



# PRODUCT STANDARD

HYDERABAD

Prod. Std. No. GT54225

REV. No. 27

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## OFF-BASE ENCLOSURE GAS TURBINE UNIT

### 1.0 GENERAL

This specification defines the requirements for the design, fabrication, inspection, pre-shipment erection and delivery of an off-base enclosure for a gas turbine of GENERAL ELECTRIC / BHEL - Model as per variant in Table-1. The off-base enclosure, as referred to in this specification, denotes a single structure which shall enclose the gas turbine - Accessory Compartment & Turbine Compartment base and Load compartment. (Ref the G.A drg. enclosed per the Var-No. in Table-I. The offbase enclosure is a key component of the gas turbine package. The system being offered by the Vendor shall be highly reliable for gas turbine service with regard to the functions as required by this specification, and for the conditions defined by this specification.

### 1.1 EQUIPMENT TO BE SUPPLIED BY VENDOR

- a) Off-base Enclosure per the Enclosure Outline Drawing (Ref. - Var No. in Table-1) & to include support structure & installation hardware.
- b) Fire protection piping & nozzles complete with all supporting hardware.
- c) Internal lighting arrangement & door-alarms, lamps complete with all conduits, fittings, cable and supporting hardware etc. (Power supply by "others").
- d) Foundation hardware for enclosure.
- e) Aux. lifting hoists as indicated in outline Drg.
- f) Erection & commissioning spares shall form part of supply
- g) Vendor to quote separately for 2 YEARS operational spares.

### 1.2 Services Required BY Vendor

- 1.2.1 Technical data and information as required to support BHEL at customer meetings particularly at customer's place.
- 1.2.2 Erection & Commissioning of the equipment at site (separate quotation required for this service).
- 1.2.3 Supervision of erection & commissioning of the equipment at site (separate quotation required for this service on per diem basis).

Revisions :

Refer to record of revisions

Prepared :

K.S.

Approved :

M.S.

Date :

5-5-87

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## 1.3. Equipment And Services To Be Supplied by "Others"

- a) Unloading and storage of equipment site.
- b) Installation-To include labour, Utilities & Consumable - for option 1.2.3 above.
- c) Fire detection system on the G.T , Load gear Box & Generator area.
- d) Fire protection gas bottles unit & control system, including interconnection piping outside the enclosure "Battery limit".
- e) Walkways internal to enclosure which are supported from GT / Generator base.
- f) Door latches (supply by BHEL )

## 1.4 SYSTEM DESCRIPTION

The purpose of an off-base enclosure , and the requirements thereof, is to provide acoustic attenuation of gas turbine noise; thermal insulation , containment of carbondioxide or fire protection media during fire protection system discharge and to present a pleasing appearance to the plant. The off base enclosure shall cover the gas turbine, accessory Turbine compartments and exhaust compt. Internal walls are required to separate the various Compartments of the enclosure. The offbase enclosure shall be supported on the foundation ( supplied by others). The enclosure shall be designed for indoor or outdoor use. ( Refer to the Var No. Table-I & the outline drawing).

## 2.0 DOCUMENTATION

### 2.1 Applicable Documents

#### 2.1.1 Codes and Standards

The latest issue in effect at the time of the purchase order of the following codes and standards are part of this specification to the extent specified herein.

- a) American Society Mechanical Engineering ( ASME - IX) - Welding and Qualification).
- b) American Society for Testing and Materials ( ASTM )



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- c) American Society for Non- Destructive Testing (ASNT)
- d) Structural Steel - IS2062
- e) American Society of Civil Engineers ( ASCE / IS800)
- f) Seismic loads - IS1893
- g) Any other relevant codes and standards if called for in the outline drg.
- h) Sea worthy packing BHEL Spec. HY0490569, (guideline) - valid only for export job.
- i) Fire protection system - NFPA 12.
- j) Steel Structural painting council (SSPC)
- k) National Electric Code (NEC) / IS2148 - Explosion proof requirement.
- l) Structural Steel Specification - IS2062
- m) Anti - skid grating - BHEL Specification GT54155.

### 2.1.2 **BHEL Drawings:**

Off base Enclosure outline Drawing - as per applicable var. No. in Table-I & purchase enquiry.

- 2.1.3 Nothing in this specification shall be construed to relieve the vendor of his responsibility for compliance with the applicable documents. Any conflict between the applicable documents and this specification shall be brought to the attention of BHEL for resolution.



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## 2.2 Vendor Submittals

Sl. No	Document Description	With offer	After LOI (within 3 weeks)	O & M (Cl. 2.2.1)
1.	Gen. Arrangement Drawing with sectional details	√	√ (Final)	√
2.	Structural framing drawing and analysis report		√	√
3.	Design Report ( Cl. 2.2.2)	√	√	
4.	Foundation interface drawing and loading	√	√ (Final)	√
5.	Electrical conduiting and lighting drawing		√	√
6.	CO <sub>2</sub> fire fighting piping drawing.		√	√
7.	Painting schedule	√	√	
8.	BOM of complete enclosure system (add also items Cl. 3.3.5 , 7.4 & 7.5) (Ref format No. GTEG - BOM-01 enclosed)		√	√
9.	Vendor quality Documentation (Cl. 2.2.4)	√	√	
10.	Weight and C.G Drawing for all major components		√	√
11.	Installation drawings and Instructions		√	√
12.	As built drawings			√
13.	Deviation (if any) with justification - Cl. 2.2.3	√	-	-
14.	Packing Procedure (C. 7.1.1)		√	-
15.	ERRECTION SEQUENCE	-	√	√

### 2.2.1 O & M Manuals

a) Vendor shall supply 2 copies of O & M manuals one month in advance for review before submission of final 20 copies. The O & M manuals shall contain all instructions of erection, commissioning , operation and maintenance with drgs., Check lists , “ Do’s & Don’ts “, warnings , all the approved detailed documents and drawings , all spare items with their part nos. , identified and the BOM etc., The manual shall have the documents neatly & properly arranged , sectionalized and contained in a durable and aesthetic folder.

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- b) Soft copies of Erection drawings and O&M manual are to be furnished on CDs (2 nos) along with O&M manuals hard copies.

NOTE: Submission of O & M manuals will be treated as part of main supply of equipment.

### 2.2.2 Design Report:

The design report shall include the following , as minimum

- a. Structural design calculations with all loads and load combinations identified along with the design criteria and allowable stress levels and deflections as defined by this specification.
- b. Analysis to support recommended anchor bolt size and material.
- c. Design calculations and/or test data to support that off-base enclosure with their panels , roof & ducting etc will meet the acoustic requirements of this specification.
- d. Fire fighting system nozzle selection criteria.
- e. Tabulated confirmation by vendor for all technical clauses , material & Quality requirements.

### 2.2.3 (a) Exceptions/Clarifications to this specification :

Exceptions if any shall be documented by supporting analysis and/or data delineating the engineering logic and technical basis for the exception. These exceptions shall be presented to BHEL for review . Exceptions resulting in a material or process substitution shall be submitted to the BHEL using a supplier deviation request.

- b) The offer shall clearly specify all exceptions in any in their offer. Otherwise it will be constructed that all requirements of this specification will be met in both words and spirit.

(c) Major exceptions are undesirable.

### 2.2.4 Quality Documents :

- 2.2.4.1 Quality Management System Level 1 ( QC Manual) The Vendor shall have an active , compliant, documented quality Management system. Compliance to the applicable and appropriate section and elements of ISO 9000 is recommended.



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The vendor shall submit a copy ( uncontrolled ) of their Quality Manual ( level 1 ) with their offer. This is required as a part of the approval and surveillance routine. A one time submittal will suffice unless major structural changes occur.

## 2.2.4.2 Vendor product quality plan:

The vendor shall submit a copy of their product quality plan. This plan shall include but not be limited to the following :

- Operation sequence
- identification of level 2 procedures in the quality Management system.

## 2.2.4.3 Vendor's Quality Assurance Plan :

The vendor shall submit detail Quality Assurance plan for BHEL review , comments and approval prior to start manufacture. See purchase order or quotation request package for additional instructions if any regarding production, inspections and tests to be performed by the vendor for repeat orders.

## 2.2.4.4 List of sub-suppliers for bought-out items.

## 3.0 TECHNICAL REQUIREMENTS:

Unless otherwise specified in applicable outline drawings 'or' in TABLE - I, the following are the technical requirements. In case of conflict in requirements, specified requirements in applicable outline drawings takes precedence.

### 3.1.1 Enclosure Design Load :

#### 3.1.1.a) The offbase enclosure shall be designed by the vendor for the following loads and allowable parameters:

1. Dead Loads
2. Live Loads
3. Design temperature ( Inside ) : The items used for enclosure shall be capable of withstanding 150<sup>0</sup>C.
4. Design Internal Pressure:-

- |                          |                 |
|--------------------------|-----------------|
| 1) Accessory compartment | (±) 2.0 in H20  |
| 2) Turbine Enclosure     | (±) 2.5 in. H20 |
| 3) Exhaust. & LG Compts. | (±) 2.0 in. H20 |

#### 5. Wind Load ( Applicable for outdoor installations ).

Basic wind speed = 200 Km/hr.



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6. Earthquake load as per site conditions. (Ref. var. Table-I)
7. Snow Load ( If applicable - as per location refer table-I)
8. Sand Load-when located in desert region only.
9. Static & Dynamic loads from enclosure mounted ventilation fans.
10. Transportation Loads.

3.1.1.b) The off-base enclosure shall maintain structural integrity after the combined application of all loads in their various load combinations.

3.1.1.c) The loading combination producing the maximum stress shall be considered. The maximum stress shall not exceed the allowable stress permitted by relevant code. All load combinations shall be identified in the structural design calculations required per paragraph 2.2.2.a

### 3.1.2 Foundation Load :

The design load requirements of paragraph 3.1.1 are set such that the offbase enclosure design will be suitable as a standard for a wide range of gas turbine sites.

### 3.1.3 Acoustic Design:

a) Unless noted otherwise in var. Table-I , the offbase enclosure shall be designed to meet the following acoustic requirement .The following noise limits as defined by ISO recommendation R1966-1971 ( E ) and the next issues.

1. NR55 at any point at 1M above ground level not closer than 100M from the Enclosure.
2. NR85 at any point at 1M above the ground level not closer than 1m from the Enclosure.

The vendor shall use the sound power levels of the gas turbine listed in Annexure - 1 in the design calculations. The vendor shall provide a report to verify the acoustic design.

b) Silencers and insulated ventilation ducting for outlets if required shall be provided by vendor and justify in their design report.



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## 3.1.4 ELECTRICAL PROTECTION:

Unless specified otherwise all electrical equipment's supplied like light fittings, switches, junction boxes, conduiting etc. shall be of explosion proof design and suitable for NEC hazardous area, classification NEC, CL-I, group C&D, Div-II / IS2148 - Gr-II A & II B.

## 3.2 Design and Fabrication Requirements:

### 3.2.1 General:

- a) The offbase enclosure shall be designed and fabricated to good engineering and manufacturing practices and in accordance with the applicable codes and standards. The offbase shall be designed for reliable service of twenty (20) years, as a minimum. The enclosure shall be designed for ease of maintenance of the enclosure and designed for worker safety.
- b) The offbase sub assemblies shall be factory assembled. taking full advantage of the shipping limitations (size and weight) for component size. The system shall also be designed to minimize field erection time.
- c) Lifting provisions shall be provided on each piece of equipment. 100 % DPT necessary for all lifting provisions welding etc.

### 3.2.2 Materials:

All materials of the offbase enclosure shall be suitable for the gas turbine environment and their intended function. Refer also applicable codes per Cl. 2.1.1

### 3.2.3 Welding:

All manufacturing and inspection processes used in the fabrication of the offbase enclosure shall be in accordance with ASME - Section - IX. Welding procedures shall be in approved by BHEL or BHEL approved agency, the welders shall be qualified to these welding procedures. Visual inspection and acceptance standards for all welds shall be in accordance with AWS D1.1

All external exposed weld joints shall be welded with continuous fillets unless otherwise specified.

### 3.2.4 Leak Tightness and Dampers Operation:

The enclosure shall be sealed against leakage in order to meet the following requirements: maintain a low external acoustic level, to accommodate the





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enclosure fire protection system, protect the interior equipment from inclement weather and also to maintain positive pressure inside - when specified. Except for the ventilation inlet/outlet dampers, no light shall be visible through joints or seals when viewed from inside a dark enclosure with bright external lighting. (Gravity and gas operated dampers (unless noted otherwise - supplied by "others") close to tight fitting seal to accommodate the fire protection system and it shall operate smoothly without appreciable friction. All dampers shall be fitted with ball bearings.

All the doors and panels shall flush completely at the sealing surfaces on the frame work. Durable double sealing arrangement is preferred for all doors.

## 3.2.5 Structural Frame:

- a) The offbase enclosure shall be supported by an internal structural frame. The structural frame shall be an independent structure from the enclosure wall and roof panels and shall be removable to permit equipment maintenance. The structural frame shall be designed such that the enclosure will still meet code, as required by paragraph 3.1.1 of this specification, when one, half or all of the wall/ roof panels are removed. The structural frame shall be designed to limit the vertical deflection to 1/240 of the member span and the lateral drift to 1/200.
- b) Movable lifting hoists ( 4 nos. ) be provided and fitted into the enclosure compartments as specified in outline drawing. Lifting hoists are manually operated type each with a capacity of 1 ton. The required head room space and operating distance will be specified at design review stage. The hoist shall be procured from a reputed vendor.

## 3.2.6.1 Enclosure Wall panels and Roof panels:

The enclosure wall panel and roof pieces shall be designed to be easily removable and reinstalled to permit equipment maintenance. The external plate for the panels shall be of CRCA sheet 3.15mm (min) and deflection shall be limited to 1/80 of the span of plate between stiffeners, taking full advantage of multi-span continuity where appropriate. Internal panel stiffeners shall be designed to limit the deflection to 1/80 of the stiffener span. Stiffeners shall be assumed to approximate an unrestrained pinned condition at exterior ends and fully continuity over interior supports.

In order to maintain as cool enclosure external surface temperature, and to reduce internal noise reverberation, the wall panels and roof pieces shall be internally insulated. Insulation slab material shall be min. 100 kg/m<sup>3</sup> density mineral wool covered with glass-wool cloth and stapled with SS pins. Total panel thickness of 100 mm (min.). Lead sheet of thickness 0.5 mm shall be placed in between the insulation slabs. The insulation shall be covered by ( enclosure inside surface ) hot dip or spray galvanised perforated sheet of 1.6

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mm thk. ( min. ). Perforated sheet shall have 40% opening area and each piece having edges of unperforated border of 50mm. Alternative lead substitute materials can be used, details are to be furnished in offer.

3.2.6.2 The roof of the enclosure outside shall be provided with minimum 5 mm thick CS plate (IS2062).

3.2.6.3 Outer sheet shall be machined pressed to have uniform finish.

## 3.2.7 Enclosure Doors and Approach:

3.2.7.1 The offbase enclosure shall have man-doors located as shown on the offbase Enclosure drawing enclosed . The doors shall be fabricated panel, similar in construction to the wall panels. The doors shall be designed with a double seal which seals around the full perimeter of the door for a tight fitting, non-leaking seal. The door shall be held tightly closed with a single externally mounted latch. (The door latches are of heavy duty construction, chrome plated with panic release mechanism and supplied by BHEL for fitting on the door panels by the enclosure vendor).

Door hinges shall be of heavy duty construction , impact resistant with a chrome plated - corrosion resistant surface coating. All door hardware (latches, hinges , etc.) shall be mounted to the door such that they are easily removable for shipping or maintenance purpose.

A “ drip edge” shall be provided above each door to divert rain water from the doorway opening. Each panel and door shall be identified with Door-No. / panel -No. A warning indication to evacuate enclosure on fire alarm shall be provided.

3.2.7.2 Approach steps ( ladder ) shall be provided with hand rails and platform for approach to the doors. ( Ref. enclosed drawing). The steps and platform anti-skid grating shall be hot-dip / spray galvanized.( Refer BHEL spec. GT54155). The hand rails shall be from galv. pipe with G.I / chrome plated pipe fittings.

3.2.7.3 On opening of any door , it shall provide electrical signal for remote indication. Necessary limit switches ( DPDT) & interlock should be provided with wiring ( conduit run ) complete in all respects. All electrical termination's shall be wired upto a single point junction box.

3.2.7.4 Vendor to provide name plates and warning plates at all appropriate places. The language in these plates shall be in English (and also in local language , if required; Local language shall be indicated during the drawing review stage).



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3.2.7.5 Viewing windows shall be provided ( in specified panels/doors only) with toughened glass and same shall withstand enclosure inside design parameters.

## 3.2.8 Enclosure Internal Walls:

3.2.8.1 Each internal wall shall be of two (2) piece construction. These walls are insulated and identical to enclosure wall panels .The perforated sides of the panels shall face the turbine area of the enclosure. The internal wall panels shall be located as shown in the outline drawing. Both the panels shall have cut-outs to allow for pipe penetrations. The vendor shall supply 3.15 MM thick plates sized to cover the openings. The plates will be cut in the field to fit around the pipe and seal the penetrations. The vendor shall supply self tapping screws to fasten these plates to wall panels.

3.2.8.2 The internal wall panels shall have a door on each side of machine ( as shown in outline drawing) at the walkway level to facilitate passage through the walkway in between the compartments. These man-doors shall have proper sealing .Normally these doors remain close (latched) during operation . View glass windows are required in these doors. (Refer also Cl. 3.2.7.5) . Mark "PUSH" & "PULL" appropriately on each side of door.

3.2.8.3 The vendor shall design the internal wall panels to seal the areas from various plenums upto the enclosure internal wall panels , roof panels , and foundation . The internal wall shall also seal up to the turbine base. The wall shall be sealed to the turbine base with a filler plate. The vendor shall provide self-tapping screws to fasten the filler plate to the internal wall and high temperature silicon caulk to seal the filler plate.to the turbine base.

3.2.8.3 **Shield wall** :- A shield wall is envisaged between the space of aft of the Exh. plenum and the load-gear box , so that the load gear box is not subjected to the heat radiation from the hot exhaust plenum aft surface. This shield wall shall be removable ( Bolted ) sheet metal panels for attending / overhaul of the exhaust plenum area. This internal shield wall extends from top upto a certain level above GT Base structure to leave a gap for ventilation air blow from side & bottom of Exhaust plenum. ( Refer drg. enclosed).

## 3.2.9 Inlet & Exhaust Duct Penetrations of Enclosure:

The gas turbine inlet transition duct & Exhaust duct shall penetrate the enclosure roof at the location shown on enclosed drawing.The gap between the roof and the transition duct shall be sealed with a high temperature silicon gasket suitable for the gas turbine environment.



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The inlet transition duct mounting surface for the gasket shall also be provided by the vendor. The mounting surface shall be ASTM A 36 / equivalent flat, which will be field welded with a continuous weld to the inlet transition duct, the vendor shall show this weld detail on the enclosure installation drawing.

The vendor shall include a "NOTE" in the installation drawings that the erection agency shall size the length of the gasket and batten strips to be compatible with roof opening and the inlet transition duct mounting bar lengths. Mounting surface bars shall also be painted with inlet duct painting.

## 3.2.10 Piping and Cable Penetrations:-

All piping and cable penetrations will be finalised during drawing approval stage. The vendor shall supply split flashing plates with cut-outs to fit around the pipe, to cover the holes. The vendor shall design the enclosure such that the structural frame or panel stiffeners will not be located in the vicinity of the pipe penetration. The vendor shall include the pipe flashing plates on the outline drawing and designate with Item - Nos. and also Tabulate in the Bill of Materials (BOM). The 'C' plates shall be screwed to panel with galvanised screens, with gaskets.

## 3.3 Surface Preparation and Painting :

3.3.1 Non-stainless steel & non-galvanised exterior and interior surfaces shall be GRIT blast cleaned in accordance with process Specification No. SSPC-SP6 (near white material surface-SA 2-1/2. All parts, components and assemblies shall be thoroughly cleaned prior to painting. This shall include the removal of all loose, scattered or excess welding material or solder material, weld flash, metal chips or any other foreign matter, burrs or sharp edges.

### 3.3.2 Primer & Intermediate :

Zinc rich epoxy primer - 50  $\mu$  Dft. After primer apply intermediate high built MIO epoxy - 125  $\mu$  Dft on both external and internal surfaces.

### 3.3.3 Finish Paint :

Aliphatic urethane finish paint - 75  $\mu$  Dft

3.3.4 Outside paint colour scheme will be intimated by BHEL later during drawing review stage.



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## 3.3.5 Stock paint :

Upon completion , vendor to deliver 5 % each of colour (used as stock for future patch up ) along with main supply. Item to be included in the BOM..

Stock paint shall be delivered to site in original unopened containers with manufacturing label intact , taking of shelf life and the actual finish painting at site.

3.3.6 Vendor to conduct paint adherence test, DFT test and wet down test before dispatch.

3.3.7 All parts shall be painted in painting booth, outside painting in open air not permitted.

## 4.0 LIGHTING REQUIREMENTS:

Lighting arrangement within the offbase is in vendor's scope. Offbase interior shall be furnished with both AC and DC. Lighting in order to allow proper inspection and maintenance of GT equipment . AC lighting is for normal running and for emergency DC lighting is to be provided.

4.1 The salient features of enclosure lighting as follows.:

4.1.1 All lighting equipment including conduit fittings, lighting fixtures, junction boxes, switches etc. shall be of explosion proof design.

4.1.2 The cables used for lighting which are running inside the conduit pipes shall be PTFE cable type 'E' (600V grade) 260 deg. C of size 14AWG - 19/27.

4.1.3 All cable termination shall be brought to junction boxes located in G.T . Accessory compartment area. DC & AC terminations shall be on separate junction Boxes. Power input to these junction boxes by "others" . The junction boxes shall be supplied with expl. proof . Cable glands. The required cable size & power requirement shall be informed to BHEL & indicated on the drawing.

4.1.4 All lighting fixtures & conducting etc., shall be made in such a way that they shall be accessible for easy maintenance. ON / OFF switches shall be provided outside the enclosure.

4.1.5 One row of Flourescent lamps on either side enclosure shall be provided with AC 220V 50 Hz. Min of 150-LUX intensity to be maintained with the above provision. Lights shall be suitable for compartment temp.

4.1.6 DC 125V lighting (Flourescent type) arrangements shall be provided for emergency conditions, with auto - changeover facility in case of AC- failure condition. (provision covered in junction boxes).

4.1.7 Lighting required in all compartments unless specified otherwise.



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## 5.0 Fire Protection Piping Requirements:

- 5.1 Vendor to provide CO<sub>2</sub> fire protection piping coming within the offbase enclosure. Scope includes galvanised piping with appropriate number of nozzles for distribution of CO<sub>2</sub> within enclosure, selection & design as per NFPA 12.
- 5.2 All tubing shall be SS-304, with tube fittings SS-316 "Swagelok" make only ( double compression ferrule type ) and the pipes shall be of carbon steel ( A53 - seamless - Gal - Sch80 )
- 5.3 All pipe fitting of NPT threaded ends only ( ASTM 105 Grade, class 3000 )
- 5.4 Pneumatic pressure test shall be conducted at a pressure of 8 kg/cm<sup>2</sup>, holding time 10 minutes and a max. pressure drop permissible is 0.4 kg/cm<sup>2</sup>.
- 5.5 All nozzles SS-304 only ( both initial & extended discharge ).
- 5.6 All openings on the offbase enclosure shall provided with CO<sub>2</sub> operated damper latch arrangement. These dampers will have to automatically get enclosed in the event of CO<sub>2</sub> release into the fire protection piping. SS - Tubing shall be trimmed upto the CO<sub>2</sub> damper mechanism.
- 5.7 The fire protection piping in vendor's scope ends at the battery limits of Enclosure wall outside - ( NPT - capped ) & indicated on drawings.

## 6.0 QUALITY ASSURANCE :

### 6.1 Factory Inspection and Tests

The vendor is responsible for the performance of all test and inspection requirements to ensure adequacy of materials and performance of the equipment to meet the requirements of this specification. The vendor may use their own facilities or any commercial laboratory acceptable to BHEL unless otherwise specified. BHEL reserves the right to inspect the equipment and witness any test prior to shipment and as per "Hold-Points" defined in the approved Quality Assurance plan. Vendor shall give reasonable notice in writing of the date and place of any test to allow ample time to exercise the right to witness the test by BHEL/BHEL's authorised inspection (AI) and/or BHEL's customer.

All test and inspections shall be conducted in a manner to permit the recording of pertinent data in reliable and accurate values so as to permit proper evaluation of inspection and test results by BHEL/AI/BHEL's customer.

- 6.1.1 Vendor shall submit the detail Quality Assurance ( QA ) plan within 3 weeks of L.O.I. The same shall be reviewed for inspection "Hold points" &



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accordingly approve the QA plan. Vendor shall follow this approved QA plan in all stages of design, manufacturing, testing, erection & commissioning.

### 6.2 Shop - Assembly & Test

Prior to shipment, the vendor shall fully shop erect the offbase enclosure at vendor's works.. Appropriate level fixture shall be used for the mock up assembly. All the structural members and panels / doors etc., shall match properly without members being strained. Match - mark shall be applied on each member. The vendor shall give reasonable notice in writing of the date and place of the shop erection to allow ample time for the assembly inspection & tests as per QA plan. Co2 piping and light fittings are also to be assembled for mock up assembly.

### 6.3 Visual Inspection Qualification

The final appearance of the offbase enclosure shall have a neat, clean, & excellent appearance. Wall and roof panel sheet metal surfaces shall be flat without ripples/ weaving or dimples due to welding ( excluding formed areas ). There shall be no spattered to excess welding material, metal chips or other foreign matter, burrs or sharp edges.

6.3.1 To prevent bleeding rust stains on the enclosure surface, the vendor shall conduct a visual test to check for potential stain areas. Bleeding rust stains occur when water comes in contact with non-visible non-painting surface and drips down to visible surfaces bringing rust with it subsequently staining the visible surface. In order to prevent such an occurrence in the field, the vendor shall conduct a wet down test, where the exterior of the assembled enclosure is soaked with bleeding rust shall constitute test failure and considered unacceptable to BHEL.

Wet down test is conditional requirement based on GT location and will be applicable if specified in the ordering outline drawing. (Ref var no in Table-1)

6.3.2 Inspection requirements of the enclosure shall be enlisted as per various technical requirement this specification.

## 7.0 PREPARATION FOR DELIVERY

### 7.1 Packing

This supplier shall make shipment using the minimum number of shipping containers consistent with the requirements of safe transit, available modes of transportation and routing. It shall be the supplier's responsibility to determine that packaging as done is adequate to preserve the integrity of the equipment surfaces after having met the visual standards of (paragraph 6.0 of this specification ) such that all equipment shall arrive at its destination in an



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undamaged condition (no ingress of dust, rain water and without dents, distortions etc.) and ready for its intended use.

To maintain the finish of painted surfaces, all enclosures packing must be covered with suitable PVC sheet and bituminous cloth during transport. Crates shall be made of structural steel frame works and provided with intermediate wooden separator suitably. If enclosures are being shipped by sea, all enclosures must be packed in an environment which will remain salt free. (Please refer cl.2.1.1.h above)

## 7.2 Marking

All despatchable loose parts, panels, structures and/or shipping packets & containers etc. shall be individually permanently and legibly marked/tagged for part number identification as per the BOM, so as to store, locate & identify the items conveniently, easily & quickly at site. Small loose items like fasteners etc. shall be kept in separate packs and identified as above.

## 7.3 Shipment

For specific shipping instructions, see the purchase order or quotation request. Approval to ship must be obtained from the BHEL purchasing department.

If certain shipment items become the late dispatching, due to unavoidable reasons, approval of all such items must be obtained from BHEL purchasing department at least two weeks prior to shipment. At the time of shipment, two copies of the packing list and/or shortage list with ref to BOM with the promised shipping dates if applicable, must be airmailed to the purchasing department.

## 7.4 Spare Parts

The vendor shall supply 10% spare nuts, bolts, clamps, washers, cables, gaskets, field installed insulation and lagging material etc. These items are part of main supply. Same shall be marked necessarily & noted in the BOM.

## 7.5 Special Tools

The vendor shall provide a complete set of special tools that may be required for installation, normal maintenance & complete overhaul of the equipment. Same shall be enlisted in the BOM. and part no. given in drg.

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8.0 Guarantee:-

Vendor shall furnish a full guarantee for the performance of the total system. Unless noted otherwise in the applicable variant no. in Table-I/ Purchase request, this guarantee shall be applicable for a period of 2yrs from the date of dispatch or 18 months from the date of commissioning, whichever is earlier.

- 8.1 Review/approval of vendor's documents shall not relieve the vendor from there responsibilities for compliance with the applicable codes, standards & good Engg. practices.

PACKING

- 9.0 - Wooden Box packing with plywood covering for panels and structures.  
- Wooden planks between panels.  
- Wooden Box packing with GI sheet cover for Loose parts.  
- Metalic frame work with poly covering for Duct pieces.

Vendor shall submit to BHEL the packing procedure adopted for review.



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## ANNEXURE - 1

### SOUND POWER LEVEL

Frequency (HZ.)	Power Level (dB ref. to 1 picowatt)		
	FR-9E GAS TURBINE	FR-5/FR-6B GAS TURBINE	Fr 9FA
31.5	149.0	130.0	119
63	151.0	128.0	121
125	153.0	125.0	120
250	155.0	129.0	117
500	154.0	129.0	116
1000	153.0	128.0	118
2000	150.0	137.0	124
4000	146.0	138.0	126
8000	140.0	134.0	122

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## Fire Fighting Piping:

1. All nozzle & piping within enclosure is in vendor scope of supply.
2. Number of nozzles given below are indicative only. Vendor to calculate the actual requirements, and submit for BHEL's approval.
3. Vendor shall submit CO 2 discharge nozzle drg's for BHEL approval.

	ACC	TURB.	EXH	AFT	LG
Initial :	3	5	3	2	3
Extend:	2	4	3	1	2


4. All ventilation opening in the enclosure shall be provided with CO 2 operated dampers.

These CO 2 latches shall be operated on initial discharge.

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VAR No.	DESCRIPTION	SITE CONDITION	REMARKS	CODE	PROJECT
01	GT - Off-base enclosure Turbine - FR9	- Indoor installation - Ambient Temperature Max. : 37°C. Min. : 17°C. - RH - 90% Max. - Elevation - 0m. MSL. - Seismic Zone - <u>IV</u> (IS : 1893)	- Power supply 415 V, 3φ, 50Hz. 240 V, 1φ, 50Hz. & 125 V - DC - Explosion Proof electrical systems required. Outline Drawing No.: 0-359-08-91002	GT9754225010	2 x FR-9E  - NTPC KAYAMKULAM
02	GT-OFFBASE GEN-ON BASE ENCLOSURES FR-5	- Indoor Installation - Design Amb: 35 °C MAX. Temp: 45°C MIN. " = 15°C - RH = 100 % - SEISMIC ZONE-II (IS 1893) Coefficient = 0.02 Imp. factor = 1.5	• Power Supply 415V, 3φ, 50 HZ 240V, 1φ, 50 HZ 125 V DC • Expi. proof Electrical systems • Outline drg 1-359-08-59008	GT9754225020	H PCL - VIZAG 2 x FR5
03	GT-OFF BASE GEN-ON BASE ENCLOSURE 6FA GT	- out door installation - Site data same as VAR-01.	• POWER SUPPLY 415V, 3φ 50HZ 240V, 1φ 50HZ 125V-DC • Expi. proof elec • out line drg 1-359-08-71001	GT9754225030	TNEB-6FA GT 1 GEN

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TABLE - 1

VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	CODE	PROJECT
04	GT 2 GEN OFF BASE ENCLOSURE	<ul style="list-style-type: none"> <li>OUT DOOR INSTALLATION</li> <li>Site data Same as Var-01</li> </ul>	<ul style="list-style-type: none"> <li>POWER SUPPLY 415V, 3<math>\phi</math>, 50 HZ</li> <li>220V, 1<math>\phi</math>, 50 HZ</li> <li>125V-DC</li> <li>Exp. proof Elec.</li> <li>out line dry</li> <li>1-359.08.61010 Var-01</li> </ul>	GT 354 225060	SUJANA 4XFL6 SPLIT BASE
05	GT 1 GEN OFF BASE ENCLOSURE	<ul style="list-style-type: none"> <li>OUT DOOR INSTALLATION</li> <li>Site Data</li> <li>Amb - 50°C Max</li> <li>10°C min; 50% RH</li> <li>Wind - 160 Km/h</li> <li>Seismic - Zone-3</li> <li>UBC</li> </ul>	<ul style="list-style-type: none"> <li>OUT line dry</li> <li>0-35908-91003</li> <li>-Gen. Encl</li> <li>0-13915-31071</li> <li>POWER SUPPLY on per Var-04</li> <li>EX. pl. proof Electricals.</li> </ul>	GT 754 225052	OMAN - RUSAIL
06	GT 1 GEN OFF BASE ENCLOSURE	<ul style="list-style-type: none"> <li>in door installation</li> <li>Site data Same as Var-01</li> </ul>	<ul style="list-style-type: none"> <li>Power Supply 415V, 3<math>\phi</math> 50 HZ</li> <li>220V, 1<math>\phi</math> 50 HZ</li> <li>125V DC</li> <li>Exp. proof Elec</li> <li>out line dry</li> <li>1-359.08.61010 Var-02</li> </ul>	GT 754 225060	BPCL - FL6 GT

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VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	MATL CODE	PROJECT			
07	GT & Generator OFF-BASE ENCLOSURE	INDOOR INSTALLATION SITE DATA: Amb - 50°C MAX 8.3°C MIN 64% RH WIND : 160 KMPH	Power Supply : - 415V, 3φ, 50 HZ 240V, 1φ 50 HZ 125V-DC - Expt. proof electricals - Out line Drgs 1-359-08-71001 Starting means Encl. is not applicable	GT9754225079	GSECL - PR6PA DHUVARAN			
08	GT-OFFBASE & GENERATOR - ON BASE ENCLOSURES, FR-5	INDOOR INSTALLATION SITE DATA : Design Amb : 35°C Max. Temp : 45°C Min. Temp : 18°C - RH = 70% - SEISMIC ZONE II (IS 1893) Imp. factor = 1.5 WIND : 200 KMPH	POWER SUPPLY : - 415 V, 3φ, 50 HZ 240V, 1φ, 50 HZ & 125 V - DC - Explosion proof electrical systems - Out line Drgs. : 1-359-08-51011 & 1-359-08-51012	GT9754225087	CPCL - CHENNA 2 x FR-5			
09	GT AND GENERATOR OFF BASE ENCLOSURE	INDOOR INSTALLATION SITE DATA: Design Ambient : 0 to 44°C Max Temp : 44°C Min Temp : -40°C RH : 85% [at 10°C] 33% [at 44°C] Seismic zone : Earthquake intensity Zone. Wind : 40 m/sec	POWER SUPPLY - 415V, 3φ, 50 HZ 240V, 1φ, 50 HZ 125V-DC - Explosion proof Electricals OUTLINE DRA NO : 1-359-08-61011	GT9754225095	TCO KAZAKHSTAN FR-68.			

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VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	MATL CODE	PROJECT
10	GT AND LOAD GEAR BOX OFF BASE ENCLOSURE	INDOOR INSTALLATION <u>SITE DATA:</u> Design Ambient : 45 DEG C Max Temp : 47 DEG C Min Temp : 2 DEG C RH : 36% @ 45 DEG C SEISMIC ZONE-IV (IS 1893) WIND : 150 KMPH (Max)	POWER SUPPLY : - 415V, 3 Phase, 50 Hz - 240V, 1 Phase, 50 Hz - 125V DC - EXPLOSION PROOF ELECTRICAL SYSTEMS OUTLINE DRG NOS : 1-35908-51013 Var - 01, 1-35908-51012 AND 0-13915-31106 GENERATOR MATL CODE : TG9712080110	GT 9754225109	IOC MATHURA 1 X FR-5
11	GT AND GENERATOR OFF - BASE ENCLOSURE FR-6	INDOOR INSTALLATION <u>SITE DATA:</u> Design Ambient : 40 DEG C Max Temp : 46.6 DEG C Min Temp : -0.7 DEG C RH : 80% @ 40 DEG C SEISMIC ZONE-IV (IS 1893) WIND : 152 KMPH (Max)	POWER SUPPLY : - 415V, 3 Phase, 50 Hz - 240V, 1 Phase, 50 Hz - 125V DC - EXPLOSION PROOF ELECTRICAL SYSTEMS OUTLINE DRG NOS : 1-359-08-61012 0-139-15-31110 AND 1-35908-51012	GT9754225117	IOC PANIPAT 4X FR-6B
12	GT AND GENERATOR OFF - BASE ENCLOSURE FR 6FA +	OUTDOOR INSTALLATION <u>SITE DATA:</u> AMB - 50° C Max 8.3° C Min 64% RH WIND : 160 Kmph	Power supply : - 415V, 3Ø, 50Hz 240V, 1Ø, 50Hz, 125V - DC - Expl proof Electricals - Out line Drg 1-359-08-71001-02 Starting means Enclosure is not applicable	GT 9754225125	GSECL - Dhuvanan Unit -II FR 6FA + e

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VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	MATL CODE	PROJECT
13	GT and Generator Off Base enclosure Fr9E.	Out door installation - Site data : Temp : 50°C Max 5°C Min RH : 90% Wind : 200 kmph	- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz - Explosion proof (Exd) Electricals. - Outline Drawings 1-35908-91004 -Rev.01 0-13915-31100 - All internal walkways, accessory platforms are in supplier scope.	GT9754225133	RVUNL - Fr9E
14	GT and Generator Off Base enclosure Fr5.	Out door installation - Site data : Temp : 50°C Max 5°C Min RH : 90% Wind : 200 kmph	- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz - Explosion proof (Exd) Electricals. - Outline Drawings 1-35908-51012 1-35908-51014 0-13915-31067 - All internal walkways, accessory platforms are in supplier scope.	GT9754225141	HPCL - Fr5 VIZAG



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15	GT and Generator Off Base enclosure Fr 6.	Out door installation - Site data : Temp : 50°C Max 5°C Min RH : 90% Wind : 200 kmph	<ul style="list-style-type: none"><li>- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz</li><li>- Explosion proof (Exd) Electricals.</li><li>- Outline Drawings 1-35908-51012 1-35908-61013 0-139-05-31001</li><li>- All walkways, accessory platforms are in supplier scope.</li><li>- Acoustic Hoods &amp; Silencers for all roof top fans and Ex. Frame Blowers.</li><li>- Supplier to hire consultant for aesthetic study by BHEL's approved third party.</li><li>- The Recommendations Shall be Reviewed by BHEL / RIL and implementation by supplier. Painting as per GTEG/RIL-H/ 001.</li><li>- Access vent Duct and canopy for Generator Duct Joints ARE IN VENDOR SCOPE.</li></ul>	GT9754225150	RIL.
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16	GT and Generator Off Base enclosure Fr-6.	<p>Out door installation</p> <p>- Site data :</p> <p>Temp : 50°C Max 5°C Min</p> <p>RH : 90%</p> <p>Wind : 200 kmph</p>	<p>- Power supply 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz</p> <p>- Explosion proof (Exd) Electricals.</p> <p>- Outline Drawings 1-35908-51012 1-35908-61014 0-139-05-31002</p> <p>- All walkways, accessory platforms are in supplier scope.</p> <p>- Acoustic Barrier, Rain Hoods, Silencers &amp; Expansion Joints for all roof top fans are in supplier scope.</p> <p>- Painting as per GTEG/ REGN/001.</p> <p>- Conopy for Generator Duct Joints are in vendor scope.</p>	GT9754225168	REGENCY
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VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	MATL CODE	PROJECT
17	GT and Generator Off Base enclosure Fr9E.	in door installation - Site data : Temp : 50°C Max 5°C Min RH : 90% Wind : 200 kmph	- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz - Explosion proof (Exd) Electricals. - Outline Drawings 0-359-08-91004 0-139-15-31126 - All internal walkways, accessory platforms are in supplier scope.	GT9754225176	Essar-FR-9
18	GT and Generator Off Base enclosure Fr5.	INDOOR INSTALLATION SITE DATA : Design Amb : 35°C Max. Temp : 45°C Min. Temp : 18°C - RH = 70% - SEISMIC ZONE II (IS 1893) Imp. factor = 1.5 WIND : 200 KMPH	- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz - Explosion proof (Exd) Electricals. - Outline Drawings 1-35908-51012 1-35908-51014 0-13905-31003 - All internal walkways, accessory platforms are in supplier scope.	GT9754225184	CPCL-II

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VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	MATL CODE	PROJECT
19	GT and Generator Off Base enclosure Fr-9E.	in door installation - Site data : Temp : 50°C Max 5°C Min RH : 90% Wind : 200 kmph	<ul style="list-style-type: none"> <li>- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz</li> <li>- Explosion proof (Exd) Electricals.</li> <li>- Outline Drawings</li> <li>0-359-08-91005</li> <li>0-139-15-31126</li> <li>- All internal walkways, accessory platforms are in supplier scope.</li> </ul>	GT9754225192	ESSAR-II FR-9
20	GT & GENERATOR OFF BASE ENCLOSURES - Fr 6581.	OUT DOOR INSTALLATION - Site data : Temp : 50°C Max 5°C Min RH : 90% Wind : 200 kmph	<ul style="list-style-type: none"> <li>- POWER SUPPLY : 415 V, 3 PHASE, 50HZ 200 V, 3 PHASE, 50 HZ</li> <li>- EXPLOSION PROOF (Exd) ELECTRICALS.</li> <li>- OUT LINE DRAWINGS: 1-359-08-61014 1-359-08-51012 0-139-05-31004 1-139-43-31002</li> <li>- ALL INTERNAL WALKWAYS, ACCESS PLATFORMS ARE IN VENDOR SCOPE.</li> <li>- ACOUSTIC BARRIER RAINHOODS, SILENCERS &amp; EXPANSION JOINTS FOR ALL ROOF TOP FANS ARE IN VENDOR SCOPE.</li> <li>- PAINTING AS PER GTGEG/SUDAN/001.</li> </ul>	GT9754225206	SUDAN Fr 6581

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VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	MATL CODE	PROJECT	
21	GT and Generator Off Base enclosures - Fr9E UPRATE	Out door installation - Site data : Temp : 45°C Max : 5°C Min RH : 98% Wind : 200 kmph	- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz - Explosion proof (Exd) Electricals. - Outline Drawings <b>0-359-08-91005</b> <b>0-139-15-31136</b> - All internal walkways, accessory platforms are in supplier scope. - Painting as per GTEG/ EGCB/FR9/001	GT9754225214	Sidhirganj, Bangladesh - Fr9E UPRATE	
22	GT and Generator Off Base enclosures - Fr9E UPRATE	Out door installation - Site data : Temp : 50°C Max : - 13°C Min RH : 75% Seismic Zone : Zone - IV as per API 650	- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz - Explosion proof (Exd) Electricals. - Outline Drawings <b>0-359-08-91005</b> <b>0-139-15-31137</b> - All internal walkways, accessory platforms are in supplier scope. - Painting as per GTEG/ KURD/FR9/001	GT9754225222	Sulaymaniyah, Iraq - Fr9E UPRATE	

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VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	MATL CODE	PROJECT
23	GT and Generator Off Base enclosure - Fr5	Indoor Installation - Site data : Temp : 40°C Max 8°C Min RH : 88% Wind : 200 kmph	- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz - Explosion proof (Exd) Electricals. - Outline Drawings 1-359-08-51014 1-359-08-51012 0-139-05-31005 - All internal walkways, accessory platforms are in supplier scope.	GT9754225230	BRPL BONGAIGON- Fr 5.
24	GT and Generator Off Base enclosure - Fr5	Outdoor Installation - Site data : Temp : 50°C Max. 20°C Min. RH : 50 % Min. 100% Max. Wind : 200 kmph	- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz - Explosion proof (Exd) Electricals. - Outline Drawings 1-359-08-51014 1-359-08-51012 0-139-05-31006 - All internal walkways, accessory platforms are in supplier scope.	GT9754225249	ORC - Fr5

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VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	MATL CODE	PROJECT
25	GT & GENERATOR OFF BASE ENCLOSURES - Fr 6581.	Indoor Installation - Site data : Temp : 46.7°C Max : 4.4°C Min RH : 90% Wind : 200 kmph	- POWER SUPPLY : 415 V, 3 PHASE, 50HZ 200 V, 3 PHASE, 50 HZ - EXPLOSION PROOF (Exd) ELECTRICALS. - OUT LINE DRAWINGS: 1-359-08-61014-Rev-00 1-359-08-51012-Rev-00 0-139-05-31007-Rev-01 1-139-43-31003-Rev-00 - ALL INTERNAL WALKWAYS, ACCESS PLATFORMS ARE IN VENDOR SCOPE.	GT9754225257	IOC-BARODA & BPCL-KOCHI
26	GT and Generator Off Base enclosures - Fr9E UPRATE	Outdoor Installation Site Data- Temp - 48°C Max 5°C Min RH - 96 % Max 27 % Min Seismic Zone - Zone-IV as per IS:1893 Wind : 200 kmph	- Power supply : 415v, 3 phase, 50 Hz 220v, 3 phase, 50 Hz - Explosion proof (Exd) Electricals. - Outline Drawings 0-359-08-91005 0-139-15-31139-Rev-00 1-138-04-31043-Rev-02 1-139-15-31057-Rev-00 - All internal walkways, accessory platforms are in supplier scope.	GT9754225265	ESSAR


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VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	MATL CODE	PROJECT
27.	GT & GENERATOR OFF BASE ENCLOSURES - Fr 6581.	Outdoor Installation  - Site Data Temp - 43° C Max 17° C Min  RH - 99 % Max 50 % Min  Wind : 200kmph	- POWER SUPPLY : 415 V, 3 PHASE, 50HZ 200 V, 3 PHASE, 50 HZ - EXPLOSION PROOF (Exd) ELECTRICALS. - OUT LINE DRAWINGS: 1-359-08-61014-Rev-00 1-359-08-51012-Rev-00 0-139-05-31008-Rev-00 1-139-43-31003-Rev-00 - ALL INTERNAL WALKWAYS, ACCESS PLATFORMS ARE IN VENDOR SCOPE.	GT9754225273	EID PARRY
28.	GT & GENERATOR OFF BASE ENCLOSURES - Fr 6581.	Outdoor Installation  - Site Data Temp - 45° C Max 13° C Min  RH - 100% Max 30 % Min  Wind : 200kmph	- POWER SUPPLY : 415 V, 3 PHASE, 50HZ 200 V, 3 PHASE, 50 HZ - EXPLOSION PROOF (Exd) ELECTRICALS. - OUT LINE DRAWINGS: 1-359-08-61014 1-359-08-51012 0-139-05-31009 - ALL INTERNAL WALKWAYS, ACCESS PLATFORMS ARE IN VENDOR SCOPE.	GT9754225281	RIL - DAHEJ



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				<b>PRODUCT STANDARD</b>  <b>HYDERABAD</b>	
				Prod. Std. No. GT54225 REV. No. 27 Page 33 OF 37	
VAR NO	DESCRIPTION	SITE CONDITION	REMARKS	MATL CODE	PROJECT
29.	GT & GENERATOR OFF BASE ENCLOSURES - Fr 5	Outdoor Installation - Site Data Temp - 40°C Max 5°C Min RH - 90 %  Wind : 200kmph	- POWER SUPPLY : 415 V, 3 PHASE, 50HZ 200 V, 3 PHASE, 50 HZ - EXPLOSION PROOF (Exd) ELECTRICALS. - OUT LINE DRAWINGS: 1-359-08-51014 1-359-08-51012 0-139-05-31011 - ALL INTERNAL WALKWAYS, ACCESS PLATFORMS ARE IN VENDOR SCOPE.	GT9754225290	GOT-BARAMURA
30.	GT & GENERATOR OFF BASE ENCLOSURES - Fr 5	Outdoor Installation - Site Data Temp: 48.0°C Max (-) 4.7°C Min RH - 82% Max 16% Min  Wind : 200kmph	- POWER SUPPLY : 415 V, 3 PHASE, 50HZ 200 V, 3 PHASE, 50 HZ - EXPLOSION PROOF (Exd) ELECTRICALS. - OUT LINE DRAWINGS: 1-359-08-51014 1-359-08-51012 0-139-05-31010 - ALL INTERNAL WALKWAYS, ACCESS PLATFORMS ARE IN VENDOR SCOPE.	GT9754225303	MARUTI SUZUKI

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				<b>PRODUCT STANDARD</b> <b>HYDERABAD</b>	
				Prod. Std. No. GT54225 REV. No. 27 Page 34 OF 37	

VAR NO	DESCRIPTION	SITE CONDITION	REMARKS / applicable drgs	MATL CODE	PROJECT
31.	GT OFF BASE ENCLOSURES Fr9FA	Indoor Installation - Site Data Temp - 43° C Max 9.4° C Min RH - 96 % Max 15 % Min Wind : 200kmph	3-358-28-81001 0-358-28-81001 0-358-28-81002 0-358-28-81003 0-358-28-81004 0-358-28-81005 1-358-28-81001 1-358-28-81002 1-358-28-81003 2-358-28-81001 2-358-28-81002 2-358-28-81003 2-358-28-81004 All Walkways int and external in vendor scope. bridge crane, LCI walkways is in vendor scope.	GT9754225311	RIL-NAGOTHANE
32.	GT & GENERATOR OFF BASE ENCLOSURES - Fr 6581.	Indoor Installation - Site Data Temp - 46.1° C Max 1.0° C Min RH - 85 % Max 20 % Min Wind : 200 kmph	- POWER SUPPLY : 415 V, 3 PHASE, 50HZ 200 V, 3 PHASE, 50 HZ - EXPLOSION PROOF (Exd) ELECTRICALS. - OUT LINE DRAWINGS: 1-359-08-61014 - Rev.01 1-359-08-51012 - Rev.01 0-139-05-31013- Rev.00 1-139-43-31003- Rev.00 - ALL INTERNAL WALKWAYS, ACCESS PLATFORMS ARE IN VENDOR SCOPE.	GT9754225320	GSSR BHATINDA

Ref. Doc.

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## PRODUCT STANDARD

HYDERABAD

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VAR NO	DESCRIPTION	SITE CONDITION	REMARKS / applicable drgs	MATL CODE	PROJECT
33	GT OFF BASE ENCLOSURES Fr9FA	Indoor Installation - Site Data Temp - 43° C Max 9.4° C Min RH - 96 % Max 15% Min Wind : 200kmph	SAME AS VAR 31 WITH EXTRA TC LADDER ALSO IN SCOPE (03582881006)	GT9754225338	BAWANA-III & IV -PIPAV-II -ONGC-II
34	GT & GENERATOR OFF BASE ENCLOSURES Fr 6581	-Outdoor Installation -Site Data Temp - 48°C Max - 5°C Min RH-80%@40°C WIND-200kmph	POWER SUPPLY 415V, 3 Phase, 50Hz 200v, 3Phase, 50Hz -Explosion proof (Exd) Electricals -outline drawings. 1-359-08-61014-Rev.01 1-359-08-51012-Rev.00 0-139-05-31014-Rev.00 1-139-43-31003-Rev.00 Internal walkways, Access platforms are in Vendor scope.	GT9754225346	GNFC- BHARUCH



PRODUCT STANDARD  
HYDERABAD

Prod. Std. No.: GT54225

Rev. No.: 27


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RECORD OF REVISIONS

Rev. No.	Date	Revision Details	Revised	Approved
00	5-5-97	FIRST MADE	NS	
01	10-9-97	VAR-01 added.	NS NS	BIB
02	29-3-98	Var-03 added	NS	NS
03	8-6-98	Var-04 added	NS	NS
04	16-8-99	Var-05 added	NS	NS
05	30-12-99	VAR. 06 added.	20. B. B. S. S.	NS
06	30-07-2001	Var 07 added	Revisy (GSSR)	NS
07	28-01-2002	VAR 08 added	V (VSH)	(BSN)
08	08-04-2002	VAR 09 added	NS (G.J.C)	Revisy (GSSR)
09	23-04-2003	In Var.: 08 Remarks Column Drg.No. 1-359-08-51012 added.	(YVR)	(BIB)
10	08-05-2003	VAR NO - 10 ADDED	V (VSH)	(BIB)
11	09.09.03	Var No - 11 Added and Sh 18 Modified.	NS (G.J.C)	(BIB)
12	02-04-04	Var No - 12 Added	Revisy (GSSR)	(BIB)
13	25-06-04	Var. No's. 13 & 14 added.	NS (Y.V.RAO)	(BIB)
14	25-09-04	VAR. 15 ADDED	NS (BSN)	(BIB)
15	06-04-05	Var No's 16 & 17 added.	NS (Y.V.RAO)	(BIB)
16	30-05-05	In Var No. 17, Outline Drg.Numbers Changed.	NS (Y.V.RAO)	(BIB)
17	05-09-05	- CLAUSE NO.3.0 MODIFIED. - PANEL THICKNESS CHANGED FROM 75 mm (Min) TO 100 mm (Min). - IN VAR.NO.13 OUTLINE DRG.NO.CHANGED FROM 1-359-08-91004 TO 1-359-08-91004-REV.01.	NS (Y.V.RAO)	(BIB)
18	06-06-06	VAR. NO. 18 ADDED.	NS (Y.V.RAO)	(BIB)
19	16-06-06	VAR.NO.19 ADDED.	NS (Y.V.RAO)	(BIB)
20	20.01.07	VAR.NO. 20 ADDED.	NS (Y.V.RAO)	(BSN)
21	01.03.07	Var.No's : 21 & 22 added and Clause 1.2 revised. - ERRECTION SEQUENCE ADDED. - Clause 7.2 Revised.	NS (Y.V.RAO)	(BSN)
22	02.05.07	Var.No.23 Added.	NS (Y.V.RAO)	(BSN)

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TD -106 -3	Rev. No. 5 Form No.		<b>PRODUCT STANDARD</b>  <b>HYDERABAD</b>		Prod. Std. No. GT54225	
					Rev. No. 27	
					Page 37 OF 37	
<b>RECORD OF REVISIONS</b>						
<b>COPYRIGHT AND CONFIDENTIAL</b>  The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	Rev. No.	Date	Revision Details	Revised	Approved	
	23	26-06-07	VAR. NO. 24 Added.	LAD (Y.V.RAO)	(BSN)	
	24	30-10-07	VAR.NO. 25 Added.	LAD (Y.V.RAO)	(BSN)	
	25	29-11-07	VAR. NO. 26 and 27 Added	LAD (Y.V.RAO)	(BSN)	
	26	28-04-08	VAR. NO'S:28 to 33 ADDED	LAD (Y.V.RAO)	(BSN)	
	27	19.11.08	VAR.NO.34 ADDED. IN VAR NO 32, OUTLINE DRAWING NUMBERS UPDATED.	LAD (Y.V.RAO)	(BSN)	
	Ref. Doc					

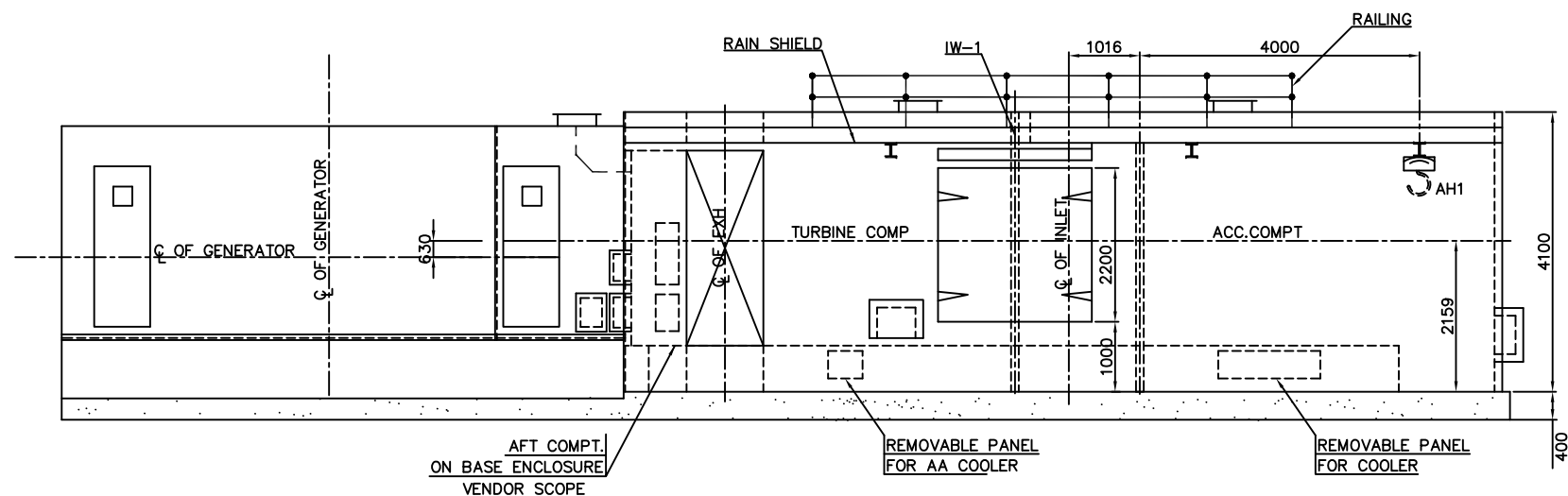
GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

INVENTORY NO	SIGN. AND DATE	REF. DRG. NO.	COMPUTER FILE NAME
			13590851014-S01-R00.DWG



AFT COMPT. AIR OUTLET  
THRU LOAD GEAR VENT FAN  
REFER GEN. ENCL. DRAWING.

REFER DRAWING NO  
1-35908-51012 FOR  
DETAILS

ELEVATION (STAIRCASE NOT SHOWN)

1. DESIGN DATA : REFER SPECIFICATION VAR TABLE  
NOISE LEVEL REQUIRED NR55 >100M FROM ENCLOSURE  
NR85 <1M FROM ENCLOSURE.

2. MATERIALS :

WALL PANEL CONSTRUCTION :  
OUTER SHEET 3MM THK CR SHEET  
INSULATION - MIN. WOOL DEN 100KG/CU.M 100THK  
INSULATION IS WRAPPED IN FIBRE GLASS CLOTH  
& PLACED IN SHELVES.

ROOF PANEL CONSTRUCTION :  
OUTER SHEET 5 MM THK CS PLATE IS 2062  
INSULATION - MIN. WOOL DEN 100KG/CU.M 100THK  
INSULATION IS WRAPPED IN FIBRE GLASS CLOTH  
& PLACED IN SHELVES.

3. MANUAL HOIST WITH TROLLEY 1.0T CAPACITY.

4. ALL LIFTING LUGS ARE TO BE 100% DPT TESTED.

5. QA PLAN NO : TO FURNISH WITH OFFER.

6. TRAIL ASSEMBLY OF COMPLETE UNIT IS REQUIRED BEFORE DESPATCH.

7. CLEANING & PAINTING  
ALL THE INSIDE & OUTSIDE SURFACES WILL BE GRIT BLASTED TO SA 2 1/2 STD.  
OF SWEDISH SPEC. SIS-05-S900, 1967 STD.  
PAINTING HAS TO BE DONE INDOOR IN PROTECTED ENVIRONMENT.

INTERNAL PAINTING:  
ACC. COMPT:

a) FIRST COAT-ZINC RICH EPOXY PRIMER UP TO 50 microns DFT.  
b) SECOND COAT-HI-BUILD MIO EPOXY UP TO 100 microns DFT.  
c) FINISH COAT-FINISH PAINT OF ALIPHATIC URETHANE OF 50 microns DFT.  
d) SHADE-WHITE. TOTAL DFT 200 microns.

TURBINE COMPT. & LOAD COMPT:

a) FIRST COAT-IN ORGANIC ZINC SILICATE PRIMER UP TO 50 microns DFT.  
FINISH COAT-HIGH TEMPERATURE ALUMINIUM SILICON UP TO 50 microns DFT.  
TOTAL DFT=100 microns.

EXTERNAL SURFACE PAINTING

a) FIRST COAT-ZINC RICH EPOXY PRIMER UP TO 50 microns DFT.  
b) SECOND COAT-HI-BUILD MIO EPOXY UP TO 100 microns DFT.  
c) FINISH COAT-FINISH PAINT OF ALIPHATIC URETHANE OF 50 microns DFT.  
d) SHADE-FRENCH BLUE AS PER IS:5-166, TOTAL DFT 200 microns.

8. ONE NUMBER LIFTING HOIST SHALL BE PROVIDED AS SHOWN. TWO EXTRA BEAMS FOR HOIST ARRANGEMENT SHALL BE PROVIDED. LOCATION OF THE BEAMS WILL BE DECIDED DURING DETAIL ENGINEERING.

9. ALL INTERNAL WALKWAYS, SUPPORT BRACKETS, APPROACH PLATFORMS ARE IN VENDOR SCOPE OF SUPPLY. EXTENT OF WALKWAY IS MARKED ON THE DRAWING. WALK WAY SUPPORTED ON ACCESSORY AND TURBINE BASE SHALL BE AS PER DRG 03640151003. COMPARTMENT WALKWAY SHALL BE EXTENDED UP TO ENCLOSURE WALL AS SHOWN. FLOOR GRATING SHALL BE AS PER SPEC GT54155, HAND RAILING PROVIDED INSIDE AND OUT SIDE ENCLOSURE SHALL BE MINIMUM 1.5" DIA. GRATING SHALL BE HOT DIP GALVANISED AND OTHER STRUCTURALS INCLUDING RAILING SHALL BE PAINTED.

10. LIGHTING(AC & DC) WITHIN ACCESSORY COMPARTMENT AND GENERATOR IS IN VENDOR SCOPE. EXPLOSIVE PROOF FLUORESCENT LIGHTS ARE TO BE PROVIDED AS PER SPECIFICATION. NO LIGHTING IN TURBINE AND LOAD COMPARTMENTS.

11. CO2 PIPING & NOZZLES WITHIN GT AND GENERATOR ENCLOSURES ARE IN VENDORS SCOPE OF SUPPLY.VENDOR TO FURNISH DESIGN SIZING DETAILS FOR BHEL APPROVAL. CO2 PIPING ASSEMBLIES ARE TO BE PRESSURE TESTED.

12. GRAVITY DAMPERS FOR GT ENCLOSURE ARE FREE ISSUE ITEMS AS PER BELOW DETAILS.

~~- GT ACCESS COMPT. - 22" X 18" - 2 NOS.~~  
~~- GT TURBINE COMPT. - 22" X 18" - 2 NOS.~~  
~~- GT TURBINE COMPT. - 16" X 16" - 2 NOS.~~  
~~- LGB COMPT. - 16" X 16" - 2 NOS.~~



13. GRAVITY DAMPERS FOR AFT. COMPT. AND GENERATOR ENCLOSURE ARE IN VENDOR SCOPE. ACOUSTIC HOODS ARE TO BE PROVIDED FOR ALL AIR INLET DAMPERS.

14. DOOR LATCHES AND HINGES ARE FREE ISSUE ITEMS FROM BHEL.

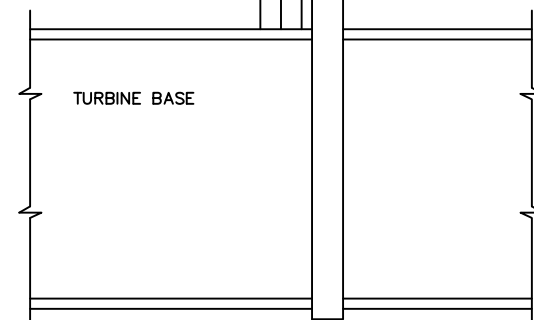
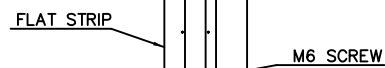
15. VENTILATION OPENINGS SHOWN ARE INDICATIVE. ACTUAL REQUIREMENT WILL BE FURNISHED DURING DETAILED DESIGN.

16. HIGH TEMPERATURE SILICONE GASKETS ARE TO BE USED IN TURBINE AND EXHAUST PLENUM AREA.

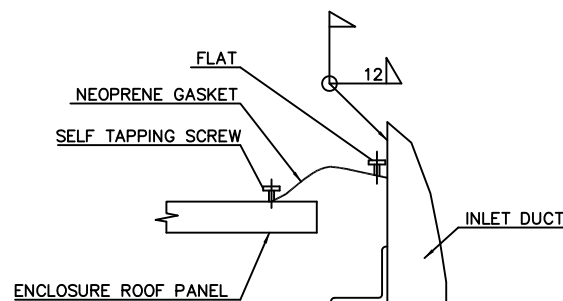
[illegible]

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT					Fr-5, GT				
 BHARAT HEAVY ELECTRICALS LTD. HYDERABAD					NAME		SIGN.	DATE	NO.OF VAR.
					DRN. PADMA			20.07.04	
					CHD. Y.V.RAO		<i>Y.V.R.</i>	20.07.04	N.A.
					APPD. B.I.BABU		<i>B.I.</i>	20.07.04	
DEPT.	GTD	UNTOL. DIMS. GR.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.		ITEM NO.	
CODE	423	<i>SAFA</i>		1:50	N.A.	N.A.		N.A.	NO.OF ITEMS -N.A.-
TITLE					CARD CODE N.A.	DRAWING NO. 1-359-08-51014			REV. 01
GA OF GT AND GENERATOR OFFBASE ENCLOSURE					SHT. No. 01		NO. OF SHT. 02		

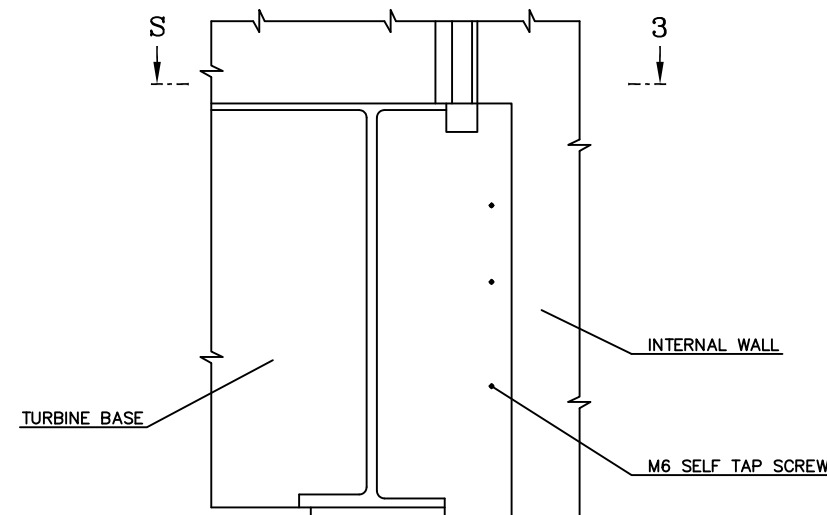
GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261



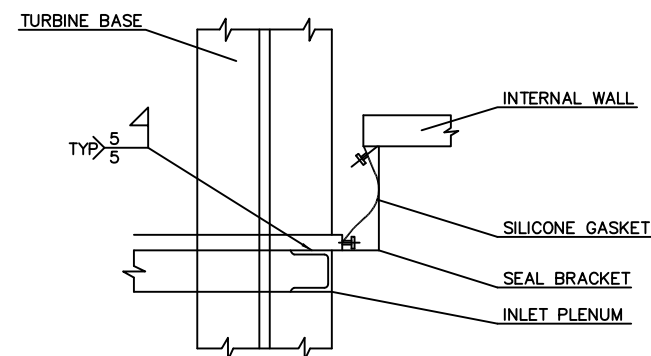
### INLET DUCT INTERNAL WALL INTERFACE



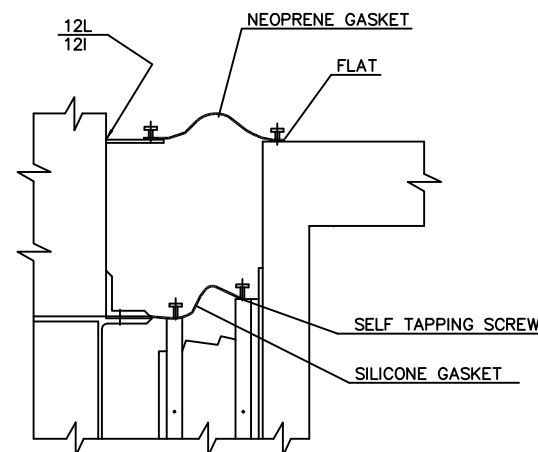
DETAIL D-2



### CONNECTION BETWEEN GT BASE & INTERNAL WALL

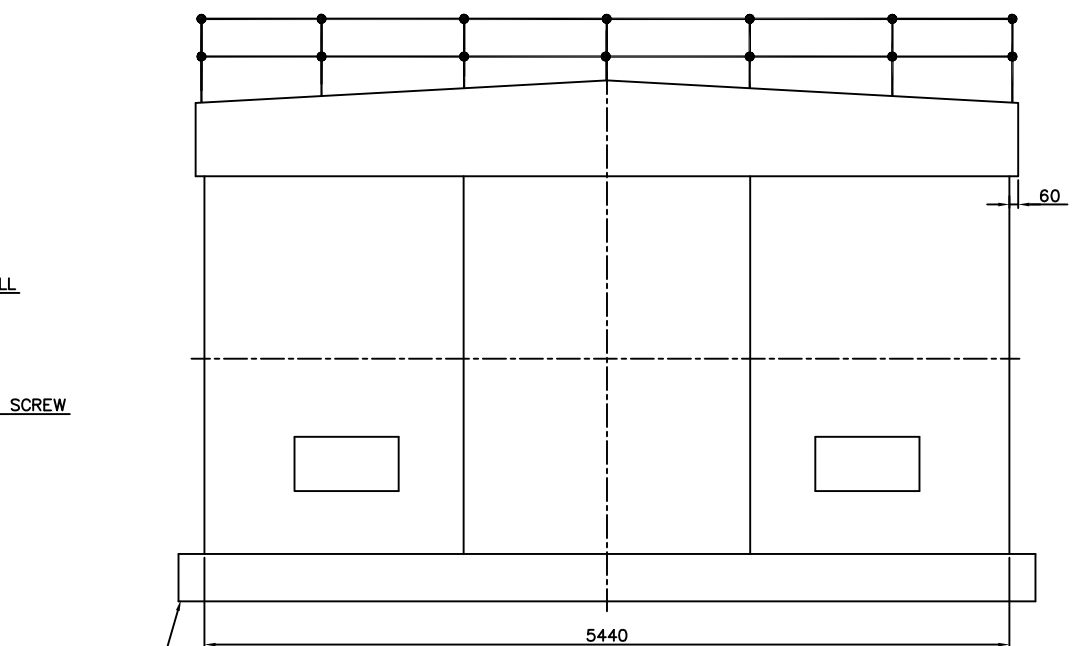


SECTION S-3

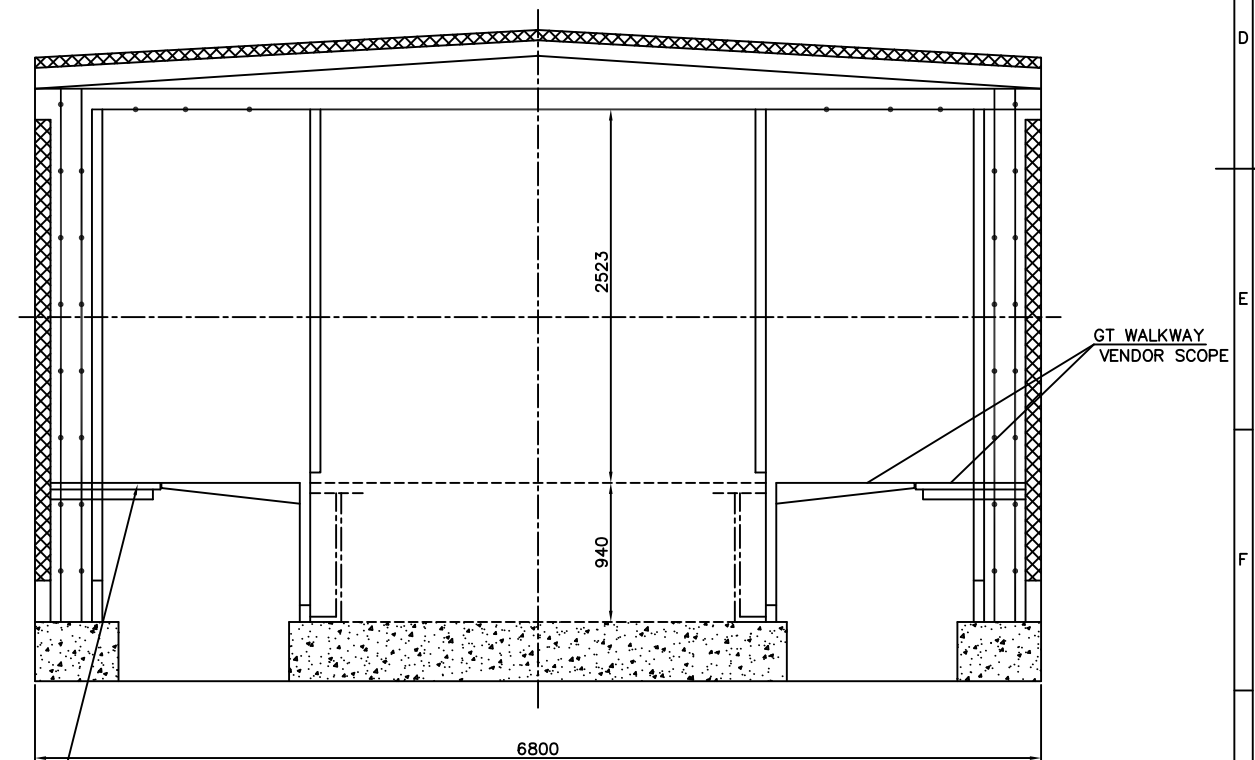


DETAIL B-2



APPROACH PLATFORM UPTO GT WALKWAY  
AND GT WALKWAY IS IN VENDOR SCOPE



VIEW A

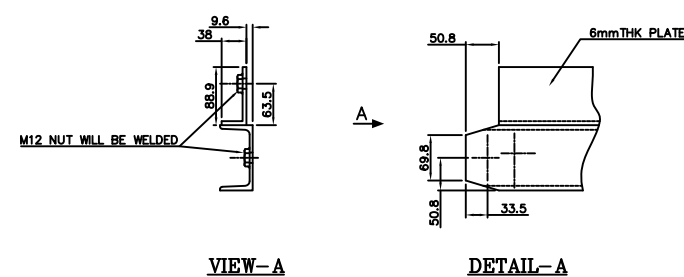
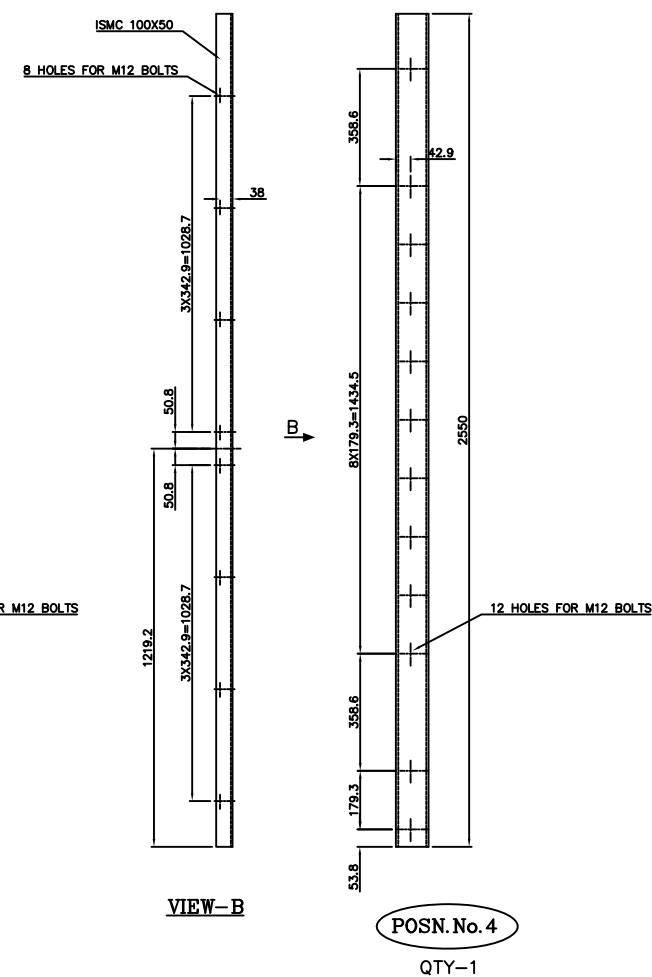


SECTION A-A AT INTERNAL (IW-1)

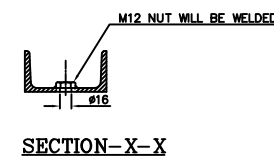
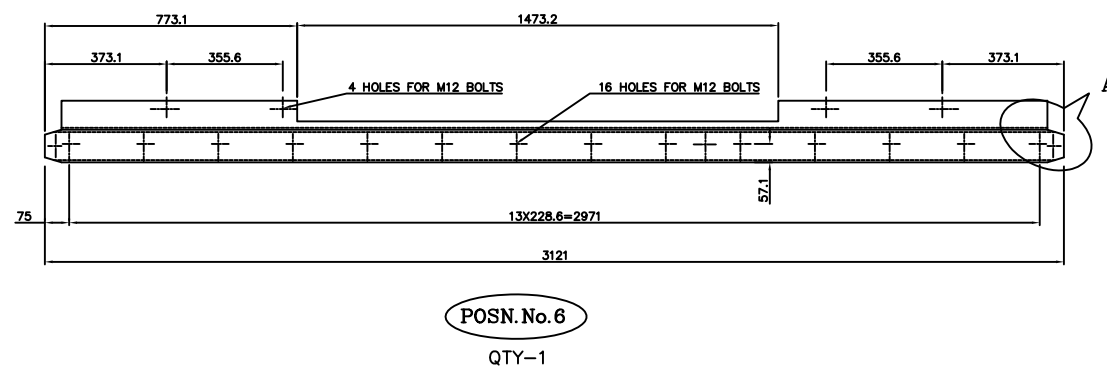
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		Fr-5, GT			
 BHARAT HEAVY ELECTRICALS LTD. HYDERABAD		NAME	SIGN.	DATE	NO.OF VAR.
		DRN.	PADMA	20.07.04	
		CHD.	V.V.RAO	20.07.04	N.A.
		APPD.	B.I.ABABU	20.07.04	
DEPT. GTD CODE.	UNTOOL. DIMS. GR. GMAE		SCALE 1: 25	WEIGHT (KG) NA	REF. TO ASSY. DRG. NA
423					ITEM NO. N.A.
TITLE		CARD CODE	DRAWING NO. 1-359-08-51014		REV. 01
GA OF GT AND GENERATOR OFFBASE ENCLOSURE		N.A.	SHT. NO. 02		NO. OF SHT. 02

AND DATE	REF. DRG. NO.	COMPUTER FILE NAME 13590851012-S00-R00.DWG			
			F	K	C

GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261



1) POSN. NO'S : 1 TO 10 ARE IN VENDOR SCOPE.  
2) PAINTING AS PER INLET DUCT SPECIFICATION.



POSN.No.7 SEAL RUBBER STRIP- 279A1151P001, QTY-2

POSN.No.8 WASHER FLAT - 235A6949P001, QTY-32

POSN.No.9 BOLT HEX.HD. M12 X 50, QTY-60

POSN.No.10 WASHER PLAIN, QTY-28

TYPE OF PRODUCT OR		FRAME-5, GT			
NAME OF CUSTOMER/PROJECT					
SHARAT HEAVY ELECTRICALS LIMITED HYDERABAD		NAME V.V.BASU	SIGN.	DATE 11-07-02	MO. OF VAR
		ORL. YVR		11-07-02	
		APPO B.I.BABU		11-07-02	
QTY. 500	UNTL. DIMS. 600x70	SCALE N.T.S.	WEIGHT (KGS) NA	REF. TO ASSY. DRG.	ITEM NO. 11-07-02
QTY. 500					
TITLE LOOSE PIECES FOR INLET DUCTING		CARD CODE NA	DRAWING NO. 1-359-08-5102-00		REV. 01
		SHT. NO. 01		J.M.O. OF SHT. 01	





Form No. TD-106-1 REV-2		<b>PRODUCT STANDARD</b>		GT54155	
		GAS TURBINES		REV NO: 01	
		PAGE 1 OF 4			
Ref Doc 4-36401-31001	<p align="center"><b><u>GRATING ANTI SKID GALVANISED (HOT DIP)</u></b></p>				
<p>1.0 <b><u>SCOPE:</u></b> This specification is meant for supplying the Grating Anti Skid, Galvanised, to be used in Platforms for Gas Turbine equipment.</p> <p>The suply shall be as per the varient no. asked for, in the enquiry &amp; as per Drg. in Sheet 3.</p>					
<p>2.0 <b><u>VENDOR'S DRG:</u></b> The supplier shall furnish Vendor's Drg. within 1 Week of placement of order. All manufacturing, details are to be furnished in this drg.</p>					
<p>3.0 <b><u>QUALITY ASSURANCE:</u></b> Strict quality Assurance procedures are to be Adopted during the manufacturing of the Gratings.</p> <p>Facility for Inspection by BHEL/BHEL'S Representative shall be provided by the vendor during manufacturing And/OR final inspection.</p>					
<p>4.0 <b><u>GENERAL:</u></b></p> <p>4.1 One copy of Drg. is enclosed along with enquiry for Ref use by vendor. (Sheet No.3)</p> <p>4.2 <b><u>DESPATCH:</u></b> Each Assy shall be packed together and marked with BHEL code ( From Purchase Order).</p> <p>4.3 Care should be taken to avoid damages during Transport, Handling &amp; Storage.</p>					
Concurrred: STANDARDS			Issued GAS TURBINES HYDERABAD-500032 (INDIA)		
			Prepared (B.S.N.) Eng.	Approved A. S. N.	Date 930503

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# PRODUCT STANDARD

## GAS TURBINES

GT54155

**REV NO: 01**

PAGE 2 OF 4

VARIANT TABLE:-

[illegible]

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# PRODUCT STANDARD

## GAS TURBINES

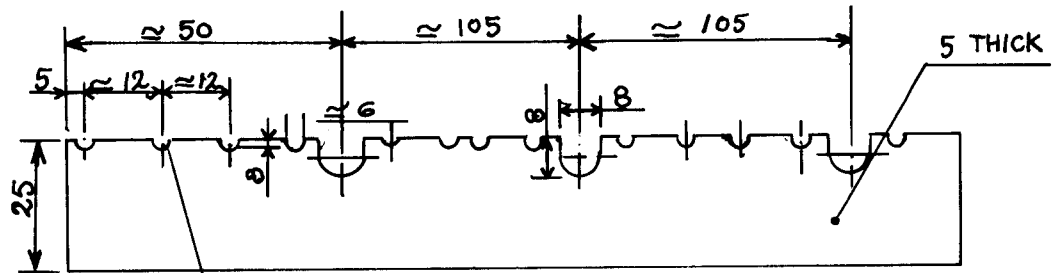
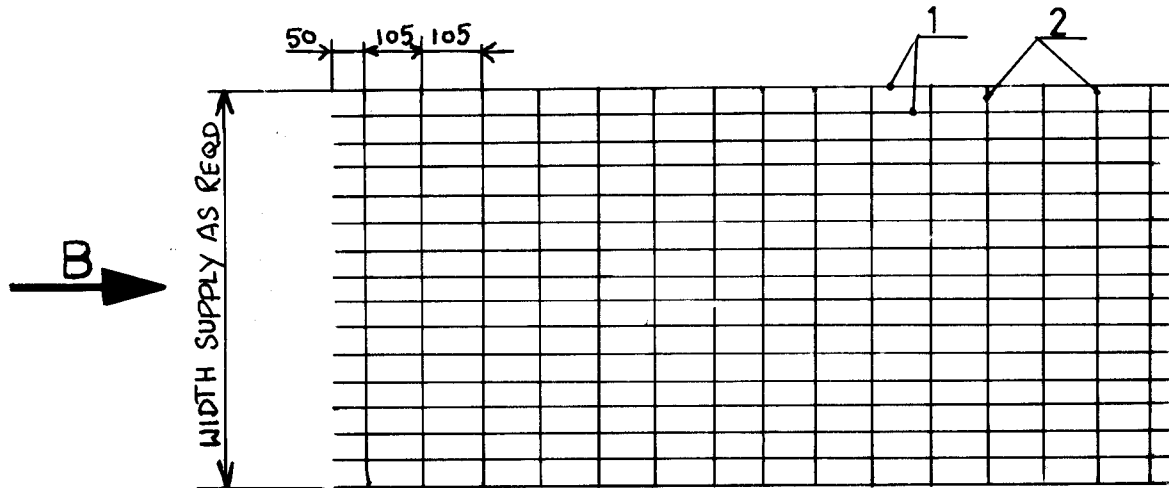
GT54155

REV NO: 01

PAGE 3 OF 4

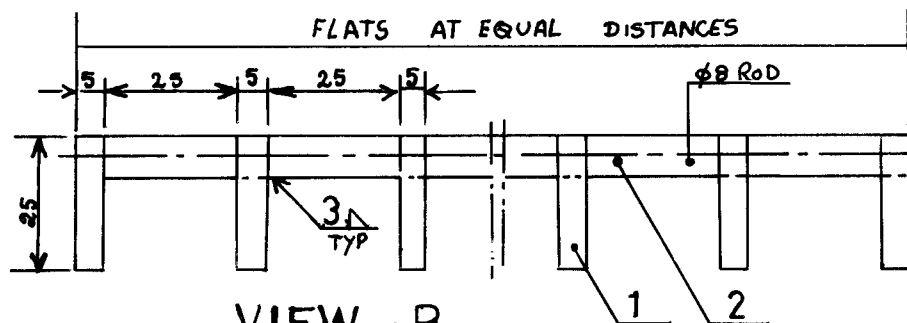
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### DETAIL OF POSITION-1

DEPRESSIONS OF APPROX. 3 mm TO BE  
DRILLED OR CHISELLED OUT AS PER  
MANUFACTURER'S SUITABILITY



### VIEW - B TURNED

POSITION NO	DESCRIPTION	MATERIAL	REMARKS
1.	FLAT 25x6	IS:226	
2.	ROD φ8	IS:1570	

NOTE:- COMPLETE ASSLY SHALL BE HOT-DIP GALVANISED 80÷100μ THK.



## PRODUCT STANDARD

**HYDERABAD**

Prod. Std. No. **GT54155**

Rev. No. 01

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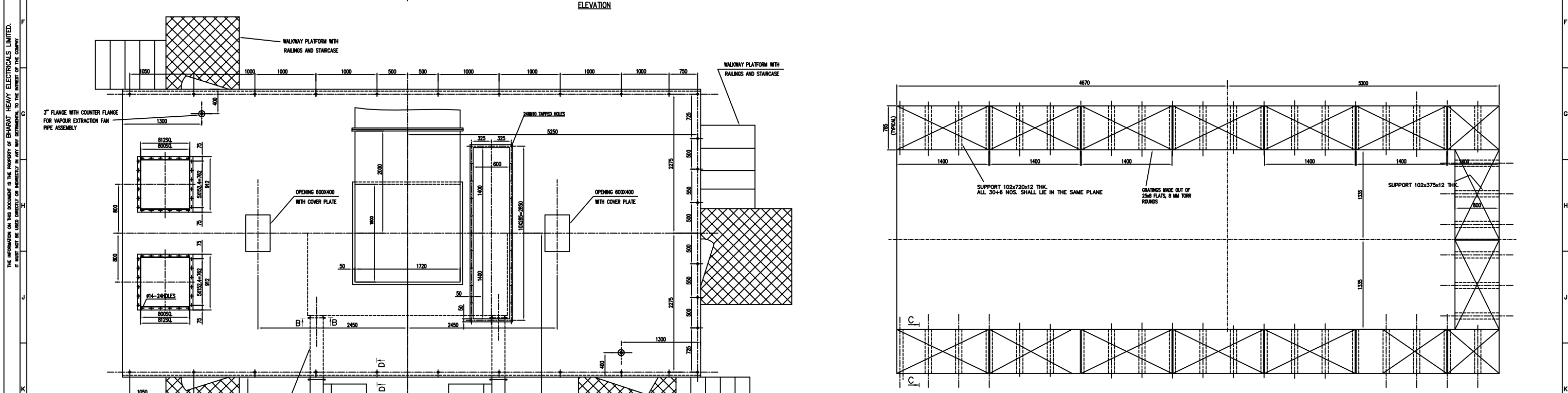
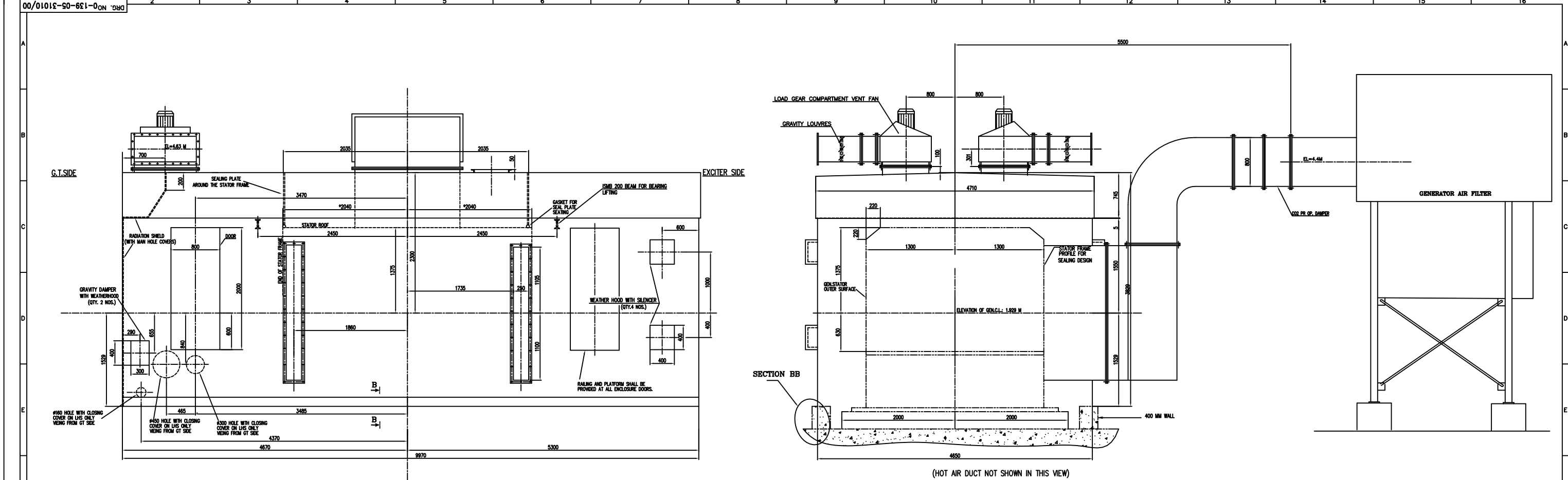
## RECORD OF REVISIONS

[illegible]

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Ref. Doc



**NOTES:**

1. ALL CLOSING COVERS SHALL BE FASTENED WITH GASKETS.
2. THE INTERFACE BETWEEN GT AND GENERATOR ENCLOSURES SHALL BE VERIFIED WHILE DESIGNING THE LENGTH OF END PANELS.
3. DIMENSIONS REPRESENTED WITH \* ARE FOR INFORMATION ONLY.
4. FINISH OF ENCLOSURE TO FOUNDATION INCLUDING FASTENERS IN ENCLOSURE SCOPE.
5. TECHNICAL DELIVERY CONDITIONS SHALL BE AS PER IS 6980 REV.02.
6. CO2 PIPING INSIDE THE ENCLOSURE IN ENCLOSURE SCOPE.
7. VENDOR SHALL PHONE NOISE ATTENUATION TO 85 dB AT SITE.

**THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...**

1. REF. TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD SHARP EDGES 1:2 TO 1:0 AT 45°.
3. INTERNAL M/CD CORNER RADI 1 TO 0.7.
4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.

REV.	DATE	ALTD	CHD	APPD.	REV.	DATE	ALTD	CHD	APPD.	REV.	DATE	ALTD	CHD	APPD.	REV.	DATE	ALTD	CHD	APPD.	REV.	DATE	ALTD	CHD	APPD.	REV.	DATE	ALTD	CHD	APPD.	REV.	DATE	ALTD	CHD	APPD.																																													
1					2					3					4					5					6					7					8					9					10					11					12					13					14					15					16				

ITEM NO.	DESCRIPTION	DRAWING NO.	VAR. NO.	RAW MATERIAL SIZE OR CASTING DRG. NO. OR FORGING DRG. NO.	MATERIAL CODE	MATERIAL SPECN.	NET WT.	GROSS WT.	QUANTITY

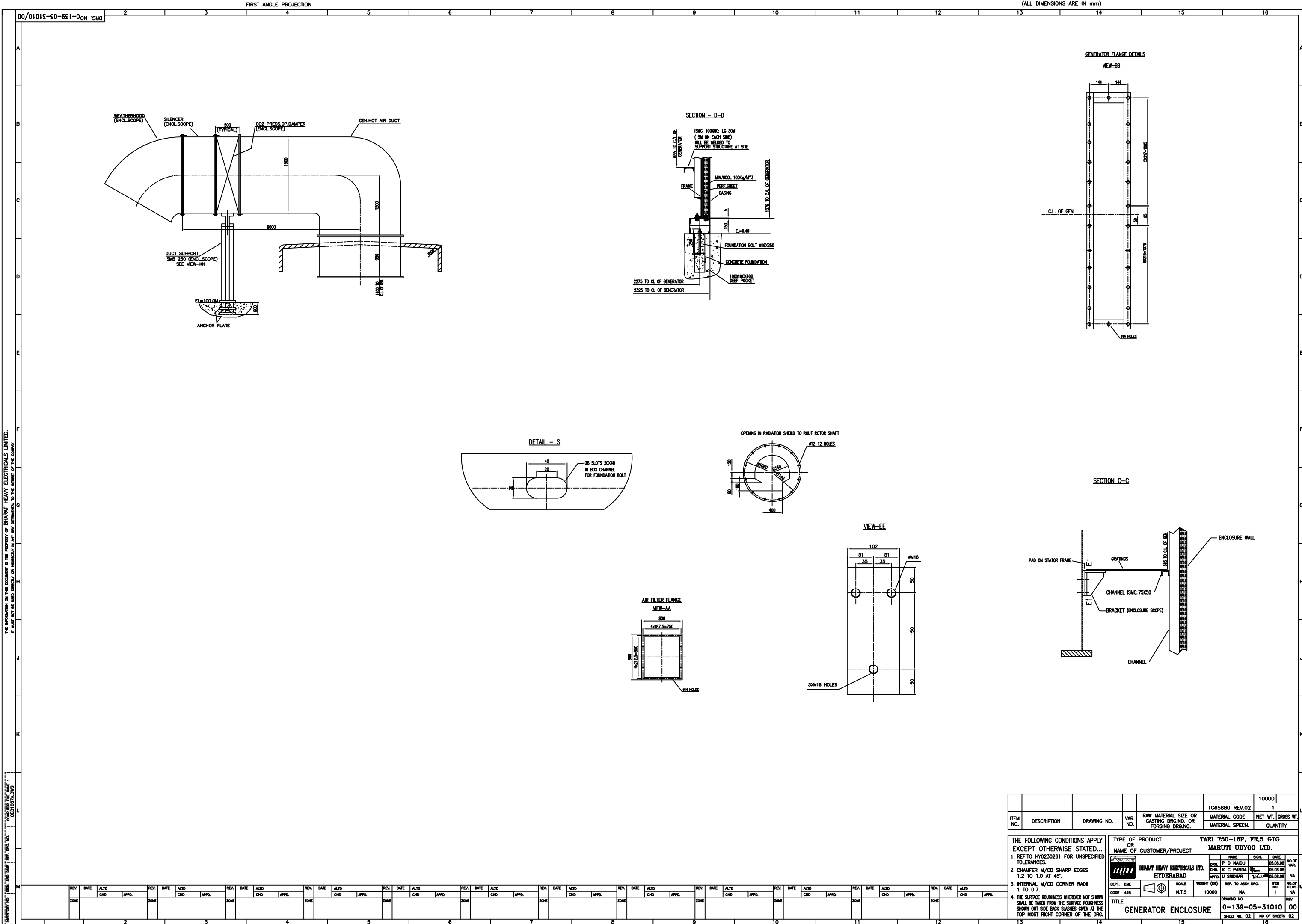
TARI 750-18P, FR.5 GTG			
MARUTI UDYOG LTD.			
NAME	DATE	SIGN.	NO. OF
P. D. NAIDU	05.08.08		VAR.
K. C. PANDA	05.08.08		VAR.
U. SRIDHAR	05.08.08		VAR.


DEPT.	ENR.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO. OF
CODE 425		N.T.S	10000	NA	1	ITEMS

**GENERATOR ENCLOSURE**


0-139-05-31010 00


SHEET NO. 01 NO OF SHEETS 02





D-106-1 Rev. 4 FORM NO.		<b>PRODUCT STANDARD</b>  HYDERABAD		<b>TG 65880</b> Rev:02	
				PAGE 1 OF 7	
COPYRIGHT AND CONFIDENTIAL  The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	<u><b>ENCLOSURE FOR GENERATOR AND AUXILIARIES</b></u>				
	<p>1.0 Scope: This specification covers the technical requirements of enclosure for generator and its auxiliaries to be manufactured and supplied, erected and tested as detailed below: The enclosure shall provide weather protection, sound attenuation and structural support for associated equipment, containment of carbon dioxide during fire protection system discharge and compartmental lighting (A.C. and D.C.) including conduiting. The complete erected enclosure shall present a very pleasing appearance of the plant.</p> <p>1.1 The scope also includes assembly of enclosure vent fans, radiation shield, and vapour extraction fans and exhaust ducting from fan exhaust to the end of weather louvers.</p> <p>1.2 This specification supplements the enclosure drawings, which give a conceptual design with overall envelope dimensions. While erecting the generator enclosure, it is the responsibility of the vendor to make the overall GT and Generator enclosure assembly even, without any interface problems.</p> <p>1.3 Complete erection of generator enclosure is in vendor's scope. Erection may have to be carried out at BHEL or specified project site or both which will be specified by the purchase department.</p> <p>2.0 Constructional Features: Refer to relevant drawings mentioned in the order for constructional features and dimensional details.</p> <p>2.1 The enclosure shall be manufactured as  a) Support structure  b) Side panels and doors  c) Roof panels  d) Exhaust duct</p> <p>2.2 The enclosure shall be made in different compartments to facilitate easy assembly and Handling during erection and maintenance.</p> <p>2.3 The enclosure shall be water and dust proof and suitable for outdoor mounting. All the joints shall be leakproof.</p> <p>2.4 All lifting tackles shall be concealed.</p> <p>2.6 The partitions shown inside shall match with the contour of the machine components on which they rest. The edges of the partitions shall be properly dressed after gas cutting. The partitions through which rotor passes shall be suitably split for facilitating easy assembly / disassembly. The split zone shall be adequately reinforced with additional stiffeners. Only felt shall be used towards the rotor side to seal the rotor clearances.</p>				
Ref. Doc.	Rev. no. 01	Revisions: SPECIFICATION GENERALLY REVISED	Prepared: K.S.RAO	Checked: U.SRIDHAR	Approved: M.M.RAU



D-106-1 Rev. 4	FORM NO.		<b>PRODUCT STANDARD</b>  <b>HYDERABAD</b>	<b>TG 65880</b> Rev:02 <b>PAGE 2 OF 7</b>
<b>Ref. Doc.</b>	<b>Copyright and Confidential</b> The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	<p>2.7 Doors shall be of hinged type with view glasses suitably located.</p> <p>2.8 Slope of top roofing on each side: 1.5 *.</p> <p>3.0 Materials:</p> <p>3.1 Outer sheet of side panels: 3 mm thk. CRCW steel sheet as per IS: 513 Gr.D, equivalent to ASTM A 620. Surface finish shall be matt finished, uncoiled. The sheets shall be procured from reputed suppliers only and the vendor is obliged to furnish, when asked by BHEL, the test reports of the material.</p> <p>3.2 Outer sheet of roof: 4 mm thk. mild steel sheet as per IS 1079 St.34.</p> <p>3.3 Inner sheet: 1.6mm perforated mild steel sheet to IS 513 Gr.D with an open area of 30-40%.</p> <p>3.4 Rubber gaskets: The rubber sheets and profiles used at various locations of the enclosure including those at partitions and panels shall be made of silicone rubber suitable for design temperature of 180°C. Reference may be made to BHEL specification TG 65849 for technical delivery conditions</p> <p>3.5 View glasses : toughened glass sheets (Acrylic glass sheet not acceptable)</p> <p>3.6 Fasteners : all fixing bolts, screws, nuts and washers shall be galvanized and shall be procured to IS 1364, P8.8/ P8 grade minimum.</p> <p>3.7 Conduit pipes : galvanized steel pipes as per IS:1239 part-I</p> <p>3.8 Pipe fittings : galvanized steel fittings as per IS:1239 part-II</p> <p>4.0 Sealing :</p> <p>4.1 The enclosure forms part of the machine cooling circuit and hence sealing shall be effective and hence, employed gaskets / profiles at parting joints shall be made of reliable and suitable material as given above from reputed rubber manufacturers. Effective sealing is an essential prerequisite and shall be provided at the following locations.</p> <p>4.1.1 All doors, dampers, side walls to base, side walls to top part, inter compartment partitions (both at side wall and roof) ,</p> <p>4.2 The seal tightness of the above joints shall be ensured by means of an air jet directed at all over the periphery and checking from other side. Supplier to demonstrate this both at his works during mock-up assembly and after site erection.</p> <p>5.0 Noise Control :</p> <p>5.1 The inner surface of enclosure shall carry noise absorbing material like rock-wool to attenuate the noise emanating from the generator, gearbox and exciter.</p>		

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COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.		5.2 The rockwool / glasswool shall be in the form of mats. They shall then be wrapped with glass cloth all around. Suitable partitions shall be provided in the side panels to prevent sagging of rock-wool sheets.		
		5.3 The maximum noise generated by generator and its auxiliaries is around 97 dB (A). This shall be reduced to <div>a) 80 dB (A) or less at 1 m from the enclosure outer surface near field noise) and</div> <div>b) 60 dB (A) or less at 120 m from machine (far field noise).</div>		
		5.4 Supplier shall achieve the noise levels mentioned in Cl.5.3 a&b, guarantee and prove them at site. Supplier to foresee this aspect prior to detailed design and if necessary include lead sheet in the panels to bring down the noise to acceptable levels.		
		5.5 The enclosure itself shall not be a source of noise generation. It shall neither rattle nor create any low frequency hum at operating speed of the machine (3000 rpm).		
		5.6 The supplier shall ensure that the natural frequency of enclosure is well away from 50 and 85 hz or 60 and 85 hz along with their harmonics depending on the site location.		
		5.7 The exhaust ducting above the gear box compartment and the hot air outlet ducting in the generator ( in case of open ventilated machines) shall be provided with a silencer to absorb noise generated inside. The same ducting shall be assembled with CO2 pressure operated dampers and weather louvers.		
		6.0 Electrical wiring:		
		6.1 The wiring shall be drawn through galvanized steel conduit pipes.		
		6.2 The conduit pipes shall run through the top channel of support structure.		
		6.3 All the electrical fittings like switches, junction boxes etc. shall be flameproof.		
Ref. Doc.		6.4 All the wiring shall terminate at outside the base of the side all in a power socket.		
		6.5 The supplier shall submit the electrical layout for approval by BHEL .		
		6.6 All the switches shall be of concealed type.		
		7.0 Lighting:		
		7.1 The enclosure shall be provided with industrial grade incandescent lamps of 100 W capacity at 230 V A.C. The no. of lamps required shall be indicated in the drawing.		
		7.2 All the lighting fixtures shall be flexibly mounted to the side frame ( not to the roof) such that the machine vibrations are not transmitted to the lamps.		
		7.3 In addition to the A.C. lamps, 2 nos. of D.C. lamps of 15 W,110V capacity shall be provided; one in gear-box compartment and the other in exciter compartment.		
		8.0 Dampers: Gravity and pressure operated dampers shall be provided in the enclosure at the openings indicated in the drawing.		

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<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.</div>		9.0	Fans:	
		9.1	The exhaust fans provided above the gear box compartment are not in the supplier's Scope. However enclosure supplier shall assemble these fans and continue the exhaust ducting (enclosure scope).	
		9.2	Vapour extraction fans and piping are not in enclosure scope. However their assembly at site is included in enclosure scope.	
		10.0	Surface preparation and Painting:	
		10.1	Both internal and external surfaces of panels, doors sealing plates, structurals, roof, perforated sheets, dampers, ducts etc. should be shot/sand blasted to SA 21/2 standard of Swedish specification SIS-05-S900-1967/ IS 9954-1981. Cleaning of the blast surface as per IS 1477 PT1.	
		10.2	Surfaces to be coated shall be free of grease, oil, and loose mill scale. Oil and grease shall be removed by solvent cleaning methods.	
		10.3	Unevenness, dents, nicks etc. are not permissible on the outer surfaces.	
		10.4	Surfaces prepared for coating shall be coated the same day and before any visible rusting occurs.	
		10.5	Touchup and repair of damaged primer (scratched, rusted, peeled, blistered etc.) shall be repaired by the painting agency.	
		10.6	Coating shall be applied in strict adherence with the paint manufacturer's latest published instructions. The manufacturer's recommended curing or drying time shall be allowed between various coats. Thickness of coating shall be as per annexure – I or as per drawing for both inner and outer surfaces. In the event of conflict, differences shall be brought to the attention of engineering for resolution.	
		10.7	While preparing the paints, only those thinners approved by the paint supplier through his catalogues shall be used.	
		10.8	Paints manufactured from the same supplier and batch shall be used for generator as well as turbine enclosures. No difference in shade over the entire enclosure length is permitted.	
		10.9	Quality control will have the right to reject the enclosure in case of non-compliance of any of the above.	
Ref. Doc.	10.10	Primer coats shall be inspected and cleaned when required by the inspector before applying finish coats.		
	10.11	Dry film thickness shall be measured after each coat by the inspector using a Mikro-test, Elcometer or any other accepted equipment.		
	10.12	The painting agency shall have in its possession at all times a wet film thickness gauge for continuous check of the wet film as applied.		

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		HYDERABAD		PAGE 5 OF 7
COPYRIGHT AND CONFIDENTIAL  The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	11.0	Assembly:		
	11.1	The various compartments of enclosure shall match flush when assembled along its entire length.		
	11.2	Completed enclosure shall be trial assembled at vendor's works and offer it for BHEL inspection. At least one week advance intimation shall be given to BHEL inspecting agency and purchase department on the date of trial assembly.		
	11.3	Waviness of panels, roof, door etc. shall not exceed 1 mm per meter length after final assembly.		
	12.0	Outdoor mounting: The enclosure shall be suitable for outdoor mounting.		
	12.1	The support structure shall be designed to withstand the wind loads coming on to the enclosure.		
	12.2	The roof parts shall be free from cracks, pin holes, weld seam blow holes etc. The soundness of welds in the roof parts shall be checked with dye-penetrant.		
	12.0	Performance: The compartment enclosures shall be leak tight and doors shall flush properly with the frame. Except for dampers no light shall be visible through joints or seals when viewed from inside a dark enclosure with a bright light outside. The complete enclosure shall be drip proof.		
	13.0	Pressure testing of Enclosure: In case of positive pressurized enclosures (when specified in the enquiry), the complete enclosure shall be pressure tested to withstand a pressure of 75 mm of WC. This test shall be conducted at site in presence of BHEL and BHEL's customer.		
	14.0	Preparation for delivery: Preservation and packing shall be accomplished in accordance with acceptable commercial practices (for domestic or foreign shipments) unless otherwise indicated on the purchase order or quotation request. Enclosure shall be carefully packed in fully enclosed wooden crates with internal steel framing using minimum 8 mm plywood per IS 303 Gr. WWR/BC, BHEL standard AA51101, suitably protected from rain etc., by covering with Hessain Bitumen coated Polyethylene Kraft Paper per BHEL Standard HY78473. Proper care shall be taken to avoid any damage of enclosure components. All fasteners and gaskets shall be individually packed and tagged as per BOM. A separate packing list shall accompany with each container. For seaworthy packing requirements, refer BHEL specification HY0490569.		
	15.0	Inspection: Immediately after receipt of order from BHEL, the vendor shall submit a quality plan indicating the proposed stages of inspection on the enclosure and its components. Based on the quality plan and technical requirements, BHEL will inform stage inspections and final inspections which will be witnessed by BHEL.		
	16.0	Guarantee: The supplier shall furnish the guarantee certificate as having fulfilled various requirements outlined in this specification.		
	17.0	Rejection: BHEL has the right to reject the entire or part of the ordered equipment notwithstanding its initial acceptance during the period of guarantee, if it does not comply with the specification requirements and supplier shall replace the rejected equipment or damaged items free of cost at the earliest without jeopardizing BHEL's committed schedules.		
Ref. Doc.				

D-106-1 Rev. 4 FORM NO.		<div><div><div>बी एच ई एल</div><div>BHEL</div></div></div>		PRODUCT STANDARD		TG 65880 Rev:02	
				HYDERABAD		PAGE 6 OF 7	
<div>ANNEXURE-I</div> <div>PAINTING SCHEME</div> <div>I) PRIMER (1 X RZ2) : ZINC RICH EPOXY PRIMER<div>1.1 DRY FILM THICKNESS : 50 MICRONS</div><div>1.2 REQUIRED SURFACE PREPARATION : 25-35 MICRONS</div><div>1.3<div><div>GROUP-A</div><div>PENTADUR ZINC 8536 CURING AGENT : 9502</div></div><div><div>GROUP-B</div><div>HEMPADUR ZINC CHROMATE(YELLOW) 8332 OR HEMPADUR ZINC PHOSPHATE 8538 OR HEMPEL'S UNIPRIMER 1314 CURING AGENT : 808</div></div></div></div> <div>II) INTERMEDIATE COAT (MIO) : HIGH BUILD MIO EPOXY<div>2.1 DRY FILM THICKNESS : 125 MICRONS.</div><div>2.2 REQUIRED SURFACE PREPARATION : CLEAN, DRY, EPOXY PRIMER</div><div>2.3<div><div>GROUP-A</div><div>PENTADUR ZINC : 8530 CURING AGENT : 9504 OR : 9542</div></div><div><div>GROUP-B</div><div>HEMPADUR HI-BUILD ENAMEL 4520 CURING AGENT : 845</div></div></div></div> <div>II) FINAL COAT (V5): ALIPHATIC URETHANE FINISH:<div>3.1 DRY FILM THICKNESS : 75 MICRONS</div><div>3.2 REQUIRED SURFACE PREPARATION : CLEAN, DRY, EPOXY PRIMER WITH MIO</div><div>3.3<div><div>GROUP-A</div><div>PENTADUR HB 5520 THINNER : 799 OR : 450 SA</div></div><div><div>GROUP-B</div><div>HEMPADUR 5334 THINNER : 845</div></div></div></div> <div>NOTE: INTERMIXING OF PAINTS PERTAINING TO DIFFERENT GROUPS IS NOT PERMISSIBLE .</div>							
Ref. Doc.							

Ref. Doc.

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<div>2.0 COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.</div>			RECORD OF REVISIONS							
			Rev. No.	Date	Revision Details				Revised By	Approved By
			01	12.8.98	Specification generally revised.					
			02	27.04.07	Specification generally revised.					
			<b>DISTRIBUTION TABLE</b>							
DEPT	EME	02-SHOP	02-QC	QA	06-SHOP	06-QC	02-TECH	02-TESTING		
	1	1	1	1						
	FSS									
	1									
Ref. Doc.										

2	SH.01 OF
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GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261

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1. DESIGN DATA REFER SPECIFICATION VAR TABLE  
NOISE LEVEL REQUIRED NR55 >100M FROM ENCLOSURE  
NR85 <1M FROM ENCLOSURE.

WALL PANEL CONSTRUCTION :  
OUTER SHEET 3MM THK CR SHEET  
INSULATION - MIN. WOOL DEN 100KG/CU.M 100THK  
INSULATION IS WRAPPED IN FIBRE GLASS CLOTH  
& PLACED IN SHELVES.

ROOF PANEL CONSTRUCTION :  
OUTER SHEET 5 MM THK CS PLATE IS 2062  
INSULATION - MIN. WOOL DEN 100KG/CU.M 100THK  
INSULATION IS WRAPPED IN FIBRE GLASS CLOTH  
& PLACED IN SHELVES.

4. ALL LIFTING LUGS ARE TO BE 100% DPT TESTED.

5. QA PLAN NO : TO FURNISH WITH OFFER.

6. TRAIL ASSEMBLY OF COMPLETE UNIT IS REQUIRED BEFORE DESPATCH.

7. CLEANING & PAINTING  
ALL THE INSIDE & OUTSIDE SURFACES WILL BE GRIT BLASTED TO SA 2 1/2 STD.  
OF SWEDISH SPEC. SIS-05-S900, 1967 STD.  
PAINTING HAS TO BE DONE INDOOR IN PROTECTED ENVIRONMENT.

INTERNAL PAINTING:

7.1 ACC. COMPT:

a) FIRST COST-ZINC RICH EPOXY PRIMER UP TO 50 microns DFT.

b) SECOND COAT-HI-BUILD MIO EPOXY UP TO 100 microns DET.

c) FINISH COAT—FINISH PAINT OF ALIPHATIC URETHANE OF 50 microns DET.

d) SHADE WHITE TOTAL DET 300 microns

d) SHADE=WHITE. TOTAL DFT 200  
 F.O. TURNING COUNT: 0. LOAD COUNT: 0

## 7.2 TURBINE COMPT. & LOAD COMPT:

a) FIRST COAT—IN ORGANIC ZINC SILICATE PRIMER UP TO 50 microns DFT.  
FINISH COAT—HIGH TEMPERATURE ALUMUNUM SILICON UP TO 50 microns DFT.  
TOTAL DFT=100 microns.

### 7.3 EXTERNAL SURFACE PAINTING

a) FIRST COAT- ZINC RICH EPOXY PRIMER UP TO 50 MICRONS DET

b) SECOND COAT-HI-BUILD MIO EPOXY UP TO 100 microns DET

c) FINISH COAT—FINISH PAINT OF ALIPHATIC URETHANE OF 50 microns DET.

d) SHADE—FRENCH BLUE AS PER IS:5-166. TOTAL DET 200 microns

7.4 ALL INTERNAL SURFACES OF PANELS ARE TO BE PRIMER COATED

7.4 ALL INTERNAL SURFACES OF PANELS ARE TO BE PRIMER COATED UP TO 50 MICRONS BEFORE FILLING INSULATION.

8. ONE NUMBER LIFTING HOIST SHALL BE PROVIDED AS SHOWN. THREE NO BEAMS FOR HOIST ARRANGEMENT SHALL BE PROVIDED. LOCATION OF THE BEAMS WILL BE DECIDED DURING DETAIL ENGINEERING.

9. ALL INTERNAL WALKWAYS, SUPPORT BRACKETS, APPROACH PLATFORMS ARE IN VENDOR SCOPE OF SUPPLY. EXTENT OF WALKWAY IS MARKED ON THE DRAWING. WALK WAY SUPPORTED ON ACCESSORY AND TURBINE BASE SHALL BE AS PER DRG 03640161005. COMPARTMENT WALKWAY SHALL BE EXTENDED UP TO ENCLOSURE WALL AS SHOWN. FLOOR GRATING SHALL BE AS PER SPEC GT54155, HAND RAILING PROVIDED INSIDE AND OUT SIDE ENCLOSURE SHALL BE MINIMUM 1.5" DIA. GRATING SHALL BE HOT DIP GALVANISED AND OTHER STRUCTURALS INCLUDING RAILING SHALL BE PAINTED.

10. LIGHTING(AC & DC) WITHIN ACCESSORY COMPARTMENT AND GENERATOR IS IN VENDOR SCOPE. EXPLOSIVE PROOF FLUORESCENT LIGHTS ARE TO BE PROVIDED AS PER SPECIFICATION. NO LIGHTING IN TURBINE AND LOAD COMPARTMENTS.

11. CO2 PIPING & NOZZLES WITHIN GT AND GENERATOR ENCLOSURES ARE IN VENDORS SCOPE OF SUPPLY.VENDOR TO FURNISH DESIGN SIZING DETAILS FOR BHEL APPROVAL. CO2 PIPING ASSEMBLIES ARE TO BE PRESSURE TESTED.



12. DOOR LATCHES AND HINGES ARE FREE ISSUE ITEMS FROM BHEL.

13. VENTILATION OPENINGS SHOWN ARE INDICATIVE. ACTUAL REQUIREMENT WILL BE FURNISHED DURING DETAILED DESIGN. ACOUSTIC HOODS ALONG WITH OUTLET

14. HIGH TEMPERATURE SILICONE GASKETS ARE TO BE USED IN TURBINE AND EXHAUST PLENUM AREA.

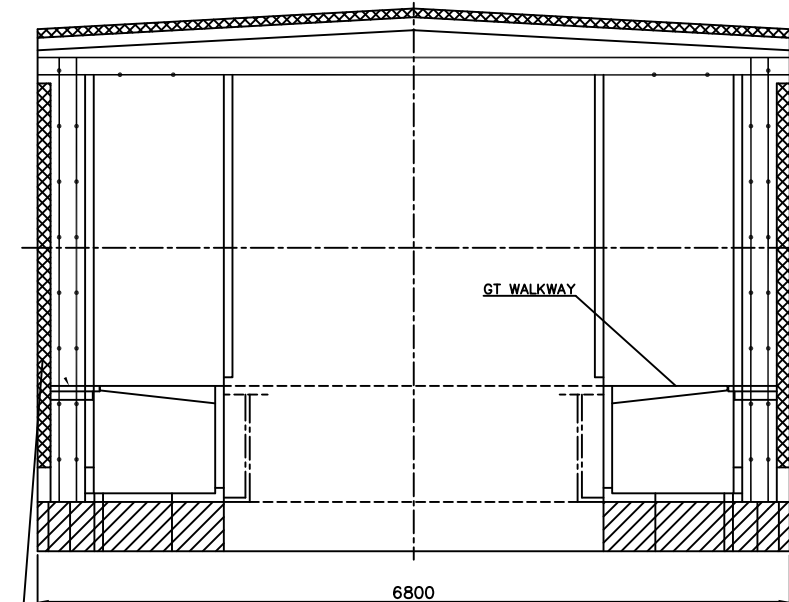
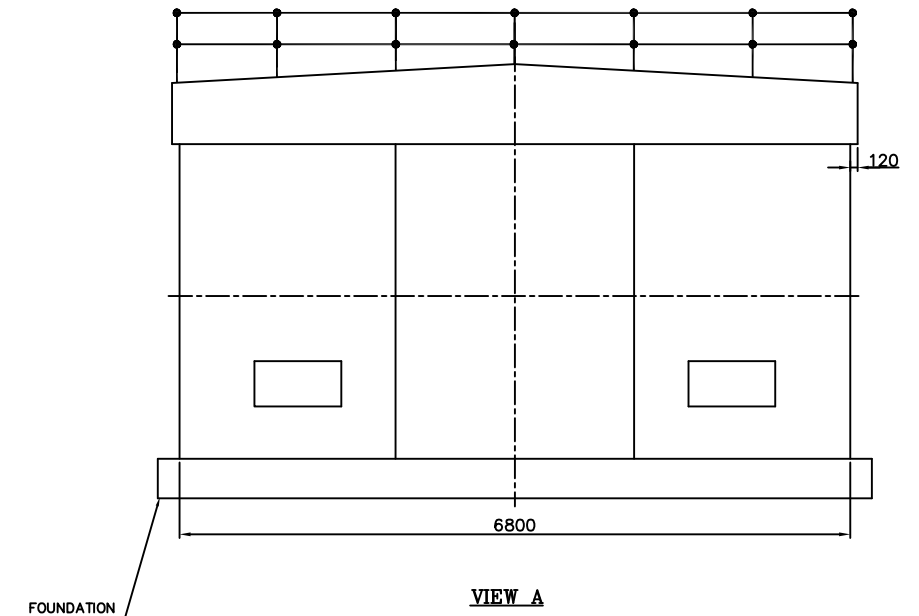
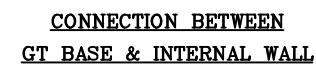
15. ADEQUATE FACILITIES SHALL BE PROVIDED FOR RAIN WATER DRAINING ON ENCLOSURE ROOF AND FAN AREA.

16. ~~9~~ NORMALLY NOT APPLICABLE. FOR EXACT REQUIREMENT REFER ORDERING SHEET.

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT					FR-6, GT			
 BHARAT HEAVY ELECTRICALS LTD. HYDERABAD		NAME		SIGN.	DATE	NO.OF VAR.		
		DRN.	V.B.BASU	<i>[Signature]</i>	30.9.04			
		CHD.	B.S.N	<i>[Signature]</i>	30.9.04			
		APPD.	B.I.BABU	<i>[Signature]</i>	30.9.04			
DEPT.	INTOL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS	
GTD CODE.	GR. <i>SAFE</i>		1:60	N.A	NA	N.A.-	N.A.-	
123								
TITLE				CARD CODE	DRAWING NO.		REV.	
GA OF GT AND GENERATOR				N.A.	1-359-08-61014		01	
OFFBASE ENCLOSURE				SHT. No 01		NO. OF SHT. 02		

SH.02 OF 2






GENERAL DIMENSIONAL LIMITS, FITS & TOLERANCES AS PER HY0230261



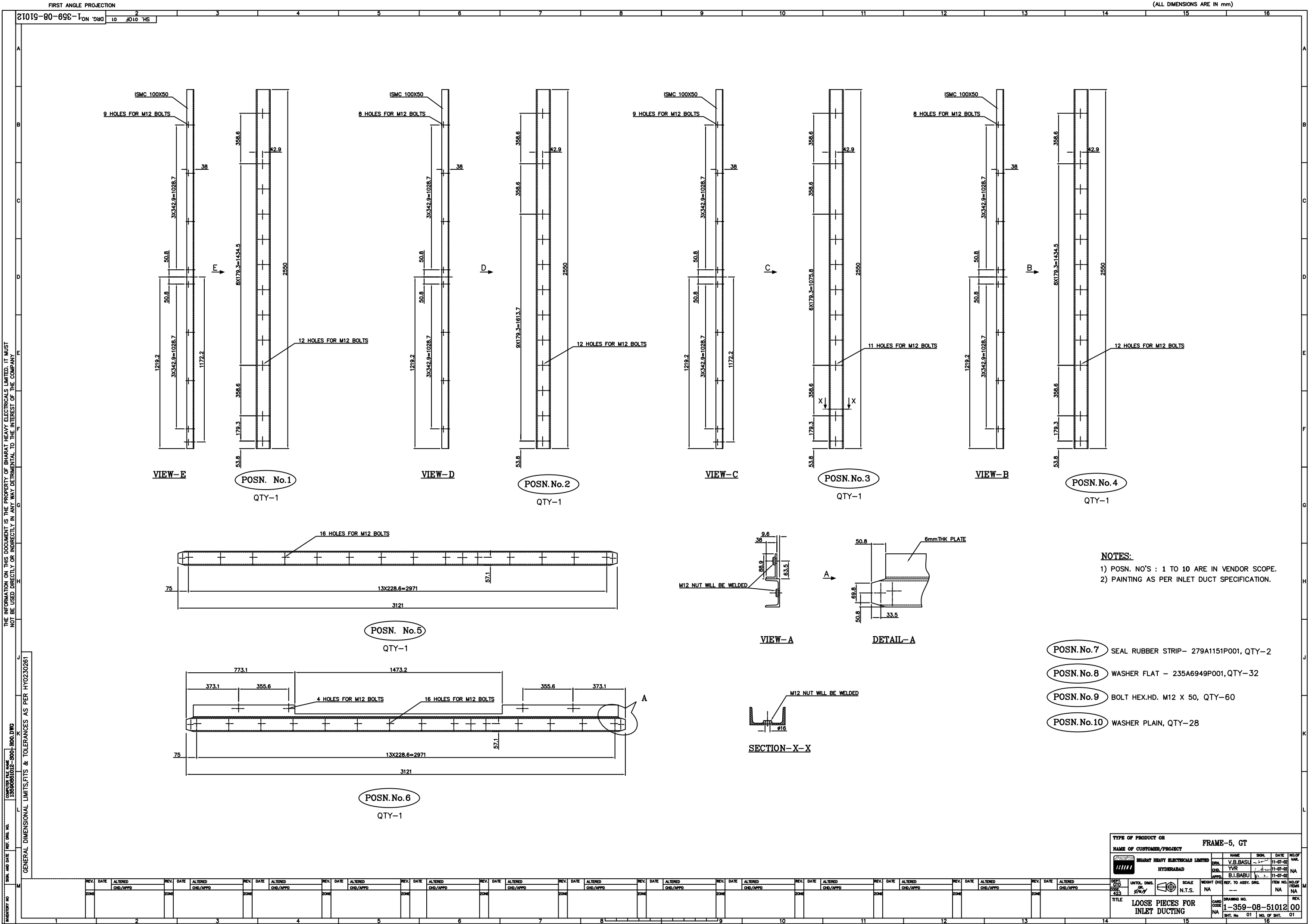
SECTION A-A AT INTERNAL (IW-1)

APPROACH PLATFORM UPTO GT  
WALKWAY IS IN VENDOR SCOPE

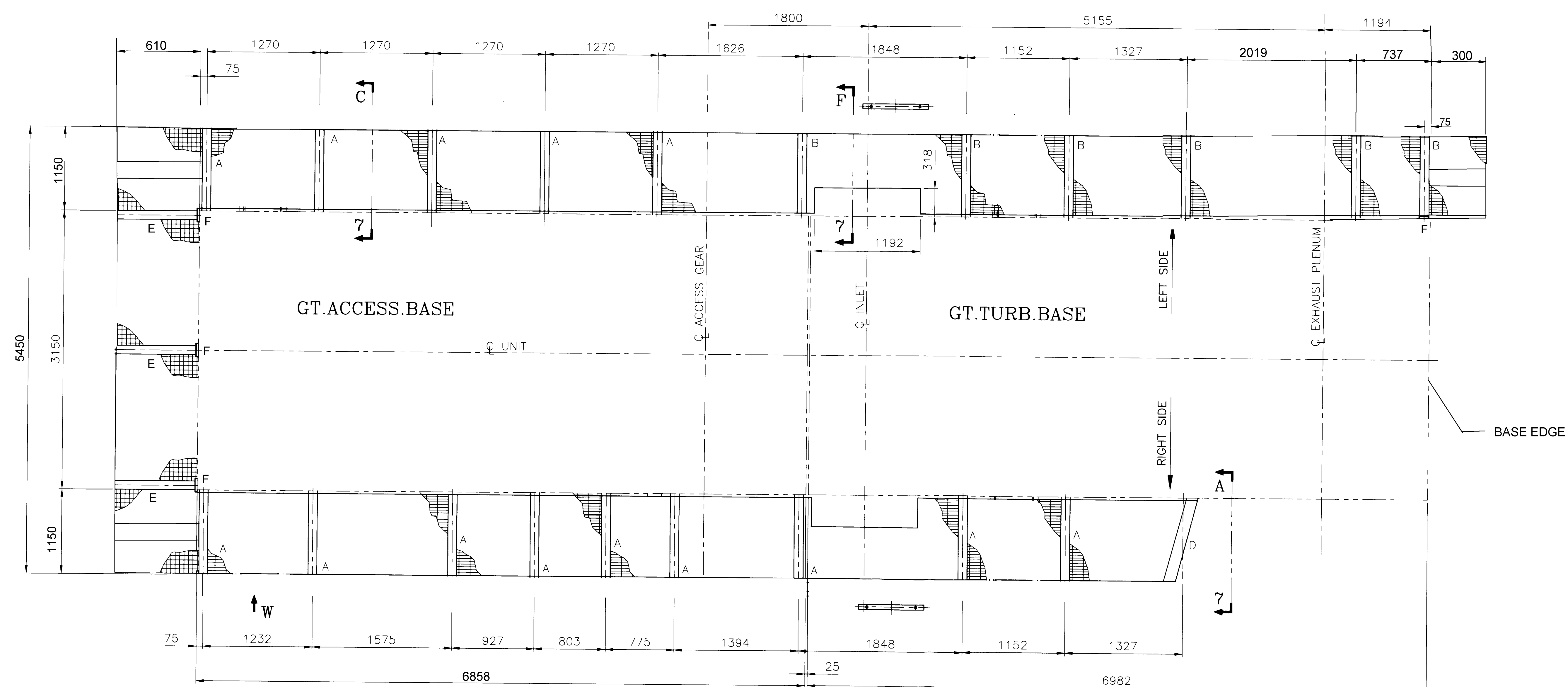
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CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD	CHD/APPD
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT					FR-6, GT				
 BHARAT HEAVY ELECTRICALS LTD. HYDERABAD						NAME	SIGN.	DATE	NO.OF VAR.
					DRN.	V.B.BASU		30.9.04	
					CHD.	B.S.N.		30.9.04	N.A.
					APPD.	B.I.BABU		30.9.04	
DEPT.	UNTL. DIMS.		SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.		ITEM NO.	NO.OF ITEMS	
GTD CODE	GR. GMAF		1:60	N.A	NA		N.A.-A-	N.A.-A-	
TITLE					CARD CODE	DRAWING NO.		REV.	
GA OF GT AND GENERATOR					N.A.	1-359-08-61014		01	
					SHT. No 02		No. OF SHT. 02		



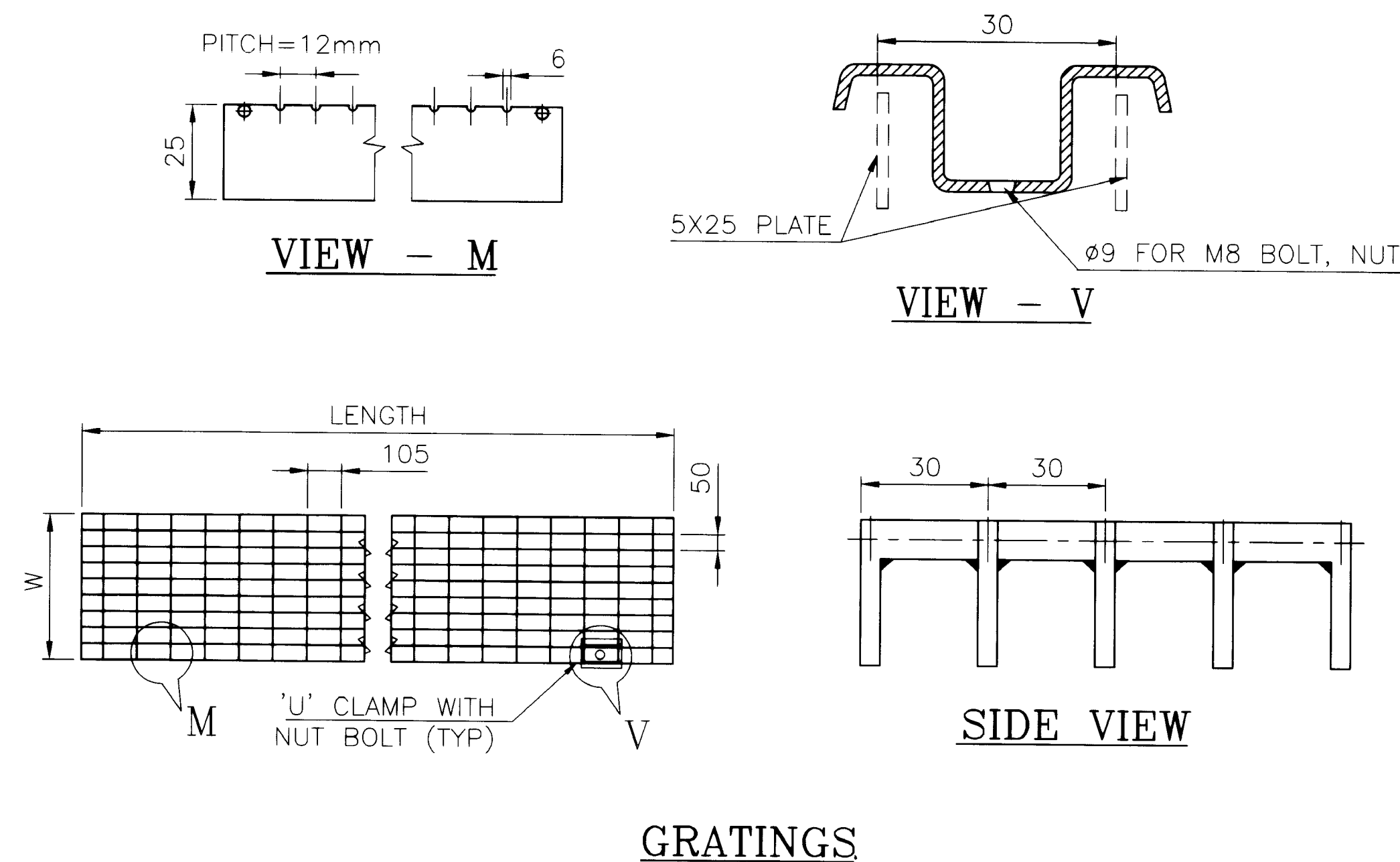


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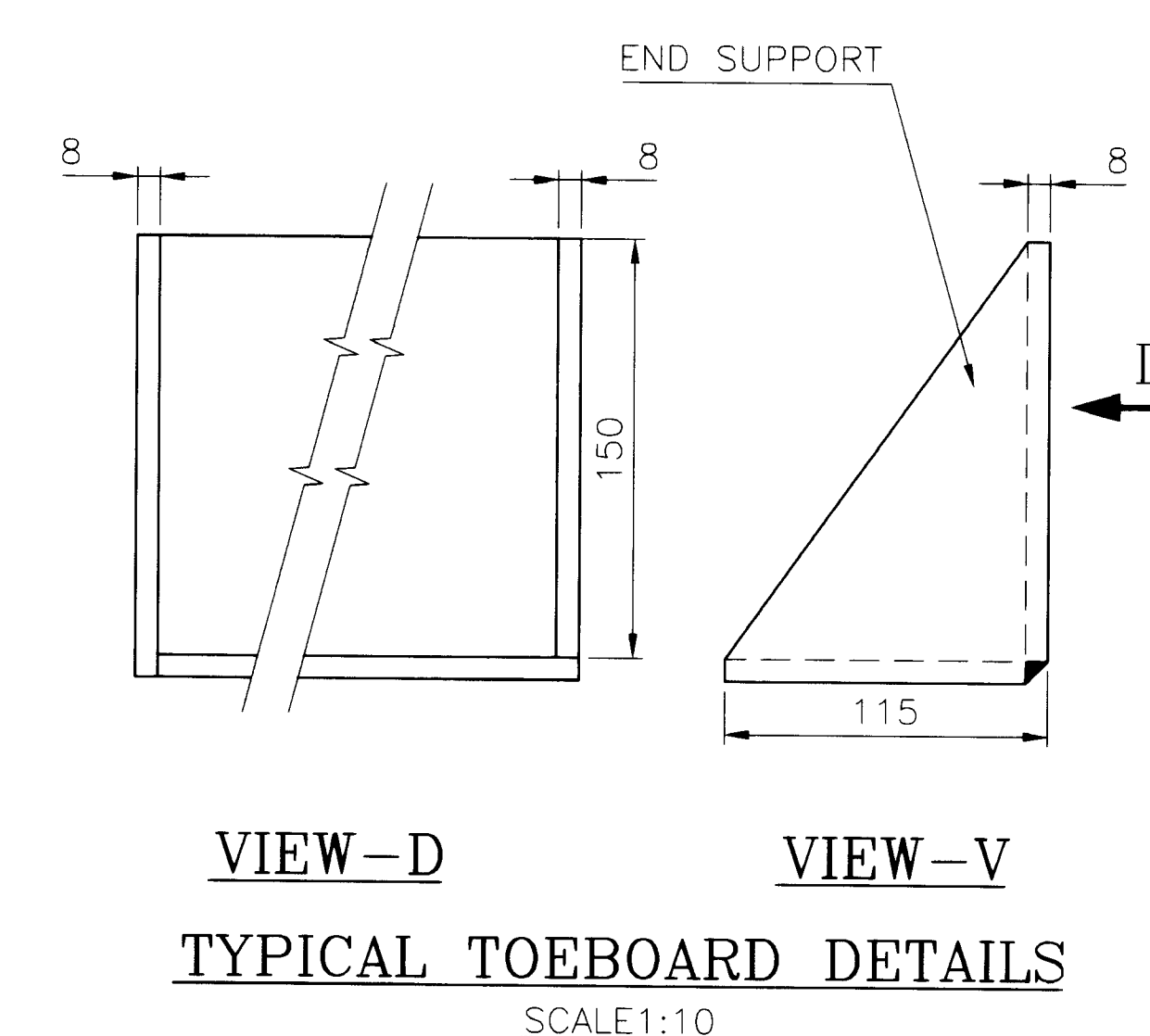


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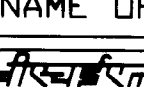







1. PIPE FITTINGS ARE 1 1/2" CLASS 'B' GALVANISED.
2. PIPES ARE 1 1/2" SIZE CLASS 'B' GALVANISED.
3. ALL GRATINGS ARE HOT DIP GALVANISED.
4. SUPPORTS, TOE BOARDS ARE STAIRCASES ARE HOT DIP GALVANISED.
5. ZINC RICH PRIMER PAINT TO BE APPLIED FOR ALL SURFACES EXCEPT PIPES , FITTINGS AND GALVANISED SURFACES.
6. SUITABLE FASTENERS ARE TO BE SUPPLIED WITH 10% EXTRA QUANTITY (ALL GALVANISED)
7. SUPPLY IS AS PER BHEL SPEC. GT54027.
8. 4 No's OF 'L' TYPE BRACKETS TO BE SUPPLIED LOOSE ( MARKED 'F').
9. 3 No's OF SUPPORTS TO BE SUPPLIED ( MARKED 'E').



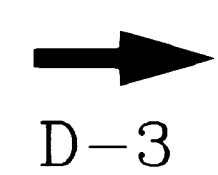
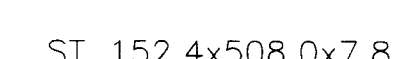
BRACKET DETAILS ('L' TYPE)  
(4 PLACES)  
SCALE 1:3



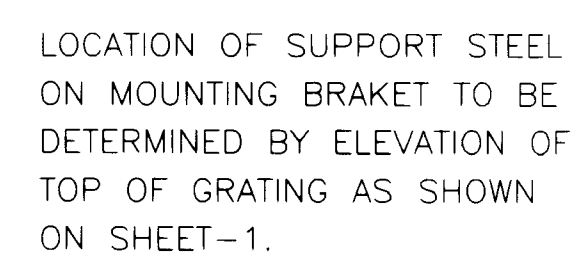
- VAR  
01 RHS EXHAUST AS SHOWN.
- VAR  
02 LHS EXHAUST OWSA VAR-01



TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT					FR-6-S																
 BHARAT HEAVY ELECTRICALS LTD. HYDERABAD					<table><tr><th>NAME</th><th>SIGN</th><th>DATE</th></tr><tr><td>DRI. POORNIMA CAD</td><td></td><td>14.02.00</td></tr><tr><td>CDI. Y.V. RAO</td><td></td><td>14.02.00</td></tr><tr><td>DR. S. BABU</td><td></td><td>14.02.00</td></tr></table>					NAME	SIGN	DATE	DRI. POORNIMA CAD		14.02.00	CDI. Y.V. RAO		14.02.00	DR. S. BABU		14.02.00
NAME	SIGN	DATE																			
DRI. POORNIMA CAD		14.02.00																			
CDI. Y.V. RAO		14.02.00																			
DR. S. BABU		14.02.00																			
DEPT CODE	UNIT, DIMS OR UNIT		SCALE	WEIGHT	APPROV	NO. OF ASSY	DRG.	ITEM NO.													
423	1/25		1:25		-NA-	-NA-	-NA-														
TITLE WALKWAY FOR FT FR-6 S (FOR OFF BASE)					CARD CODE NA	DRAWING NO <b>0-364-01-61005</b>															
					SHT	NO	OF	SHT													
14					15																

INVENTORY NO	SIGN. AND DATE	REF. ORG. NO.	COMPUTER FILE NAME
		109E9476	03640161004-S02-R01.TIF



DETAIL D-2

[illegible]

TYPE OF PRODUCT OR NAME OF COMPANY/PROJECT				FR6-S																			
 BHARAT HEAVY ELECTRICALS LTD. HYDERABAD				<table border="1"> <thead> <tr> <th>NAME</th> <th>SIGN</th> <th>DATE</th> <th>NO OF VARS</th> </tr> </thead> <tbody> <tr> <td>DRM. POORNIMA CAP</td> <td><i>[Signature]</i></td> <td>14.02.00</td> <td>NA</td> </tr> <tr> <td>CHD. V. RAO</td> <td><i>[Signature]</i></td> <td>14.02.00</td> <td>NA</td> </tr> <tr> <td>CHD. BABU</td> <td><i>[Signature]</i></td> <td>14.02.00</td> <td>NA</td> </tr> </tbody> </table>				NAME	SIGN	DATE	NO OF VARS	DRM. POORNIMA CAP	<i>[Signature]</i>	14.02.00	NA	CHD. V. RAO	<i>[Signature]</i>	14.02.00	NA	CHD. BABU	<i>[Signature]</i>	14.02.00	NA
NAME	SIGN	DATE	NO OF VARS																				
DRM. POORNIMA CAP	<i>[Signature]</i>	14.02.00	NA																				
CHD. V. RAO	<i>[Signature]</i>	14.02.00	NA																				
CHD. BABU	<i>[Signature]</i>	14.02.00	NA																				
DEPT	UNIT	DIMS		SCALE	WEIGHT	REQ	REV. TO ASSY. DRG.	ITEM NO	NO OF ITEMS														
CODE	123	9/4/16		1:1.0 1:2.5	NA	NA	NA	NA	NA														
TITLE <b>WALKWAY FOR GT FR-6 S (FOR OFFBASE)</b>						DRAWING NO. <b>0-364-01-61005</b>		REV. <b>01</b>															
CARD CODE NA						SH. NO. 02 OF 02 02																	

Form No. TD-106-1 REV-2				PRODUCT STANDARD		GT54155	
Ref Doc 4-36401-31001				GAS TURBINES		REV NO: 01	
						PAGE 1 OF 4	
<p align="center"><u>GRATING ANTI SKID GALVANISED (HOT DIP)</u></p>							
<p>1.0 <u>SCOPE:</u> This specification is meant for supplying the Grating Anti Skid, Galvanised, to be used in Platforms for Gas Turbine equipment.</p> <p>The suply shall be as per the varient no. asked for, in the enquiry &amp; as per Drg. in Sheet 3.</p>							
<p>2.0 <u>VENDOR'S DRG:</u> The supplier shall furnish Vendor's Drg. within 1 Week of placement of order. All manufacturing, details are to be furnished in this drg.</p>							
<p>3.0 <u>QUALITY ASSURANCE:</u> Strict quality Assurance procedures are to be Adopted during the manufacturing of the Gratings.</p> <p>Facility for Inspection by BHEL/BHEL'S Representative shall be provided by the vendor during manufacturing And/OR final inspection.</p>							
<p>4.0 <u>GENERAL:</u></p> <p>4.1 One copy of Drg. is enclosed along with enquiry for Ref use by vendor. (Sheet No.3)</p> <p>4.2 <u>DESPATCH:</u> Each Assy shall be packed together and marked with BHEL code ( From Purchase Order).</p> <p>4.3 Care should be taken to avoid damages during Transport, Handling &amp; Storage.</p>							
Concurred:		STANDARDS		Issued GAS TURBINES HYDERABAD-500032 (INDIA)			
				Prepared (B.S.N.) Eng.		Approved A. S. N.	
						Date 930503	

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## PRODUCT STANDARD

## GAS TURBINES

GT54155

**REV NO: 01**

PAGE 2 OF 4

VARIANT TABLE:-

[illegible]

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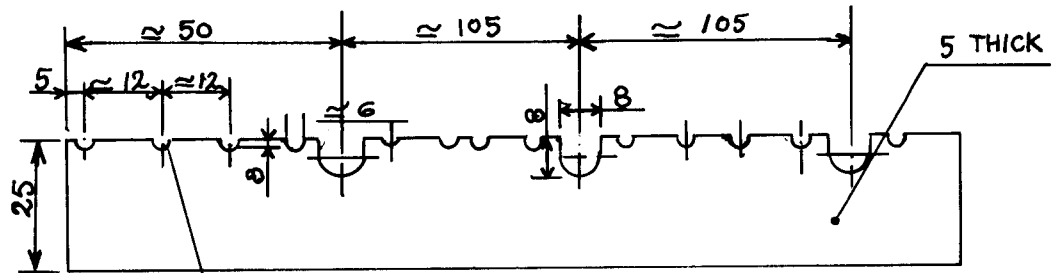
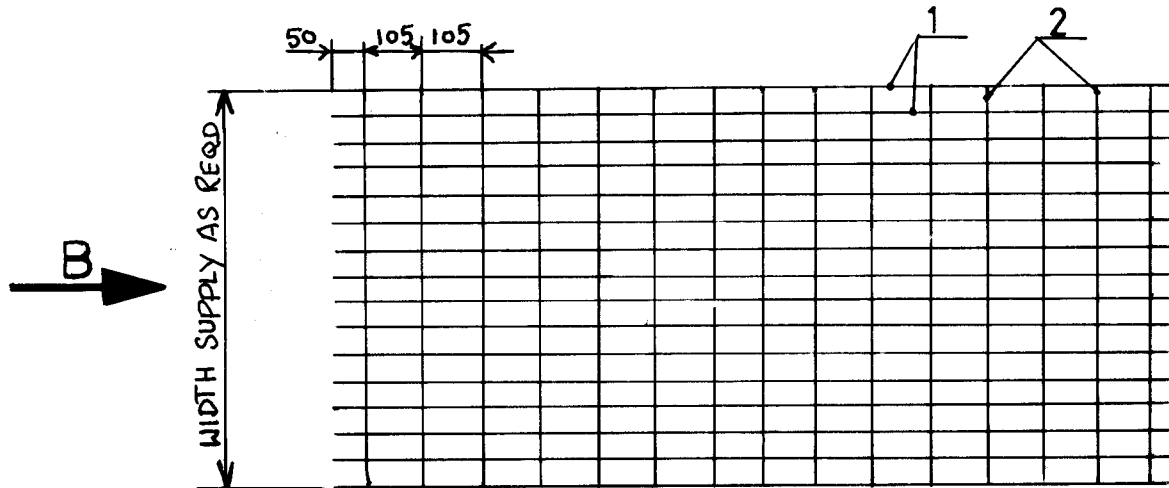
## PRODUCT STANDARD

## GAS TURBINES

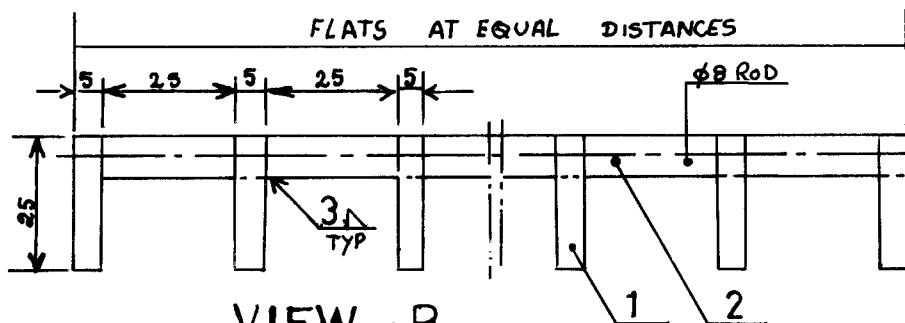
GT54155

REV NO: 01

PAGE 3 OF 4

DETAIL OF POSITION-1

DEPRESSIONS OF APPROX. 3 mm TO BE  
DRILLED OR CHISELLED OUT AS PER  
MANUFACTURER'S SUITABILITY

VIEW - B  
TURNED

POSITION NO	DESCRIPTION	MATERIAL	REMARKS
1.	FLAT 25x6	IS:226	
2.	ROD φ8	IS:1570	

NOTE:- COMPLETE ASSLY SHALL BE HOT-DIP GALVANISED 80÷100 μ THK.



## PRODUCT STANDARD

**HYDERABAD**

**Prod. Std. No. GT54155**

Rev. No. 01

Page 4 of 4

## RECORD OF REVISIONS

[illegible]

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Ref. Doc



[illegible]

Technical drawing of a generator enclosure showing front and side elevations with dimensions and annotations.

**Dimensions:**

- Overall width: 2250
- Overall height: 3945
- Top section height: 745
- Door height: 1551
- Door width: 800
- Stator frame width: 1450 (each side)
- Generator outer surface width: 1353
- Generator base height: 630
- ES END PANEL BASE height: 100.5290
- Top of concrete for end base: 100.3555
- EL of concrete: 100.5295 (below generator)

**Annotations:**

- AB: TOP OF CONCRETE FOR END BASE : 100.3555 M
- EL OF CONCRETE: 100.5295 M (BELOW GENERATOR)
- ES END PANEL BASE (100.5290)
- STATOR FRAME PROFILE FOR SEALING DESIGN
- DOOR
- ELEVATION OF GEN.C.L.: 101.897 M
- GEN. STATOR OUTER SURFACE

**Notes:**

1. SPECIFICATION FEATURES SUCH AS PAINTING, ENCLOSEMENT, MOUNTING, DRAINAGE, ETC.
2. ALL THE OPENINGS SHALL BE PROTECTED BY MESH TO PREVENT ENTRY OF DEBRIS.
3. NOISE REDUCTION MEASURES SHALL BE TAKEN ON THE SIDE AND TOP OF THE ENCLOSURE.
4. TRIAL ASSEMBLY SHALL BE DONE BY B.H.E.L. BEFORE FINAL FABRICATION.
5. SURFACE PREPARATION SHALL BE DONE BY B.H.E.L. BEFORE PAINTING.
6. SHADE OF FINISH SHALL BE AS PER SPECIFICATION.
7. ALL THE ROOFING SHALL BE DONE TO AVOID DAMAGE TO THE ENCLOSURE.
8. ALL FASTENERS SHALL BE OF GALVANIZED STEEL.
9. THE GENERATOR SHALL BE MOUNTED ON A CONCRETE BASE OF THICKNESS OF 150 MM.
10. SCOPE OF SUPPLY SHALL INCLUDE ALL THE DUCTS BETWEEN GENERATOR AND ENCLOSURE.
11. DUCTS SHALL BE OF GALVANIZED STEEL WITH RINGS MADE OF GALVANIZED STEEL.
12. SPECIFICATION SHALL BE AS PER B.H.E.L. DRAWING NO. 100.5290/100.5295.
13. CO2 PIPING SHALL BE OF GALVANIZED STEEL.

\*\*\* NOTE: DURING Erection, THE GENERATOR SHALL BE MOUNTED BETWEEN GT AND ENCLOSURE.

1. SPECIFICATIONS : TO 65860, REV.02, CONSTRU.
2. FEATURES SUCH AS DUCTS, WALKWAYS, RAILINGS, PAINTING ETC. ARE IN SIMILAR TO GT ENCL.
3. ENCLOSURE SHALL BE WEATHER PROOF AND SUITABLE FOR OUTDOOR MOUNTING. DEGREE OF PROTECTION IP 54 OF IEC 34-5
4. ALL THE OPENINGS IN THE ENCLOSURE SHALL BE COVERED BY ALUMINIUM WIRE MESH TO PREVENT ENTRY OF INSECTS.
5. VIBRATION REDUCTION AS PER CLAUSE 5.3 OF TO 65860-804B (A)
6. THE SIDE AND ROOF PANELS SHALL BE OF WELDED CONSTRUCTION ONLY.
7. TRIAL ASSEMBLY SHALL BE CARRIED OUT AT SUPPLIER'S WORKS FOR INSPECTION BY BUREAU OF STANDARDS DESPATCH TO SITE.
8. SURFACE PREPARATION AND PAINTING AS PER GT ENCLOSURE PAINTING SCHEME.
9. SHADE OF FINISH PAINT : SHADE NO. : SAME AS GT ENCLOSURE.
10. ALL THE ROOFS AND SIDE PANELS SHALL BE PROPERLY PACKED BEFORE DESPATCH, TO AVOID DAMAGES DURING TRANSPORT AND HANDLING.
11. ALL FASTENERS ARE IN SUPPLIER'S SCOPE.
12. THE GENERATOR IS PROVIDED WITH OPEN CIRCUIT VENTILATION SYSTEM, OUTDOOR MOUNTED.
13. THICKNESS OF OUTER SHEET FOR ROOF PANELS = 4 MM.
14. ROOF PANELS SHALL BE 3.0 MM COLD ROLL.
15. THICKNESS OF PERFORATED SHEET - FOR ROOF AND WALL PANELS = 1.6 MM
16. SCOPE OF SUPPLY: ENCLOSURE, WALKWAYS AND SUPPORTS, GEN.AIR DUCTS, INTERMEDIATE DUCTS BETWEEN STATOR AND ENCLOSURE, DAMPERS IN GEN.DUCTS ETC.
17. ALL DUCTS SHALL BE MADE OF 5 THK SHEETS, REINFORCED IN BETWEEN WITH RECTANGULAR RINGS MADE WITH ISA 50 ANGLES
18. SPECIFICATION OF WALKWAY IS SAME AS THAT OF GT WALKWAY.
19. CO2 PIPING IS (DRAWING 1-139-43-31003) IN ENCLOSURE SCOPE.

\*\*\* NOTE: DURING ENCLOSURE DESIGN, IT SHALL BE ENSURED BY THE VENDOR THAT NO CLEARANCE/ INTERFERENCE EXIST BETWEEN GT AND GENERATOR ENCLOSURES.

ELEVATION

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INVENTORY NO	SIGN. AND DATE	REF. DRG. NO.	COMPUTER FILE NAME :
			0E01067A.DWG

3" FLANGE WITH COUNTER FLANGE FOR VAPOUR EXTRACTION FAN PIPE ASSEMBLY

SEALING PLATE 5 THICK

OPENING 600X400 WITH COVER PLATE

OPENING 600X400 WITH COVER PLATE

RADIATION (HEAT) SHIELD WITH TWO OPENINGS SIZE 1000X600mm CLOSED WITH COVER SHEETS

COOLER DUCT

WALKWAY PLATFORM WITH RAILINGS AND STAIRCASE

WALKWAY PLATFORMS WITH SUPPORTS, GRATINGS, RAILING AND STAIRCASE (ENCLOSURE SCOPE)

DETAIL

EL. OF ENCL. BOTTOM

40

20

20

28 SLOTS 20X40  
IN BOX CHANNEL  
FOR FOUNDATION BOLT

OPENING IN RADIATION SHIELD TO ROUT ROTOR SHAFT

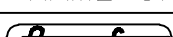

WALKWAY BETWEEN GENERATOR AND ENCLOSURE ( ENCL.SCOPE)  
AT ELEVATION 101.269 M (SUITABLE SUPPORTING ARRANGEMENT TO BE GIVEN FOR THE GRATINGS)

SECTION D-D

ITEM NO.	DESCRIPTION	DRAWING NO.	VAR. NO.	RAW MATERIAL SIZE OR CASTING DRG.NO. OR FORGING DRG.NO.	10000	
					TG65880 REV.02	1
					MATERIAL CODE	NET WT. GROSS WT.
					MATERIAL SPECN.	QUANTITY

THE FOLLOWING CONDITIONS APPLY  
EXCEPT OTHERWISE STATED...

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT	TARI 800-24P (Fr.6 G.T.G.) GURU GOBIND SINGH REFINERY LIMITED, BHATINDA
---	---

 <b>भारत भारी बिजली</b> <b>BHEL</b>		<b>भारत भारी बिजली लि.</b> <b>HYDERABAD</b>		NAME		DATE	NO. OF VAR.
				DRN. ANAND		02.09.08	
				CHD. SHAUKAT		02.09.08	
				APPD. U SRIDHAR		02.09.08	
DEPT. EME		SCALE	WEIGHT (KG)	REF. TO ASSY DRG.		ITEM NO.	NO. OF ITEMS
CODE 425		N.T.S	10000	NA		1.	

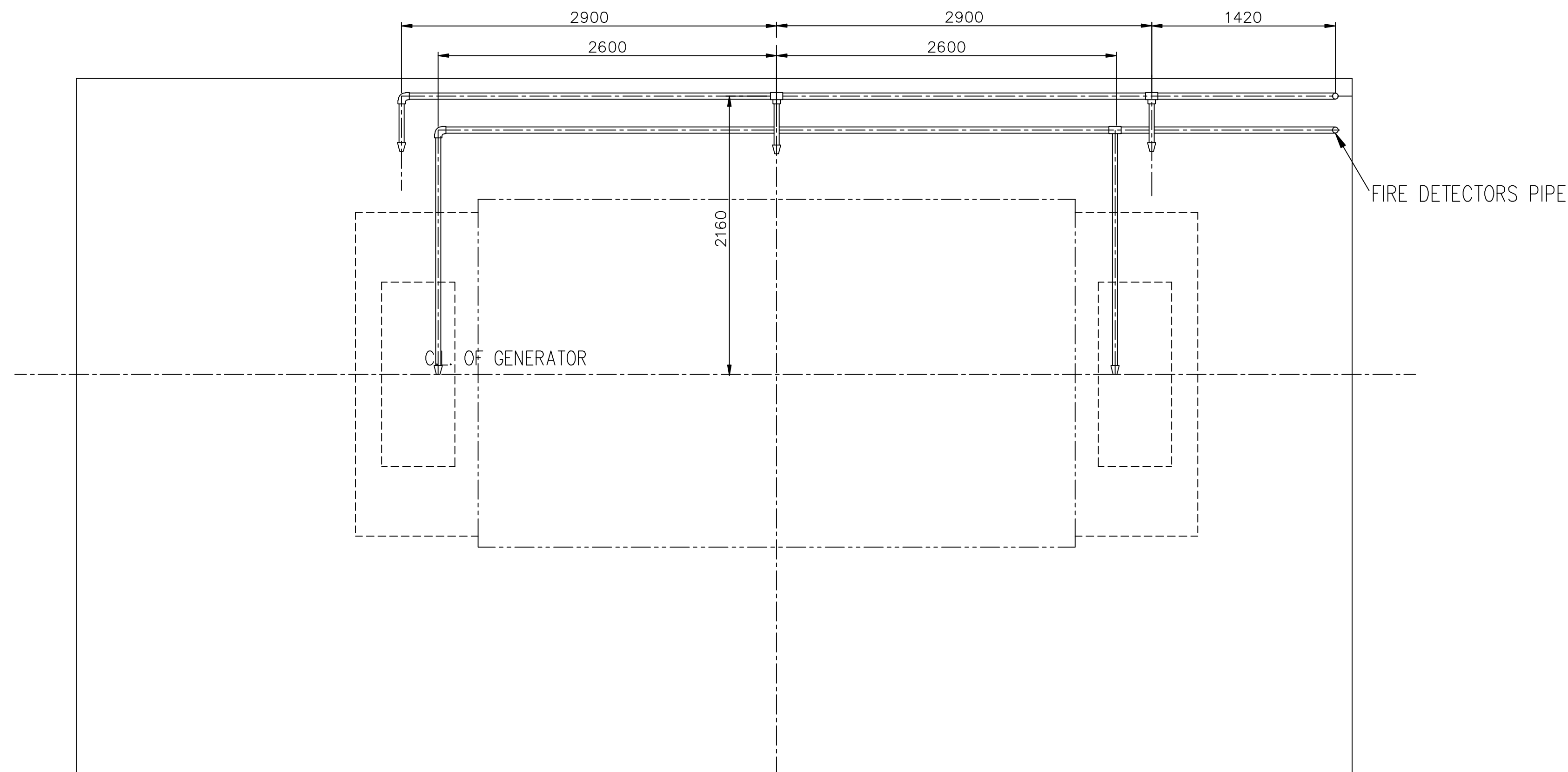
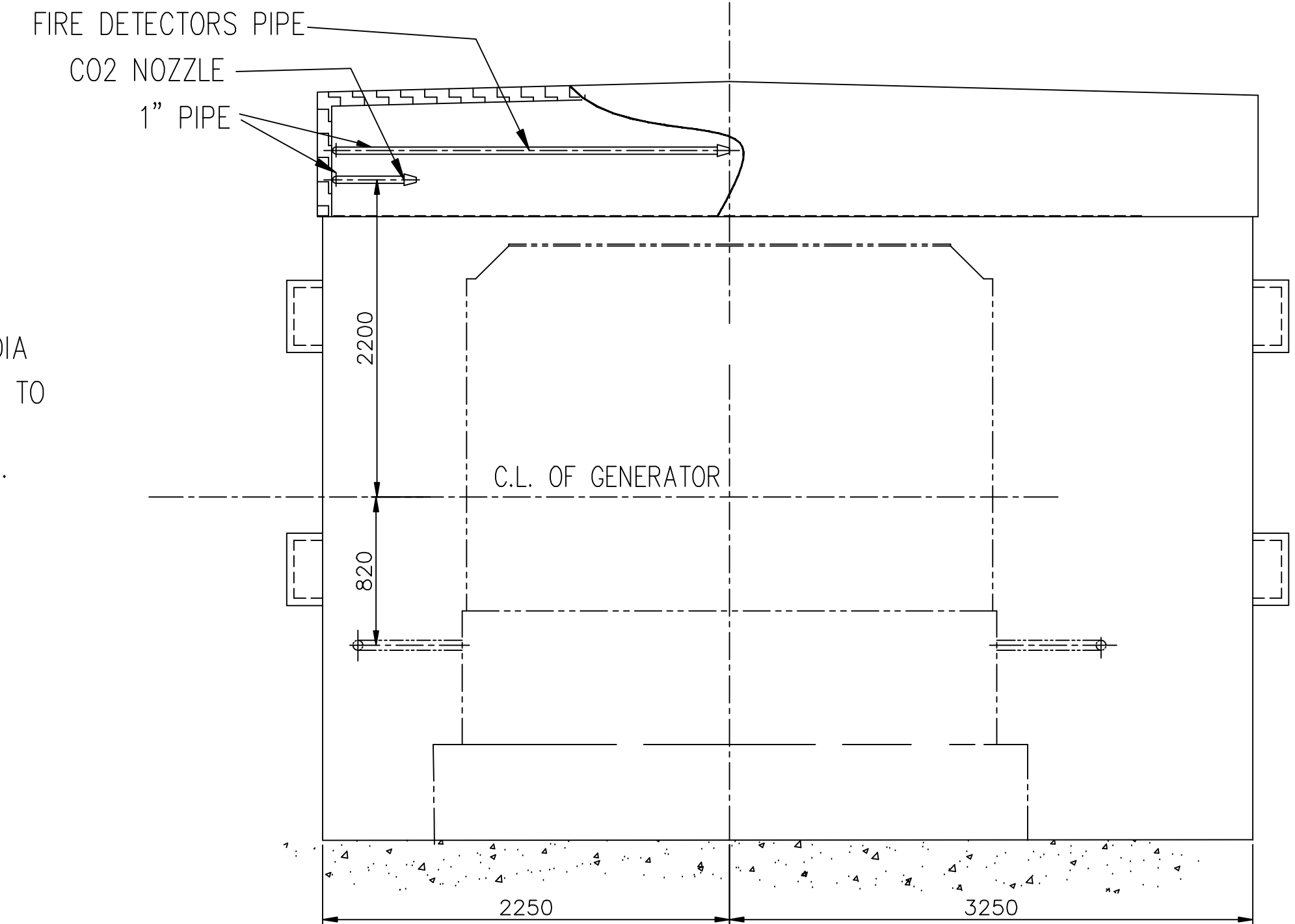
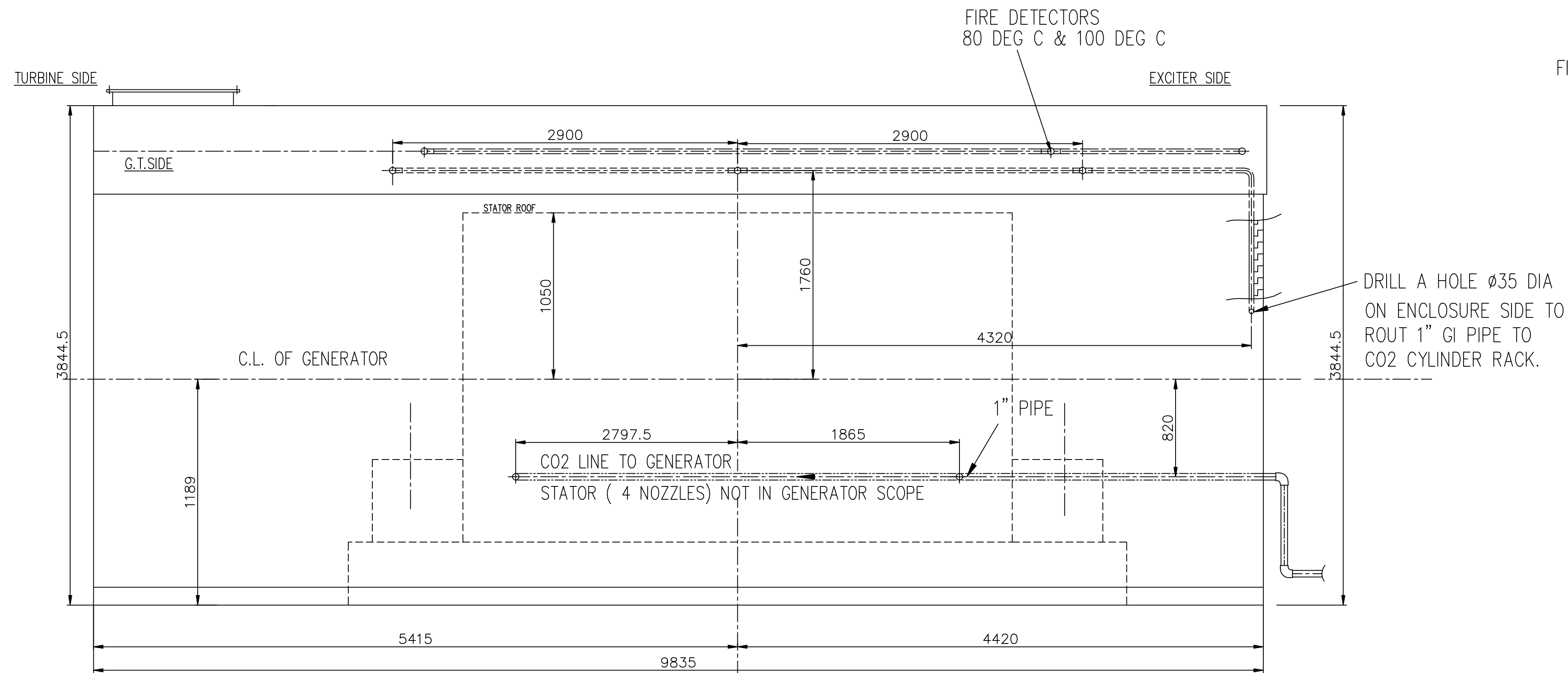
TITLE		DRAWING NO.	REV.
GENERATOR ENCLOSURE		0-139-05-31013	00

THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...

1. REF. TO HY0230261 FOR UNSPECIFIED TOLERANCES.
2. CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.
3. INTERNAL M/CD CORNER RADII 1 TO 0.7.
4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE

		SHEET NO. 01	NO OF SHEETS 01
	15	16	

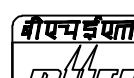
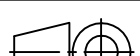





## REMARKS


1. ALL THE PIPING,FITTINGS AND NOZZLES ( 3 NO EACH FOR INITIAL AND EXTENDED DISCHARGE) IN ENCLOSURE SCOPE.
2. CO2 PIPE ROUTING: INITIAL AND EXTENDED DISCHARGE ( 4 TAPPINGS) FOR GENERATOR AND TWO TAP OFFS EACH FOR ENCLOSURE ( ONE ABOVE LOAD GEAR BOX AND ONE IN THE EXCITER COMPARTMENT).
3. CO2 PIPE ROUTING TO ALL CO2 DAMPERS IN ENCLOSURE SCOPE.
4. REFER TO 0-13905-31013 FOR ENCLOSURE DETAILS.
5. CO2 PIPING SHALL BE ROUTED ON LHS OF THE ENCLOSURE VIEWING FROM GT SIDE.


					ASSEMBLY	N.A.		G
						N.A.		
ITEM NO	DESCRIPTION	DRAWING NO.	VAR. NO.	RAW MATERIAL SIZE OR CASTING DRG.NO. OR FORGING DRG.NO.	MATERIAL CODE	NET WT.	GROSS WT.	
					MATERIAL SPECN.	QUANTITY		


THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED....			TYPE OF PRODUCT NAME OF CUSTOMER/PROJECT		TARI 800-24P (Fr.6 G.T.G.) GURU GOBIND SINGH REFINERY LIMITED, BHINDA									
1. REF. TO HY0230261 FOR UNSPECIFIED TOLERANCES.			 BHARAT HEAVY ELECTRICALS LIMITED HYDERABAD		NAME		SIGN.		DATE		NO.OF VAR.			
2. CHAMFER M/C.D. SHARP EDGES 1.2 TO 1.0 AT 45°.					CHD.				08.10.07		NA			
3. INTERNAL M/C.D. CORNER RADII 1.0 TO 0.7					APPD.		U.SRIDHAR		08.10.07					
4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.			DEPT. UNTOL. DIMS. GR. CODE C/M/F				SCALE N.T.S.		WEIGHT (KG) N.A.		REF. TO ASSY DRG. NA		ITEM NO. NA NO.OF ITEMS N.A.	
TITLE CO <sub>2</sub> PIPING FOR GENERATOR FIRE PROTECTION SYSTEM					CARD CODE		DRAWING NO. 1-139-43-31003						REV. 00	
					SHEET NO. 1		NO OF SHEETS 1							


REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
		CHD./APPD.			CHD./APPD.			CHD./APPD.
ZONE			ZONE			ZONE		


D-106-1 Rev. 4 FORM NO.		<b>PRODUCT STANDARD</b>  HYDERABAD		<b>TG 65880</b> Rev:02	
				PAGE 1 OF 7	
COPYRIGHT AND CONFIDENTIAL  The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	<u><b>ENCLOSURE FOR GENERATOR AND AUXILIARIES</b></u>				
	<p>1.0 Scope:</p> <p>This specification covers the technical requirements of enclosure for generator and its auxiliaries to be manufactured and supplied, erected and tested as detailed below: The enclosure shall provide weather protection, sound attenuation and structural support for associated equipment, containment of carbon dioxide during fire protection system discharge and compartmental lighting (A.C. and D.C.) including conduiting. The complete erected enclosure shall present a very pleasing appearance of the plant.</p> <p>1.1 The scope also includes assembly of enclosure vent fans, radiation shield, and vapour extraction fans and exhaust ducting from fan exhaust to the end of weather louvers.</p> <p>1.2 This specification supplements the enclosure drawings, which give a conceptual design with overall envelope dimensions. While erecting the generator enclosure, it is the responsibility of the vendor to make the overall GT and Generator enclosure assembly even, without any interface problems.</p> <p>1.3 Complete erection of generator enclosure is in vendor's scope. Erection may have to be carried out at BHEL or specified project site or both which will be specified by the purchase department.</p> <p>2.0 Constructional Features:</p> <p>Refer to relevant drawings mentioned in the order for constructional features and dimensional details.</p> <p>2.1 The enclosure shall be manufactured as</p> <ol style="list-style-type: none"> <li>Support structure</li> <li>Side panels and doors</li> <li>Roof panels</li> <li>Exhaust duct</li> </ol> <p>2.2 The enclosure shall be made in different compartments to facilitate easy assembly and Handling during erection and maintenance.</p> <p>2.3 The enclosure shall be water and dust proof and suitable for outdoor mounting. All the joints shall be leakproof.</p> <p>2.4 All lifting tackles shall be concealed.</p> <p>2.6 The partitions shown inside shall match with the contour of the machine components on which they rest. The edges of the partitions shall be properly dressed after gas cutting. The partitions through which rotor passes shall be suitably split for facilitating easy assembly / disassembly. The split zone shall be adequately reinforced with additional stiffeners. Only felt shall be used towards the rotor side to seal the rotor clearances.</p>				
Ref. Doc.	Rev. no. 01	Revisions: SPECIFICATION GENERALLY REVISED	Prepared: K.S.RAO	Checked: U.SRIDHAR	Approved: M.M.RAU


D-106-1 Rev. 4	FORM NO.		<b>PRODUCT STANDARD</b>  <b>HYDERABAD</b>	<b>TG 65880</b> Rev:02 <b>PAGE 2 OF 7</b>
<b>Ref. Doc.</b>	<b>Copyright and Confidential</b> The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.	<p>2.7 Doors shall be of hinged type with view glasses suitably located.</p> <p>2.8 Slope of top roofing on each side: 1.5 *.</p> <p>3.0 Materials:</p> <p>3.1 Outer sheet of side panels: 3 mm thk. CRCW steel sheet as per IS: 513 Gr.D, equivalent to ASTM A 620. Surface finish shall be matt finished, uncoiled. The sheets shall be procured from reputed suppliers only and the vendor is obliged to furnish, when asked by BHEL, the test reports of the material.</p> <p>3.2 Outer sheet of roof: 4 mm thk. mild steel sheet as per IS 1079 St.34.</p> <p>3.3 Inner sheet: 1.6mm perforated mild steel sheet to IS 513 Gr.D with an open area of 30-40%.</p> <p>3.4 Rubber gaskets: The rubber sheets and profiles used at various locations of the enclosure including those at partitions and panels shall be made of silicone rubber suitable for design temperature of 180°C. Reference may be made to BHEL specification TG 65849 for technical delivery conditions</p> <p>3.5 View glasses : toughened glass sheets (Acrylic glass sheet not acceptable)</p> <p>3.6 Fasteners : all fixing bolts, screws, nuts and washers shall be galvanized and shall be procured to IS 1364, P8.8/ P8 grade minimum.</p> <p>3.7 Conduit pipes : galvanized steel pipes as per IS:1239 part-I</p> <p>3.8 Pipe fittings : galvanized steel fittings as per IS:1239 part-II</p> <p>4.0 Sealing :</p> <p>4.1 The enclosure forms part of the machine cooling circuit and hence sealing shall be effective and hence, employed gaskets / profiles at parting joints shall be made of reliable and suitable material as given above from reputed rubber manufacturers. Effective sealing is an essential prerequisite and shall be provided at the following locations.</p> <p>4.1.1 All doors, dampers, side walls to base, side walls to top part, inter compartment partitions (both at side wall and roof) ,</p> <p>4.2 The seal tightness of the above joints shall be ensured by means of an air jet directed at all over the periphery and checking from other side. Supplier to demonstrate this both at his works during mock-up assembly and after site erection.</p> <p>5.0 Noise Control :</p> <p>5.1 The inner surface of enclosure shall carry noise absorbing material like rock-wool to attenuate the noise emanating from the generator, gearbox and exciter.</p>		

D-106-1 Rev. 4 FORM NO.		<div></div> <div>PRODUCT STANDARD</div> <div>HYDERABAD</div>		<div>TG 65880</div> <div>Rev:02</div> <div>PAGE 3 OF 7</div>
COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.		5.2 The rockwool / glasswool shall be in the form of mats. They shall then be wrapped with glass cloth all around. Suitable partitions shall be provided in the side panels to prevent sagging of rock-wool sheets.		
		5.3 The maximum noise generated by generator and its auxiliaries is around 97 dB (A). This shall be reduced to a) 80 dB (A) or less at 1 m from the enclosure outer surface near field noise) and b) 60 dB (A) or less at 120 m from machine (far field noise).		
		5.4 Supplier shall achieve the noise levels mentioned in Cl.5.3 a&b, guarantee and prove them at site. Supplier to foresee this aspect prior to detailed design and if necessary include lead sheet in the panels to bring down the noise to acceptable levels.		
		5.5 The enclosure itself shall not be a source of noise generation. It shall neither rattle nor create any low frequency hum at operating speed of the machine (3000 rpm).		
		5.6 The supplier shall ensure that the natural frequency of enclosure is well away from 50 and 85 hz or 60 and 85 hz along with their harmonics depending on the site location.		
		5.7 The exhaust ducting above the gear box compartment and the hot air outlet ducting in the generator ( in case of open ventilated machines) shall be provided with a silencer to absorb noise generated inside. The same ducting shall be assembled with CO2 pressure operated dampers and weather louvers.		
		6.0 Electrical wiring:		
		6.1 The wiring shall be drawn through galvanized steel conduit pipes.		
		6.2 The conduit pipes shall run through the top channel of support structure.		
		6.3 All the electrical fittings like switches, junction boxes etc. shall be flameproof.		
		6.4 All the wiring shall terminate at outside the base of the side all in a power socket.		
		6.5 The supplier shall submit the electrical layout for approval by BHEL .		
		6.6 All the switches shall be of concealed type.		
		7.0 Lighting:		
		7.1 The enclosure shall be provided with industrial grade incandescent lamps of 100 W capacity at 230 V A.C. The no. of lamps required shall be indicated in the drawing.		
		7.2 All the lighting fixtures shall be flexibly mounted to the side frame ( not to the roof) such that the machine vibrations are not transmitted to the lamps.		
Ref. Doc.		7.3 In addition to the A.C. lamps, 2 nos. of D.C. lamps of 15 W,110V capacity shall be provided; one in gear-box compartment and the other in exciter compartment.		
		8.0 Dampers: Gravity and pressure operated dampers shall be provided in the enclosure at the openings indicated in the drawing.		

D-106-1 Rev. 4 FORM NO.			<b>PRODUCT STANDARD</b>		<b>TG 65880</b> Rev:02	
			<b>HYDERABAD</b>		<b>PAGE 4 OF 7</b>	
<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.</div>			9.0	Fans:		
			9.1	The exhaust fans provided above the gear box compartment are not in the supplier's Scope. However enclosure supplier shall assemble these fans and continue the exhaust ducting (enclosure scope).		
			9.2	Vapour extraction fans and piping are not in enclosure scope. However their assembly at site is included in enclosure scope.		
			10.0	Surface preparation and Painting:		
			10.1	Both internal and external surfaces of panels, doors sealing plates, structurals, roof, perforated sheets, dampers, ducts etc. should be shot/sand blasted to SA 21/2 standard of Swedish specification SIS-05-S900-1967/ IS 9954-1981. Cleaning of the blast surface as per IS 1477 PT1.		
			10.2	Surfaces to be coated shall be free of grease, oil, and loose mill scale. Oil and grease shall be removed by solvent cleaning methods.		
			10.3	Unevenness, dents, nicks etc. are not permissible on the outer surfaces.		
			10.4	Surfaces prepared for coating shall be coated the same day and before any visible rusting occurs.		
			10.5	Touchup and repair of damaged primer (scratched, rusted, peeled, blistered etc.) shall be repaired by the painting agency.		
			10.6	Coating shall be applied in strict adherence with the paint manufacturer's latest published instructions. The manufacturer's recommended curing or drying time shall be allowed between various coats. Thickness of coating shall be as per annexure – I or as per drawing for both inner and outer surfaces. In the event of conflict, differences shall be brought to the attention of engineering for resolution.		
			10.7	While preparing the paints, only those thinners approved by the paint supplier through his catalogues shall be used.		
			10.8	Paints manufactured from the same supplier and batch shall be used for generator as well as turbine enclosures. No difference in shade over the entire enclosure length is permitted.		
			10.9	Quality control will have the right to reject the enclosure in case of non-compliance of any of the above.		
Ref. Doc.	10.10	Primer coats shall be inspected and cleaned when required by the inspector before applying finish coats.				
	10.11	Dry film thickness shall be measured after each coat by the inspector using a Mikro-test, Elcometer or any other accepted equipment.				
	10.12	The painting agency shall have in its possession at all times a wet film thickness gauge for continuous check of the wet film as applied.				

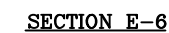
D-106-1 Rev. 4 FORM NO.		<div><div><div>बी एच ई एल</div><div></div></div><div>PRODUCT STANDARD</div><div>HYDERABAD</div></div>		<div>TG 65880</div> <div>Rev:02</div> <div>PAGE 5 OF 7</div>
<div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED. It must not be used directly or indirectly in any way detrimental to the interest of the company.</div>		11.0 Assembly:		
		11.1 The various compartments of enclosure shall match flush when assembled along its entire length.		
		11.2 Completed enclosure shall be trial assembled at vendor's works and offer it for BHEL inspection. At least one week advance intimation shall be given to BHEL inspecting agency and purchase department on the date of trial assembly.		
		11.3 Waviness of panels, roof, door etc. shall not exceed 1 mm per meter length after final assembly.		
		12.0 Outdoor mounting: The enclosure shall be suitable for outdoor mounting.		
		12.1 The support structure shall be designed to withstand the wind loads coming on to the enclosure.		
		12.2 The roof parts shall be free from cracks, pin holes, weld seam blow holes etc. The soundness of welds in the roof parts shall be checked with dye-penetrant.		
		12.0 Performance: The compartment enclosures shall be leak tight and doors shall flush properly with the frame. Except for dampers no light shall be visible through joints or seals when viewed from inside a dark enclosure with a bright light outside. The complete enclosure shall be drip proof.		
		13.0 Pressure testing of Enclosure: In case of positive pressurized enclosures (when specified in the enquiry), the complete enclosure shall be pressure tested to withstand a pressure of 75 mm of WC. This test shall be conducted at site in presence of BHEL and BHEL's customer.		
		14.0 Preparation for delivery: Preservation and packing shall be accomplished in accordance with acceptable commercial practices (for domestic or foreign shipments) unless otherwise indicated on the purchase order or quotation request. Enclosure shall be carefully packed in fully enclosed wooden crates with internal steel framing using minimum 8 mm plywood per IS 303 Gr. WWR/BC, BHEL standard AA51101, suitably protected from rain etc., by covering with Hessain Bitumen coated Polyethylene Kraft Paper per BHEL Standard HY78473. Proper care shall be taken to avoid any damage of enclosure components. All fasteners and gaskets shall be individually packed and tagged as per BOM. A separate packing list shall accompany with each container. For seaworthy packing requirements, refer BHEL specification HY0490569.		
15.0 Inspection: Immediately after receipt of order from BHEL, the vendor shall submit a quality plan indicating the proposed stages of inspection on the enclosure and its components. Based on the quality plan and technical requirements, BHEL will inform stage inspections and final inspections which will be witnessed by BHEL.				
16.0 Guarantee: The supplier shall furnish the guarantee certificate as having fulfilled various requirements outlined in this specification.				
17.0 Rejection: BHEL has the right to reject the entire or part of the ordered equipment notwithstanding its initial acceptance during the period of guarantee, if it does not comply with the specification requirements and supplier shall replace the rejected equipment or damaged items free of cost at the earliest without jeopardizing BHEL's committed schedules.				
Ref. Doc.				

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<div> <div>COPYRIGHT AND CONFIDENTIAL</div> <div>The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED.</div> <div>It must not be used directly or indirectly in any way detrimental to the interest of the company.</div> </div>		<div> <div>ANNEXURE-I</div> <div>PAINTING SCHEME</div> <div> <div>I) PRIMER (1 X RZ2) : ZINC RICH EPOXY PRIMER</div> <div> <div>1.1 DRY FILM THICKNESS : 50 MICRONS</div> <div>1.2 REQUIRED SURFACE PREPARATION : 25-35 MICRONS</div> <div>1.3</div> <div> <div>GROUP-A</div> <div> PENTADUR ZINC 8536 CURING AGENT : 9502 </div> </div> <div> <div>GROUP-B</div> <div> HEMPADUR ZINC CHROMATE(YELLOW) 8332 OR HEMPADUR ZINC PHOSPHATE 8538 OR HEMPEL'S UNIPRIMER 1314 CURING AGENT : 808 </div> </div> </div> </div> </div>	
	Ref. Doc.	<div> <div>II) INTERMEDIATE COAT (MIO) : HIGH BUILD MIO EPOXY</div> <div> <div>2.1 DRY FILM THICKNESS : 125 MICRONS.</div> <div>2.2 REQUIRED SURFACE PREPARATION : CLEAN, DRY, EPOXY PRIMER</div> <div>2.3</div> <div> <div>GROUP-A</div> <div> PENTADUR ZINC : 8530 CURING AGENT : 9504 OR : 9542 </div> </div> <div> <div>GROUP-B</div> <div> HEMPADUR HI-BUILD ENAMEL 4520 CURING AGENT : 845 </div> </div> </div> </div>	
		<div> <div>II) FINAL COAT (V5): ALIPHATIC URETHANE FINISH:</div> <div> <div>3.1 DRY FILM THICKNESS : 75 MICRONS</div> <div>3.2 REQUIRED SURFACE PREPARATION : CLEAN, DRY, EPOXY PRIMER WITH MIO</div> <div>3.3</div> <div> <div>GROUP-A</div> <div> PENTADUR HB 5520 THINNER : 799 OR : 450 SA </div> </div> <div> <div>GROUP-B</div> <div> HEMPADUR 5334 THINNER : 845 </div> </div> </div> </div>	
		NOTE: INTERMIXING OF PAINTS PERTAINING TO DIFFERENT GROUPS IS NOT PERMISSIBLE .	

TD-106-2 Rev No. 4	Form No.		PRODUCT STANDARD					TG 65880		
								Rev No. 02		
								Page 7 of 7		
2.0 COPYRIGHT AND CONFIDENTIAL The information on this document is the property of BHARAT HEAVY ELECTRICALS LIMITED, It must not be used directly or indirectly in any way detrimental to the interest of the company.	RECORD OF REVISIONS									
	Rev. No.	Date	Revision Details				Revised By	Approved By		
	01	12.8.98	Specification generally revised.							
	02	27.04.07	Specification generally revised.							
	<b><u>DISTRIBUTION TABLE</u></b>									
DEPT	EME	02-SHOP	02-QC	QA	06-SHOP	06-QC	02-TECH	02-TESTING		
	1	1	1	1						
	FSS									
	1									
Ref. Doc.										




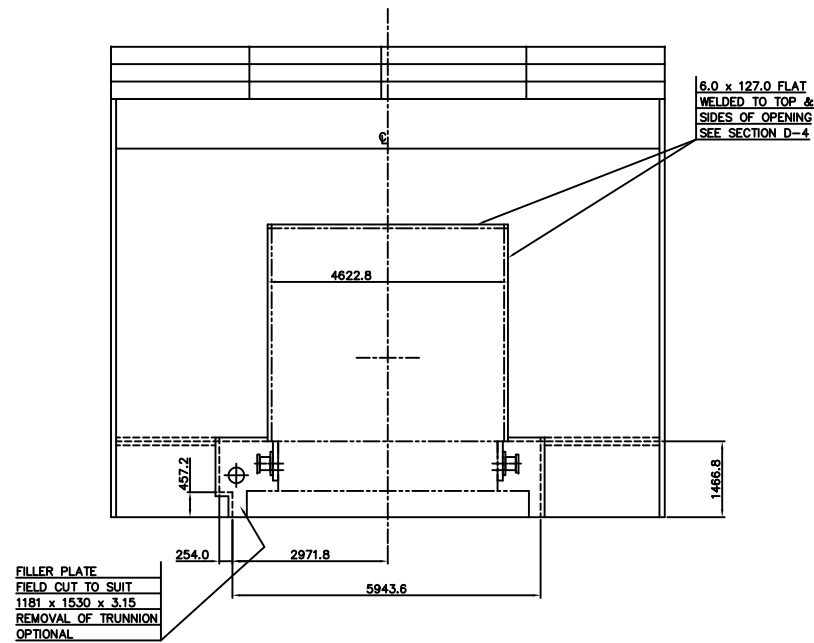
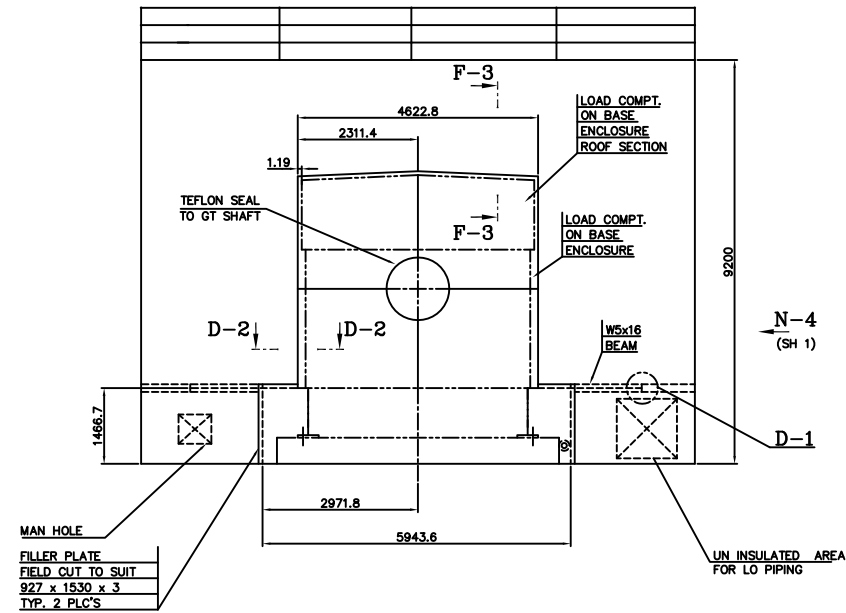
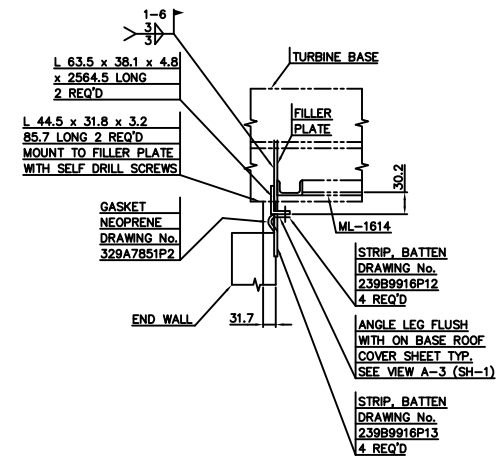
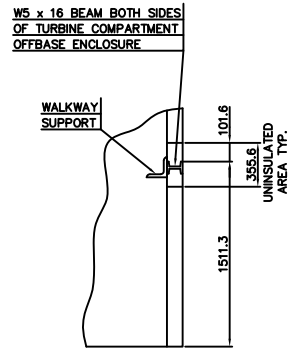
	L	K	J
GENERAL DIMENSIONAL LIMITS,FITS & TOLERANCES AS PER HY0230261			



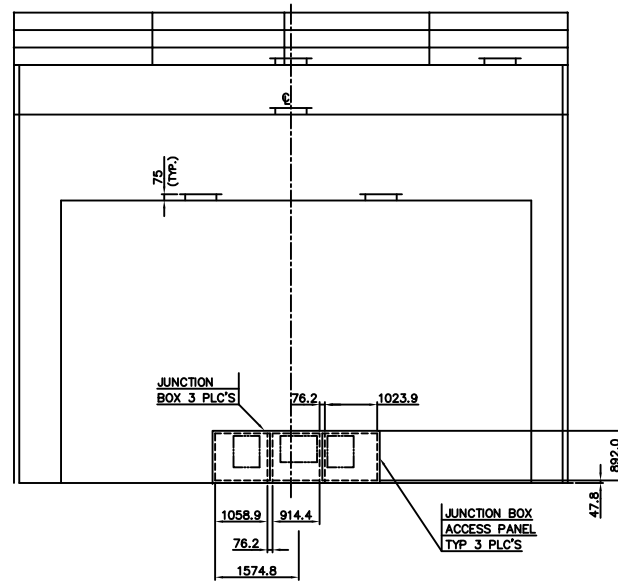
1. OFF BASE ENCLOSURE FOR ACCESSORY AND TURBINE COMPT.ON BASE ENCLOSURE FOR TURBINE AFT AREA AS SHOWN.
2. FOR GENERATOR ENCLOSURE DETAILS REFER DRAWING NO : REF.SPEC.VARIANT TABLE.
3. STANDARD-GE FREE ON BASE ENCLOSURE DETAILS ARE TO BE FOLLOWED FOR ON BASE LOAD COMPT.(03E8807) AND TURBINE COMPT AFT AREA(04E833E).
4. LOAD COMPT. & TURBINE AFT AREA ARE TO BE SEALED TO EX.PLENUM & GT AS PER GE BASE ENCLOSURE ARRANGEMENTS (04E833E).
5. OUT SIDE ACCESS LADDER, APPROACH PLATFORMS AND ALL WALKWAYS INSIDE ENCLOSURE ARE IN VENDOR SCOPE OF SUPPLY.
6. VENT DUCT OPENINGS SHOWN ARE INDICATIVE.FINAL DETAILS WILL BE FURNISHED LATER.
7. UNIT IS LOCATED OUT DOOR, DESIGN DATA AS PER SPECIFICATION GT5422S.
8. LIGHTING(AC & DC) WITHIN ACCESSORY COMPARTMENT AND GENERATOR IS IN VENDOR SCOPE. EXPLOSIVE PROOF LIGHTING ARE TO BE PROVIDED AS PER SPECIFICATION. NO LIGHTING IN TURBINE AND LOAD COMPARTMENTS.
9. CO2 PIPING & NOZZLES WITHIN GT AND GENERATOR ENCLOSURES ARE IN VENDORS SCOPE OF SUPPLY.VENDOR TO FURNISH DESIGN SIZING DETAILS FOR BHEL APPROVAL. TURBINE FANS (BY OTHERS),CO2 LATCH IS IN ENCLOSURE SCOPE.
10. MANUAL HOIST OF 2.0T CAPACITY SHALL BE PROVIDED IN ACCESSORY COMPARTMENT. CROSS BEAMS ARE TO BE PROVIDED AT SELECTED LOCATIONS IN ACCESSORY AND TURBINE COMPARTMENT FOR FIXING PULLEY BLOCK TROLLEY FOR MAINTENANCE.
11. CLEANING AND PAINTINGAS PER SPECIFICATION GT5422S.
12. DOOR LATCHES HINGES WILL BE SUPPLIED BY BHEL AS FREE ISSUE ITEMS.
13. ALL INTERNAL WALKWAYS, SUPPORT BRACKETS, APPROACH PLATFORM ARE IN VENDOR SCOPE OF SUPPLY. EXTENT OF WALKWAY IS MARKED ON THE DRAWING. WALK WAY SUPPORTED ON ACCESSORY AND TURBINE BASE SHALL BE AS PER DRG 03640191003. TURBINE COMPT WALKWAY SHALL BE EXTENDED UP TO ENCLOSURE WALL AS SHOWN. FLOOR GRATING SHALL BE AS PER SPEC GT54155, HAND RAILING PROVIDED OUT SIDE ENCLOSURE SHALL BE MINIMUM 1.8" DIA. GRATING SHALL BE HOT DIP GALVANIZED AND OTHER STRUCTURALS INCLUDING RAILING SHALL BE PAINTED. NO GROUND SUPPORT ALLOWED IN INSIDE COMPARTMENT.
14. THIS DRAWING SHOWS TYPICAL RHS EXHAUST. EXHAUST SIDE OF PROJECT VARIES PER SITE LAYOUT. FINAL SIDE WILL BE INDICATED DURING DETAIL DESIGN.
15. PIPE OPENINGS ON ROOF AND SIDE PANELS WILL BE FINALIZED DURING DETAILED DESIGNING. C-PLATESARE TO BE PROVIDED FOR ALL PIPE OPENINGS.
16. ALL GASKETS AND SEALS IN TURBINE COMPARTMENT AND EXHAUST PLENUM COMPARTMENT SHALL BE HIGH TEMP. SILICON.



TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT				FR-19, UPRATE			
 BHARAT HEAVY ELECTRICALS LTD. HYDERABAD				NAME J.C.S/VSB SGN. Y.V.R DATE 17.6.00 NO. 17.6.00			
DEPT.	UNIT	UNTL. DIMS.	SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	HOLD. ITEM
CODE	023	9/4/4	1:50		109 E 9858		
TITLE				DRAWING NO.			
OFF BASE ENCLOSURE				N.A. CODE 0-359-08-91005-00 PART NO. CT NO. OF SET. 02			

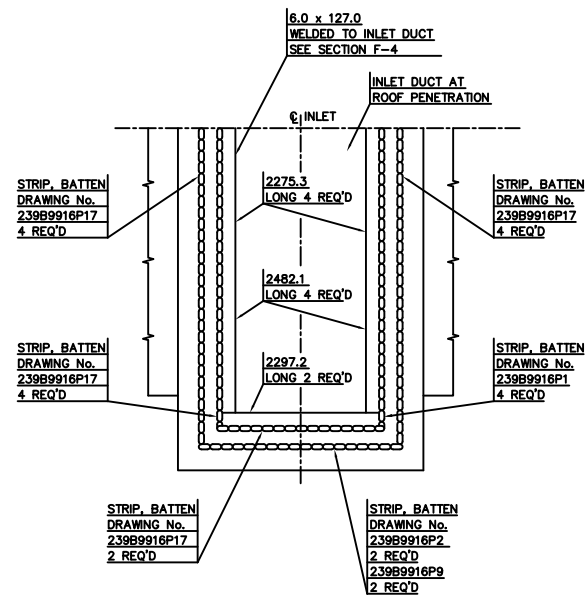
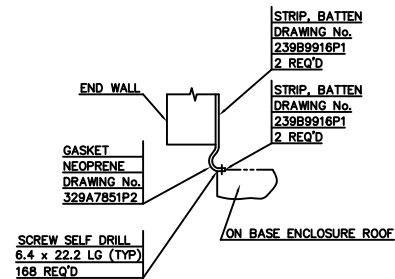
SECTION D-3  
(OPENING IN ENCLOSURE INTERNAL WALL)VIEW A-3  
(OPENING IN ENCLOSURE END WALL)SECTION D-2  
(ROTATED 90° CW)

DETAIL D-1

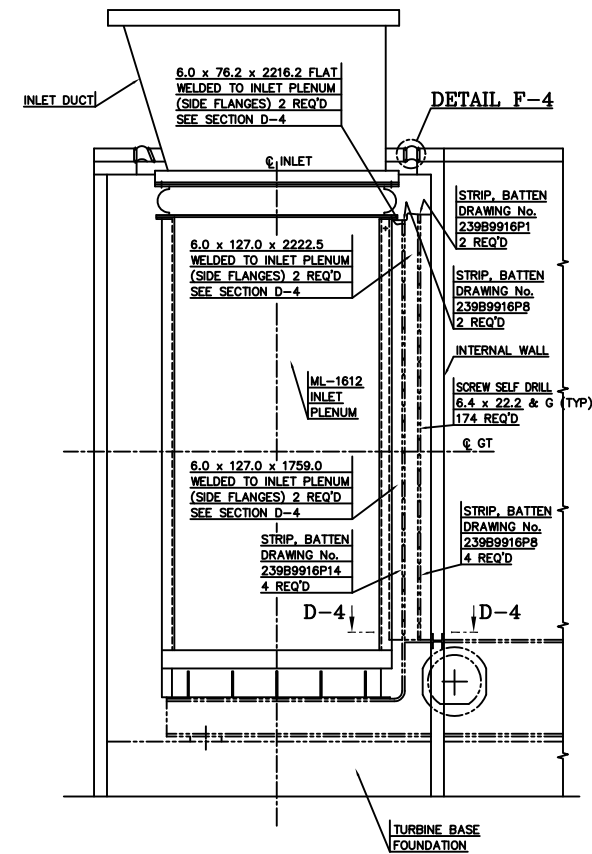


VIEW B-3

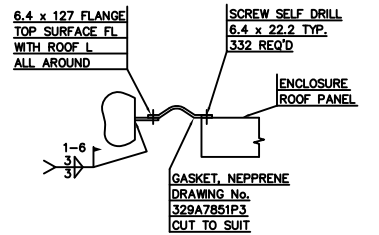
NOTE:-  
DIMENSIONS SHOWN FOR JUNCTION BOX ACCESS OPENINGS (3 REQ'D) STRUCTURAL MEMBERS FOR OPENING MUST BE ELECTRICALLY NONCONDUCTIVE

PARTIAL VIEW E-4  
(TOTAL QTY'S SHOWN)

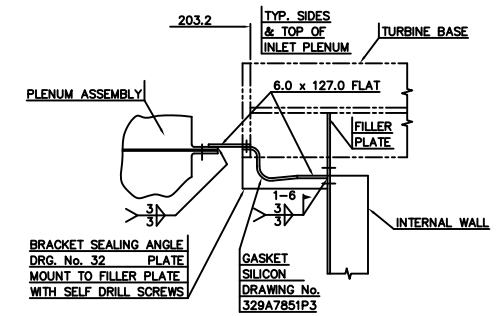
SECTION F-3



SECTION A-7

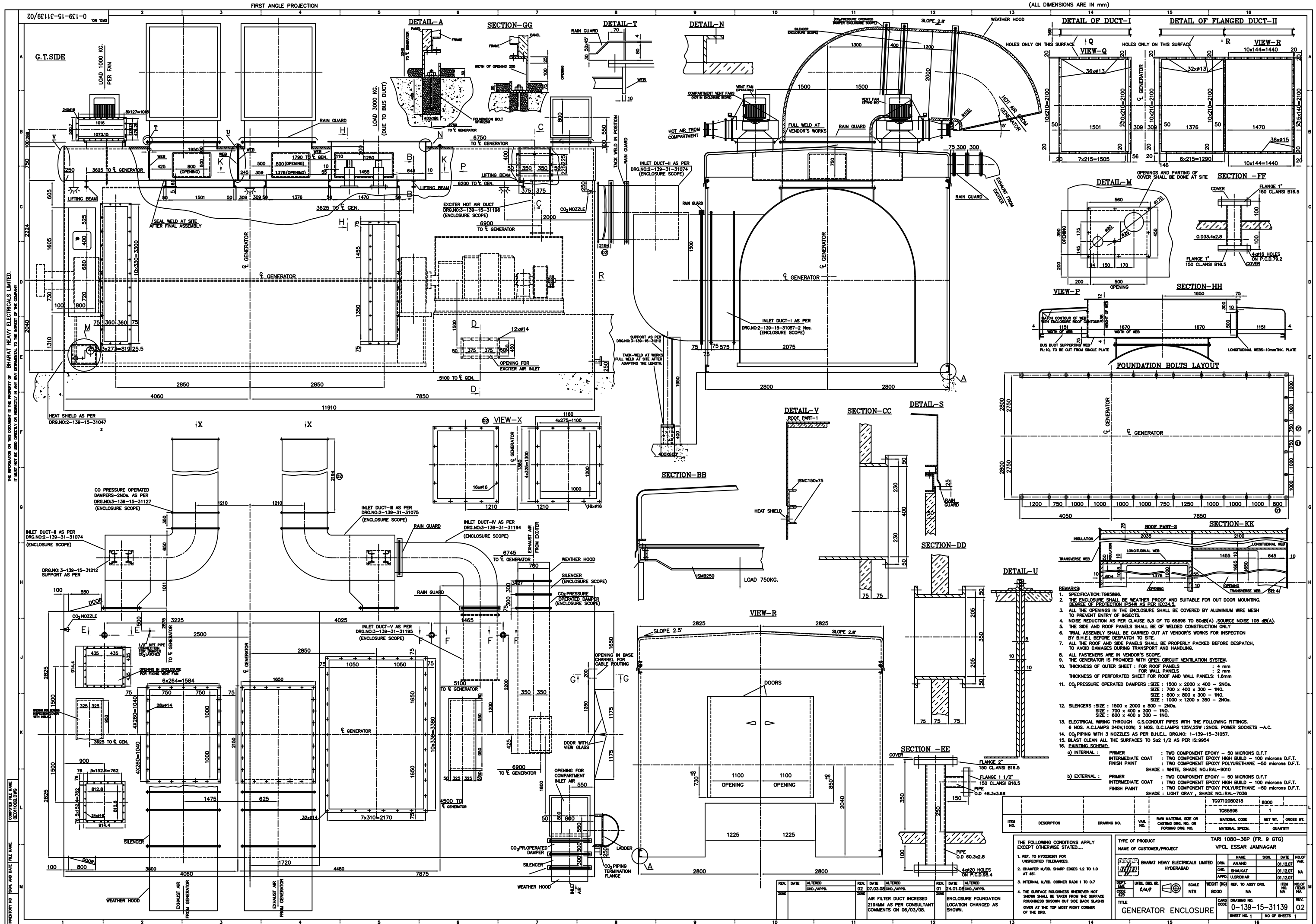


DETAIL F-4



SECTION D-4

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		FR-9, UPRATE			
BHARAT HEAVY ELECTRICALS LTD. HYDERABAD		NAME	SIGN	DATE	NO. OF
		DRG. J.C.S.		17.6.08	VAR.
		CHD. Y.V.R.		17.6.08	N.A.
		APPD. S.BABU		17.6.08	N.A.
DEPT. CODE 410		UNTL. DMS. OR N/A	SCALE 1:1	WEIGHT (KG) REF. TO ASSY. DRG. 109 E 9858	ITEM NO. NO. OF ITEMS
TITLE		DRAWING NO. 0-350-08-9100500		REV. NO. NO. OF SH. 02	
OFF BASE ENCLOSURE					



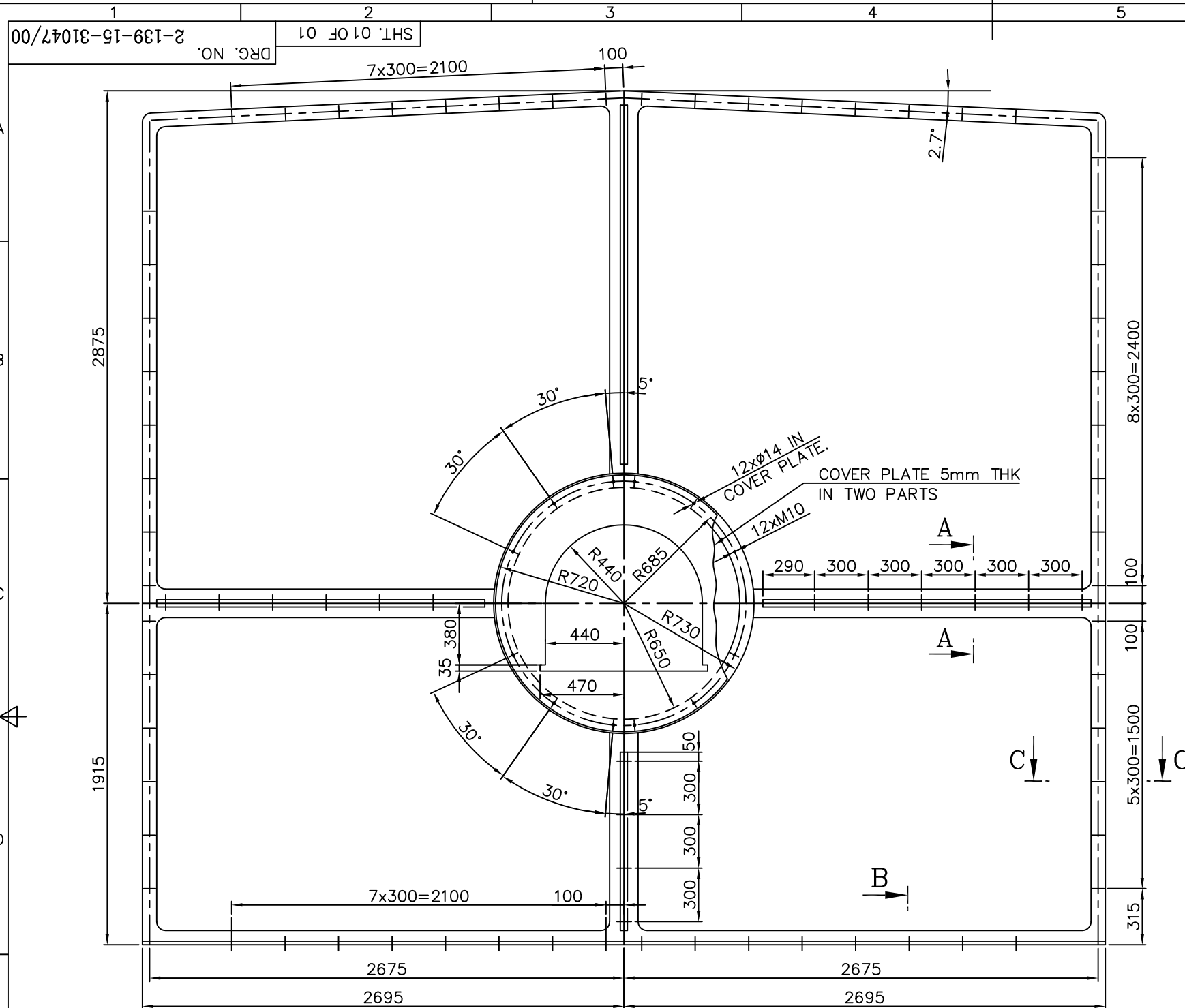




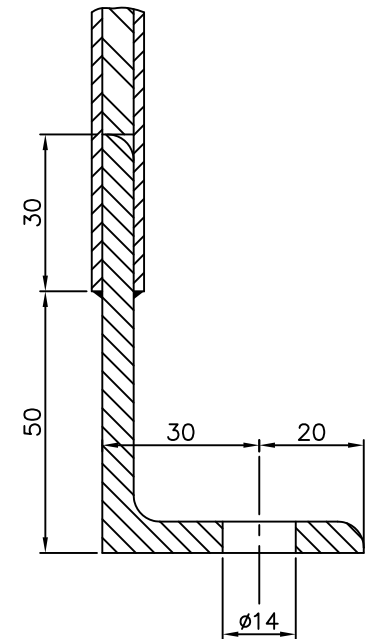
(ALL DIMENSIONS ARE IN mm)

INVENTORY NO	SIGN. AND DATE	REF. DRG. NO.	COMPUTER FILE NAME
		2EO 1047A	2EO1047A.DWG

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SECTION-BB



Technical drawing of a shaft with a keyway. The shaft is shown in cross-section with a key inserted into a keyway. The dimension  $d$  indicates the shaft diameter.

	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED	REV.	DATE	ALTERED
			CHD / APPD			CHD / APPD			CHD / APPD			CHD / APPD
	ZONE			ZONE			ZONE			ZONE		
		1			2			3			4	

						ASSEMBLY	960			
							1			
ITEM NO	DESCRIPTION	DRAWING NO.	VAR. NO.	RAW MATERIAL SIZE OR CASTING DRG.NO. OR FORGING DRG.NO.	MATERIAL CODE		NET WT.	GROSS WT.		
					MATERIAL SPECN.		QUANTITY			
THE FOLLOWING CONDITIONS APPLY EXCEPT OTHERWISE STATED...				TYPE OF PRODUCT OR TARI 1080-36P						
1. REF.TO HY0230261 FOR UNSPECIFIED TOLERANCES.				NAME OF CUSTOMER/PROJECT						
2. CHAMFER M/CD SHARP EDGES 1.2 TO 1.0 AT 45°.				 BHARAT HEAVY ELECTRICALS LTD. HYDERABAD			NAME	SIGN.	DATE	NO.OF VAR.
3. INTERNAL M/CD CORNER RADII 1 TO 0.7.						DRN.	G.SATISH			-NA-
4. THE SURFACE ROUGHNESS WHEREVER NOT SHOWN SHALL BE TAKEN FROM THE SURFACE ROUGHNESS SHOWN OUT SIDE BACK SLASHES GIVEN AT THE TOP MOST RIGHT CORNER OF THE DRG.						CHD.	G.HEMBRAM			
						APPD.	S.BUTCHAYYA			
DEPT. E.M.E		UNTOL. DIMS. GR. ø/M/F				SCALE	WEIGHT (KG)	REF. TO ASSY. DRG.	ITEM NO.	NO.OF ITEMS
CODE 425		ø/M/F				1:10	960	NA	NA	NA
TITLE							CARD CODE	DRAWING NO.		REV.
RADIATION SHIELD							-NA-	2-139-15-31047		00
								SHT. No 01	NO. OF SHT. 01	



**PRODUCT STANDARD**  
**ELECTRICAL MACHINES ENGINEERING**

TG 65896

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**ENCLOSURE FOR FR-9 G.T.G**

**1.0 Scope:**

This specification covers the requirements of generator enclosure to be designed, manufactured, supplied, erected and performance tested as detailed below.

**2.0 Construction:**

2.1 The enclosure shall be of panel construction.

2.2 Refer to relevant drawings mentioned in the order for constructional features and dimensional details.

2.3 The enclosures shall be manufactured as

- a) Support structure
- b) Side panels and doors
- c) Roof panels

2.4 The degree of protection for enclosure is IP54 as per IEC34.1. The enclosure shall be water and dust proof and all the joints shall be leakproof.

2.5 All lifting tackles shall be concealed.

2.6 The partitions shown inside, shall match contour of the machine components on which they rest. The partitions through which rotor passes shall be suitably split without having stiffness for facilitating easy assembly/disassembly.

2.7 Doors shall be hinged type with view glasses.

2.8 The covers on the openings shown in the drawing shall be sliding type. The sliding movement shall be smooth and free (by providing railing and roller arrangement).

2.9 Slope of top roofing on each side: 2.8°.

**3.0 Materials:**

3.1 Outer Sheet of Side panels: 2mm thk CRCW steel sheet as per IS: 513 DD

3.2 Outer Sheet of roof: 4mm thk. mild steel sheet as per IS: 1079 st.34.

3.3 Inner Sheet: 1.6mm performed mild steel sheet

3.4 Rubber Gaskets: Neoprene rubber sheets having temperature withstandability upto 120°C.

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Prepared

G. HEMBRAM

Approved

S.BUTCHAYYA

Date

4-3-97

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- 3.5 Partition Gaskets and side panel Gaskets: EPDM rubber as per TG 65849  
Temperature withstandability  
upto 180°C.
- 3.6 View Glasses: Toughened glass sheets (Acrylic sheet not acceptable)
- 3.7 Fasteners: All fixing bolts, screws, nuts and washers shall be galvanised.
- 3.8 Conduit Pipes: Galvanised steel pipes as per IS: 1239 part-I
- 3.9 Pipe Fittings: Galvanised steel fittings as per IS:1239 part – II.
- 4.0 Sealing:
- 4.1 Effective sealing shall be provided at the following places to prevent ingress of dust into the enclosure and transmission of noise.
- All doors, all covers, busducts openings.  
Side walls to base  
Side walls to roof  
Partition to machine surface.
- 5.0 Noise Control:
- 5.1 The inner surface of enclosure shall carry noise absorbing material like rock-wool to attenuate the noise emanating from the generator and exciter.
- 5.2 The rock-wool/glass-wool shall be in the form of blocks. They shall then be wrapped with glass cloth all around. Suitable partitions shall be provided in the side panels to prevent sagging of rock-wool sheets.
- 5.3 The maximum noise generated by generator and its auxiliaries is maximum 105 dB (A). This shall be reduced to:
- a) 80 dB (A) or less at 1m from the enclosure outer surface (near field noise) and  
b) 60 dB (A) or less at 120m from machine (far field noise).
- 5.4 Supplier shall achieve the noise levels mentioned in Cl.5.3. a & b. guarantee and prove them at site.
- 5.5 The enclosure itself shall not be a source of noise generation. It shall not rattle nor create any low frequency hum at operating speed of the machine (3000 rpm).
- 5.6 The supplier shall ensure that the natural frequency of enclosure is away from 50 HZ or its harmonics.


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	<p><b>6.0     <u>Electrical Wiring:</u></b></p> <p>6.1     The wiring shall be drawn through galvanised steel conduit pipes.</p> <p>6.2     The conduit pipes shall be run through the top channel of support structure.</p> <p>6.3     All the electrical fittings like switches, junction boxes etc. shall be flame proof.</p> <p>6.4     All the wiring shall terminate at outside the base of side wall in power socket.</p> <p>6.5     The supplier shall submit the electrical layout for approval of BHEL.</p> <p>6.6     All the switches shall be of concealed type.</p> <p><b>7.0     <u>Lighting:</u></b></p> <p>7.1     The enclosure shall be provided with industrial grade incandescent lamps of 100 W capacity of 230 V A.C. The no. of lamps required is indicated in the drawing.</p> <p>7.2     All the lighting fixtures shall be flexibly mounted to the side frame (not to the roof) such that the machine vibrations are not transmitted to the lamps.</p> <p>7.3     In addition to the A.C. lamps 2 nos. of D.C. lamps shall be provided; one near the generator front bearing area and the other near the generator rear bearing.</p> <p><b>8.0     <u>Dampers:</u></b></p> <p>Gravity/pressure operated dampers shall be provided in the enclosure at the openings if indicated in the drawing.</p> <p><b>9.0     <u>Fans:</u></b></p> <p>9.1     If any exhaust fans are shown in the drawing, they are in BHEL scope.</p> <p>9.2     Supplier shall assemble the BHEL procured fans on the enclosure at the indicated locations.</p> <p><b>10.0    <u>Surface Preparation &amp; Painting:</u></b></p> <p>10.1    All the metal parts shall be treated in 7-tank process before painting to remove rust, scales and grease. Alternatively the surfaces can be shot/sand blasted to achieve the required surface for painting. Required surface quality is Sa 2 ½ as per IS 9954.</p> <p>10.2    Unevenness, dents, nicks etc are not promissible on the outer surface.</p>	
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	<p>10.3 Paint both internal and external surfaces with</p> <ul style="list-style-type: none"> <li>i) One coat of epoxy primer.</li> <li>ii) One coat of 2 components epoxy finish paint at works.</li> <li>iii) One coat of 2 component epoxy finish paint at site.</li> </ul> <p>10.4 Colour : Shade No. 631 of IS5 (Light gray) unless otherwise indicated in the Drawing or in the order.</p> <p>11.0 <u>Assembly:</u></p> <p>11.1 The various compartments of enclosure shall match flush when assembled along its entire length.</p> <p>11.2 Complete enclosure shall be trial assembled at vendors works.</p> <p>11.0 <u>Outdoor Mounting:</u></p> <p>The enclosure shall be suitable for outdoor mounting only when specified on the Drawing.</p> <p>12.1 The support structure shall be designed to withstand the wind loads coming on the enclosure.</p> <p>12.2 The roof parts shall be free from cracks, pin holes, weld seam blow holes etc. The soundness of welds in the roof parts shall be checked with dye-penetrant.</p> <p>12.0 <u>Inspection:</u></p> <p>Immediately after receipt of order from BHEL, the vendor shall submit a quality plan indicating the proposed stages of inspection on the enclosure and its components. Based on the quality plan and technical requirements. BHEL will inform stage inspections and final inspections which will be witnessed by BHEL.</p> <p>13.0 <u>Test Requirements:</u></p> <ul style="list-style-type: none"> <li>i) Surface preparation for painting.</li> <li>ii) Painting thickness check.</li> <li>iii) Paint adherence check.</li> <li>iv) Degree of protection test in case of outdoor mounting only.</li> <li>v) Over all dimensions.</li> <li>vi) Waviness check.</li> <li>vii) Noise level test at site.</li> <li>viii) Trial assembly check.</li> </ul>	
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**15.0 Sampling:**

5% of the total panels shall be checked for tests i, ii, iii.  
100% of the panels and supporting structures and roof shall be checked for tests iv, v, vi, vii and viii.

**16.0 Test Certificates:**

3 copies of test certificates for all the tests at 14.0 shall be submitted.

**17.0 Marking:**

All the components shall be given a unique identification number and the same shall be indicated in the Assembly/Erection drawing. These numbers shall be tagged to the components before despatch.

**18.0 Packing:**

All the roof and side panels shall be packed in wooden boxes and fully covered before despatch. Supporting structure parts can be packed in wooden frames to prevent mechanical damage.

**19.0 Guarantee:**

The supplier shall furnish the guarantee certificate as having fulfilled various requirements outlined in this specification. The supplier shall replace rectify, replace damage items free of cost without jeopardising the purchaser's committed schedule.

**20.0 Rejection:**

BHEL has the right to reject the entire or part of the ordered equipment notwithstanding its initial acceptance if it does not meet the specification requirements and supplier shall replace the rejected equipment free of <sup>cost</sup> at the earliest without effecting BHEL commitments.

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