TECHNICAL SPECIFICATION FOR ACOUSTIC ENCLOSURE (85dB)

1.0 SCOPE :

This specification covers the broad guidelines on design, fabrication, supply & erection of Acoustic Enclosure for Steam Turbine or Steam Turbine & Gear Box at site to reduce average noise level, measured at 1 m distance from the nearest surface of acoustic enclosure and at 1.2 m height, to be less than 85 dB(A). An insertion loss of 20 dB minimum in noise level at 1.2 m height must be obtained with acoustic enclosure.

Acoustic Enclosure must satisfy all the requirements of ISO/FDIS 15667.

The scope of work covers design, engineering, manufacturing, supply and erection of Acoustic Enclosure at site for Steam Turbine or Steam Turbine & Gear Box as per this specification and drawing referred in the enquiry. Base/support structure, acoustic panels, fasteners, fixtures, gaskets, seals, equipment for lighting, ventilation system (exhaust silencers, tubular type exhaust fans, air intake manifolds etc.), control panel and all the electrical wiring from acoustic enclosure up to control panel shall fall within the scope of vendor.

The vendor shall demonstrate achievement of reduction in noise level by measurement at site as per ISO 11546-2. Complete responsibility of noise reduction at site is with vendor.

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2.0 IMPORTANT :

Design of Acoustic Enclosure is sole responsibility of vendor. Approval of drawings, calculations, quality plan etc. by BHEL shall in no way absolve vendor from either design responsibility or performance demonstration nor shall construct to allow any alteration in the scope of supply with respect to enquiry/purchase order.

3.0 PURPOSE :

The function of Acoustic Enclosure is to provide an overall covering to reduce the noise level resulting from TG set operation. It also provides an aesthetic look and protects TG set from ingress of dust, dirt etc.

4.0 DESIGN :

Broad guidelines on the design of acoustic enclosure are specified here. However, mechanical as well as fabrication design of acoustic enclosure is sole responsibility of the Acoustic Enclosure vendor.

Acoustic enclosure should be designed to meet the following requirements –

4.1 ISO/FDIS 15667.

4.2 The noise level of Turbine shall be reduced to less than 85 dB (A). The expected noise level due to Turbine set operation at various speeds without Acoustic Enclosure is 105 dB(A) maximum, i.e. insertion loss of 20 dB minimum in noise level must be obtained.

4.3 The supporting structure shall be sufficiently strong to withstand load of panels, and it must retain shape and size under all operating conditions and under the weight of personnel working on acoustic enclosure for assembly/dis-assembly etc. Vendor to submit STAAD analysis for our review.

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Prepared	Checked	Approved	Date
K.K. RAO	K.K. RAO	AK	01.08.2007

4.4 The top members including structural members shall be dismantlable without necessitating removal of side members for taking out Steam Turbine, & Gear Box etc. for repairs/maintenance purposes. Sidewalls should retain original shape and should not deflect or bend when roof panels/members are removed.

4.5 Roof panels should preferably be designed in such a way that panels on top of turbine & gear box shall be removable independently. No supporting member shall be located in this area.

4.6 Suitable induced ventilation system shall be provided to reduce heat build up and remove moisture, oil vapour or gases from inside and to allow comfortable environment for repair/inspection inside the enclosure. At least 20% ventilation capacity shall be located above Turbine set.

Ventilation system shall be designed for removal of heat as indicated in the purchase specification.

4.7 Sufficient illumination inside the enclosure shall be ensured for ease of inspection/repair (see Clause 5.6).

4.8 Electrical fitting & cabling shall be weather proof conforming to IP-55.

4.9 Perfect joint matching with well-defined corner without any sharp edge shall be ensured. Waviness, depression etc. on any panel is not acceptable.

4.10 Pipes coming out of the enclosure shall be properly sealed against vibration and noise.

3 **4.11** Suitable elastic mounts/damping material shall be used below column base plate to isolate acoustic enclosure from structure borne vibrations.

4.12 Doors shall be provided at indicated locations. Doors along with their seals shall be fitted neatly into the doorframes. Doors shall be provided with non-protruding locking arrangement and door catchers for locking and securing the doors in open position respectively.

Any change in location of doors may foul with equipment and, therefore, shall be done after prior approval of BHEL.

4.13 Acoustic enclosure shall be manufactured, erected and painted with good workmanship to give it excellent aesthetic look (see Painting Scheme/Instructions). Special attention shall be given to joints of side cover panel. Complete fit-up gaps shall be checked during trial assembly at vendor's works.

3 **4.14** Acoustic enclosure is to be designed / manufactured by the vendor keeping in view the actual site conditions, in order to avoid rework/rectification at site. If vendor desires to change the overall dimensions of the acoustic enclosure based on site conditions, prior approval of BHEL shall be obtained.

4.15 Outlets of Atmospheric Relief Diaphragm if applicable shall be brought outside the acoustic enclosure (ceiling) through suitable chutes/vertical shafts. Opening of chutes/ vertical shafts shall be covered with grills having opening 100x100 mm approximately.

4.16 All the controls of ventilation system, lighting and emergency lighting shall be provided on a single control panel.

4.17 One permanent ladder to reach the roof of the acoustic enclosure shall be provided. One permanent ladder to reach one level of the roof from another level of roof of the acoustic enclosure shall be provided (If Applicable).

4.18 Individual parts of the acoustic enclosure shall be marked permanently and visibly for ease of assembly /dismantling.

3 **4.19** Vendor is responsible for total design, supply & installation based on BHEL inputs. Hence vendor to confirm compliance. Any changes/modification required in enclosure till handing over to customer to suit site condition shall be carried out by vendor without commercial implications to meet the specification requirement.

3 **4.20** Turbine Enclosure vendor offer shall include any minor modifications at site to meet the site actual Erection condition such as

a) Additional Cut out for pipe openings and cable tray openings, shifting of door & exhaust fan location, Provision of any additional structural support.

b) 10% of additional material (Structure and panels) shall be considered by Enclosure vendor for any modifications/additions at site.

No price or delivery implications will be entertained during erection stage for the above.

3 **4.21** For modifications if required above 10% of surface area of the enclosure, the prices quoted in price schedule S.No. 03.c will be operated.

4.22 Vendor to note that modification based on site requirement shall be generally extending the panels/ fans etc. hence, vendor to quote optional prices for the item indicated in clause no. 14.2 below.

4.23 Loading:

The structures shall be designed to support the following and environmental loadings without permanent deformation.

Live Load: 150kg/cm^2

Dynamic Load: Loading due to crane holding and rail road shipment shall 1.5G's transverse and 2.5G's axial

5.0 CONSTRUCTIONAL DETAILS :

3 The acoustic enclosure is designed to be fixed on the embedded plates provided on the concrete floor on turbine deck. The Acoustic Enclosure basically consists of:

- Column, column base plate, supports and fasteners etc.
- Supporting structure
- Acoustic panels
- Ventilation System
- Lighting
- Control Panel

All the material of the construction shall be fire proof and shall not be get affected by heat, oil vapour. The sound absorbing material used should not impose any health hazard and shall be chemically inert particularly with oil.

5.1 Base structure :

3 Base structure consisting of channel, angle or rectangular hollow sections shall be fixed on embedded plate of turbine deck with help of column base plate. Column base plate shall be isolated from the embedded plate by appropriate elastic mounts/vibration damping material. The material of Base Frame shall conform to IS: 2062; Grade B.

A bridge structure shall be made to clear the pipeline and support panels, wherever any pipe is coming out. 3

All the supports and fasteners for securing the base frame to embedded plate/floor are in the scope of acoustic enclosure vendor.

5.2 Supporting Frame:

Infrastructure for supporting acoustic panels, doors etc. will be called Supporting Frame.

It must be possible to assemble the acoustic enclosure during initial stage of erection to form a self-supporting framework without need for elaborate erection aids. The material of Supporting Frame should conform to IS: 2062; Grade B.

5.3 Acoustic Panels:

The walls and roof of acoustic enclosure shall be fabricated out of acoustic panels of minimum 75 mm thickness having –

- Outer facing sheet of 1.5 mm thickness or more CRCA sheet (conforming to IS:513, grade O, Temper Designation "H")
- Inner perforated sheet of 1 mm thickness or more of galvanized steel (conforming to IS: 227; clause 8) with > 30% open space. Opening in perforated sheets shall be 3 to 5 mm diameter.
- Sandwiched absorbing mineral wool (conforming to IS: 8183) in between outside and inside facing sheets having a minimum density of 64 kg/m2.
- A glass fabric layer between mineral wool and inside perforated sheet.
- Proper adhesive sealing arrangement in-between the panels.

Minor variation in thickness of outer and inner facing sheets is acceptable provided combined thickness of both is 2.5 mm or more.

The acoustic material shall be adequately supported and be able to withstand vibration during turbine operation.

The acoustic panels shall be attached to the supporting frame structure by means of suitable fasteners preferably countersunk type. Acoustic panels should have large surface area and should be of uniform width and height as far as possible. All acoustic panels are arranged outside the supporting frame structure. The gap between two acoustic panels should not be more than 1.5 mm. Fitting design should be suitable for repeated assembly and disassembly.

5.4 Windows and Glass Doors :

Doors of 900x2100 mm size shall be provided at locations indicated in the drawing. Viewing windows consisting of non-tinted toughened float safety glass (TF) conforming to IS: 2553 (Part–1) of nominal thickness 6 mm or above, size 400x400 mm shall be provided in all the doors.

Doors in front of governing panels shall be of non-tinted toughened float safety glass (TF) conforming to IS: 2553 (Part–1) of nominal thickness 12 mm or above in a suitable metallic frame.

5.5 Ventilation System:

Acoustic enclosure shall be designed with required number of exhaust silencers equipped with heavy-duty operation fans to take care of the air intake and exhaust. All electrical fittings, cabling, fans etc. shall be weather proof conforming to IP-55. The fans shall be of axial tubular type of reputed make e.g. Nadi, Alstom or equivalent.

Ventilation system should incorporate suitable noise reduction measures (exhaust silencers - to contain noise level within specified limits) and sufficient number of air intake manifolds. The air intake manifolds should be located inside the acoustic enclosure.

5.6 Lighting :

Lights shall be installed inside the acoustic enclosure to provide sufficient illumination (300 LUX) for instrument reading and minor repairs. Provision of emergency lights suitable for 110V DC / 220 V DC supply (Shall be confirmed) should also be made to provide minimum 70 LUX illumination. DC lights shall be compulsory of LED type. 5 Necessary arrangement to be made in control panel for illumination in all possible cases of 3 wire and 4 wire system. 3

5.7 Wiring :

All wiring for lighting and ventilation system shall be done in weather proof galvanized iron conduits with receptacles, junction box etc.

All electrical fittings, cabling etc. shall be weather proof confirming to IP-55.

5.8 Control Panel :

The control panel will be Floor mounted, cubical pattern, dust & vermin proof, totally enclosed and gasketted made out of 16 gauges CRCA sheet having the following provisions:

- Required nos. of FSU complete with HRC fuses
- Single phase preventer and control fuses
- Required nos. of fan control circuit with necessary switch, contactor, overload relay & PB switches with indicating lamp.
- Provision for group starting of fan motors, indication-showing status of individual circuits.
- Provision for auto-change over of emergency lighting system from AC to DC source in case of power failure.
- Separate MCB to control outside light points
- The panel shall be complete with all internal wiring, connection and termination provision for incoming and outgoing cables including proper earthing provision & other safety requirements.
- Provision for auto-change over of exhaust fans to standby fan in case of working fan trip. 3
- Isolation transformer shall be provided to derive earthing from source supply of 415V, 3phase, 3 wire system.

6.0 NOISE LEVEL MEASUREMENT :

The reduction in average noise level shall be demonstrated by measurement as per ISO 11546-2. Due account of back ground noise shall be made while evaluating the noise level. A performance test report giving detailed noise calculation shall be provided showing:

6.1 Weighted overall sound pressure levels or octave-band data at specified positions, such as

- at 1 m distance from the acoustic enclosure,
- averaged over an enveloping surface,
- at a work station,
- inside the enclosure,
- at a specified reference point in the neighbourhood

6.2 A-weighted overall sound power levels and octave-band data of sound Emission from the acoustic enclosure and enclosed noise source.

Octave-band data of the sound emission from the acoustic enclosure or the sound source to be enclosed are preferred.

6.3 Demonstration of noise level below 85 dB(A) shall be done by vendor at site after the competition of erection of enclosure and same shall be mentioned in completion certificate. To achieve the noise level below 85 dB(A) vendor shall provide all the necessary sealing/acoustic material to reduce noise leakage. Complete responsibility of noise reduction at site is in vendor scope. 3

7.0 REFERENCE TO STANDARDS:

Latest revisions of the following codes shall be used for the design of acoustic enclosure:

ISO/FDIS 15667: Acoustics – Guidelines for noise control by enclosures and cabins; and VDI guidelines for the design of intake & exhaust system.

8.0 INSPECTION AND QUALITY PLAN :

The vendor shall submit Quality Plan separately for inspection to be carried out during procurement and shop working/fabrication, prior to receipt of items at site, and for inspection to be carried out at site during receipt at site, storage, pre-erection, erection and post-erection activities.

All material procured shall be identified and co-related to vendor's material certificates. These material certificates would be reviewed and checked for conformance to relevant specifications by BHEL. Dimensional measurement and visual inspection shall be carried out on materials by BHEL to check for defects/damages.

Painting thickness shall be checked as per specification/drawing.

Vendor will carry out all tests/inspection required to ensure that all materials procured conforms to the requirement of this specification. The inspection check list/quality plan shall be reviewed by BHEL and shall be approved subsequently. BHEL may identify customer hold points, to be witnessed by BHEL/customer's representative on inspection check list/quality plan. Vendor shall give inspection call well in advance (15 days) to enable BHEL to depute their inspector for the same.

9.0 PAINTING & CONSERVATION:

The acoustic enclosure will be painted with full/half gloss polyurethane paint. Alternatively, powder coating or panels fabricated from pre-powder coated sheets are also acceptable.

Shade of paint shall be 693 (Aircraft Grey) conforming to IS: 5 unless otherwise specified in enquiry/purchase order. Or as per project specific requirement. 3

If paint is damaged/scratched during shipment/storage, one coat of finfish paint shall be applied at site. 3

9.1 Full/Half Gloss Polyurethane Paint:

a) Prior to application of paint, surfaces to be painted shall be cleaned/prepared for painting as per IS: 8629 – part 2.
b) Two coats of epoxy based zinc rich primer paint (IS:14589) shall be applied (dry film thickness – 35 + 35 µm)

c) One coat of high build intermediate epoxy paint [BHEL specification AA56112, equivalent Epilux 4 HB Epoxy Coating (Berger Paints) or Epilac HB Epoxy Paint (Jenson & Nicholson paints)] shall be applied thereafter (dry film thickness - 70 µm).
d) Two finishing coats of full gloss polyurethane finishing paint (IS:13213) shall be applied (dry film thickness - 30 + 30 µm). The shade of the paint shall be intimated after placement of order.
e) The total thickness of paint shall not be less than 200 µm. 3
f) If paint is damaged/scratched during shipment/storage, one coat of "full gloss polyurethane finishing paint" (IS:13213) shall be applied at site (dry film thickness - 30 µm).

The primer paint, intermediate epoxy paint and finishing paint should be of same make.

9.2 Powder Coating :

Powder Coating process shall be preceded by phosphating as per IS:3618 – Class B (Medium Weight). Powder coating process shall be as per IS:13871 to achieve coating thickness 70 µm.

Panels fabricated out of pre-coated sheets as above are acceptable provided no damage to coating is ensured in fabrication process.

10.0 PRE-APPROVAL DOCUMENTS :

The vendor shall prepare the pre-approval documents based on this specification and the drawing furnished separately. These pre-approval documents are required in triplicate. Pre-approval documents consist of:

a) GA drawing of Acoustic Enclosure with part list and total weight.
b) GA drawing of control panel with control schematic total power requirement and physical location of the control panel.
c) Electrical wiring diagrams both for AC & DC.
d) Electrical Load list containing following details.
   i). Source of supply (AC/DC)
   ii). Electrical load in KW.
   iii). Number of feeder required both for AC & DC.
e) Base frame details.
f) Supporting frame details.
g) Acoustic panel details.
h) Ventilation Calculations as per clause 15.0.
i) Assembly plan
j) Plan for the lighting installation inside the acoustic enclosure.
k) Quality Plan

3 Vendor should visit the respective sites to discuss with BHEL representatives/customer to finalise the layout, locations & sizes & number of doors and general erection suiting to actual site requirements before start of fabrication of enclosure.
Vendor may give a call to BHEL for a joint visit to sites.

Approval of drawings and quality plan authorizes vendor to start manufacturing activity, but does not absolve the vendor from design/performance responsibility. BHEL shall have right to pass on approved drawings/quality plan to BHEL'S customers/authorized inspection agency.

11.0 FINAL DOCUMENTS :

11.1 6 hard copies of Operation and Maintenance manuals consisting of installation & assembly/disassembly instructions/ procedure, in addition to the document included in clause no. 10.0 above, shall be sent directly to the customer along with the consignment.

Two each of hard and soft copies (in CD's/ DVD's) shall be sent to BHEL separately.

11.2 5 copies of following certificates :

a) Material test certificates of sheet and mineral wool
b) Dimensional report
c) Visual and painting report

11.3 5 copies of performance test report.

11.4 One soft copy of the as built document as per site requirement and the certificate and reports as indicated in 11.2 and 11.3 above, shall be sent to BHEL, after completion of performance test at site.

12.0 PACKING AND CONSERVATION:

All the items shall be conserved and packed to avoid damage during shipment and handling. If paint is damaged/scratched during shipment, one coat of "full gloss polyurethane finishing paint" (IS: 13213) or the paint shade as specified in job specification shall be applied at site (dry film thickness - 30 µm) during erection.

4 The packing of acoustic enclosure consignment shall be suitable for harsh storage conditions for 6 months.

For the projects in abroad, the seaworthy packing will be required. The same shall be as per BHEL standard specification no.HY0490574.

13.0 CROSS-REFERRED STANDARDS:

- FDIS 15667
- ISO 11546-2
- IEC60079-0
- IS:5
- IS:2062
- IS:513
- IS:227
- IS:8183
- IS:3618
- IS:13213
- IS:8629
- IS:14589
- IS: 2553 (Part–1)
- IS:13871
- IS:13346
- AA56112
- IP-55

14.0 Vendor shall offer in line with following

14.1 The complete system is in line with specification and submit the deviation if any along with the offer.

14.2 Vendor to quote optional prices for the following items with individual prices. Structural & erection shall be included in the price quoted. The prices shall be considered in case of modification, if any while erection at site.

3

- Additional door
- Spare Exhaust fan
- Acoustic enclosure panel including structure & erection per Sqm price.

14.3 Seaworthy packing if applicable.

14.4 Vendor to submit ventilation calculation sheet as per clause no. 15.0, along with the offer.

14.5 Complete responsibility of noise reduction below 85 dB(A) at site is with vendor.

15.0 Sample ventilation calculation:

Project:		
Case1:		
Heat to be removed 'q' (Kcal/hr)	=	q
Specific heat of air at constant pressure(Kcal/kg-K)	=	0.257
Temperature difference °C (Max allowed rise in temperature of air going out)	=	5
Air quantity required to remove 'q' Kcal/hr heat	=	q / (0.257x5)
add 10% safety margin	=	
Therefore total air quantity required 'Q' CMH	=	
Case 2:		
Enclosure size	=	length x width x height
Volume 'V' (m^3)	=	
No. of Air changes 'A'	=	Q / V
if 'A'<K then		
Air quantity required to be handled (CMH)	=	K x V
otherwise		
Air quantity required to be handled (CMH)	=	Q
FAN Selection:		
Size	=	
Free Air delivery in m3/hr	=	
Volume flow in m3/hr at 20 mm WG#	=	
No. of fan required 'n'	=	
Total Number of Fans	=	(n) working + x* standby
Motor Rating	=	kw/ Pole
Motor Fan speed	=	RPM

Notes:
1. Considering the density of air as 1.0 kg/m^3
2. CMH Cubic Meter per Hour
3. K=Value of Number of Air Changes will be provided in purchase specification

* Minimum No. of standby fans required =1

Assumed Pressure Drop in Silencer. Vendor to do the calculation based on the pressure drop in the silencer to be supplied.

Annexure-I to purchase specification TC54327 Rev 05

PRICE SCHEDULE

Enquiry ref. No: Date:
Offer ref no. Date:

Sl.No	Description	Qty	Unit Price (In figures In words)	Total Price (In figures In words)
01	**Turbine Enclosure as per spec TC54327**	1		
02	**Erection & Commissioning activity for the complete Acoustic Enclosure at project Site**	Lump sum		
03	**Optional items (To be ordered if required later)**			
	a. Additional door	1		
	b. Spare Exhaust fan	1		
	c. Modification/additional requirement. Additional enclosure material including structure & its erection for modification.(For modifications envisaged over and above what is specified in clause 4.21)	XX Sq.m	Per Sq.m	
	Total for L1 evaluation {Sum of Sl.no. 01, 02, 03a, 03b and 03c above}			

Notes: 1) All Items in Sl.No.01, Sl.No.02 & Sl.No.03 are to be considered for L1 price evaluation
2) Erection and commissioning price vide Sl.No.02 above shall be valid for 2 years after placement of main order.
3) Validity of Optional items vide Sl.No.03 above shall be 2 Years after dispatch of consignment.
4) The quantity indicated against optional items 3a, 3b, 3c is for L1 evaluation purpose only, however the actual quantity will be as per the requirement and the unit prices will be operated for the additional quantity.

- The Un-priced Price schedule shall be furnished along with technical offer with 'QUOTED' marked against each item.
- The Price bid shall be furnished in this Price schedule format only with '**Price (in figures and words)' marked against each item.**

Vendor's Signature **Vendor's Company seal**

VARIANT TABLE

Var.No.	Description	Material code	Remarks
01	Turbine Enclosure as per TC64327-01	TC9754327017	
02	Turbine Enclosure as per TC64327-02	TC9754327025	
03	Turbine Enclosure as per TC64327-03	TC9754327033	
04	Turbine Enclosure as per TC64327-04	TC9754327041	
05	Turbine Enclosure as per TC64327-05	TC9754327050	
06	Turbine Enclosure as per TC64327-06	TC9754327068	
07	Turbine Enclosure as per TC64327-07	TC9754327076	
08	Turbine Enclosure as per TC64327-08	TC9754327084	
09	Turbine Enclosure as per TC64327-09	TC9754327092	
10	Turbine Enclosure as per TC64327-10	TC9754327106	
11	Turbine Enclosure as per TC64327-11	TC9754327114	
12	Turbine Enclosure as per TC64327-12	TC9754327122	
13	Turbine Enclosure as per TC64327-13	TC9754327130	
14	Turbine Enclosure as per TC64327-14	TC9754327149	
15	Turbine Enclosure as per TC64327-15	TC9754327157	
16	Turbine Enclosure as per TC64327-16	TC9754327165	
17	Turbine Enclosure as per TC64327-17	TC9754327173	
18	Turbine Enclosure as per TC64327-18	TC9754327181	
19	Turbine Enclosure as per TC64327-19	TC9754327190	
20	Turbine Enclosure as per TC64327-20	TC9754327203	
21	Turbine Enclosure as per TC64327-21	TC9754327211	
22	Turbine Enclosure as per TC64327-22	TC9754327220	
23	Turbine Enclosure as per TC64327-23	TC9754327238	
24	Turbine Enclosure as per TC64327-24	TC9754327246	
25	Turbine Enclosure as per TC64327-25	TC9754327254	

Variant Table

Var.No.	Description	Material code	Remarks
26	Turbine Enclosure as per TC64327-26	TC9754327262	
27	Turbine Enclosure as per TC64327-27	TC9754327270	
28	Turbine Enclosure as per TC64327-28	TC9754327289	
29	Turbine Enclosure as per TC64327-29	TC9754327297	
30	Turbine Enclosure as per TC64327-30	TC9754327300	
31	Turbine Enclosure as per TC64327-31	TC9754327319	
32	Turbine Enclosure as per TC64327-32	TC9754327327	
33	Turbine Enclosure as per TC64327-33	TC9754327335	
34	Turbine Enclosure as per TC64327-34	TC9754327343	
35	Turbine Enclosure as per TC64327-35	TC9754327351	
36	Turbine Enclosure as per TC64327-36	TC9754327360	
37	Turbine Enclosure as per TC64327-37	TC9754327378	
38	Turbine Enclosure as per TC64327-38	TC9754327386	
39	Turbine Enclosure as per TC64327-39	TC9754327394	
40	Turbine Enclosure as per TC64327-40	TC9754327408	
41	Turbine Enclosure as per TC64327-41	TC9754327416	
42	Turbine Enclosure as per TC64327-42	TC9754327424	
43	Turbine Enclosure as per TC64327-43	TC9754327432	
44	Turbine Enclosure as per TC64327-44	TC9754327440	
45	Turbine Enclosure as per TC64327-45	TC9754327459	
46	Turbine Enclosure as per TC64327-46	TC9754327467	
47	Turbine Enclosure as per TC64327-47	TC9754327475	
48	Turbine Enclosure as per TC64327-48	TC9754327483	
49	Turbine Enclosure as per TC64327-49	TC9754327491	
50	Turbine Enclosure as per TC64327-50	TC9754327505	

Variant Table

Var.No.	Description	Material code	Remarks
51	Turbine Enclosure as per TC64327-51	TC9754327513	
52	Turbine Enclosure as per TC64327-52	TC9754327521	
53	Turbine Enclosure as per TC64327-53	TC9754327530	
54	Turbine Enclosure as per TC64327-54	TC9754327548	
55	Turbine Enclosure as per TC64327-55	TC9754327556	
56	Turbine Enclosure as per TC64327-56	TC9754327564	
57	Turbine Enclosure as per TC64327-57	TC9754327572	
58	Turbine Enclosure as per TC64327-58	TC9754327580	
59	Turbine Enclosure as per TC64327-59	TC9754327599	
60	Turbine Enclosure as per TC64327-60	TC9754327602	
61	Turbine Enclosure as per TC64327-61	TC9754327610	
62	Turbine Enclosure as per TC64327-62	TC9754327629	
63	Turbine Enclosure as per TC64327-63	TC9754327637	
64	Turbine Enclosure as per TC64327-64	TC9754327645	
65	Turbine Enclosure as per TC64327-65	TC9754327653	
66	Turbine Enclosure as per TC64327-66	TC9754327661	
67	Turbine Enclosure as per TC64327-67	TC9754327670	
68	Turbine Enclosure as per TC64327-68	TC9754327688	
69	Turbine Enclosure as per TC64327-69	TC9754327696	
70	Turbine Enclosure as per TC64327-70	TC9754327700	
71	Turbine Enclosure as per TC64327-71	TC9754327718	
72	Turbine Enclosure as per TC64327-72	TC9754327726	
73	Turbine Enclosure as per TC64327-73	TC9754327734	
74	Turbine Enclosure as per TC64327-74	TC9754327742	
75	Turbine Enclosure as per TC64327-75	TC9754327750	

Variant Table

Var.No.	Description	Material code	Remarks
76	Turbine Enclosure as per TC64327-76	TC9754327769	
77	Turbine Enclosure as per TC64327-77	TC9754327777	
78	Turbine Enclosure as per TC64327-78	TC9754327785	
79	Turbine Enclosure as per TC64327-79	TC9754327793	
80	Turbine Enclosure as per TC64327-80	TC9754327807	
81	Turbine Enclosure as per TC64327-81	TC9754327815	
82	Turbine Enclosure as per TC64327-82	TC9754327823	
83	Turbine Enclosure as per TC64327-83	TC9754327831	
84	Turbine Enclosure as per TC64327-84	TC9754327840	
85	Turbine Enclosure as per TC64327-85	TC9754327858	
86	Turbine Enclosure as per TC64327-86	TC9754327866	
87	Turbine Enclosure as per TC64327-87	TC9754327874	
88	Turbine Enclosure as per TC64327-88	TC9754327882	
89	Turbine Enclosure as per TC64327-89	TC9754327890	
90	Turbine Enclosure as per TC64327-90	TC9754327904	
91	Turbine Enclosure as per TC64327-91	TC9754327912	
92	Turbine Enclosure as per TC64327-92	TC9754327920	
93	Turbine Enclosure as per TC64327-93	TC9754327939	
94	Turbine Enclosure as per TC64327-94	TC9754327947	
95	Turbine Enclosure as per TC64327-95	TC9754327955	
96	Turbine Enclosure as per TC64327-96	TC9754327963	
97	Turbine Enclosure as per TC64327-97	TC9754327971	
98	Turbine Enclosure as per TC64327-98	TC9754327980	
99	Turbine Enclosure as per TC64327-99	TC9754327998	

RECORD OF REVISION

Rev. No.	Date	Revision Details	Revised	Approved
00	01.08.2007	New Standard	--	
01	24.06.2008	Variant table added	K.K. RAO	A.K.
02	23.11.2009	Electrical fitting changed to weather proof and updated.	M.ASIM	S.K.DASH
03	18.04.2017	Revised as indicated – 3	KOTTA BHARATH	SUNIL B JIWTODE
04	08.08.2017	Revised as indicated – 4 Clause No.12	KOTTA BHARATH	SUNIL B JIWTODE
05	05.08.19	Revised as indicated – 5 Clause No.5.6. (DC LED Lights)	KOTTA BHARATH	SUNIL B JIWTODE