BHARAT HEAVY ELECTRICALS LIMITED

TRANSMISSION PROJECTS ENGINEERING MANAGEMENT

DOCUMENT No.	TB-348-316-004	Rev no.-00	Prepared	Checked	Approved
TYPE OF DOC.	TECHNICAL SPECIFICATION	NAME	SK	SKS	AS
TITLE		SIGN			
SPECIFICATION FOR 400kV POST INSULATORS		DATE	28.12.11	28/12/11	29/12/11
		GROUP	TBEM	W.O. No	80010

CUSTOMER/ CONSULTANT	**The West Bengal Power Development Corporation Ltd. / Development Consultants Private Ltd. Kolkata**
PROJECT	**2X500MW thermal power extension project Unit-3 & 4 at Sagardighi- 400KV Switchyard**

CONTENTS

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS

Distribution		TBTS	O/C	TBMM	TBQM	TBCM
	To					
	Copies	-	1	3	-	-

SECTION 1
SCOPE, SPECIFIC TECHNICAL REQUIREMENTS AND QUANTITIES

1.1 SCOPE:

This technical specification covers the requirements of design, manufacture, testing at works, packing and dispatch of post Insulators complete with accessories as listed under this specification.

This section covers the specific technical requirements of Isolators. This constitutes minimum technical parameters for the above item as specified by the customer (WBPDCL). The offered equipment shall also comply with the General Technical Requirements for the project as detailed under section-3 of this specification.

The specification comprise of following sections:
Section-1: Scope, specific technical requirements & Bill of Quantities.
Section-2: Equipment specification under scope of supplies.
Section-3: General technical requirements for all equipments under the project.
Section-4: Equipment Data Sheet
In case of any conflict between various sections, order of precedence shall be in the same order as listed above.

The equipment is required for the following project:

Name of customer : The West Bengal Power Development Corporation Ltd.

Name of Consultant : Development Consultants Private Ltd. Kolkata

Name of the project : 2X500MW thermal power extension project Unit-3 & 4 at Sagardighi- 400KV Switchyard

1.2 SPECIFIC TECHNICAL REQUIREMENTS:

Sl. No.	TECHNICAL PARAMETERS	400kV
1.	Type	Solid Core
2.	Voltage Class (kV)	420
3.	Rated frequency(Hz)	50
4.	Design Ambient Temperature(°C)	50
5.	Applicable IS	2544
6.	Dry and wet one minute power frequency withstand voltage (kV rms)	680
7.	1.2x50µs impulse withstand Voltage (kVp)	1425
8.	Switching impulse withstand voltage (kVp)	1050
9.	Maximum radio interference voltage at 1MHz & 266kV rms phase to ground voltage	1000 micro volt
10.	Corona extinction voltage (kV rms).	320(min.)
11.	Cantilever strength (per stack)	**8kN**
12.	Minimum Torsional moment	As per IEC -273
13.	Total height of Insulator (mm)	**3650**

14.	P.C.D	
	Top(min.)	127
	Bottom(min.)	300
15.	No. of bolts.	
	Top	4
	Bottom	8
16.	Diameter of Bolt/holes(mm)	
	Top	M16
	Bottom	18
17.	Pollution levels as per IEC-815	Heavy (III)
18.	Minimum total creepage distance for heavy pollution (mm)	**10500**
19.	Seismic Acceleration	0.3g
20.	System Neutral earthing	Effectively grounded

Note-If Corona extinction voltage is to be achieved with the help of Corona ring or any other similar device, the same shall be deemed to be included in the scope of the Contractor and to be indicated clearly.

1.3 QUANTITIES:

1.3.1 QUANTITY:

Sl. No.	Description	Main Qty.	Spare Qty.
1.	420kV Bus Post Insulator with Corona Rings	52 Nos.	0
2.	420kV Post Insulator Without Corona Rings	156 Nos.	6 Nos.

1.3.2 Mandatory special tests – Following special tests listed under shall be carried out on post insulators (as per IS: 2554/ IEC: 168).

(1)Test for deflection under load (clause 5.3).

(2) Radio interference test (see IEC 60437)

(3) Artificial pollution test (see IEC 60507)

1.3.3 Accessories Required

Nut, Bolts & Spring Washers for following must be supplied with each BPI.

(1) For interconnecting insulator units.

(2) For fixing BPI on support steel lattice structure (Steel structure thickness-12mm).

Note -1 -Prices for accessories shall be included in the equipment prices.

Note-2--The Quantities indicated above is subject to change by ±20%

1.4 TYPE TESTS:

Bidder shall submit valid type test reports (as per relevant IEC/IS standard) for the tests carried out within last five years from the date of LOA (**i.e. 22.02.2011)** . The reports should have been conducted on identical or similar equipment/components to those offered. In case type test reports are more than 5 years old (from the date of LOA) or the reports of type tests are found to be technically unacceptable , the type test shall be conducted by the vendor without cost and delivery implication to BHEL.

1.5 INSPECTION & TESTING:

Before being fitted on the equipment, all components shall be subjected to routine tests at the Contractors factory, as per the relevant IEC/IS standards. A detailed test report proving the successful passing of such tests shall be provided.

Prior to dispatch, the routine & acceptance tests shall be carried out on equipment in accordance with the applicable IEC /IS and the material shall be offered for final inspection to BHEL and WBDPCL in accordance with agreed quality plan with 3 weeks advance information.

1.6 QUALITY PLAN:

The contractor shall carry out contract works in accordance with sound quality management principles which shall include such as controls which are necessary to ensure full compliance to all requirements of the specification & applicable international standards. These quality management requirement shall apply to all activities during design, procurement, manufacturing, inspection, testing, packaging, shipping, inland transportation, storage, site erection & commissioning. Contractor shall submit detailed Quality Plan for BHEL / customer's approval.

- - x x - -

SECTION - 2
EQUIPMENT SPECIFICATION

1. GENERAL

This section covers the general technical requirements of support Insulators. In case of any discrepancies between the requirements mentioned in this section and those specified in other sections of this specification, this section shall prevail and shall be treated as binding requirements

2. APPLICABLE STANDARDS :

Sl. No.	STANDARD	DETAILS
1.	Zinc Ingot	IS:209-1992
2.	Porcelain Post Insulators for systems. with nominal voltage greater than 1000V	IS:2544–1973 IEC 168-1994
3.	Method for testing uniformity of coating of Zinc coated articles.	IS:2633-1986
4.	Recommended practice for hot dip Galvanising on iron & steel	IS:2629-1985
5.	Hot dip Zinc coating on Structural steel and other allied products.	IS:4759-1984 ASTMA-153
6.	Electric power connectors	IS:5561-1970
7.	Method for determination of mass of zinc coating on iron and steel articles.	IS:6745-1972
8.	Dimensions of Indoor and outdoor porcelain post insulators and post insulator units for system with nominal voltage greater than 1000V Part 3 Outdoor pedestal post insulators.	IS:5350-1971 IEC273–1990
9.	Methods for switching impulse tests on high voltage insulators	IS:8269-1976 IEC 506-1975
10.	Methods for artificial pollution tests on high voltage insulators for use on AC systems.	IS:8704-1978 IEC 815 1986
11.	Specification for timber species suitable for wooden packaging.	IS:6662-1980
12.	Methods for radio interference test on high voltage insulators.	IS:8263-1976/ IEC437-1973
13.	Wet process porcelain Insulators	ANSI-C29
14.	Test methods for electrical power insulators	ANSI-C29.1
15.	For wet process porcelain Insulators apparatus post type	ANSI-C29.8
16.	Indian Electricity Rules	IE Rules 1956

3. CONSTRUCTIONAL FEATURES

3.1 The Post insulators shall conform in general to latest IS: 2544, IEC-168 and IEC-815.

3.2 Post type insulators shall consist of a porcelain part permanently secured in a metal base to be mounted on the supporting structures. They shall be capable of being mounted upright. They shall be designed to withstand any shocks to which they may be subjected to by the operation of the associated equipment. Insulators of identical

rating shall be interchangeable. Insulator having sufficient cantilever strength shall be of wet process porcelain, brown glazed and free from all blemishes.

3.3 Porcelain used shall be homogeneous vitreous , free from lamination, cavities and other flaws or imperfections that might affect the mechanical or dielectric quality and shall be thoroughly vitrified, tough and impervious to moisture.

3.4 Glazing of the porcelain shall be of uniform brown in colour, free from blisters, burrs and other similar defects.

3.5 The insulator shall have alternate long and short sheds with aerodynamic profile. The shed profile shall also meet the requirements of IEC-815 for the specified pollution level.

3.6 When operating at normal rated voltage there shall be no electric discharge between conductor and insulators which cause corrosion or injury to conductors or insulators by the formation of substance produced by chemical action.

3.7 The design of the insulators shall be such that stresses due to expansion and contraction in any part of the insulator shall not lead to deterioration.

3.8 All ferrous parts shall be hot dip galvanized in accordance with the latest edition of IS: 2633, & IS: 4579. The zinc used for galvanizing shall be grade in 99.55 as per IS: 209. The zinc coating shall be uniform, adherent; smooth reasonably bright, continuous and free from imperfections such as flux ash, rust stains, bulky white deposits and blisters. The metal parts shall not produce any noise generating corona under the operating conditions.

1. Every bolt shall be provided with a steel washer under the nut so that part of the threaded portion of the bolts is within the thickness of the parts bolted together.
2. Flat washer shall be circular of a diameter 2.5 times that of bolt and of suitable thickness. Where bolt heads/nuts bear upon the beveled surfaces they shall be provided with square tapered washers of suitable thickness to afford seating with the axis of the bolt.
3. All bolts and nuts shall be of steel with well-formed hexagonal heads forged from the solid and shall be hot dip galvanised. The nuts shall be good fit on the bolts and two clear threads shall show through the nut when it has been finally tightened up.

3.9 Bidder shall make available data on all the essential features of design including the method of assembly of shells and metals parts, number of shells per insulator, the manner in which mechanical stresses are transmitted through shells to adjacent parts, provision for meeting expansion stresses, results of corona and thermal shock tests, recommended working strength and any special design or arrangements employed to increase life under service conditions.

4. TESTS

In accordance with the stipulations of the specification, the post insulators shall be subjected to type, acceptance, sample and routine tests as per IS: 2544 and IEC-168 latest version.

4.1 In accordance with the requirements stipulated under section 3, the Post Insulator should have been type tested as per IEC/IS and shall be subjected to routine and

acceptance tests in accordance with IS/IEC document. Type test reports of the tests conducted earlier on similar equipment shall be submitted. It is the responsibility of the supplier to get the type test reports approved from the ultimate customer (WBPDCL) with no commercial implications to BHEL. If the valid type test reports are not available with the bidder then the tests shall be conducted by the bidder free of cost.

4.2 Type Tests

1. Visual examination
2. Verification of dimensions
3. Visible discharge test
4. Impulse voltage withstand test
5. Dry power –frequency voltage withstand test
6. Wet power –frequency voltage withstand test
7. Temperature cycle test
8. Test for mechanical strength
9. Puncture test (for insulators Type B only)
10. Porosity test
11. Galvanizing test
12. Switching impulse test
13. Measurement of R.I.V (Dry)
14. Corona extinction voltage test (Dry)
15. Test for deflection under load

4.3 In addition to acceptance/ sample/routine tests as per IS: 2544 and IEC-168, the following tests shall also be carried out.

a) Ultrasonic test as an acceptance test
b) Soundness test, metallurgical tests and magnetic test on MCI caps and pedestal tests as acceptance test.
c) All hot dip galvanized components shall be subject to check for uniformity of thickness and weight of zinc coating on sample basis.
d) The bending test shall be carried out at 50% minimum failing loads in four directions as a routine test and at 100% minimum failing load in four directions as an acceptance test.
e) Acceptance norms for visual defects allowed at site and also at works shall be agreed in the quality plan

5. DRAWINGS/DOCUMENTS SHALL BE SUBMITTED AT THE CONTRACT STAGE

1. Type test reports
2. General Technical Particular (GTP)
3. Complete technical literature supported by catalogues
4. GA drawing of Bus Post insulator indicating the following
   (i) Details of insulator and hardware assembly
   (ii) Fixing details top and bottom
   (iii) Creepage distance & shed profile

(iv)Mounting arrangement for both fixed and sliding tubular bus clamp and expansion joints
(v) Cantilever strength
(vi) Corona shield drawing and its fixing arrangement
(vii) Quality plan
(viii) Field Quality plan
(ix) Installation Instruction
(x) Storage Instruction
(xi) Installation and maintenance manual

SECTION-3

3.0 GENERAL

This section stipulates the General Technical Requirements under the Contract and will form an integral part of the Technical Specification.

The provisions under this section are intended to supplement general requirements for the materials, equipments and services covered under other respective sections and are not exclusive. However in case of conflict between the requirements specified in this section and requirements specified under other sections, the requirements specified under respective sections shall hold good.

3.1 PROJECT INFORMATION AND SYSTEM PARAMETERS

a)	Customer/ Purchaser/ Owner	The West Bengal Power Development Corporation Ltd.
b)	Consultant/Owner's Engineer	Development Consultants Private Ltd. Kolkata
c)	Project Title	2X500MW thermal power extension project Unit-3 & 4 at Sagardighi- 400KV Switchyard
d)	Location	Site is located at Manigram village of Murshidabad district in West Bengal and around 240kM from Kolkata. 13kM north of Sagardighi town by the side of the SMGR(Sagardighi Manigram –Gankar Raghunathganj) road at a distance of 20kM from National Highway 34 . Nearest railway station is Manigram adjacent to the site on Bandel-Barhawara branch line and 6.5kM from Sagardighi railway station on Sainthia-Azimhunj line of eastern railway. Nearest Airport - Kolkata. Nearest Seaport-Kolkata/Haldia
e)	Altitude	34 m above MSL
f)	Transport Facilities	Road/Rail
g)	Postal Address	To follow
SITE CONDITIONS		
a)	Maximum Design ambient dry bulb temperature	50°C
b)	Minimum Design ambient dry bulb temperature	5°C
c)	Average Relative humidity (for design)	73 %
d)	Maximum relative humidity	84%

e)	Pollution Severity	Heavily Polluted
f)	Seismic zone	III
g)	Wind velocity	47m/sec.
h)	Wind pressure	150kg/sq.mts
i)	Terrain category	2
j)	Risk coefficient (K1)	1.07
k)		
l)	Average rainfall	1389mm

SYSTEM PARAMETERS

Nominal system voltage	**400 kV**
Highest system voltage	420 kV
Basic Impulse level(dry /wet)	1425kVP
Power frequency withstand voltage dry/wet	630kVrms
Switching Impulse withstand voltage Phase to Earth	1050kVP
Switching Impulse withstand voltage Phase to Phase	1575kVP
Maximum radio interference voltage at 1MHz & 266kV rms phase to ground voltage	1000 Micro volt
Rated short time current	40 kA for 1 sec
Frequency	50 Hz
Creepage distance	25mm/kV
System Earthing	Effectively Earthed

AUXILIARY POWER SUPPLY

3 phase A.C power supply	415V ±10%, 50 Hz±5%, 3-phase 4 wire,50kA, solidly earthed, combined voltage and frequency variation ±10%
1 phase A.C power supply	240V±10%, 50 Hz±5%, 1-phase AC supply
D.C. power supply	220V ±10%, 2-wire , 25kA, ungrounded 48V ±10%, 2 wire system positively earthed

3.2 GENERAL TECHNICAL REQUIREMENT

3.2.1 TYPE TESTS

All equipment/systems to be supplied shall conform to type tests as per relevant standards and proven type. The Bidder / Contractor shall furnish the reports of all the type tests carried out in within last **five years from the date of LOA (i.e. 22.02.2011)** as listed in relevant clauses in

respective electrical specification and relevant standards for all components / equipment / systems. These reports should be for the tests conducted on identical/similar components/equipment/systems to those offered/proposed to be supplied under this contract.

Type tests done in an independent government laboratory or in the presence of representative of State Electricity Board or other reputed public undertakings, the type test reports of the same shall be submitted for scrutiny /approval. If these are found suitable and technically acceptable. conducting of type tests shall be waived off.

In case Contractor is not able to submit report of type test(s) conducted in last five years, or in case type test report(s) are not found to be meeting the specification/relevant standard requirements, then all such tests shall be conducted under this contract by the Bidder free of cost to Employer/Purchaser, and reports shall be submitted for approval. No charges shall be paid under this contract. All acceptance and routine tests as per relevant standards and specification shall be deemed to be included in the bid price.

3.2.2 CODES AND STANDARDS

All materials and equipment shall generally comply in all respect with the latest edition of relevant international electro-technical commission (IEC) or any other internationally accepted standard which ensure equal or better quality or relevant Indian standard(IS) mentioned against each equipment and this specification.

3.3 MATERIAL/WORKMANSHIP

3.3.1 General Requirement

Where the specification does not contain characteristics with reference to workmanship, equipment, materials and components of the covered Equipment it is understood that the same must be new, of highest grade of the best quality of their kind conforming to best engineering practice and suitable for the purpose for which they are intended.

The design of the Works shall be such that installation, future expansions, replacements and general maintenance may be undertaken with a minimum of time and expenses. Each component shall be designed to be consistent with its duty and suitable factors of safety, subject to mutual agreements and shall be used throughout the design. All joints and fastenings shall be devised, constructed and documented so that the component parts shall be accurately positioned and restrained to fulfill their required function. In general screw threads shall be standard metric threads. The use of other thread forms will only be permitted when prior approval has been obtained from purchaser.

Whenever possible, all similar part of the Works shall be made to gauge and shall also be made interchangeable with similar parts. All spare parts shall be interchangeable with, and shall be made of the same materials and workmanship as the corresponding parts of the Equipment supplied under the Specification. Where feasible, common component units shall be employed in

different pieces of equipment in order to minimize spare parts stocking requirements. All equipment of the same type and rating shall be physically and electrically interchangeable.

All materials and equipment shall be installed in strict accordance with the manufacturer's recommendation(s). Only first-class work in accordance with the best modern practices will be accepted. Installation shall be constructed as being the erection of equipment at its permanent location. This, unless otherwise specified, shall include unpacking, cleaning and lifting into position, grouting, leveling, aligning, coupling of or bolting down to previously installed equipment bases/foundations, performing the alignment check and final adjustment prior to initial operation, testing and commissioning in accordance with the manufacturer's tolerances and instructions and the Specification. All factory assembled rotating machinery shall be checked for alignment and adjustments made as necessary to re-establish the manufacture's limits suitable guards shall be provided for the protection of personal on all exposed rotating and / or moving machine parts and shall be designed for easy installation and removal for maintenance purpose. The spare equipment(s) shall be installed at designated locations and tested for healthiness.
The Contractor shall apply oil and grease of the proper specification to suit the machinery, as is necessary for the installation of the equipment. Lubricants used for installation purposes shall be drained out and the system flushed through where necessary for applying the lubricant required for operation. The Contractor shall apply all operational lubricants to the equipment installed by him.
All oil, grease and other consumables used in the Works/ Equipment shall be purchased in India unless the Contractor has any special requirement for the specific application of a type of oil or grease not available in India. In such is the case he shall declare in the proposal, where such oil or grease is available. He shall help purchaser in establishing equivalent Indian make and Indian Contractor. The same shall be applicable to other consumables too.

3.3.2 Provisions For Exposure to Hot and Humid climate

Outdoor equipment supplied under the specification shall be suitable for service and storage under tropical conditions of high temperature, high humidity, heavy rainfall and environment favorable to the growth of fungi and mildew. The indoor equipments located in non-air conditioned areas shall also be of same type.

3.4 COLOUR SCHEME AND CODES FOR PIPE SERVICE/PANELS

The contractor shall propose a color scheme for those equipment/Items for which the colour scheme has not been specified in the specification for the approval of purchaser. The decision of purchaser shall be final. The scheme shall include:

Finishing colour of Indoor equipment

Finishing colour of Outdoor equipment.

Finish colour of all cubicles.

Finishing colour of various auxiliary system equipment including piping

Finishing colour of various building items.

Painting process shall be of powder coating type.All surface shall be cleaned , phosphated and given two coats of rust –resistant primer followed by two coats of finish paints . The interior of all panels cabinets and enclosures shall be finished with gloss white enamel. Two final powder coats of synthetic enamel paint of light grey shade(631 of IS-5) shall be given to exterior surface of all the panels. Sufficient quantities of touch paint shall be furnished for application at site. All The indoor cubicles shall be of same colour scheme and for other miscellaneous items, colour scheme will be approved by the purchaser.

3.5 PROTECTION

All coated surfaces shall be protected against abrasion, impact, discoloration and any other damages. All exposed threaded portions shall be suitably protected with either a metallic or a non-metallic protecting device. All ends of all valves, pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.

All equipment accessories and wiring shall have fungus protection, involving special treatment of insulation and metal against fungus, insects and corrosion.The parts which are likely to get rusted, due to exposure to weather should also be properly treated and protected in a suitable manner. Screens of corrosion resistant material shall be furnished on all ventilating louvers to prevent entry of insects.

3.6 FUNGISTATIC VARNISH

Besides the space heaters, special moisture and fungus resistant varnish shall be applied on the parts, which may be subjected or predisposed to the formation of fungi due to the presence or deposit of nutrient substances. The varnish shall not be applied to any surface of part where the treatment will interface with the operation or performance of the equipment. Such surfaces or parts shall be protected against the application to the varnish.

3.7 SURFACE FINISH

All interiors and exteriors of tanks, control cubicles and other metal parts shall be throughly cleaned to remove all rust, scales, corrosion, greases or other adhering foreign matter. All steel surfaces in contact with insulating oil as far as accessible, shall be painted with not less than two coats of heat resistant, oil insoluble, insulating paints.

All metal surfaces exposed to atmosphere shall be given two primer coats of zinc chromate and two coats of epoxy paint with epoxy base thinner. All metal parts not accessible for paintaing shall be made of corrosion resisting material. All machine finished or bright surfaces shall be coated with a suitable preventive compound and suitabley wrapped or other wise protected. All paints shall be carefully selected to withstand tropical heat and extremes of weather within the

limit specified. The paint shall not scale off or wrinkle or be removed by abrasion due to normal handling. All external painting shall be as per shade no. 631 of IS:5.

3.8 GALVANIZING

All ferrous parts including all sizes of nuts, bolts, Plain and spring washers, support channels, structures, shall be hot dip galvanised conforming to latest version of IS:2629 or any other equivalent authoritative standard. However, hardware less than M12 size shall be electro-galvasized. Minimum weight of zinc coating shall be 610 gm/sq.m and minimum thickness of coating shall be 85 microns for all items thicker than 6mm. For items lower than 6 mm thickness, requirement of coating shall be as per relevant ASTM.

3.9 PACKING

The following details are to be clearly indicated in the material forwarding documents:

a) Name and address of the consignee.
b) Purchase order number.
c) Name of supplier/s.
d) Description of equipment / material.
e) Net weight.
f) Gross weight.

All the equipments shall be suitably protected, coated, covered or boxed and crated to prevent damage or deterioration during transit, handling and storage at Site till the time of erection. On request of the purchaser, the Contractor shall also submit packing details/associated drawing for any equipment material under his scope of supply, to facilitate the purchaser to repack any equipment/ material at a later date, in case the need arises. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.The cases containing easily damageable material shall be very carefully packed and marked with appropriate caution symbol i.e. fragile, handle with care, use no Hooks etc.

3.10 HANDLING, STORING AND INSTALLATION

Contractor may engage manufacturer's Engineers to supervise if required for unloading, transportation to site, storing, testing and commissioning of the various equipment being procured by them separately. In case of any doubt/misunderstanding as to the correct interpretation of manufacturer's drawings or instructions, necessary clarifications shall be obtained from the purchaser. Contractor shall be held responsible for any damage to the equipment consequent to not following manufacturer's drawings/instructions correctly.

Where assemblies are supplied in more than one section, contractor shall make all necessary mechanical and electrical connections between sections including the connection between buses. Contractor shall also do necessary adjustments/alignments necessary for proper operation of circuit breakers, isolators and their operating mechanisms. All components shall be protected

against damage during unloading, transportation, storage, installation, testing and commissioning.

Contractor shall be responsible for examining all the shipment immediately of any damage, shortage, discrepancy etc. for the purpose of Purchaser's information only. Any demurrage, pilferage and other such charges claimed by the transporters, railways etc. shall be to the account of the Contractor.The Contractor shall be fully responsible, for the equipment/material until the same is handed over to the purchaser in an operating condition after commissioning.

The minimum phase to earth, phase to phase and section clearance along-with other technical parameters for the various switchyard voltage levels to be maintained shall be strictly as per the approved drawings.

The design and workmanship shall be in accordance with the best engineering practices to ensure satisfactory performance throughout the service life. If at any stage during the execution of the Contract, it is observed that the erected equipment(s) do not meet the above minimum clearances, the Contractor shall immediately proceed to correct the discrepancy at his risks and costs.

3.11 DEGREE OF PROTECTION

The enclosures of the Control Cabinets, Junction boxes and Marshalling boxes panels etc to be installed shall be provided with degree of protection as detailed here under:

a) Installed out door: IP-55

b) Installed indoor in air conditioned area: IP-31

c) Installed in covered area IP:52

d) Installed indoor-in non air-conditioned area where possibilities of entry of water is limited:IP-41

e) For LT switchgear (AC & DC distribution Boards): IP-54

The degree of protection shall be in accordance with IS:13947, (Part-1)/IEC-947(Part-1). Type test report/or degree of protection test on each type of the box shall be submitted for approval.

3.12 RATING PLATES, NAME PLATES AND LABELS

Type or serial number together with details of the loading conditions under which the item of the substation in question has designed to operate and such diagram plates as may required by the Purchaser. The rating plate of each equipment shall be according to IEC requirements.

All such nameplate instruction plates, rating plates shall be bilingual with Hindi inscription first

followed by English. Alternately two separate plates one with Hindi and other with English inscriptions may be provided. All measurements shall be in M.K.S units.

3.13 EARTHING

Circuit breakers, LA, Isolator, CVT , CT , BPI shall be provided with two grounding pads suitable for connection to galvanized steel flat. Control panels, Relay panel, outdoor marshalling boxes, Junction boxes, Lighting panels and distribution board shall be provided with two grounding pads, for connection to galvanized steel flat. The two pads shall be provided, one each at the middle of the two opposite sides of the bottom frame of the equipment. Earthing of hinged door shall be done by using a separate earth wire.

3.14 QUALITY

BHEL quality plan to be followed subject to TBEM / customer's approval.

3.15 DOCUMENTATION

3.15.1 LIST OF DOCUMENTS

The bidder shall submit a detailed list of drawings / documents along with the bid proposal which he intends to submit to the Employer after award of the contract.

The supplier shall necessarily submit all the drawings / documents unless any thing is waived.

All engineering data submitted by the Contractor after final process including review and approval by the Employer shall form part of the Contract Document and the entire works performed under this specification shall be performed in strict conformity, unless otherwise expressly requested by the Employer in Writing.

3.15.2 DRAWINGS

All drawings submitted by the Contractor including those submitted at the time of bid shall be in sufficient detail to indicate the type, size, arrangement, material description, Bill of Materials, weight of each component, break-up for packing and shipment, the external connections, fixing arrangement required, the dimensions required for installation and interconnections with other equipments and materials, clearances and spaces required for installation and interconnection between various portions of equipments and any other information specifically requested in the specifications.

Each drawing submitted by the Contractor shall be clearly marked with the name of the Employer, name of consultant ,the unit designation, contract no. , and the name of the Project .If

standard catalogue pages are submitted, the applicable items shall be indicated therein. All titles, noting, markings and writings on the drawing shall be in English. All the dimensions should be in metric units.

Further work by the Contractor shall be in strict accordance with these drawings and no deviation shall be permitted without the written approval of the Employer if so required.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawing shall be at the Contractor's risk. The Contractor may make any changes in the design which are necessary to make the equipment conform to the provisions and intent of the Contract and such changes will again be subject to approval by the Employer. Approval of Contractor's drawing or work by the Employer shall not relieve the contractor of any of his responsibilities and liabilities under the Contract.

3.15.3 APPROVAL PROCEDURE

The scheduled dates for the submission of these as well as for, any data/information to be furnished by the Employer would be discussed and finalised at the time of award. The supplier shall also submit required no. of copies as mentioned in this specification of all drawings/design documents/test reports for approval by the Employer. The following schedule shall be followed generally for approval.

i.	Approval/comments/by employer on Initial submission	Within 2 weeks of receipt
ii.	Resubmission	Within 2 (two) weeks (whenever from date of comments required) Including both ways postal time.
iii.	Approval or comments	Within 2 weeks of receipt of resubmission
iv.	Furnishing of distribution copies	2 weeks from the date of last approval.

Note: The contractor may please note that all resubmissions must incorporate, all comments given in the submission by the Employer failing which the submission of documents is likely to be returned. Every revision shall be a revision number, date and subject, in a revision block provided in the drawing, clearly marking the changes incorporated.

The title block of drawings shall contain the following information incorporated in all contract drawings. Please refer enclosed sheet for details of Title block.

3.15.4 DOCUMENTS TO BE SUBMITTED ALONGWITH OFFER

1) Drawings
2) Guaranteed Technical Particulars
3) Type Test Reports
4) Manufacturing Quality Plan

3.15.5 DOCUMENTATION SCHEDULE

S. No.	DESCRIPTION	TENDER STAGE	CONTRACT STAGE FOR APPROVAL	FINAL DOCUMENTATION	
			Prints	Prints	CDs
1	Drawings and Data Sheets	1	6	7	4 nos of all drawings/ documents
2	Drawings "As Built "	-	-	7	
3	Type Test Reports	1	6	7	
4	Erection Manuals	-	6	7	
5	Operation and Maintenance Manuals	-	6	7	
6	Manufacturing Quality Plan	1	6	7	
7	Field Quality Plan	1	6	7	
8	Inspection Test Reports	-	-	7	

Soft copies of drawings at contract stage shall also be submitted in **PDF format**.

Drawings will also be submitted in mini cartridges in AUTOCAD Release -14 package or any other CAD package along with conversion files for all major items.

Final Documentation shall be submitted in bound volumes with Customer & Project etc. written on top.

DEVELOPMENT CONSULTANTS PRIVATE LIMITED KOLKATA

THE WEST BENGAL POWER DEVELOPMENT CORPN LTD

(2 x 500 MW) SAGARDIGHI THERMAL POWER EXTENTION PROJECT (UNIT 3 & 4)

TRANSMISSION PROJECTS W.B.P.D.C.L.

h) Protective Creepage Distance, mm :

5.0 **Post Insulators**

a) Make :

b) Type :

c) Reference standard :

d) Highest system voltage Permissible KV(rms) :

e) Insulation level

i) 1 min. 50HZ Dry withstand Voltage KV (rms) :

ii) 1 min. 50HZ wet withstand Voltage KV (rms) :

iii) 1.2/50 micro sec impulse withstand voltage KVp :

f) Visible discharge 50 Hz voltage KV (rms) :

g) Creepage Distance, mm :

h) Protective Creepage Distance, mm :

i) Cantilever strength (upright) per stack kg :

j) Tensile strength :

k) Compression strength, kg :

l) Weight per stack, kg. :

m) Height per stack, mm :

6.0 Clamps and Connectors

a) Make :

b) Type :

DEVIATION SCHEDULE

SCHEDULE OF TECHNICAL DEVIATIONS

Bidder shall list below all technical deviation clause wise w.r.t. tender specifications:

S.No.	Page No.	Clause No.	Deviation	Reason / Justification

Any deviation not specifically brought out in this section shall not be admissible for any commercial implication at later stage. Except to the technical deviations listed in this schedule, bidder's offer shall be considered in full compliance to the tender specifications irrespective of any such deviation indicated / taken elsewhere in the submitted offer.

Date: Tenderer's Stamp & Signature