

Ref No. : PE/PG/YE1/E-5240/2016/CORRIGENDA/02

Date: 28.06.2016

CORRIGENDA / ADDENDUM-02

SUBJECT: 1 X 370 MW KPCL YELAHANKA CCPP
TENDER ENQUIRY FOR VENTILATION SYSTEM
OUR REF: TENDER ENQUIRY NO: PE/PG/YE1/E-5240/2016, DATED: 27.05.2016


DUE DATE
08.07.2016
BY 10.00AM

1. The last date of submission of offer against tender for Ventilation System invited vide Enquiry No PE/PG/YE1/E-5240/2016, Dtd-27.05.2016 is extended up to 08.07.2016, 10.00AM.
2. Please find Amendment I to Technical Specification.
3. Please find Revised Price Format enclosed.

All bidders are requested to visit the website www.bhel.com (Tender Notifications Section) OR www.bhelpem.com.
All future corrigenda/ amendment and due date extension, if any, for this tender shall be hosted only on above websites.

Thanking You,

With Regards,
For & on behalf of BHEL


SUMEET SAHAY
SR ENGINEER/PG-I-2

सुमीत सहारा / SUMEET SAHAY
वरिष्ठ अभियंता (पी.जी.-1-2) / Sr. Engineer (PG-I-2)
भारत भारी इलेक्ट्रिकल्स लिमिटेड / Bharat Heavy Electricals Ltd.
पावर सेक्टर-प्रोजेक्ट इंजीनियरिंग प्रबंधन
Power Sector-Project Engineering Management
प्लॉट नं.-25, सेक्टर-16ए, नोएडा-201 301
Plot No. 25, Sector-16A, Noida-201 301

Please reply to:

Sh Sumeet Sahay, Sr. Engineer
PG-I-2

Power Project Engineering Institute Building
HRD & ESI Complex Plot No. 25, Sector -16 A,
BHEL-PEM,Noida-201301 (U.P.)
Tel No.0120-4213532, 09999498202



ANNEXURE - I TO NIT REF NO-PE/PG/VE1/E-5240/2016, DTD-27.05.2016

1 X 370 MW YELAHANKA CCPP

PRICE SCHEDULE FOR VENTILATION SYSTEM - SUPPLY, E&C AND MANDATORY SPARES

INDIAN BIDDER

SUPPLY

ERECTION AND COMMISSIONING

GRAND TOTAL

REV 01

SL NO	DESCRIPTION OF EQUIPMENT/ ITEM	QTY	UOM	UNIT EX-WORKS PRICE (DULY PACKED) (INR)	TOTAL EX-WORKS PRICE (DULY PACKED) (INR)	ED (INCLUDING CESS) @...% (INR)	CST/VAT @...% AGAINST FORM 'C' (INR)	FREIGHT CHARGES (INCLUDING SERVICE TAX) @...% OF TOTAL EX WORKS (INR)	TOTAL F.O.R SITE PRICE (INR)	E&C (INR)	SERVICE TAX @...% (INR)	E&C INCLUDING SERVICE TAX (INR)	TOTAL LUMP SUM PRICE FOR SUPPLY AND E&C WITH SERVICE TAX. (INR)
				1	2	3	4	5	6 = 2+3+4+5	7	8	9 = 7+8	10 = 6+9
1.0	Total Lumpsum firm prices for equipment & Services as specified, Comprising Engineering, design, manufacture, inspection & Testing at manufacturer's/subvender's works, Painting at manufacturer's works, duly packed for transportation, delivery to site, unloading, storage & handling at site, fabrication, erection and commissioning, minor civil work, performance and guarantee testing, submission of as built drawing, O&M Manual, carrying out acceptance tests at site, and final painting of complete Ventilation system on turnkey basis as per specification PE-TS-409-554-A001 including mandatory spares, special tool & tackle for maintenance, commissioning spares, all taxes, duties etc.												
2.0	Break up prices for items covered in clause 1.0 above.												
2.1	Double skinned Packaged ambient air handling unit shall comprise of centrifugal fans (DIDW) with TEFC squirrel cage induction motors, drive pkg, prefilter with filter mounting frame, inlet air louvers, bird screen, VI pads, cadmium plated foundation bolts, nuts, & washers, canvass connection, outlet damper, VCD and all other accessories as required for complete installation as per specifications. The capacity of each fan shall be 100,000 CMH at 65 mm SP.	10	NO										
2.2*	Supply air ducting (finished) for above area complete with dampers, grills (with VCD & without VCD), supports (painted) and all accessories as specified.												
2.2.1*	Finished GSS (zinc coating 275 gms/sq.m) Ducting with support structure etc.	1700	SQM*										
a)*	18 G	2000	SQM*										
b)*	20 G	2500	SQM*										
c)*	22 G	200	SQM*										
d)*	24 G	200	SQM*										
2.2.2*	MS Duct With Epoxy paint for battery room.	50	SQM*										
2.2.3*	MS Grilles with VCD	70	SQM*										
2.2.4*	MS Grilles without VCD	5	SQM*										
2.2.5*	Exposed duct insulation as per specifications.	1500	SQM*										
2.2.6*	Wall mounted dampers (gravity operated) for different areas.	20	SQM*										
2.2.7*	Inlet Louvers	20	SQM*										
2.3*	FIRE DAMPER												
a)*	Fire damper	10	SQM*										
b)*	Motorized Actuator with single phase power supply for the above Fire damper with auto resetting, limit switches, indication lamps etc	18	SQM*										
c)*	Fusible Link type Fire Damper	5	SQM*										
2.4*	Roof extractor units (axial flow type) with hood, disconnect switch and all accessories as specified. Following fan shall have 15 mmwc static pressure.												
a)*	Capacity 50,000 CMH with Motor rating 5.5 KW	10	Nos.*										
b)*	Capacity 40,000 CMH with Motor rating 5.5 KW	2	Nos.*										
c)*	Capacity 20,000 CMH with Motor rating 2.2 KW	2	Nos.*										
2.5*	Axial flow supply fans with pre and fine filter (wall mounted) complete with casing, TEFC sq cage induction motors & mounting frame, MS rain protection cowl, bird screen and all other accessories (suitable for 415V/3-phase supply). Following fan shall have 30 mmwc static pressure.												
a)*	Capacity 10,000 CMH with Motor rating 2.2 KW	12	Nos.*										
b)*	Capacity 7,500 CMH with Motor rating 1.5 KW	2	Nos.*										
c)*	Capacity 6,000 CMH with Motor rating 1.1 KW	2	Nos.*										
d)*	Capacity 4,000 CMH with Motor rating 0.75 KW	8	Nos.*										
2.6*	Axial flow supply fans with pre filter (wall mounted) complete with casing, TEFC sq cage induction motors & mounting frame, MS rain protection cowl, bird screen and all other accessories (suitable for 415V/3-phase supply) as specified. Following fan shall have 20 mmwc static pressure.												
a)*	Capacity 10,000 CMH with Motor rating 1.5 KW	10	Nos.*										
b)*	Capacity 7,500 CMH with Motor rating 1.1 KW	14	Nos.*										
c)*	Capacity 6,000 CMH with Motor rating 1.1 KW	2	Nos.*										
d)*	Capacity 4,000 CMH with Motor rating 0.75 KW	2	Nos.*										

Handwritten signature and date: 25/8/16



ANNEXURE - II TO NIT REF NO-PE/PG/YE1/E-5240/2016, DTD-27.05.2016
1 X 370 MW YELAHANKA CCPP

REV 01

PRICE SCHEDULE FOR VENTILATION SYSTEM - MANDATORY SPARES

Sl No	DESCRIPTION OF EQUIPMENT/ ITEM	QTY/UOM	IMPORTED ITEMS (Supply not from Indian Territory)						INDIGENEOUS ITEMS (Supply from Indian Territory)				GRAND TOTAL			
			UNIT F.O.B. PRICE (INCLUDING SEAWORTHY PACKING, HANDLING AND TRANSPORTATION ON TO VENDORS OWN PORT.) (CURRENCY)	TOTAL F.O.B. PRICE (INCLUDING SEAWORTHY PACKING, HANDLING AND TRANSPORTATION ON TO VENDORS OWN PORT.) (CURRENCY)	OCEAN FREIGHT (CURRENCY)	OCEAN / MARINE INSURANCE	CUSTOM DUTY AFTER AVAILING CENVAT BENEFIT IF APPLICABLE (INR)	INLAND FREIGHT CHARGES (INCLUDING SERVICE TAX) (INR)	F.O.R. SITE IMPORTED ITEMS SUPPLY PRICE (CURRENCY + INR)	UNIT EX- WORKS PRICE (DULY PACKED) (INR)	TOTAL EX- WORKS PRICE (DULY PACKED) (INR)	ED (INCLUDING CESS) @ % (INR)		CST/VAT @ % Against Form 'C'/E/EI (INR)	FREIGHT CHARGES (INCLUDING SERVICE TAX) @ % OF TOTAL EX WORKS (INR)	TOTAL F.O.R SITE PRICE (INR)
A	MECHANICAL		1	2	3	4	5	6	7=2+3+5+6	8	9	10	11	12	13=9+10+11+12	14 = 7+13
1	CENTRIFUGAL FANS															
1.1	V-BELTS	1 SET														
1.2	BLOWER BEARING	1 SET														
1.3	BLOWER MOTOR BEARINGS	1 SET														
1.4	GASKET	1 SET														
1.5	MOTOR	1 NO														
2	AXIAL FANS/ ROOF EXTRACTOR (FOR EACH SIZE)															
2.1	FAN BEARINGS	1 SET														
2.2	FAN MOTOR BEARING	1 SET														
2.3	FAN MOTOR	1 NO														
1	CENTRIFUGAL FANS															
1.1	V-BELTS	1 SET														
1.2	BLOWER BEARING	1 SET														
1.3	BLOWER MOTOR BEARINGS	1 SET														
1.4	GASKET	1 SET														
1.5	MOTOR	1 NO														
2	AXIAL FANS/ ROOF EXTRACTOR (FOR EACH SIZE)															
2.1	FAN BEARINGS	1 SET														
2.2	FAN MOTOR BEARING	1 SET														
2.3	FAN MOTOR	1 NO														
NOTES																
1	The bidder shall furnish unit rates for variable item (marked *) for necessary adjustment (plus or minus) variation during detailed engg. stage.															
2	Price format shall not be changed by the bidder as the bidder may get disqualified by doing so.															

[Signature]
28/6

सुनील साहय/SUNJEEV SAHAY
 बरिष्ठ अभियन्ता (वी.सी.-1-2)/Sr. Engineer (PC-1-2)
 भारत हीरो इलेक्ट्रिकल्स लिमिटेड/ Bharat Hero Electricals Ltd.
 पावर सेक्टर-परियोजना कर्मचारिण प्रबन्धक
 Power Sector-Project Engineering Management
 ब्लॉक नं.-25, फ्लैट-15B, नगरपालिका-201 301
 Plot No. 25, Sector-15B, Newa-201 301



VENTILATION SYSTEM
YELAHANKA
(1X370 MW)

SPECIFICATION NO. PE-TS-409-554-A001

ADDENDUM No. 1

DATE: 27.06.2016

SHEET : 1 OF 2

YELAHANKA CCPP
(1x370 MW)

ADDENDUM No. 1

(TECH SPEC No. PE-TS-409-554-A001)

VENTILATION SYSTEM



**VENTILATION SYSTEM
YELAHANKA
(1X370 MW)**

SPECIFICATION NO. PE-TS-409-554-A001

ADDENDUM No. 1

DATE: 27.06.2016

SHEET : 2 OF 2

ADDENDUM No. 1 TO THE TECHNICAL SPECIFICATION PE-TS-409-554-A001 VENTILATION SYSTEM OF YELAHANKA CCPP (1X370MW)

1. AMENDMENT TO EXISTING CLAUSES OF THE TECHNICAL SPECIFICATION

S.No	Clause	To Be Read As (Amendment)
1.	Volume III, section 6, suggestive price format. Serial no 2.0	Revised Volume III section 6, shall be read as per attached Appendix "A".
2.	Volume II B, section E, Annexure I	Revised Volume II B, section E, Annexure-I shall be read as per attached Appendix "B".
3.	Volume II B, section E, Annexure IV, LIST OF TOOLS & TACKLES	Volume II B, section E, Annexure IV, list of tools & tackles shall be read as "LIST OF TOOLS & TACKLES and COMMISSIONING SPARES". Attached as Appendix "C".
4.	Volume II B, section C1, clause no 4.2.1	Revised Volume II B, section C1, clause no 4.2.1 shall be read as "The casing of Ambient air handling unit shall be of double skin construction. Double skin sandwich panels (inside and outside) shall be fabricated using minimum 0.6mm thick GSS sheet. Outer sheet shall be pre-coated whereas inner sheet shall be plain GSS. The insulation shall be 25 mm thick polyurethane insulation of minimum 40 kg/m ³ density in between sheets."
5.	Ventilation ducting layout	Ventilation duct Layout drawing is attached.



**1x370MW YELAHANKA CCPP
VENTILATION**

SUGGESTIVE PRICE FORMAT

SPECIFICATION No: PE-TS-409-554-A001

VOLUME : III

SECTION : 6

REV 01

DATE: JUNE 2016

SHEET 1 OF 4

**APPENDIX - A
SUGGESTIVE PRICE FORMAT**

VENTILATION SYSTEM FOR 1 x 370 MW YELAHANKA CCPP --- SUGGESTIVE PRICE FORMAT

REV-01

SL No	DESCRIPTION OF EQUIPMENT/ ITEM	QTY	UNIT	SUPPLY						ERECTION AND COMMISIONING				TOTAL
				Unit Price (Rs)	Total ex-works price (Rs)	ED (Inc CESS) (Rs)	CST / VAT (Rs)	Freight (Including service tax, if applicable) (Rs)	TOTAL FOR site price SUPPLY (Rs)	Unit Price (Rs)	Total price (Rs)	Service Tax (Rs)	TOTAL PRICE (Erection and commissioning including Service tax)	Total Price Supply FIOR site and E&C including service tax (Rs)
1.0	Total lumpsum firm prices for equipment & Services as specified, Comprising Engineering, design, manufacture, inspection & Testing at manufacturer's/subvondor's works, Painting at manufactures works, duly packed for transportation, delivery to site, unloading, storage & handling at site, fabrication, erection and commissioning, minor civil work,performance and guarantee testing, submission of as built drawing, O&M Manual, carrying out acceptance tests at site, and final painting of complete Ventilation system on turnkey basis as per specification PE-TS-409-554-A001 including mandatory spares, special tool & tackels for maintenance, commissioning spares, all taxes, duties etc.													
2.0	Break up prices for items covered in clause 1.0 above.													
2.1	Double skinned Packaged ambient air handling unit shall comprise of centrifugal fans (DIDW) with TEFC Squirrel Cage induction motors, drive pkg, prefilter with filter mounting frame, inlet air louvers, bird screen, VI pads, cadmium plated foundation bolts, nuts, & washers, canvass connection, outlet damper, VCD and all other accessories as required for complete installation as per specifications. The capacity of each fan shall be 100,000 CMH at 65 mm SP.	10	NO											
2.2*	Supply air ducting (finished) for above area complete with dampers, grills (with VCD & without VCD), supports (painted) and all accessories as specified.													
2.2.1*	Finished GSS (zinc coating 275 gms/sq.m) Ducting with support structure etc.													
a)*	18 G	1700	SQM*											
b)*	20 G	2000	SQM*											
c)*	22 G	2500	SQM*											
d)*	24 G	200	SQM*											
2.2.2*	MS Duct With Epoxy paint for battery room.	50	SQM*											
2.2.3*	MS Grilles with VCD	70	SQM*											
2.2.4*	MS Grilles without VCD	5	SQM*											
2.2.5*	Exposed duct insulation as per specifications.	1500	SQM*											
2.2.6*	Wall mounted dampers (gravity operated) for different areas.	20	SQM*											
2.2.7*	Inlet Louvres	20	SQM*											
2.3*	FIRE DAMPER													
a)*	Fire damper	10	SQM*											
b)*	Motorized Actuator with single phase power supply for the above Fire damper with auto resetting, limit switches, indication lamps etc	18	SQM*											
c)*	Fusible Link type Fire Damper	5	SQM*											
2.4*	Roof extractor units (axial flow type) with hood, disconnect switch and all accessories as specified. Following fan shall have 15 mmwc static pressure.													
a)*	Capacity 50,000 CMH with Motor rating 5.5 KW	10	Nos.*											
b)*	Capacity 40,000 CMH with Motor rating 5.5 KW	2	Nos.*											
c)*	Capacity 20,000 CMH with Motor rating 2.2 KW	2	Nos.*											

VENTILATION SYSTEM FOR 1 x 370 MW YELAHANKA CCPP --- SUGGESTIVE PRICE FORMAT

REV-01

SL No	DESCRIPTION OF EQUIPMENT/ ITEM	QTY	UNIT	SUPPLY						ERECTION AND COMMISIONING				TOTAL			
				Unit Price (Rs)	Total ex-works price (Rs)	ED (Inc CESS) (Rs)	CST / VAT (Rs)	Freight (Including service tax, if applicable) (Rs)	TOTAL FOR site price SUPPLY (Rs)	Unit Price (Rs)	Total price (Rs)	Service Tax (Rs)	TOTAL PRICE (Erection and commissioning including Service tax)	Total Price Supply FIOR site and E&C including service tax (Rs)			
2.11	Total lumpsum price for commissioning spares inclusive of packing forwarding, transportation up to site, etc. (Bidder shall submit item-wise price break-up).	1	LOT										NA				
2.12	Instruments and accessories for complete hookup of ventilation system with main central control system.	1	LOT														
2.13	Manually operated trolley of 1 Ton cap with base area 2 m X 1.5 M	3	Nos.											NA			
2.14	Total lumpsum price for Mandatory Spare inclusive of packing forwarding, transportation up to site, etc. (Bidder to submit item-wise price break-up seperately).	1	LOT											NA			

NOTES

- 1 The bidder shall furnish unit rates for variable item (marked *) for necessary adjustment (plus or minus) variation during detailed engg. stage.
- 2 Price format shall not be changed by the bidder as the bidder may get disqualified by doing so.
- 3 Item mentioned against Sl. No. 2.10,2.11,2.13 and 2.14 are supply item only, E&C for the same is not applicable.

VENTILATION SYSTEM FOR 1 x 370 MW YELAHANKA CCPP --- MANDATORY SPARES SUGGESTIVE PRICE FORMAT

SL No	DESCRIPTION OF EQUIPMENT/ ITEM	QTY	UNIT	SUPPLY						ERECTION AND COMMISSIONING				TOTAL
				Unit Price (Rs)	Total ex-works price (Rs)	ED (IncCESS) (Rs)	CST / VAT (Rs)	Freight (Including service tax, if applicable) (Rs)	TOTAL FOR site price SUPPLY (Rs)	Unit Price (Rs)	Total price (Rs)	Service Tax (Rs)	TOTAL PRICE (Erection and commissioning including Service tax)	Total Price Supply FIOR site and E&C including service tax (Rs)
1	CENTRIFUGAL FANS													
1.1	V-BELTS	1 SET												
1.2	BLOWER BEARING	1 SET												
1.3	BLOWER MOTOR BEARINGS	1 SET												
1.4	GASKET	1 SET												
1.5	MOTOR	1 NO												
2.	AXIAL FANS/ ROOF EXTRACTOR (FOR EACH SIZE)													
2.1	FAN BEARINGS	1 SET												
2.2	FAN MOTOR BEARING	1 SET												
2.3	FAN MOTOR	1 NO												
1	CENTRIFUGAL FANS													
1.1	V-BELTS	1 SET												
1.2	BLOWER BEARING	1 SET												
1.3	BLOWER MOTOR BEARINGS	1 SET												
1.4	GASKET	1 SET												
1.5	MOTOR	1 NO												
2.	AXIAL FANS/ ROOF EXTRACTOR (FOR EACH SIZE)													
2.1	FAN BEARINGS	1 SET												
2.2	FAN MOTOR BEARING	1 SET												
2.3	FAN MOTOR	1 NO												

NOTES

- 1 The bidder shall furnish unit rates for variable item (marked *) for necessary adjustment (plus or minus) variation during detailed engg. stage.
- 2 Price format shall not be changed by the bidder as the bidder may get disqualified by doing so.



**1x370MW YELAHANKA CCPP
VENTILATION SYSTEM**

LIST OF MAKES OF SUB-VENDOR ITEMS

SPECIFICATION NO. PE-TS-409-554-A001

VOLUME : II B

SECTION : E

REV 00

DATE: JUNE 2016

SHEET 1 OF 3

APPENDIX - B

LIST OF MAKES OF SUB-VENDOR ITEMS



1x370MW YELAHANKA CCPP
VENTILATION SYSTEM

LIST OF MAKES OF SUB-VENDOR ITEMS

SPECIFICATION NO. PE-TS-409-554-A001

VOLUME : II B

SECTION : E

REV 00

DATE: JUNE 2016

SHEET 2 OF 3

S.No.	Description	Makes
1.	AIR WASHER & UAF*	HYDERABAD POLLUTION CONTROL / SK SYSTEM / ADVANCE VENTILATION / DRAFT AIR / BLUE STAR / VOLTAS / STERLING WILSON & ROOTS COOLING SYSTEM / C.DOCTOR
2.	CENTRIFUGAL FAN	FLAKT / KRUGGER / DRAFT AIR / HYDERABAD POLLUTION CONTROL / ADVANCE VENTILATION / PATEL AIR / NICOTRA/ SK SYSTEM / MARATHON / CB DOCTOR / SARLA
3.	AXIAL FLOW FANS/RE UNITS	HYDERABAD POLLUTION/ SK SYSTEM / ADVANCE VENTILATION / KRUGER / NICOTRA / MARATHON / FLAKT / CB DOCTOR/ PATEL AIR /SITAL
4.	CENTRIFUGAL WATER PUMP	BEST & CROMPTON / JYOTI / SAM TURBO / KBL / KSB / M&P / VOLTAS / BEACON-WEIR / WORTHINGTON / FLOWMORE / SULZER / BHARAT PUMPS & COMPRESSORS LTD / FLOWSERVE INDIA CONTROL PVT LTD / V-FLOW PUMPS & SYSTEMS CO
5.	INDUCTION MOTORS (LT)	SIEMENS / ABB / CGL / MARATHON / KEC / BHARAT BIJLEE / NGEF /JYOTI / LHP
6.	AIR FILTER	PUROLATOR / FMI / ANFILCO / TENACITY / JOHN FOWLER /SPECTRUM / AIR TECH / PUROMATIC
7.	INSULTATION MATERIAL	BEARDSHELL / K-FLEX / PARAMONT/ ARMAFLEX / SUPREME / LLOYDS / UP TWIGA
8.	FIRE DAMPER	TSC / CARRYAIRE / RAVISTAR (SYSTEM AIR)
9.	BUTTERFLY VALVE	AUDCO / FOURESS / INTER VALVE / BDK / WEIR BDK / TYCO / CRANE PROCESS / KEYSTONE
10.	NON RETURN VALVE	LEADER / H.SARKAR / FLUID LINE / HI -TECH / CRESENT / A V VALVES / BANKIM & COMPANY / SHIVADURGA
11.	GATE/GLOBE VALVES	CRESENT / BDK / AUDCO / FOURESS / KIRLOSKAR / SANT / BOMBAY METAL & ALLOYS / BANKIM / LEADER / H SARKAR / AV VALVES / VENUS PUMPS AND ENGG
12.	PIPING - ERW	SURYA ROSHNI / TISCO / DADU PIPES / INDUS TUBE / WELSPUN / TATA / BST / JINDAL / SAIL
13.	GI SHEETS FOR DUCTING	TISCO / INDIAN IRON & STEEL CO LTD. / RASHITRYA ISPAT NIGAM LTD. / ESSAR/ ISPAT INDUSTRIES / JSW STEEL / LLOYDS STEEL / BHUSHAN / TATA / SAIL / JINDAL
14.	HUMID STAT	JHONSON CONTROL / HONEYWELL / PENN
15.	PRESSURE GAUGE	GENERAL INST CONSORTIUM / BELL / H.GURU INST / WAAREE INSTRUMENTS / H. GURU IND / FORBES MARSHALL / MANOMETER / A.N. INST / GAUGES BOURDON / GLUCK / WIKA / ASHCROFT / BAUMER TECHNOLOGIES/Precision Mass Products/ Bose Panda
16.	TEMPERATURE GAUGE	H. GURU IND/ H.GURU INST/ FORBES MARSHALL/DETRIVE INST & ELECTRONICS / PYRO ELECTRIC /TOSHNIWAL BROSS / WAREE INSTRUMENTS / A.N.INST / GOA INSTRUMENTS / WIKA/ ASHCROFT / H GURU (SI)/ Baumer technologies/ Gauge Bourdon/ Goa Thermostat/ Budenberg Gauge/ Precision Mass Products



**1x370MW YELAHANKA CCPP
VENTILATION SYSTEM**

SPECIFICATION NO. PE-TS-409-554-A001

VOLUME : II B

SECTION : E

REV 00

DATE: JUNE 2016

LIST OF MAKES OF SUB-VENDOR ITEMS

SHEET 3 OF 3

17.	LEVEL GAUGE	GENERAL INSTRUMENTS / CHEMTROLS / SBEM, PUNE/ AUTOMAT MUMBAI /SIGMA / TOSHNIWAL / TECHNOMATIC / TELACO /LEVCON / D K INSTRUMENTS / PUNE TECHTROL / FLOW STAR/ Bliss Anand
18.	PRESSURE SWITCH / DP SWITCHES	BELLS / DANFOSS / DK INSTRUMENTS/ DRESSER / SOR INC / VASU / SWITZER / INDFOSS / TRAFAG / GIC / ASHCROFT/ Kasturba Udyog/ Barksdale/ Precision Mass/ Mittal Refrigeration
19.	LEVEL SWITCH	SBEM / BLISS ANAND / HI TECH / RAMAN INST / SIGMA / SOR INC / WAREE INST / LEVCON / DK INSTURMENT / V AUTOMAT /CHEMTROLS / SIMENS / FLOW STAR / TRAC/ Nivo Controls/ Pune Techtrols/ SAPCON Instruments/ Baumer Technologies/ GIC
20.	Y / POT STRAINER	MULTITEX / GREAVES COTTON / JAYPEE / SANT / OTOKLIN / GRAND PRIX / GUJARAT OTOLIFT / DS ENGG / SAROJINI ENTERPRISE / BHATIA ENGINEERING / FILTRATION ENGINEERS INDIA PVT LTD / SUNGOV ENGINEERING
21.	CONTROL PANEL	INDUSTRIAL CONTROL & APPLIANCE/ PYROTECH /POSITRONICS / CONTROL & SWITCHGEAR /SIEMENS / L&T /GE POWER /RITTAL / HOFFMAN
NOTE		
	* Designed by C. Doctor / Blue Star / Voltas / Hyderabad Pollution Controls / SK System /Advance Ventilation / Draft Air / Sterling & Wilson / Roots cooling and fabricated by their approved fabricators.	
	Above sub-vendor are also subjected to Customer approval during detailed engineering.	



**1x370MW YELAHANKA CCPP
VENTILATION SYSTEM**

LIST OF COMMISSIONING SPARES

SPECIFICATION No: PE-TS-409-554-A001

VOLUME : II B

SECTION : E

REV 01

DATE: JUNE 2016

SHEET 1 OF 2

APPENDIX- C

COMMISSIONING SPARES



**1x370MW YELAHANKA CCPP
VENTILATION SYSTEM**

LIST OF COMMISSIONING SPARES

SPECIFICATION No: PE-TS-409-554-A001

VOLUME : II B

SECTION : E

REV 01

DATE: JUNE 2016

SHEET 2 OF 2

LIST OF COMMISSIONING SPARES

SL NO	ITEM DESCRIPTION	UNIT	QTY
1	FAN BELTS	SET	1
2	TEMPERATURE GAUGE	NO.	1
3	FILTER	SET	1

NOTE:-

The above mentioned lists are tentative only, same shall be finalized during detailed engineering, as per system / customer requirement.



**1x370MW YELAHANKA CCP
VENTILATION SYSTEM
SPECIFIC TECHNICAL REQUIREMENT**

SPECIFICATION No: PE-TS-409-553-A001

VOLUME: II B

SECTION : C 1

REV. 01

DATE: JUNE 2016

SHEET 1 OF 15

SECTION: C 1

SPECIFIC TECHNICAL REQUIREMENT



**1x370MW YELAHANKA CCPP
VENTILATION SYSTEM
SPECIFIC TECHNICAL REQUIREMENT**

SPECIFICATION No: PE-TS-409-553-A001

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1. INTENT

- 1.1 The purpose of this document is to bring out clarity with regard to the following:
- a) System description and basic operation & control philosophy.
 - b) Major technical requirements of various items covered under this package.
 - c) Scope, terminal points, exclusion.
 - d) Layout requirement.
- 1.2 Approved copy of this document shall form the basis for subsequent approval of ventilation system vendor documents (by client /their consultant).

2. SYSTEM DESCRIPTION

- 2.1 The Dry Ventilation System is provided in the following locations within the Power House and various auxiliary buildings. Coursing of air in desired direction / areas shall be made by using roof extractor's/exhaust fans.
- 2.2 Following buildings are considered for ambient air ventilation system:
- a) GTG/STG Building
 - b) Switch Gear room and cable spreader room in power house building.
 - c) DG Set room.
 - d) Battery rooms.
 - e) AC Plant Room.
 - f) Compressor House.
 - g) BFP Building
 - h) MCC and Cable vaults in BHEL Scope
 - i) Toilets of the buildings in BHEL Scope.
 - j) CW treatment plant
 - k) CW ozonation plant.
 - l) Fire station building
 - m) Raw Water Pump House, CW Pump House, Ware House, pantry & toilets of Canteen building, Chlorination room, Reverse Osmosis Plant, toilets of Security and time house.
- 2.3 For STG and GTG building, ventilation system shall be provided with adequate number of packaged ambient air handling Unit located on both sides of STG and GTG buildings. The hot air from GTG and STG building shall be exhausted by means of adequate number of power roof extractors. This is in addition to necessary ventilation system provided for GTG enclosure.
- 2.4 The supplied air in the lower level of TG hall after taking the heat load of TG bay rises through different openings to the upper floors and is then finally exhausted by means of roof



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exhausters placed over the roof of TG Hall. Some quantity of air leaks out through various leakage areas thus maintaining slight positive pressure inside w.r.t. outside.

- 2.5 Various auxiliary buildings shall be provided (which are in BHEL Scope) with mechanical ventilation i.e. system consisting of supply air fans, exhaust air fans/roof extractors or combination of both shall be provided.
- 2.6 The battery room shall be maintained at negative pressure to prevent leakage of fumes to outside from the battery room's. The exhaust from the battery room shall be exhausted by means of duct with the outlet 1 m above the roof level by means of tube axial flow fans.
- 2.7 The battery & oil rooms shall be exhaust ventilated where the intake air shall be through gravity damper.

3. DESIGN INPUT / CRITERIA

- 3.1.1 The outside design conditions considered are as follows:

	Summer	Monsoon	Winter
DBT (°C)	35.6	27.8	14.4
WBT (°C)	25.6	25.6	12.2

NOTE: Above weather conditions of Bangalore are considered for yelahanka from ISHRAE handbook.

The inside design conditions:-

The ventilation system shall be sized based on either air flow rate calculated considering temperature of 5°C (maximum) above DBT during summer or air flow rate calculated considering minimum 15 number of air changes/hour, whichever results in higher air flow rate.

- 3.1.2 The ventilation philosophy in various areas shall be as under:

S.No.	Area	Type of Ventilation	ACPH
1	TG Hall & Cable Spreader room	Ventilation with package ambient air handling units & mechanical exhaust from roof extractor units.	15
2	Electrical Rooms (M.C.C. room, Switchgear room in GTG & STG Building)	Pressurized ventilation with package ambient air handling units & exhaust through gravity operated back draft damper.	20
3	All toilets, pantries.	Negatively ventilated by means of exhaust air fans	20
4	Battery and battery charger room	Negative pressurization of 5 mm by means of axial flow exhaust fans with flameproof motors.	30
5	Elevator Machine room	Supply air through axial fan filter unit and exhaust through gravity damper.	15
6	AC Plant room	Mechanical Exhaust by means of axial flow exhaust fans	15
7	CW Pump Houses	Mechanical Exhaust by means of axial flow exhaust fans / RE Unit.	20



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8	Chlorination plant	Mechanical Exhaust by means of axial flow exhaust fans.	30
9	Electrical rooms for all Auxiliary Buildings, i.e., associated with pump houses etc.	Supply air through axial fan filter unit (Pre-filter and fine filter) and exhaust through gravity damper.	20
10	Compressor House	Supply air through axial fan filter unit and exhaust through axial exhaust fan.	15
11	CW treatment plant	Supply air through axial fan filter unit and exhaust through axial exhaust fan.	15
12	DG House	Mechanical exhaust by means of axial flow exhaust fans	25
13	Warehouse	Mechanical exhaust by means of axial flow exhaust fans	20
14	RO DM Plant	Mechanical exhaust by means of axial flow exhaust fans	20
15	BFP building	Mechanical exhaust by means of axial flow exhaust fans	20
16	Raw / Fire water pump house	Mechanical exhaust by means of axial flow exhaust fans	20
17	CW ozonisation plant	Mechanical exhaust by means of axial flow exhaust fans	20
18	Fire station building	Mechanical exhaust by means of axial flow exhaust fans	20

3.1.3 All equipment shall be designed for continuous duty.

3.1.4 The ducting shall be sized to have constant friction drop along its length with air velocity in the ducts normally not exceeding 12.7 m/sec for ventilation system. However the air velocity shall be increased more than 12.7 m/sec, in case of neck formation / transmission piece.

3.1.5 Motorized type electrically operated fire dampers of 120 min fire rating shall be provided in the ventilation supply air ducting leading to electrical rooms like switchgear rooms, cable spreader rooms etc. These dampers shall be operated with the help of signal from smoke detectors/ thermal sensors.

3.1.6 All ventilation system shall operate on 100% fresh air.

3.1.7 Supply air duct (only exposed ducts) shall be insulated with 25mm thick insulation made up of fibre glass of density 32kg/m³. The adhesive used for setting the insulation shall be non-flammable and vapour proof adhesive.

3.1.8 Standard codes:

- IS 277: GALVANIZED STEEL SHEETS (PLAIN AND CORRUGATED) - SPECIFICATION
- 325: THREE PHASE INDUCTION MOTORS - SPECIFICATION
- IS 655: AIR DUCTS - SPECIFICATION



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- IS 3588: ELECTRIC AXIAL FANS - SPECIFICATION
- IS 4894: CENTRIFUGAL FANS
- UL 555: FIRE DAMPERS GUIDE
- BS: 6540: FILTERS

3.1.9 For pumps & fans, continuous motor rating (at 50 Deg.C ambient) shall be at least ten percent (15%) above the max. load demand of the pump in the entire operation range.

4. BRIEF SCOPE

4.1 SYSTEM CAPACITY

The ventilation system shall include the following:

4.1.1 Ventilation for GTG and STG building.

4.1.2 To meet the ventilation requirement of various power house building areas, total 10 nos package ambient air handling units each having capacity of 1,00,000 CMH shall be provided.

4.1.3 Ventilation for Auxiliary buildings

4.1.4 To meet the ventilation requirement of building/areas listed under point no 2.2, exhaust fans/supply fans of suitable capacity shall be provided.

4.2 EQUIPMENT AND SERVICES TO BE PROVIDED FOR VENTILATION SYSTEM

Ambient air handling units

4.2.1 **The casing of ambient air handling unit shall be of double skin construction. Double skin sandwich panels (inside and outside) shall be fabricated using minimum 0.6mm thick GSS sheet. Outer sheet shall be pre-coated whereas inner sheet shall be plain GSS. The insulation shall be 25 mm thick polyurethane insulation of minimum 40 kg/m³ density in between sheets.**

4.2.2 Each centrifugal fan shall be complete with

4.2.3 Fan impeller (backward curved) with casing & supports.

4.2.4 Electric drive motor.

4.2.5 Drive Pulleys, V-belt, belt guards, slide rails etc.

4.2.6 Dampers and flexible connection with matching flanges.

4.2.7 Spring type Vibration isolators or ribbed neoprene pad or cushy foot type mountings, foundation bolts and nuts.

4.2.8 Removable drain plug with fan casing.

Wall mounted axial flow and propeller fan

4.2.9 Each wall mounted axial flow fan shall be complete with

4.2.10 Fans shall have cast aluminum impeller with blades of aerofoil design & casing.

4.2.11 The speed of fans shall not exceed 960 rpm for fan with impeller diameter above 450 mm and 1400 rpm for fan with impeller diameter 450 mm or less. However for fans having static pressure of 30 mm WC or above the speed of the fan shall not exceed 1440 rpm for fan with



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impeller diameter of above 450mm and 2800 rpm for fan with impeller diameter of 450 mm or less. The first critical speed of rotating assembly shall be at least 25% above the operating speed.

- 4.2.12 Electric drive motor with coupling if any, including motor brackets.
- 4.2.13 Rain protection cowl, inlet and outlet cones, bird protection screen adjustable damper, vibration isolators, nuts and bolts, back draft dampers etc. Shall be provided.
- 4.2.14 All supply air axial flow fans shall be provided with pre-filters (and also fine filters for MCC/switchgear room).

These fans shall cater to the areas as indicated in the fan schedule of ventilation system.

Roof extractor unit:

Each roof extractor unit shall be complete with

- 4.2.15 Fan impeller shall be of cast aluminium with blades of aerofoil design, electric drive motor with motor coupling if any and motor bracket.
- 4.2.16 Hood of the roof ventilator shall be of hinged type providing easy access to motor and impeller. Mounting frame for mounting the roof ventilators shall be provided.
- 4.2.17 The speed of fans shall not exceed 960 rpm for fan with impeller diameter above 450 mm and 1400 rpm for fan with impeller diameter 450 mm or less.
- 4.2.18 Support frame and structure: M.S of adequate thickness.
- 4.2.19 All accessories such as rain protection exhaust hood, transformation piece, vibration isolators etc., as required shall be provided.

These fans shall cater to the areas as indicated in the fan schedule of ventilation system.

All supply / Exhaust Air ducting

- 4.2.20 Air distribution from packaged ambient Air handling units shall be done through ducting system, grilles and diffusers. Ducts shall be made of GI sheets of class 275 as per IS: 277 (i.e., having Zinc coating 275 gm/ m²). The air velocity in the ducts shall not normally exceed 12.7 m/sec. for ventilation system. However the air velocity shall be increase more than 12.7 m/sec up to 15 m/s., in case of layout constraint to clear the duct. All ducting shall be designed on equal friction method and fabricated as per IS: 655.

	Larger dimensions of Duct	Thickness of GS sheet (mm)	Type of Transverse Joint Connection	Bracing
a.	Upto 600	0.63 (24 g)	S-drive, 25 mm pocket or bar slips on 2.5 m centers	30 x 30 x3 angles 1.2 m from joint
b.	601 thru 750	0.63 (24 g)	S-drive, 25 mm pocket or 25 mm bar slips on 2.5 m centers	25 x 25 x 3 angles braced at 1.2 m from joints.
c.	751 thru 1000	0.80 (22 g)	S-drive, 25 mm pocket or 25 mm bar slips on 2.5 m centers	25 x 25 x3 angles Braced at 1.2 m from joints.



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d.	1001 thru 1500	0.80 (22 g)	40 x 40 angle connections or 40 mm pocket or 40 mm bar slips with 35 x 3 bar reinforcing on 2.5 m centers	40 x 40 x 4 angle Braced at 1.2 m from joints.
e.	1501 thru 2200	1.00 (20 g)	40 x 40 angle Connections or 40 mm pocket or 40 mm bar slips with 35 x 3 bar reinforcing on 2.5 m centers.	40 x 40x 4 angle Braced at 600 mm from joints.
f.	2201 and larger	1.25 (18 g)	50 x 50 angle connections or 40 mm pocket or 40 mm bar slips 1 m centers with 35 x 3 bar reinforcing	50 x 50 x 5 angle Braced at 600 mm from joints.

4.2.21 For Battery room areas, chlorination room where exhaust ducting is required for ventilation, MS ducting having epoxy coating shall be provided. For all parts coming in contact with acid fumes (in battery rooms) a coat of epoxy resin based Zinc phosphate primer of min thickness of DFT of 100 micron followed with under coat of epoxy resin based paint pigmented with titanium dioxide of min DFT of 100 microns shall be applied and a top coat consisting of one coat of epoxy paint of approved shade and colour with glassy finish of min DFT of 75 microns.

4.2.22 The supply air grilles shall be of extruded aluminium construction for ventilation system.

4.2.23 Volume control dampers, guide vane, splitter dampers.

4.2.24 Supports and hangers including anchor bolts as required.

4.2.25 Manually adjustable/back draft type/Gravity type exhaust air dampers.

Insulation

4.2.26 Thermal insulation shall be provided for the duct exposed to sun / rain only.

4.2.27 Lot-Insulation shall be provided as under:

S. No.	Surface	Insulation Material	Insulation Form	Thickness (mm)	Finish
i)	Supply ventilation Duct exposed to Sun	Resin bonded glass Wool (IS:8183) Or Nitrile Rubber	Roll / Slab Roll / Slab	25	F-3

4.2.28 The specification for various finishes shall be as follows

Finish F-1:

Step-1: Wrapping of Poly-Bonded Hessian (PBH- to act as vapour seal) on outer surface of insulation with 50mm overlap stitching and sealing of overlap with synthetic adhesive like CPRX or equivalent compound.



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Step-2: The surface then shall be wrapped with 19 mm mesh 24 SWG GI wire netting, butting all the joints and laced down with 22 SWG lacing wire.

Step-3: Sand cement (4:1) plaster shall be applied in two layers totalling to 12.5 mm thick, the second layer being brought to a smooth finish. A water proofing compound shall be added to the cement before its application

Finish F-2:

Step-1: Insulation shall be covered with 500g polythene with 50 mm overlap and sealing of overlap with synthetic adhesive like CPRX or Equivalent compound.

Step-2: Same as step-2 of Finish F-1 above.

Step-3: Same as step-2 of Finish F-1 above.

Finish F-3:

Step-1: Same as step-1 of Finish-1 above

Step-2: Same as step-2 of Finish-1 above

Step-3: Same as step-3 of Finish-1 above

Step-4: Application of 3 mm thick coat of water proofing compound "SHALIKOTE 30" or equivalent and wrapped with fibre glass RP tissue followed by final coat of 3 mm thick water proofing compound "SHALIKOTE 30" or equivalent over the RP tissue.

Step-5: After the above treatment 22G aluminium sheet cladding properly stitched at all joints shall be provided over the external surface.

5. CONTROL PHILOSOPHY

5.1.1 **Common PLC for Air-Conditioning and Ventilation System** is being provided. PLC based controls in the ventilation system is provided only for the packaged ambient air handling units of the GTG and STG building. The detail of PLC based control is included in the design memorandum of AC System.

5.1.2 Supply air fans, exhaust air fans / roof extractor units of each area shall be provided with their local starter panel. The fans (both supply and exhaust fans) associated with mechanical ventilation system shall be operated locally.

6. RE / WALL MOUNTED FANS SHALL BE SELECTED SO AS TO HAVE MOTOR RATING AND WALL / SLAB OPENING AS UNDER. FEEDER SUITABLE FOR FOLLOWING RATINGS ONLY SHALL BE PROVIDED BY BHEL.

1.	Roof extractor units with 15 mmwc static pressure.		
	Capacity	Motor rating	Roof / Slab opening
a.	50,000 CMH	5.5 KW	1320mm
b.	40,000 CMH	5.5 KW	1320mm



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c.	20,000 CMH	2.2 KW	1140mm
2	Axial flow supply fans with 30 mmwc static pressure.		
	Capacity	Motor rating	Wall opening
a.	10,000 CMH	2.2 KW	800mmx800mm
b.	7,500 CMH	1.5 KW	700mmx700mm
c.	6,000 CMH	1.1 KW	600mmx600mm
d.	4,000 CMH	0.75 KW	500mmx500mm
3	Axial flow supply fans with 20 mmwc static pressure.		
	Capacity	Motor rating	Wall opening
a.	10,000 CMH	1.5 KW	800mmx800mm
b.	7,500 CMH	1.1 KW	700mmx700mm
c.	6,000 CMH	1.1 KW	600mmx600mm
d.	4,000 CMH	0.75 KW	600mmx600mm
4	Axial flow exhaust fans (Bifurcated type) with 15 mmwc static pressure.		
	Capacity	Motor rating	Wall opening
a.	15,000 CMH	2.2 KW	900mmx900mm
b.	10,000 CMH	1.5 KW	800mmx800mm
c.	7,500 CMH	1.1 KW	700mmx700mm
d.	2,000 CMH	0.55 KW	500mmx500mm
5	Axial flow exhaust fans with 10 mmwc static pressure.		
	Capacity	Motor rating	Wall opening
a.	15,000 CMH	1.1 KW	900mmx900mm
b.	10,000 CMH	0.75 KW	800mmx800mm
c.	7,500 CMH	0.55 KW	700mmx700mm
d.	6,000 CMH	0.55 KW	600mmx600mm
e.	2,000 CMH	0.37 KW	500mmx500mm



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6	Exhaust fan (propeller type) with 5 mmwc static pressure.		
	Capacity	Motor rating	Wall opening
a.	1200 CMH	100 W	300 mm circular

Motor rating for Centrifugal fan

Sr. no.	Items	Motor rating (Kw)
1.	Centrifugal fan (100000 CMH / 65 mmWC SP)	30

Efficiency of centrifugal fan shall not be less than 70%.

7. MATERIALS OF CONSTRUCTION

7.1 CENTRIFUGAL FAN

- Fan Casing (side plates & stiffeners): Mild Steel Sheets/plate to IS: 2062 Gr.B / IS: 1079 /Eq. The minimum thickness of casing shall be 3.15 mm.
- Impeller hub: Mild Steel
- Impeller back plate blade & shroud: Mild Steel to IS: 2062 Gr.B.
- Shaft: EN - 8 or eqv.
- Shaft sleeve: EN - 8 or eqv.
- Flexible connection at outlet/inlet: Fire resistant type plastic impregnated canvas with M.S. flange and cleats (3 mm thick).
- V Belt (matched sets): ISI marked (Reinforced rubber section to (IS: 4776)
- Bolts & nuts: Galvanized / MS (Epoxy painted).
- Vibration isolating cushy foot mountings, foundation bolts and nuts etc.

7.2 AXIAL FAN

- Casing : M.S. sheet – 3 mm thk for fan dia up to 750 mm 5mm thick for fan dia of 750 mm and above as per IS:1079 / IS:2062 Gr.B
- Hub: As per manufacturer std. (AL- LM6)
- Neoprene rubber pads: As required.
- Supporting frame for mounting: Required.
- Protective screen at inlet: Yes (Min 14 SWG Galvanized wire knitted in 1" square mesh).
- Mounting flange on casing: At inlet and outlet.
- Painting / protecting coating – All the MS parts shall be galvanised or protected with three coats of epoxy paint.

7.3 ROOF EXTRACTOR UNIT

- Casing/cowl/hood: (Spray / hot galvanised M.S. Sheet to IS: 2062 Gr.B (Short duct casing).



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7.4 AIR FILTERS

PRE FILTER

- Filter Media: Fibrous material (extruded polyethylene) or felt filter: Dry types with element of 5 ply construction for fabric type.
- Efficiency: Average arrestance of 65-80% when tested in accordance with BS: 6540 / ASHRAE – 52-76.
- Allowable pressure drop: Initial pressure drop – Not to exceed 5.0 mm WC at rated flow. Final pressure drops- Up to 7.5 mm WC.
- Frame Work 18 G GSS.
- Filter mounting frame shall be GI angle iron frame of adequate thickness.
- Size – 610 x 610 mm (Approx.)
- Washable SS FILTER (for Air washer / UAF units)
- The filters shall be washable/cleanable type construction of SS 316 wire netting with three or more layers of wire mesh of different mesh sizes stitched together and held in a SS / Al frame of adequate thickness but not less than 18 SWG for Al and 20 SWG for SS suitable for long use in an industrial plant. The filter when flooded shall have a filtration efficiency of 90% down to 10 microns.
- The filter mat shall be weaved with SS wire of 0.16mm diameter providing an aperture of max 0.025mm

FINE FILTER

- Filter Media: Synthetic non-woven for fresh air pressurization (MCC).
- Efficiency: Average arrestance of 80-90% when tested in accordance with BS: 6540 / ASHRAE – 52-76
- Frame Work: 18 G GSS.

7.5 VALVES:

- Valves shall have full sizes port and suitable for horizontal and as well as vertical installation.
- Valves for regulating duty shall be of globe type suitable for controlling throughout its lift.
- Gate, Globe and stop check valves shall have bonnet back seat to facilitate easy replacement of packing with the valves in service.
- All safety / relief valves shall be so constructed that the failure of any part does not obstruct the free discharge.
- Manual gear operators be provided for valves of size 250 NB and above.
- All valves with rising stem shall have position indicators.
- All valves shall be provided with locking arrangement.
- All water line valves shall be of cast iron body for sizes 65 NB and above conforming to IS: 780 and Gun metal construction for sizes less than 65 NB conforming to IS: 778. Cast iron parts shall conform to IS: 210 Gr. FG 220.

8. GENERAL

- 1) Basis of design, all calculations including heat load calculations for summer seasons, equipment selection criterion, layout drawings/ schemes/G.A. dwg and documents like data sheet/ technical particulars etc. Are subject to Customer approval during detail engineering stage.



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- 2) Vendor to furnish characteristic curves for all major equipment offered indicating duty point during detailed engineering.
- 3) Vendor to include the Back wash arrangement of pot strainer with gate valve, piping etc for the Air Washer.
- 4) Vendor to include level gauge & level switch for each Air-washer tank for alarm & trip of the pumps. Also include one no. Pressure switch for each air washer pump
- 5) All drawings and documents shall be computer based.
- 6) All commissioning spares & consumables for trouble free operation shall be provided.
- 7) Quality Requirements in the Technical Specification are indicating minimum requirements for inspection and testing. Vendor shall note that quality plan is subject to Customer & BHEL-approval during detail engineering stage. Standard QP format is enclosed in the technical specification.
- 8) Indicative list of makes is enclosed as per Annexure-I however these equipments / items shall be subject to Customer & BHEL approval during detail engineering Stage.
- 9) Inserts or any support arrangement for fixing ducting, fans, piping etc. shall not be provided by BHEL. Necessary supports may be taken from nearest structure / walls / roofs / floors etc. by Vendor.
- 10) Fixing frame works for diffusers and grilles in the scope of Vendor.
- 11) Anchor fastener shall be used by vendor for fixing duct pipes etc. wherever applicable.
- 12) Necessary supports and structures / frames etc. as required for supporting the duct / piping / equipment's etc. as lump-sum basis is in the scope of Vendor and no unit rates shall be applicable for these items.
- 13) Drain piping within room up to the drain point to be provided by the Vendor.
- 14) Vendor to furnish schedule of power and control cables. Vendor to furnish cable termination details interconnection drawings etc. during detail engineering stage.
- 15) The tools and machine required for erection of equipment shall be arranged by Vendor.
- 16) Tools & tackles as required for regular maintenance shall be supplied by Vendor.
- 17) Instruments required for performance testing of various equipment / system of the package shall be arranged by Vendor at site.
- 18) Instrument for testing shall be calibrated by Ventilation plant supplier before taking up testing.
- 19) Temperature gauges shall be provided with thermo wells and fixing arrangement.
- 20) Pressure gauges shall have provision for air venting. Three way valves shall be used which shall have air venting provision.



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- 21) Matching sockets / stubs (weld type) for flow switches and other instruments shall be supplied.
- 22) Bidders shall guarantee to maintain specified inside design conditions during summer, monsoon and winter and also even if the internal equipment load varies from 100% to 25%.
- 23) Besides the system performance as above, bidder shall guarantee major technical parameters of various equipment's as per design basis / details furnished.
- 24) The guarantee tests shall cover but not limited to the following rated parameters for smooth operation of ventilation system.
 - Design dry bulb temperature and relative humidity of conditioned air, Auxiliary power consumption, Vibration and noise level etc.
 - Performance test of the Ventilation system shall be carried out at site after proper installation. The site test shall include performance testing of equipment for 72 continuous hours in summer or monsoon and 24 continuous hours in winter. Bidder, as may be required to carry out site tests shall arrange all instruments, tools etc.
 - All calibrated instruments to be used for the tests at manufacturer's works/site shall be arranged by the bidder. Any Electrical/C&I items and accessories like junction box, glands etc. shall be included by vendor in his scope. Only those items shall be provide free of cost which are categorically listed in the Electrical scope sheet of technical specification.
- 25) Motorized fire damper will be installed at supply air duct in electrical areas like MCC / Switchgear room / cable spreader room etc. in power house building and ESP building. Fire damper will close on receiving fire signal from fire protection system and shall also be possible manually from remote control panel. Also respective Air washers / UAFs shall trip on receiving fire signal from fire protection system.
- 26) Vendor to furnish drawings / documents as per the drgs. /documents submission schedule given in the contract.
- 27) Each motor terminal box shall be provided with cable gland and lugs for the size and type of power and control cable of respective motor.
- 28) All electrical equipment shall be suitable for the power supply fault levels and other climatic conditions indicated in project information / synopsis enclosed.
- 29) The bidder's proposal shall be for equipment in accordance with the Tech. Specification.
- 30) Tender drawings enclosed form the part of specification and the bidder shall check the space requirements.
- 31) Bidder should suitably group the signals coming from various instrument etc. and the same shall terminate in local JB, from Local JB common cable to PLC / panel / MCC shall be selected. Any Electrical / C&I items and accessories like junction box, glands etc. shall be included by vendor in his



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scope. Only those items shall be provided free of cost which are categorically listed in the Electrical scope sheet of technical specification.

- 32) Feeder for a combination of fire dampers / valves etc. shall be derived from respective control panel by bidder. Distribution through junction box / distribution board shall be in bidders' scope and shall have provision for isolation of individual fire damper / valves. Suitable transformer shall be provided by bidder (if required) to derive the power input.
- 33) In the event of any conflict between the requirements of two clauses of this specification documents or requirements of different codes and standards specified, the more stringent requirement as per the interpretation of the owner shall apply.
- 34) Bidder to note that BHEL reserve the right for drg/doc submission through web based Document Management System. Bidder would be provided access to the DMS for drg/doc approval and adequate training for the same. Bidder to ensure proper net connectivity at their end.
- 35) Quality requirements in the Technical specification are minimum requirements for inspection and testing. Vendor to note that quality plans are subject to Customer approval during detail engineering stage. Standard QP format is enclosed in the technical specification.
- 36) The drawings/ documents submitted by vendor 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 attributable to vendor's account. For any clarification/discussion required to complete the drawings, the bidder shall himself depute his personal to BHEL / Customer's place any number of time as per the requirement for across the table discussions/ finalizations/ submissions of drawings.
- 37) All openings required in brick wall for installing the axial supply and exhaust fans, propeller fans, duct opening, louvers and damper openings etc shall be done by vendor. Grouting of fans along with anchor fasteners shall also be done by vendor. The openings shall be finished properly. In case openings are done once the wall have been painted, repainting, to match with the existing wall paint shall also be done by the vendor. Sealing of duct opening, grouting of foundation / foundation bolts etc. including special type of grouting like GPX2 etc. are in the scope of Ventilation system vendor.
- 38) Flat, platform type RCC / PCC foundation shall be provided for installing Air washer / UAF and UAF fan / pumps etc. Vendor shall fix the equipment using proper anchor fasteners to secure the equipment and obtain parameter related to vibration and noise.
- 39) Bidder to note that the P&ID shows only the bare minimum requirement of valves and instruments. Any instrumentation & valves as required for the completion of the system in line with technical specification shall be provided by bidder during detailed engineering without any commercial implication.
- 40) All codes and standards shall be as per contract specifications

9. EXCLUSIONS

Items of works listed below are excluded from scope of the Ventilation plant supplier.



**1x370MW YELAHANKA CCPP
VENTILATION SYSTEM
SPECIFIC TECHNICAL REQUIREMENT**

SPECIFICATION No: PE-TS-409-553-A001

VOLUME: II B

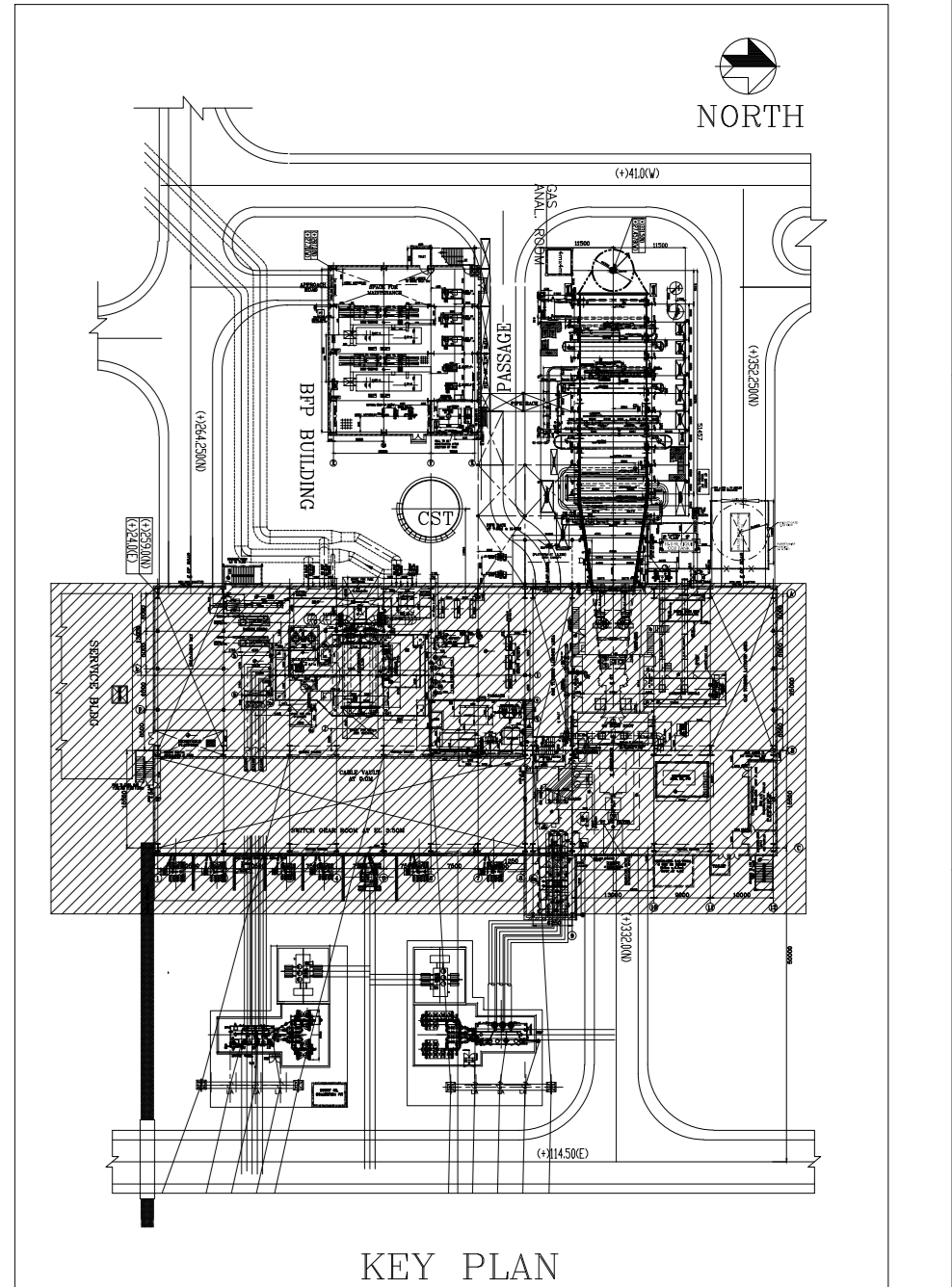
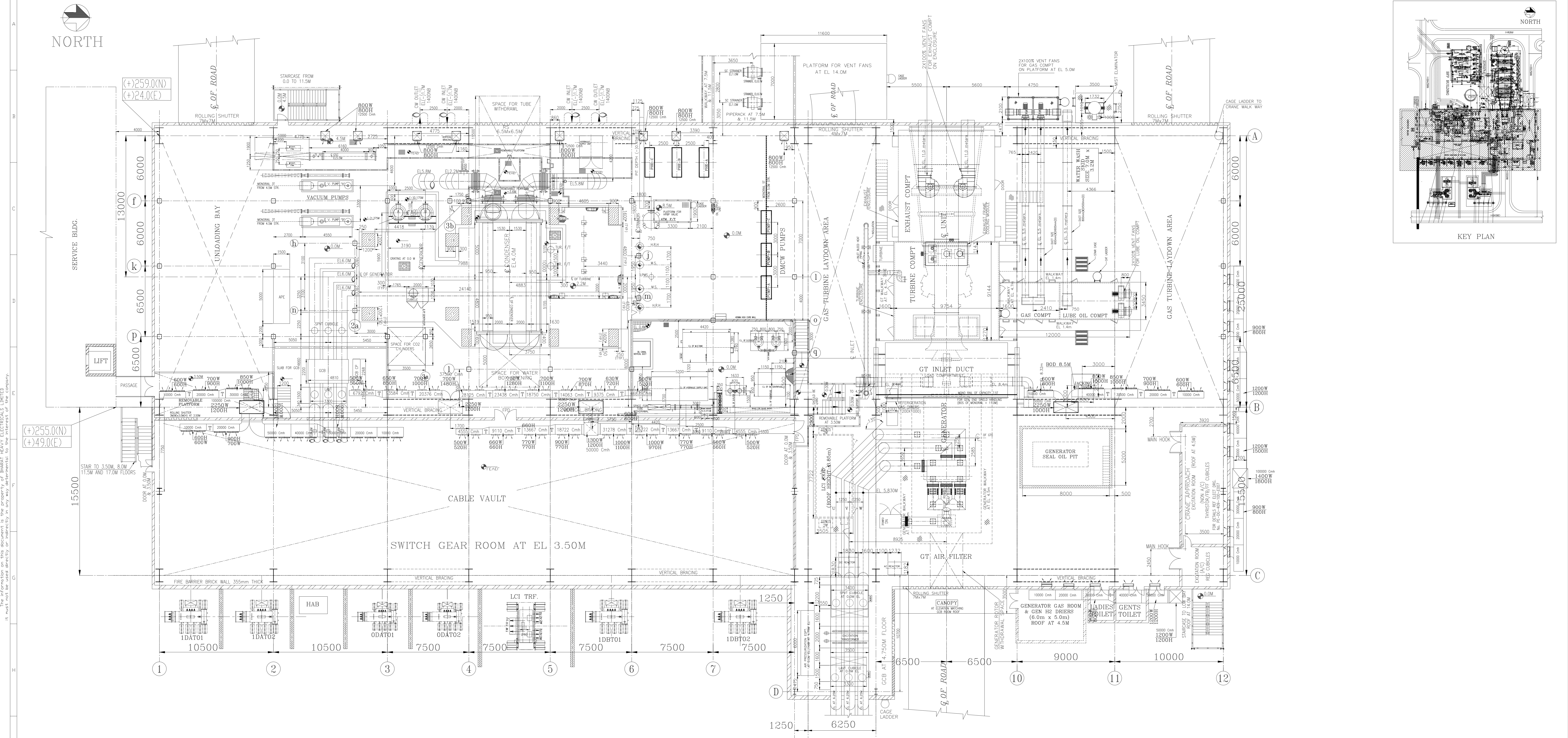
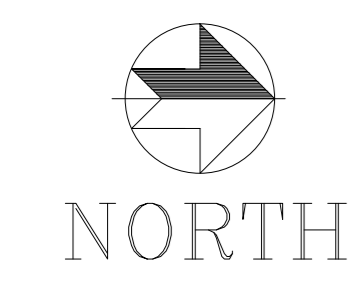
SECTION : C 1

REV. 01

DATE: JUNE 2016

SHEET 15 OF 15

- 1) Construction of Air washer plant room, foundations for Ventilation equipments (air washer, centrifugal fan, RE Unit only).
- 2) Slab cut out for running ducts, pipes, cables, grilles/dampers. Underground masonry trenches and masonry risers.
- 3) Provision of drain traps / points,
- 4) For Electrical scope, refer Electrical scope matrix sheet.
- 5) Lighting of Air washer plant rooms /areas
- 6) Lifting & handling arrangement in Air washer plant for maintenance purpose.
- 7) Structure for running the ventilation ducting header outside 'A'- Row, however required inputs shall be provided by the vendor.

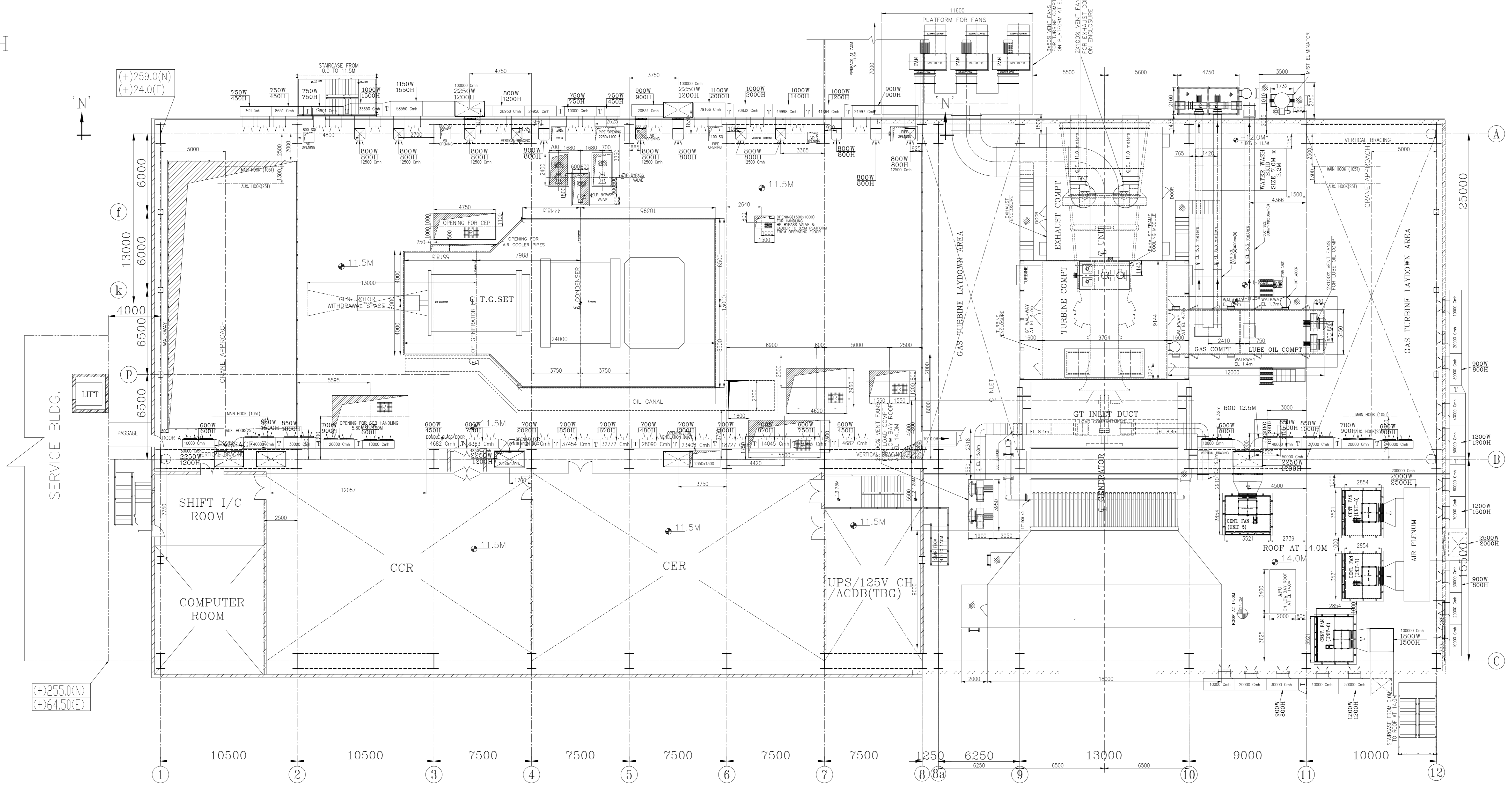
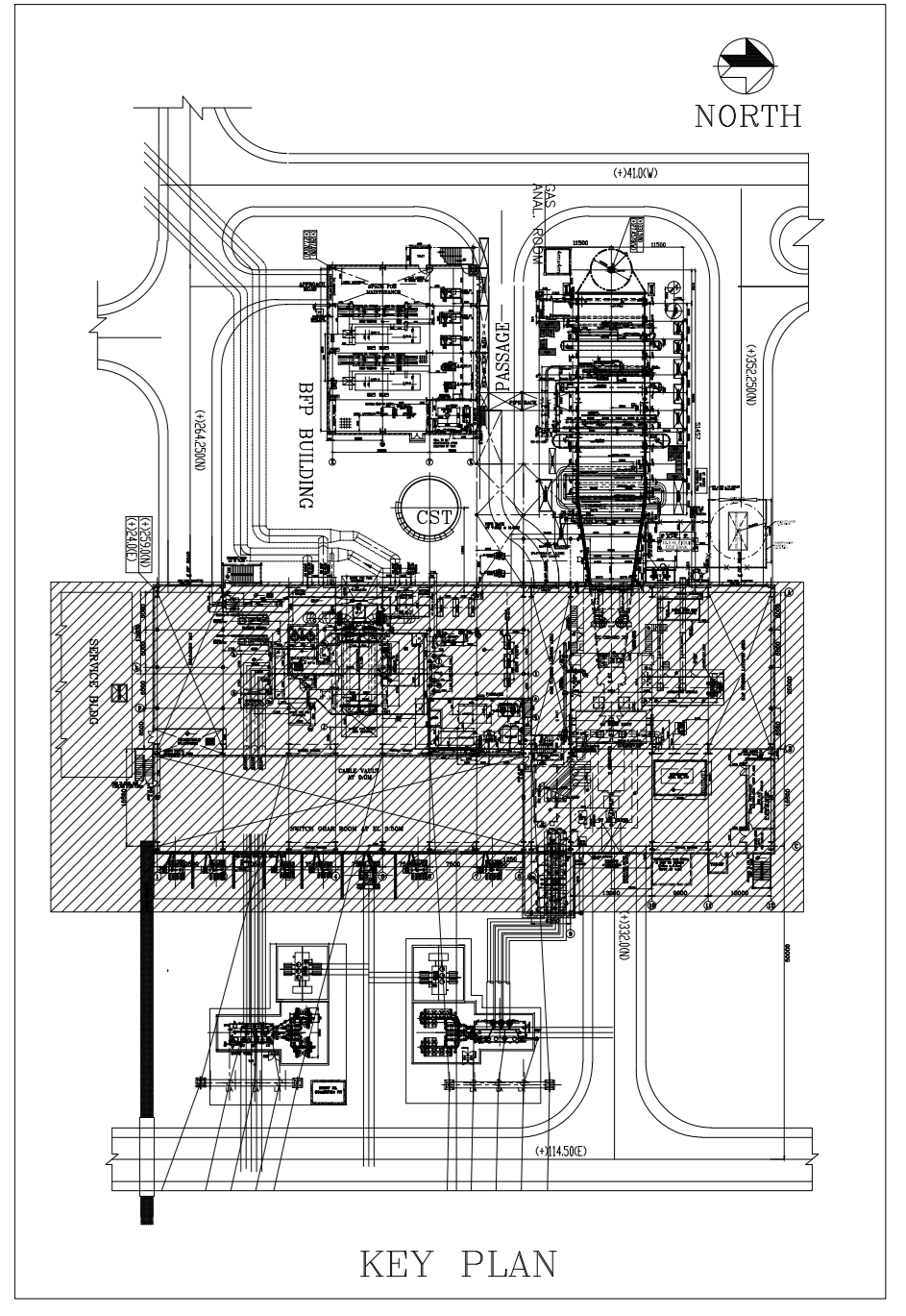
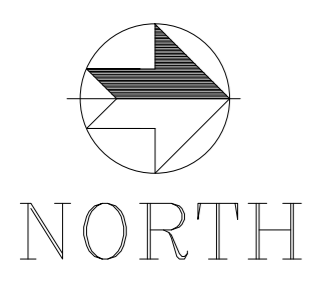


NOTE:
1. BIDDER SHALL FOLLOW THE DUCT ROUTING AS SHOWN IN THIS DRAWING. FURTHER, BIDDER TO RECHECK THE SIZE & CALCULATION.

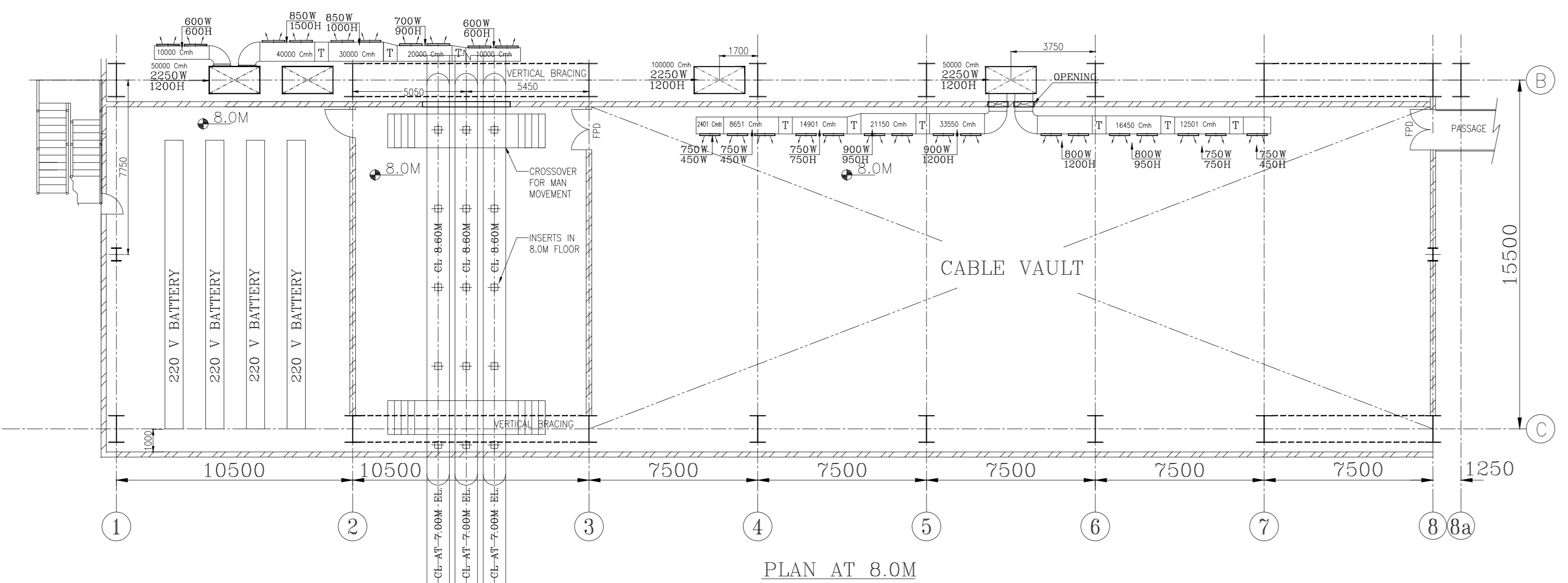
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OWNER KARNATAKA POWER CORPORATION LIMITED IX370 MW YELAHANKA COMBINED CYCLE POWER PLANT	
OWNER'S CONSULTANT FICHTNER	FICHTNER Consulting Engineers (India) Private Limited, Chennai, Bengaluru
EPC CONTRACTOR BHARAT HEAVY ELECTRICALS LTD	POWER SECTOR PROJECT ENGINEERING MANAGEMENT NDA
JOB No. 409	STATUS CONTRACT
DISTRIBUTION	
REV. DATE. ALTD. CHD. APPD.	REV. DATE. ALTD. CHD. APPD.
1. 02.04.2016 PUNEET LAJ	1. 02.04.2016 PUNEET LAJ
2. 03.05.2016 PUNEET LAJ	2. 03.05.2016 PUNEET LAJ
3. 04.06.2016 PUNEET LAJ	3. 04.06.2016 PUNEET LAJ
TITLE VENTILATION DUCT LAYOUT DRAWING A-ROW & BC BAY SIDE	
MPL. C. MSE. I. MAX. E.	DEPT. SCALE
DRAWING NO. PE-DG-409-554-A605	
SHEET 01 OF 04 REV. 0	

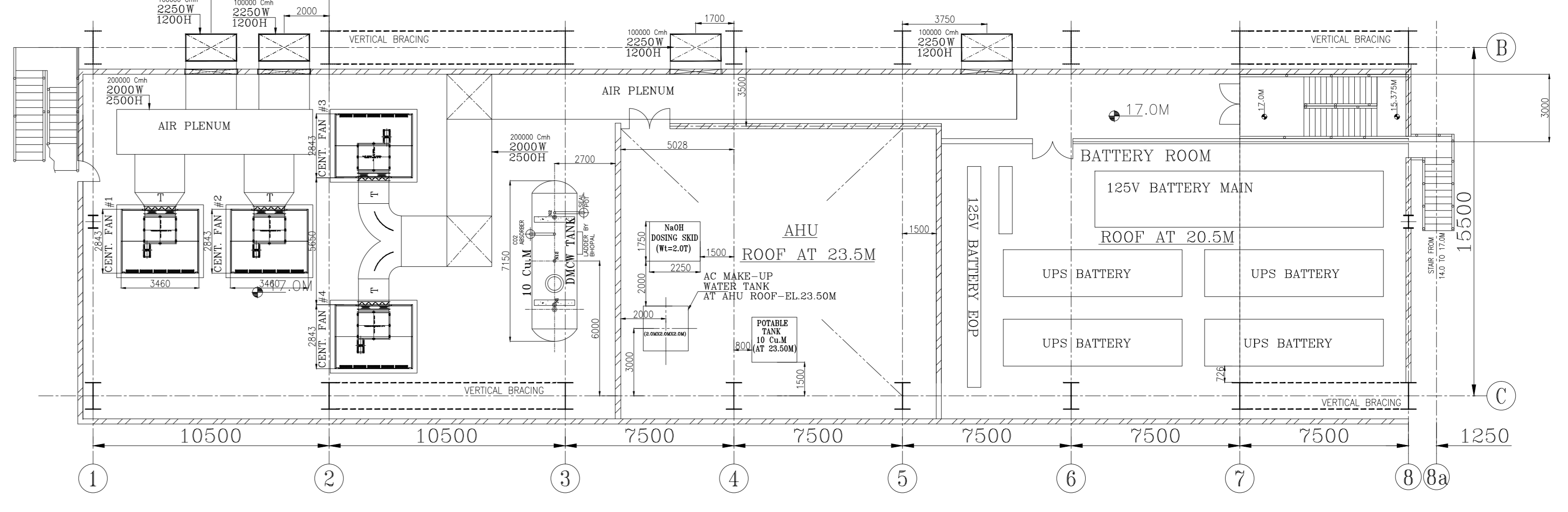
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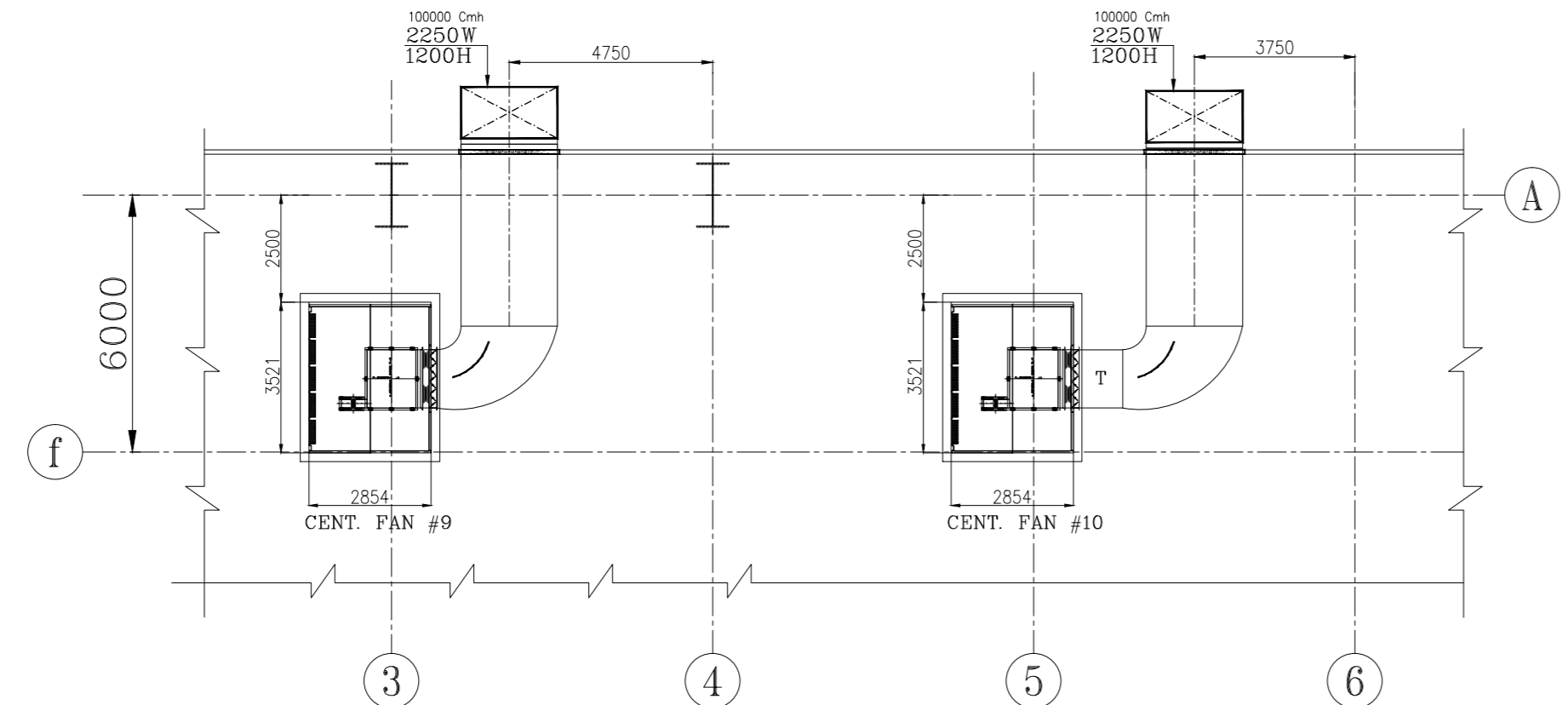
PLAN AT 11.5M



PLAN AT 8.0M



PLAN AT 17.0M



PLAN AT STG HALL AB BAY ROOF ≈ EL.32.0M

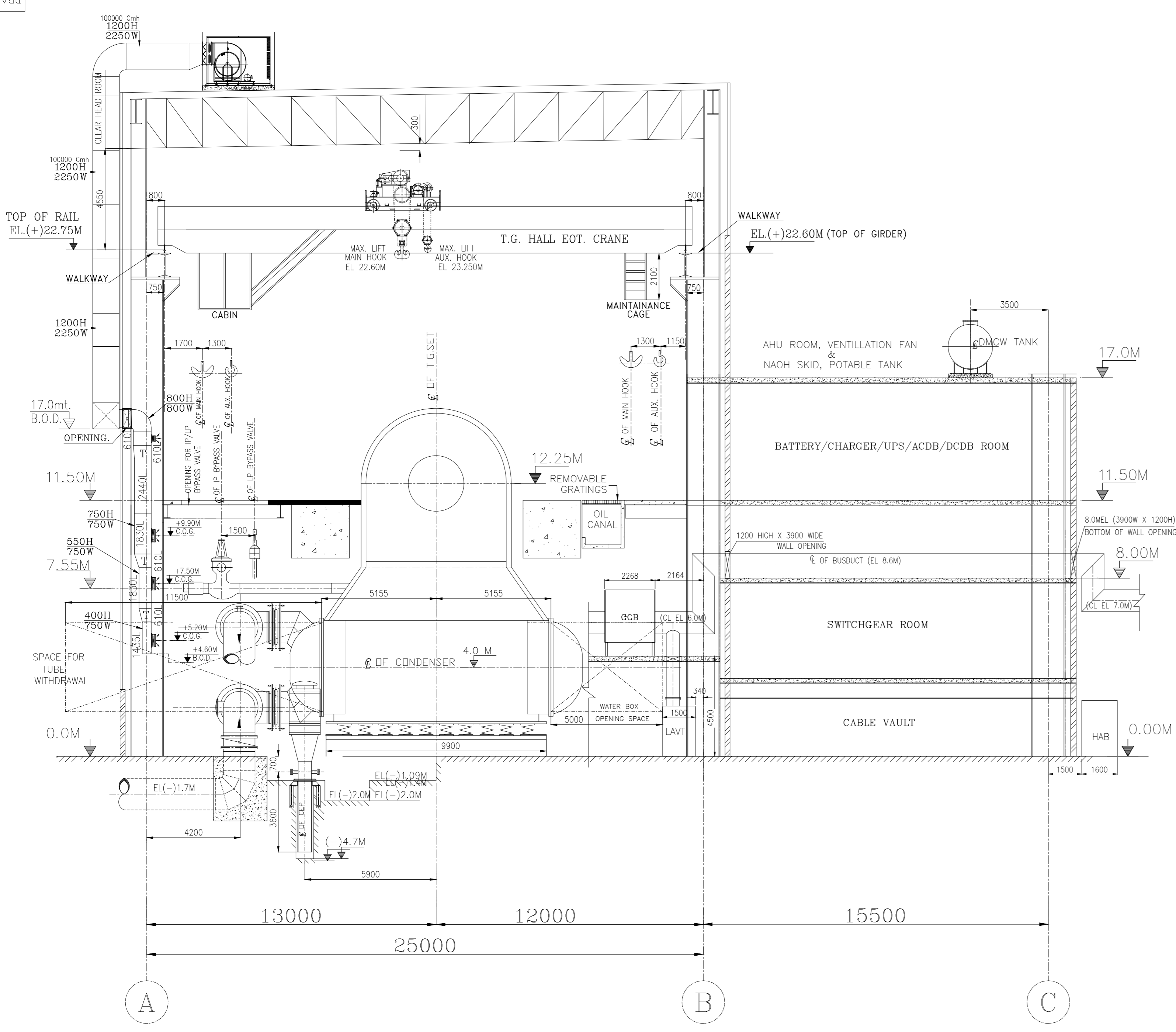
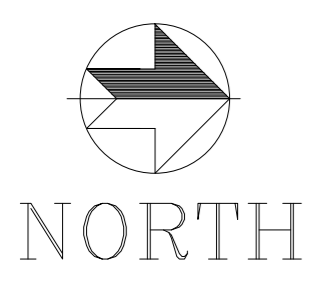
LIFT, RIGHT AND CONFIDENTIAL. The information on this drawing is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company. COMPUTER FILE NAME: 409-102-1005-22

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STATUS	CONTRACT
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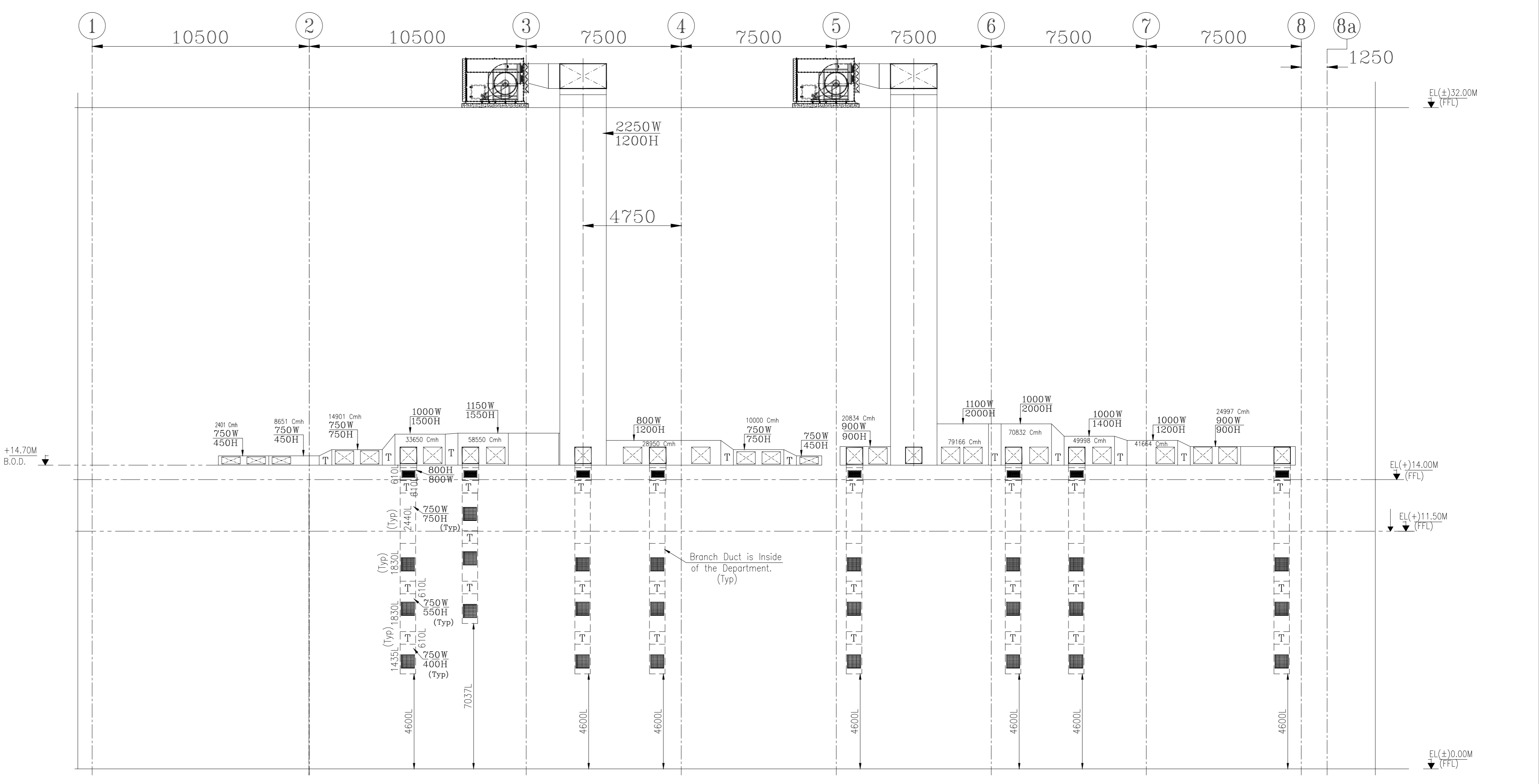
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OWNER'S CONSULTANT	FICHTNER Consulting Engineers (India) Private Limited, Chennai, Bengaluru			
EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA			
DEPT. CODE	DRN	NAME	SIGN	DATE
M	BE/SN	AG		25.05.2016
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	APPD	SKM		25.05.2016

REV	DATE	ALTD	CHD	APPD	REV	DATE	ALTD	CHD	APPD

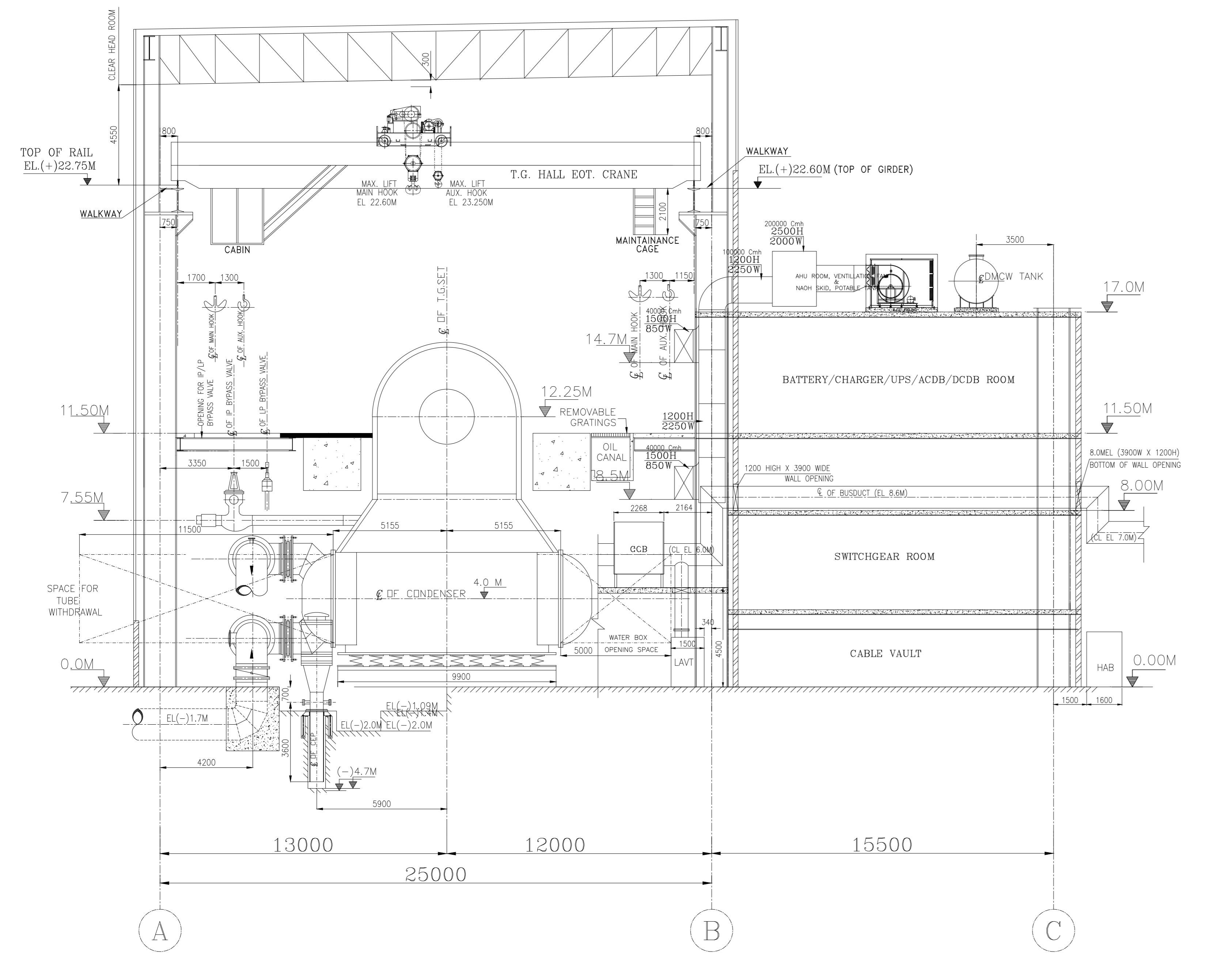
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MPL	C	MSE	I	MAX	E	DEPT. SCALE	DRAWING NO. PE-DG-409-554-A605		
SIGN					SHEET 02 OF 04				
DATE					REV. 0				



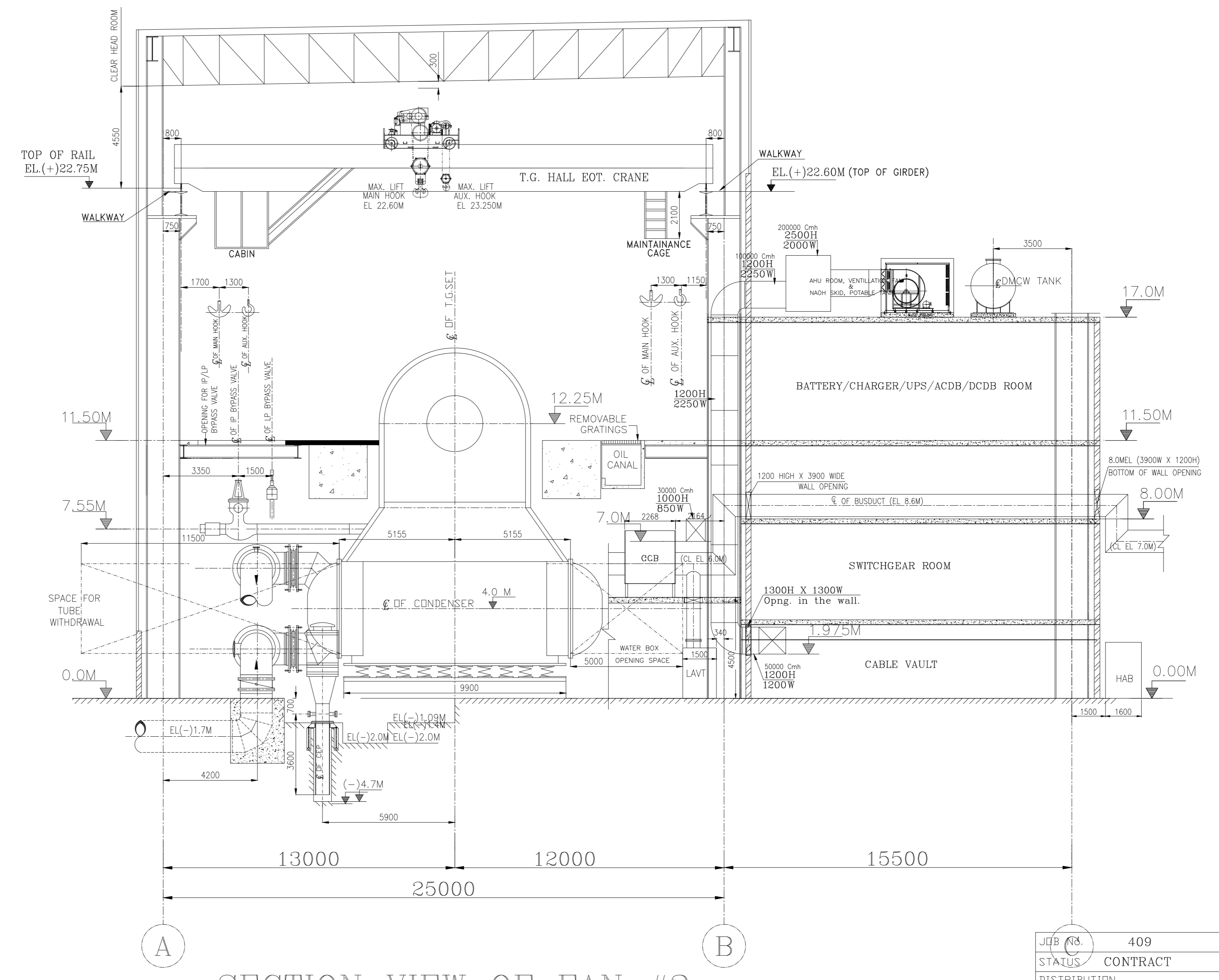
SECTION VIEW OF FAN #9 & #10



SECTION AT-NN



SECTION VIEW OF FAN #1



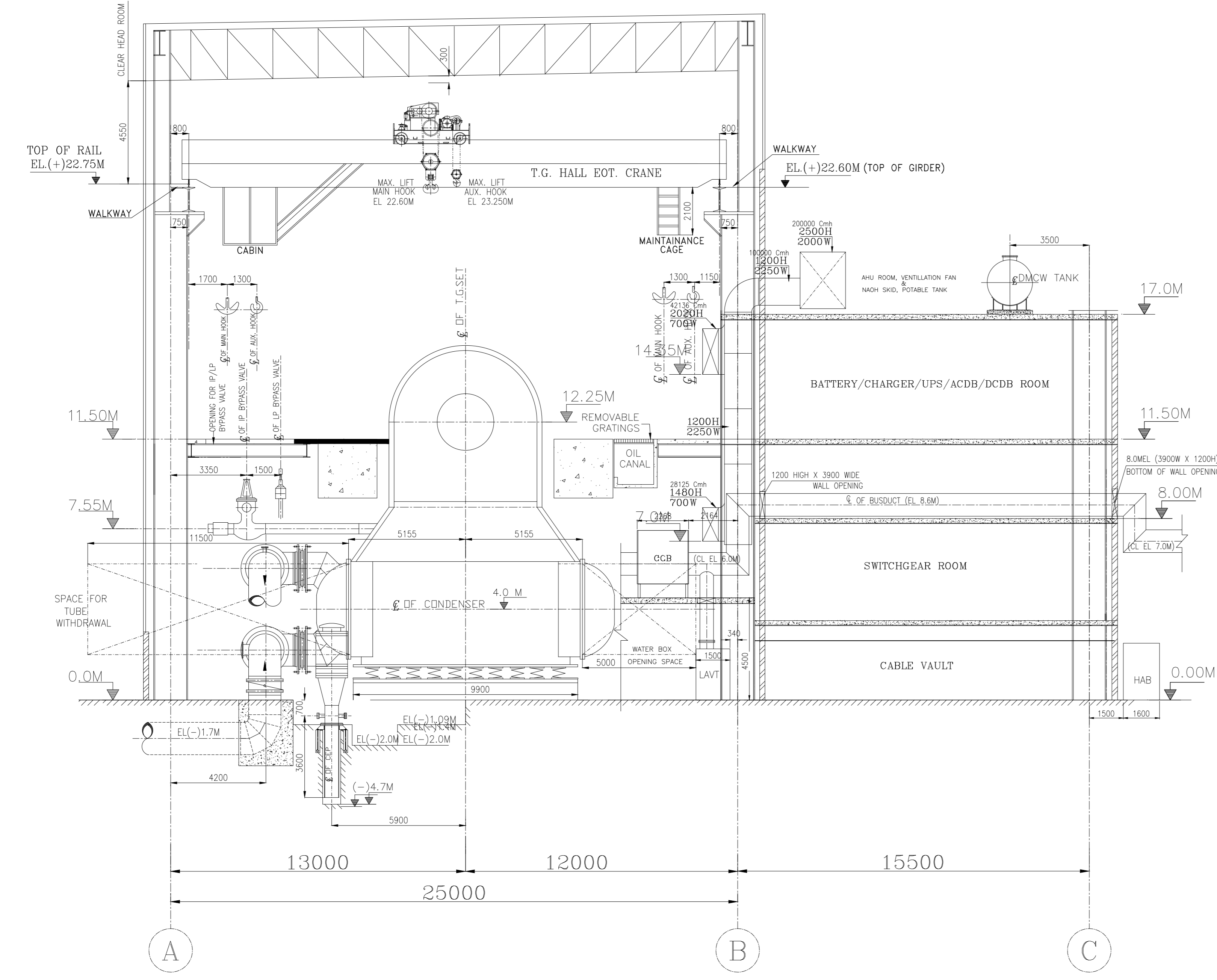
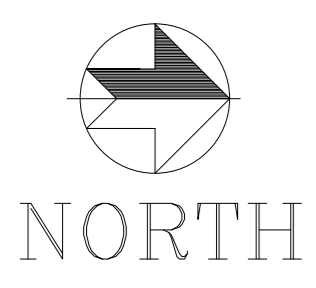
SECTION VIEW OF FAN #2

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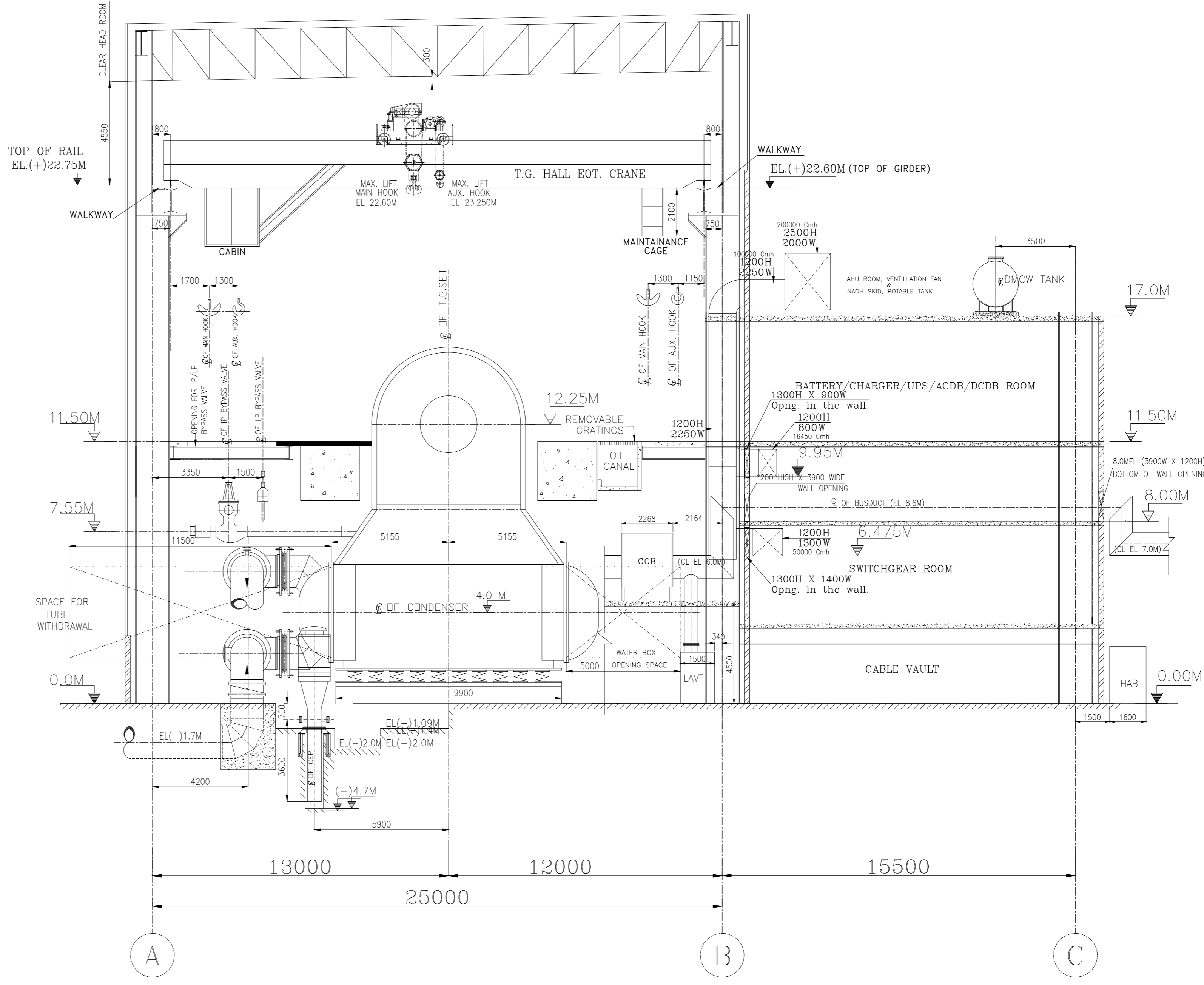
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OWNER'S CONSULTANT		IX370 MW YELAHANKA COMBINED CYCLE POWER PLANT	
FICHTNER		FICHTNER Consulting Engineers (India) Private Limited, Chennai, Bengaluru	
EPC CONTRACTOR		BHARAT HEAVY ELECTRICALS LTD	
JOB NO.		409	
STATUS		CONTRACT	
DISTRIBUTION		POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA	
DEPT. CODE	DRN. YR.	NAME	SIGN.
M	BE3N	AG	
	CHD	VR	
	APPD	SKM	

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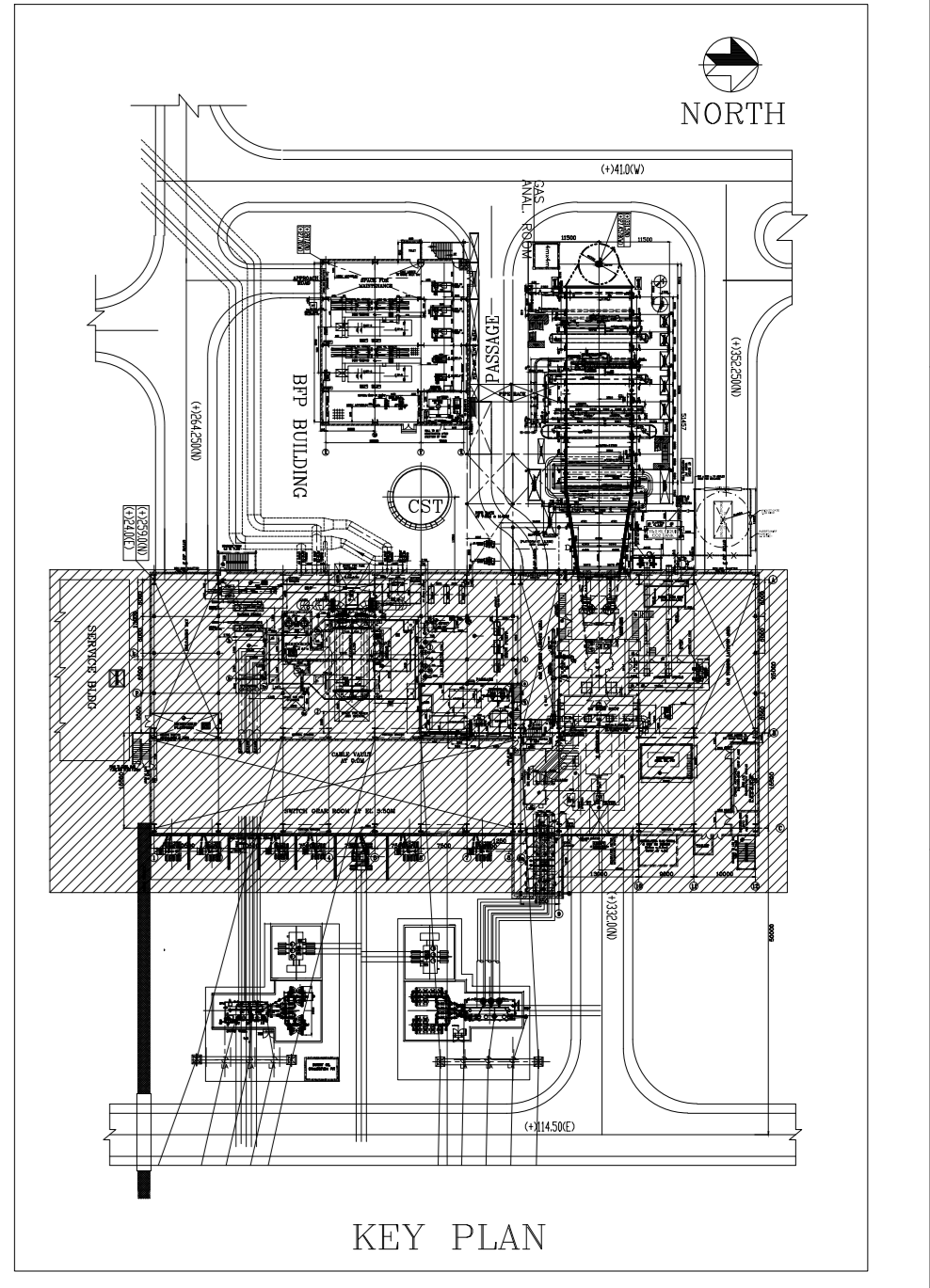
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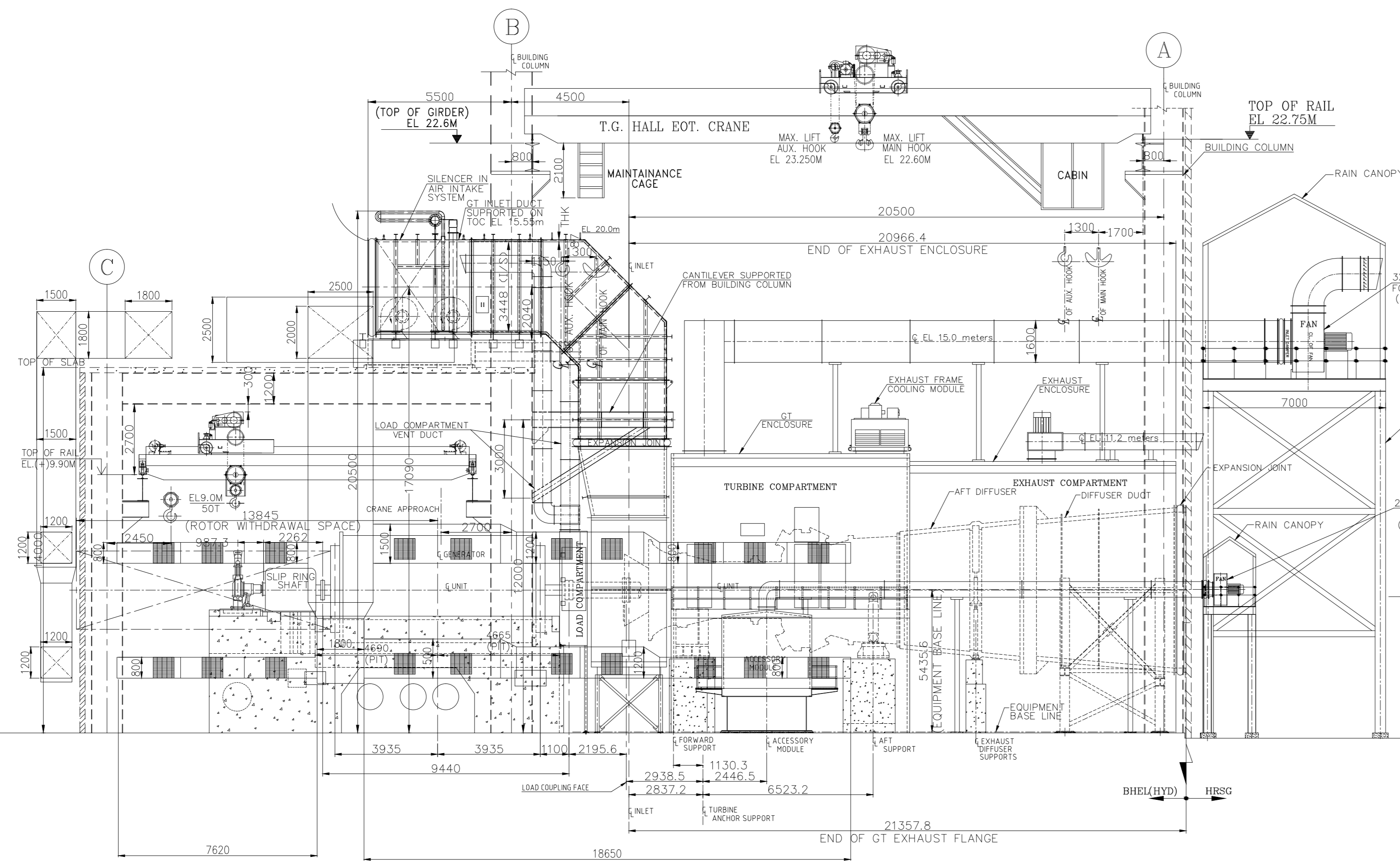
SECTION VIEW OF FAN #3



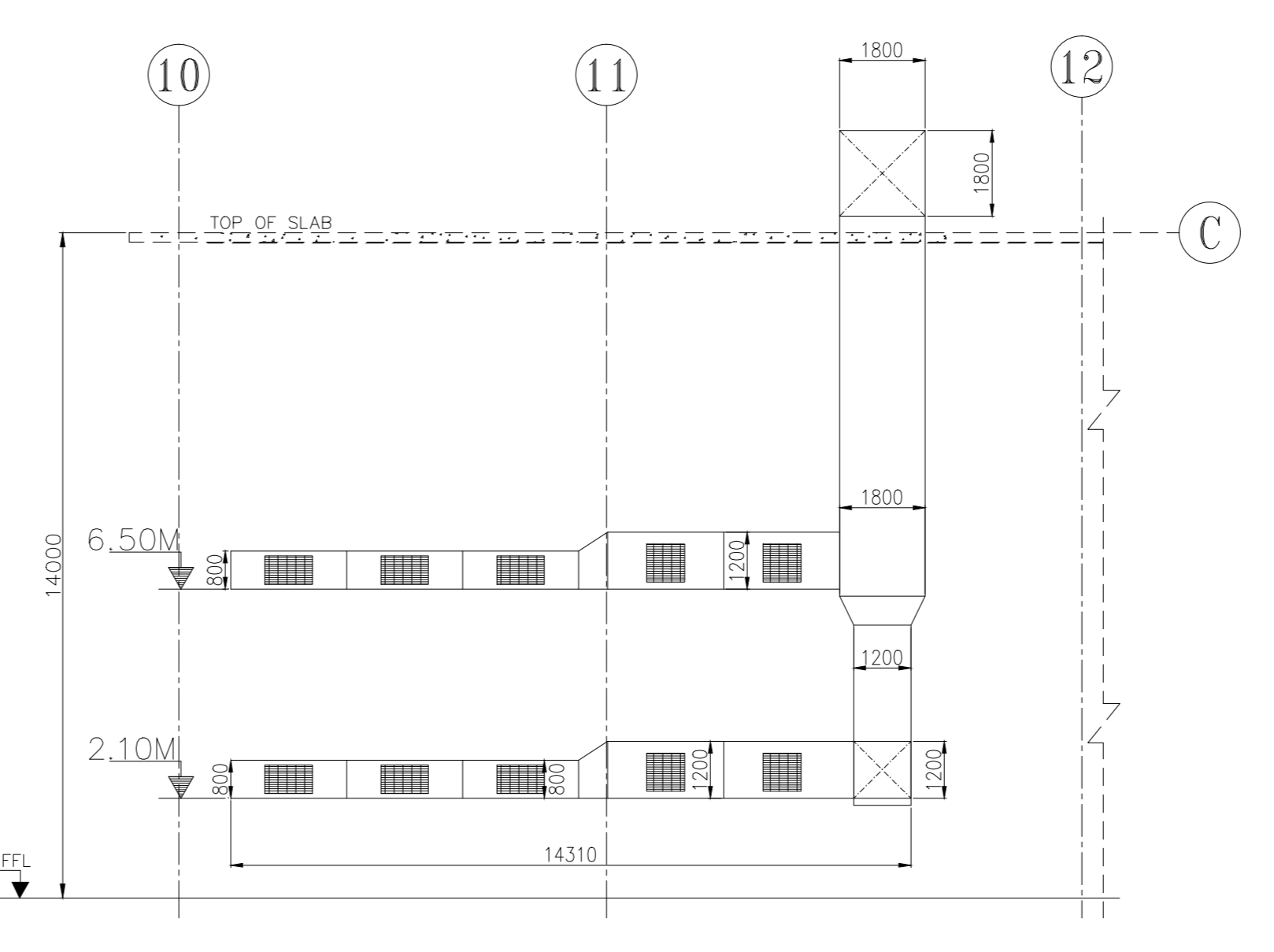
SECTION VIEW OF FAN #4



KEY PLAN



SECTION VIEW OF FAN #7 & 8



SECTION VIEW OF FAN #6

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JOB No.	409
STATUS	CONTRACT
DISTRIBUTION	
TO	
NO. OF	

OWNER	KARNATAKA POWER CORPORATION LIMITED IX370 MW YELAHANKA COMBINED CYCLE POWER PLANT				
OWNER'S CONSULTANT	FICHTNER Consulting Engineers (India) Private Limited, Chennai, Bengaluru				
EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LTD POWER SECTOR PROJECT ENGINEERING MANAGEMENT NOIDA				
DEPT. CODE	DRN	YR	NAME	SIGN	DATE
M	CHD	VR	BE/SN	AG	25.05.2016
			CHD	VR	25.05.2016
			APPD	SKM	25.05.2016

REV	DATE	ALTD	CHD	APPD	REV	DATE	ALTD	CHD	APPD

TITLE					VENTILATION DUCT LAYOUT DRAWING A-ROW & BC BAY SIDE				
MPL	C	MSE	I	MAX	E	DEPT.	SCALE	DRAWING NO.	PE-DG-409-554-A605
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