TAMILNADU GENERATION AND DISTRIBUTION CORPORATION

2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI

VOLUME-II B

TECHNICAL SPECIFICATIONS
FOR
VIBRATION ISOLATION SYSTEM
FOR
ID FAN FOUNDATION (4 NOS)
PA FAN FOUNDATION (4 NOS)
FD FAN FOUNDATION (4 NOS)

SPECIFICATION NO. PE-TS-412-618-C001

BHARAT HEAVY ELECTRICALS LIMITED
Project Engineering Management
PPEI BUILDING, HRD & ESI COMPLEX
Plot No. 25, Sector 16A
NOIDA, U.P. – 201301

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SECTION 'A'

SCOPE OF WORK

SCOPE

1. Supply of Vibration Isolation System (VIS)

i) Vibration Isolation System (VIS)
ii) Tools and facilities required for erection and commissioning including seaworthy packing & transportation etc. complete.

2. Supervision of erection and commissioning of the VIS.

Vendor shall deploy experienced manpower for setting the VIS in position and final adjustments after machine installation. Vendor shall also confirm the readiness at site before deploying the manpower for supervision of erection. Vendor shall furnish proposed erection strategy of the entire system and procedure for replacement of VIS and downtime involved.

3. Design & Engineering for the Vibration Isolation System

Design and engineering shall consist of the following:

i) Selection of Vibration Isolation System (VIS).
ii) Static and dynamic analysis and design of RCC deck slab (supporting arrangement for the equipment supported on VIS)
iii) Calculation of loads on supporting structure along with their points of application and deflection limitations.
iv) Calculation should establish that no dynamic loads are transferred to the structure supporting VIS and that the foundation system meets the amplitude/frequency requirements.
v) Checking of stiffness for structure supporting VIS.

4. Documentation

Vendor shall furnish following documents:

i) Bill of materials of various elements included in the supply along with detailed specifications of system and various items included in supply and standards local or international standards to which they conform.
ii) General Arrangement (GA) drawing showing location and supporting details of VIS.
iii) GA and reinforced concrete details drawings for deck slab including bar bending schedule.
iv) Embedment drawings showing location of all embedment and their details pertaining to RCC deck slab.
v) Design document
vi) Methodology of providing the shuttering and its removal as well as concreting of deck slab, installation of VIS and sequence of above operation.
vii) Installation and maintenance manual indicating equipment, procedures, etc. necessary for installation/maintenance VIS.

viii) List of power plants where such systems have been successfully installed for such applications.

ix) Performance certificate from the end user/customer for at least two successfully executed contracts for such system.

SECTION 'B'

PROJECT INFORMATION

PROJECT INFORMATION

OWNER	TAMILNADU GENERATION AND DISTRIBUTION CORPORATION(TENGEDCO)
CONSULTANT	DESIGN PRIVATE LIMITED, DESIGN HOUSE, GREATER KAILEASH-II, NEW DELHI
NAME OF PROJECT	2X660 MW ENNORE SEZ COAL BASED STPP AT ASH DYKE OF NCTPS, CHENNAI
SITE LOCATION	The proposed site for main power plant is located near Ennore port (approx. 5 kms)
NEAREST RAILWAY STATION	Nearest Railway Station is Athipattu Pudunagar (5 kms.)
NEAREST VILLAGE	Vayalur
NEAREST TOWN & CITY	Chennai (35 kms.)
NEAREST AIRPORT	Chennai (60 kms.)
NEAREST SEAPORT	Ennore (5 kms.)
Climatic Conditions	
a. Temperature	
i) Maximum (Average)	$32.0^{0}C$
ii) Minimum (Average)	$24^{0}C$
iii) Design ambient temperature	$35^{0}C$

SECTION 'C'

SPECIFIC TECHNICAL REQUIREMENTS

1. General Requirement

1.01. Vendor shall supply vibration isolation system for ID(4 nos.), PA(4 nos.) & FD(4 nos.) fan foundation. The vibration isolation system shall consist of steel helical spring units and viscous dampers. The type and number of springs shall be selected based on the input drawings as per Table-1 to satisfy the design requirement as per the section –C and section-D. The spring units shall conform to DIN 2089 and DIN 2096.

Table-1

Sl. No	TITLE	DRAWING NO.
1	GENERAL ARRANGEMENT OF INDUCED DRAFT FAN SAF 38.5/25-1	1-00-099-28997 (R0)
2	GENERAL ARRANGEMENT OF PRIMARY AIR FAN PAF 20/11.2-2	1-00-100-28998 (R0)
3	GENERAL ARRANGEMENT OF FORCED DRAFT FAN FAF 26.6/12.5-1	1-00-098-28996 (R0)

1.02. The helical spring units and viscous dampers supplied by vendor should be of proven make.

1.03. Isolation efficiency of at least 90% shall be provided for the fan foundation.

2. Seismic Loading:

The site is located in Zone III as per IS: 1893/Part I -2003 & IS: 1893- Part II- 2005.
Zone factor(Z) shall be 0.16
Importance factor shall be considered as 1.75.

Type of soil : soft

3. Wind Loading :

Basic wind speed at project site is 50 m/sec. as per IS: 875-1987 (Part 3).

Probability factor,(k1 risk coefficient), terrain, height and structure size factor, k2 and topography factor, k3 shall be as per IS:875.

4. Material of construction

i. Grade of Concrete M35.
ii. Reinforcement bars shall be as per the following codes:
TMT of Grade Fe 500 : IS 1786
Mild steel bars : Grade I of IS: 432

5. **Documents to be submitted by vendor**

i. Soft copy of all documents/drawings shall be furnished in pdf and AutoCAD format as applicable.
ii. Hard copies shall also be submitted.
iii. Submission of civil drawings/documents shall be as mentioned in the table-2.

Table-2

	Drawing	Document
For Approval	Soft copy + 4 nos. hard copies	Soft copy + 4 nos. hard copies
For RFC	Soft copy + 7 nos. hard copies	

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SECTION - D

SUB-SECTION – D26

VIBRATION ISOLATION SYSTEM

SPECIFICATION NO. PE-TS-999-600-C026

Bharat Heavy Electricals Limited

Project Engineering Management

C0NTENT

VIBRATION ISOLATION SYSTEM

1.00.00 SCOPE

This section covers supply, supervision of erection/ commissioning & design engineering of the vibration isolation system (VIS) suitable for ID/PA/FD Fans/ TDBFP/MDBFP/TURBOGENERATORS/MILLS .The vibration isolation system shall be of proven make and should be in successful operation for similar machines.

2.00.00 Supply of VIS

VIS shall be supplied complete along with recommended spares if any. The selection of VIS shall be done by the vendor, in case not done by customer , so that the amplitude at bearing locations are within permissible limits as per machine supplier recommendation or ISO10816 whichever is governing and no dynamic loads are transferred to the structure supporting VIS. Minimum 90 % isolation shall be achieved and the system shall be capable of withstanding Seismic/Wind forces.

3.00.00 Supervision of Erection and Commissioning

3.01.00 Manual

Vendor shall supply installation and maintenance manual indicating equipment, procedures etc. necessary for installation and replacement of VIS with downtime involved.

3.02.00 Tools and facilities

Vendor shall supply all tools and facilities as required for successful erection and commissioning of VIS. Vendor shall deploy experienced manpower to supervise successful installation of VIS

4.00.00 Design Engineering of Vibration Isolation System

4.01.00 Dynamic Analysis

The dynamic analysis shall consist of free vibration analysis and forced vibration analysis. Isolation efficiency of at least 90 % shall be obtained. The fundamental natural frequency shall be sufficiently above or below the

frequency corresponding to operating speed .Vibration amplitude shall be calculated at all bearing locations and shall satisfy the permissible limits as per ISO 10816 or as specified by the machine supplier. Transient analysis shall be carried out for the short circuit /blade failure condition with an appropriate force function if required by the machine supplier. The forces for which substructure is to be designed shall be furnished.

4.02.00 Static Analysis

The static analysis shall include the

a) Dead weights of machine stationary parts,
b) Dead weights of machine rotary parts
c) Loads due to machine power torque
d) Loads due to maximum allowable unbalance
e) Temperature loads
f) Loads due to blade unbalance/short circuit
g) Erections loads
h) Seismic Loads
i) Any other loads given by the supplier

Various load combinations must be investigated to obtain the most severe loads for foundation design purpose as per relevant IS codes or as per machine supplier recommendation whichever is more critical.

4.03.00 Check for Shaft Misalignment

Foundation deck must be adequately stiff to withstand all operating load combinations without excessively upsetting the rotor shaft alignment .The structural design must carefully be analysed for relative deflection for the members supporting machine shaft to satisfy the limits as given by machine supplier if any.

4.04.00 Design of RCC deck supported on VIS

Vendor shall provide General arrangement drawing of deck showing location and supporting detail of VIS, all embedment and their details as per the machine supplier drawing.

RCC design shall be done by working stress method for all machine foundations. Minimum reinforcement shall be governed by IS : 2974 as well IS : 456.

All documents/drawings shall be supplied in 25 (twenty five) prints. All calculations shall be supplied in 6 (six) sets. Soft copy of the drawings in Auto Cad shall be supplied along with the soft copy of the documents supplied

All documentation shall be in English language and all RCC/structural design shall be conforming to the relevant Indian Standard Code of practice.

5.00.00 Quality Plan and Test Certificate

Vendor shall furnish the quality plan and Test certificate for the hardware in their scope of supply. The quality plan shall be reviewed by BHEL /Consultant wherein the inspection and hold points shall be indicated. Vendor shall submit test certificate based on approved Quality Plan. Despatch of material by the vendor shall only take place after the receipt of Material Dispatch Clearance Certificate (MDCC) issued by BHEL/Consultant on the basis of test reports/test certificates submitted by the Vendor after manufacture.

6.00.00 Environmental Protection

VIS shall be suitably protected against environmental damages e.g. abrasion, discolouration, corrosion, oily water etc. to give a prolonged service matching the plant life.