

S. NO.	DESCRIPTION	QTY.	MATERIAL
46	FLEXIBLE COUPLING (SPACER TYPE)	01	C.I.
45	COUPLING GUARD	01	M.S. (Fab.)
44	DOWEL PIN (Wearing Ring Impeller)	04	EN-8/EN-9
43	WEARING RING IMPELLER (Front & Back Side)	02	BRONZE (IS:318, L.TB-II)
42	HEX. HD. BOLT WITH NUT & WASHER	04	M.S. (IS-1367 Gr.-4.6)
41	SKID BASE	01	Carbon Steel (IS-2062)
40	O-RING	01	NITRILE RUBBER
39	STUD BOLT WITH NUT	02	M.S. (IS-1367 Gr.-4.6)
38	HEX. HD. CAP SCREW	12	M.S. (IS-1367 Gr.-4.6)
37	STUD BOLT WITH NUT	02	S.S.-316
36	PIPE NIPPLE	01	STEEL
35	WATER SLINGER	01	RUBBER
34	PIPE PLUG	01	M.I.
33	PIPE PLUG	02	M.I.
32	GREASE RELEASE FITTING	02	STEEL
31	PIPE PLUG	01	M.I.
30	HEX. HD. BOLT WITH NUT & WASHER	02	M.S. (IS-1367 Gr.-4.6)
29	SUPPORT FOOT	01	M.S. (Plate)
28	HEX. HD. CAP SCREW WITH WASHER	02	M.S. (IS-1367 Gr.-4.6)
27	BRG. LOCK WASHER	01	STEEL
26	BRG. LOCK NUT	01	STEEL
25	KEY FOR COUPLING	01	EN-8
24	PUMP SHAFT	01	ASTM A 276 S.S.-316
23	BEARING SPACER (INNER)	01	STEEL
22	HEX. HD. CAP SCREW	08	M.S. (IS-1367 Gr.-4.6)
21	BEARING COVER	01	C.I. (IS-210, FG 260)
20	BEARING SPACER (OUTER)	01	STEEL
19	FRAME/BEARING HOUSING	01	C.I. (IS-210, FG 260)
18	PIPE PLUG	01	M.I.
17	ANTI FRICTION BEARING (N.D.E.) (6310 Z-C3)	02	BRG. STEEL (SKF/ FAG)
16	BEARING COVER	01	C.I. (IS-210, FG 260)
15	GLAND HALF	02	C.I. (IS-210, FG 260)
14	SHAFT SLEEVE	01	ASTM A 276 S.S.-316
13	GREASE CUP WITH N.R.V.	01	STEEL
12	PIPE NIPPLE WITH COUPLING	01	G.I.
11	WATER SEAL RING	01	BRONZE (IS:318, L.TB-II)
10	PACKING PCS. (Champion Make, Style No.- 3116)	04	GRAPH. IMP. COTTON YARN. (Non Asbestos)
09	BACK COVER/BACK HEAD	01	2% NI.C.I. (IS-210, FG 260)
08	WEARING RING CASING (Back Side)	01	BRONZE (IS:318, L.TB-V)
07	PIPE PLUG	02	M.I.
06	KEY FOR IMPELLER	01	EN-8
05	IMPELLER NUT	01	STEEL
04	IMPELLER	01	BRONZE (IS:318, L.TB-II)
03	WEARING RING CASING (Front Side)	01	BRONZE (IS:318, L.TB-V)
02	DOWEL PIN	04	EN-8/EN-9
01	CASING (VOLUTE)	01	2% NI.C.I. (IS-210, FG 260)

FLOWMORE LIMITED
NEW DELHI
JOB NAME :- RECIRCULATION WATER PUMP

DRN.	NAME	DATE	TITLE	SCALE
	SUNIL	02.01.2019	CROSS SECTIONAL DRAWING FOR HORIZONTAL END SUCTION PUMP	N.T.S.
	D.K.S.	02.01.2019		SHEET 1 OF 1
	P.K.S.	02.01.2019		SIZE A4
	DRAWING NO.	CSD-SALE18123878 10		REV. 0

PUMP PARTICULARS

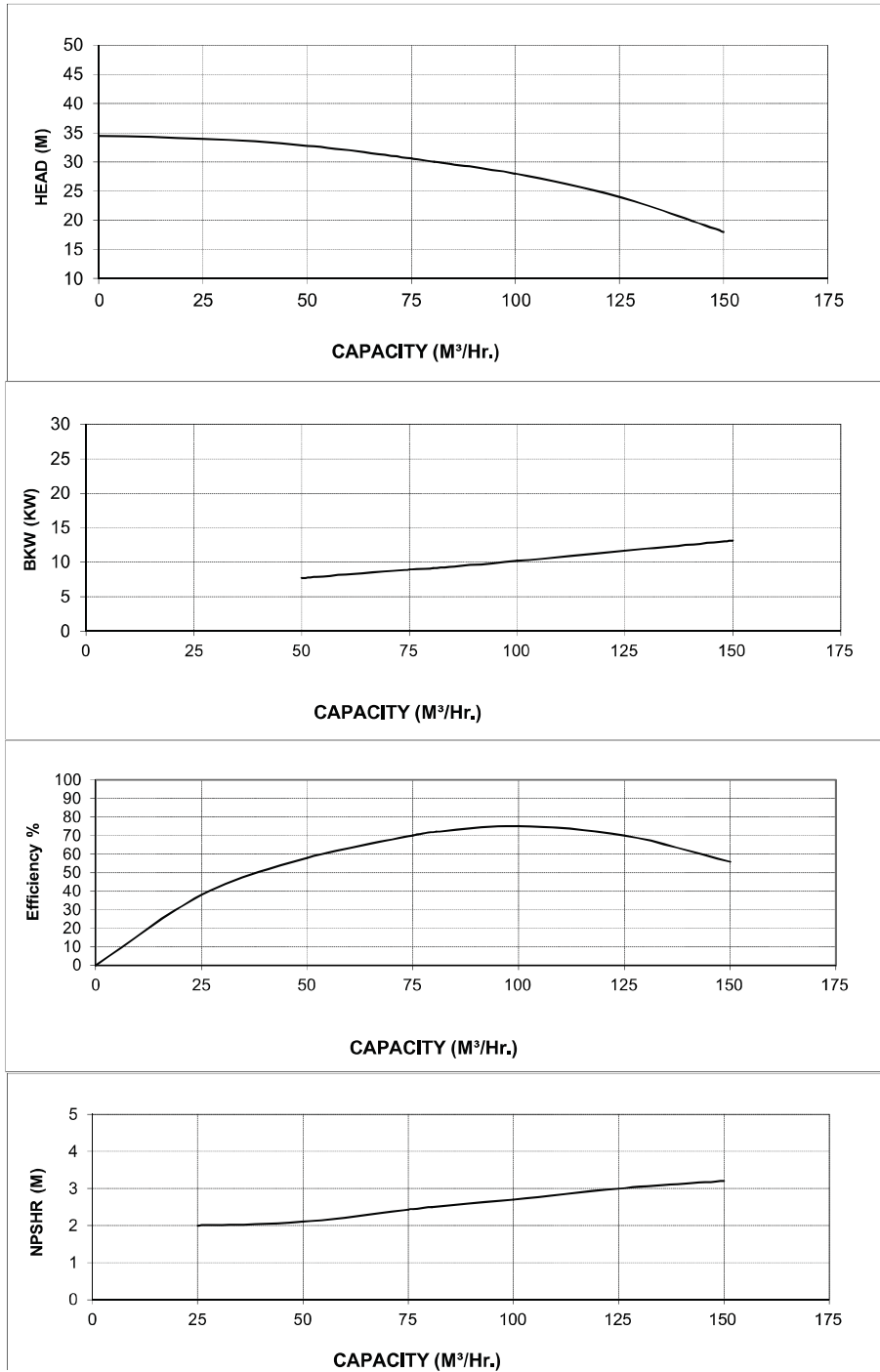
FIG.	--	F 5625
SIZE	--	125x100 (5"x4")
STAGE	--	SINGLE
LUB.	--	GREASE

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

THESE ITEM ARE NOT SHOWN IN THIS DRAWING.

FLOWMORE LIMITED

PERFORMANCE CURVE



		MODEL	F5625 125X100
CAPACITY	81 M³/Hr	TYPE	Endsuction
HEAD	30 Mtrs	NPSHR	2,5 Mtrs
EFFICIENCY	72 %	RPM	1480 rpm
INPUT	9,14 KW	MOTOR RATING	15 KW



CLAUSE NO.

FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES

(xi) Mist Outlet Droplet Content APPLICABLE FOR ANNEXURE-I, ITEM NO. B1.1, B1.2 & B1.3, PERFORMANCE TEST APPLICABLE FOR UAF

The mist eliminator outlet droplet content shall be guaranteed to be ≤ 20 mg/Nm³ at absorber outlet measured over a period of 24 hrs continuous operation.

Mist outlet-droplet content shall be measured as per applicable clauses in VDI Norm 3679 and the Contractor shall carry out the tests as per the test procedure approved by the Employer.

(xii) Availability of FGD Plant

The Contractor shall guarantee the maximum availability of FGD Plant for the range of coal and limestone specified inline with the requirements stipulated in clause 7.00.00 of this Sub-Section

(xiii) Air Conditioning System

A. Following shall be demonstrated at Shop

- 1) Capacity and static pressure of AHU fans at its rated duty point.

B. Following shall be demonstrated at Site

- 1) Capacity (TR) of air cooled condensing units (D-X type) for A/C system of FGD control room building.
- 2) Guaranteed room conditions during summer for all the Air conditioned areas.
- 3) Vibration and noise level of condensing units & centrifugal fans of AHUs.

(xiv) Ventilation System

A. Following shall be demonstrated at Shop

- 1) Capacity and discharge pressure of pumps of UAF units at its rated duty point of Ventilation system.
- 2) Capacity and static pressure of UAF fans at its rated duty point of Ventilation system.

B. Following shall be demonstrated at Site

- 1) Vibration & Noise level of centrifugal fans & pumps of UAF units.


(xv) Compressed Air System

a) Following shall be demonstrated at shop:

- i) Capacity and discharge pressure of each air compressor.

b) Following shall be demonstrated at site:

- ii) Dew point of air at the outlet of air drying plants of air compressor.

CLAUSE NO.	FUNCTIONAL GUARANTEES AND LIQUIDATED DAMAGES			
6.00.00	<p>xxvii) Air Conditioning System (*)</p> <p>Total Power consumption at motor input terminals of working units (i.e. excluding stand-by) at its rated duty point of compressor and condenser fans of air cooled condensing unit, Air handling unit (AHU) fans for the Air conditioning system of FGD Control Room Building divided by total nos. of units in respective project..</p> <p>xxviii) Total power consumption at motor input terminal at rated duty of fan of UAF divided by total nos. of units in respective project. (*)</p> <p>((*) Above guaranteed power consumption values shall be at 20 deg C for centrifugal fans of AHUs and at 30 deg C for centrifugal fans of UAF units and at an elevation of RL (referring to GLP of respective projects) for both AHUs and UAF centrifugal fans.)</p>			
	<p>xxix) Total power consumption at motor input terminal at rated duty of Air compressor, Air drying plant (Heater and blower, as applicable) divided by total nos. of units in respective project</p> <p>NOTE:</p> <ol style="list-style-type: none"> The equipment's listed above for calculating auxiliary power consumption are indicative. Any other equipment required for continuous operation of the system shall also be considered for calculation of auxiliary power consumption. Power consumption of all equipments provided on unitized basis shall be included in the unit auxiliary power consumption. For common station auxiliaries, the power consumption shall be assigned to each unit based on unit load for the purpose of calculating the unit auxiliary power consumption. The bidder shall furnish a list of equipments to be covered under auxiliary power consumption, which shall be subject to Employer's approval. Transformer losses (TL) shall be considered as per following (as applicable)- Aux/LT Outdoor/ LT Indoor Transformer: 100 % No load loss and 25 % of Copper Losses. Auxiliary power shall be measured without SCR (De-NOx) system. Auxiliary power shall be measured at the switchgear of the drives. <p>METHOD OF COMPUTING TEST EFFICIENCY OF FGD</p> <p>The performance tests shall be carried out in accordance with ASME PTC 40 (1991) code. No tolerance or allowance on the test result will be permitted for instrument errors or inaccuracy, the method of testing or any other causes. The details of the</p>			
<p>LOT-3 PROJECTS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE</p>	<p>TECHNICAL SPECIFICATION SECTION – VI, PART-A BID NO. CS 3011-109(3)-9</p>	<p>SUB-SECTION-VI FUNCTIONAL GUARANTEES & LIQUIDATED DAMAGES</p>	<p>PAGE 28 OF 30</p>	

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Package	HVAC FOR FGD	
Document Title	PG Test Procedure for AC & Ventilation System	
OWNER	NTPC Limited	
EPC Contractor	Bharat Heavy Electrical Limited	
Document No.	PE-V0-466-(571-13000-A)-A404	Rev.:02
CONTRACTOR		

1.0.0 INTRODUCTION

In accordance with the condition of contract / letter of award on successful completion of system trial operation at site and liquidation of all defects, the system / individual equipments shall be subjected to performance and Guarantee Tests at site.

2.0.0 SCOPE

The test procedure shall cover the Performance and Guarantee Tests to be conducted at site for the entire system / sub systems and individual equipments covered in the Air-conditioning & Ventilation System as specified. The test procedure shall cover the testing method for parameters covered as "Guaranteed Parameters" in LOA and checking of ratings and performance requirements stipulated for various equipments covered in the specifications.

3.0.0 OBJECTIVE OF THE TEST

- 3.1.0 To check healthy working of all the equipments forming the total air conditioning and ventilation system.
- 3.2.0 To check the power consumption of the motors for which power consumption limits are guaranteed at specified capacity of equipments.
- 3.3.0 To verify the total capacity of the plant including stand-by equipments. The tonnage rating (capacity) obtained from all AHUs. However, capacity of plant shall be verified during summer but room temperature verification for 24 hours shall be done in both summer and monsoon.
- 3.4.0 Capacity rating and guaranteed power consumption to be established during summer only during May to August, when the ambient temperature (DBT) is generally high and humid.
- 3.5.0 To check the temperature and relative humidity conditions during summer and monsoon in the air-conditioned space with those incorporated in the contract.
- 3.6.0 Operating parameters of the system to be logged for complete cycle with calibrated instruments at the time of capacity test.
- 3.7.0 Operating parameters of the system may be logged with online instruments except calibrated psychrometer for Room condition test during Monsoon test.
- 3.8.0 To check satisfactory operation of all safety switches and electrical interlocks for each individual equipment and for the complete system.
- 3.9.0 Vibration and noise level to be measured for all rotating equipments.

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4.0.0 CONDITION OF TEST

4.1.0 CONDUCTANCE OF TEST

Performance and Guarantee Test at site shall be conducted by accredited representatives of the Vendor, BHEL/ NTPC. The contractor shall be given permission to inspect the entire system in advance and make it ready for test. Vendor's representative's witness and associate with all phases of the test and record the data jointly with BHEL/NTPC representatives.

4.1.1 The responsibility for conducting the test rests with the vendor.

4.1.2 Necessary power supply to all the equipments (as required by system) as per scope shall be provided by BHEL/NTPC.

4.2.0 TEST INSTRUMENTS

4.2.1 All instruments required for the PG Test will be provided by the Vendor.

4.2.2 Calibration of test instruments shall be responsibility of the vendor

4.2.3 Calibration of instruments (to be used in the test) shall be carried out at a Govt. / NTPC/BHEL approved test laboratory/NABL approved Laboratory.

4.2.4 Calibration of the instruments should be carried out prior to, but not more than six months before the commencement of the test. The calibration certificate of the instruments should be valid for the period of the test.

4.2.5 Calibration certificates (in original) of all instruments from Govt. /NTPC/BHEL approved Test Laboratory shall be submitted by the vendor for NTPC approval prior to start of the test. Original Calibration certificate will be returned to vendor after review & acceptance of the certificate.

4.2.6 All the calibrated instruments preferably shall be sealed after calibration at Test Lab & intactness of the seal shall be checked by NTPC/BHEL before start of the test. NTPC/BHEL shall issue a certificate confirming the breakage of the seal after verification of instruments.

4.2.7 On line pressure gauges shall be used for recording the parameters of compressor cycle.

4.2.8 Calibrated gauges of $\pm 0.5\%$ accuracy shall be used on water circuit for pressure and temperature measurement.

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4.2.9 Airflow of AHU shall be measured by using calibrated anemometer /velometer.

4.2.10 Bearing temperature is to be measured with Temperature Gun of ± 1 Deg C accuracy with LC of 0.5 deg C.

4.2.12 Dry and wet bulb temperatures shall be measured using sling psychrometers. The sling psychrometers shall be ± 0.5 % accuracy with LC of 0.5 Deg C.

4.2.13 All power consumption measurements shall be done by 2-wattmeter method OR clamp-on power analyzer. The wattmeter of accuracy class $\pm 1\%$ duly calibrated shall be used.

4.2.14 Tachometer for RPM measurement shall be of $\pm 1.0\%$ accuracy.

4.2.15 Calibrated instruments shall be used for vibration and noise level measurement.

4.3.0 PRE-REQUISITES TO THE P & G TESTS

4.3.1 The contractor should furnish a written statement to the effect that work covered in the contract has been completed for the system for which PG test will be carried out.

4.3.2 All the erection/commissioning protocols in respect of hydro test of pipelines headers, alarm/annunciation/control system, vibration and noise level data of AHU and Condensing Unit during commissioning shall be made available during PG Test by the vendor.

4.3.3 All NTPC approved datasheets for the plant/system for which PG test is to be carried out to be made available during PG Test.

4.3.4 Uninterrupted power supply within specified parameters for the duration of the test to be ensured by NTPC/BHEL.

4.3.5 Proper lubrication and oil level of all equipments to be ensured.

4.3.6 Cleanliness of plant/system shall be ensured by BHEL/NTPC.

4.3.7 Protection relays of switchgears and all motor feeders shall be checked by BHEL/ NTPC.

4.3.8 Readiness of all protections, interlocks and safety switches to be ensured. Joint protocol in this respect shall be signed.

4.3.9 Availability of suitable fire protection systems/firefighting equipments to be ensured By BHEL/NTPC during PG Test.

4.3.10 Deputation of team to site to be associated with the P & G Test to be ensured by the Vendor.

4.3.11 Successful completion of trial operation.

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4.3.12 Arrangement of all calibrated test instrument as per Cl. No. 4.2.0 to be ensured by the VENDOR

4.3.13 The plant/system shall be jointly inspected by NTPC/BHEL, Vendor and a joint protocol shall be signed that the plant is fit for P & G Test.

4.4.0 GUARANTEED PARAMETERS DECLARATION

The contractor should furnish a declaration in the manner as per Appendix-I for the guaranteed parameters which attract levy of liquidated damages for shortfall in performance. Also declaration in manner as per Appendix-II shall be given by contractor for other parameter covered as other guaranteed parameter Without liquidity damages.

5.0.0 TEST METHODOLOGY

The test can be classified into two following groups:

Air-conditioning System

1. Equipment performance
2. Capacity Assessment – Verify the plant capacity (tonnage rating), during summer Period May to August when ambient Temperature (DBT) is generally high.
3. Power consumption at specified capacity of equipment.
4. Room condition test during summer and monsoon.

Ventilation System

1. Equipment performance
2. Capacity of Fan and Pump of UAF
3. Power consumption of motor for UAF at specified capacity of the equipment.
4. Saturation Efficiency of UAF

Air-conditioning System

5.1.0 Equipment performance

The plant should run continuously for 2 to 3 hours for stabilization of the system before measurements. After stabilization of the system, various parameters of the major equipment will be recorded in hourly log sheet. Four sets of such readings are to be recorded under stable conditions.

Followings are the parameters to be recorded during equipment performance check

5.1.1 Current rating and voltage of all motors with on line meter or calibrated tong tester to be logged.

5.1.2 Bearing temperature of all motors with calibrated Temperature Gun.

5.1.3 DBT and WBT measurement of leaving air from canvas connection/ after copper Coil of

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AHU shall be measured.

5.1.4 Velocity of air shall be measured on the filters at the suction area of the AHUs with calibrated anemometer/velometer.

5.1.5 After completion of capacity tests, working of heaters and humidifiers shall be demonstrated by adjusting the set points. The instruments controlling these equipments are to be kept in their set points during PG test and shall operate automatically only, if the inside conditions demand for.

5.1.6 Speed of rotating equipment, wherever possible shall be checked with calibrated Tachometer

5.1.7 Noise and vibration level measurement

Vibration and noise level of AHU measured during PG test. Permissible limit of vibration for AHU, shall be in line with VDI 2056 class IV machines (Good Zone) i.e. 4.0mm/sec. Vibration level of Air Cooled Condensing unit shall be as per manufacturer recommendation.

The maximum noise level shall be 85 dbA at 1.5 meter elevation and at a horizontal distance of 1.0 meter from the equipment.

5.1.8 Interlock & Protection need to be checked & recorded in the form of a protocol jointly signed by persons responsible for conductance of PG test.

5.2.0 CAPACITY ASSESSMENT:

Air Cooled Condensing System:

5.2.1 Plant capacity from AHU method

For verifying the plant capacity by AHU method the total air quantity handled by individual AHU shall be measured as mentioned below:

Air quantity measurement will be taken in front of AHU suction in a direction perpendicular to AHU suction area. The air velocity shall be measured with calibrated anemometer/ Velometer. While taking this measurement on filters in front of AHU suction area. The air velocity shall be measured with calibrated anemometer/velometer, the following conditions are to be maintained:

- a. All the AHUs except the standby unit should be in running condition.
- b. Doors leading to AHU room should be kept closed and all other openings in AHU room as well as in the air-conditioned space and the areas in the return air path are to be sealed.

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- c. Air quantity of fresh air should be measured and damper is to be adjusted to allow the required quantity of fresh air only.
- d. Air velocity should be measured using calibrated Anemometer/velometer. Velocity shall be taken at 9 transverse points in a direction perpendicular to AHU suction area. Measurements shall be carried out to compute average air flow.

AHU being the ultimate equipment for heat transfer, Capacity of the system shall be arrived at by calculations based on various recorded data of AHU.

It is to be ensured that while recording different parameters of AHU, the rotary compressor shall run at full load.

METHOD OF CALCULATIONS:

$T = Q \times d \times (E1-E2)/3024$
Where,

T = Capacity in TR

Q = Quantity of air in m³/hr

D = Density of air AHU inlet in kg/m³, i.e. 1.2 kg/m³

E1 = Enthalpy of entering air at AHU in Kcal/kg

E2 = Enthalpy of leaving air from AHU in Kcal/kg

Q is to be calculated by multiplying mean velocity of air by inlet suction area of AHU.

E1 & E2 are to be found out by plotting dry and wet bulb temperatures of entering and leaving air on psychrometric chart.

5.3.0 POWER CONSUMPTION TEST:

Measurement of power for all motors shall be done by Power Analyzer OR Two wattmeter method only. Power measurement shall be done at rated capacity during test equipments.

5.4.0 ROOM CONDITION TEST:

Room condition shall consist of taking the readings of dry and wet bulb temperature at different location points to be mutually decided at site in the areas which are air-conditioned by the respective system/plant room condition test shall be done after stabilization of system.

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The dry and wet bulb temperature shall be measured by sling psychrometer which will have accuracy of $\pm 0.5\%$ with at least count of 0.5 deg C.

This will be carried out for 24 hours continuously and readings will be taken every two hours. Standby equipment should be changed over during these 24 hours. This test shall be carried out during summer when the maximum ambient temperature is at least 40°C and during when relative humidity prevalent is not less than **(-) 10%** of design value.

Ventilation System

6.1.0 Equipment performance

The plant should run continuously for 2 to 3 hours for stabilization of the system before measurements. After stabilization of the system, various parameters of the major equipment will be recorded in hourly log sheet. Four sets of such readings are to be recorded under stable conditions.

Followings are the parameters to be recorded during equipment performance check

6.1.1 Current rating and voltage of all motors with on line meter or calibrated tong tester to be logged.

6.1.2 Bearing temperature of all motors with calibrated RTD/temp gauge/temp gun.

6.1.3 Velocity of air shall be measured on the filters at the suction area of the UAF with calibrated anemometer/velometer.

6.1.4 Pressure drop across filter to be measured with water filled U tube manometer.

6.1.5 Speed of rotating equipment, wherever possible shall be checked with calibrated Tachometer

6.1.7 Noise and vibration level measurement

Vibration and noise level of UAF Fan and recirculation pump to be measured during PG test. Permissible limit of vibration for pumps shall be 75 microns pk-pk and for UAF Fan , shall be in line with VDI 2056 class X machines (Good Zone) i.e. 6.8mm/sec.

The maximum noise level shall be 85 dbA at 1.5 meter elevation and at a horizontal distance of 1.0 meter from the equipment.

6.1.8 Interlock & Protection need to be checked & recorded in the form of a protocol jointly signed by persons responsible for conductance of PG test.

6.2.0 CAPACITY OF FANS & PUMPS

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The air flow quantity shall be calculated by measuring velocity with help of Anemometer in front of intake louver. Velocity shall be measured at 5-7 transverse points across the intake louver of Unitary Air Filtration (UAF) unit to compute average velocity for flow calculations across Unitary Air Filtration Unit. Four sets of such reading shall be recorded.

Fan Capacity in m³/hr = (Average velocity (m/sec) x Inlet suction area (m²) x 3600)
Where,

Inlet suction area = Area of Intake louver in m² of UAF

Capacities of UAF pumps shall be obtained from the characteristic curve of pump and pressure differential across the pump.

6.3.0 POWER CONSUMPTION TEST:

Measurement of power for all motors shall be done by Power Analyzer OR Two wattmeter method only. Power measurement shall be done at rated capacity during test equipments.

6.4.0 UAF Saturation Efficiency.

6.4.1 Saturation Efficiency shall be computed using following formula:-

Saturation Efficiency:

$(T_e - T_i) / (T_e - t_e) > 60\%$, where

T_e = Dry Bulb temperature Entering UAF Unit.

T_i = Dry Bulb temperature Leaving UAF Unit.

t_e = Wet Bulb temperature Entering UAF Unit.

Dry Bulb & Wet Bulb Temperature at Inlet & Outlet of UAF shall be measured by Sling Phychrometer reading will be taken through moving air and continued till reading becomes steady. The forming part of Sling Phychrometer shall be +/- 0.5% deg C.

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ANNEXURE-I

AIR CONDITIONING & VENTILATION SYSTEM PACKAGE

Guarantee Declaration

A. Category –I Guarantees

Guaranteed Power Consumption for Air Conditioning System

SL. No.	Description of Equipment	Technical Parameter at rated duty point	Quantities for working Units	Guaranteed Power Consumption at motor input terminal and control panel (in kW)
1.0	A/C System			
1.1	Air Cooled Condensing Unit			
1.1.1	Out Door Unit			
1.1.2	AHU Unit			
1.1.3	Ventilation System			
2.0	UAF			
2.1	UAF Fan			
	Total			

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ANNEXURE-II

OTHER GUARANTEED PARAMETERS

Design Ambient Temperature (summer)	i) DB – 43.9°C ii) WB – 25.6.0°C
Design Ambient Temperature (monsoon)	i) DB – 38.4°C ii) WB – 27.8°C
Design Ambient Temperature (winter)	i) DB – 15°C ii) WB – 10°C

FGD Control Building.

Design Indoor Conditions

DB

RH

FGD Control Room

24°C±1°C

50%±5%

Plant Capacity

- | | |
|------------------|--|
| i) Main AC Plant | 50 TR Air Cooled Condensing Unit (3W+3S) |
|------------------|--|

Pump Capacity

- | | |
|-------------------------------------|--------------------------------------|
| i) Water Recirculation Pump for UAF | 84 m ³ /hr & 30 head (1W) |
|-------------------------------------|--------------------------------------|

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Sr. No.	Equipment	Description of Parameter	Guaranteed Value as per LOA	Quantity (working quantity as per tech. Spec.)	Value noted during PG test
A	AC Plant for FGD Control Room Building:				
1	Air Cooled Condensing Unit, 50 TR	Power consumption in KW at motor input terminal at rated duty point for each drive			
1.1	Out Door Unit	Do		3 Nos.	
1.2	AHU	Do		3 Nos.	
B	Ventilation Plant for FGD Control Room Building:				
2	UAF			2 Nos.	
2.1	UAF Fan				Shop Test Value to be noted at duty point as per spec of Functional Guarantees hence not need to check during PG test.

Project	3X200+3X500+1x500 MW NTPC KORBA TPP-FGD	
Package	HVAC FOR FGD	
Document Title	PG Test Procedure for AC & Ventilation System	
OWNER	NTPC Limited	
EPC Contractor	Bharat Heavy Electrical Limited	
Document No.	PE-V0-466-(571-13000-A)-A404	Rev.:02
CONTRACTOR		

Format for Recording Temperature Parameter Across AHU									
Area:		Instrument Used & Sr. No.:							
Sr. No.	Unit of Operation	Reading No.	Time / Hrs	Entering Air Parameters			Leaving Air Parameters		
				DB (°C)	WB (°C)	Enthalpy (kcal/kg)	DB (°C)	WB (°C)	Enthalpy (kcal/kg)
1	Air Handling Unit No.	1							
		2							
		3							
		4							
2	Air Handling Unit No.	1							
		2							
		3							
		4							
3	Air Handling Unit No.	1							
		2							
		3							
		4							
4	Air Handling Unit No.	1							
		2							
		3							
		4							
5	Air Handling Unit No.	1							
		2							
		3							
		4							
6	Air Handling Unit No.	1							
		2							
		3							
		4							
		2							
		3							
		4							
NTPC		BHEL			AVPL				

Project	3X200+3X500+1x500 MW NTPC KORBA TPP-FGD	
Package	HVAC FOR FGD	
Document Title	PG Test Procedure for AC & Ventilation System	
OWNER	NTPC Limited	
EPC Contractor	Bharat Heavy Electrical Limited	
Document No.	PE-V0-466-(571-13000-A)-A404	Rev.:02
CONTRACTOR		

Format for Recording Vibration Level & Noise Level of Equipment									
Area:						Appendix - III			
Instrument Used & Sr. No.:				Reading Set No.					
Sr. No.	Equipment	Reading No.	Time	Displacement in Microns			Noise Level In dBA	RPM	Remarks
				V	H	A			
1	AHU No. :	1							
		2							
		3							
		4							
2	AHU No. :	1							
		2							
		3							
		4							
3	AHU No. :	1							
		2							
		3							
		4							
4	AHU No. :	1							
		2							
		3							
		4							
5	AHU No. :	1							
		2							
		3							
		4							
6	AHU No. :	1							
		2							
		3							
		4							
		2							
		3							
		4							
NTPC			BHEL			AVPL			

Project	3X200+3X500+1x500 MW NTPC KORBA TPP-FGD	
Package	HVAC FOR FGD	
Document Title	PG Test Procedure for AC & Ventilation System	
OWNER	NTPC Limited	
EPC Contractor	Bharat Heavy Electrical Limited	
Document No.	PE-V0-466-(571-13000-A)-A404	Rev.:02
CONTRACTOR		

Format for Recording Bearing Temperature Deg. C of Equipment						
Project:			Package:			
Area:			Contractor: Advance Ventilation Pvt. Ltd.			
Instrument Used & Sr. No.:			COA No.:			
Reading Set:			Unit of Operation:		Date:	
Document No.			Rev. -00			
Sr. No.	Equipment	Reading No.	Time	Drive END	Non Drive END	Remarks
1	FAN NO. :	1				
		2				
		3				
		4				
2	FAN NO. :	1				
		2				
		3				
		4				
3	FAN NO. :	1				
		2				
		3				
		4				
4	FAN NO. :	1				
		2				
		3				
		4				
5	FAN NO. :	1				
		2				
		3				
		4				
6	PUMP NO. :	1				
		2				
		3				
		4				
7	PUMP NO. :	1				
		2				
		3				
		4				
8	PUMP NO. :	1				
		2				
		3				
		4				
9	PUMP NO. :	1				
		2				
		3				
		4				
10	PUMP NO. :	1				
		2				
		3				
		4				
	AVPL		BHEL		NTPC	


Project	3X200+3X500+1x500 MW NTPC KORBA TPP-FGD	
Package	HVAC FOR FGD	
Document Title	PG Test Procedure for AC & Ventilation System	
OWNER	NTPC Limited	
EPC Contractor	Bharat Heavy Electrical Limited	
Document No.	PE-V0-466-(571-13000-A)-A404	Rev.:02
CONTRACTOR		

Format for Recording Vibration Level & Noise Level of Equipment									
Project:				Package:					
Area:				Contractor: Advance Ventilation Pvt. Ltd.					
Instrument Used & Sr. No.:				COA No.:					
Reading Set:				Unit of Operation:		Date:			
Document No.				Rev. -					
Sr. No.	Equipment	Reading No.	Time	Displacement in Microns			Noise Level In dBA	RPM	Remarks
				V	H	A			
1	FAN NO. :	1							
		2							
		3							
		4							
2	FAN NO. :	1							
		2							
		3							
		4							
3	FAN NO. :	1							
		2							
		3							
		4							
4	FAN NO. :	1							
		2							
		3							
		4							
5	FAN NO. :	1							
		2							
		3							
		4							
NTPC				BHEL			AVPL		

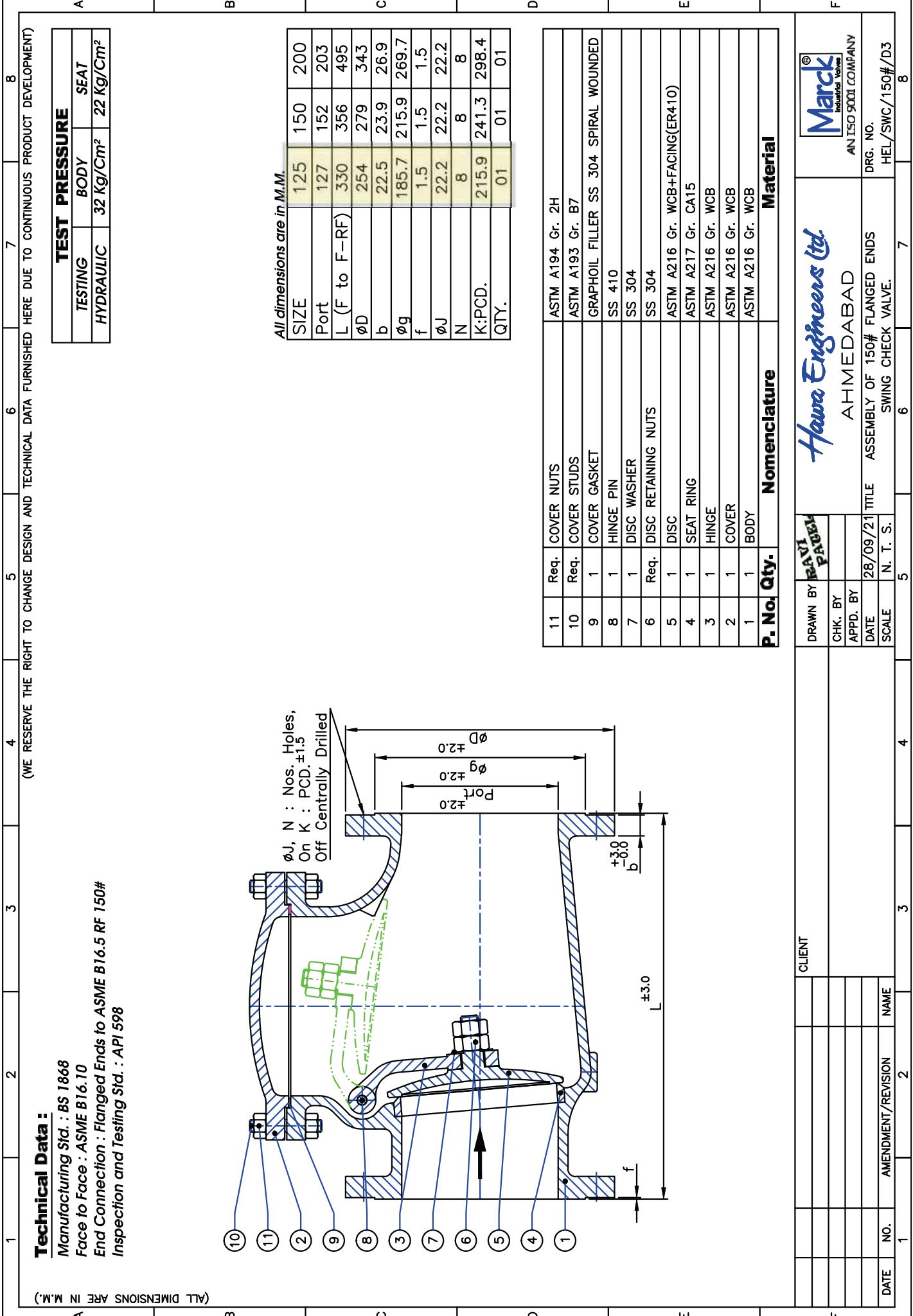
Customer	NTPC	Job No.	M22/DEL-27.BHEL
Project	3X200+3X500+1X500 MW NTPC KORBA TPP	Date	06.02.2023
BHEL Doc. No.	PE-VO-466-(571-13000-A)-A206	NTPC No.	2100-109-PVM-Y-002D

**TECHNICAL DATA SHEET & G.A. DRWG. FOR CAST
IRON VALVES(GATE VALVE,CHECK VALVE, GLOBE
VALVE) OF VENTILATION SYSTEM**

APPLICABLE FOR ANNEXURE-I, ITEM NO.
B1a, B1b & B1c (VALVES)

HAWA ENGINEERS LTD		
Plot No. 129 B/h, Kashiram Textile Mill Narol Ahmedabad : 382405		
SWING CHECK VALVE		
Size & Quantity		As per Annexure-I
End Connection		FLANGED END TO ASME B 16.5 RF 150#
BODY		ASTM A 216 Gr WCB
COVER		ASTM A 216 Gr WCB
HINGE		ASTM A 216 Gr WCB
SEAT RING		ASTM A 217 Gr CA15
DISC		ASTM A 217 Gr CA15
DISC RETAINING NUTS		SS 304
HINGE PIN		SS 410
COVER GASKET		GRAPHOIL FILLER SS 304 SPIRAL WOUNDED
COVER STUDS		ASTM A193 Gr B7
COVER NUTS		ASTM A194 Gr 2H
HAWA Brand name		MARCK
Design Standard		BS 1868
Testing Standard		API 598
Body Hydro Shell Test Pr(Kg/cm²)		32
Seat Hydro Shell Test Pr(Kg/cm²)		22





(WE RESERVE THE RIGHT TO CHANGE DESIGN AND TECHNICAL DATA FURNISHED HERE DUE TO CONTINUOUS PRODUCT DEVELOPMENT)

Technical Data :

Manufacturing Std. : BS 1868
 Face to Face : ASME B16.10
 End Connection : Flanged Ends to ASME B16.5 RF 150#
 Inspection and Testing Std. : API 598

TEST PRESSURE

TESTING	BODY	SEAT
HYDRAULIC	32 Kg/Cm ²	22 Kg/Cm ²

All dimensions are in M.M.

SIZE	125	150	200
Port	127	152	203
L (F to F-RF)	330	356	495
øD	254	279	343
b	22.5	23.9	26.9
øg	185.7	215.9	269.7
f	1.5	1.5	1.5
øJ	22.2	22.2	22.2
N	8	8	8
K:PCD.	215.9	241.3	298.4
QTY.	01	01	01

11	Req.	COVER NUTS	ASTM A194 Gr. 2H
10	Req.	COVER STUDS	ASTM A193 Gr. B7
9	1	COVER GASKET	GRAPHOIL FILLER SS 304 SPIRAL WOUNDED
8	1	HINGE PIN	SS 410
7	1	DISC WASHER	SS 304
6	Req.	DISC RETAINING NUTS	SS 304
5	1	DISC	ASTM A216 Gr. WCB+FACING(ER410)
4	1	SEAT RING	ASTM A217 Gr. CA15
3	1	HINGE	ASTM A216 Gr. WCB
2	1	COVER	ASTM A216 Gr. WCB
1	1	BODY	ASTM A216 Gr. WCB
P. No.	Qty.	Nomenclature	Material

DRAWN BY		RAVI PATEL	
CHK. BY			
APPD. BY			
DATE	28/09/21	TITLE	ASSEMBLY OF 150# FLANGED ENDS SWING CHECK VALVE.
SCALE	N. T. S.		

Hawa Engineers Ltd.
 AHMEDABAD



AN ISO 9001 COMPANY
 DRG. NO. HEL/SWC/150#/D3

CLIENT	
AMENDMENT/REVISION	NAME
1	

Customer	NTPC	Job No.	M22/DEL-27.BHEL
Project	3X200+3X500+1X500 MW NTPC KORBA TPP	Date	06.02.2023
BHEL Doc. No.	PE-VO-466-(571-13000-A)-A206	NTPC No.	2100-109-PVM-Y-002D

HAWA ENGINEERS LTD

Plot No. 129 B/h, Kashiram Textile Mill Narol Ahmedabad : 382405



GATE VALVE DATA SHEET

Size	As per Annexure-I
End Connection	FLANGED TO ASME B 16.5 RF 150#
Body	ASTM A 216 Gr WCB
Bonnet	ASTM A 216 Gr WCB
WEDGE	ASTM A217 Gr CA15
STEM	ASTM A276 - T410
Seat ring	ASTM A217 Gr CA15
Back seat	OVERLAY
Gland	ASTM A276 - T410
Gland flange	ASTM A 216 Gr WCB
Bonnet Gasket	SPW SS 304
Bonnet Stud & Nut	ASTM A193 Gr B7 / ASTM A194 Gr 2H
Valve make	MARCK
Hand Wheel	Malleable iron
MFG STD	API 600
Testing Standard	API 598
Body Hydro Shell Test Pr(Kg/cm ²)	32
Seat Hydro Shell Test Pr(Kg/cm ²)	22

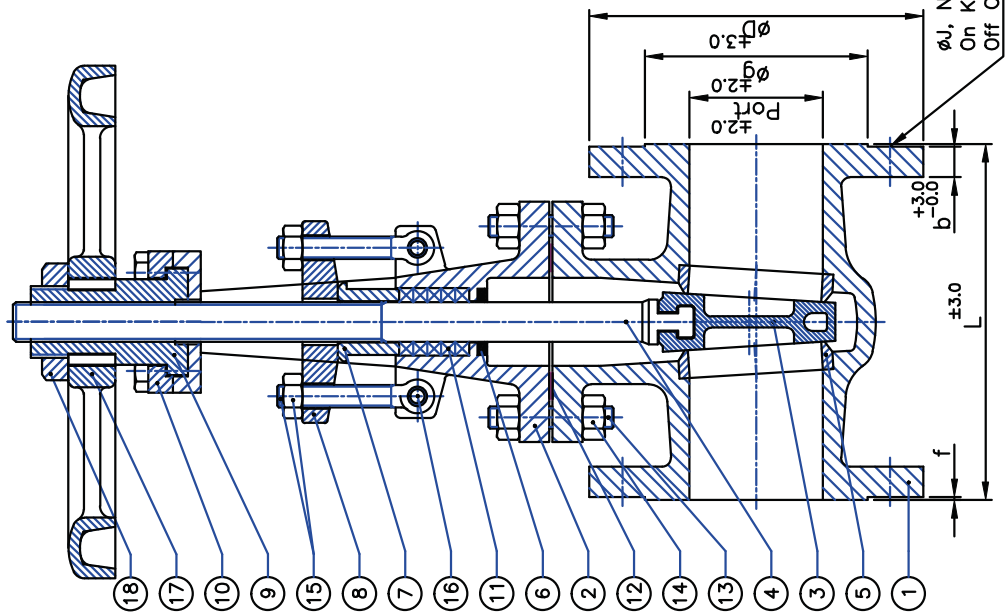


(WE RESERVE THE RIGHT TO CHANGE DESIGN AND TECHNICAL DATA FURNISHED HERE DUE TO CONTINUOUS PRODUCT DEVELOPMENT)

Technical Data :

Manufacturing Std. : API 600
 Face to Face : ASME B16.10
 End Connection : Flanged Ends to ASME B16.5 RF 150#
 Inspection and Testing Std. : API 598

TEST PRESSURE		
TESTING	BODY	SEAT
HYDRAULIC	32 Kg/Cm ²	22 Kg/Cm ²



All dimensions are in M.M.

SIZE	50	65	80	100	125	150
Port	51	64	76	102	127	152
L Face to Face-RF	178	190	203	229	254	267
ØD	150	180	190	230	255	280
b	14.3	15.9	17.5	22.3	22.3	23.9
Øg	92.1	104.8	127	157.2	185.7	215.9
f	2	2	2	2	2	2
ØJ	19.05	19.05	19.05	19.05	22.2	22.2
N	4	4	4	8	8	8
K:PCD.	120.7	139.7	152.4	190.5	215.9	241.3
QTY.	0 5	0 1	0 1	0 1	0 1	0 3

18	1	HANDWHEEL NUT	CARBON STEEL
17	1	HANDWHEEL	MALLEABLE IRON/C.I.
16	2-2	GLAND LUG BOLTS & NUTS	CARBON STEEL
15	2-2	GLAND EYEBOLTS & NUTS	CARBON STEEL
14	Req.	BONNET NUTS	ASTM A194 Gr. 2H
13	Req.	BONNET STUDS	ASTM A193 Gr. B7
12	1	BONNET GASKET	GRAPHOIL FILLER SS 304 SPIRAL WOUND
11	5min.	STEM PACKINGS	GRAPHOIL
10	1	SLEEVE RETAINER	CARBON STEEL
9	1	YOKE SLEEVE	S.G. IRON (ASTM A395)
8	1	GLAND FLANGE	ASTM A216 Gr. WCB
7	1	GLAND	ASTM A276-T410
6	1	BACKSEAT	OVERLAY
5	2	SEAT RINGS	ASTM A217 Gr. CA15
4	1	STEM	ASTM A276-T410
3	1	WEDGE	ASTM A217 Gr. CA15
2	1	BONNET	ASTM A216 Gr. WCB
1	1	BODY	ASTM A216 Gr. WCB
P.No.	Qty.	Nomenclature	Material

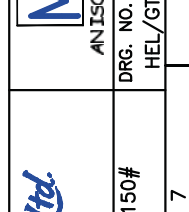
DRAWN BY	IRFAN
CHK. BY	
APPD. BY	
DATE	17/12/18
SCALE	N. T. S.

Hawa Engineers Ltd.
 AHMEDABAD
 ASSEMBLY OF 'OS' & 'Y' TYPE 150#
 FLANGED ENDS GATE VALVE.

CLIENT	
AMENDMENT/REVISION	
DATE	
NO.	
NAME	

1	2	3	4	5	6	7	8
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DRG. NO.	HEL/GT/150#/D1
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HAWA ENGINEERS LTD

Plot No. 129 B/h, Kashiram Textile Mill Narol Ahmedabad : 382405

GUN METAL GATE VALVE DATA SHEET

Size	50MM
End Connection	FLANGED ENDS TO IS 778, BUT DRILLING AS PER ASME B 16.5 150#
Body	GUN METAL
Bonnet	GUN METAL
Wedge	GUN METAL
Stem	H.T.BRASS / FORGED BRASS
BACK SEAT	GUN METAL
GLAND	GUN METAL
GLAND NUT	GUN METAL
GLAND PACKING	ASBESTOS
HAND WHEEL	C.I.
HAND WHEEL NUT & WAHSER	CARBON STEEL
Design Standard	IS 778
Body Hydro Shell Test Pr	1.5 MPA
Seat Hydro Shell Test Pr	1.0 MPA

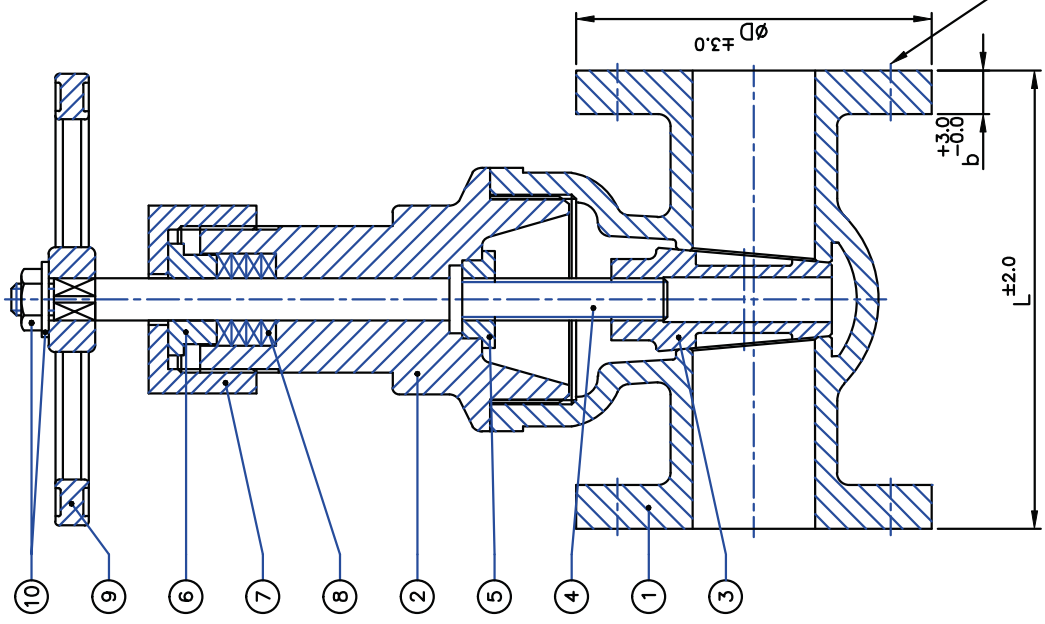


(WE RESERVE THE RIGHT TO CHANGE DESIGN AND TECHNICAL DATA FURNISHED HERE DUE TO CONTINUOUS PRODUCT DEVELOPMENT)

Technical Data :

Manufacturing Std. : IS 778 Class-1 (PN 1.0)
 End Connections : Flanged Ends to IS 778, But Drilling As Per ASME B16.5 150#

HYDROSTATIC TEST PRESSURE		
PN - RATING	BODY	SEAT
1.0 MPa.	1.5 MPa.	1.0 MPa.



All dimensions are in M.M.

SIZE	50
L	120
ØD	165
b	11
ØJ	19.05
N	4
K:PCD.	120.6
QTY.	01

10	1-1	Hand wheel Nut & Washer	Carbon steel
9	1	Hand wheel	C.I.
8	Reqd.	Gland packings	Asbestos
7	1	Gland nut	Gun metal
6	1	Gland	Gun metal
5	1	Back seat	Gun metal
4	1	Stem	H.T. Brass/Forged Brass
3	1	Wedge	Gun metal
2	1	Bonnet	Gun metal
1	1	Body	Gun metal

ØJ, N : Nos. Holes,
 On K : PCD. ±1.5
 Off Centrally Drilled

L ±2.0

Ø ±3.0

+3.0
 -0.0
 b

Material

BILL OF MATERIAL

DRAWN BY		SABI	
CHK. BY			
APPD. BY			
DATE	02/02/23	TITLE	ASSEMBLY OF FLANGED ENDS
SCALE	N. T. S.		NON-RISING STEM GATE VALVE CLASS-1
CLIENT		Hawa Engineers Ltd.	
		AHMEDABAD	
AMENDMENT/REVISION		GA DRG. NO.	
NO.	NAME	HEL/GT/NRS/CL1/FE/D	



AN ISO 9001 COMPANY

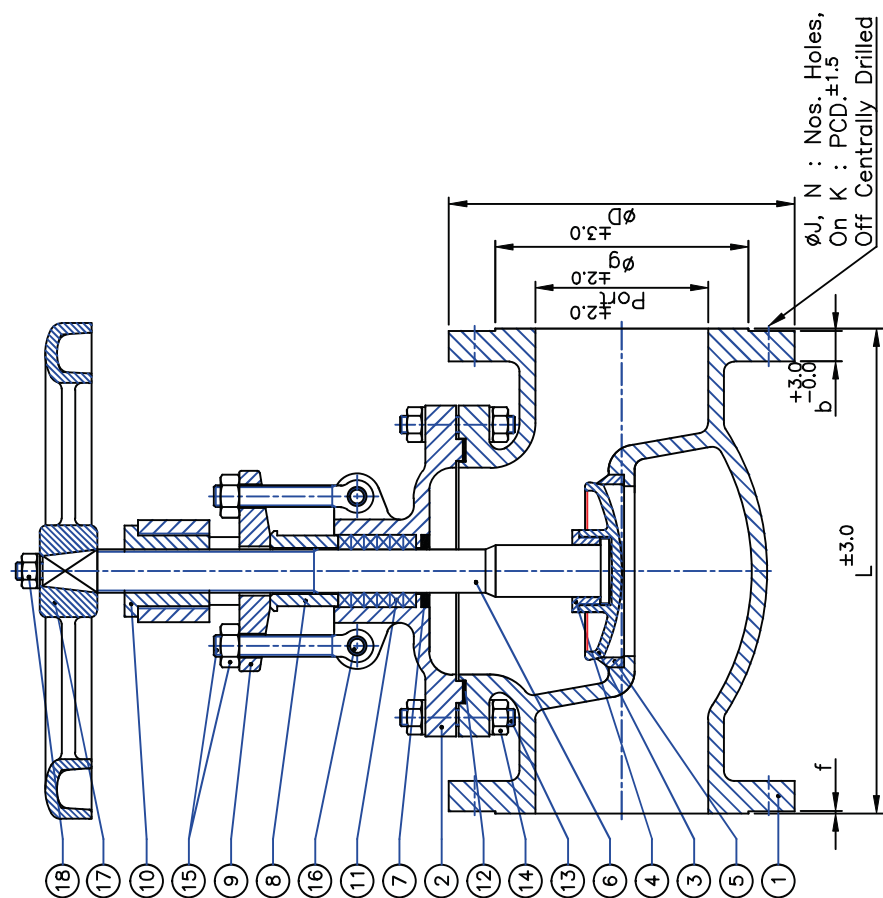
Customer	NTPC	Job No.	M22/DEL-27.BHEL
Project	3X200+3X500+1X500MW NTPC KORBA TPP	Date	06.02.2023
BHEL Doc. No.	PE-VO-466-(571-13000-A)-A206	NTPC No.	2100-109-PVM-Y-002D

HAWA ENGINEERS LTD Plot No. 129 B/h, Kashiram Textile Mill Narol Ahmedabad : 382405		
		GLOBE VALVE DATA SHEET
Size	As per Annexure-I	
End Connection	FLANGED TO ASME B 16.5 RF 150#	
Body	ASTM A 216 Gr WCB	
Bonnet	ASTM A 216 Gr WCB	
WEDGE	ASTM A217 Gr CA15	
STEM	ASTM A276 - T410	
Seat ring	ASTM A217 Gr CA15	
Back seat	OVERLAY	
Gland	ASTM A276 - T410	
Gland flange	ASTM A 216 Gr WCB	
Bonnet Gasket	SPW SS 304	
Bonnet Stud & Nut	B7 / 2H	
Valve make	MARCK	
Hand Wheel	Malleable Iron	
MFG STD	API 600	
Testing Standard	API 598	
Body Hydro Shell Test Pr(Kg/cm ²)	32	
Seat Hydro Shell Test Pr(Kg/cm ²)	22	



Technical Data :

Manufacturing Std. : BS 1873
 Face to Face : ASME B16.10
 End Connection : Flanged Ends to ASME B16.5 RF 150#
 Inspection and Testing Std. : BS EN 12266-1



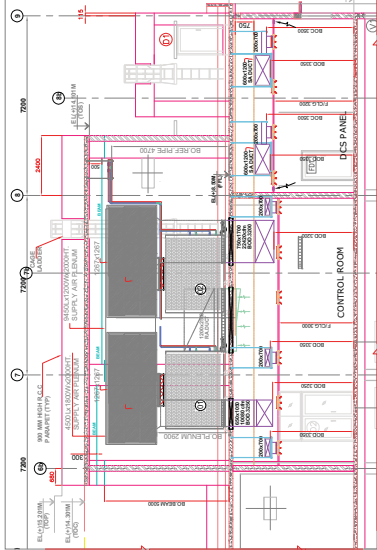
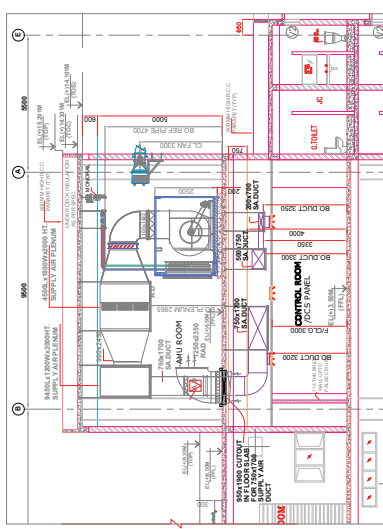
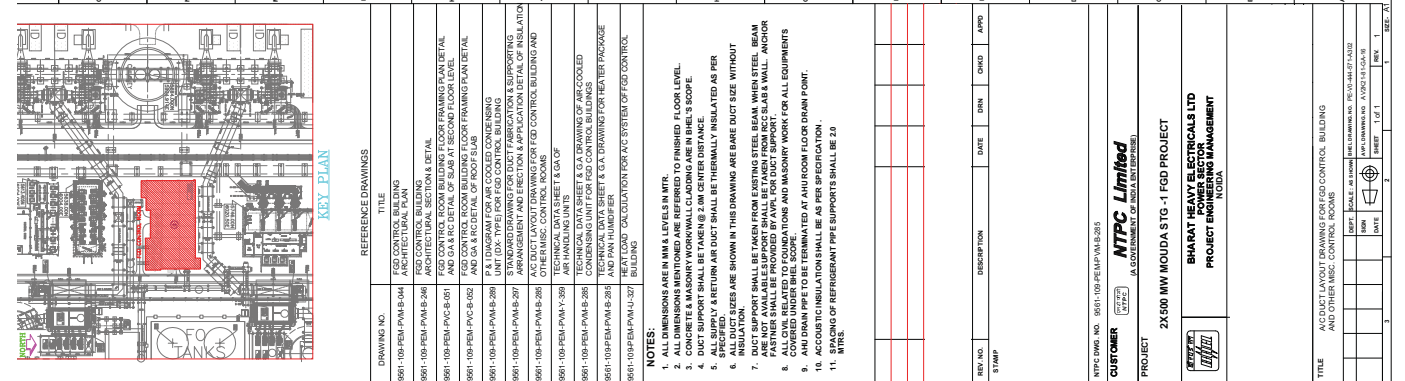
TEST PRESSURE		
TESTING	BODY	SEAT
HYDRAULIC	32 Kg/Cm ²	22 Kg/Cm ²

All dimensions are in M.M.

SIZE	125	150
Port	127	152
L Face to Face-RF	356	406
ØD	255	280
b	22.3	23.9
Øg	185.7	215.9
f	2	2
ØJ	22.2	22.2
N	8	8
K:PCD.	215.9	241.3
QTY.	01	01

P. No.	Qty.	Nomenclature	Material
18	2	WHEEL NUT & WASHER	CARBON STEEL
17	1	HANDWHEEL	MALLEABLE IRON/C.I.
16	2	GLAND LUG BOLTS & NUTS	CARBON STEEL
15	2	GLAND EYEBOLTS & NUTS	CARBON STEEL
14	Req.	BONNET NUTS	ASTM A194 Gr. 2H
13	Req.	BONNET STUDS	ASTM A193 Gr. B7
12	1	BONNET GASKET	GRAPHOIL FILLER SS 304 SPIRAL WOUNDED
11	5min.	STEM PACKINGS	BRAIDED GRAPHITE+DIE MOULDED GRAPHITE
10	1	YOKE BUSH	S.G. IRON (ASTM A395)
9	1	GLAND FLANGE	ASTM A216 Gr. WCB
8	1	GLAND	ASTM A276-T410
7	1	BACKSEAT	OVERLAY
6	1	STEM	ASTM A276-T410
5	1	SEAT RING	ASTM A217 Gr. CA15
4	1	DISC RETAINER	ASTM A276-T410
3	1	DISC	ASTM A216 Gr. WCB+FACING(ER410)
2	1	BONNET	ASTM A216 Gr. WCB
1	1	BODY	ASTM A216 Gr. WCB

DRAWN BY		IRFAN	Hawa Engineers Ltd.		Marck Industrial Valves		
CHK. BY			AHMEDABAD		AN ISO 9001 COMPANY		
APPD. BY			ASSEMBLY OF 150#		DRG. NO.		
DATE	17/12/18	TITLE	FLANGED ENDS GLOBE VALVE.		HEL/GB/150#/D4		
SCALE	N. T. S.						
1	2	3	4	5	6	7	
AMENDMENT/REVISION	NAME						
1							



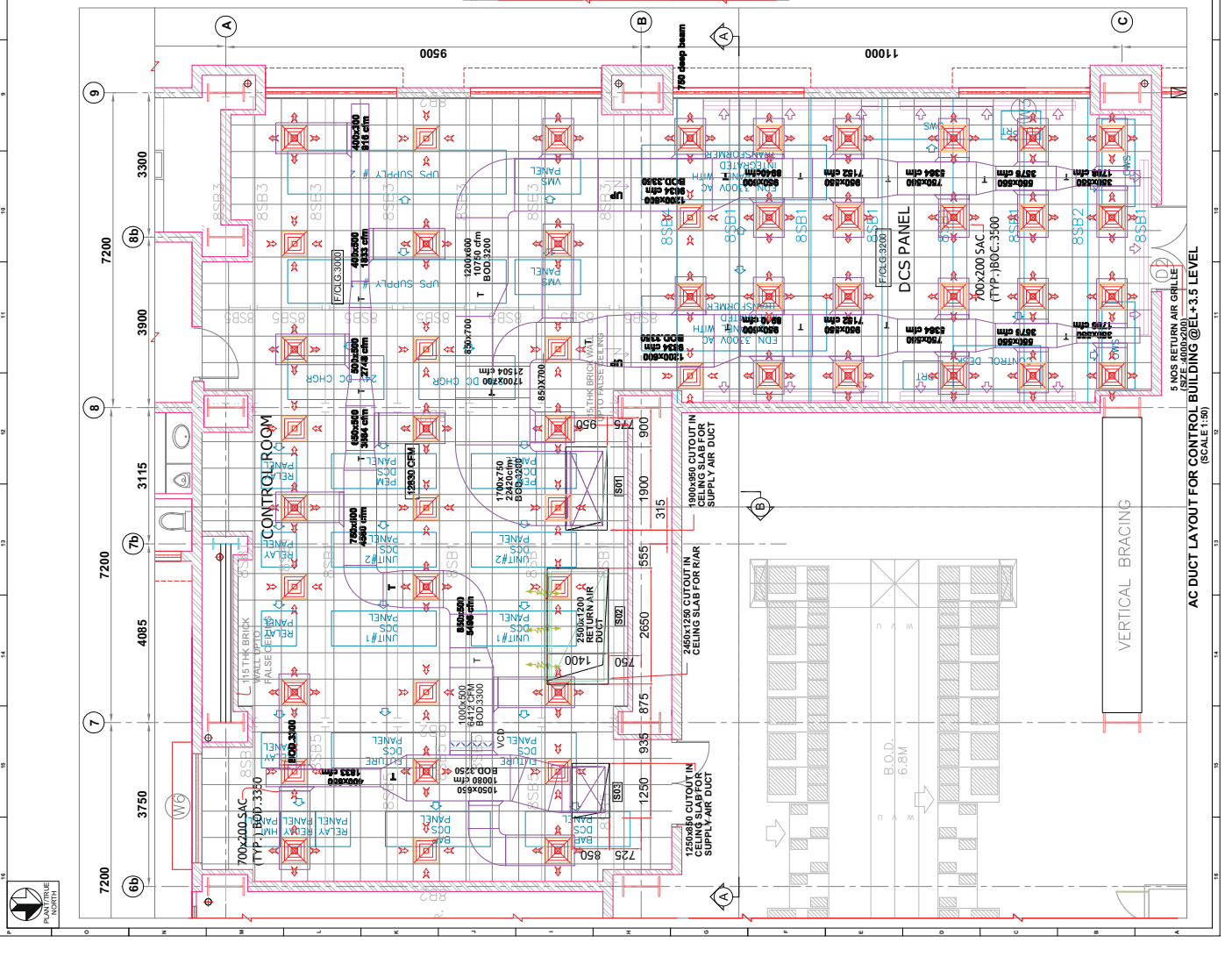
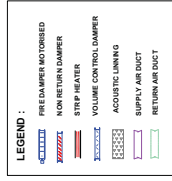
AIR DISTRIBUTION & DIFFUSER SCHEDULE:

S.NO	ROOM NAME	TOTAL SUPPLY AIR QTY DIFFUSER SA DIFFUSERA DIFFUSER WITH OUT VCD	AIR QTY. (CFM) EACH DIFFUSER	NECK SIZE WITH VCD	DIFFUSER	NO. OF
01	CONTROL ROOM GRID 8A & B	1280 CFM	914 CFM	459x450	14 Nos.	14 Nos.
02	CONTROL ROOM GRID 8B & C/B	1987 CFM	894 CFM	459x450	22 Nos.	2 Nos.

GRILLE SCHEDULE:
 200 MM CONTINUOUS GRILLE: 20.8 RMT (FOR RETURN AIR)

SLAB OPENING SCHEDULE:

SLAB NO.	SIZE	NO. OF	QTY.
001	1000x800	SLAB OPENING	1 MC
002	2000x1000	SLAB OPENING	1 MC
003	1500x1000	SLAB OPENING	1 MC



REFERENCE DRAWINGS

DRAWING NO.	TITLE
8601-100-PEM-PWA-0-04	FSD CONTROL BUILDING
8601-100-PEM-PWA-0-04	FSD CONTROL BUILDING ARCHITECTURAL SECTIONS & DETAIL
8601-100-PEM-PWA-0-05	FSD CONTROL BUILDING ARCHITECTURAL SECTIONS & DETAIL AND GA R/C DETAIL OF SLAB AT SECOND FLOOR LEVEL
8601-100-PEM-PWA-0-05	FSD CONTROL ROOM BUILDING FLOOR FRAMING PLAN DETAIL AND GA DETAIL OF ROOF SLAB
8601-100-PEM-PWA-0-20	3-D RENDERING DRAWING FOR DUCT FABRICATION & SUPPORTING
8601-100-PEM-PWA-0-20	3-D RENDERING DRAWING FOR FSD CONTROL BUILDING AND OTHER MISC. CONTROL ROOMS
8601-100-PEM-PWA-0-20	ACT/ECT LAYOUT DRAWING FOR FSD CONTROL BUILDING AND OTHER MISC. CONTROL ROOMS
8601-100-PEM-PWA-0-20	TECHNICAL DATA SHEET 'A' GA OF
8601-100-PEM-PWA-0-20	TECHNICAL DATA SHEET 'B' GA OF
8601-100-PEM-PWA-0-20	CONVENING UNIT FOR FSD CONTROL BUILDING
8601-100-PEM-PWA-0-20	CONVENING UNIT FOR FSD CONTROL BUILDING AND PAN HALL/DBR
8601-100-PEM-PWA-0-20	HEAT LOAD CALCULATION FOR A/C SYSTEM OF FSD CONTROL BUILDING

- NOTES:**
1. DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
 2. ALL DIMENSIONS MENTIONED ARE REFERRED TO FINISHED FLOOR LEVEL.
 3. CONCRETE & MASONRY WORK WALL CLADDING ARE IN BIEL'S SCOPE.
 4. DUCT SUPPORT SHALL BE TAKEN @ 2.0M CENTER DISTANCE.
 5. SPECIFIED RETURN AIR DUCT SHALL BE THERMALLY INSULATED AS PER SPECIFIED.
 6. ALL DUCT SEES ARE SHOWN IN THIS DRAWING ARE BARE DUCT SIZE WITHOUT INSULATION.
 7. DUCT SUPPORT SHALL BE TAKEN FROM CASTING STEEL BEAM WHEN STEEL BEAM ARE NOT AVAILABLE SUPPORT SHALL BE TAKEN FROM REINFORCED CONCRETE WALL. ALL DUCTS RELATED TO FOUNDATIONS AND MASONRY WORK FOR ALL EQUIPMENTS SHALL BE TAKEN FROM FOUNDATION.
 8. ALL DRAIN PIPE TO BE TERMINATED AT AHU ROOM FLOOR DRAIN POINT.
 9. ACCORDING TO INSULATION SHALL BE AS PER SPECIFICATION.
 10. SPACING OF REFRIGERANT PIPE SUPPORTS SHALL BE 2.0 MTR.

REV. NO. / STAMP | **DESCRIPTION** | **DATE** | **SKN** | **CHKD** | **APPRD**

CUSTOMER: NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: 2X500 MW MOUDA STG -1 FSD PROJECT

CLIENT: BHARAT HEAVY ELECTRICALS LTD
 POWER SECTOR
 PROJECT ENGINEERING
 MOUDA

JOB NO.: 444 | **CONTRACT:**

STATUS: DISTRIBUTION

REV. DATE | **ALTD** | **CHKD** | **APPRD**

TITLE: AC DUCT LAYOUT FOR CONTROL BUILDING @EL.+3.5 LEVEL AND OTHER MISC. CONTROL ROOMS

SCALE: 1:50 | **DATE:** 10/02/2023 | **REV. 1** | **REV. 2** | **REV. 3** | **REV. 4** | **REV. 5** | **REV. 6** | **REV. 7** | **REV. 8** | **REV. 9** | **REV. 10**

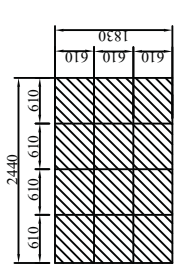
TECHNICAL DATA SHEET & GA DRAWING OF AIR
HANDLING UNIT FGD BUILDING

Customer	NTPC	Job No.	M21/DEL-81.BHEL
Project	3X500 MW NTPC MOUDA TPP STAGE-I (FGD SYSTEM PACKAGE)	Date	14.07.2022
BHEL Doc. No.	PE-V0-444-571-A202		

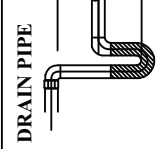
Sr. No.	Description	Details
1	Model no. AHU	ETU-350H
2	Manufacturer of AHU	
3	No. of AHUs offered	2(1W+1S)
4	Location	FGD Control Building at 8.50M
5	Capacity	32500CFM
6	Type	Floor Mounted, DX-Type Double Skin
7	Overall Dimension(LxWxH)	As per GA
8	TR Rating	65TR
10	Static Pressure	65 mm WC
11	Noise Level at 1 m distance	≤85dB
12	Casing	
12.1	AHU- Outer skin	0.63 mm Pre-coated GI
12.2	AHU- Inner Skin	0.63 mm Plain GI
12.3	Panel Thickness	25±2mm
12.4	Insulation Material between panel sheets	25 mm thick CFC free PUF injected, density 40±2 kg/m ³
12.5	Profile/ Frame work	Aluminium Hollow Profile
13	Cooling Coil	
13.1	Tube Material & thickness	Copper/0.3
13.2	Tube diameter	3/8"
13.3	No. of rows	4
13.4	Fins per inch	11-13
13.5	Fin MOC	Aluminium
14	Fan Section	
14.1	Fan Type	Centrifugal DIDW (Backward Curved Blade)
14.2	Fan Impeller- MOC	Carbon Steel IS 513
14.3	Fan Casing material	Mild steel with 3 mm minimum thickness IS513
14.4	Shaft	EN 8 Steel
15	Filter	
15.1	Pre filter	
15.1.1	Type	Cassette
15.1.2	Size of each type	610x610x50 / 305x610x50
15.1.3	No. of filter for each AHU	15 / 5 nos
15.1.4	Filter Frame & Material	18G, GI
15.1.5	Filter Media	Washable non-woven synthetic fiber or high density polyethylene (HDPE) media. (Washable & fire retardant and resistant to moisture, fungi, bacteria & frost) with HDPE
15.2	Fine filter	
15.2.1	Type	Cassette

15.2.2	Size of each type	610x610x305
15.2.3	No. of filter for each AHU	21 nos
15.2.4	Filter Frame & Material	18G, GI
15.2.5	Filter Media	Washable non-woven synthetic fiber or high density polyethylene (HDPE) media. (Washable & fire retardant and resistant to moisture, fungi, bacteria & frost) with HDPE
16	Drain Pan	1.2mm thick. SS304 isolated from bottom floor panel through 25mm thick heavy duty treated for fire (TF) quality expanded polystyrene or polyurethane foam
17	Other Accessories	
17.1	Damper	No return Damper
17.2	Flexible Connection	Water Proof, Fire retardant neoprene impregnated (at fan discharge)
17.3	Vibration Isolation Pad for Complete AHU	Neoprene rubber cushy foot
17.4	Vibration Isolation Efficiency	75%

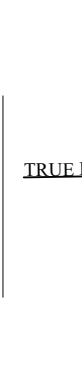
minimum 85%



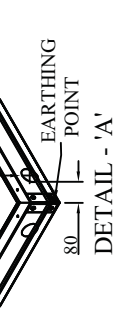
SECTION FILTER GRID DETAILS FOR PRE FILTER



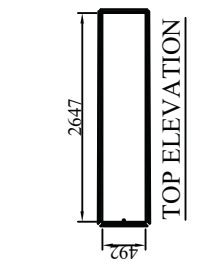
DRAIN PIPE U TRAP DETAIL



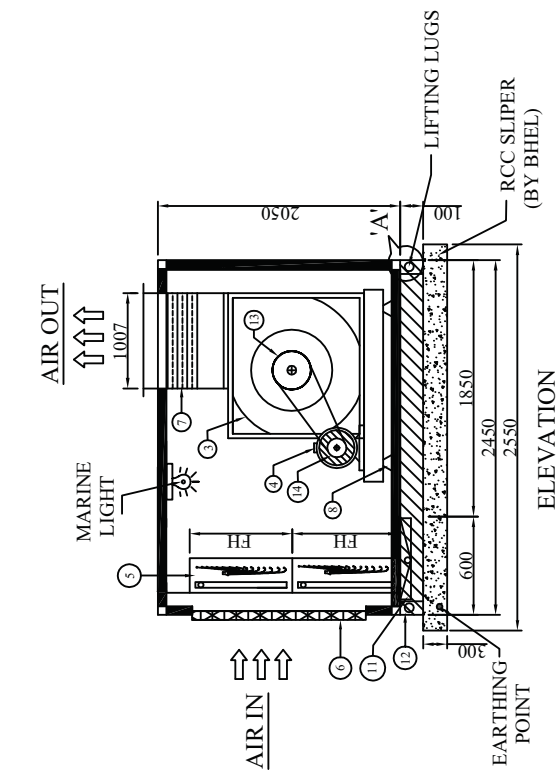
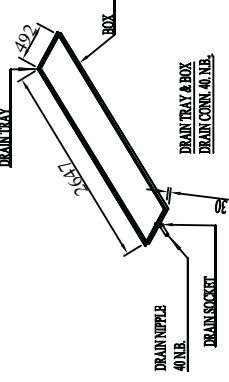
A-FAN TOTAL STATIC PRESSURE U TRAP DETAIL



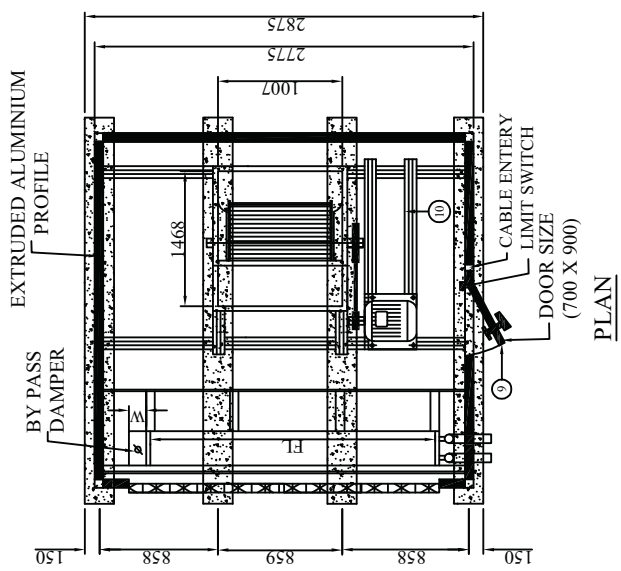
DETAIL - 'A' FOR LIFTING LUGS



TOP ELEVATION



ELEVATION

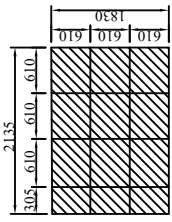


PLAN

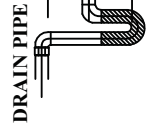
S.NO	DESCRIPTION	MATERIAL	QTY
1	AHU CAPACITY	22000 CFM (37400 CMH)	6
2	STATIC PRESSURE	65 MM WG	-
3	BLOWER	800MM DIA., (BC) MAKE: 'AVPL'	1
4	MOTOR (W/O)	20.0 H.P. (41.5V ± 10%, 50 HZ), (4 POLE)	-
5	COOLING COIL (DX-TYPE)	952.5 FH X 2000 FL X 382 D (270 D, X 0.4 MM THK.	2
6	COIL HEADER	COPPER HEADER WITH BRASS DISTRIBUTOR	-
7	COIL FRAME	GALVANIZED ALUMINIUM 737G / 11-13 FPI	-
8	COIL - FINS	610 X 610 X 50 X 12 NOS	-
9	CANVASS CONNECTION	FIRE RETARDANT CANVASS CLOTH	-
10	VIBRATION ISOLATORS	SPRING MOUNTED	6
11	INSPECTION DOOR	DOUBLE SKIN	1
12	FAN & MOTOR BASE	EXTRUDED ALUMINIUM PROFILE	-
13	DRAIN TRAY	186 S.S.-304 DULY PUF INJECTED & COVERED WITH PLAIN GI SHEET	-
14	UNIT BASE	GI CHANNEL BASE FRAME	1
15	FAN PULLEY (C.I)	254 MM X 38 PB	1
16	MOTOR PULLEY (C.I)	172 MM X 38 PB	1
17	FAN RPM	979	-
18	FAN OUTLET VELOCITY	10.24 m/sec	-
19	INNER SHEET	0.63 MM THK. PRE COATED GI SHEET	-
20	OUTER SHEET	0.63 MM THK. PLAIN GI SHEET	-
21	PANEL THICKNESS	25 MM	-
22	BY PASS DAMPER	PUF INJECTED (CFC / HFC FREE & FIRE RETARDANT)	-
23	NO OF DISTRIBUTOR	110 (W) X 1905 (FH)	-
24		TO BE CONFIRMED BY CLIENT	-

LOCATION	OPERATING WEIGHT (APPROX. KG) - 1320 KG DYNAMIC WEIGHT (APPROX. KG) - 1980 KG
	FH COOLING FIN HEIGHT FL COOLING FIN LENGTH
PLEASE CONFIRM FACING FILTERS	FAN DISCHARGE:
MOTOR CONNECTION: <input type="checkbox"/> RHS <input type="checkbox"/> LHS	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
COIL CONNECTION: <input type="checkbox"/> RHS <input type="checkbox"/> LHS	UNIT DISPATCH CONDITIONS
DRAIN CONNECTION: <input type="checkbox"/> RHS <input type="checkbox"/> LHS	ASSEMBLED <input type="checkbox"/> DISMANTAL <input type="checkbox"/> C.K.D

DRG. TITLE
DOUBLE SKIN FLOOR MOUNTED AIR HANDLING UNIT
PROJECT NAME :- M/s. IN200-4X500 MW NTPC KORBA TTP-FGD
CLIENT/CONSULTANT :- NTPC
EPC CONTRACTOR :- M/s. BIARATH HEAVY ELECTRICAL LIMITED

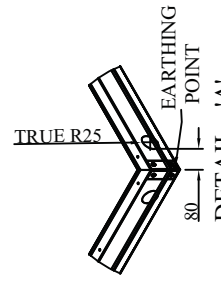


FILTER GRID DETAILS FOR PRE-FILTER



DRAIN PIPE

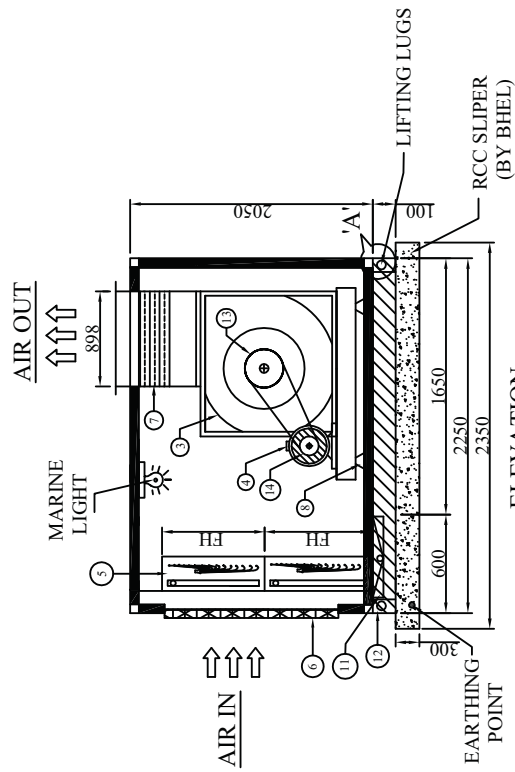
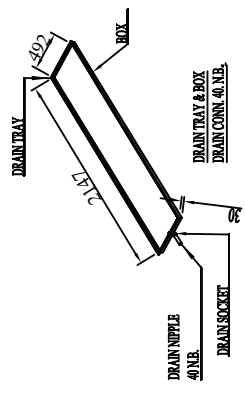
A- FAN TOTAL STATIC PRESSURE U TRAP DETAIL



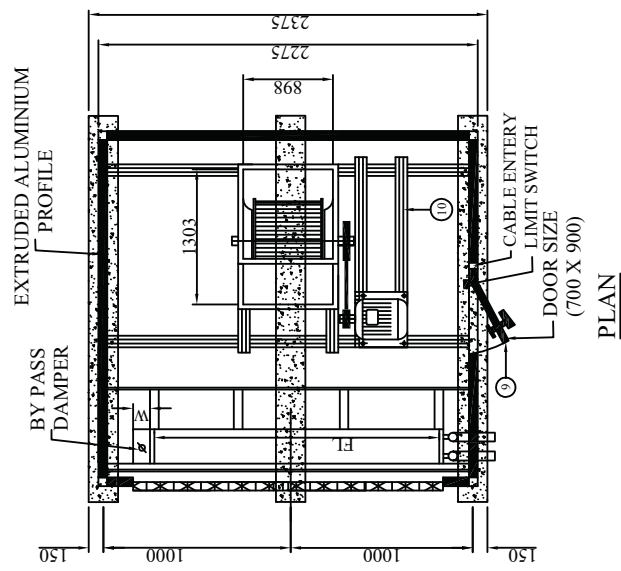
DETAIL - 'A' FOR LIFTING LUGS



TOP ELEVATION



ELEVATION



PLAN

SNO	DESCRIPTION	MATERIAL	QTY
1	AHU CAPACITY	17500 CFM (29750 CMH)	2
2	STATIC PRESSURE	65 MM WG	-
3	BLOWER	710 MM DIA., (BC) MAKE: AVPL	1
4	MOTOR	15.0 HP. (415V ± 10%, 50 Hz), (4 POLE)	-
5	COOLING COIL (DX-TYPE)	952.5 FH X 1740 EL X 4RD. I/2" O.D. X 0.4 MM THK.	2
(I)	COIL HEADER	COPPER HEADER WITH BRASS DISTRIBUTOR	-
(II)	COIL FRAME	GALVANIZED	-
(III)	COIL - FINS	ALUMINIUM / 37G / 11-13 FPI	-
(IV)	COIL - FINS	ALUMINIUM / 37G / 11-13 FPI	-
6	PRE-FILTER	610 X 610 X 50 NOS; 610 X 905 X 50 X 3 NOS	-
7	CANVASS CONNECTION	FIRE RETARDANT CANVASS CLOTH	-
8	VIBRATION ISOLATORS	SPRING MOUNTED	6
9	INSPECTION DOOR	DOUBLE SKIN	1
10	FAN & MOTOR BASE	EXTRUDED ALUMINIUM PROFILE	-
11	DRAIN TRAY	18G S.S-304 DULY PUF INJECTED & COVERED WITH PLAIN GI SHEET	-
12	UNIT BASE	GI CHANNEL BASE FRAME	-
13	FAN PULLEY (C.I)	200 MM X 3SPB	1
14	MOTOR PULLEY (C.I)	152 MM X 3SPB	1
15	FAN RPM	1096	-
16	FAN OUTLET VELOCITY	10.25 m/sec	-
17	OUTER SHEET	0.63 MM THK PRE COATED GI SHEET	-
18	INNER SHEET	0.63 MM THK PLAIN GI SHEET	-
19	PANEL THICKNESS	(25±2) MM	-
20	PANEL INSULATION	PUF INJECTED (CFC / HFC FREE & FIRE RETARDANT)	-
21	BY PASS DAMPER	110 (W) X 1905 (FH)	-
22	NO OF DISTRIBUTOR	2 NOS	-

LOCATION	-
OPERATING WEIGHT (APPROX. KG)	- 1050 KG
DYNAMIC WEIGHT (APPROX. KG)	- 1600 KG
FH	COOLING FIN HEIGHT
FL	COOLING FIN LENGTH

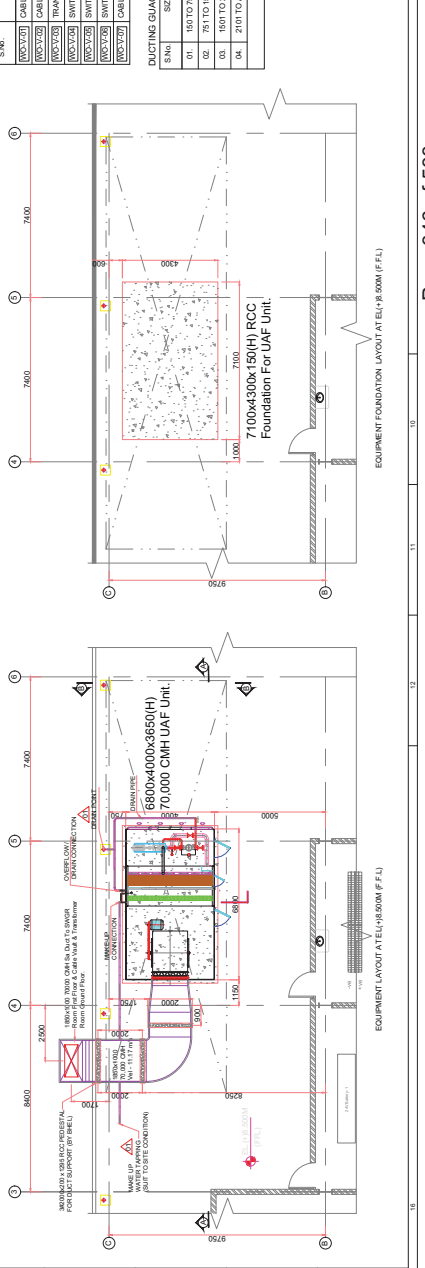
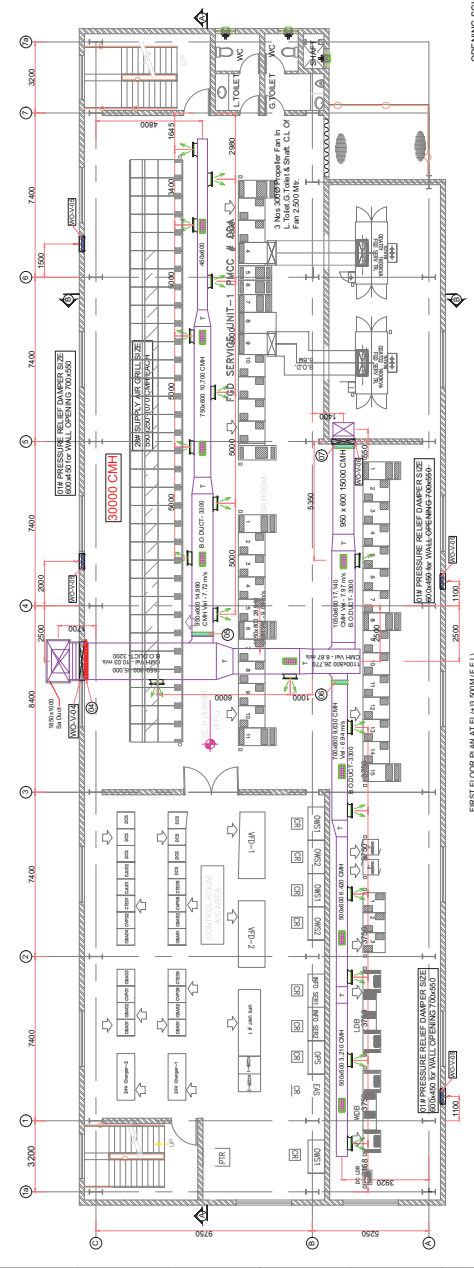
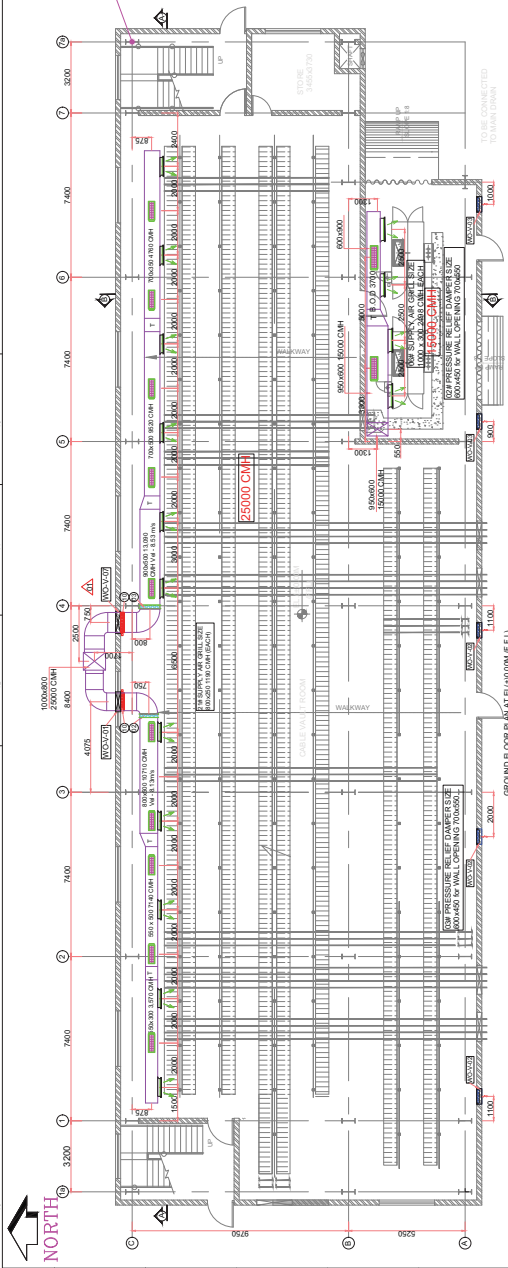
PLEASE CONFIRM FACING FILTERS	FAN DISCHARGE:	
MOTOR CONNECTION: <input type="checkbox"/> RHS <input type="checkbox"/> LHS	<input type="checkbox"/>	<input type="checkbox"/>
COIL CONNECTION: <input type="checkbox"/> RHS <input type="checkbox"/> LHS	<input type="checkbox"/>	<input type="checkbox"/>
DRAIN CONNECTION: <input type="checkbox"/> RHS <input type="checkbox"/> LHS	<input type="checkbox"/>	<input type="checkbox"/>

UNIT DISPATCH CONDITIONS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ASSEMBLED	<input type="checkbox"/>	DISMANTAL	<input type="checkbox"/>
CKD	<input type="checkbox"/>		<input type="checkbox"/>

DRG. TITLE
DOUBLE SKIN FLOOR MOUNTED AIR HANDLING UNIT
 PROJECT NAME :- M/s. FGD BHILAI
 CLIENT/CONSULTANT :- NTPC
 EPC CONTRACTOR :- M/s. BHARAT HEAVY ELECTRICAL LIMITED

APPLICABLE FOR ANNEXURE-I, ITEM NO. B1a FOR FOUNDATION DETAILS OF UAF

9401 OF 1760 UN



TITLE	DRAWING NO.
FGD CONTROL ROOM BUILDING ARCHITECTURAL PLAN ELEVATION & SECTION	PE-03-468-651-13000A-0201
TECHNICAL DATA SHEET & GA DRAWING FOR CENTRIFUGAL PUMP FOR UAF UNIT	PE-03-468-651-13000A-0204
HEAT LOAD CALCULATION FOR EVAPORATIVE COOLING SYSTEM OF FGD BUILDING	PE-03-468-651-13000A-0103
PAID FOR UAF UNIT FOR FGD BUILDING	PE-03-468-651-13000A-0104
ACQUISITION LAYOUT (IND & OUTDOOR UNITS) WITH COMPLETE FOUNDATION DETAIL FOR FGD CONTROL BUILDING	PE-03-468-651-13000A-0201
STANDARD DRAWING FOR DUCT FABRICATION & APPLICATION DETAIL OF INSULATION	PE-03-468-651-13000A-0204

- NOTES:
1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE NOTED OTHERWISE.
 2. THE FINISHED FLOOR LEVEL (F.F.L.) OF BUILDING GROUND FLOOR IS +0.00M WHICH CORRESPOND TO R.L. = 20M.
 3. ALL DIMENSIONS SHALL BE PROVIDED UP TO THE FINISHED TO R.L. = 20M.
 4. FOR CONCRETE WALL OPENING EQUIPMENT FOUNDATION TO BE PROVIDED BY THE USER. THE DUCT SUPPORTING STRUCTURE OF FOUNDATION SHALL BE IN ACCORDANCE WITH THE SPECIFICATION OF THE USER.
 5. ALL SUPPLY AIR DUCT SHALL BE 200 MM CENTER TO CENTER.
 6. ALL SUPPLY AIR DUCT SHALL BE 200 MM CENTER TO CENTER.
 7. DUCT SUPPORT IN TYPICAL 200 MM CENTER TO CENTER.
 8. PREFERABLY DUCT SUPPORT TO BE FROM TOP EXISTING BEAM, WHERE STEEL BEAM IS NOT AVAILABLE, DUCT SUPPORT MAY BE FROM SUBS & WALL. ANCHOR FASTENER SHALL BE PROVIDED BY USER.
 9. VENTILATION DUCT WITH IN THE BUILDINGS SHALL BE INSULATED WITHOUT ANY INSULATION DUCT EXPOSED TO THE ENVIRONMENT SHALL BE INSULATED AFTER SPECIFICATION.
 10. SPACING OF REINFORCEMENT TYPE SUPPORT SHALL BE AT 200 MM.
 11. ALL DIMENSIONS SHALL BE PROVIDED UP TO THE FINISHED TO R.L. = 20M.



S.N.	LOCATION	DESCRIPTION	SIZE (W X H)	BOTTOM OF OPENING	QTY
01	CABLE WALK (G.F)	FOR SUPPLY AIR DUCT	900 X 600	EL. + 1.75M	1
02	CABLE WALK (G.F)	FOR GRAVITY DAMPER	700 X 500	EL. + 2.250 MP	3
03	TRANSFORMER ROOM (G.F)	FOR GRAVITY DAMPER	700 X 500	EL. + 2.250 MP	1
04	SWITCHGEAR HALL (F.F)	FOR SUPPLY AIR DUCT	1950 X 900	EL. + 6.65M	1
05	SWITCHGEAR HALL (F.F)	FOR GRAVITY DAMPER	700 X 500	EL. + 7.1 M	4
06	SWITCHGEAR HALL (F.F)	FOR SUPPLY AIR DUCT	1950 X 700	EL. + 7.0 MP	1
07	CABLE WALK (G.F)	FOR SUPPLY AIR DUCT	900 X 600	EL. + 1.75M	1

CUSTOMER: NTPC Limited (A GOVERNMENT OF INDIA ENTERPRISE)

PROJECT: 2 X 250 MW NSPCL BHILAI TPP FGD

POWER SECTOR

PROJECT ENGINEERING MANAGEMENT

INDIA

STAMP: [Signature]

DATE: 11/08/2024

SCALE: 1:100

PROJECT NO: PE-03-468-651-13000A-0201

SHEET NO: 1 OF 2

S.N.	LOCATION	DESCRIPTION	SIZE (W X H)	BOTTOM OF OPENING	QTY
01	CABLE WALK (G.F)	FOR SUPPLY AIR DUCT	900 X 600	EL. + 1.75M	1
02	CABLE WALK (G.F)	FOR GRAVITY DAMPER	700 X 500	EL. + 2.250 MP	3
03	TRANSFORMER ROOM (G.F)	FOR GRAVITY DAMPER	700 X 500	EL. + 2.250 MP	1
04	SWITCHGEAR HALL (F.F)	FOR SUPPLY AIR DUCT	1950 X 900	EL. + 6.65M	1
05	SWITCHGEAR HALL (F.F)	FOR GRAVITY DAMPER	700 X 500	EL. + 7.1 M	4
06	SWITCHGEAR HALL (F.F)	FOR SUPPLY AIR DUCT	1950 X 700	EL. + 7.0 MP	1
07	CABLE WALK (G.F)	FOR SUPPLY AIR DUCT	900 X 600	EL. + 1.75M	1

S.N.	SIZE	QUANTITY	INSULATION
01.	100 TO 700 MM	24	212.5mm
02.	751 TO 1500 MM	22	212.5mm
03.	1501 TO 2100 MM	20	141.5mm
04.	2101 TO ABOVE	18	110.5mm
TOTAL		84	560.5mm

REV	DATE	BY	CHK	APPD

JOB NO: 468

STATUS: CONTRACT

DISTRIBUTION:

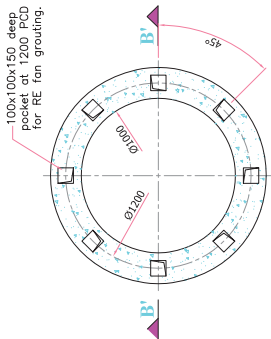
JOB: KORBA FGD HVAC SYSTEM FOR FGD AXIAL FAN BILL OF QUANTITY				
Sr. No.	Type of fan	Static Pressure		Quantity as per Fan Schedule
1	40000 CMH	15	mmWCSP	4
2	20000 CMH	15	mmWCSP	0
3	10000 CMH	30	mmWCSP	5
4	7500 CMH	30	mmWCSP	0
5	6000 CMH	30	mmWCSP	10
6	4000 CMH	30	mmWCSP	1
7	10000 CMH	20	mmWCSP	33
8	7500 CMH	20	mmWCSP	0
9	6000 CMH	20	mmWCSP	1
10	4000 CMH	20	mmWCSP	0
11	15000 CMH	15	mmWCSP	0
12	10000 CMH	15	mmWCSP	0
13	7500 CMH	15	mmWCSP	4
14	4000 CMH	15	mmWCSP	0
15	2000 CMH	15	mmWCSP	2
16	15000 CMH	10	mmWCSP	1
17	10000 CMH	10	mmWCSP	2
18	7500 CMH	10	mmWCSP	0
19	6000 CMH	10	mmWCSP	2
20	4000 CMH	10	mmWCSP	1
21	2000 CMH	10	mmWCSP	0
22	1000 CMH	5	mmWCSP	12

TECHNICAL DATASHEET & GA DRAWING FOR ROOF EXTRACTOR ALONG WITH FIXING DETAILS				
Sr. No.	Description	Unit	Particulars	
1	Item		Roof Extractor (Axial flow fan)	
2	Manufacturer			
3	Model No.			
4	Impeller Speed	RPM	970	960
5	Capacity	CMH	20000	40000
6	Quantity		As per Ventilation Fan Schedule	
7	Static pressure at 20 °C	mmWG	15	15
8	Velocity pressure at 20 °C	mmWG	5	9
9	Total pressure	mmWG	20	24
10	Impeller Diameter	mm	800	1000
11	No. of Blade	Nos.	8	8
12	Type of Blade		Fixed / variable pitch Cast Aluminium blade	
13	Blade Angle	Degree	27.5	25
14	Shaft Power at 20 °C	BkW	1.57	4.16
15	Fan Efficiency	%	70	70
16	Bearing Type & No.		Ball Bearing (6206 ZZ & 6205 ZZ)	Ball Bearing (6208 ZZ & 6305 ZZ)
17	Weight of Fan			
	a) Static Load	Kg	105	185
	b) Dynamic Load		150	225
18	Performance curves enclosed (yes/No)		yes	
19	Motor Data			
	a) Rating at 50 °C ambient temperature	kW/Pole	2.2/6	5.5/6
	b) Speed	RPM	970	960
	c) Type of Mounting		Foot mounting shaft upward (V6)	
	e) Direction of Rotation		Clockwise / Anti - Clockwise	
20	Material			
	a) Impeller		Cast Aluminium	
	b) Casing		MS Sheet 5 mm thick	
	c) Shaft		Motor Shaft (EN-8)	
	d) Hood		MS 3.15 MM THICKNESS	
21	Painting		Epoxy Paint/ 150 micron	
22	Galvanized Bird screen of 15 mm sq. with Cowl		Provided	
23	Vibration level		As per ISO: 14694	
24	Accessories		Fan mounting duct, Rain protection cowl, Protective screen at inlet: Min. 14 SWG Galvanized wire knitted in 1" square mesh	
25	Inspection & Testing		As per approved QAP	

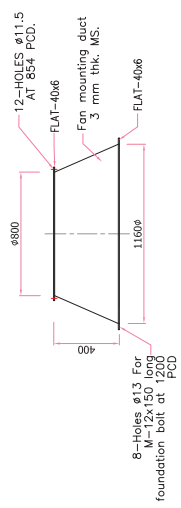
REFERENCE DOCUMENTS / DRAWINGS	
DOCUMENT / DRAWING NO.	DOCUMENT / DRAWING TITLE

<p>NOTES:</p> <ol style="list-style-type: none"> 1. ALL EQUIPMENTS SHALL BE DESIGNED FOR CONTINUOUS DUTY. 2. ALL DIMENSIONS ARE IN MM, AND ELEVATIONS ARE IN MTRS, UNLESS OTHERWISE STATED. 3. FAN INVERSION LEVEL SHALL BE AS PER ISO : 14644. 4. 15 MM MIN. AIR GAP SHALL BE PROVIDED BETWEEN FAN & TRANSITION HOOD. 5. ITEM LISTED IN THE PART LIST FOR ONE FAN ONLY. 6. MTPC APPROVED FAN SCHEDULE FOR FINAL R.F. FAN QTY. 	<table border="1"> <tr> <td>AIR CAPACITY</td> <td>: 20,000 CMH</td> </tr> <tr> <td>FAN STATIC PRESSURE</td> <td>: 14 (CmH₂O)</td> </tr> <tr> <td>FAN STATIC LOAD</td> <td>: 105 KG</td> </tr> <tr> <td>DYNAMIC LOAD</td> <td>: 150 KG</td> </tr> </table>	AIR CAPACITY	: 20,000 CMH	FAN STATIC PRESSURE	: 14 (CmH ₂ O)	FAN STATIC LOAD	: 105 KG	DYNAMIC LOAD	: 150 KG
AIR CAPACITY	: 20,000 CMH								
FAN STATIC PRESSURE	: 14 (CmH ₂ O)								
FAN STATIC LOAD	: 105 KG								
DYNAMIC LOAD	: 150 KG								

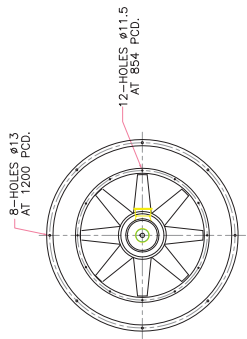
PART NO.	DESCRIPTION	SIZE	QTY.	MATLS/NAME
05.	WIRE MESH (15 MM SQ.)	#800	+	
04.	ROOF EXHAUSTER COIL	#120/AVP70	+	
03.	TRANSITION DUCT/HOOD	#1160/AB00	+	
02.	MOTOR 2.2KW/POLE	-	+	
01.	ROOF EXTRACTOR FAN	-	+	



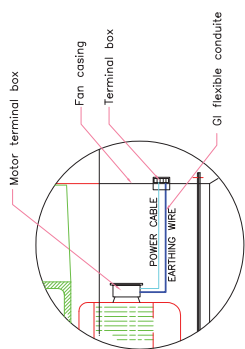
ROOF OPENING DETAIL



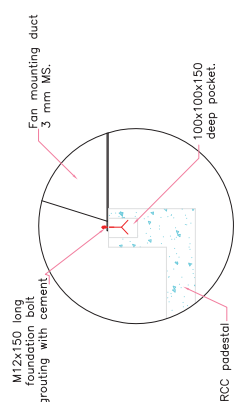
ROOF EXTRACTOR FAN MOUNTING DUCT DETAIL



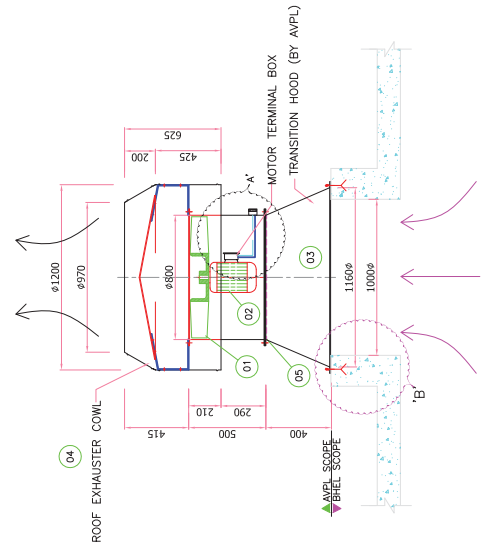
FAN TOP VIEW



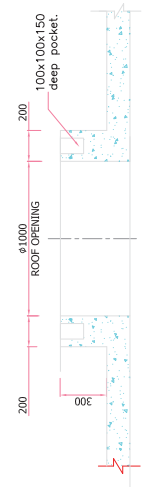
DETAIL 'A'



DETAIL 'B'



ELEVATION VIEW



SECTION B-B'

NO. 455	CONTRACT
DATE	

- NOTES:**
1. ALL DIMENSIONS SHALL BE AS SHOWN FOR CONTRACTORS QUOTE.
 2. ALL DIMENSIONS ARE IN MM, AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE SPECIFIED.
 3. ALL DIMENSIONS SHALL BE AS PER IS: 14999.
 4. 13 MM THICK RAFTER MARKET SHALL BE PROVIDED BETWEEN FAN & TRANSITION HOOD.
 5. REFER APPROVED FAN SCHEDULE FOR FAN, RE-FAN QTY.

ITEM NO.	DESCRIPTION	SIZE	QTY.	MATL/SPEC
05.	WIRE MESH (IS 1591)	1000	1 No.	
04.	ROOF EXHAUSTER COWL	1500 / 1156	1 No.	
03.	FAN MOUNTING DUCT	1350 / 1000	1 No.	
02.	MOTOR & SW/POLE	-	1 No.	
01.	ROOF EXTRACTOR FAN	-	1 No.	

AIR CAPACITY : 40,000 CMH
 FAN STATIC PRESSURE : 15 (mmwc)
 FAN STATIC LOAD : 185 KG
 DYNAMIC LOAD : 225 KG

WPC DRAW. NO. _____

CUSTOMER: **MTPC Limited**
 (A MAHARASHTRA GOVT. ENTERPRISE)

PROJECT: 3X2004-34500+14500 MW NTPC KORBA TPP
 (TOD SYSTEM PACKAGE)

PROJECT MANAGER: BHARAT HEAVY ELECTRICALS LTD
 POWER SYSTEMS DIVISION
 INDIA

DATE: _____

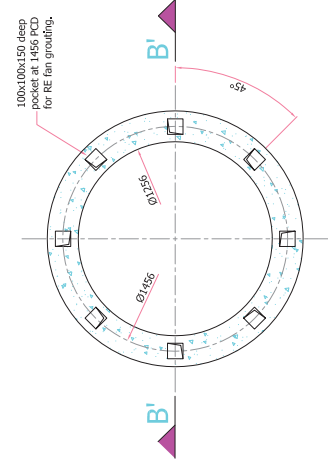
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BY: _____

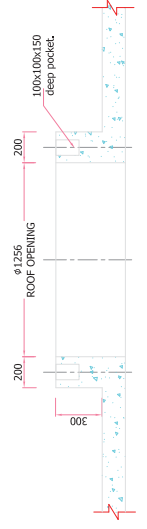
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APPROVED: _____

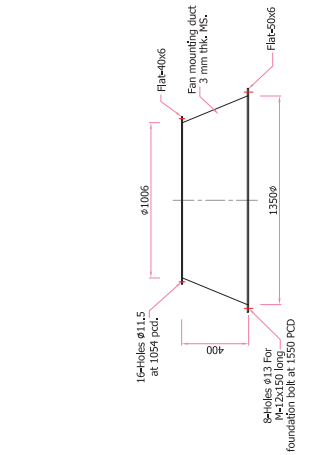
TITLE: TECHNICAL DATA SHEET & COORDINATE DRAWING OF FAN AND FAN POLE
 AND MOUNTING SYSTEM ALUMINIUM FINISH DETAILS AND G.O.P. PROPELLER FAN



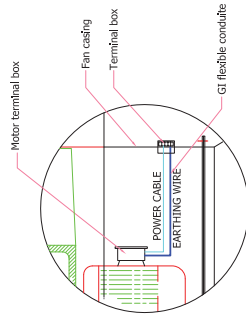
ROOF OPENING DETAIL FOR



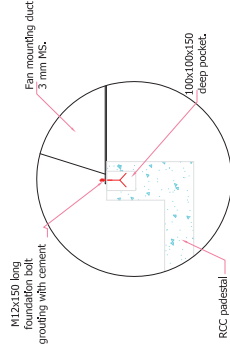
SECTION B-B'



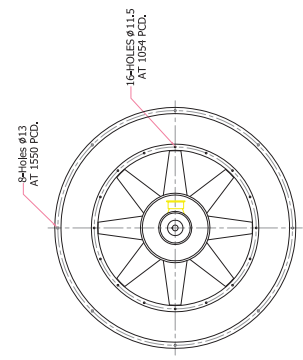
ROOF EXTRACTOR FAN MOUNTING DUCT DETAIL



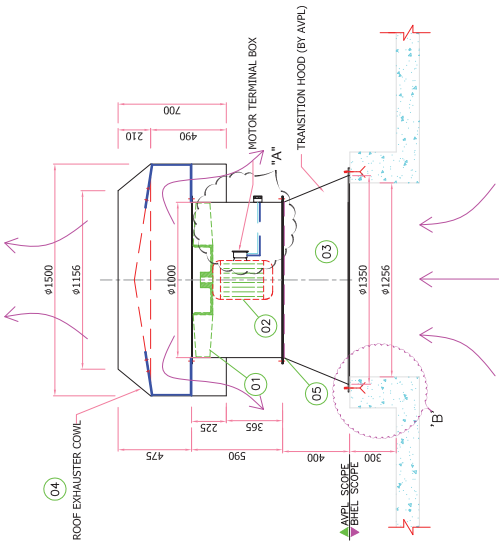
DETAIL 'A'



DETAIL 'B'

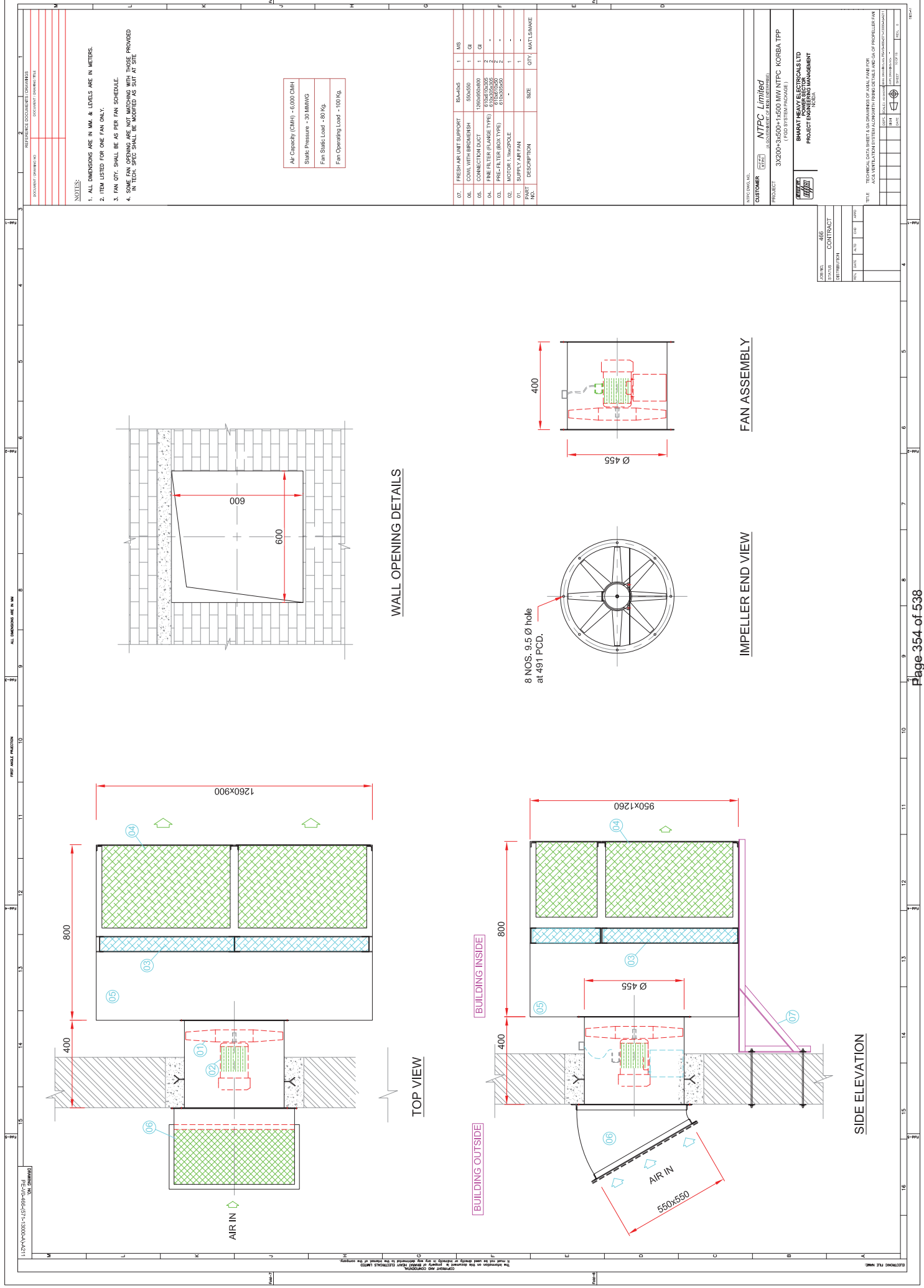


FAN TOP VIEW



ELEVATION VIEW

TECHNICAL DATA SHEET & GA DRAWING FOR AXIAL FLOW SUPPLY FANS 30 mm WC STATIC						
Sr. No.	Description	Unit	Particulars			
1	Manufacturer					
2	Model No.					
3	Type of Fan		Axial Flow Supply Fans with 30mm WC Static			
4	Capacity	CMH	10000	7500	6000	4000
5	Quantity		As per fan schedule			
6	Static pressure	mmWG	30	30	30	30
7	Total pressure	mmWG	33.25	31.5	37	37.5
8	Impeller Diameter	mm	800	800	450	400
9	Type of blade		Fixed/variable pitch Cast Aluminium blade			
10	No. of blade	Nos.	8	8	8	8
11	Blade angle	Degree	17.5	15	17.5	20
12	Drive Arrgt.		Impeller mounted directly on the motor shaft			
13	Fan/Impeller Speed	RPM	1420	1410	2840	2830
14	Shaft Power	BkW	1.54	1.09	1.03	0.69
15	Fan Efficiency	%	60	60	60	60
16	Bearing Type		Ball Bearing			
17	Selection curves enclosed (yes/No)		yes	yes	yes	yes
18	Motor Data					
	a) Rating	kW/Pole	2.2/4	1.5/4	1.1/2	0.75/2
	b) Speed	RPM	1420	1410	2840	2830
	c) Type of Mounting		B3			
	e) Direction of Rotation		Clockwise / Anti-clockwise			
20	Material					
	a) Impeller		Cast Aluminium			
	b) Casing		MS			
	c) Casing thickness (mm)		5		3	
	d) Shaft		Motor Shaft (EN-8)			
19	Accessories		Rain protection cowl, birdmesh			
20	Filter					
	20.1 Filter type		Pre-filter			
	a) Filter size		610 X 610 X 50			
	b) No. of filters		4	3	3	2
	c) Filter efficiency		Average arrestance efficiency (65-80)%			
	20.2 Filter type		Fine-filter			
	a) Filter size		610 X 610 X 305			
	b) No. of filters		4	3	3	2
	c) Filter efficiency		>90% As per BS:6540/ASHRAE-52-76/EN779			
21	Painting		Epoxy Paint 150 Microns			
22	Noise Level	dB(A)	≤ 85			
23	Inspection & Testing		As per approved QAP			



WALL OPENING DETAILS

FAN ASSEMBLY

IMPELLER END VIEW

NOTES:

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METERS.
2. ITEM LISTED FOR ONE FAN ONLY.
3. FAN QTY. SHALL BE AS PER FAN SCHEDULE.
4. SOME FAN OPENINGS ARE NOT MATCHING WITH THOSE PROVIDED IN TECH. SPEC. SHALL BE MODIFIED AS SUIT AT SITE.

Air Capacity (CMH) - 6000 CMH
Static Pressure - 30 MMWG
Fan Static Load - 80 Kg.
Fan Operating Load - 100 Kg.

PART NO.	DESCRIPTION	SIZE	QTY.	MATERIALS MAKE
07.	FRESH AIR UNIT SUPPORT	IS-40x5	1	MS
08.	COIL WITH BROOMSH	500x50	1	GI
09.	CONNECTION DUCT	1260x900	1	GI
04.	FINE FILTER (LARGE TYPE)	6 (100x200)	2	-
05.	PRE-FILTER (BOX TYPE)	6 (100x200)	2	-
02.	MOTOR 1.1hp/POLE	1	1	-
01.	SUPPLY AIR FAN	1	1	-

NTPC DRAWING NO. _____

CUSTOMER: **NTPC Limited**
(A CORPORATION OF GOVT. OF INDIA)

PROJECT: **3X2000-3x500+1x500 MW NTPC KORBA TPP**
(FGD SYSTEM PACKAGE)

SHARAT HEAVY ELECTRICALS LTD
PROJECT MANAGEMENT & CONSTRUCTION MANAGEMENT
 INDIA

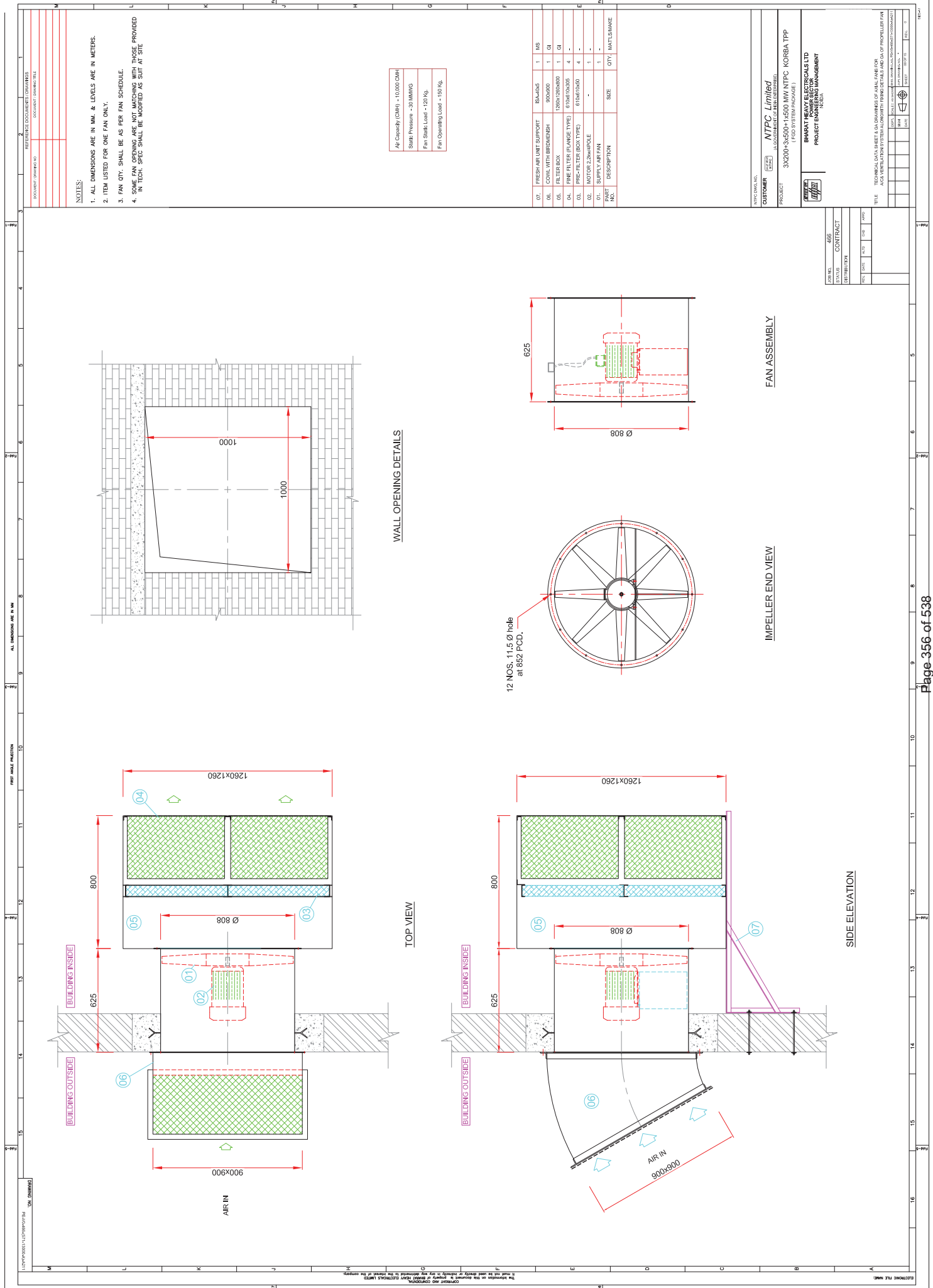
DATE: _____

TITLE: **TECHNICAL DATA SHEET & GA DRAWINGS OF AXIAL FAN FOR ACS VENTILATION SYSTEM (WITH FORMING DETAILS AND GA OF PROPELLER END)**

SCALE: _____

REVISIONS:

NO.	DATE	BY	CHKD	PROJ

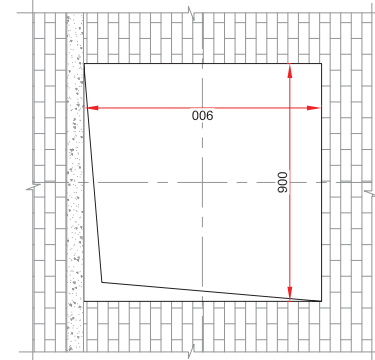


TECHNICAL DATA SHEET & GA DRAWING FOR AXIAL FLOW SUPPLY FANS 20 mm WC STATIC

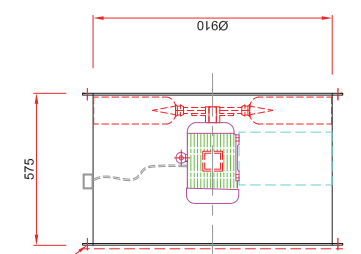
Sr. No.	Description	Unit	Particulars			
1	Manufacturer		AVPL			
2	Model No.		AdTV-850	AdTV-800	AdTV-800	AdTV-800
3	Type of Fan		Axial Flow Supply Fans with 20mm WC Static			
4	Capacity	CMH	10000	7500	6000	4000
5	Quantity		As per fan schedule			
6	Static pressure	mmWG	20	20	20	20
7	Total pressure	mmWG	21.5	21	20.6	20.3
8	Impeller Diameter	mm	850	800	800	800
9	Type of blade		Fixed/variable pitch Cast Aluminium blade			
10	No. of blade	Nos.	12	9	9	9
11	Blade angle	Degree	29	30	28.5	21.5
12	Drive Arrgt.		Impeller mounted directly on the motor shaft			
13	Fan/Impeller Speed	RPM	935	930	930	925
14	Shaft Power	BkW	1.05	0.86	0.71	0.45
15	Fan Efficiency	%	57	50	47	50
16	Bearing Type		Ball Bearing			
17	Selection curves enclosed (yes/No)		yes	yes	yes	yes
18	Motor Data					
	a) Rating	kW/Pole	1.5/6	1.1/6	1.1/6	0.75/6
	b) Speed	RPM	935	930	930	925
	c) Type of Mounting		B3			
	e) Direction of Rotation		Clockwise / Anti-clockwise			
19	Material					
	a) Impeller		Cast Aluminium			
	b) Casing		MS			
	c) Casing thickness (mm)		5			
	d) Shaft		Motor Shaft (EN-8)			
20	Accessories		Rain protection cowl, birdmesh			
21	Filter					
	21.1 Filter type		Pre-filter			
	a) Filter size		610 X 610 X 50			
	b) No. of filters		4	3	3	2
	c) Filter efficiency		Average arrestance efficiency (65-80)%			
22	Painting		Epoxy Paint 150 Microns			
23	Noise Level	dB(A)	≤ 85			
24	Inspection & Testing		As per approved QAP			

REFERENCE DOCUMENTS (DRAWINGS)		DOCUMENT IDENTIFIER			
DOCUMENT IDENTIFIER		DOCUMENT IDENTIFIER			
<p>NOTES:</p> <ol style="list-style-type: none"> ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METERS. ITEM LISTED FOR ONE FAN ONLY. FAN QTY. SHALL BE AS PER FAN SCHEDULE. SOME FAN OPENING ARE NOT MATCHING WITH THOSE PROVIDED IN TECH. SPEC. SHALL BE WORKED AS SUIT AT SITE. 					
<p>AP Capacity (Cfm) - 4100 Cfm Static Pressure - 20 MMWG Fan Static Load - 120 kg. Fan Operating Load - 150 kg.</p>					
QTY.	FRESH AIR UNIT SUPPORT	BS-405	1		
QTY.	CONV. WITH BROWSE	3000	1		
QTY.	FILTER BOX	3000/2000	1		
QTY.	PRE-FILTER (FLANGE TYPE)	6100/1000	2		
QTY.	MOTOR (2hp/4pole)	-	1		
QTY.	SUPPLY AIR FAN	-	1		
QTY.	NO. OF	DESCRIPTION	SIZE	QTY.	MATERIAL

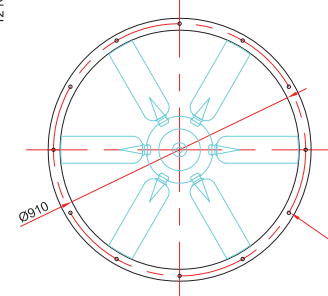
NTPC INDIA
CUSTOMER NTPC Limited
ALUMINUM & CHEMICALS UNIT, RAIPUR
PROJECT 3X200+3500+14500 MW NTPC KORBA TPP
(FGD SYSTEM PACKAGE)
PROJECT ENGINEERING MANAGEMENT
SHARAT HEAVY ELECTRICALS LTD
INDIA



WALL OPENING DETAILS



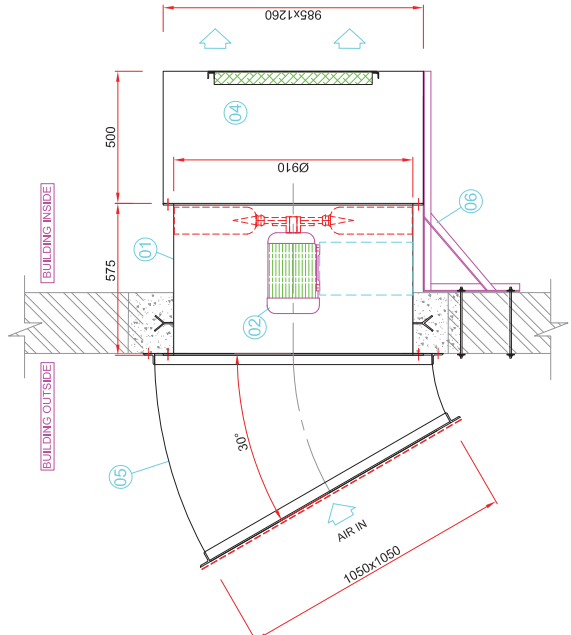
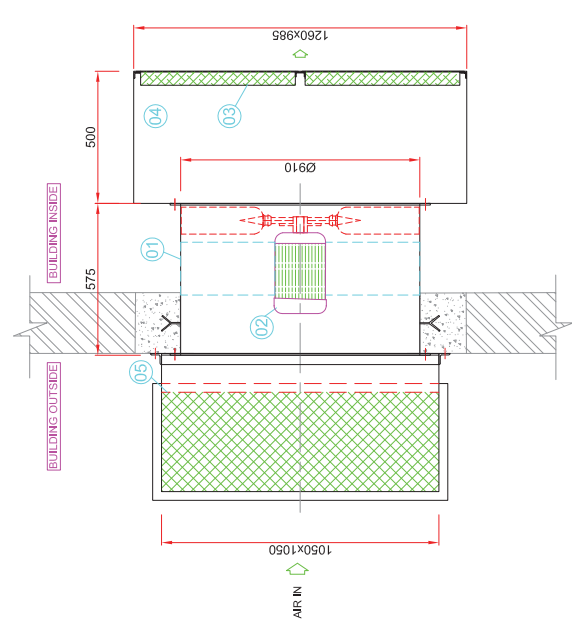
FAN ASSEMBLY



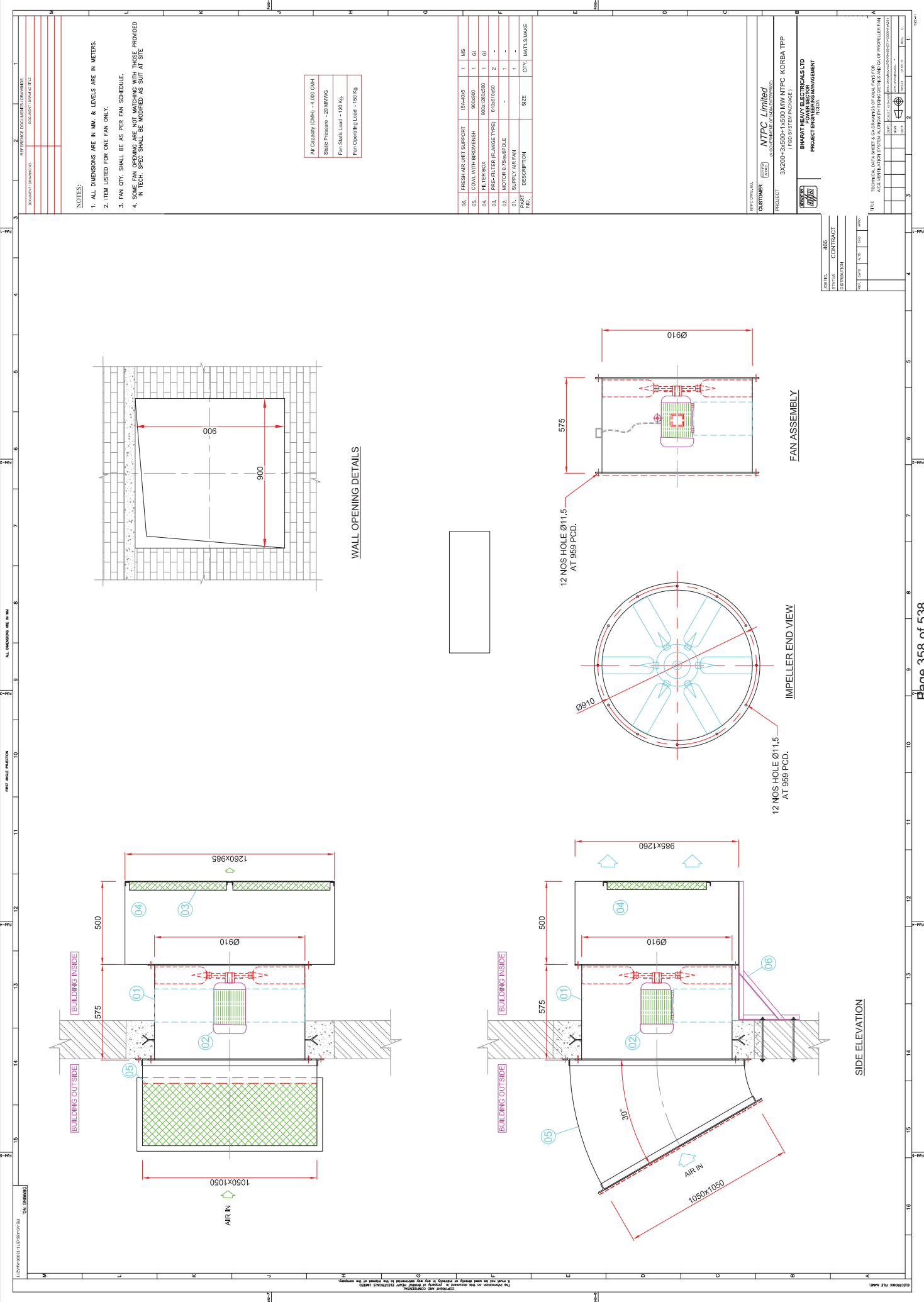
IMPELLER END VIEW

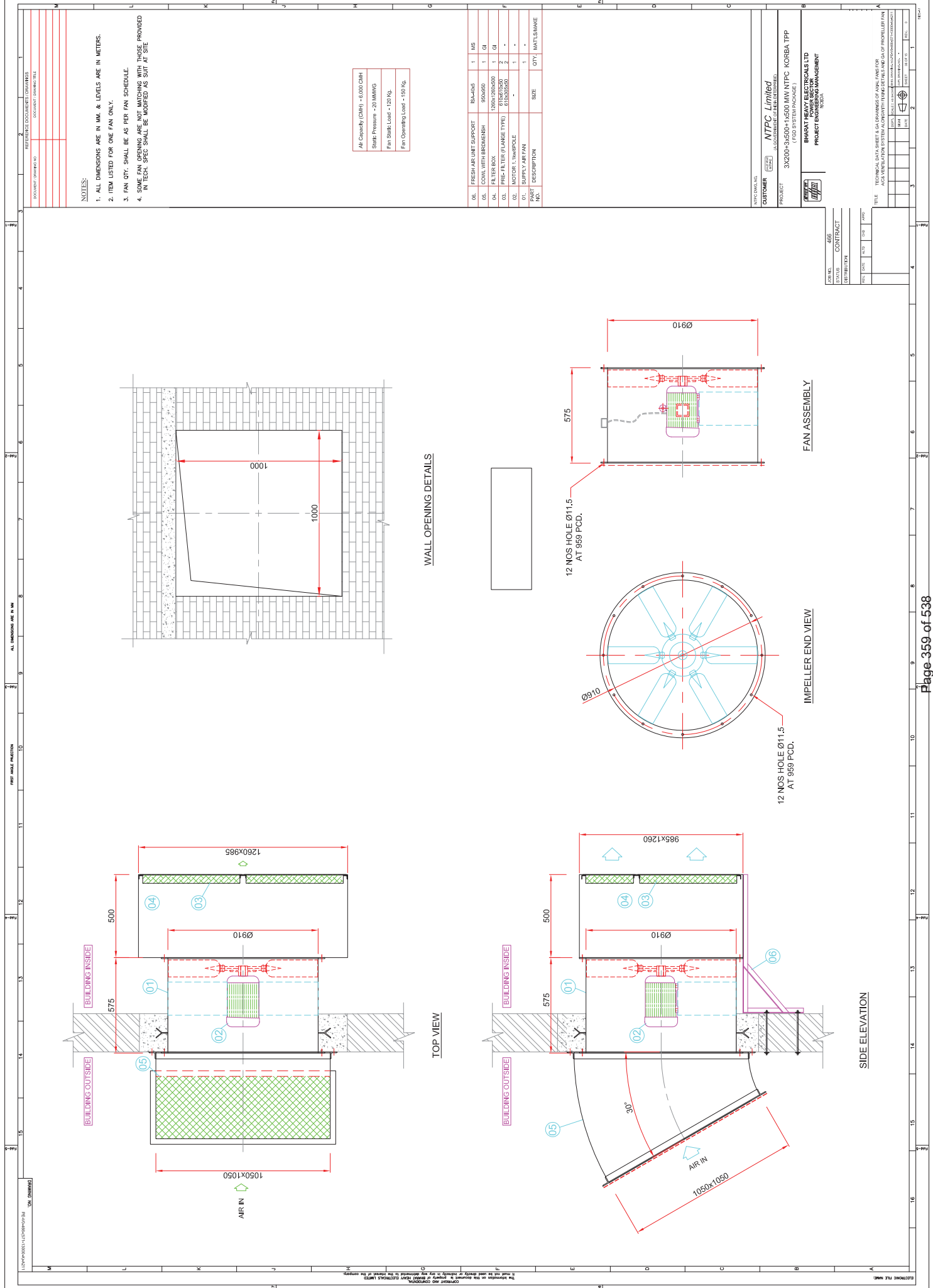
12 NOS HOLE Ø11.5 AT 969 PCD.

12 NOS HOLE Ø11.5 AT 969 PCD.

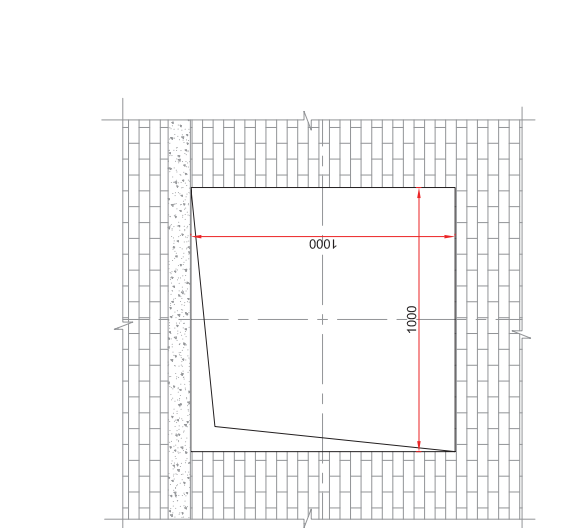


SIDE ELEVATION



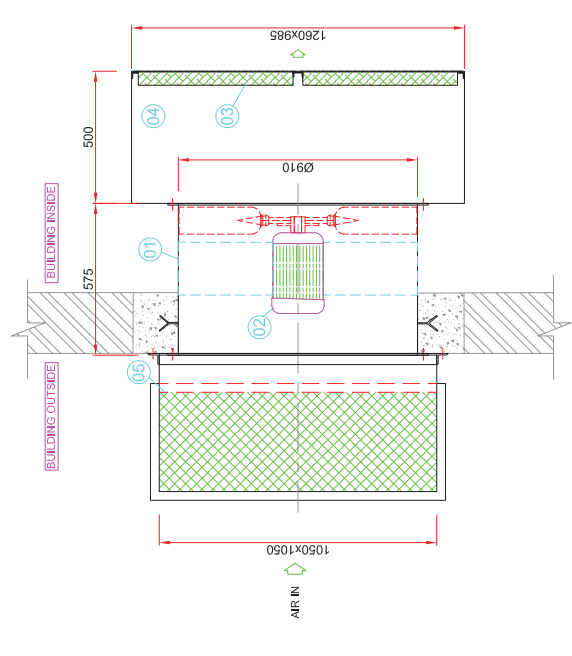


REFERENCE DOCUMENTS (DRAWINGS)		DOCUMENT IDENTIFIER																																				
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<p>NOTES:</p> <ol style="list-style-type: none"> ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METERS. ITEM LISTED FOR ONE FAN ONLY. FAN QTY. SHALL BE AS PER FAN SCHEDULE. SOME FAN OPENING ARE NOT MATCHING WITH THOSE PROVIDED IN TECH. SPEC SHALL BE WORKED AS SUIT AT SITE BY APPL. 																																						
<p>Air Capacity (CMH) = 7,500 CMH Static Pressure = 20 MMWG Fan Static Load = 120 Kg. Fan Operating Load = 150 Kg.</p>		<table border="1"> <tr> <th>NO.</th> <th>DESCRIPTION</th> <th>SIZE</th> <th>QTY.</th> <th>UNIT</th> </tr> <tr> <td>06.</td> <td>FRESH AIR UNIT SUPPORT</td> <td>BS-4005</td> <td>1</td> <td>MS</td> </tr> <tr> <td>05.</td> <td>COIL WITH BRUSHLESS</td> <td>900x950</td> <td>1</td> <td>GI</td> </tr> <tr> <td>04.</td> <td>FILTER BOX</td> <td>1260x985x900</td> <td>1</td> <td>GI</td> </tr> <tr> <td>03.</td> <td>PRE-FILTER FLANGE TYPE</td> <td>Ø1050/Ø910</td> <td>2</td> <td>-</td> </tr> <tr> <td>02.</td> <td>MOTOR 1, 1/2HP POLE</td> <td>1260x985</td> <td>1</td> <td>-</td> </tr> <tr> <td>01.</td> <td>SUPPLY AIR FAN</td> <td>AdTV-900/8 B</td> <td>1</td> <td>-</td> </tr> </table>		NO.	DESCRIPTION	SIZE	QTY.	UNIT	06.	FRESH AIR UNIT SUPPORT	BS-4005	1	MS	05.	COIL WITH BRUSHLESS	900x950	1	GI	04.	FILTER BOX	1260x985x900	1	GI	03.	PRE-FILTER FLANGE TYPE	Ø1050/Ø910	2	-	02.	MOTOR 1, 1/2HP POLE	1260x985	1	-	01.	SUPPLY AIR FAN	AdTV-900/8 B	1	-
NO.	DESCRIPTION	SIZE	QTY.	UNIT																																		
06.	FRESH AIR UNIT SUPPORT	BS-4005	1	MS																																		
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02.	MOTOR 1, 1/2HP POLE	1260x985	1	-																																		
01.	SUPPLY AIR FAN	AdTV-900/8 B	1	-																																		
<p>NTPC INDIA, CUSTOMER: NTPC Limited PROJECT: 3X200-3500+1500 MW NTPC KORBA TPP (FGD SYSTEM PACKAGE) BHARAT HEAVY ELECTRICALS LTD PROJECT ENGINEERING MANAGEMENT INDIA</p>																																						

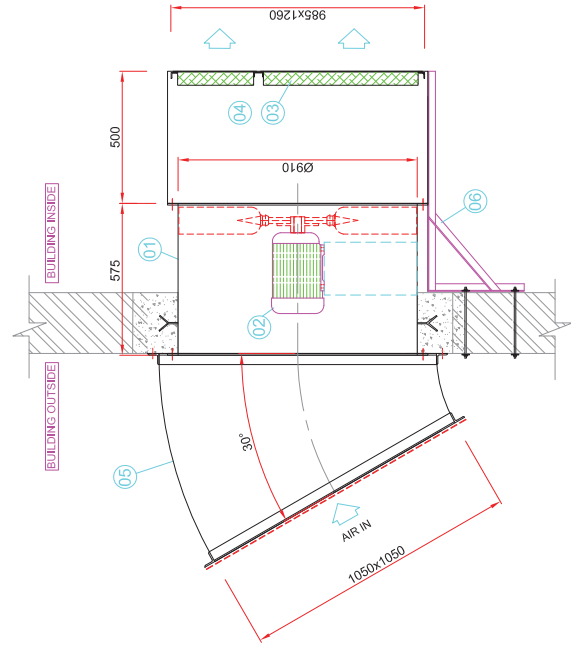


WALL OPENING DETAILS

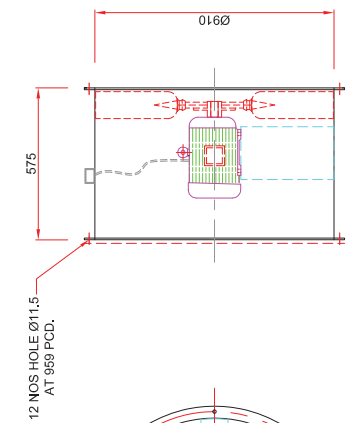
AdTV-900/8 B



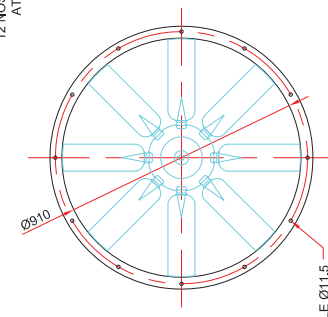
TOP VIEW



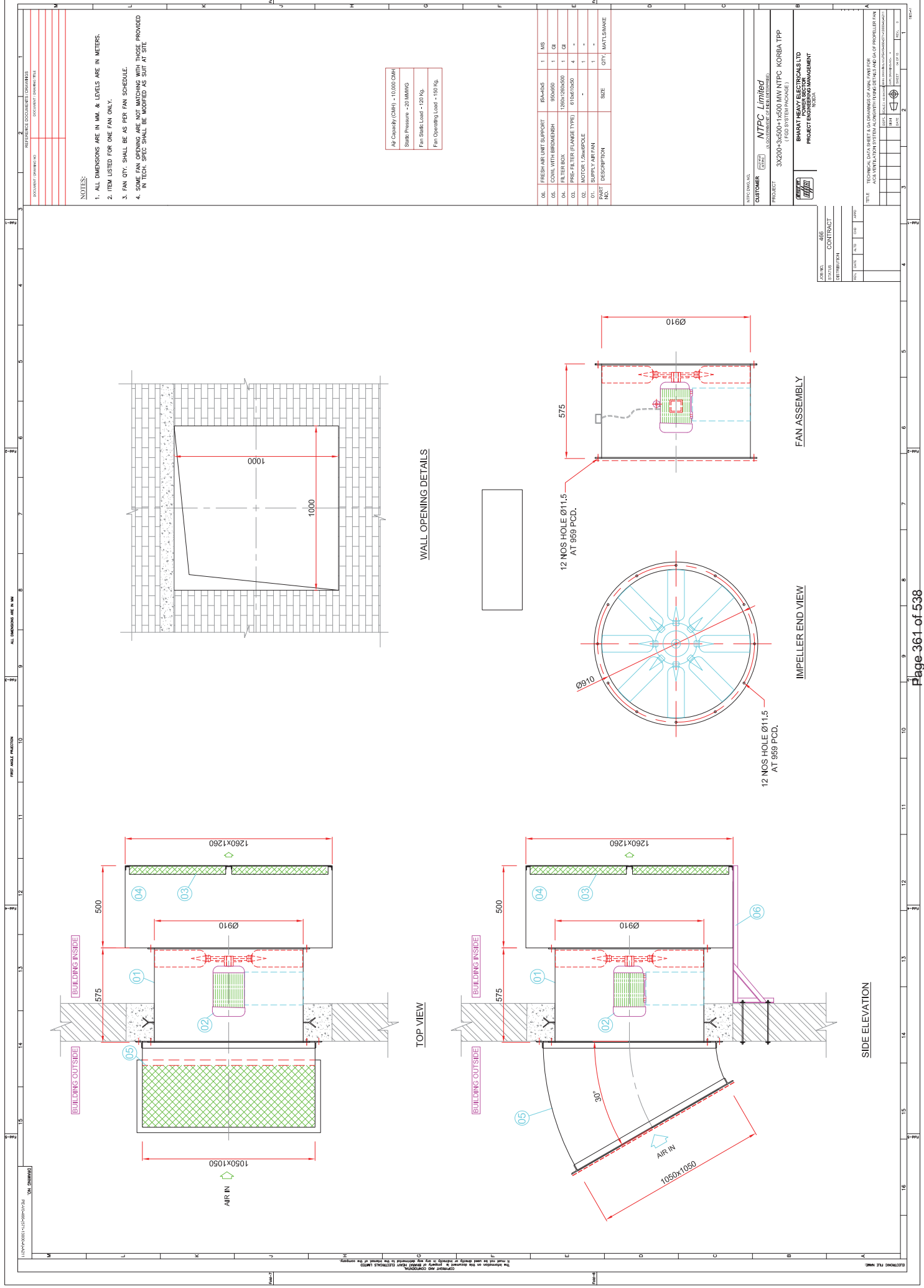
SIDE ELEVATION



FAN ASSEMBLY



IMPELLER END VIEW



NOTES:

1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METERS.
2. ITEM LISTED FOR ONE FAN ONLY.
3. FAN QTY. SHALL BE AS PER FAN SCHEDULE.
4. SOME FAN OPENING ARE NOT MATCHING WITH THOSE PROVIDED IN TECH. SPEC. SHALL BE WORKED AS SUIT AT SITE.

Air Capacity (Clean) - 10,000 CMH
Static Pressure - 20 MMWG
Fan Start Load - 120 Kg.
Fan Operating Load - 190 Kg.

DL	FRESH AIR UNIT SUPPORT	QTY.	MATERIALS NAME
01	CONC. WITH BRICKWORK	1	MS
02	FILTER BOX	1	GI
03	PRE-FILTER (FAN TYPE)	1	GI
04	IMPELLER	4	-
05	MOTOR LAWSPOLE	1	-
06	SUPPLY AIR FAN	1	-
07	WALL OPENING	1	-

NTPC INDIA
 CUSTOMER: **NTPC Limited**
 PROJECT: 3X200+3x500+1x500 MW NTPC KORBA TPP
 (FGD SYSTEM PACKAGE)
 BHARAT HEAVY ELECTRICALS LTD
 PROJECT ENGINEERING MANAGEMENT
 INDIA

NO.	REV.	DATE	BY	CHKD.	APPD.

WALL OPENING DETAILS

FAN ASSEMBLY

IMPELLER END VIEW

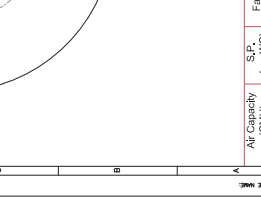
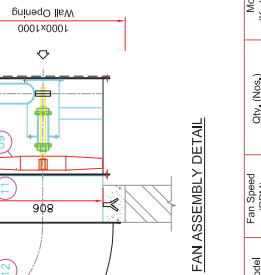
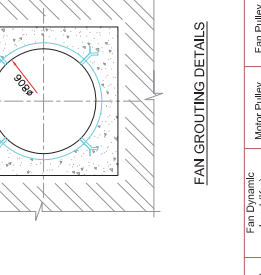
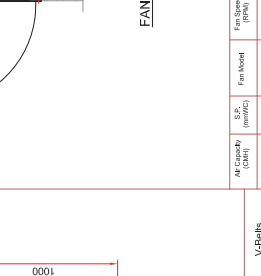
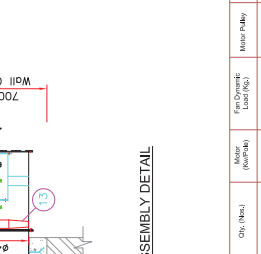
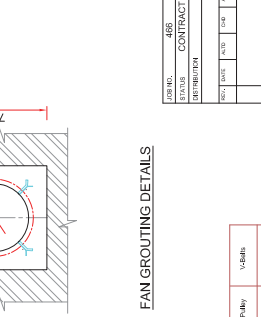
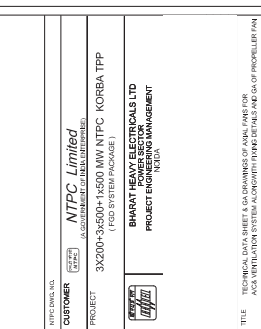
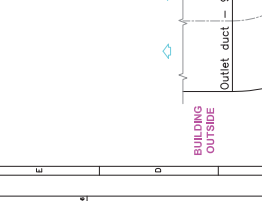
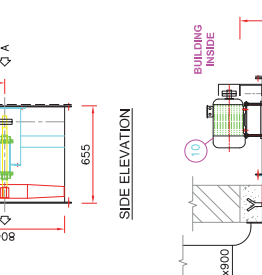
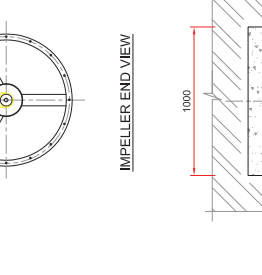
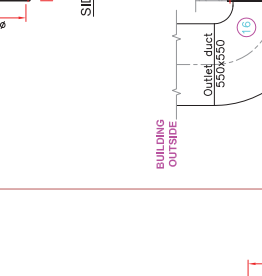
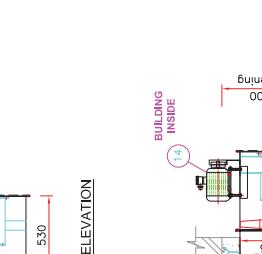
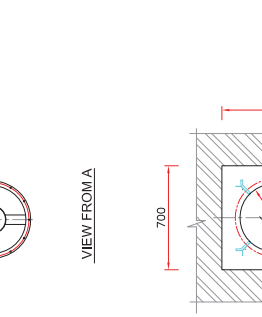
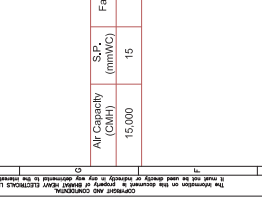
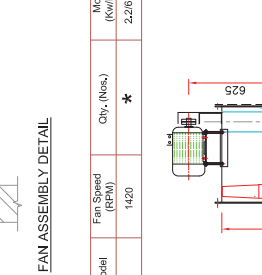
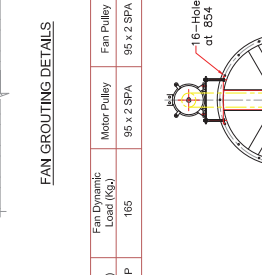
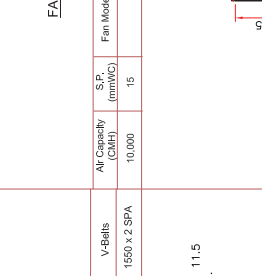
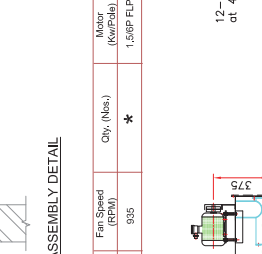
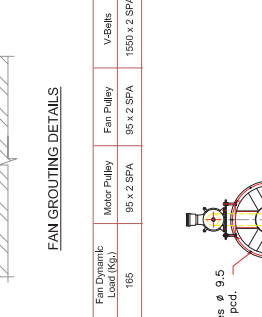
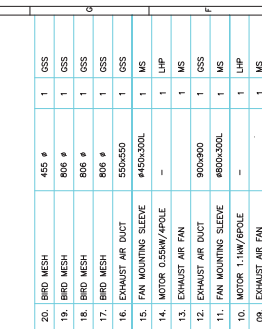
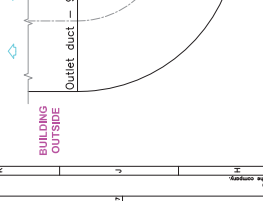
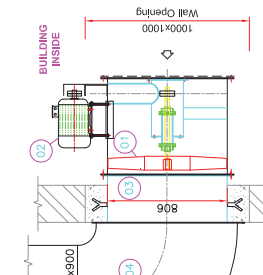
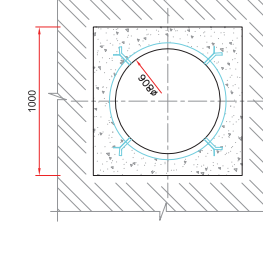
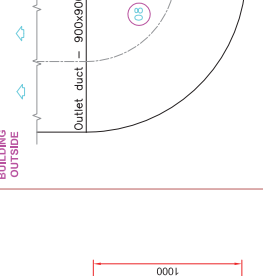
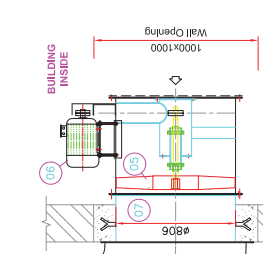
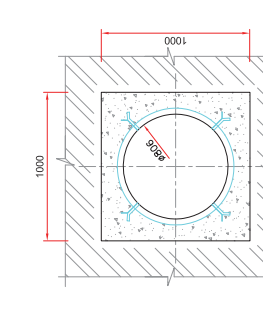
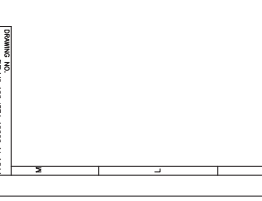
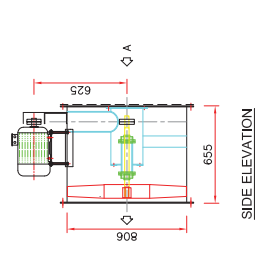
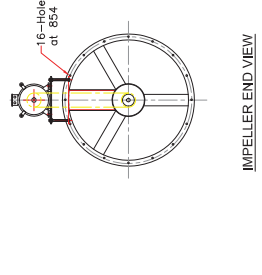
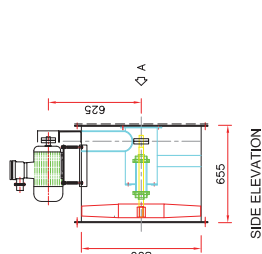
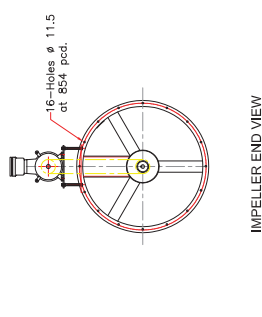
SIDE ELEVATION

TOP VIEW

TECHNICAL DATA SHEET & GA DRAWING FOR AXIAL FLOW EXHAUST FANS (BIFURCATED TYPE) 15 mm WC STATIC

Sr. No.	Description	Unit	Particulars			
1	Manufacturer		AVPL			
2	Model No.		AdBFP-800	AdBFP-800	AdBFP-450	AdBFP-450
3	Type of Fan		Axial Flow Exhaust Fans with 15mm WC Static			
4	Capacity	CMH	10000	7500	4000	2000
5	Quantity		As per fan schedule			
6	Static pressure	mmWG	15	15	15	15
7	Total pressure	mmWG	18	16.5	17.8	16.1
8	Impeller Diameter	mm	800	800	450	450
9	Type of blade		Fixed/variable pitch Cast Aluminium blade			
10	No. of blade	Nos.	8	8	6	6
11	Blade angle	Degree	17.5	17.5	34	23.5
12	Drive Arrgt.		Bifurcated type			
13	Fan/Impeller Speed	RPM	935	930	1405	1405
14	Shaft Power	BkW	0.83	0.60	0.37	0.20
15	Fan Efficiency	%	60	57	53	44
16	Bearing Type		Ball Bearing			
17	Selection curves enclosed (yes/No)		yes	yes	yes	yes
18	Motor Data					
	a) Rating	kW/Pole	1.5/6 (FLP)	1.1/6 (FLP)	0.55/4 (FLP)	0.55/4 (FLP)
	b) Speed	RPM	935	930	1405	1405
	c) Type of Mounting		B3			
	e) Direction of Rotation		Clockwise / Anti-clockwise			
19	Material					
	a) Impeller		Cast Aluminium			
	b) Casing		MS			
	c) Casing thickness (mm)		5		3	
	d) Shaft		Motor Shaft (EN-8)			
20	Accessories		Rain protection cowl, birdmesh			
21	Painting		Epoxy Paint 150 Microns			
22	Noise Level	dB(A)	≤ 85			
23	Inspection & Testing		As per approved QAP			

NOTES:
 1. ALL DIMENSIONS ARE IN MM. & LEVELS ARE IN METERS.
 2. EXHAUST AIR FAN ASSEMBLY SUPPORTED ON FAN MOUNTING SLEEVE.
 3. ITEM LISTED FOR ONE FAN ONLY.
 4. FAN QTY. SHALL BE AS PER FAN SCHEDULE.
 5. THE FAN ASSEMBLY SHALL BE PROVIDED AS SHOWN IN THE DRAWING. THE FAN SHALL BE PROVIDED IN THE BUILDING AS SHOWN IN THE DRAWING.
 6. CONN. WITH BRID MESH SHALL BE PROVIDED AT AIR DISCHARGE.



ITEM NO.	DESCRIPTION	SIZE	QTY.	UNIT	MARKING
20.	BRID MESH	455 #	1	GSS	
19.	BRID MESH	806 #	1	GSS	
18.	BRID MESH	806 #	1	GSS	
17.	BRID MESH	806 #	1	GSS	
16.	EXHAUST AIR DUCT	900x900	1	GSS	
15.	FAN MOUNTING SLEEVE	4450x300L	1	MS	
14.	MOTOR 0.55kW/4POLE	-	1	LHP	
13.	EXHAUST AIR FAN	900x900	1	MS	
12.	EXHAUST AIR DUCT	900x900	1	GSS	
11.	FAN MOUNTING SLEEVE	4400x300L	1	MS	
10.	MOTOR 1.1kW/4POLE	-	1	LHP	
09.	EXHAUST AIR FAN	900x900	1	MS	
08.	EXHAUST AIR DUCT	900x900	1	GSS	
07.	FAN MOUNTING SLEEVE	4400x300L	1	MS	
06.	MOTOR 1.5kW/4POLE	-	1	LHP	
05.	EXHAUST AIR FAN	900x900	1	MS	
04.	EXHAUST AIR DUCT	900x900	1	GSS	
03.	FAN MOUNTING SLEEVE	4400x300L	1	MS	
02.	MOTOR 2.2kW/4POLE	-	1	LHP	
01.	EXHAUST AIR FAN	900x900	1	MS	

ITEM NO.	DESCRIPTION	SIZE	QTY.	UNIT	MARKING
1550 x 2 SPA	V-Bells				
95 x 2 SPA	Fan Pulley				
95 x 2 SPA	Motor Pulley				
165	Fan Dynamic Load (Kg)				
1.58/2P FLP	Motor (Kw/Pole)				
935	Fan Speed (RPM)				
15	S.P. (mmWC)				
10,000	Air Capacity (CMH)				

ITEM NO.	DESCRIPTION	SIZE	QTY.	UNIT	MARKING
1550 x 2 SPA	V-Bells				
80 x 2 SPA	Fan Pulley				
80 x 2 SPA	Motor Pulley				
115	Fan Dynamic Load (Kg)				
0.64/2P FLP	Motor (Kw/Pole)				
1400	Fan Speed (RPM)				
15	S.P. (mmWC)				
2,000	Air Capacity (CMH)				

ITEM NO.	DESCRIPTION	SIZE	QTY.	UNIT	MARKING
1550 x 2 SPA	V-Bells				
80 x 2 SPA	Fan Pulley				
80 x 2 SPA	Motor Pulley				
115	Fan Dynamic Load (Kg)				
0.64/2P FLP	Motor (Kw/Pole)				
1400	Fan Speed (RPM)				
15	S.P. (mmWC)				
2,000	Air Capacity (CMH)				

ITEM NO.	DESCRIPTION	SIZE	QTY.	UNIT	MARKING
1550 x 2 SPA	V-Bells				
80 x 2 SPA	Fan Pulley				
80 x 2 SPA	Motor Pulley				
115	Fan Dynamic Load (Kg)				
0.64/2P FLP	Motor (Kw/Pole)				
1400	Fan Speed (RPM)				
15	S.P. (mmWC)				
2,000	Air Capacity (CMH)				

ITEM NO.	DESCRIPTION	SIZE	QTY.	UNIT	MARKING
1550 x 2 SPA	V-Bells				
80 x 2 SPA	Fan Pulley				
80 x 2 SPA	Motor Pulley				
115	Fan Dynamic Load (Kg)				
0.64/2P FLP	Motor (Kw/Pole)				
1400	Fan Speed (RPM)				
15	S.P. (mmWC)				
2,000	Air Capacity (CMH)				

ITEM NO.	DESCRIPTION	SIZE	QTY.	UNIT	MARKING
1550 x 2 SPA	V-Bells				
80 x 2 SPA	Fan Pulley				
80 x 2 SPA	Motor Pulley				
115	Fan Dynamic Load (Kg)				
0.64/2P FLP	Motor (Kw/Pole)				
1400	Fan Speed (RPM)				
15	S.P. (mmWC)				
2,000	Air Capacity (CMH)				

ITEM NO.	DESCRIPTION	SIZE	QTY.	UNIT	MARKING
1550 x 2 SPA	V-Bells				
80 x 2 SPA	Fan Pulley				
80 x 2 SPA	Motor Pulley				
115	Fan Dynamic Load (Kg)				
0.64/2P FLP	Motor (Kw/Pole)				
1400	Fan Speed (RPM)				
15	S.P. (mmWC)				
2,000	Air Capacity (CMH)				

ITEM NO.	DESCRIPTION	SIZE	QTY.	UNIT	MARKING
1550 x 2 SPA	V-Bells				
80 x 2 SPA	Fan Pulley				
80 x 2 SPA	Motor Pulley				
115	Fan Dynamic Load (Kg)				
0.64/2P FLP	Motor (Kw/Pole)				
1400	Fan Speed (RPM)				
15	S.P. (mmWC)				
2,000	Air Capacity (CMH)				

ITEM NO.	DESCRIPTION	SIZE	QTY.	UNIT	MARKING
1550 x 2 SPA	V-Bells				
80 x 2 SPA	Fan Pulley				
80 x 2 SPA	Motor Pulley				
115	Fan Dynamic Load (Kg)				
0.64/2P FLP	Motor (Kw/Pole)				
1400	Fan Speed (RPM)				
15	S.P. (mmWC)				
2,000	Air Capacity (CMH)				

TECHNICAL DATA SHEET & GA DRAWING FOR AXIAL FLOW EXHAUST FANS 10 mm WC STATIC

Sr. No.	Description	Unit	Particulars					
1	Manufacturer							
2	Model No.							
3	Type of Fan		Axial Flow Exhaust Fans with 10mm WC Static					
4	Capacity	CMH	15000	10000	7500	6000	4000	2000
5	Quantity		As per fan schedule					
6	Static pressure	mmWG	10	10	10	10	10	10
7	Total pressure	mmWG	14.8	12.5	12.5	11.6	13.5	11.5
8	Impeller Diameter	mm	700	700	600	600	450	450
9	Type of blade		Fixed/variable pitch Cast Aluminium blade					
10	No. of blade	Nos.	8	8	8	8	8	8
11	Blade angle	Degree	30	22.5	27.5	25	25	17.5
12	Drive Arrgt.		Impeller mounted directly on the motor shaft					
13	Fan/Impeller Speed	RPM	930	925	915	915	1405	1360
14	Shaft Power	BkW	0.96	0.58	0.43	0.32	0.25	0.11
15	Fan Efficiency	%	64	60	60	60	60	60
16	Bearing Type		Ball Bearing					
17	Selection curves enclosed (yes/No)		yes	yes	yes	yes	yes	yes
18	Motor Data							
	a) Rating	kW/Pole	1.1/6	0.75/6	0.55/6	0.55/6	0.55/4	0.37/4
	b) Speed	RPM	930	925	915	915	1405	1360
	c) Type of Mounting		B3					
	e) Direction of Rotation		Clockwise / Anti-clockwise					
19	Material							
	a) Impeller		Cast Aluminium					
	b) Casing		MS					
	c) Casing thickness (mm)		3					
	d) Shaft		Motor Shaft (EN-8)					
20	Accessories		Rain protection cowl, birdmesh					
21	Painting		Epoxy Paint 150 Microns					
22	Noise Level	dB(A)	≤ 85					
23	Inspection & Testing		As per approved QAP					

Sr. No.	DESCRIPTION	SPECIFICATION
1.	Model	300-6-1
2.	Make	Crompton Greaves
3.	Capacity	1000 CMH
4.	Static Pressure	5 mmWC
5.	Test Voltages	230V/50Hz/1 Ph./ AC
6.	Power Input	55 W
7.	Amp.	0.26 A
8.	Speed (min.)	950 RPM
9.	No. of Poles	6
10.	Noise level	<= 54 dBA

HEAVY DUTY EXHAUST FANS

Selecting the right exhaust fan for your needs:

The size, number of exhaust fans required for a particular application is directly dependent upon location, and the number of air changes required per hour.

In order to determine correct size and number of fans, the following factors need consideration:

- Size of room
- Number of occupants and their activities,
- Heat generated from sources like solar radiations, machineries, & processes etc.
- Relative humidity and outside temperature.

Features:

- Totally enclosed, continuously rated highly efficient heavy-duty motor with pressure die cast aluminum rotor mounted on two ball bearings.
- Aerodynamically contoured blades handle maximum air with minimum power consumption.
- Rigid frame with rubber mountings for silent operation.
- Epoxy powder coating with specially pretreated components for better resistance to corrosion.
- Degree of protection against dust & water entry is IP55.
- Both hub and impeller are balanced & frame and arms are mounted on rubber bushings through M.S. Clamps. Hence, vibrations are virtually eliminated.



SELECTION CRITERIA AND RECOMMENDED MINIMUM FRESH AIR SUPPLY

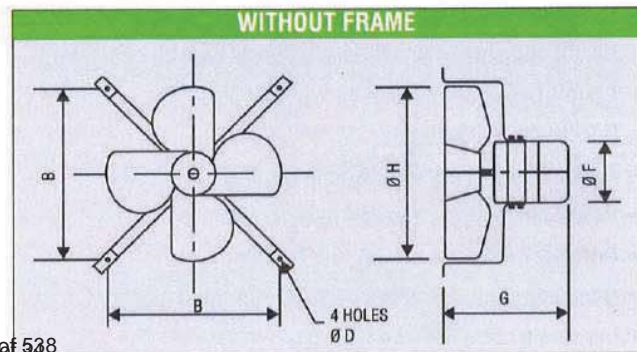
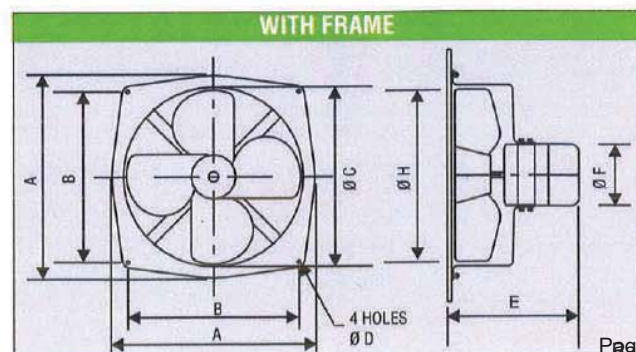
SELECTION CRITERIA	
APPLICATIONS	NUMBER OF AIR CHANGES/HR
RESIDENCES, STORAGE AREAS	1-2
LIBRARIES, CLASS ROOMS	2-4
ASSEMBLY HALLS, LABS	4-6
LAVATORIES, BARS, HOSPITALS WARDS	6-8
THEATRES, WORKSHOPS, GARAGES	6-10
CAFES, CANTEENS	8-12
RESTAURANTS, LAUNDRIES	10-15
BAKERIES, CANTEEN KITCHENS	15-30
BOILER HOUSES, ENGINE ROOMS	15-30
FOUNDARIES & FURNACE ROOMS	30-60

RECOMMENDED MINIMUM FRESH AIR SUPPLY		
AIR SPACE/PERSON	AIR SUPPLY/PERSON	AIR CHANGES/HR
3 CUM	61 CUM/HR	20
6 CUM	40 CUM/HR	6.5
9 CUM	29 CUM/HR	3.2
12 CUM	21 CUM/HR	1.8

GENERAL ARRANGEMENT DETAILS FOR EXHD SERIES

DIMENSIONAL SPECIFICATION

SIZE	A mm	B mm	C mm	D mm	E mm	F mm	G mm	H mm
030	385	315	327	9.5	300	125	255	300
038	470	375	405	9.5	310	127	285	380
045	570	450	482	10.5	360	162	345	450
060	720	600	635	11.5	405	162	385	600
090	1060	836	952	17.5	375	215	360	900



HEAVY DUTY EXHAUST FANS/ AIR CIRCULATORS

EXHAUST FAN PERFORMANCE GUIDE

MODEL NAME	IMPELLER (DIA) MM	PHASE	POLE	SPEED (RPM)	CURRENT (AMP)	POWER INPUT (WATTS)	AIR DELIVERY CMH	AIR DELIVERY CFM	NOISE LEVEL (DBA)
EXHD300-4-1*	300	Single	4 Pole	1400	0.43	90	1710	1005	56
EXHD300-6-1*	300	Single	6 Pole	950	0.26	55	1145	670	54
EXHD380-4-1*	380	Single	4 Pole	1400	0.72	150	3250	1910	63
EXHD380-4-3	380	Three	4 Pole	1400	0.3	150	3250	1910	63
EXHD380-6-1	380	Single	6 Pole	950	0.48	100	2000	1175	56
EXHD380-6-3	380	Three	6 Pole	950	0.22	100	2000	1175	56
EXHD450-4-1*	450	Single	4 Pole	1400	1.98	410	6120	3600	65
EXHD450-4-3	450	Three	4 Pole	1400	0.94	410	6120	3600	65
EXHD450-6-1	450	Single	6 Pole	950	0.7	145	3900	2290	63
EXHD450-6-3	450	Three	6 Pole	950	0.33	145	3900	2290	63
EXHD600-6-1	600	Single	6 Pole	950	2.65	550	9400	5525	65
EXHD600-6-3	600	Three	6 Pole	950	1.27	550	9400	5525	65
EXHD600-8-1	600	Single	8 Pole	700	1.23	255	7100	4175	63
EXHD600-8-3	600	Three	8 Pole	700	0.56	255	7100	4175	63
EXHD900-8-3	900	Three	8 Pole	700	2.6	1200	25200	14820	68

* Selective Range ISI Marked

Rated Voltage 230 V, 50 Hz AC for single phase & 415 V, 50 Hz for three phase

Applications

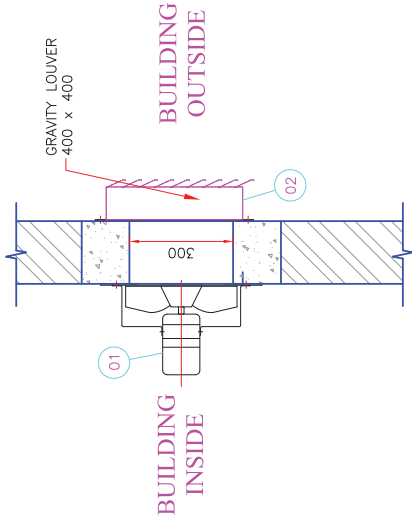
- Heavy duty exhaust fans are ideal for use in industrial set ups, industrial canteens, kitchens, paint shops, hotels, theatres and auditoriums.
- It is also extensively used by OEM customers for room coolers, flour mills, milk dairies, food and processing units, battery rooms for exhausting stale hot air and supplying fresh air, paint booths, welding equipment, cold storage units, strong rooms etc.
- EXHD Range goes a long way in providing a healthy environment and making life more comfortable.

AIR CIRCULATORS

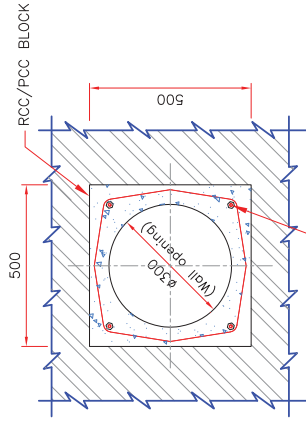
These are heavy-duty oscillation type propeller fans used for air movement generally in humid atmospheres demanding air circulation.

Special Features :

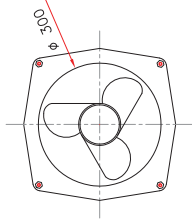
- Aerodynamically designed blades for higher air delivery & minimum noise level.
- Sturdy brazed wire guards with powder coating to ensure corrosion resistance.
- Epoxy powder coated.
- Indexing to different positions at 360 degrees for flexibility.
- Dynamically balanced blades.
- Height adjustment provided in pedestal type air circulators.
- Double ball bearings to ensure longer life.
- Oscillation to 85 degrees.
- Robust base to ensure absolute stability.
- Power consumption limited to bare minimum.
- Attractive aesthetic design to suit your décor.
- Generally conforming to IS:2997-1964.
- Insulation class is Class B



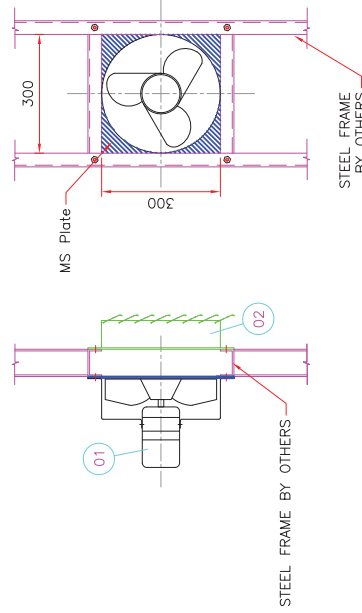
FAN ASSY. DETAIL



FAN GROUTING DETAIL



FRONT VIEW



FAN FIXING DETAIL WITH STEEL STRUCTURE

Capacity (CMH)	1200	Fan dia	ø300	Phase	Single	Fan Speed (RPM)	1400	Qty. (Nos.)	*	Static Pressure (mmWG)	5	Motor Power (watt)	100 (Approx)	Fan Dynamic Load (Kg.)	5.5
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NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. ITEM LISTED FOR ONE FAN ONLY. AS PER APPROVED IDP.
3. INSPECTION & TESTING SHALL BE AS PER APPROVED IDP.
4. PAINTING AS PER COMPANY STANDARD PRACTICE.

* FAN QTY. SHALL BE AS PER APPROVED FAN SCHEDULE.

QTY.	Gravel Louvers - 400x400	1 m ² .	Q/No.	
01.	Propeller fan 300	1 m ² .	MS	CO/WH/IN
PART NO.	DESCRIPTION	QTY	MATERIAL	MAKE

NTPC Electricals
CUSTOMER **NTPC Limited**
(A S. GOVT. ENTERPRISE)
PROJECT 3X200+3x500+1x500 MW NTPC KORBA TPP
(FCG SYSTEM PACKAGE)


PROJECT BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR POWER SECTOR
PROJECT POWER SECTOR MANAGEMENT
INDIA

NO.	REV.	DATE	BY	CHKD.	APPD.

TITLE TECHNICAL DATA SHEET & DRAWINGS OF FAN FOR
 ACS VENTILATION SYSTEM ALORINTI (FAN) OF AREA OF PROPELLER FAN

INDEX					
PROJECT NAME		KORBA- FGD			
CUSTOMER		NTPC Limited			
EPC CONTRACTOR		BHARAT HEAVY ELECTRICALS LTD			
SUPPLIER					
PACKAGE		HVAC FOR FGD			
DOCUMENT NO.		PE-V0-466-(571-13000-A)-A219			
TOTAL NO. OF PAGES		93			
S. NO.	APPLICATION	FAN TYPE	MOTOR KW/P	LOAD BkW	PAGE NO.
1	40000 CMH @ 15mm Roof Extractor	RE Fan	5.5 KW / 6 pole	4.16 KW	03-09
2	10000 CMH @ 20mm Axial Fan	Supply Air Fan	1.5 KW / 6 Pole	1.05 KW	10-16
3	10000 CMH @ 30mm Axial Fan	Supply Air Fan	2.2 KW / 4 Pole	1.54 KW	17-23
4	15000 CMH @ 10mm Axial Fan	Exhaust Air Fan	1.1 KW / 6 Pole	0.96 KW	24-30
	6000 CMH @ 20mm Axial Fan	Supply Air Fan		0.71 KW	
5	4000 CMH @ 30mm Axial Fan	Supply Air Fan	0.75 KW / 2 Pole	0.485 KW	31-37
6	6000 CMH @ 30mm Axial Fan	Supply Air Fan	1.1 KW / 2 Pole	0.854 KW	38-44
		Fresh Air Fan			
7	4000 CMH @ 10mm Axial Fan	Exhaust Air Fan	0.55 KW/ 4 Pole	0.25	45-51
8	AHU Centrifugal Fan	Centrifugal Fan	15 KW / 4 Pole	9.51 KW	52-58
	UAF Pump	Centrifugal Pump		9.34 KW	
9	7500 CMH @ 15mm Axial Fan	Bifurcated Exhaust Fan	1.1 KW / 6 Pole (FLP)	0.6 KW	59-65
10	2000 CMH @ 15mm Axial Fan	Bifurcated Exhaust Fan	0.55 KW / 4 Pole (FLP)	0.37 KW	66-72
11	10000 CMH @ 10mm Axial Fan	Exhaust Air Fan	0.75 KW / 6 Pole	0.58 KW	73-79
12	UAF Centrifugal Fan	Centrifugal Fan	37 KW / 4 Pole	30.9 KW	80-86

APPLICABLE FOR ANNEXURE-I, ITEM NO. B1b, B3, B4, B5, B6, B7 & B8 (AXIAL FAN MOTOR, CENTRIFUGAL FAN & PUMP MOTOR)

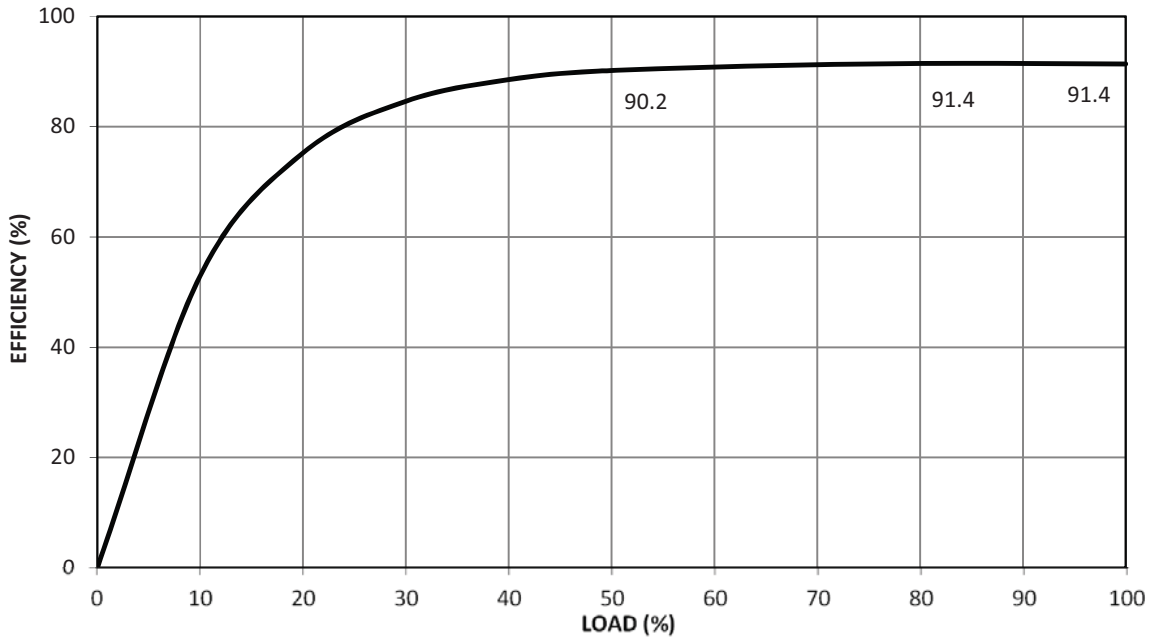
		DATA SHEET: INDUCTION MOTOR		Motor Type 2HE3 164-04			
No. of Phases		3	Reference Standard		IS:12615		
Frame Designation		160M	Protection IS:4691		IP 55		
Rated Output	kW	11.0	Vibration Standard		IS:12075		
	HP	15.0	Noise Standard		IS:12065		
No. of Poles		4	Duty		S1		
Rated Voltage		V	415	Insulation Class		F	
Rated Frequency		Hz	50	Cooling IS:6362		IC411	
Rated Current		A	19.8	Terminal Box Details	Type	HM4GN	
Rated Speed		rpm	1460		Terminal Size	M6	
Rated Torque		kgm	7.34		No. of Terminal	6	
Efficiency	Full load	%	91.4		Max. cable size (Al)	mm ²	1x3Cx25
	3/4 load	%	91.4	DE	6309ZZ		
	1/2 load	%	90.2	NDE	6209ZZ		
Power factor	Full load		0.85	Bearing Data	Lubrication	Prelubricated	
	3/4 load		0.80		Life L10 (Direct Coupled)	hrs.	50,000
	1/2 load		0.72		Regreasing Time	hrs.	-
Max. Temp. Rise (Res.)		°C	70	Lifting Eyebolt		M12	
Acceleration Time		sec.	-	Motor Weight (approx)		kg	107.0
Stator Connection			D	Rotor GD ²		kgm ²	0.2369
Tropicalised? (Yes / No)			Yes	Ambient Temp.		°C	50
I _{st} / I _r			7.0	Overall Dimensions of Packed motor (LxBxH) (mm)			
T _{st} / T _r			2.3				
T _{po} / T _r			2.6	Voltage Variation ±		%	10
Locked rotor withstand time	Hot	sec.	9	Frequency Variation ±		%	5
	Cold	sec.	21	Combiend Variation ±		%	10
Remarks: (1) Efficiency Class : IE3 (2) Motor Construction : TEFC (3) Paint shade : Blue (RAL 5012) – Corrosion proof							
Data subject to tolerance as per IEC 60034-1							
Prep.: Engg		Chkd.:					
Date:		Date:					

Rated Output (kW/HP) : 11.0/15.0

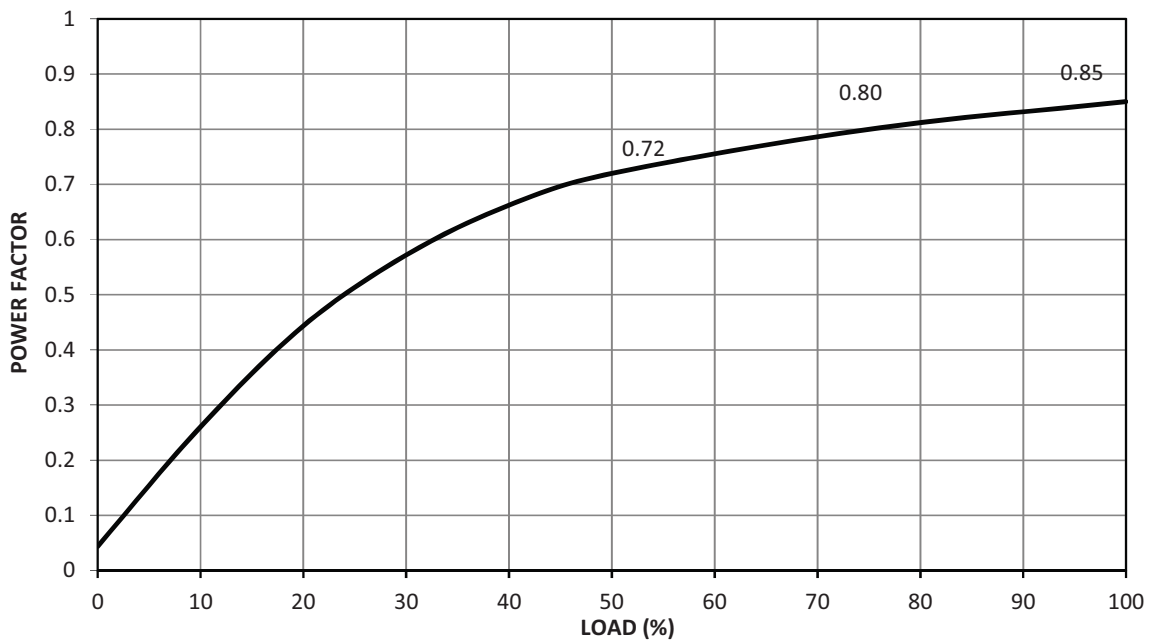
Poles : 4

Efficiency Class : IE3

LOAD VS EFFICIENCY CURVE



LOAD VS POWER FACTOR CURVE



Prep.:

SK

Date:

25-12-2021

Revision:

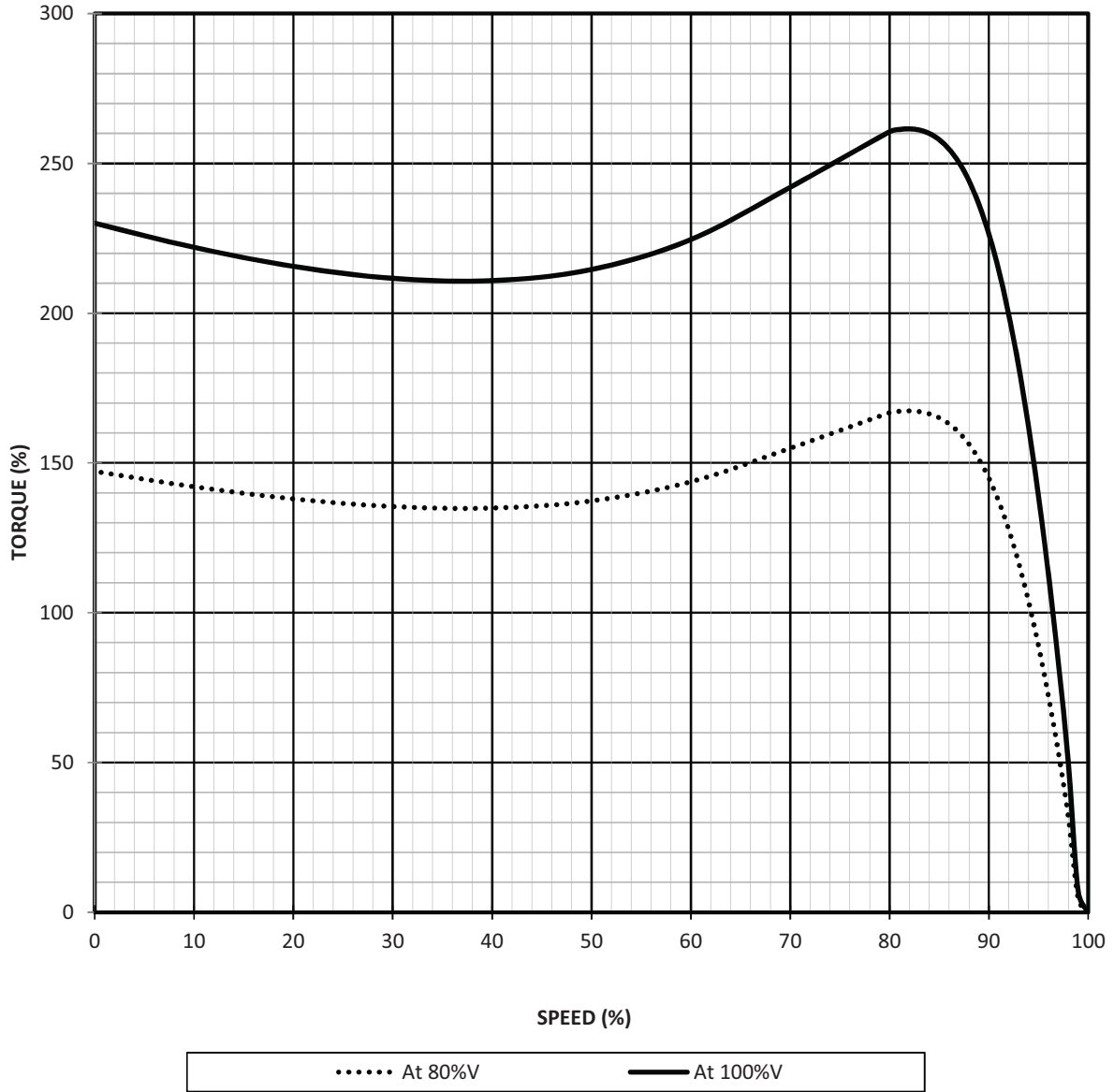
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Rated Output (kW/HP): 11.0/15.0

Poles: 4

Efficiency Class: IE3

TORQUE SPEED CURVE



Prep.:

SK

Date:

25-12-2021

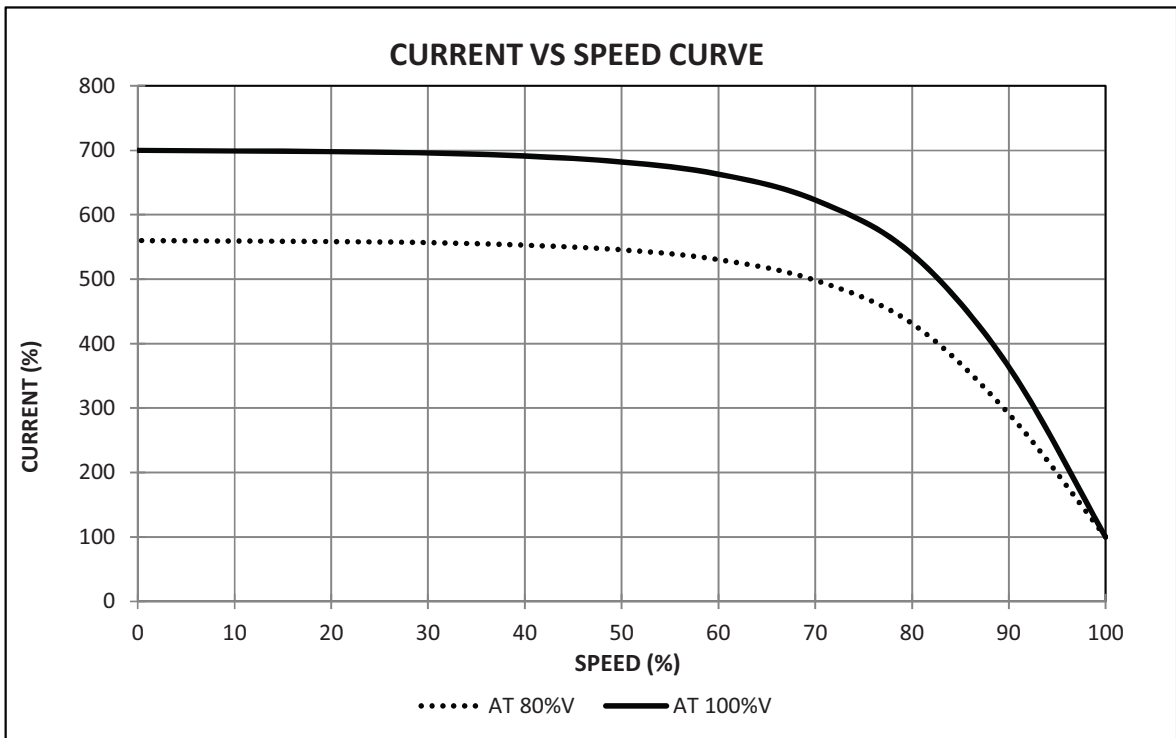
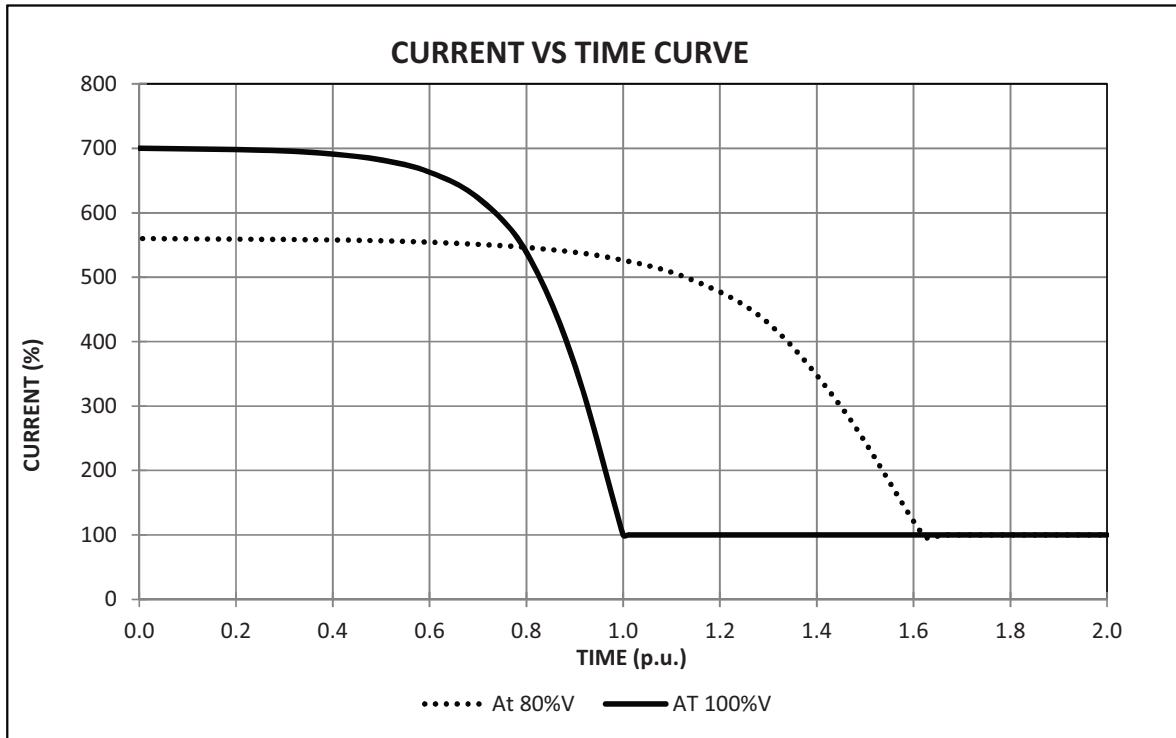
Revision:

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Rated Output (kW/HP): 11.0/15.0

Poles: 4

Efficiency Class: IE3



Prep.:

SK

Date:

25-12-2021

Revision:

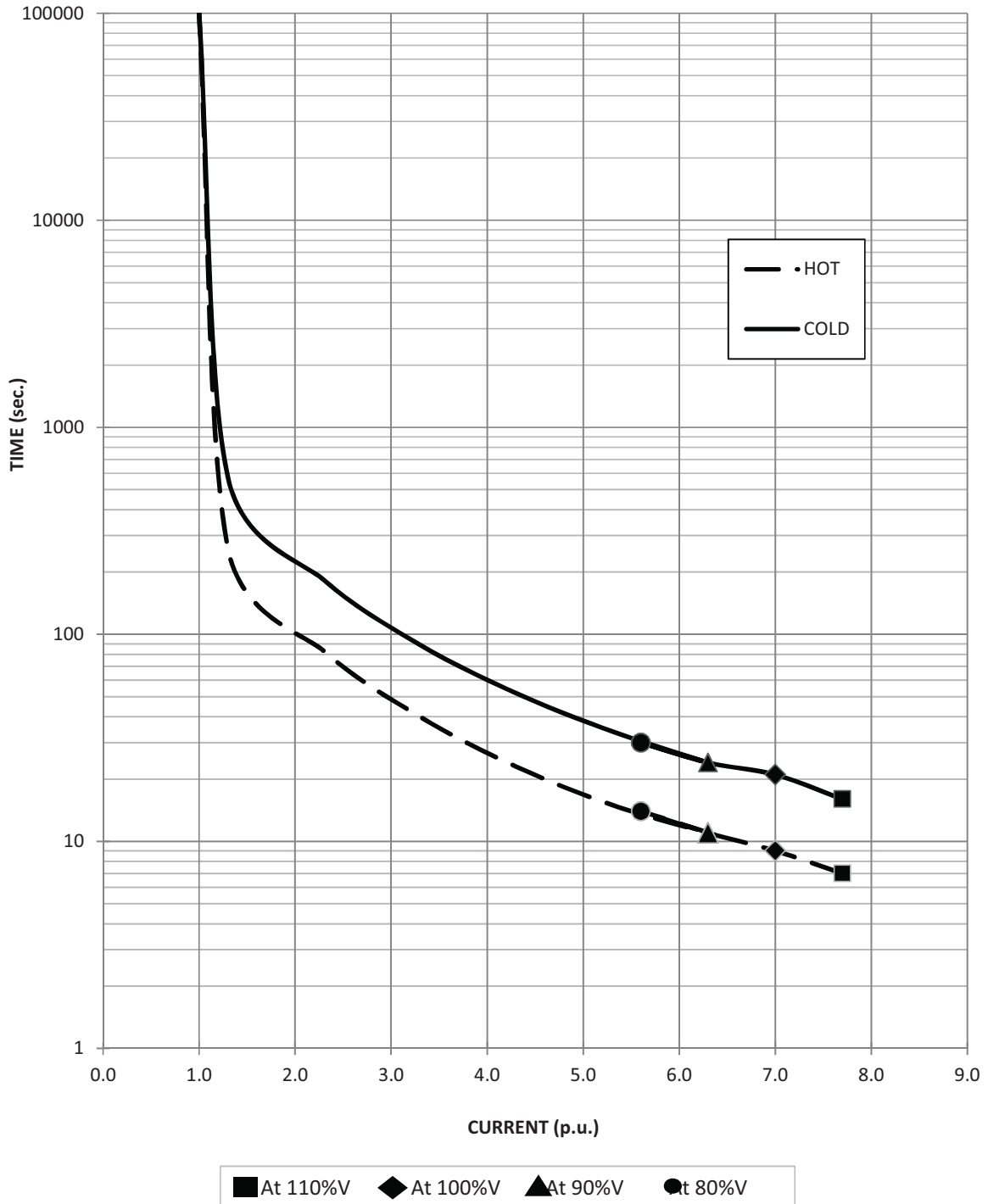
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Rated Output (kW/HP) : 11.0/15.0

Poles : 4

Efficiency Class : IE3

THERMAL WITHSTAND CURVE



Prep.:

SK

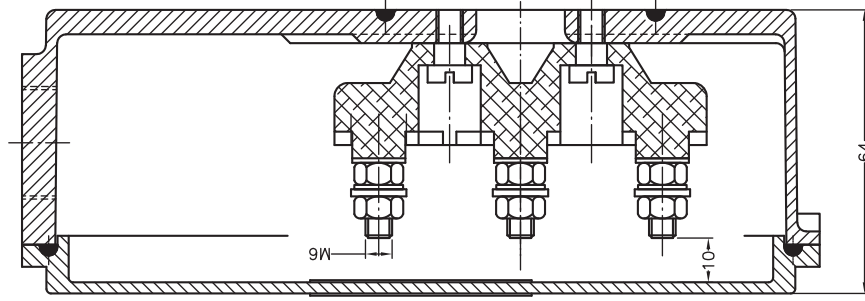
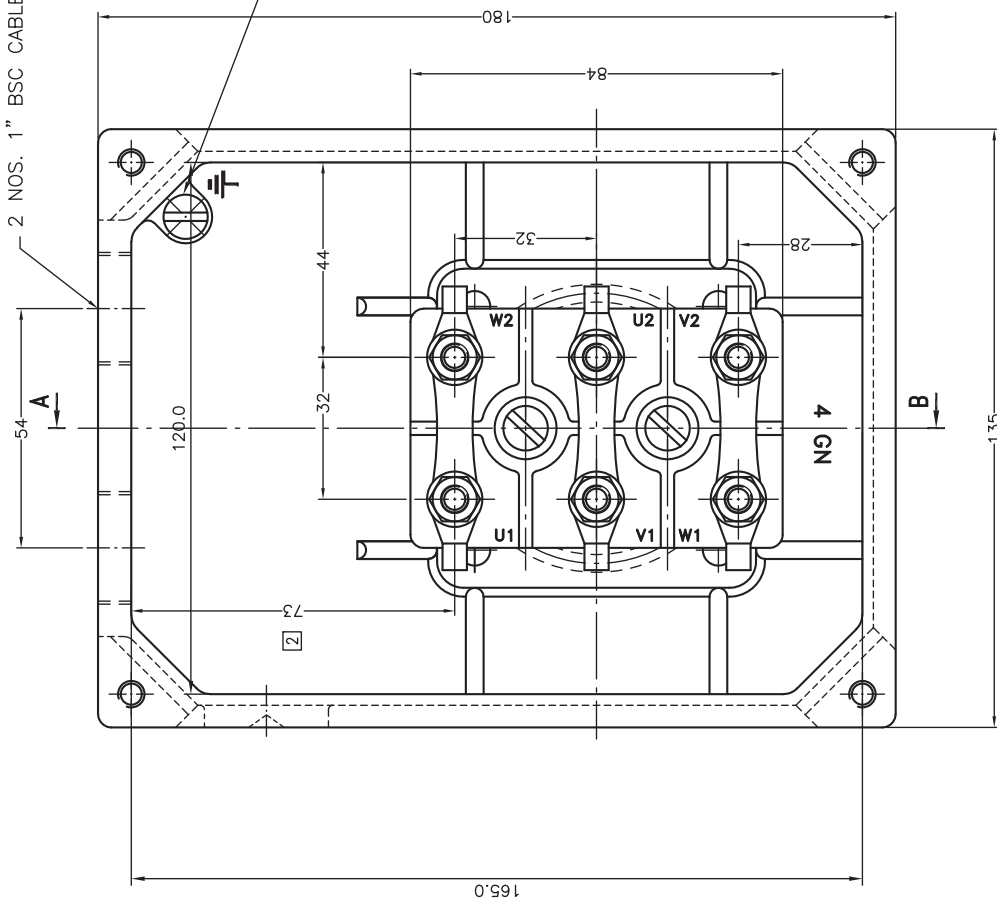
Date:

25-12-2021

Revision:

0

2 NOS. 1" BSC CABLE ENTRY THREADING



REV. STATUS

2	DIM. 73 ADDED.
1	DRAWING REDRAWN ON NEW CAD DRG. SHEET FORMAT BY KEEPING THE SAME DRG. No. & ALL THE FEATURES.

		TITLE TERMINAL BOX ASSEMBLY		SCALE NTS SHT 1/1
NAME GAMESH	DATE 05/08/11	DRG. NO.: A3-160/180-33(GN)	REV. 2	FRAME SIZE 160-180 (GN)
DRN. S.P.JADIA	CHD. S.P.JADIA	REF. 3-tbassy		
APPD. S.P.JADIA	05/08/11			

All dimensions in mm unless otherwise specified.	
NO MACHINING	~
ROUGH MACHINING	▽
SMOOTH MACHINING	▽▽
FINE MACHINE/GRIND	▽▽▽
POLISH/HONE/LAP	▽▽▽▽
MACHINING SYMBOLS	

No. of Phases		3	Reference Standard		IS:12615	
Frame Designation		132M	Protection IS:4691		IP 55	
Rated Output	kW	5.5	Vibration Standard		IS:12075	
	HP	7.5	Noise Standard		IS:12065	
No. of Poles		6	Duty		S1	
Rated Voltage		V	Insulation Class		F	
Rated Frequency		Hz	Cooling IS:6362		IC411	
Rated Current		A	Terminal Box Details	Type	HM3GN	
Rated Speed		rpm		960	Terminal Size	M5
Rated Torque		kgm		5.58	No. of Terminal	6
Efficiency	Full load	%		88.0	Max. cable size (AL)	mm ² 1x3Cx10.0
	3/4 load	%	88.0	DE	6208ZZ	
	1/2 load	%	86.0	NDE	6208ZZ	
Power factor	Full load		0.79	Bearing Data		
	3/4 load		0.72	Lubrication	Prelubricated	
	1/2 load		0.63	Life L10 (Direct Coupled)	hrs. 50,000	
Max. Temp. Rise (Res.)		°C	70	Regreasing Time	hrs. -	
Max. Temp. Rise (Res.)		°C	70	Lifting Eyebolt		
Acceleration Time		sec.	-	M10		
Acceleration Time		sec.	-	Motor Weight (approx)		
Stator Connection			D	kg	70.0	
Stator Connection			D	Rotor GD ²		
Tropicalised? (Yes / No)			Yes	kgm ²	0.1487	
Tropicalised? (Yes / No)			Yes	Ambient Temp.		
Tropicalised? (Yes / No)			Yes	°C	50	
I _{st} / I _r			7.5	Overall Dimensions of Packed motor (LxBxH) (mm)		
T _{st} / T _r			2.6	-		
T _{po} / T _r			3.0	Voltage Variation ±		
T _{po} / T _r			3.0	%	10	
Locked rotor withstand time	Hot	sec.	5	Frequency Variation ±		
	Cold	sec.	13	%	5	
Locked rotor withstand time			13	Combiend Variation ±		
Locked rotor withstand time			13	%	10	

- Remarks: (1) Efficiency Class : IE3
 (2) Motor Construction : TEFC
 (3) Suitable Cable Gland & Lugs BY AVPL
 (4) Minimum Starting Voltage : 80%
 (5) Permissible Fault Level: 50KA for 0.25 sec
 (6) No. of Hot/Cold Starts: 3/3

Data subject to tolerance as per IEC 60034-1

Prep.: Engg

Chkd.:

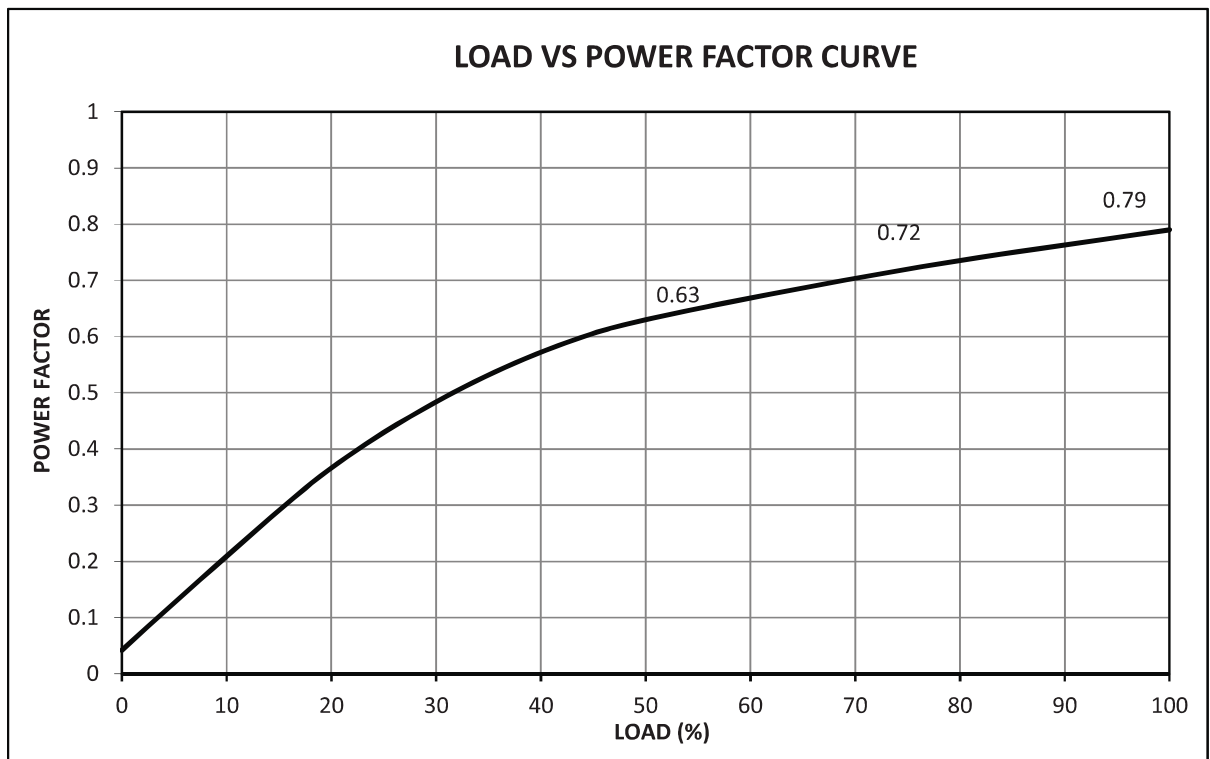
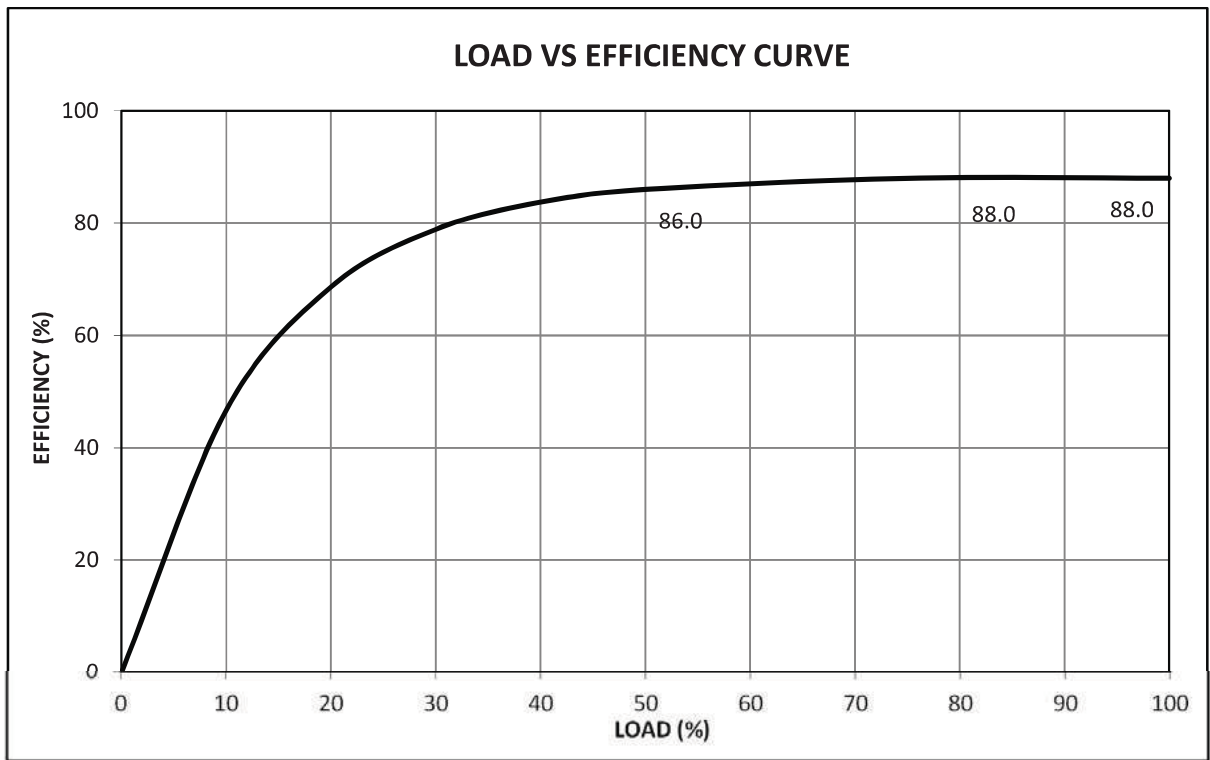
Date:

Date:

Rated Output (kW/HP) : 5.5/7.5

Poles : 6

Efficiency Class : IE3



Prep.: SK

Date: 25-12-2021

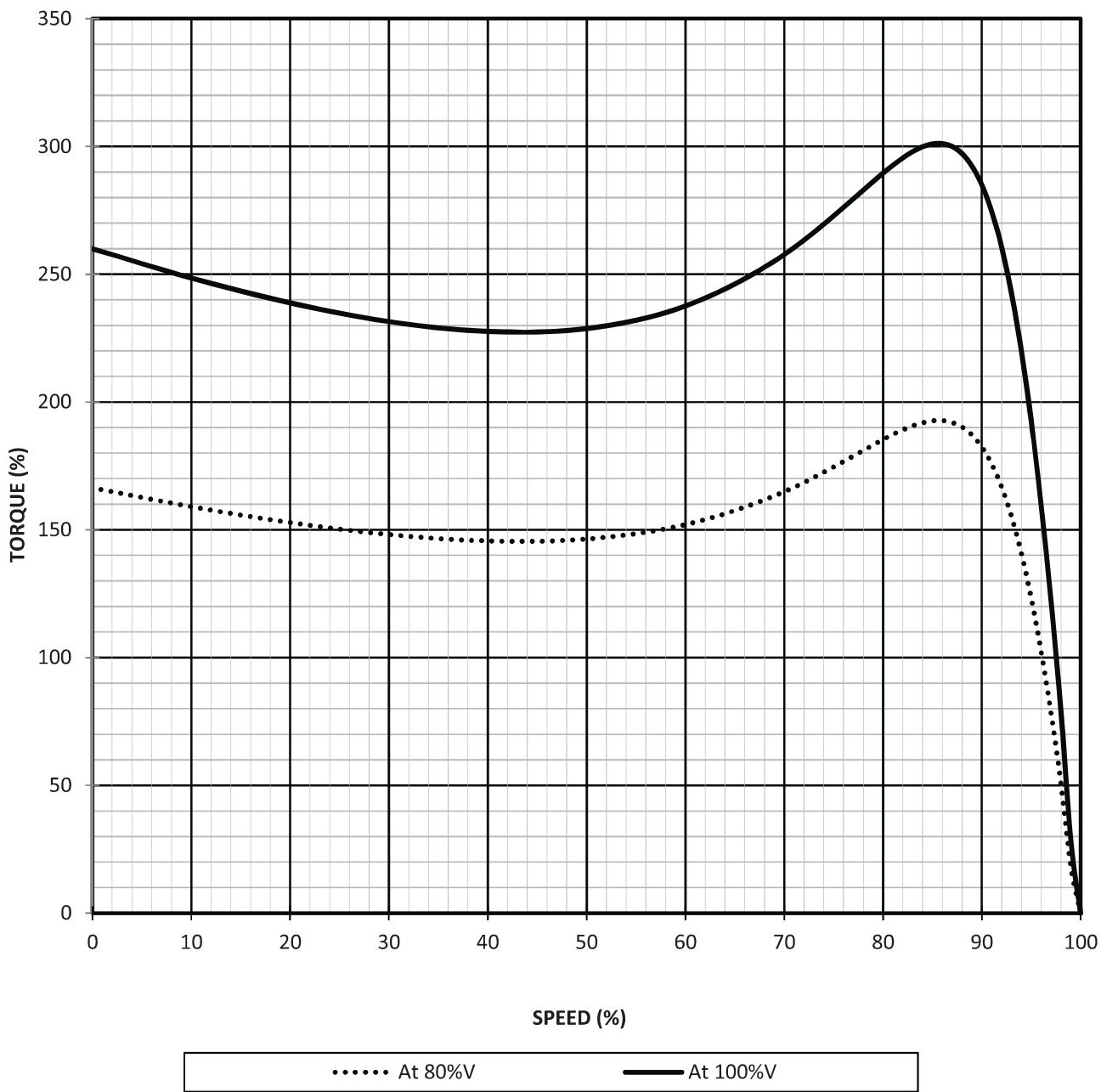
Revision: -

Rated Output (kW/HP) : 5.5/7.5

Poles : 6

Efficiency Class : IE3

TORQUE SPEED CURVE



Prep.:

SK

Date:

25-12-2021

Revision:

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