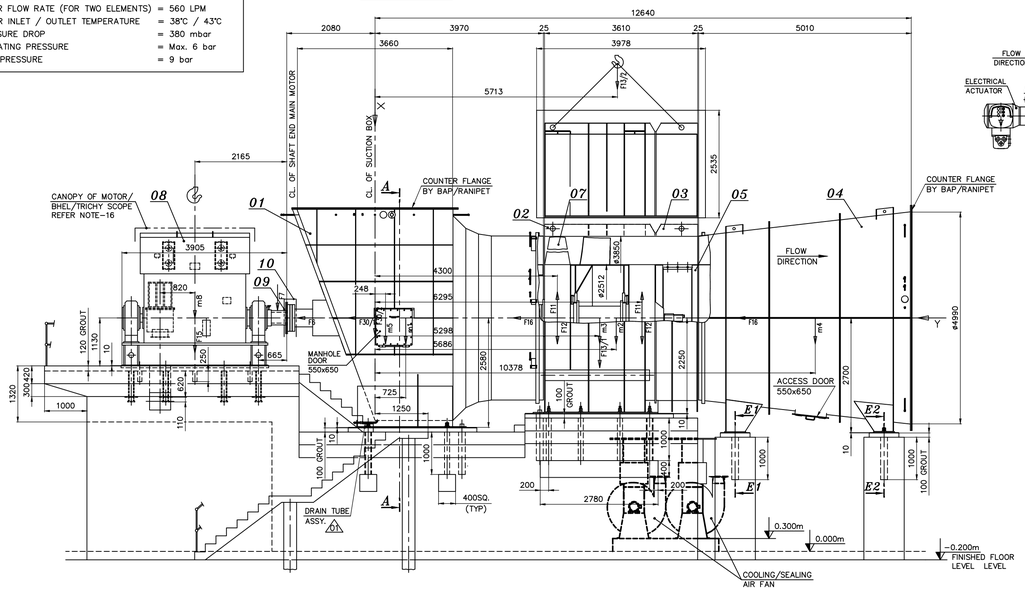
## MOTOR COOLER DATA:

| | |
|---|---|
| WATER FLOW RATE (FOR TWO ELEMENTS) | = 560 LPM |
| WATER INLET / OUTLET TEMPERATURE | = 38°C / 43°C |
| PRESSURE DROP | = 380 mbar |
| OPERATING PRESSURE | = Max. 6 bar |
| TEST PRESSURE | = 9 bar |

## MOTOR IMPORTANT NOTE:

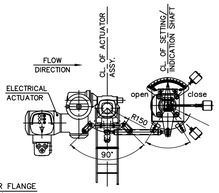
**FOUNDATION SLEEVE OF THE MOTOR TO BE USED WHILE CASTING FAN FOUNDATION. CIVIL DESIGNER TO ENSURE AVAILABILITY OF MOTOR SLEEVE AT SITE BEFORE CASTING FOUNDATION.**

## ELEVATION




## DETAIL–R

(ON ACTUATOR & ITS LINKAGE)



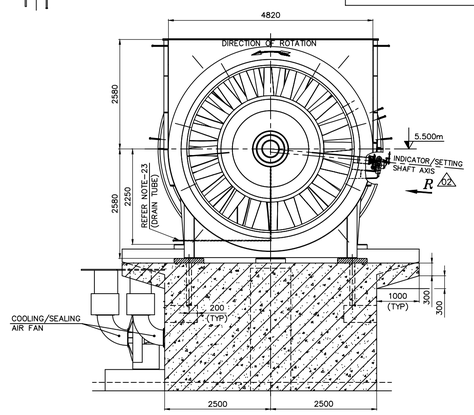

## MOTOR NOTES:

01. THE FORCES OCCUR ALTERNATELY INDEPENDENT OF THE DIRECTION OF ROTATION. (REFER LOADING ON FOUNDATION TABLE)
02. THE TRANSFER OF VIBRATIONS FROM SURROUNDING EQUIPMENT HAS TO BE AVOIDED BY SUITABLE LAYOUT OF FOUNDATION.
03. THE FIRST NATURAL FREQUENCIES OF THE FOUNDATION AFTER ERECTION OF THE MACHINE MUST DIFFER ATLEAST +25% & –20% FROM ONE & TWO TIMES RUNNING SPEED FREQUENCIES & TWO TIMES THE ELECTRICAL FREQUENCY.

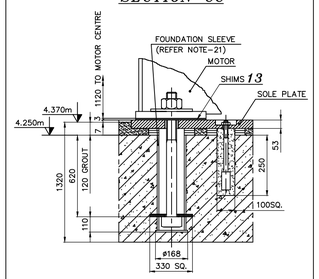
## FAN TECH DETAILS: (1)

| | | |
|---|---|---|
| FLOW | : | 595 $m^3$/sec |
| HEAD | : | 670 mmWC |
| DENSITY | : | 0.8314 Kg/$m^3$ |
| TEMPERATURE OF MEDIUM | : | 140 Deg.C |

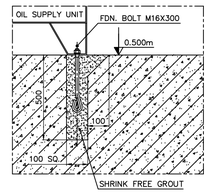
## SECTION–AA



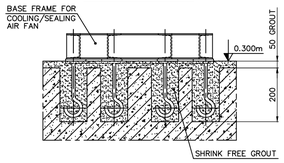

## SECTION–CC



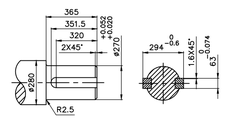

## SECTION–FF




## SECTION–HH

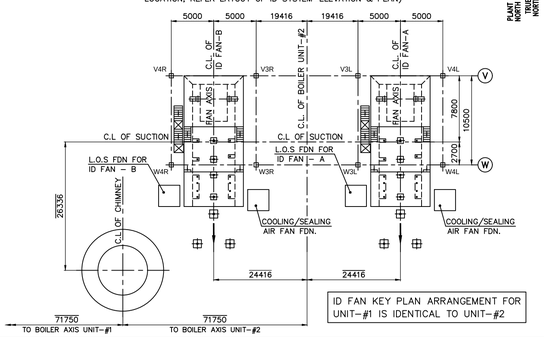



## MOTOR SHAFT END



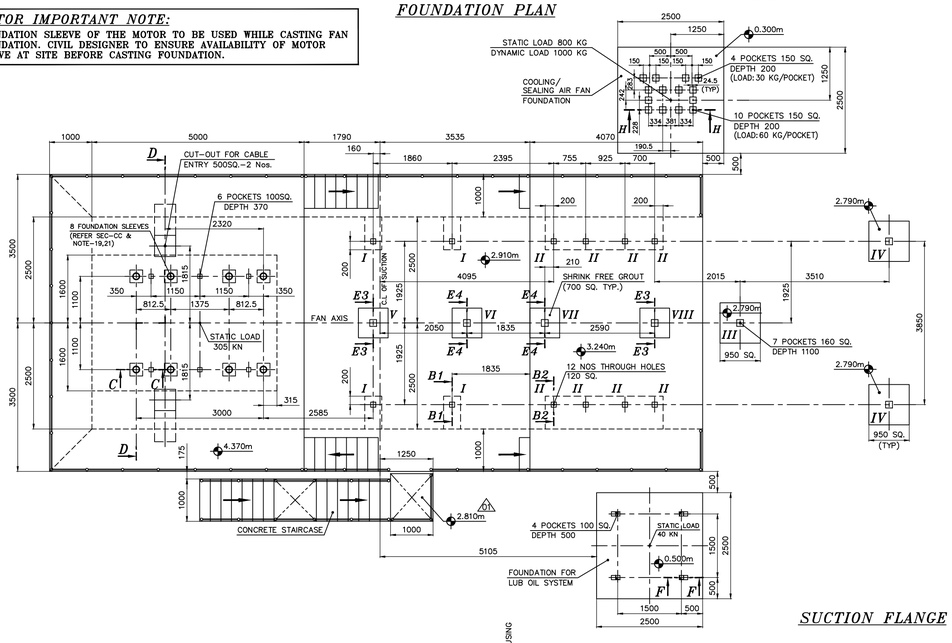

## KEY PLAN

REFER DRG. Nos. 0-00-020-77473 & 0-00-020-77474
(KEY PLAN SHOWN IS INFORMATIVE ONLY. FOR EXACT LOCATION, REFER LAYOUT OF ID SYSTEM–ELEVATION & PLAN)

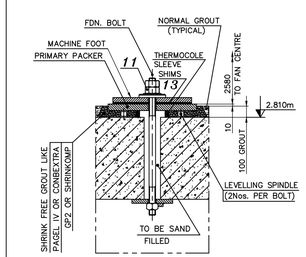



ID FAN KEY PLAN ARRANGEMENT FOR UNIT–#1 IS IDENTICAL TO UNIT–#2

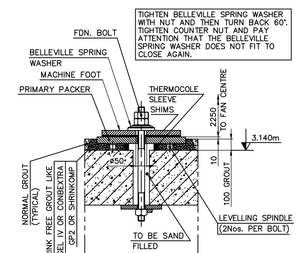
## FOUNDATION PLAN



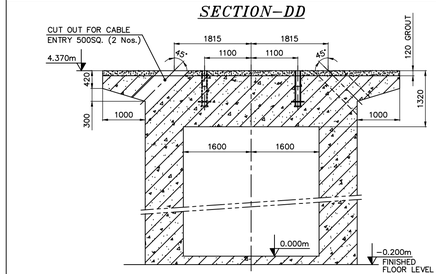

## SECTION–B1B1 (AT I)




## SECTION–B2B2 (AT II)




## SECTION–DD




| | | | | | |
|---|---|---|---|---|---|
| *VIII* | | | ±2400 | ±11700 | ±18600 ±213200 |
| *VII* | | | +318200 –75000 | ±11700 | ±18600 ±213200 |
| *VI* | | | ±70500 | ±18000 | ±4000 |
| *V* | | | ±3600 | ±18000 | ±4000 |
| *IV* | +48600 | ±3800 | ±9800 | ±9800 | ±3800 |
| *III* | +71900 | ±6200 | ±14400 | ±11400 | ±6200 |
| *II* | +121400 | ±5500 ±67500 | ±24300 | ±24300 | ±4700 ±58500 |
| *I* | +83600 | ±4000 | ±16800 | ±16800 | ±4000 |
| Point Forces in [N] | Dead Load Vertical + | Dynamic Load Vertical + ↕ | Stat. horiz. Dead Load horiz. in axial Direction + ↔ | Stat. horiz. Dead Load horiz. across to the axis + ↔ | Dyn. horiz. Dyn. Load horiz. across to the axis + ↔ |

*FOUNDATION LOAD DATA*

| | | | | |
|---|---|---|---|---|
| 30/2 | | –104027 | Stat. and dyn. forces caused by air stream of suction box in vert. direction | |
| 30/1 | | 637 | Stat. and dyn. forces caused by air stream of suction box in horiz. direction | |
| 16 | | 121604 | Axial thrust of the fan (due to pressure increase) | |
| 15 | | – | Load during starting sequence by short–circuit torque of the motor | |
| 14 | – | | Foundation | |
| 13/2 | | 106480 | Max. load when lifting the fan housings upper part | |
| 13/1 | | 152000 | Max. load when lifting the rotor assembly | |
| 12 | | 426380 | Unbalance in case of damage | |
| 11 | | 37057 | Max. rotating load due to unbalance of the fan rotor | |
| 10 | – | | Oil supply unit with oil filling | |
| 9 | – | | Frame of the motor | |
| 8 | – | | Drive motor | |
| 7 | | 17215 | Radial load on motor shaft | |
| 6 | | 20338 | Axial thrust on motor shaft for motor with fixed bearing | |
| 5 | 3130 | | Intermediate shaft with coupling | |
| 4 | 13590 | | Diffuser with tail fairing | |
| 3 | 15494 | | Complete rotor assembly | |
| 2 | 24120 | | Fan housing with straightener vane section | |
| 1 | 15650 | | Suction box nose fairing and inlet nozzle and intermediate shaft cover | |
| ID. NO. | (m) MASS IN (KG) | (F) FORCE IN (N) | DESIGNATION | |

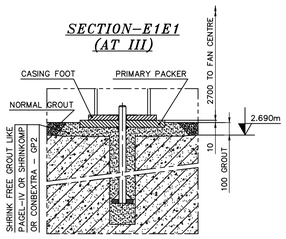
## MOTOR BEARING LUBRICATION DETAILS:

| | DE | NDE |
|---|---|---|
| BEARING SIZE | ø250 | ø250 |
| OIL QTY. | 5 LPM | 5 LPM |
| OIL INLET PRESSURE | 0.2 TO 0.5 kg/$cm^2$ | 0.2 TO 0.5 kg/$cm^2$ |
| MAX. OIL INLET TEMP. | 43°C | 43°C |
| OIL GRADE | ISO VG 68 OR EQUI. | ISO VG 68 OR EQUI. |
| LUBRICATION TYPE | FORCED OIL LUBRICATION | |

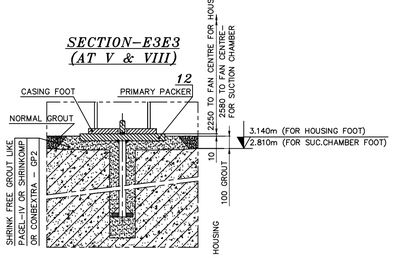
IMPORTANT NOTE:

**BHEL/SITE C&I SHALL ENSURE INSTALLATION OF STALL WARNING INSTRUMENTS AS PER ERECTION DRAWING NO. 3–00–000–40682 RELEASED BY BHEL/RANIPET AND IMPLEMENTATION OF STALL WARNING CONTROL LOGIC FOR FAN ASE PER SCHEME & WRITE–UP OF AUTO CONTROL RELEASED BY BHEL/TRICHY C&I**

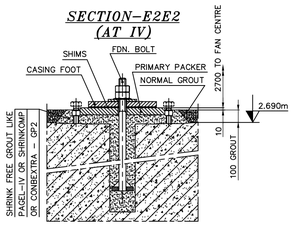
## SECTION–E1E1 (AT III)



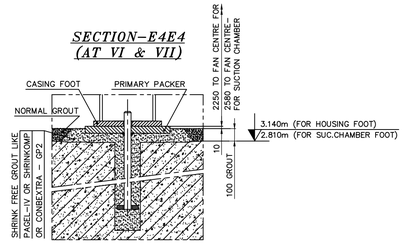

## SECTION–E3E3 (AT V & VIII)



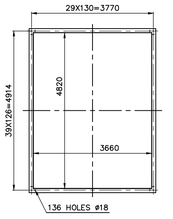

## SECTION–E2E2 (AT IV)



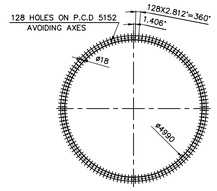

## SECTION–E4E4 (AT VI & VII)




## SUCTION FLANGE




## DELIVERY FLANGE




## NOTES:–

01. THE LOADS INDICATED ON FOUNDATION ARE WITHOUT ALLOWANCES FOR VIBRATIONS. CIVIL DESIGNERS ARE RESPONSIBLE FOR PROPER DESIGN OF FOUNDATION TAKING INTO ACCOUNT OF THE ALLOWANCES FOR VIBRATION ALSO.
02. THE DIFFERENT NATURAL FREQUENCY OF THE FOUNDATION HAVE TO BE 20% AWAY FROM THE SPEED FREQUENCY, fnmax = n/60 AND 15% AWAY FROM THE DOUBLE OF THE SPEED FREQUENCY, 2 x fnmax. THIS MEANS : 0.8xfn TO 1.2xfn AND 0.85x(2xfn) TO 1.15x(2xfn). SPEED FREQUENCY fnmax. = 12.42 HZ (2 * fnmax.) = 24.84 HZ
03. THE STIFFNESS OF THE FOUNDATION HAS TO BE ATLEAST CF>1.0E+06 N/mm FOR EACH LOAD POINT IN LONGITUDINAL, TRANSVERSAL AND VERTICAL DIRECTIONS RELATING TO THE FAN AXIS. IT HAS TO BE TAKEN INTO CONSIDERATION THAT ON SETTLING OF THE FOUNDATION THE TOTAL NATURAL FREQUENCIES OF THE FOUNDATION CAN ARISE DUE TO THE SOIL COMPACTION AND THE RESULTING INCREASES OF THE ELASTIC MODULUS. AN UNEVEN SETTLING OF THE FOUNDATION HAS TO BE EXCLUDED.
04. THE RATIO OF THE FOUNDATION MASS TO THE ROTOR MASS HAS TO BE GREATER THAN 25.
05. ADOPT IS: 2974 / PART–IV FOR THE FOUNDATION DESIGN.
06. THE CONNECTING DUCTS AT INLET AND OUTLET OF FAN MUST BE SELF SUPPORTED AND SHOULD NOT BE WELDED WITH EXPANSION JOINTS.
07. FOUNDATION POCKETS SHOULD BE PERPENDICULAR TO THE FLAT SURFACES OF FOUNDATION.
08. ACCURATE TEMPLATES SHALL BE USED FOR LOCATING CORES FOR POCKET HOLES TO ENSURE THEIR DIMENSIONAL ACCURACY.
09. TOLERANCE BETWEEN ANY TWO POCKET CENTRES IS ±5 mm.
10. TOLERANCE ON CONCRETE LEVELS +0mm/–25mm.
11. IN AREAS WHERE SOLE PLATES AND ANCHOR PLATES ARE TO BE INCORPORATED IN FOUNDATION CONCRETE, THE SIZE OF THE COARSE AGGREGATE USED SHALL NOT EXCEED 20 mm AND DOWN GRADED TO FACILITATE CHIPPING AND SCRAPPING AND THEREBY ENSURING MAXIMUM CONTACT ON THE MATING AREAS.
12. NON–SHRINK GROUT SHALL BE USED AS MENTIONED IN SECTIONAL VIEWS. FOR PREPARATION OF PRIMARY PACKERS & SHIMS, LEVELLING OF PRIMARY PACKERS AND LOCATION OF LEVELLING SPINDLES, SITE SHALL REFER PROCEDURE FOR NON–SHRINK GROUTING & SHIMMING RELEASED BY BAP/RANIPET.
13. GROUTING SHOULD BE DONE ONLY AFTER FINAL ALIGNMENT OF FAN.
14. ELEVATION & POCKET DEPTHS SHOWN IN FOUNDATION PLAN ARE INCLUDING GROUTING THICKNESS.
15. GROUTING IS IN THE SCOPE OF ERECTION GROUP/CONTRACTOR.
16. HANDRAILS, STEEL PLATFORMS & CANOPY FOR MOTOR AND THEIR EMBEDMENTS ARE IN THE SCOPE OF BHEL/TRICHY.
17. FAN FOUNDATION SHOULD NOT BE USED AS SUPPORT FOR OTHER STRUCTURES OR EQUIPMENTS.
18. FOUNDATION CONFIGURATION SHOWN IN THIS DRAWING IS ONLY INFORMATIVE/TYPICAL. COMPLETE DETAILS OF FOUNDATION WILL BE FINALISED BY CIVIL DESIGNERS.
19. FOR MOTOR ERECTION, REFER MOTOR SUPPLIER'S ERECTION MANUAL.
20. BASE FRAME, SOLE PLATE, PACKER PLATE, SHIMS, FOUNDATION BOLTS & FASTENERS RELATED TO MOTORS WILL BE IN THE SCOPE OF MOTOR SUPPLIER (BHEL BHOPAL UNIT)
21. FOUNDATION SLEEVE OF THE MOTOR IS TO BE EMBEDDED IN THE CONCRETE AS PER THE DIMENSION SHOWN. AFTER CONCRETE HAS SET, THE EXCESS PROTRUDING HEIGHT TO BE SUITABLY CUT–OFF.
22. POWER HOUSE (TG BLDG.) FINISHED GROUND FLOOR LEVEL IS EL.(+)0.00M, WHICH CORRESPONDS TO RL.(+)3.80M. BOILER PAVED LEVEL IS EL.(–)0.20M.
23. DRAIN LINE (TUBE 17.2x2.3) FROM THE FAN HOUSING SHALL BE ROUTED TO THE NEAREST DRAIN PIT BY BHEL/ PIPING CENTRE.
24. KEY PHASER MARKER REFERENCE SLOT OF DIMENSION 30X15X3mm IS PROVIDED IN COUPLING HUB ON MOTOR SIDE. SENSOR INSTALLATION (IF APPLICABLE) ON MACHINE AND DESIGN/FIXING THE BLOCKS FOR BRACKET MOUNTING ON MACHINE FACE/BEARING CASING OR ANY OTHER RECOMMENDED LOCATION SHALL BE DONE BY VMS SUPPLIER.
25. BHEL BHOPAL'S DRAWING "OUTLINE AND GENERAL ARRGT. OF ID FAN MOTOR" WITH DRAWING NO 14020041508 TO BE REFERRED FOR ID FAN MOTOR DETAILS.
26. MAXIMUM PERMISSIBLE NOISE LEVEL IS 85 dB(A) WHEN MEASURED AT 1 METRE FROM FAN CASING.
27. LUBE OIL SYSTEM FOR ID FAN SHALL BE PROVIDED WITH SUITABLE CANOPY.
28. BHEL TRICHY'S DRAWING "ID FAN HANDLING ARRANGEMENT" WITH DRAWING NO. 1–99–100–40912 TO BE REFERRED FOR ID FAN HANDLING ARRANGEMENT. (1)
29. TROLLEY WITH HOIST – CAPACITY 20/40 TONS WITH LIFT 13.5/9.5 M RESPECTIVELY. (1)

## FAN DETAILS:–

| | | |
|---|---|---|
| TYPE | : | AXIAL FAN |
| MODEL | : | SAF 38.5/25–2 |
| NO. OF FANS PER BOILER | : | TWO (IDENTICAL) |
| WEIGHT OF ROTATING PARTS | : | 15500 Kg |
| $GD^2$ OF FAN | : | 36280 kg.$m^2$ |
| SPEED OF FAN | : | 745 RPM |
| MAX. WEIGHT TO BE HANDLED FOR MAINTENANCE | : | 16000 Kg |

## MOTOR DETAILS:–

| | | |
|---|---|---|
| MAKE | : | M/s BHEL/BHOPAL |
| RATING | : | 7200 KW/747 RPM/446 AMP/11 KV |
| FRAME SIZE | : | 1TF6741–8, IP55 |
| WEIGHT OF MOTOR | : | 30000 Kg |
| WEIGHT OF ROTOR | : | 9500 Kg |
| $GD^2$ OF MOTOR | : | 6124 kg.$m^2$ (1) |
| MOTOR DRG. NO. | : | 1 402 00 41508 |
| METHOD OF COOLING | : | IC 81W |
| MAXIMUM WEIGHT TO BE HANDLED FOR MAINTENANCE | : | 30500 Kg |

## LOADING ON MOTOR FOUNDATION

| | | |
|---|---|---|
| REACTION DUE TO WEIGHT ON EACH SIDE (G) | | = 150 kN |
| MAX. SHORT CIRCUIT FORCE (MS) | | = 400 kN |
| REACTION DOWNWARD | (MS+G) | = 550 kN |
| REACTION UPWARD | (MS–G) | = 250 kN |

| | | | | |
|---|---|---|---|---|
| 15 | BEARINGS (ANTIFRICTION) | NU256 E.M1.C3 | 2 | – |
| | | 7256 B.MP.UA | 3 | – |
| 14 | FAN SHAFT | 42 CrMo4 | 1 | – |
| 13 | SHIMS | ASTM A240 | AS REQD. | – |
| 12 | PRIMARY PACKER | IS : 2062 | AS REQD. | – |
| 11 | FOUNDATION FASTENERS FOR FAN | ASTM A105 | 19 | – |
| 10 | COUPLING GUARD | IS : 1079 | 1 | – |
| 09 | SPACER COUPLING | CLASS 4/ IS 2004 | 1 | – |
| 08 | MOTOR WITH FNDN. FASTENERS | 7200 KW/747 RPM | 1 | – |
| 07 | BLADES | GGG 40 OR EQUIVALENT (NODULAR CAST IRON) (Hardness HB 30:135–185) | 20 | – |
| 06 | IMPELLER HUB | LOAD RING P500NH WELDING HUB P500NH SUPPORT RING, OTHERS P355NH | 1 | – |
| 05 | HOUSING CORE (FAN HOUSING HUB) | IS : 2062 | 1 | 16 |
| 04 | DIFFUSER | IS : 2062 | 1 | 6 |
| 03 | OUTLET GUIDE VANE ASSY. | IS : 2062 | 1 | 12 |
| 02 | IMPELLER HOUSING | IS : 2062 | 1 | 22 |
| 01 | SUCTION CHAMBER | IS : 2062 | 1 | 6 |
| SL NO | DESCRIPTION | MATERIAL | QTY. | THICKNESS (MM) (1) |

*BILL OF MATERIAL*

| REV | DATE | ALTERED | CHECKED | APPROVED |
|---|---|---|---|---|
| 02 | 28.02.2019 | SARAVANAN | PRASANNA | P.M.JAVID |

01. BLADE PITCH ACTUATOR UPTD. AS ELECTRICAL TYPE AS COMMENTED BY CUSTOMER.
02. VIEW–R UPDATED.
03. DETAIL–U DELETED.

| REV | DATE | ALTERED | CHECKED | APPROVED |
|---|---|---|---|---|
| 03 | 22.04.2019 | SARAVANAN | PRASANNA | P.M.JAVID |

01. CONSULTANT NAME UPDATED AS TCE FROM DESEIN AS PER MOM DTD: 09.04.2019 AT TCE OFFICE, BANGALORE.
02. THICKNESS COLUMN ADDED IN BOM.

| REV | DATE | ALTERED | CHECKED | APPROVED |
|---|---|---|---|---|
| 01 | 22.01.2019 | SARAVANAN | PRASANNA | P.M.JAVID |

DOCUMENT REVISED AND RESUBMITTED BASED ON MOM MADE DURING 5th ERM dtd. 7th–9th JAN'19 AT BHEL/TRICHY.



CUSTOMER Nos. : R678 & R679

| | |
|---|---|
| PROJECT | 2 X 660MW UDANGUDI SUPERCRITICAL TPP – STAGE I |
| OWNER | TAMILNADU GENERATION & DISTRIBUTION CORPORATION LTD. 5th Floor, Western Wing, NPKRR Maaligai 144, Anna salai, Chennai–600002 |
| OWNER'S CONSULTANT | TATA CONSULTING ENGINEERS LIMITED BANGALORE, INDIA |
| | BHARAT HEAVY ELECTRICALS LTD. NEW DELHI BOILER AUXILIARIES PLANT; RANIPET – INDIA–623 406 EQUIPMENT: STEAM GENERATOR |

| | NAME | SIGN | DATE |
|---|---|---|---|
| DRAWN | P.SARAVANAN | Sd/– | 22.09.2018 |
| CHECKED | PRASANNA | Sd/– | 22.09.2018 |
| APPROVED | P.M.JAVID | Sd/– | 22.09.2018 |

TITLE

# GA DRAWING FOR ID FAN WITH FOUNDATION PLAN AND LOADING DATA – SAF 38.5/25–2

| ALL DIMENSIONS ARE IN MILLIMETERS | | | BHEL DRAWING No. | REV |
|---|---|---|---|---|
| PROJECTION | SCALE N.T.S | SHEET 1 OF 1 | 1–00–099–29189 | 03 |

Size A1