHIMNEY LINER DETAILS− CAN TYPE D
25.	PE-DG-434-620-C025	CHIMNEY LINER DETAILS− CAN TYPE F & G
26.	PE-DG-434-620-C026	CHIMNEY LINER DETAILS− CAN TYPE B
27.	PE-DG-434-620-C027	CHIMNEY LINER DETAILS− CAN TYPE E
28.	PE-DG-434-620-C028	DETAILS OF LINER EXPANSION JOINTS
29.	PE-DG-434-620-C029	FIXING DETAILS OF LINER INSULATION
30.	PE-DG-434-620-C030	CHIMNEY PAINTINGS
31.	PE-DG-434-620-C031	DETAIL OF AVIATION WARNING LIGHTS
32.	PE-DG-434-620-C032	DETAIL OF PLATFORM LIGHTS
33.	PE-DG-434-620-C033	DETAIL OF ELEVATOR

NOTES: −

1. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.
2. COMPLIANCE WITH STANDARDS SHALL RELATE TO LATEST PUBLISHED EDITIONS.
3. ALL ELEVATIONS ARE REFERRED TO POWER HOUSE FINISHED GROUND FLOOR ELEVATION EL.(±)0.00M WHICH CORRESPONDS TO RL. 375.50
4. THE OTHER COMPONENTS OF THE CHIMNEY INCLUDE ROLL UP DOORS, PERSONNEL ACCESS DOORS, HAND RAILS, HOOD HATCH, LINER TEST PORTS, NON METALLIC EXPANSION JOINTS, RAIN WATER DRAINAGE SYSTEM, VENTILATION OPENINGS, ELECTRICAL POWER SUPPLY DISTRIBUTION BOARDS, LIGHTING PANELS, SOCKET OUTLETS, POWER AND CONTROL CABLING, RACEWAY SYSTEM, STAIR AND PLATFORM LIGHTING, LIGHTNING PROTECTION & GROUNDING SYSTEM, COMMUNICATIONS SYSTEM ETC. AND SHALL BE PROVIDED AS PER TECHENICAL SPECIFICATIONS.
5. FOR GENERAL NOTES AND DETAILING OF R.C.C. WORKS REFER DRG. NO. PE−DG−434−600−C001. NTPC DRG. NO.(9585−001−315−PVC−C−0451B)
6. FOR GENERAL NOTES AND DETAILING OF STEEL STRUCTURAL WORKS REFER DRG. NO. PE−DG−434−600−C002. NTPC DRG. NO.(9585−001−315−PVC−C−0089A)
7. AIRCRAFT WARNING LIGHT (A.W.L.) SHALL BE PROVIDED TO MEET THE REQUIREMENT OF RELEVANT STANDARD STATUTORY BODY.

REFERENCE DRAWINGS/DOCUMENT : −

1. PE−DG−434−100−M001 ------ PLOT PLAN
2. PE−DG−434−100−M002 ------ MAIN EQUIPMENT PLANT LAYOUT

BHEL−PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED(✓) IS RELEASED FOR	
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☐ PLANNING	☐ INFORMATION
☐ CONSTRUCTION	☐ AS BUILT DRAWING
STAMP ALL PREVIOUS REVISION AS SUPERSEDED	
ISSUED BY	
NAME	ABHAY KUMAR
SIGNATURE	−Sd−
DATE	22/06/2018

ANNEXURE-III-GENERAL ARRANGMENT CHIMNEY & LINER

REV	DATE	ALTD	CHD	APPD

REV	DATE	ALTD	CHD	APPD
R1	22.06.18	DEEPAK	AK	

REVISED AS PER NTPC COMMENTS VIDE TRANSMITTAL NO 317.214 DATED 12.06.2018 AND MARKED AS R1

NTPC. DRAWING NO. − 9585−001−317−PVC−C−0550

CUSTOMER PATRATU VIDYUT UTPADAN NIGAM LIMITED
(A SUBSIDIARY OF NTPC LTD)

3x800MW PATRATU SUPER THERMAL POWER PROJECT

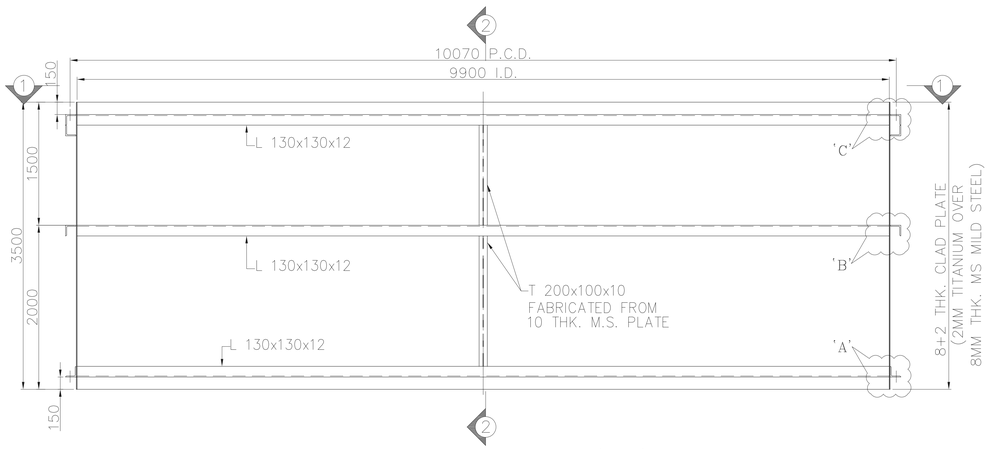
JOB NO. 434
STATUS
DISTRIBUTION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

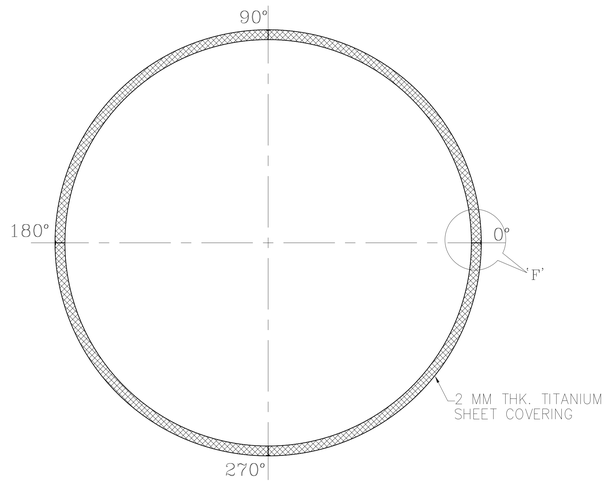
DEPT CODE		NAME	SIGN	DATE
C	DRN	DEEPAK		15.05.2018
	DESN	P. CHATERJEE		15.05.2018
	CHD	ABHAY		15.05.2018
	APPD	AKS		15.05.2018

TITLE CHIMNEY
GENERAL ARRANGEMENT UNIT#1,2 & 3

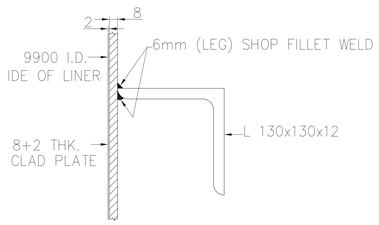
DEPT. SCALE 1:100
SIGN
DRAWING NO. PE−DG−434−620−C001
SHEET 1 OF 1 REV. 1
SIZE-A1



ELEVATION OF CAN TYPE 'SS2'



SECTION 1-1



DETAIL AT 'B'

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS. FIGURED DIMENSIONS SHALL BE FOLLOWED.
2. MILD STEEL PLATES AND ROLLED SECTIONS SHALL CONFIRM TO GRADE A OF IS:2062 FOR MATERIALS UPTO 20MM IN THICKNESS.
3. HOT ROLLED SECTIONS SHALL CONFIRM TO IS:808 PART I TO IV.
4. TITANIUM CLAD PLATES SHALL BE OF GRADE 2 AS PER ASME SB265 AND SHALL CONFORM TO ASTM B898-11. FABRICATION OF TITANIUM CLAD PLATES SHALL BE DONE IN ACCORDANCE WITH SPECIFICATION NO. 9591-001-317-PVC-U-400
5. SPECIAL QUALITY BOLTS SHALL BE BLACK GRADE OF PROPERTY CLASS 8.8 CONFIRMING IS:1367.
6. WASHERS, NUTS AND HELICAL SPRING LOCKING WASHERS SHALL BE OF QUALITY CLASS NOT LESS THAN THAT OF THE BOLTS.
7. WELDING FOR ALL MS. PLATE/MEMBERS SHALL BE DONE WITH LOW HYDROGEN TYPE WELDING CONFORM TO IS:816 NAD IS:9595 AND TO THE REQUIREMENT OF THE SPECIFICATION.
8. ALL FILLET AND BUTT WELDS ARE TO BE CONTINUOUS.
9. ALL SHOP WELDS USED TO CONNECT CURVED PLATES FORMING FLUE CANS AND OTHER BUTT WELDS, WHERE REQUIRED, SHALL BE FULL PENETRATION BUTT WELD.
10. ANY TEMPORARY STIFFENING STEEL WORK REQUIRED DURING FABRICATION, TRANSPORTATION OR ERECTION PURPOSES SHALL BE DESIGNED AND SUPPLIED BY THE CONTRACTOR, SUCH STEEL WORK SHALL BE REMOVED AND FLUE SURFACES MADE GOOD AFTER ERECTION.
11. TESTING OF WELDS UNLESS NOTED OTHERWISE ON THE DRAWINGS, SHALL BE AS FOLLOWS:

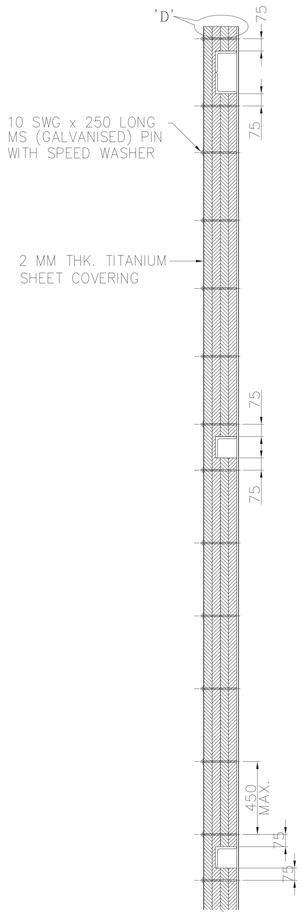
a) FILLET WELDS:
   i) MACROETCH EXAMINATION ON PRODUCTION COUPONS.
   ii) 100% DYE PENETRATION TEST/MAGNETIC PARTICLE TEST.

b) BUT WELDS:
   i) 100% DYE PENETRATION TEST AFTER BLACK GOUGING.
   ii) 10% (FOR SHOP WELDS) AND 15% (FOR SITE WELDS) RADIOGRAPHY TEST. WHERE RADIOGRAPHY IS NOT POSSIBLE, ULTRASONIC TESTING WILL BE CARRIED OUT.

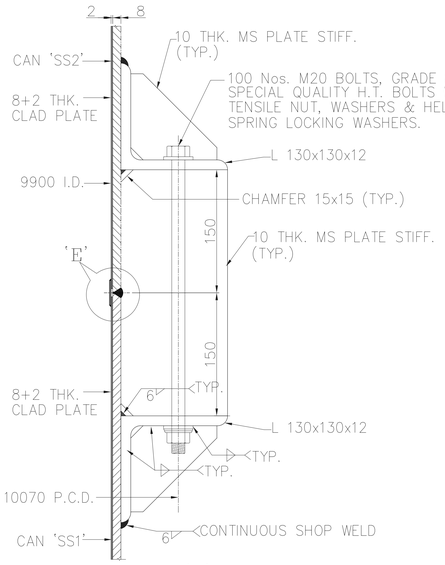
c) THE WELD RUN TO BE TESTED. SHALL BE EVENLY DISTRIBUTED OVER THE TOTAL LENGTH OF APPLICABLE WELDS ON EACH CAN.

d) THE PERCENTAGE OF WELDS TESTED, SHALL BE INCREASED AS JUDGED NECESSARY BY THE ENGINEER-IN-CHARGE, BUT TO NOT LESS THAN 20% FOLLOWING IDENTIFICATION OF SIGNIFICANT DEFECTIVE WELDS AND ONLY REDUCED TO THE 10%/15% NORM AFTER CONSISTENT QUALITY/ INTEGRITY IS RE-ESTABLISHED.

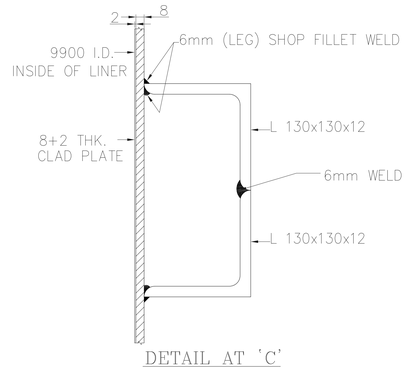
12. WELDING OF TITANIUM PLATE SHALL BE DONE IN ACCORDANCE WITH TECHNICAL SPECIFICATION.
13. THE TERM 'SHOP' WELD REFERS TO ALL WELDS MADE DURING FABRICATION, OF INDIVIDUAL FLUE CANS AT FABRICATION YARD. 'SITE' WELD REFERS TO WELDS MADE DURING FLUE ERECTION FOR JOINING TOGETHER OF CANS WITHIN WIND SHIELD.
14. FOR GENERAL NOTES AND DETAILING OF STEEL STRUCTURAL WORKS REFER DRG. NO. PE-DG-434-600-C002.
15. CONDENSATE COLLECTION CHANNEL SHALL BE WELDED WITH FLUE CAN AS APPLICABLE AS PER CONDENSATE FLOW STUDY. FOR DETAIL AND LOCATION OF CONDENSATE COLLECTION CHANNEL REFER SEPARATE DRG.



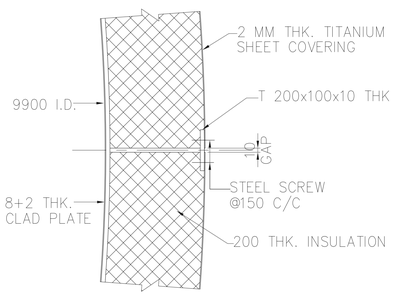
SECTION 2-2



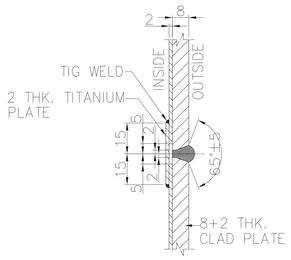
DETAIL AT 'A'



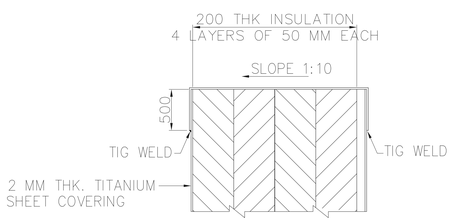
DETAIL AT 'C'



DETAIL AT - 'F'



DETAIL AT - 'E'



DETAIL AT - 'D'

THIS DRG SHALL BE READ IN CONJUCTION WITH 9585-001-317-PVC-C-0572B

BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED(✓) IS RELEASED FOR	
☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
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ISSUED BY	
NAME	ABHAY KUMAR
SIGNATURE	-Sd-
DATE	15/12/2018

ANNEXURE-III-GENERAL
ARRANGMENT CHIMNEY & LINER

NTPC. DRAWING NO. - 9585-001-317-PVC-C-0572A

CUSTOMER
NTPC LIMITED

3x800MW PATRATU SUPER THERMAL POWER PROJECT

JOB NO.	434
STATUS	
DISTRIBUTION	

DATE	ALTD	CHD	APPD

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

	DEPT CODE	NAME	SIGN	DATE
C	DRN	DEEPAK	-Sd-	15.12.2018
	DESN	P. CHATERJEE	-Sd-	15.12.2018
	CHD	ABHAY	-Sd-	15.12.2018
	APPD	AKS	-Sd-	15.12.2018

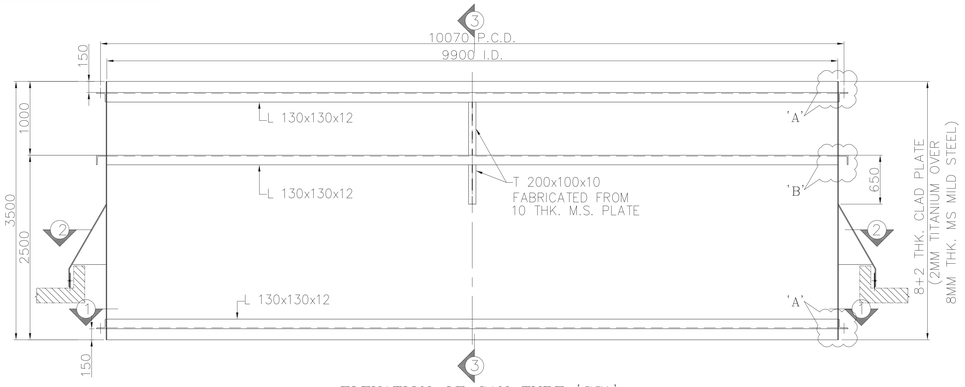
TITLE
CHIMNEY
LINER DETAILS- CAN TYPE SS2

DEPT.
SCALE 1:100
SIGN
DRAWING NO.
PE-DG-434-620-C020
SHEET 1 OF 1
REV. 0
SIZE-A1

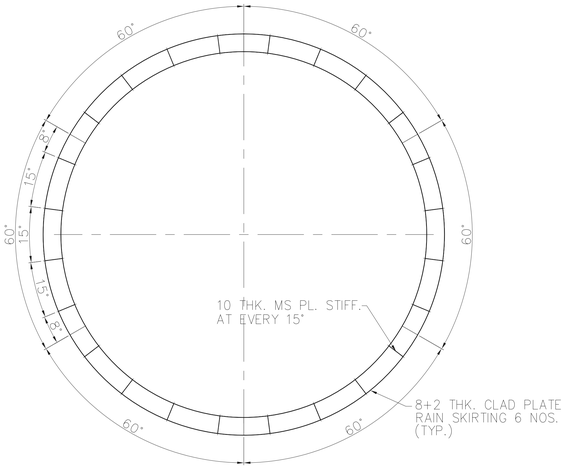
COMPUTER FILE NAME:

DRAWING No. PE-DG-434-620-C021

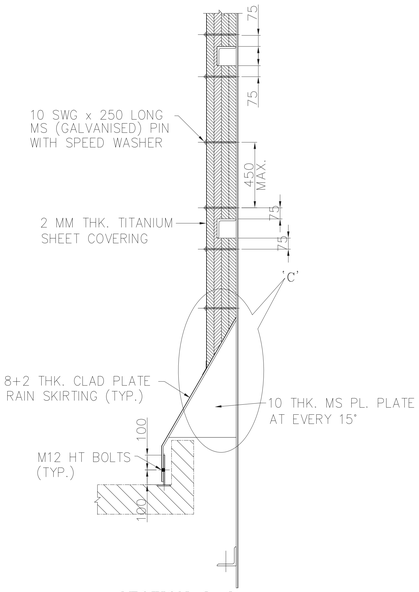
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM



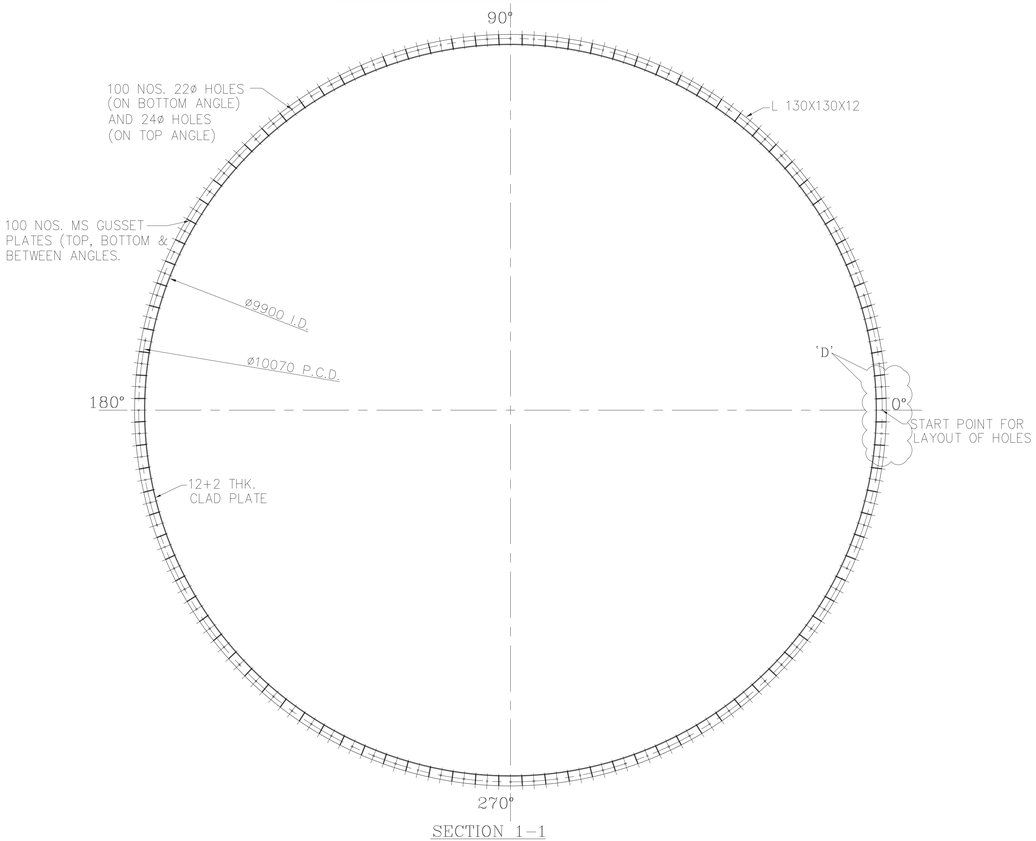
ELEVATION OF CAN TYPE 'SS1'



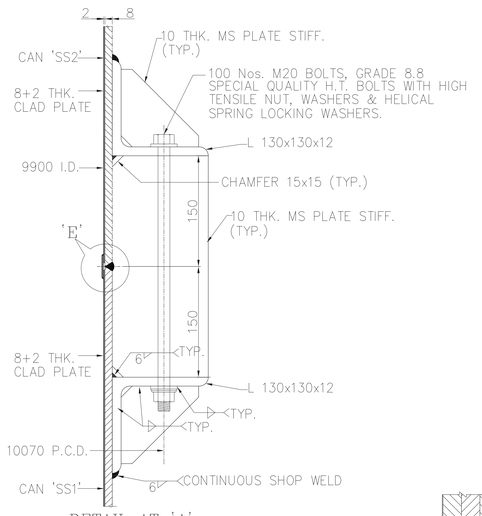
PLAN 2-2
(SHOWING RAIN SKIRTING)



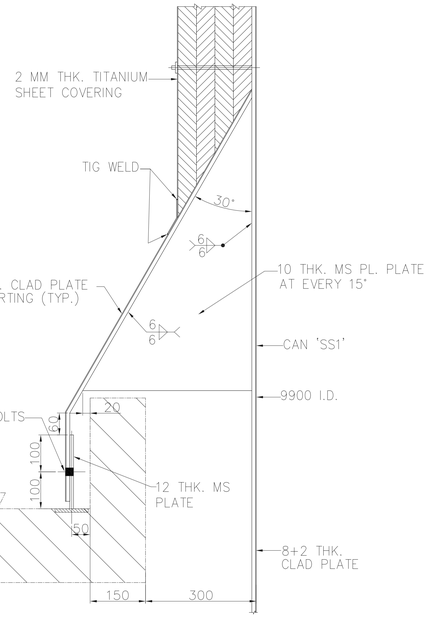
SECTION 3-3



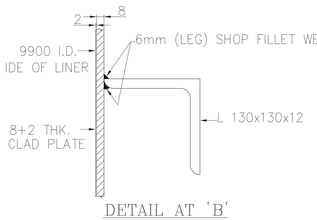
SECTION 1-1



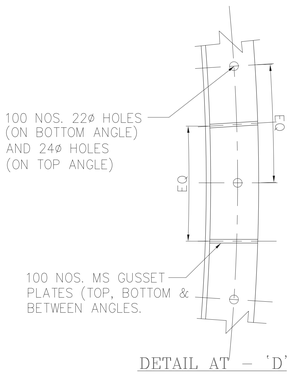
DETAIL AT 'A'



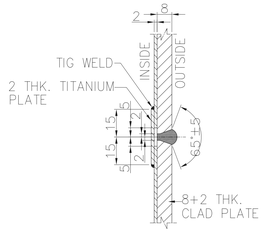
DETAIL AT 'C'



DETAIL AT 'B'



DETAIL AT - 'D'



DETAIL AT - 'E'

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS. FIGURED DIMENSIONS SHALL BE FOLLOWED.
2. MILD STEEL PLATES AND ROLLED SECTIONS SHALL CONFIRM TO GRADE A OF IS:2062 FOR MATERIALS UPTO 20MM IN THICKNESS.
3. HOT ROLLED SECTIONS SHALL CONFIRM TO IS:808 PART I TO IV.
4. TITANIUM CLAD PLATES SHALL BE OF GRADE 2 AS PER ASME SB265 AND SHALL CONFORM TO ASTM B898-11. FABRICATION OF TITANIUM CLAD PLATES SHALL BE DONE IN ACCORDANCE WITH SPECIFICATION NO. 9591-001-317-PVC-U-400
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6. WASHERS, NUTS AND HELICAL SPRING LOCKING WASHERS SHALL BE OF QUALITY CLASS NOT LESS THAN THAT OF THE BOLTS.
7. WELDING FOR ALL MS. PLATE/MEMBERS SHALL BE DONE WITH LOW HYDROGEN TYPE WELDING CONFORM TO IS:816 NAD IS:9595 AND TO THE REQUIREMENT OF THE SPECIFICATION.
8. ALL FILLET AND BUTT WELDS ARE TO BE CONTINUOUS.
9. ALL SHOP WELDS USED TO CONNECT CURVED PLATES FORMING FLUE CANS AND OTHER BUTT WELDS, WHERE REQUIRED, SHALL BE FULL PENETRATION BUTT WELD.
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b) BUT WELDS:
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d) THE PERCENTAGE OF WELDS TESTED, SHALL BE INCREASED AS JUDGED NECESSARY BY THE ENGINEER-IN-CHARGE, BUT TO NOT LESS THAN 20% FOLLOWING IDENTIFICATION OF SIGNIFICANT DEFECTIVE WELDS AND ONLY REDUCED TO THE 10%/15% NORM AFTER CONSISTENT QUALITY/ INTEGRITY IS RE-ESTABLISHED.

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14. FOR GENERAL NOTES AND DETAILING OF STEEL STRUCTURAL WORKS REFER DRG. NO. PE-DG-434-600-C002.
15. CONDENSATE COLLECTION CHANNEL SHALL BE WELDED WITH FLUE CAN AS APPLICABLE AS PER CONDENSATE FLOW STUDY. FOR DETAIL AND LOCATION OF CONDENSATE COLLECTION CHANNEL REFER SEPARATE DRG.

THIS DRG SHALL BE READ IN CONJUCTION WITH 9585-001-317-PVC-C-0572A

BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)	
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☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
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ISSUED BY	
NAME	ABHAY KUMAR
SIGNATURE	-Sd-
DATE	15/12/2018

ANNEXURE-III-GENERAL
ARRANGMENT CHIMNEY & LINER

NTPC. DRAWING NO. - 9585-001-317-PVC-C-0572B

CUSTOMER: NTPC LIMITED

3x800MW PATRATU SUPER THERMAL POWER PROJECT

JOB NO.	434
STATUS	
DISTRIBUTION	

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
C	DRN	DEEPAK	-Sd-	15.12.2018
	DESN	P. DHATERJEE	-Sd-	15.12.2018
	CHD	ABHAY	-Sd-	15.12.2018
	APPD	AVS	-Sd-	15.12.2018

DATE	ALTD	CHD	APPD

TITLE: CHIMNEY
LINER DETAILS- CAN TYPE SS1

DEPT. | SCALE 1:100 | SIGN

DRAWING NO. PE-DG-434-620-C021

SHEET 1 OF 1 | REV. 0

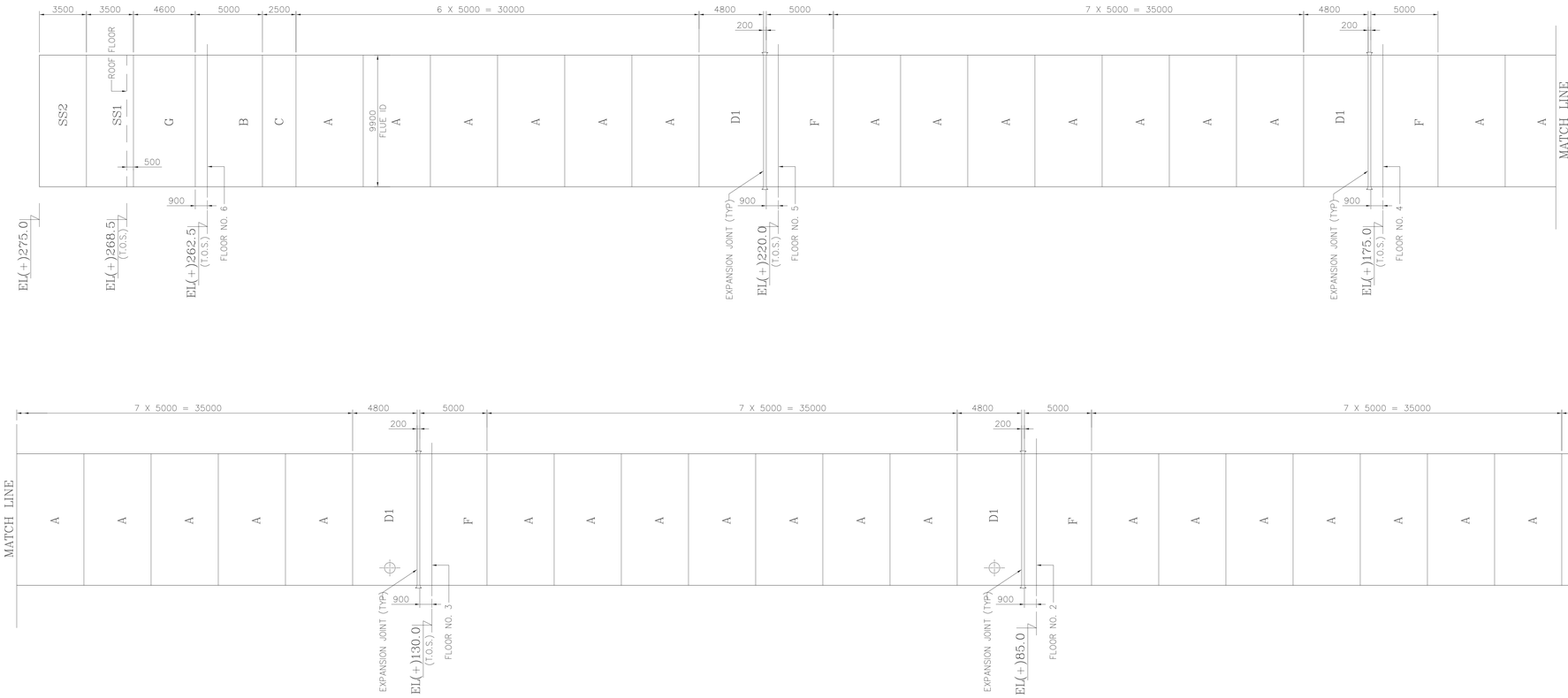
SIZE-A1

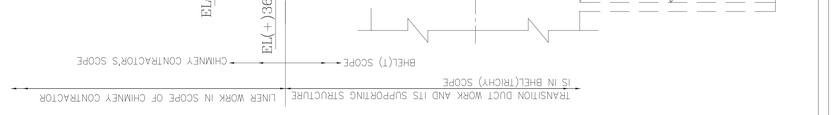
COMPUTER FILE NAME:

DRAWING No. PE-DG-434-620-C022

FIRST ANGLE PROJECTION

ALL DIMENSIONS ARE IN MM





REFERENCE DRAWINGS

1. CHIMNEY GA — PE-DG-434-620-C001 (9585-001-317-PVC-C-0550)
2. DETAILS OF INTERNAL PLATFORMS (SH1) — PE-DG-434-620-C010 (9585-001-317-PVC-C-0567A)
3. DETAILS OF INTERNAL PLATFORMS (SH2) — PE-DG-434-620-C011 (9585-001-317-PVC-C-0567B)
4. DETAIL OF LINER SUPPORT BEAMS — PE-DG-434-620-C012 (9585-001-317-PVC-C-0579)
5. DETAIL OF LINER RESTRAINT — PE-DG-434-620-C013 (9585-001-317-PVC-C-0580)
6. DETAIL OF LINER EXPANSION JOINTS — PE-DG-434-620-C028 (9585-001-317-PVC-C-0581)
7. FIXING DETAILS OF LINER INSULATION — PE-DG-434-620-C029 (9585-001-317-PVC-C-0578)
8. GENERAL ARRANGEMENT OF ID SYSTEM ELEVATION — 0-00-020-77527 (9585-001-102-PVM-B-013)
9. GENERAL ARRANGEMENT OF ID SYSTEM PLAN — 0-00-020-77528 (9585-001-102-PVM-B-444)

NOTES: –

1. ALL DIMENSIONS ARE IN MILLIMETERS AND LEVELS IN METERS.
2. FLUE DIMENSIONS AS GIVEN ARE FOR THE LINER AT AMBIENT TEMPERATURE.
3. THE LINER SHALL BE SEGMENTALLY SUPPORTED FROM THE INTERNAL PLATFORMS.
4. EACH LINER SEGMENT AFTER ERECTION AT PLATFORM LEVEL SHALL IMMEDIATELY BE LATERALLY RESTRAINED AT THE RESPECTIVE LOWER PLATFORM LEVEL BY PROVIDING LINER RESTRAINT.
5. REFER TO BHEL(T) DRAWING FOR TRANSITION DUCT AND FLUE LINER INTERFACE, AND FOR TRANSITION DUCT SUPPORTING ARRANGEMENT.

SCHEDULE OF FLUE CANS

CAN TYPE	NOS. REQD.	BHEL DRG. NO.	NTPC DRG. NO.
CAN TYPE 'SS1'	1	PE-DG-434-620-C019	9585-001-317-PVC-C-0596
CAN TYPE 'SS2'	1	PE-DG-434-620-C020	9585-001-317-PVC-C-0572A
CAN TYPE 'A'	33	PE-DG-434-620-C023	9585-001-317-PVC-C-0560
CAN TYPE 'D1'	5	PE-DG-434-620-C024	9585-001-317-PVC-C-0561
CAN TYPE 'F' & 'B'	4+1	PE-DG-434-620-C025	9585-001-317-PVC-C-0562
CAN TYPE 'G' & 'C'	1+1	PE-DG-434-620-C026	9585-001-317-PVC-C-0563
CAN TYPE 'E'	1	PE-DG-434-620-C027	9585-001-317-PVC-C-0564

BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED(✓) IS RELEASED FOR	
☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
STAMP ALL PREVIOUS REVISION AS SUPERSEDED	
ISSUED BY	
NAME	ABHAY KUMAR
SIGNATURE	-Sd-
DATE	31/10/2018

ANNEXURE-III-GENERAL
ARRANGMENT CHIMNEY & LINER

NTPC. DRAWING NO. – 9585-001-317-PVC-C-0571

CUSTOMER: NTPC LIMITED

3x800MW PATRATU SUPER THERMAL POWER PROJECT

JOB NO. 434
STATUS
DISTRIBUTION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
C	DRN	DEEPAK	–SD–	31.10.2018
	DESN	P. CHATTERJEE	–SD–	31.10.2018
	CHD	ABHAY	–SD–	31.10.2018
	APPD	AKS	–SD–	31.10.2018

	DATE	ALTD	CHD	APPD

TITLE: CHIMNEY
LINER GENERAL ARRANGEMENT

DEPT. | SCALE 1:100 | SIGN

DRAWING NO. PE-DG-434-620-C022

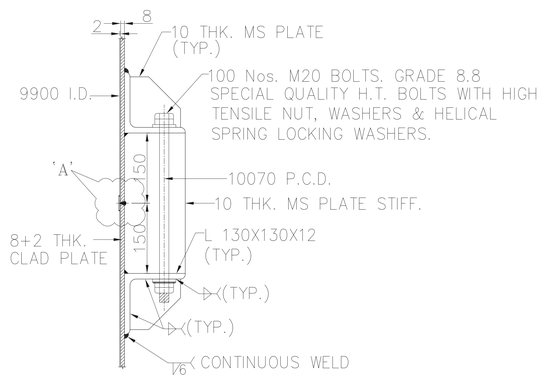
SHEET 1 OF 1 | REV. 0

SIZE:A1

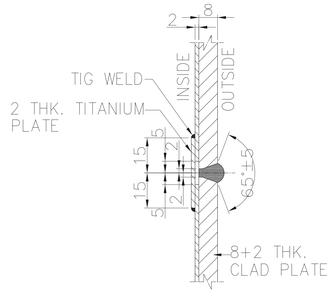
COMPUTER FILE NAME:

DRAWING No. PE-DG-434-620-C023

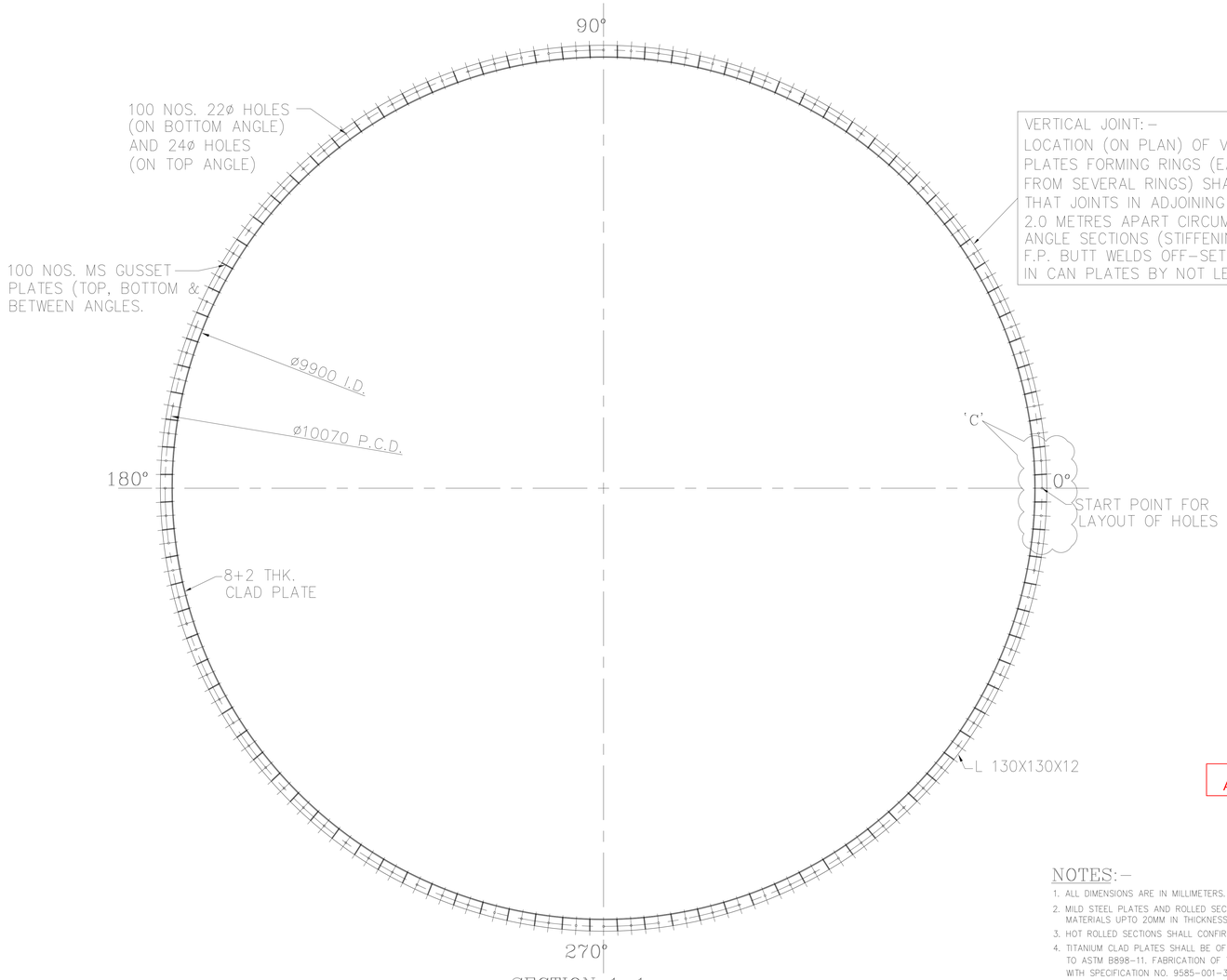
NORTH



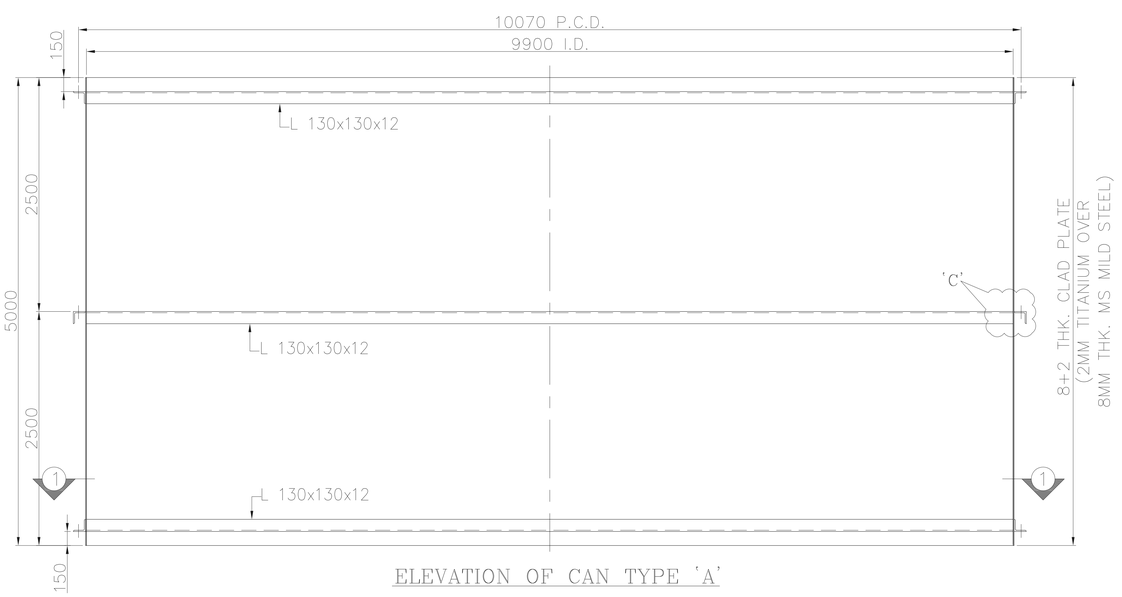
DETAIL OF JOINT BETWEEN CANS



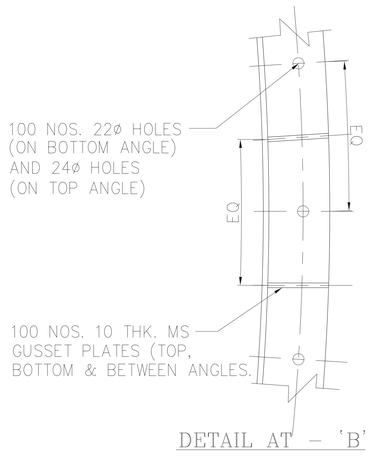
DETAIL AT – 'A'
(TYP. WELDING DETAIL FOR LINER CLAD PLATES)



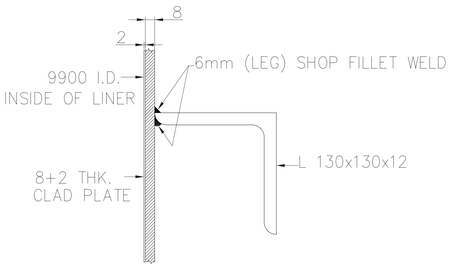
SECTION 1–1



ELEVATION OF CAN TYPE 'A'



DETAIL AT – 'B'



DETAIL AT 'C'

BHEL–PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED(✓) IS RELEASED FOR	
☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
STAMP ALL PREVIOUS REVISION AS SUPERSEDED	
ISSUED BY	
NAME	ABHAY KUMAR
SIGNATURE	–Sd–
DATE	31/10/2018

NOTES:–

1. ALL DIMENSIONS ARE IN MILLIMETERS. FIGURED DIMENSIONS SHALL BE FOLLOWED.
2. MILD STEEL PLATES AND ROLLED SECTIONS SHALL CONFIRM TO GRADE A OF IS:2062 FOR MATERIALS UPTO 20MM IN THICKNESS.
3. HOT ROLLED SECTIONS SHALL CONFIRM TO IS:808 PART I TO IV.
4. TITANIUM CLAD PLATES SHALL BE OF GRADE 2 AS PER ASME SB265 AND SHALL CONFORM TO ASTM B898–11. FABRICATION OF TITANIUM CLAD PLATES SHALL BE DONE IN ACCORDANCE WITH SPECIFICATION NO. 9585–001–317–PVC–U–400.
5. SPECIAL QUALITY BOLTS SHALL BE BLACK GRADE OF PROPERTY CLASS 8.8 CONFIRMING IS:1367.
6. WASHERS, NUTS AND HELICAL SPRING LOCKING WASHERS SHALL BE OF QUALITY CLASS NOT LESS THAN THAT OF THE BOLTS.
7. WELDING FOR ALL MS. PLATE/MEMBERS SHALL BE DONE WITH LOW HYDROGEN TYPE WELDING CONFORM TO IS:816 NAD IS:9595 AND TO THE REQUIREMENT OF THE SPECIFICATION.
8. ALL FILLET AND BUTT WELDS ARE TO BE CONTINUOUS.
9. ALL SHOP WELDS USED TO CONNECT CURVED PLATES FORMING FLUE CANS AND OTHER BUTT WELDS, WHERE REQUIRED, SHALL BE FULL PENETRATION BUTT WELD.
10. ANY TEMPORARY STIFFENING STEEL WORK REQUIRED DURING FABRICATION, TRANSPORTATION OR ERECTION PURPOSES SHALL BE DESIGNED AND SUPPLIED BY THE CONTRACTOR, SUCH STEEL WORK SHALL BE REMOVED AND FLUE SURFACES MADE GOOD AFTER ERECTION.
11. TESTING OF WELDS UNLESS NOTED OTHERWISE ON THE DRAWINGS, SHALL BE AS FOLLOWS:

a) FILLET WELDS:
   i) MACROETCH EXAMINATION ON PRODUCTION COUPONS.
   ii) 100% DYE PENETRATION TEST/MAGNETIC PARTICLE TEST.

b) BUT WELDS:
   i) 100% DYE PENETRATION TEST AFTER BLACK GOUGING.
   ii) 10% (FOR SHOP WELDS) AND 15% (FOR SITE WELDS) RADIOGRAPHY TEST. WHERE RADIOGRAPHY IS NOT POSSIBLE, ULTRASONIC TESTING WILL BE CARRIED OUT.

c) THE WELD RUN TO BE TESTED, SHALL BE EVENLY DISTRIBUTED OVER THE TOTAL LENGTH OF APPLICABLE WELDS ON EACH CAN.

d) THE PERCENTAGE OF WELDS TESTED SHALL BE INCREASED AS JUDGED NECESSARY BY THE ENGINEER–IN–CHARGE, BUT TO NOT LESS THAN 20% FOLLOWING IDENTIFICATION OF SIGNIFICANT OF DEFECTIVE WELDS AND ONLY REDUCED TO THE 10/15% NORM AFTER CONSISTENT QUALITY/ INTEGRITY IS RE–ESTABLISHED.

12. WELDING OF TITANIUM PLATE SHALL BE DONE IN ACCORDANCE WITH TECHNICAL SPECIFICATION.
13. THE TERM 'SHOP' WELD REFERS TO ALL WELDS MADE DURING FABRICATION, OF INDIVIDUAL FLUE CANS AT FABRICATION YARD. 'SITE' WELD REFERS TO WELDS MADE DURING FLUE ERECTION FOR JOINING TOGETHER OF CANS WITHIN WIND SHIELD.
14. FOR GENERAL NOTES AND DETAILING OF STEEL STRUCTURAL WORKS REFER DRG. NO. PE–DG–434–600–C002.

ANNEXURE-III-GENERAL ARRANGMENT CHIMNEY & LINER

NTPC. DRAWING NO. – 9585–001–317–PVC–C–0560

CUSTOMER: NTPC LIMITED

3x800MW PATRATU SUPER THERMAL POWER PROJECT

JOB NO. 434
STATUS
DISTRIBUTION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
C	DRN	DEEPAK	–Sd–	31.10.2018
	DESN	P. CHATTERJEE	–Sd–	31.10.2018
	CHD	ABHAY	–Sd–	31.10.2018
	APPD	A/C	–Sd–	31.10.2018

DATE	ALTD	CHD	APPD

TITLE: CHIMNEY
LINER DETAILS– CAN TYPE A

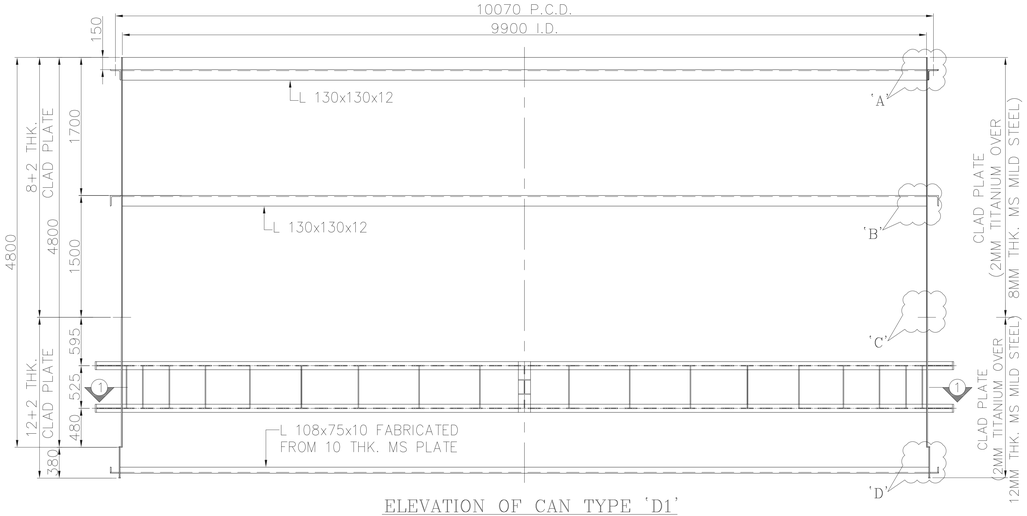
DEPT. | SCALE 1:100 | SIGN

DRAWING NO. PE–DG–434–620–C023

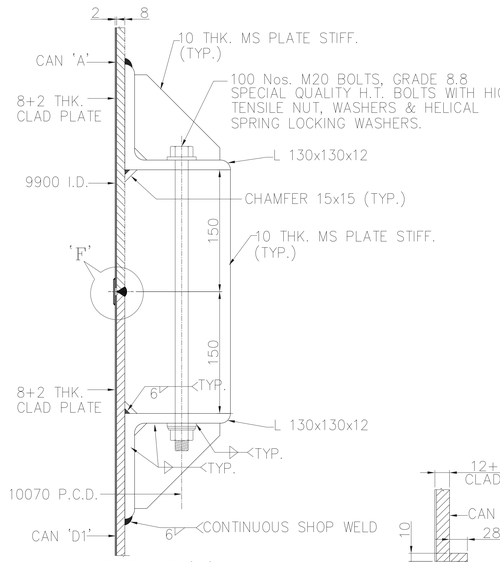
SHEET 1 OF 1 | REV. 0

SIZE:A1

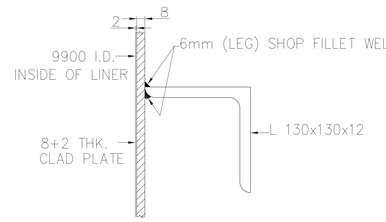
COMPUTER FILE NAME:



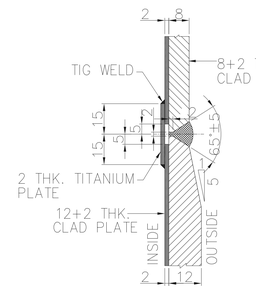
ELEVATION OF CAN TYPE 'D1'
(5 NOS. REQUIRED)



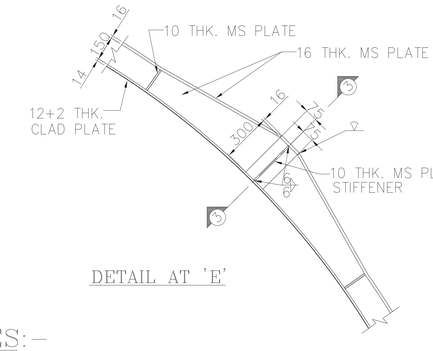
DETAIL AT 'A'



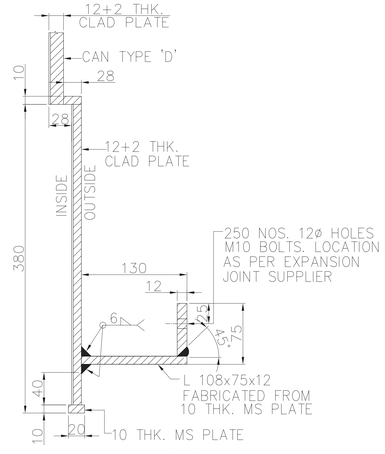
DETAIL AT 'B'



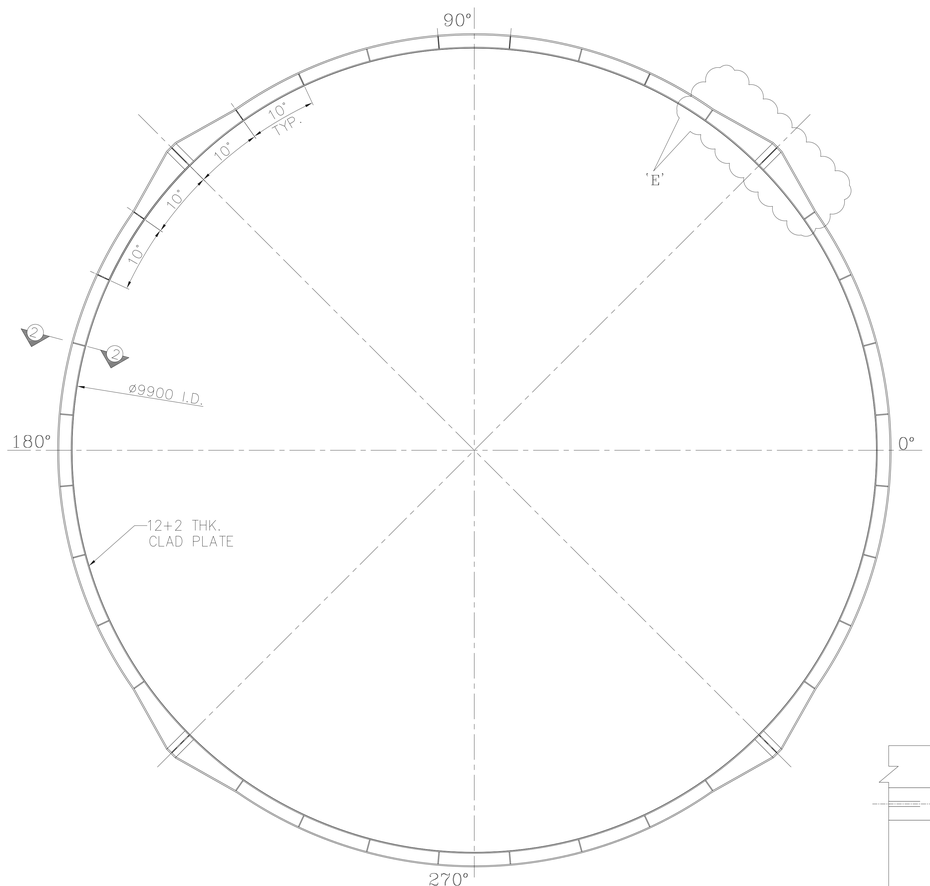
DETAIL AT 'C'



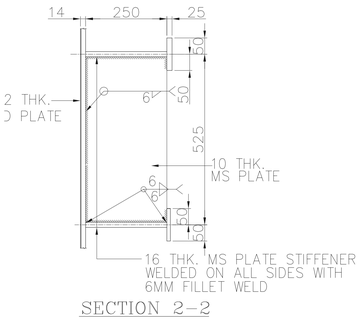
DETAIL AT 'E'



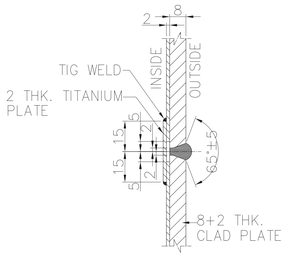
DETAIL AT 'D'
PART OF EXPANSION JOINT FOR DETAIL REFER DRG. NO. PE-DG-434-620-C028
(NTPC DRG. NO. 9585-001-317-PVC-C-5081)



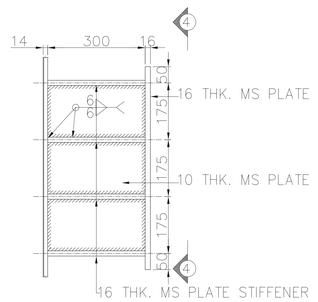
SECTION 1-1



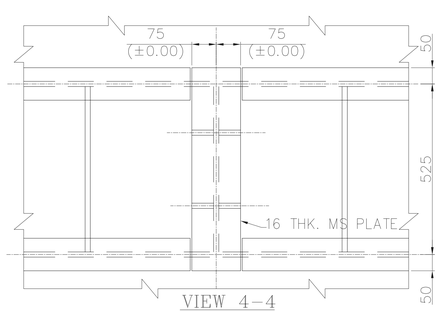
SECTION 2-2



DETAIL AT - 'F'



SECTION 3-3



VIEW 4-4

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS. FIGURED DIMENSIONS SHALL BE FOLLOWED.
2. MILD STEEL PLATES AND ROLLED SECTIONS SHALL CONFIRM TO GRADE A OF IS:2062 FOR MATERIALS UPTO 20MM IN THICKNESS.
3. HOT ROLLED SECTIONS SHALL CONFIRM TO IS:808 PART I TO IV.
4. TITANIUM CLAD PLATES SHALL BE OF GRADE 2 AS PER ASME SB265 AND SHALL CONFORM TO ASTM B898-11. FABRICATION OF TITANIUM CLAD PLATES SHALL BE DONE IN ACCORDANCE WITH SPECIFICATION NO. 9591-102-315-PVC-U-0550F-03.
5. SPECIAL QUALITY BOLTS SHALL BE BLACK GRADE OF PROPERTY CLASS 8.8 CONFIRMING IS:1367.
6. WASHERS, NUTS AND HELICAL SPRING LOCKING WASHERS SHALL BE OF QUALITY CLASS NOT LESS THAN THAT OF THE BOLTS.
7. WELDING FOR ALL MS. PLATE/MEMBERS SHALL BE DONE WITH LOW HYDROGEN TYPE WELDING CONFORM TO IS:816 NAD IS:9595 AND TO THE REQUIREMENT OF THE SPECIFICATION.
8. ALL FILLET AND BUTT WELDS ARE TO BE CONTINUOUS.
9. ALL SHOP WELDS USED TO CONNECT CURVED PLATES FORMING FLUE CANS AND OTHER BUTT WELDS, WHERE REQUIRED, SHALL BE FULL PENETRATION BUTT WELD.
10. ANY TEMPORARY STIFFENING STEEL WORK REQUIRED DURING FABRICATION, TRANSPORTATION OR ERECTION PURPOSES SHALL BE DESIGNED AND SUPPLIED BY THE CONTRACTOR, SUCH STEEL WORK SHALL BE REMOVED AND FLUE SURFACES MADE GOOD AFTER ERECTION.
11. TESTING OF WELDS UNLESS NOTED OTHERWISE ON THE DRAWINGS, SHALL BE AS FOLLOWS:
    a) FILLET WELDS:
       i) MACROETCH EXAMINATION ON PRODUCTION COUPONS.
       ii) 100% DYE PENETRATION TEST/MAGNETIC PARTICLE TEST.
    b) BUT WELDS:
       i) 100% DYE PENETRATION TEST AFTER BLACK GOUGING.
       ii) 10% (FOR SHOP WELDS) AND 15% (FOR SITE WELDS) RADIOGRAPHY TEST. WHERE RADIOGRAPHY IS NOT POSSIBLE, ULTRASONIC TESTING WILL BE CARRIED OUT.
    c) THE WELD RUN TO BE TESTED. SHALL BE EVENLY DISTRIBUTED OVER THE TOTAL LENGTH OF APPLICABLE WELDS ON EACH CAN.
    d) THE PERCENTAGE OF WELDS TESTED SHALL BE INCREASED AS JUDGED NECESSARY BY THE ENGINEER-IN-CHARGE, BUT TO NOT LESS THAN 20% FOLLOWING IDENTIFICATION OF SIGNIFICANT OF DEFECTIVE WELDS AND ONLY REDUCED TO THE 10/15% NORM AFTER CONSISTENT QUALITY/ INTEGRITY IS RE-ESTABLISHED.
12. WELDING OF TITANIUM PLATE SHALL BE DONE IN ACCORDANCE WITH TECHNICAL SPECIFICATION.
13. THE TERM 'SHOP' WELD REFERS TO ALL WELDS MADE DURING FABRICATION, OF INDIVIDUAL FLUE CANS AT FABRICATION YARD. 'SITE' WELD REFERS TO WELDS MADE DURING FLUE ERECTION FOR JOINING TOGETHER OF CANS WITHIN WIND SHIELD.
14. FOR GENERAL NOTES AND DETAILING OF STEEL STRUCTURAL WORKS REFER DRG. NO. PE-DG-434-600-C002.
15. CONDENSATE COLLECTION CHANNEL SHALL BE WELDED WITH FLUE CAN AS APPLICABLE AS PER CONDENSATE FLUE STUDY. FOR DETAIL AND LOCATION OF CONDENSATE COLLECTION CHANNEL REFER SEPARATE DRG.
16. GAS SAMPLING PORT SHALL BE PROVIDED AS PER IN FLUE CAN AS PER DRG NO.#620-C014

BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED(✓) IS RELEASED FOR	
☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
STAMP ALL PREVIOUS REVISION AS SUPERSEDED	
ISSUED BY	
NAME	ABHAY KUMAR
SIGNATURE	-Sd-
DATE	20/11/2018

ANNEXURE-III-GENERAL ARRANGMENT CHIMNEY & LINER

NTPC. DRAWING NO. - 9585-001-317-PVC-C-0561

CUSTOMER: NTPC LIMITED

3x800MW PATRATU SUPER THERMAL POWER PROJECT

JOB NO.	434
STATUS	
DISTRIBUTION	

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT		NAME	SIGN	DATE
CODE	DRN	DEEPAK	-SD-	20.11.2018
C	DESN	P. CHATTERJEE	-SD-	20.11.2018
	CHD	ABHAY	-SD-	20.11.2018
	APPD	AKS	-SD-	20.11.2018

DATE	ALTD	CHD	APPD

TITLE: CHIMNEY
LINER DETAILS- CAN TYPE D1

DEPT.	SCALE 1:100	DRAWING NO.
SIGN		PE-DG-434-620-C024

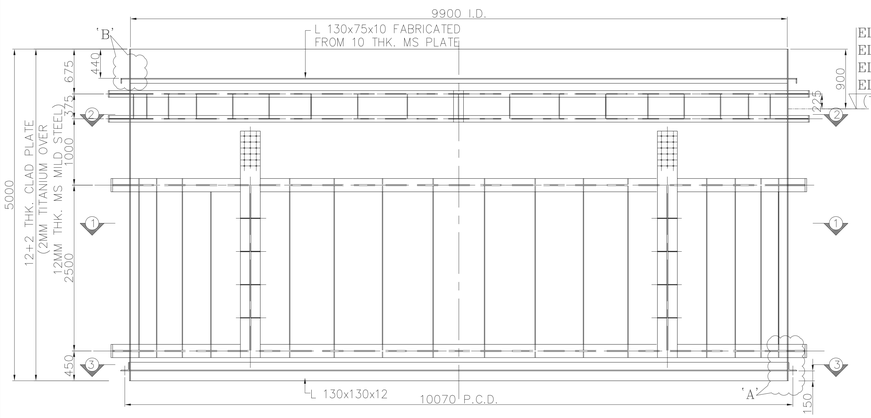
SHEET 1 OF 1 REV. 0

SIZE-A1

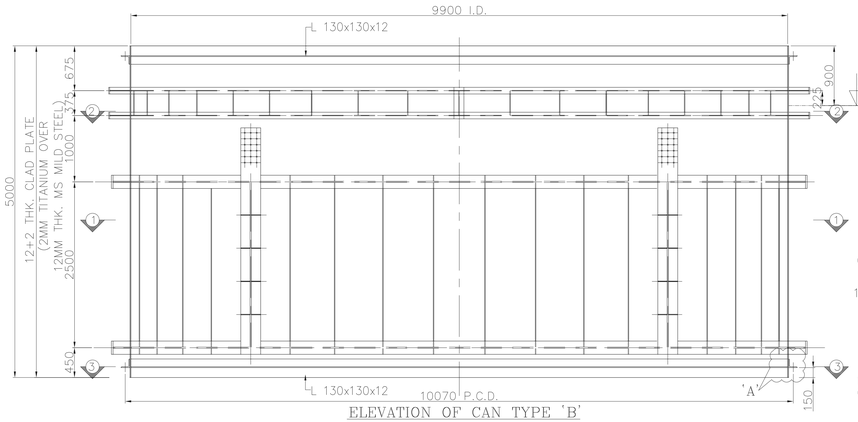
COMPUTER FILE NAME:

DRAWING No. PE-DG-434-620-C025

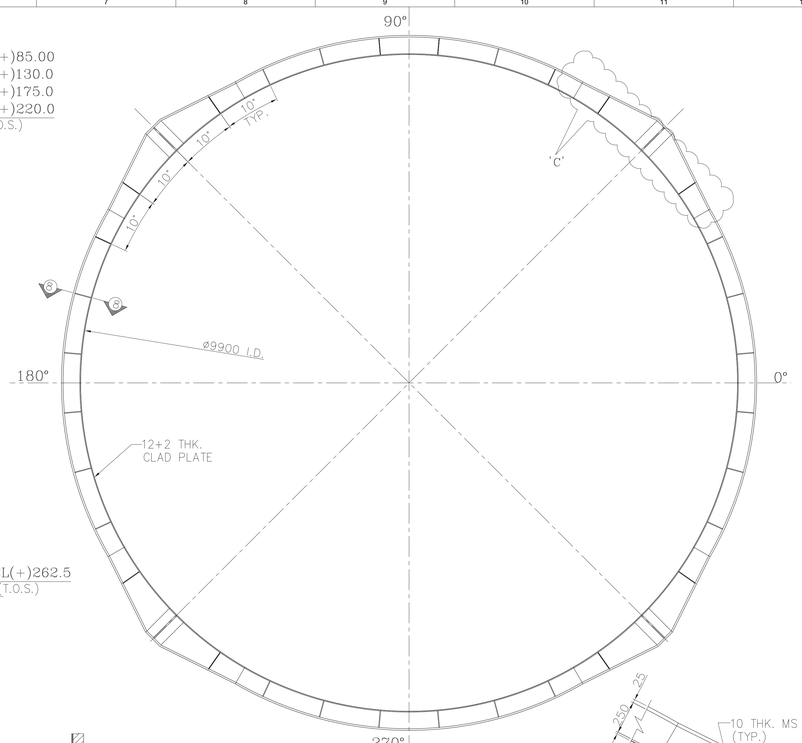
FIRST ANGLE PROJECTION | ALL DIMENSIONS ARE IN MM



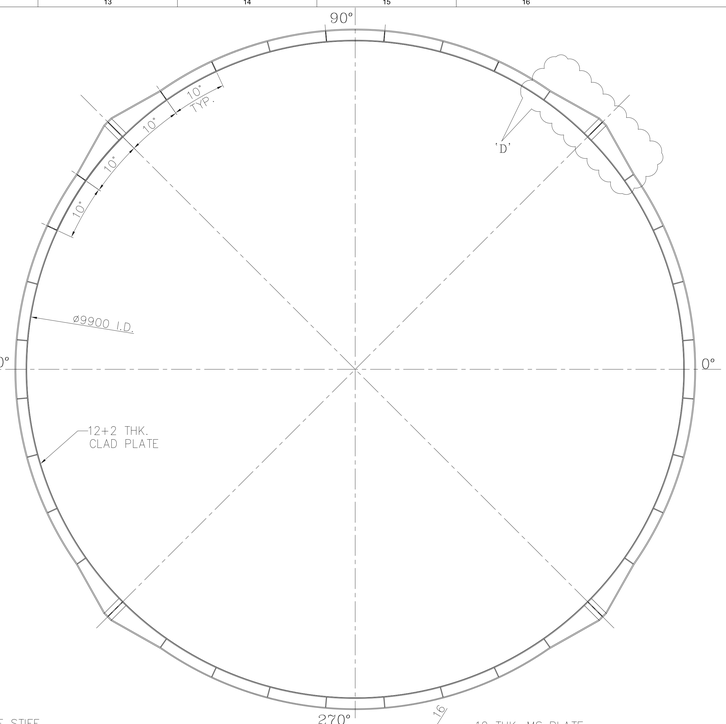
ELEVATION OF CAN TYPE 'F'
(4 NOS. REQUIRED)



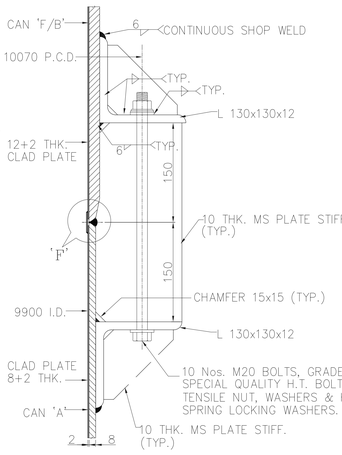
ELEVATION OF CAN TYPE 'B'



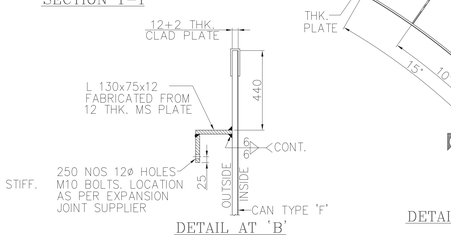
SECTION 1-1



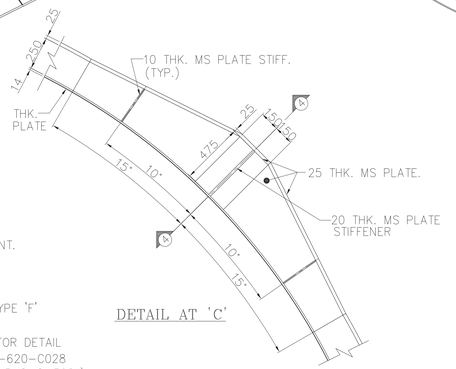
SECTION 2-2



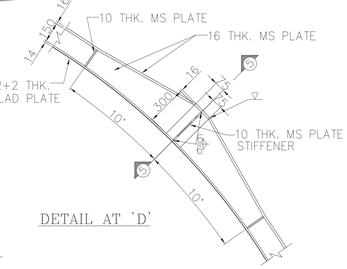
DETAIL AT 'A'



DETAIL AT 'B'
PART OF EXPANSION JOINT FOR DETAIL
REFER DRG. NO. PE-DG-434-620-C028
(NTPC DRG. NO. 9585-001-317-PVC-C-5081)



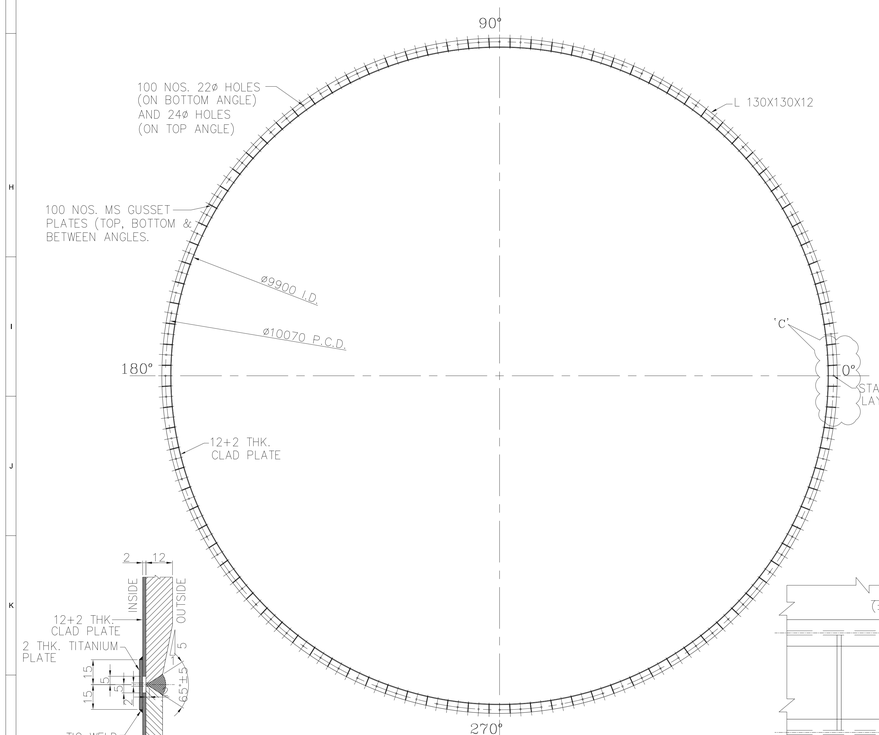
DETAIL AT 'C'



DETAIL AT 'D'

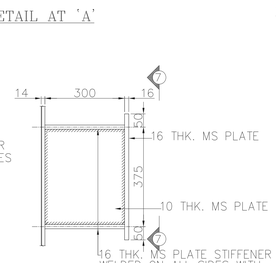
NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS. FIGURED DIMENSIONS SHALL BE FOLLOWED.
2. MILD STEEL PLATES AND ROLLED SECTIONS SHALL CONFIRM TO GRADE A OF IS:2062 FOR MATERIALS UPTO 20MM IN THICKNESS.
3. HOT ROLLED SECTIONS SHALL CONFIRM TO IS:808 PART I TO IV.
4. TITANIUM CLAD PLATES SHALL BE OF GRADE 2 AS PER ASME SB265 AND SHALL CONFORM TO ASTM B898-11. FABRICATION OF TITANIUM CLAD PLATES SHALL BE DONE IN ACCORDANCE WITH SPECIFICATION NO. 9585-001-317-PVC-U-400.
5. SPECIAL QUALITY BOLTS SHALL BE BLACK GRADE OF PROPERTY CLASS 8.8 CONFIRMING IS:1367.
6. WASHERS, NUTS AND HELICAL SPRING LOCKING WASHERS SHALL BE OF QUALITY CLASS NOT LESS THAN THAT OF THE BOLTS.
7. WELDING FOR ALL MS. PLATE/MEMBERS SHALL BE DONE WITH LOW HYDROGEN TYPE WELDING CONFORM TO IS:816 NAD IS:9595 AND TO THE REQUIREMENT OF THE SPECIFICATION.
8. ALL FILLET AND BUTT WELDS ARE TO BE CONTINUOUS.
9. ALL SHOP WELDS USED TO CONNECT CURVED PLATES FORMING FLUE CANS AND OTHER BUTT WELDS, WHERE REQUIRED, SHALL BE FULL PENETRATION BUTT WELD.
10. ANY TEMPORARY STIFFENING STEEL WORK REQUIRED DURING FABRICATION, TRANSPORTATION OR ERECTION PURPOSES SHALL BE DESIGNED AND SUPPLIED BY THE CONTRACTOR, SUCH STEEL WORK SHALL BE REMOVED AND FLUE SURFACES MADE GOOD AFTER ERECTION.
11. TESTING OF WELDS UNLESS NOTED OTHERWISE ON THE DRAWINGS, SHALL BE AS FOLLOWS:
    a) FILLET WELDS:
       i) MACROETCH EXAMINATION ON PRODUCTION COUPONS.
       ii) 100% DYE PENETRATION TEST/MAGNETIC PARTICLE TEST.
    b) BUT WELDS:
       i) 100% DYE PENETRATION TEST AFTER BLACK GOUGING.
       ii) 10% (FOR SHOP WELDS) AND 15% (FOR SITE WELDS) RADIOGRAPHY TEST. WHERE RADIOGRAPHY IS NOT POSSIBLE, ULTRASONIC TESTING WILL BE CARRIED OUT.
    c) THE WELD RUN TO BE TESTED, SHALL BE EVENLY DISTRIBUTED OVER THE TOTAL LENGTH OF APPLICABLE WELDS ON EACH CAN.
    d) THE PERCENTAGE OF WELDS TESTED SHALL BE INCREASED AS JUDGED NECESSARY BY THE ENGINEER-IN-CHARGE, BUT TO NOT LESS THAN 20% FOLLOWING IDENTIFICATION OF SIGNIFICANT OF DEFECTIVE WELDS AND ONLY REDUCED TO THE 10/15% NORM AFTER CONSISTENT QUALITY/ INTEGRITY IS RE-ESTABLISHED.
12. WELDING OF TITANIUM PLATE SHALL BE DONE IN ACCORDANCE WITH TECHNICAL SPECIFICATION.
13. THE TERM 'SHOP' WELD REFERS TO ALL WELDS MADE DURING FABRICATION, OF INDIVIDUAL FLUE CANS AT FABRICATION YARD. 'SITE' WELD REFERS TO WELDS MADE DURING FLUE ERECTION FOR JOINING TOGETHER OF CANS WITHIN WIND SHIELD.
14. FOR GENERAL NOTES AND DETAILING OF STEEL STRUCTURAL WORKS REFER DRG. NO. PE-DG-434-600-C002.
15. CONDENSATE COLLECTION CHANNEL SHALL BE WELDED WITH FLUE CAN AS APPLICABLE AS PER CONDENSATE FLUE STUDY. FOR DETAIL AND LOCATION OF CONDENSATE COLLECTION CHANNEL REFER SEPARATE DRG.

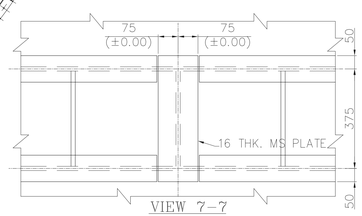


SECTION 3-3

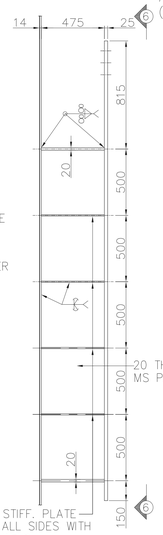
DETAIL AT 'F'



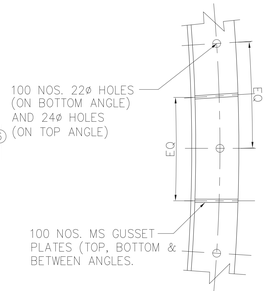
SECTION 5-5



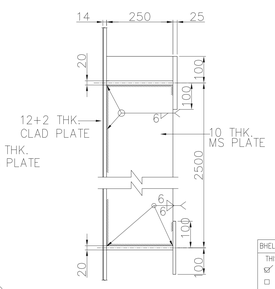
VIEW 7-7



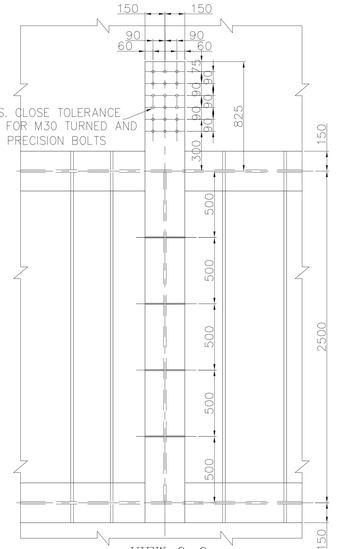
SECTION 4-4



DETAIL AT - 'E'



SECTION 8-8



VIEW 6-6

BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED(✓) IS RELEASED FOR	
☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
STAMP ALL PREVIOUS REVISION AS SUPERSEDED	
ISSUED BY	
NAME	ABHAY KUMAR
SIGNATURE	-Sd-
DATE	20/11/2018

ANNEXURE-III-GENERAL ARRANGMENT CHIMNEY & LINER

DATE	ALTD	CHD	APPD

JOB NO.	434
STATUS	
DISTRIBUTION	

NTPC. DRAWING NO. - 9585-001-317-PVC-C-0562

CUSTOMER: एन टी पी सी NTPC — NTPC LIMITED

3x800MW PATRATU SUPER THERMAL POWER PROJECT

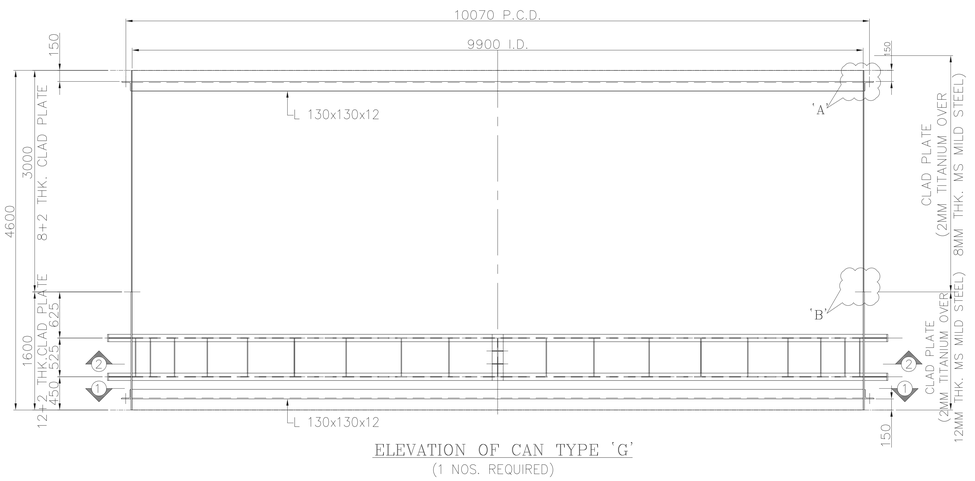
BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

CODE	DEPT	NAME	SIGN	DATE
C	DRN	DEEPAK	-Sd-	20.11.2018
	DESN	P. CHATERJEE	-Sd-	20.11.2018
	CHD	ABHAY	-Sd-	20.11.2018
	APPD	AKS	-Sd-	20.11.2018

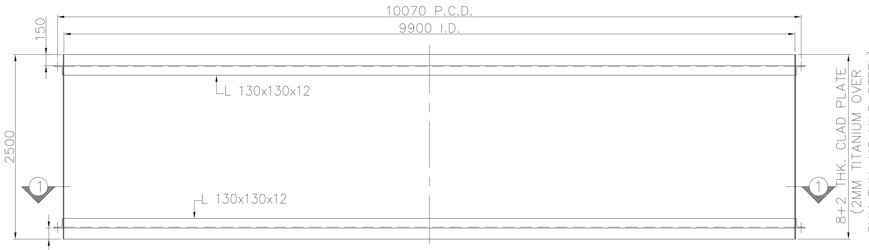
TITLE: CHIMNEY
LINER DETAILS- CAN TYPE F & B

DEPT. | SCALE 1:100 | SIGN | DRAWING NO. PE-DG-434-620-C025 | SHEET 1 OF 1 | REV. 0 | SIZE-A1

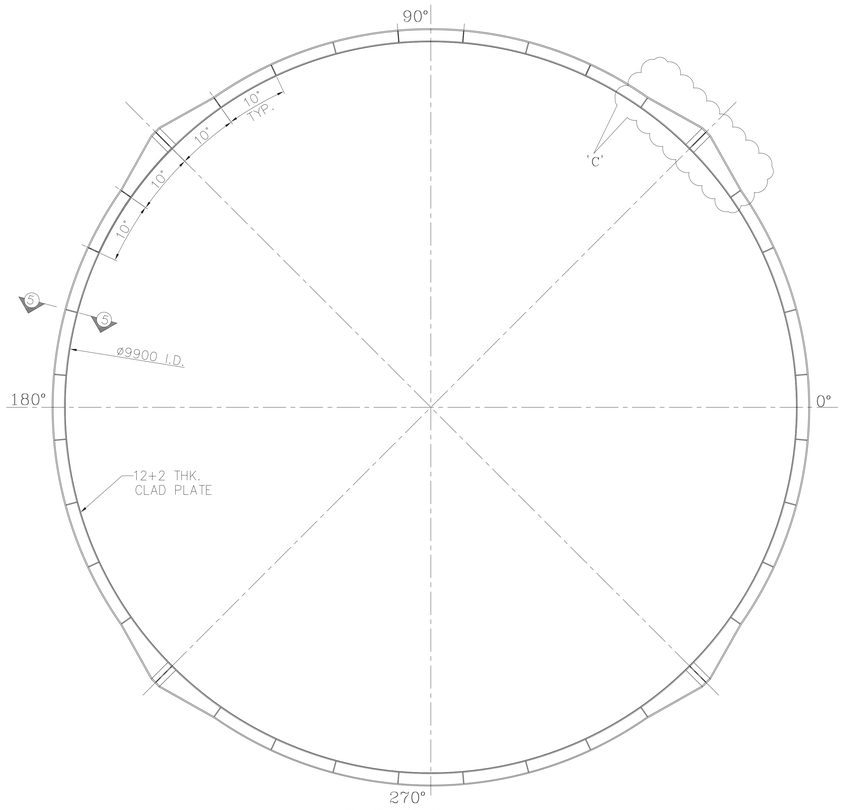
COMPUTER FILE NAME:



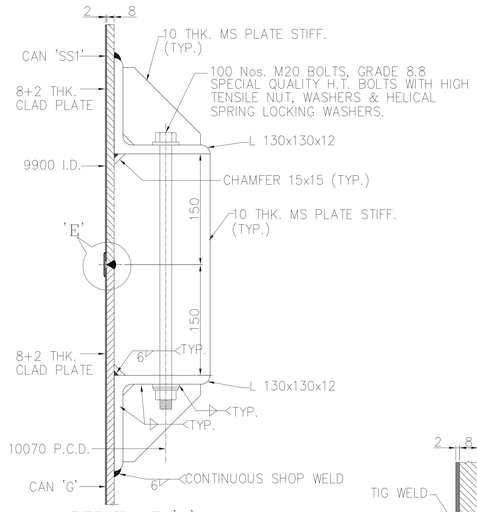
ELEVATION OF CAN TYPE 'G'
(1 NOS. REQUIRED)



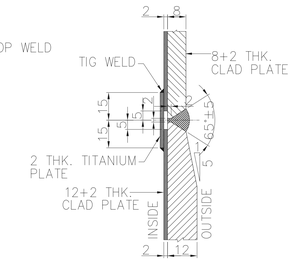
ELEVATION OF CAN TYPE 'C'



SECTION 2-2



DETAIL AT 'A'



DETAIL AT 'B'

NOTES:-

1. ALL DIMENSIONS ARE IN MILLIMETERS. FIGURED DIMENSIONS SHALL BE FOLLOWED.
2. MILD STEEL PLATES AND ROLLED SECTIONS SHALL CONFIRM TO GRADE A OF IS:2062 FOR MATERIALS UPTO 20MM IN THICKNESS.
3. HOT ROLLED SECTIONS SHALL CONFIRM TO IS:808 PART I TO IV.
4. TITANIUM CLAD PLATES SHALL BE OF GRADE 2 AS PER ASME SB265 AND SHALL CONFORM TO ASTM B898-11. FABRICATION OF TITANIUM CLAD PLATES SHALL BE DONE IN ACCORDANCE WITH SPECIFICATION NO. 9591-001-317-PVC-U-400
5. SPECIAL QUALITY BOLTS SHALL BE BLACK GRADE OF PROPERTY CLASS 8.8 CONFIRMING IS:1367.
6. WASHERS, NUTS AND HELICAL SPRING LOCKING WASHERS SHALL BE OF QUALITY CLASS NOT LESS THAN THAT OF THE BOLTS.
7. WELDING FOR ALL MS. PLATE/MEMBERS SHALL BE DONE WITH LOW HYDROGEN TYPE WELDING CONFORM TO IS:816 NAD IS:9595 AND TO THE REQUIREMENT OF THE SPECIFICATION.
8. ALL FILLET AND BUTT WELDS ARE TO BE CONTINUOUS.
9. ALL SHOP WELDS USED TO CONNECT CURVED PLATES FORMING FLUE CANS AND OTHER BUTT WELDS, WHERE REQUIRED, SHALL BE FULL PENETRATION BUTT WELD.
10. ANY TEMPORARY STIFFENING STEEL WORK REQUIRED DURING FABRICATION, TRANSPORTATION OR ERECTION PURPOSES SHALL BE DESIGNED AND SUPPLIED BY THE CONTRACTOR, SUCH STEEL WORK SHALL BE REMOVED AND FLUE SURFACES MADE GOOD AFTER ERECTION.
11. TESTING OF WELDS UNLESS NOTED OTHERWISE ON THE DRAWINGS, SHALL BE AS FOLLOWS:

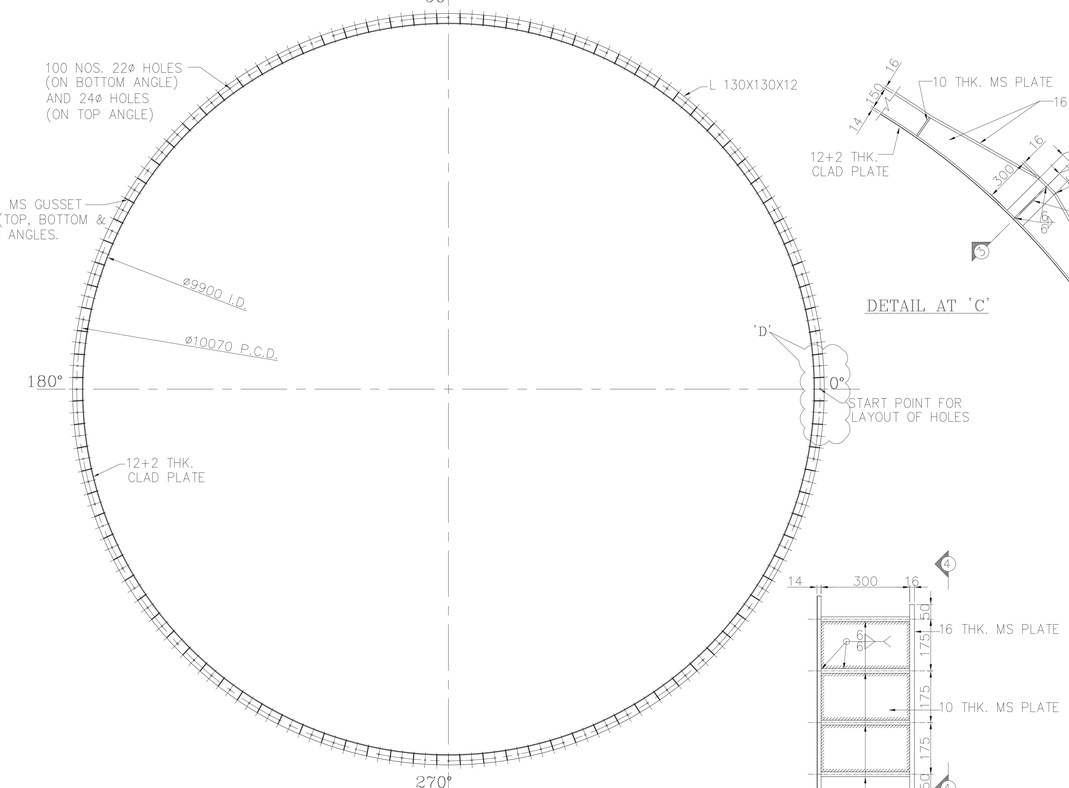
a) FILLET WELDS:
   i) MACROETCH EXAMINATION ON PRODUCTION COUPONS.
   ii) 100% DYE PENETRATION TEST/MAGNETIC PARTICLE TEST.

b) BUT WELDS:
   i) 100% DYE PENETRATION TEST AFTER BLACK GOUGING.
   ii) 10% (FOR SHOP WELDS) AND 15% (FOR SITE WELDS) RADIOGRAPHY TEST. WHERE RADIOGRAPHY IS NOT POSSIBLE, ULTRASONIC TESTING WILL BE CARRIED OUT.

c) THE WELD RUN TO BE TESTED. SHALL BE EVENLY DISTRIBUTED OVER THE TOTAL LENGTH OF APPLICABLE WELDS ON EACH CAN.

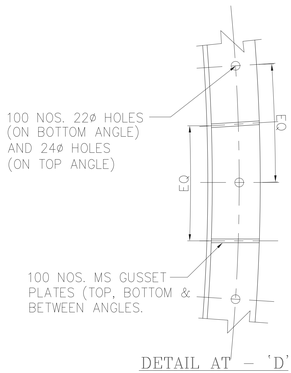
d) THE PERCENTAGE OF WELDS TESTED, SHALL BE INCREASED AS JUDGED NECESSARY BY THE ENGINEER-IN-CHARGE, BUT TO NOT LESS THAN 20% FOLLOWING IDENTIFICATION OF SIGNIFICANT DEFECTIVE WELDS AND ONLY REDUCED TO THE 10%/15% NORM AFTER CONSISTENT QUALITY/ INTEGRITY IS RE-ESTABLISHED..

12. WELDING OF TITANIUM PLATE SHALL BE DONE IN ACCORDANCE WITH TECHNICAL SPECIFICATION.
13. THE TERM 'SHOP' WELD REFERS TO ALL WELDS MADE DURING FABRICATION, OF INDIVIDUAL FLUE CANS AT FABRICATION YARD. 'SITE' WELD REFERS TO WELDS MADE DURING FLUE ERECTION FOR JOINING TOGETHER OF CANS WITHIN WIND SHIELD.
14. FOR GENERAL NOTES AND DETAILING OF STEEL STRUCTURAL WORKS REFER DRG. NO. PE-DG-434-600-C002.
15. CONDENSATE COLLECTION CHANNEL SHALL BE WELDED WITH FLUE CAN AS APPLICABLE AS PER CONDENSATE FLOW STUDY. FOR DETAIL AND LOCATION OF CONDENSATE COLLECTION CHANNEL REFER SEPARATE DRG.
16. GAS SAMPLING PORT SHALL BE PROVIDED AS PER IN FLUE CAN DRG NO.#620-C014

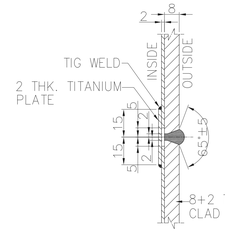


SECTION 1-1

DETAIL AT 'C'

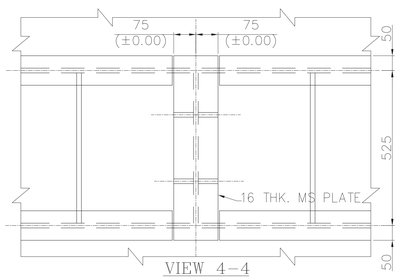


DETAIL AT - 'D'

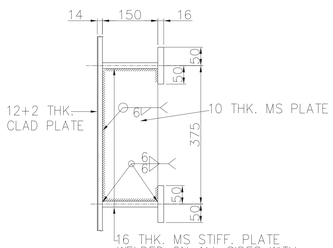


DETAIL AT - 'E'

SECTION 3-3



VIEW 4-4



SECTION 5-5

BHEL-PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED(✓) IS RELEASED FOR	
☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
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ISSUED BY	
NAME	ABHAY KUMAR
SIGNATURE	-Sd-
DATE	15/12/2018

ANNEXURE-III-GENERAL ARRANGMENT CHIMNEY & LINER

	DATE	ALTD	CHD	APPD

NTPC. DRAWING NO. - 9585-001-317-PVC-C-0563

CUSTOMER: NTPC LIMITED

3x800MW PATRATU SUPER THERMAL POWER PROJECT

JOB NO. 434
STATUS
DISTRIBUTION

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT		NAME	SIGN	DATE
CODE	DRN	DDTAK		15.12.2018
C	DESN	P. CHATERJEE		15.12.2018
	CHD	ABHAY		15.12.2018
	APPD	AKS		15.12.2018

TITLE: CHIMNEY
LINER DETAILS- CAN TYPE C & G

DEPT. | SCALE 1:100 | SIGN | DRAWING NO. PE-DG-434-620-C026 | SHEET 1 OF 1 | REV. 0

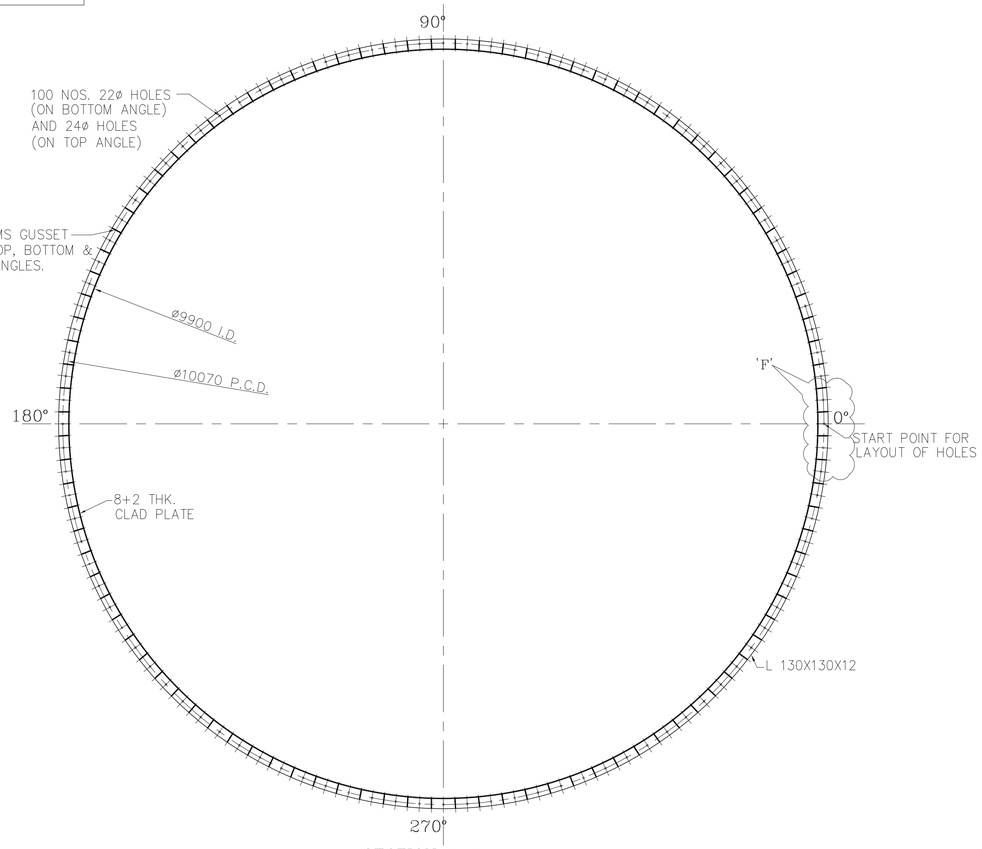
SIZE-A1

COMPUTER FILE NAME:

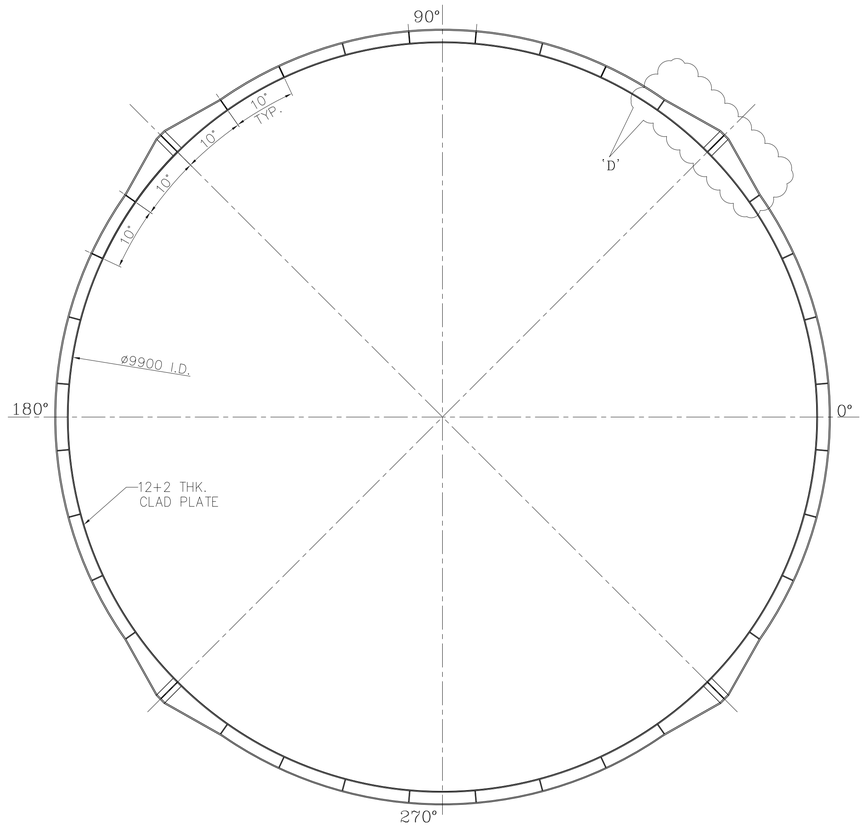
DRAWING No. PE-DG-434-620-C027

FIRST ANGLE PROJECTION

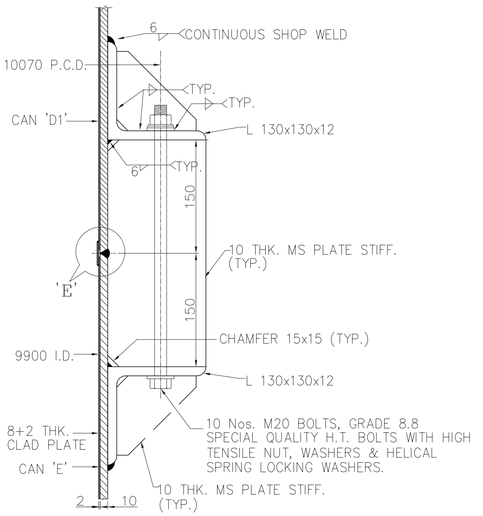
ALL DIMENSIONS ARE IN MM



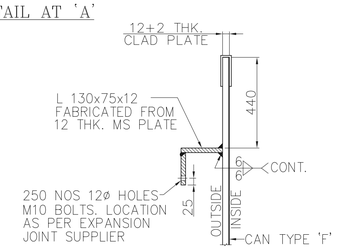
SECTION 1–1



SECTION 2–2

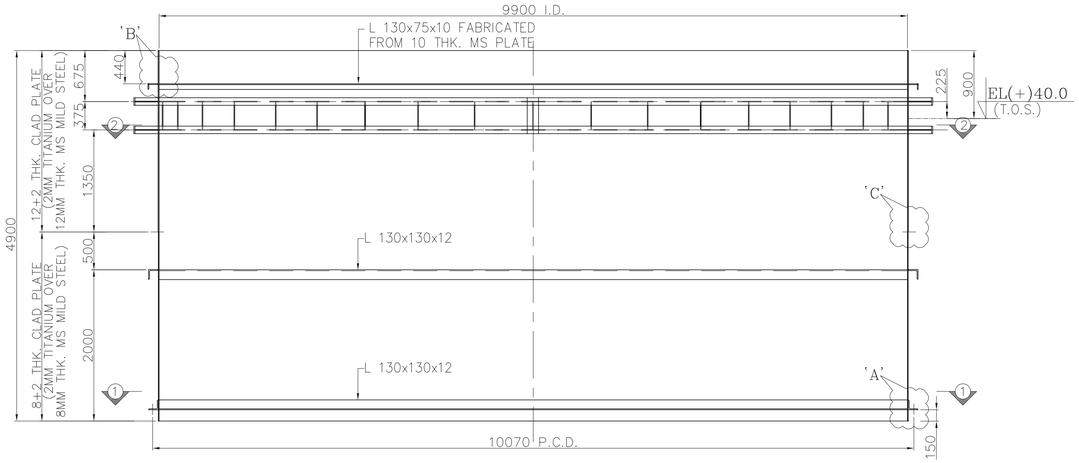


DETAIL AT 'A'

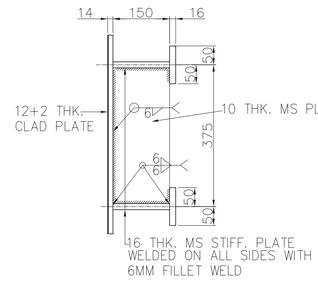


DETAIL AT 'B'

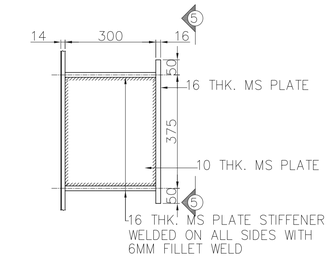
PART OF EXPANSION JOINT FOR DETAIL
REFER DRG. NO. PE-DG-434-620-C028
(NTPC DRG. NO. 9585-001-317-PVC-C-5081)



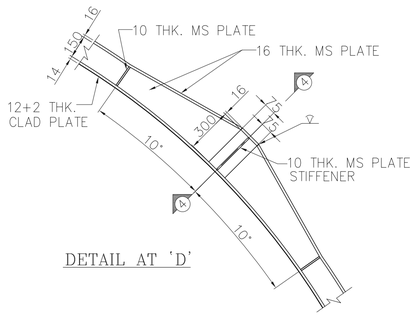
ELEVATION OF CAN TYPE 'E'



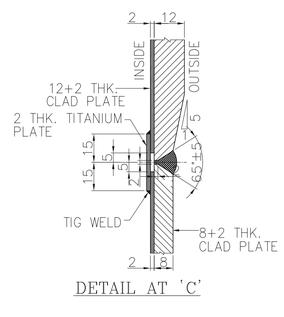
SECTION 3–3



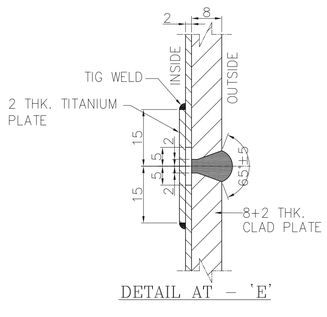
SECTION 4–4



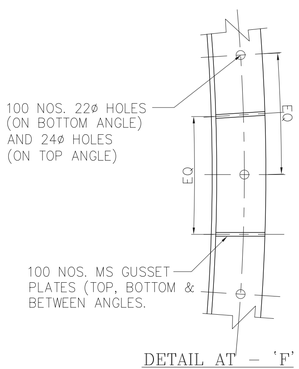
DETAIL AT 'D'



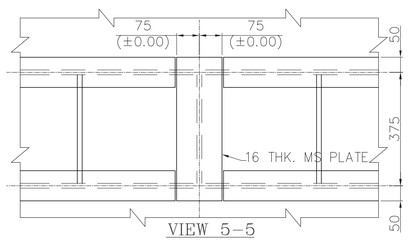
DETAIL AT 'C'



DETAIL AT – 'E'



DETAIL AT – 'F'



VIEW 5–5

NOTES:–

1. ALL DIMENSIONS ARE IN MILLIMETERS. FIGURED DIMENSIONS SHALL BE FOLLOWED.
2. MILD STEEL PLATES AND ROLLED SECTIONS SHALL CONFIRM TO GRADE A OF IS:2062 FOR MATERIALS UPTO 20MM IN THICKNESS.
3. HOT ROLLED SECTIONS SHALL CONFIRM TO IS:808 PART I TO IV.
4. TITANIUM CLAD PLATES SHALL BE OF GRADE 2 AS PER ASME SB265 AND SHALL CONFORM TO ASTM B898–11. FABRICATION OF TITANIUM CLAD PLATES SHALL BE DONE IN ACCORDANCE WITH SPECIFICATION NO. 9585–001–317–PVC–U–400.
5. SPECIAL QUALITY BOLTS SHALL BE BLACK GRADE OF PROPERTY CLASS 8.8 CONFIRMING IS:1367.
6. WASHERS, NUTS AND HELICAL SPRING LOCKING WASHERS SHALL BE OF QUALITY CLASS NOT LESS THAN THAT OF THE BOLTS.
7. WELDING FOR ALL MS. PLATE/MEMBERS SHALL BE DONE WITH LOW HYDROGEN TYPE WELDING CONFORM TO IS:816 NAD IS:9595 AND TO THE REQUIREMENT OF THE SPECIFICATION.
8. ALL FILLET AND BUTT WELDS ARE TO BE CONTINUOUS.
9. ALL SHOP WELDS USED TO CONNECT CURVED PLATES FORMING FLUE CANS AND OTHER BUTT WELDS, WHERE REQUIRED, SHALL BE FULL PENETRATION BUTT WELD.
10. ANY TEMPORARY STIFFENING STEEL WORK REQUIRED DURING FABRICATION, TRANSPORTATION OR ERECTION PURPOSES SHALL BE DESIGNED AND SUPPLIED BY THE CONTRACTOR, SUCH STEEL WORK SHALL BE REMOVED AND FLUE SURFACES MADE GOOD AFTER ERECTION.
11. TESTING OF WELDS UNLESS NOTED OTHERWISE ON THE DRAWINGS, SHALL BE AS FOLLOWS:
    a) FILLET WELDS:
       i) MACROETCH EXAMINATION ON PRODUCTION COUPONS.
       ii) 100% DYE PENETRATION TEST/MAGNETIC PARTICLE TEST.
    b) BUT WELDS:
       i) 100% DYE PENETRATION TEST AFTER BLACK GOUGING.
       ii) 10% (FOR SHOP WELDS) AND 15% (FOR SITE WELDS) RADIOGRAPHY TEST. WHERE RADIOGRAPHY IS NOT POSSIBLE, ULTRASONIC TESTING WILL BE CARRIED OUT.
    c) THE WELD RUN TO BE TESTED. SHALL BE EVENLY DISTRIBUTED OVER THE TOTAL LENGTH OF APPLICABLE WELDS ON EACH CAN.
    d) THE PERCENTAGE OF WELDS TESTED SHALL BE INCREASED AS JUDGED NECESSARY BY THE ENGINEER–IN–CHARGE, BUT TO NOT LESS THAN 20% FOLLOWING IDENTIFICATION OF SIGNIFICANT OF DEFECTIVE WELDS AND ONLY REDUCED TO THE 10/15% NORM AFTER CONSISTENT QUALITY/ INTEGRITY IS RE–ESTABLISHED.
12. WELDING OF TITANIUM PLATE SHALL BE DONE IN ACCORDANCE WITH TECHNICAL SPECIFICATION.
13. THE TERM 'SHOP' WELD REFERS TO ALL WELDS MADE DURING FABRICATION, OF INDIVIDUAL FLUE CANS AT FABRICATION YARD. 'SITE' WELD REFERS TO WELDS MADE DURING FLUE ERECTION FOR JOINING TOGETHER OF CANS WITHIN WIND SHIELD.
14. FOR GENERAL NOTES AND DETAILING OF STEEL STRUCTURAL WORKS REFER DRG. NO. PE–DG–434–600–C002.
15. CONDENSATE COLLECTION CHANNEL SHALL BE WELDED WITH FLUE CAN AS APPLICABLE AS PER CONDENSATE FLUE STUDY. FOR DETAIL AND LOCATION OF CONDENSATE COLLECTION CHANNEL REFER SEPARATE DRG.

ANNEXURE-III-GENERAL ARRANGMENT CHIMNEY & LINER

BHEL–PROJECT ENGINEERING MANAGEMENT(CIVIL)	
THIS DRAWING MARKED(✓) IS RELEASED FOR	
☑ COMMENTS/APPROVAL	
☐ PLANNING/INFORMATION	
☐ CONSTRUCTION	
STAMP ALL PREVIOUS REVISION AS SUPERSEDED	
ISSUED BY	
NAME	ABHAY KUMAR
SIGNATURE	–Sd–
DATE	31/10/2018

	DATE	ALTD	CHD	APPD

NTPC. DRAWING NO. – 9585–001–317–PVC–C–0564

CUSTOMER: NTPC LIMITED

3x800MW PATRATU SUPER THERMAL POWER PROJECT

JOB NO.	434
STATUS	
DISTRIBUTION	

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

DEPT CODE		NAME	SIGN	DATE
C	DRN	DEEPAK	–Sd–	31.10.2018
	DESN	P. CHATERJEE	–Sd–	31.10.2018
	CHD	ABHAY	–Sd–	31.10.2018
	APPD	AKS	–Sd–	31.10.2018

TITLE: CHIMNEY
LINER DETAILS– CAN TYPE E

DEPT. | SCALE 1:100 | SIGN | DRAWING NO. PE–DG–434–620–C027

SHEET 1 OF 1 | REV. 0

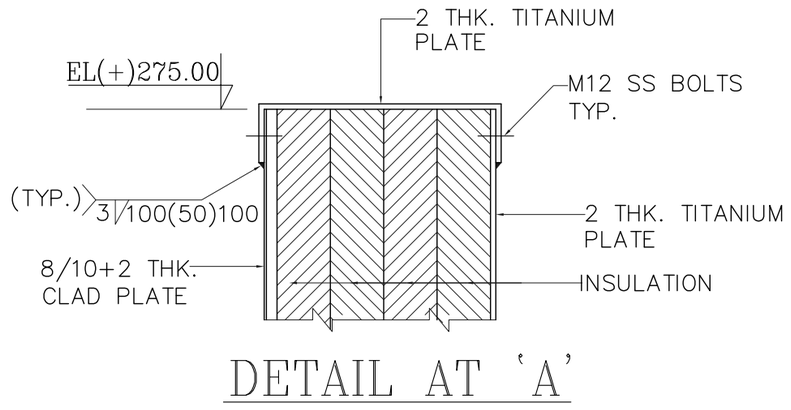
SIZE–A1

COMPUTER FILE NAME:

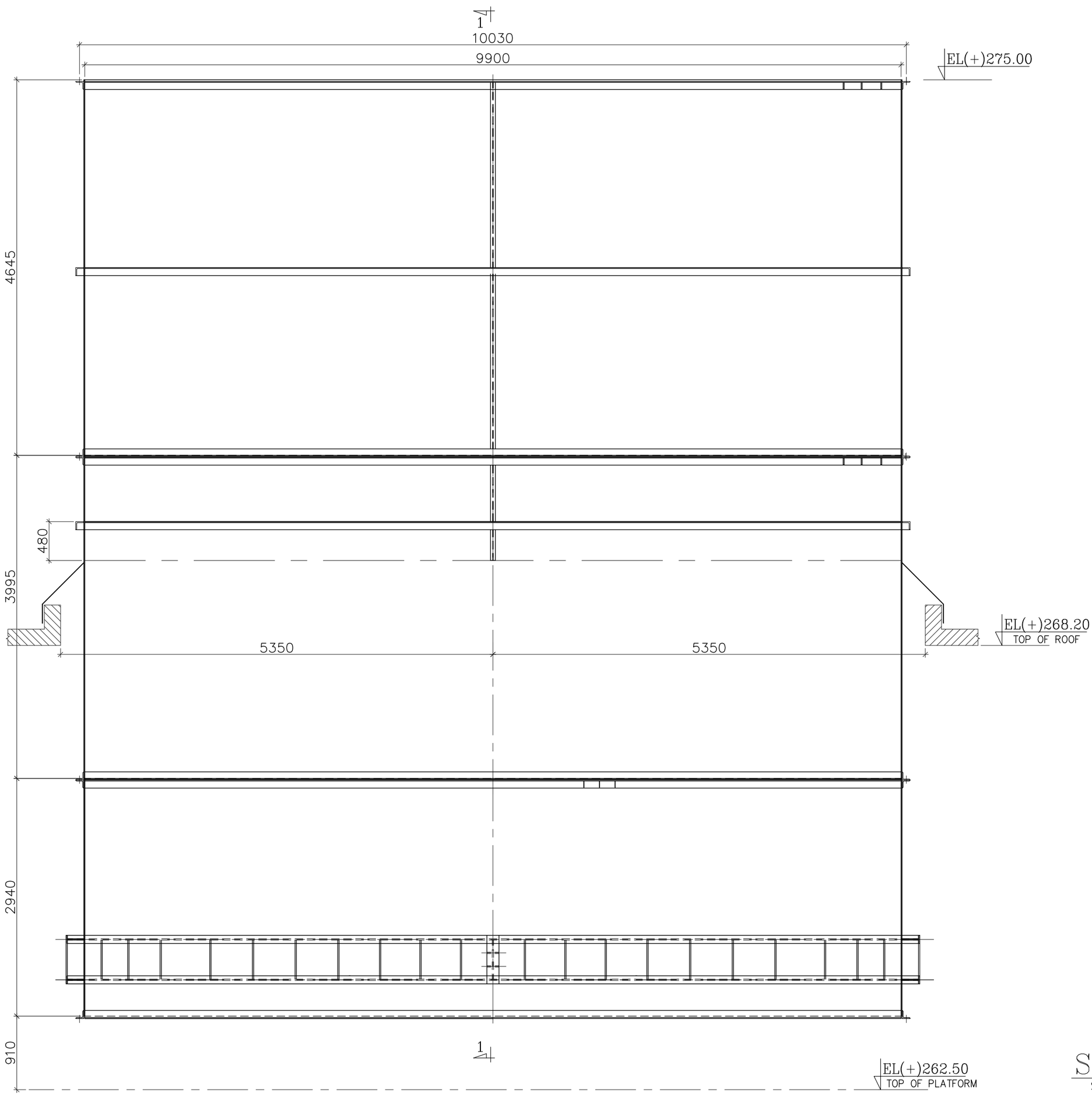
ANNEXURE-IV

PVUNL-2X800MW PATRATU STPP

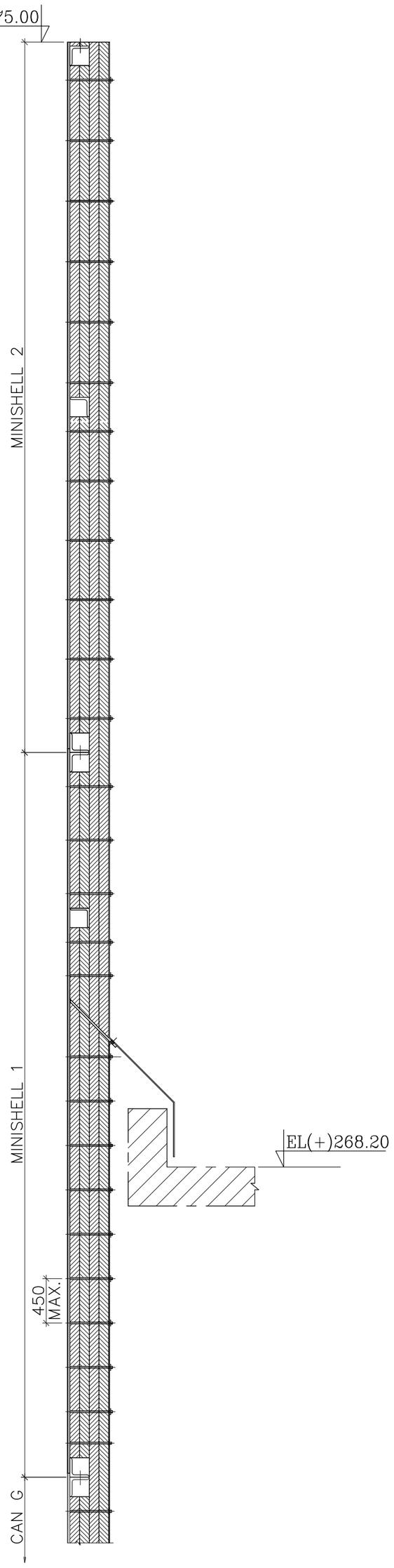
MINISHELL DETAILS



DETAIL AT 'A'



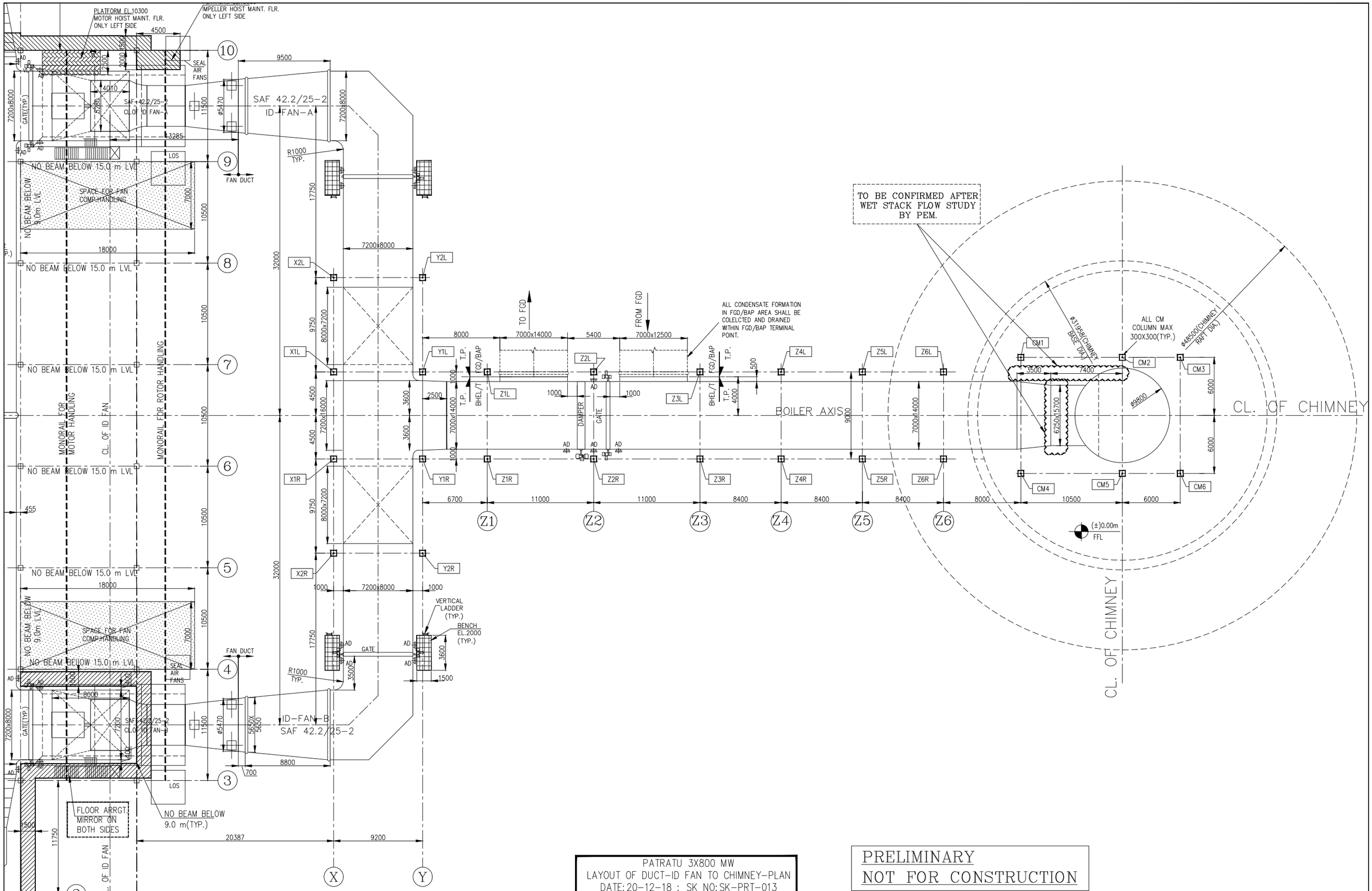
SECTION OF MINISHELL



SECTION 1–1

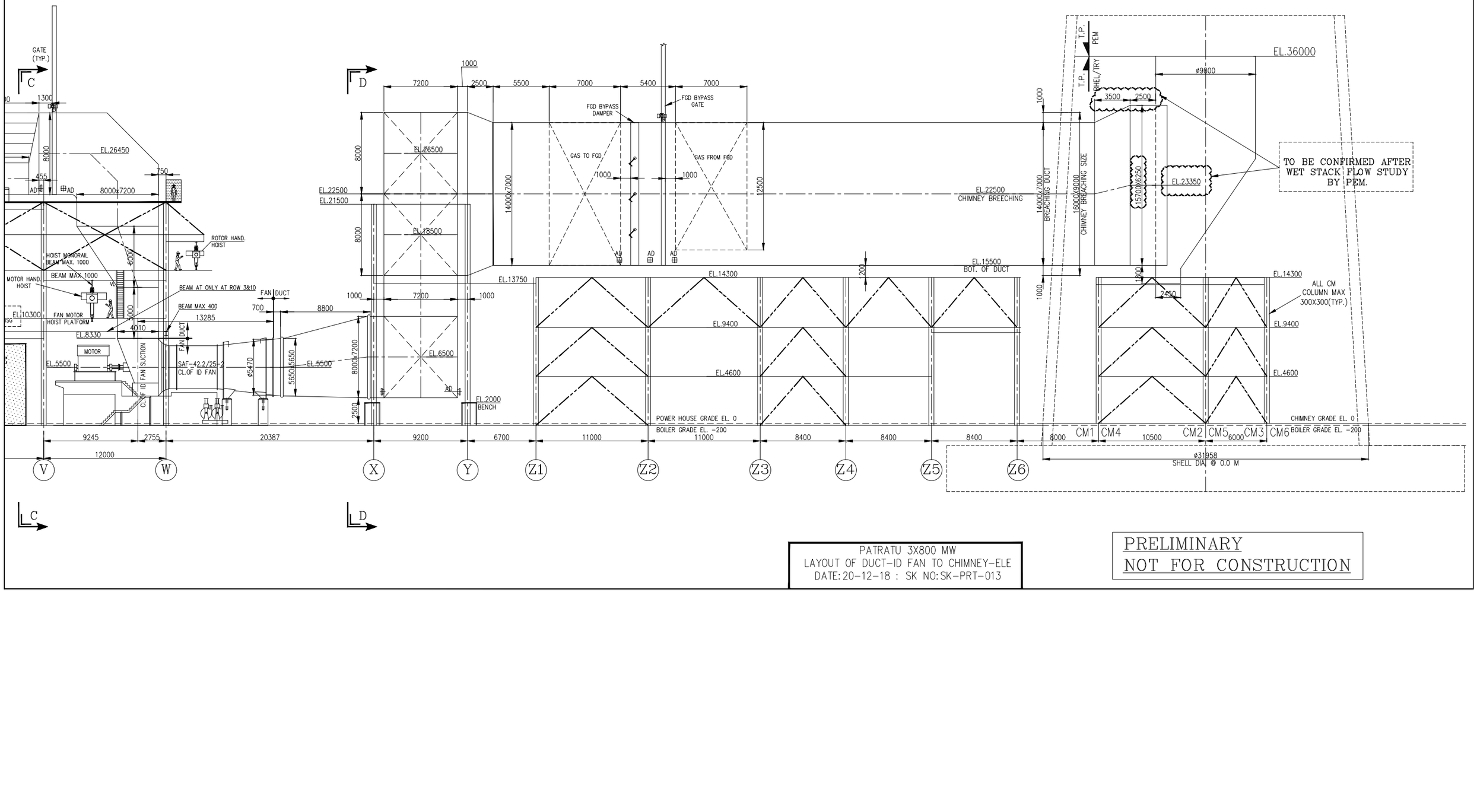
SHOWING INSULATION FIXING

ANNEXURE-V-FGD LAYOUT



PATRATU 3X800 MW
LAYOUT OF DUCT-ID FAN TO CHIMNEY-PLAN
DATE: 20-12-18 : SK NO: SK-PRT-013

PRELIMINARY
NOT FOR CONSTRUCTION



PATRATU 3X800 MW
LAYOUT OF DUCT-ID FAN TO CHIMNEY-ELE
DATE: 20-12-18 : SK NO: SK-PRT-013

PRELIMINARY
NOT FOR CONSTRUCTION

FGD OUTLET TO MAIN DUCT DETAILS

59

1091.0 E
1527.0 N

S.PIT

E.PI

PASS - F

PASS - E

PASS - D

PASS - C

PASS - B

PASS - A

D-FAN-B

FAN HANDLING SPACE

FAN HANDLING SPACE

1177.50E

LM8

1098.0E
1484.0N

12

1058.0E
1471.0N

57

13790.3
13290.3
14741.0
7000.0
16290.3
16290.3

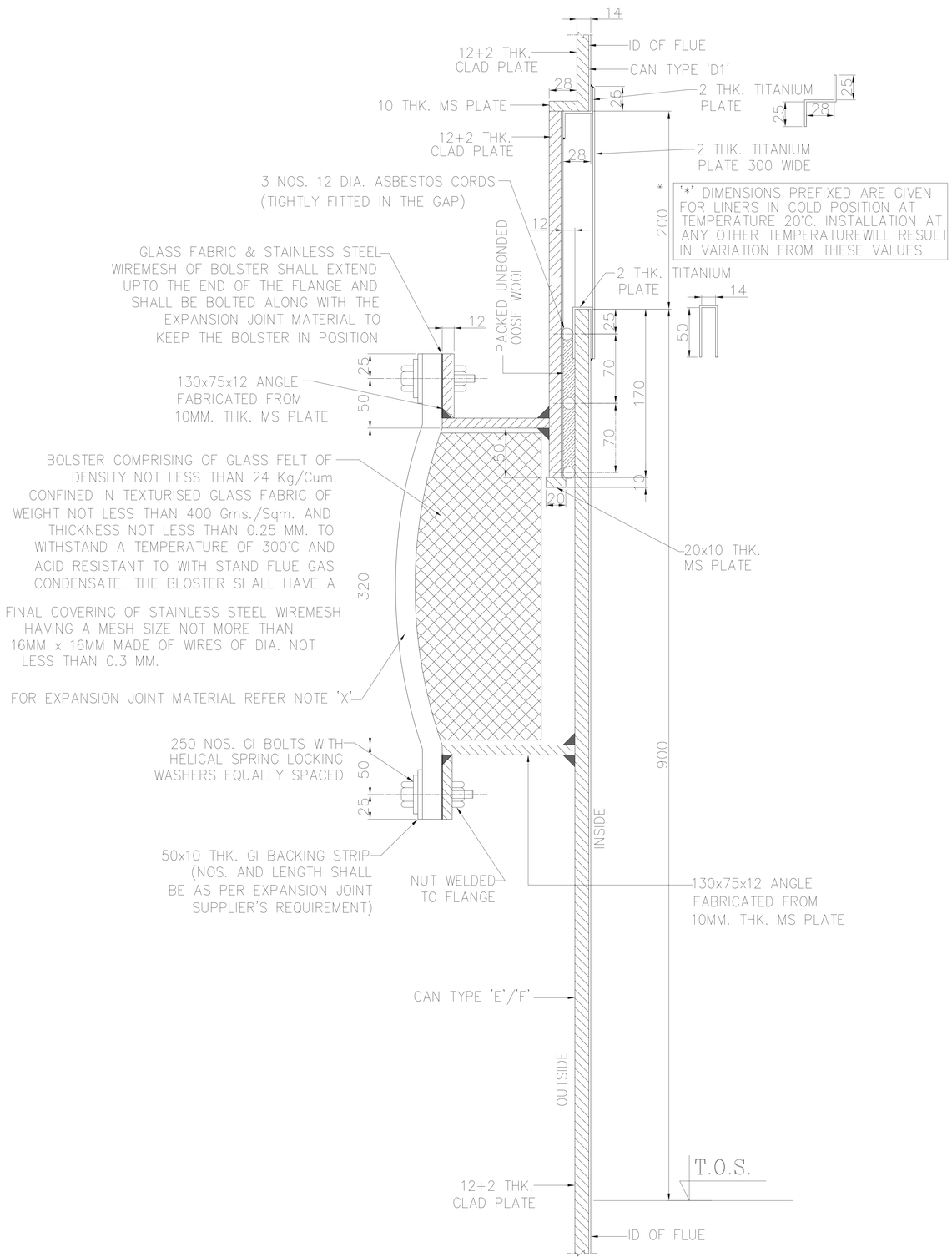
BLOCK

998.11E
1382.5N

CL OF 6.00 M WIDE ACCESS ROAD

1074.0 E

ANNEXURE-VI: EXPANSION JOINT



NOTES 'X'

1. THE EXPANSION JOINT SUPPLIER SHALL FULLY SATISFY HIMSELF ABOUT THE SATISFACTORY PERFORMANCE OF THE JOINT MATERIAL AS PER ACTUAL SITE CONDITION AND FLUE GAS PARAMETERS. THE SUPPLIER SHALL GET APPROVAL FOR SAME BEFORE INSTALLATION.
2. THE SUPPLIER SHALL GET APPROVAL FOR EXPANSION JOINT MATERIAL BEFORE INSTALLATION.
3. THE SUPPLIER SHALL ALSO PROVIDE AN INSTALLATION DISMANTLING AND MAINTENANCE USER HANDBOOK FOR THE EXPANSION COMPENSATOR
4. THE EXPANSION JOINT IN FLUE LINER SHALL COMPRISE OF NON METALLIC FLUOROELASTOMER MATERIAL SUITABLE TO WITHSTAND A TEMPERATURE OF 300° C AND SHALL BE ACID RESISTANT TO WITHSTAND FLUE GAS CONDENSATE ARISING OUT OF FLUE GAS.

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES & ELEVATIONS ARE IN METRES.
2. FASTENERS SHALL CONFIRM TO IS:1363.
3. FOR LAYOUT OF LINER CANS REFER DRG. NO. PE-DG-434-620-C022
4. THE VARIOUS LAYERS OF THE EXPANSION COMPENSATOR SHALL BE MANUFACTURED TO THE SPECIFIED THICKNESS AND UNIT WEIGHTS WITHIN A MANUFACTURING TOLERANCE OF 5% OF THE ABSOLUTE SPECIFIED VALUES.
5. THE MATERIAL SHALL BE TRANSPORTED, HANDLED, STORED, ETC. STRICTLY IN ACCORDANCE WITH THE SUPPLIER'S RECOMMENDATIONS.

EXPANSION JOINT DETAILS

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ISSUED BY	
NAME	ABHAY KUMAR
SIGNATURE	-Sd-
DATE	20.11.2018

NTPC. DRAWING NO. – 9585-001-317-PVC-C-0581

CUSTOMER: NTPC LIMITED

3x800MW PATRATU SUPER THERMAL POWER PROJECT

JOB NO.	434
STATUS	
DISTRIBUTION	

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA

	DATE	ALTD	CHD	APPD

DEPT CODE		NAME	SIGN	DATE
C	DRN	DEEPAK	-Sd-	20.11.2018
	DESN	P. CHATTERJEE	-Sd-	20.11.2018
	CHD	ABHAY	-Sd-	20.11.2018
	APPD	A/C	-Sd-	20.11.2018

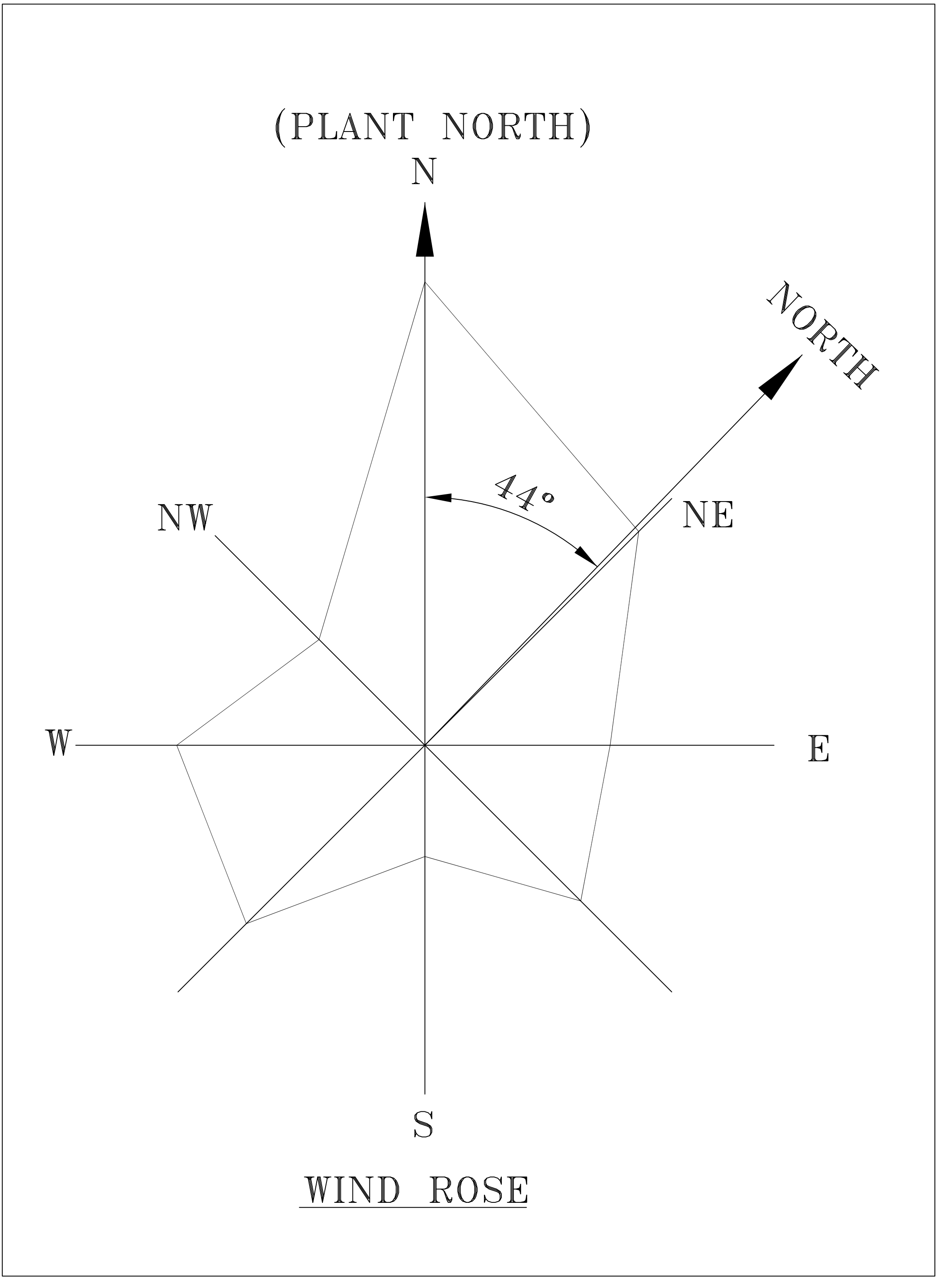
TITLE: CHIMNEY
DETAIL OF LINER EXPANSION JOINTS

DEPT. | SCALE 1:100 | DRAWING NO. PE-DG-434-620-C028
SIGN | SHEET 1 OF 1 | REV. 0

SIZE-A1

COMPUTER FILE NAME:

ANNEXURE-VII: WIND ROSE DIAGRAM
PVUNL-2X800MW PATRATU STPP



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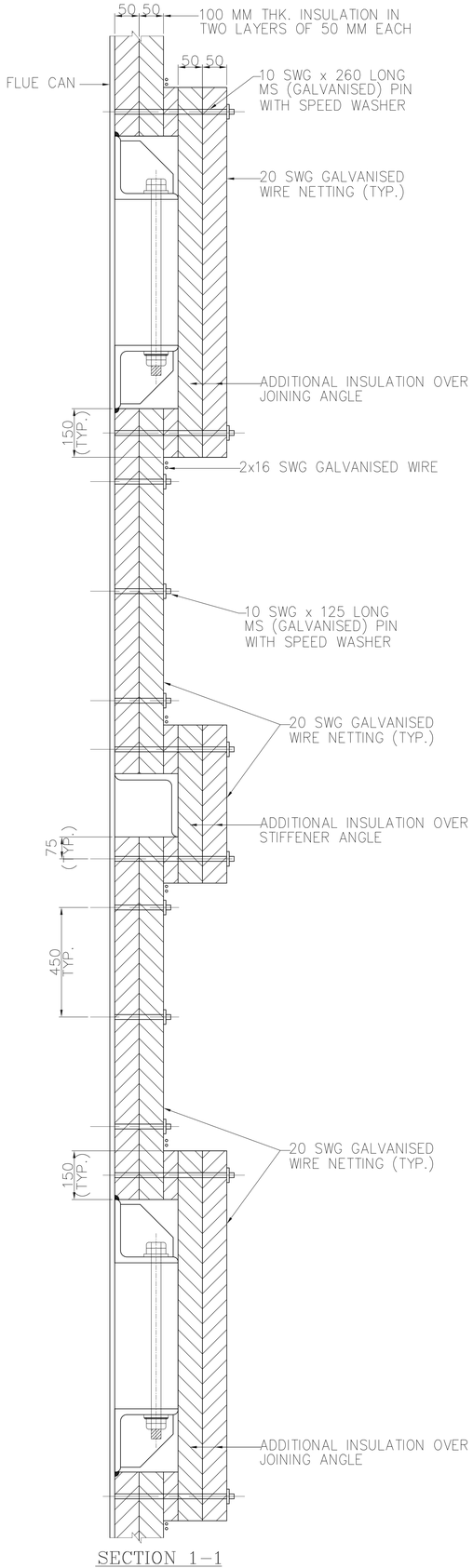
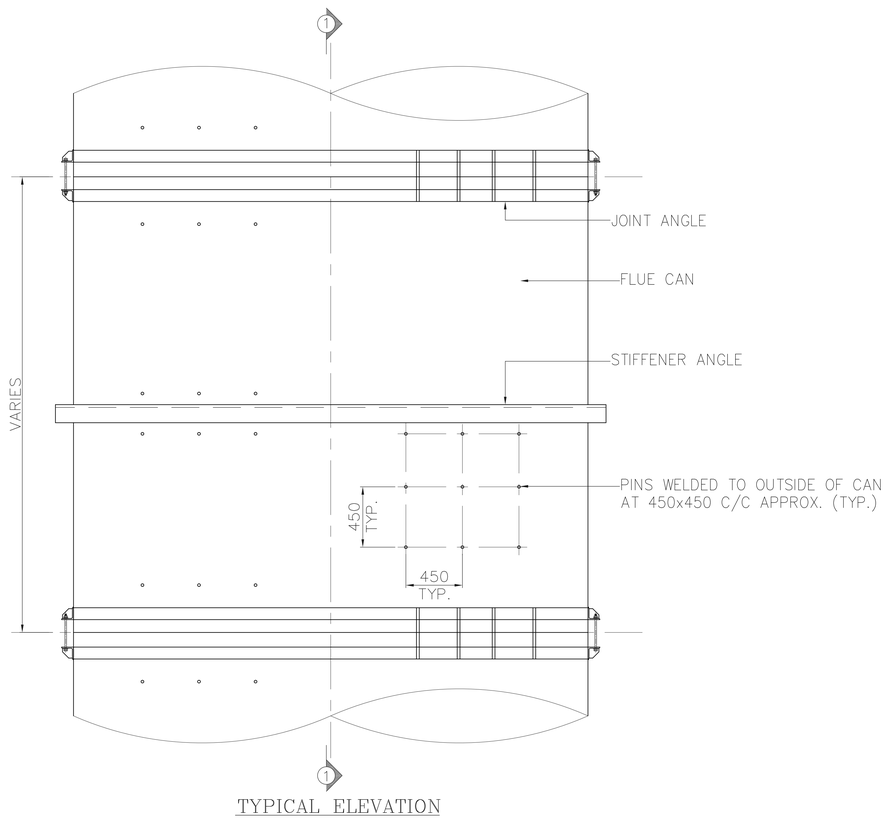


SECTION 1-1

ANNEXURE-VII: FIXING DETAIL OF LINER INSULATION



TYPICAL ELEVATION

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES AND LEVELS ARE IN METRES.
2. FLUE INSULATION SHALL BE OF RESIN BONDED ROCK WOOL SLABS OF DENSITY 100 Kg/Cum MAXIMUM THERMAL CONDUCTIVITY SHALL BE 0.52 mW/cm °c CONFORMING TO IS:819 AND IS:8183.
3. FIXING OF ALL INSULATION TO ALL THE CANS SHALL AS DEFINED IN SPECIFICATION AND AS SHOWN IN RELEVANT DRAWINGS.
4. INSULATION SHALL BE KEPT DRY ON SITE AND IN PARTICULAR SHALL REMAIN DRY AT ALL TIMES IN PLACE ON FLUE CANS.

SPECIAL NOTE

DRAWINGS / DOCUMENTS ARE BEING SUBMITTED FOR INFORMATION.
BHEL HEREBY CONFIRMS FULL COMPLIANCE TO ALL THE SPECIFIED REQUIREMENTS OF THE CONTRACT SPECIFICATION, WITHOUT ANY DEVIATION, WHATSOEVER. IN CASE DURING THE TENURE OF THE CONTRACT, IT IS OBSERVED/FOUND THAT THE DATA/ INFORMATION IN THE RELEASED DRAWING/DOCUMENT IS NOT MEETING THE CONTRACT SPECIFICATION, BHEL/ITS VENDOR(S) WILL MODIFY/ RECTIFY/REPLACE THE SAME TO MEET THE SPECIFICATION WITHOUT ANY COMMERCIAL IMPLICATION OR ANY TIME EXTENSION TO PVUNL/NTPC IN THIS REGARD.

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3x800MW PATRATU SUPER THERMAL POWER PROJECT

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	DESN	P. CHATERJEE	-Sd-	31.01.2019
	CHD	ABHAY	-Sd-	31.01.2019
	APPD	AKS	-Sd-	31.01.2019

TITLE: CHIMNEY
FIXING DETAIL OF LINER INSULATION

DEPT. | SCALE: 1:100 | SIGN | DRAWING NO. PE-DG-434-620-C029 | SHEET 1 OF 1 | REV. 0

SIZE-A1