भारत हैवी ईलैक्ट्रिकल्स लिमिटेड

BHARAT HEAVY ELECTRICALS LIMITED

पारेषण व्यापार अभियांत्रिकी प्रबंधन

TRANSMISSION BUSINESS ENGINEERING MANAGEMENT

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TITLE/ शीर्षक				नाम / NAME	TDT	SKS	AS
	FIRE FIGHTING SYSTEM			दिनांक/ DATE	21-03-17	21-03-17	21-03-17
	(132 kV Switchyard Extension)			समूह/GROUP	TBEM	W.O. No	83009
ग्राहक/ CUSTOMER	BIHAR STATE POWER GENERATION COMPANY LTD. (BSPGCL)						
परियोजना/ PROJECT	132 KV SWITCHYARD EXTENSION AT BARAUNI TPS						
CONSULTA NT	STEAG ENGINEERING SERVICES (INDIA) PVT. LTD.						

विषय-सूचि/ CONTENTS

ENCLOSURES

a. ANNEXURES TO SECTION - 1

Annexure-I – List of cables procured by BHEL.

b. ANNEXURES TO SECTION - 5

Annexure-A - Layout Plan for 220/132 kV Switchyard.

Fire Water Piping Layout of existing 220 kV Switchyard

Rev No.	Date	Altered	Checked	Approved	REVISION DETAILS			
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SECTION -1

INTENT, SYSTEM REQUIREMENT, DESIGN CRITERIA, AND SCOPE

1.0.0 INTENT OF SPECIFICATION

1.1 This specification covers the design, manufacture, inspection and testing at bidder's and/ or his sub-vendor's work(s), proper packing for transportation, delivery of **Fire Detection cum Protection System** as detailed in this section and in various other sections of this specification for **132 kV Switchyard Extn. of 2x250 MW, Barauni TPS of Bihar State Power Generation Company Ltd.**

1.2 The requirement(s) specified under 'SECTION 2, SECTION 3, SECTION 4' and 'SECTION 5' of this specification shall be considered as part of this section. In case of variance between sections the requirements of Section-1 shall prevail.

1.3 It is not the intent to specify herein all the details of design and manufacture. However, the equipment shall conform in all respects to high standards of design, engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to Purchaser/ Owner, who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material, which in his judgment is not in full accordance herewith.

1.4 It shall be the responsibility of successful bidder to obtain necessary approval(s) /clearance(s) from statutory organization(s) / authority(s) wherever applicable for the equipment / system / sub-system(s) under the scope specified herein.

1.5 The bidder shall be deemed to have understood completely all the tender drawings and documents and quoted accordingly.

1.6 The bidder has to note carefully the parameters, estimated capacities of equipment indicated and the tender drawing in the specification are only for guidance of the bidder. The system shall be designed as per relevant standards / codes and exact capacities and quantities are to be estimated by the bidder. All such estimations and design calculations shall be submitted for Purchaser's approval.

1.7 In case of any deviation, the bidder shall indicate separately the deviations clause-wise with respect to the specification in the 'Schedule of Deviation'. Deviations in any other form including clarifications/ assumptions etc will not be considered and it will be construed that the bid conforms strictly to the specification.

1.8 The **contract** shall be on **Unit Rate Basis** for the package. In case of change in the input after placement of order the additions / deletions to the scope shall be settled on the basis of unit rates agreed between the Purchaser and Contractor.

1.9 *During contract stage, quantities of various items of BOQ may vary to any extent and same rates will be applicable so far the resultant variation in total contract value is within ±20%. Variations beyond ±20% shall be negotiated mutually*.

1.10 The Purchaser and Owner in this specification stand for **BHEL** and **BSPGCL** respectively. The successful bidder shall be referred to as Contractor.

2.0.0 SYSTEM REQUIREMENTS AND DESIGN PHILOSOPHY.

2.1 This system shall be designed to provide fire detection and protection services for Bay control room in switchyard area. Design criteria shall be based on "Ordinary Hazard Occupancies" classification as described in Tariff Advisory Committee's (TAC) guidelines. All equipment or systems in the designed fire detection cum protection arrangement shall be completely in compliance with the regulations of Tariff Advisory Committee (TAC) of India / Loss Prevention Association (LPA) / National Fire Protection Association (NFPA).

2.2 Fire protection scheme envisaged under this specification shall be broadly classified as follows.

SYSTEM	**AREAS PROTECTED**
FIRE DETECTION SYSTEM	
Smoke Detection System	Bay Control rooms (5 nos.)
FIRE PROTECTION SYSTEM	
Hydrant System	132 kV Switchyard area
Portable Extinguisher	Bay Control rooms (BCR)

2.3 DESIGN FEATURES

2.3.1 Detection System

General

a. Addressable, analogue/intelligent Multisensor smoke detectors shall be provided (2 nos.) in each of the bay control rooms which will be looped in to a Fire Alarm panel (FAP) of Schrack- Seconet make located in adjacent existing 220 kV switchyard control room.

b. All the circuits from the detectors to the panels shall be closed loop type and shall be supervised for open and short circuiting.

c. Loop detection cable for signaling line circuit shall be armored flame retardant low smoke cable (FRLS) type which will be used for connecting detectors, modules, call points and networking of panels & control cables, power cables for Notification appliances.

d. Fire detection & alarm system shall be interfaced with independent air conditioning system for Bay control room i.e. BCR so that in case of any fire in any BCR, AC system specific to that area can be tripped. Control relay module in each BCR shall be provided to initiate the trip of AC system in that area.

e. Necessary isolator module etc. required to make the system function satisfactorily shall be supplied by the contractor as per requirement.

f. Manual call points (Break glass alarm stations) shall be provided near each BCR.

Specific Details:

a. Multisensor detectors shall conform to NFPA-72 standards.

b. Area Coverage for each smoke detector shall be as per TAC guidelines.

c. However other factors like beam depth and area separation criterion shall also be implemented in deciding coverage of each of the detectors.

d. Incipient fires sensed by these detectors shall trigger an alarm at the FAP.

e. Complete system and all equipment such as detectors etc shall be approved and listed by UL/FM/LPCB/VDS/TAC.

f. The complete system shall include, but not be limited to the following :

   1. Analog addressable smoke detectors.

   2. Complete Wiring/cabling.

g. Field testing facility shall be provided by the system for either the complete system specified area or a specified device while maintaining full function of areas not under test.

h. All devices shall be individually identifiable for its type, its zone location, and alarm set value, alarm and trouble indication by a unique alpha numerical label.

i. The detectors shall be self-compensating for ambient temperature and humidity.

j. The detectors shall display a steady LED when in the alarm state. The LED shall flash when in standby or normal mode.

2.3.2 Hydrant System

2.3.2.1 Fire Protection System

a. Hydrant systems for the switchyard area shall be tapped off from the nearest hydrant header of adjacent 220 kV switchyard. Fire water piping layout of existing 220 kV switchyard is enclosed. Water from this tap off shall be routed to the 132 kV switchyard extn.

b. Hydrant system shall be designed so that minimum required water pressure shall be available at the farthest point of the switchyard. Min pressure requirement of 3.5 Kg/ Sq.cm at the farthest point shall be available after considering all the head losses and also the operation of two hydrants simultaneously.

c. Hydrant system is designed for Ordinary Hazard Classification.

d. All the outdoor hydrants shall be provided with a front glass type hose box carrying 2 nos. 15 mtrs. hose along with branch pipe coupling and nozzle.

e. All hydrant pipe mains/ pipe lines shall be routed over ground on RCC pedestals. Road, Rail or pipe trench crossing shall be through RCC Hume pipes duly covered with coating and wrapping as per specification. Hume pipe for road crossing shall be NP2 class and that for rail crossing shall be NP3. Substation areas where movement of cranes/ vehicles is expected and where laying of pipes above ground is not advisable, pipes shall be laid underground.

f. Surface of all over ground pipes shall be thoroughly cleaned of mill scale, rust etc. by wire brushing. Thereafter one coat of red lead primer shall be applied. Finally two coats of synthetic enamel paint shall be applied. For underground piping coating & wrapping shall be done with two coats of coal tar/ hot enamel paint & two wraps of reinforced fibre glass tissue. The total thickness of wrapping and coating shall not be less than 3 mm. Coating & wrapping shall be inline with IS: 10221*. Supply of primer/ paints, wrapping coating etc shall be in contractor's scope.*

2.3.2.2 Specific Data

i) All hydrant valves shall be of 63 NB dia. Single headed, oblique type having Stainless steel construction conforming to IS: 5290, Type-A.

ii) Hoses shall be of non-percolating flexible type as per IS: 636 (Type-A) or Equivalent.

iii) **PIPING**

Specific features of piping for Fire Protection System shall be as follows: -

a) All the pipes shall be of medium grade with thickness as 6.35 mm for sizes 200 NB and above.

b) The pipe protection shall be as follows: To prevent soil corrosion, buried pipes shall be properly lagged with 4 mm thick wrapping and coating corrosion protection tape as per IS: 10221.

A. Above ground piping

a. Material MS for Hydrant system

b. Standard (Pipes) IS 1239/ IS 3589

c. Standard (Fitting) IS 1239 part II/ TAC

d. Class Medium

e. Type of joint Welded / Flanged

f. Type of protection: Painted (Two coats of Grey zinc primer. Two coats of enamel paint of 75 microns thickness with color shade conforming to IS: 5).

B. Underground piping

a. Material MS

b. Standard (Pipes) IS 3589/ IS 1239 Part – I

c. Standard (Fitting) IS 1239 part II for fittings NB 150 & below & Fabricated from parent pipes for NB 200 & above.

d. Type of joints Welded

e. Type of protection IS 10221/ IS 15337-2003

C. Fittings

Unless otherwise specified all elbows/ bends shall be long radius type.

All the fittings the material shall be mild steel shall be IS 1239 Part-II up to 150 mm dia and above shall fabricated from parent pipe in addition to following:

- Unless otherwise specified all elbows/ bends will be long radius type.
- The material will conform to IS-1239 part-II heavy grade /malleable iron as per IS: 1879 Part I to X

Fittings (normally filled with water): Elbow, Tee & Reducers.

- Screwed Fittings up to 50 mm diameter
- Butt welded fittings 65NB to 150 NB
- Site fabricated from parent pipe and fabricated as per BS: 2633/ BS: 534
- (90 degree elbow 3 cut, 4 piece construction. 45 deg. elbow 2cut, 3 piece construction)
- Slip-on flanges/blind flanges as per IS: 2062 Gr .A, Dimension/ Drilling standard as per ANSI B 16.5/ IS-1538 Table IV & VI F/F.
- SS-304 for Bolt & Nuts.

D. Valves

All isolation valve/cut-off valves shall be CI as per IS: 210, FG 260 body, with 13% Cr. SS stem & seating surfaces of gate valves as per guidelines/requirements specified in TAC.

Valve shall have provision of locking arrangements in open and closed position.

All the flanges & counter flanges will conform to IS-2062 Gr. A Slip on (Dimension/Drilling as per ANSI B 16.5 Cl. 150. /IS: 1538)

All valves shall be of minimum class of 150.

Strainer Body shall be as per IS: 2062 (tested).

2.3.3 Portable Fire Extinguishers:

Following types of portable extinguishers are envisaged for the bay control rooms (BCR) in the switchyard.

a. Each Bay control room shall be provided with one no. of 4.5 kg capacity carbon dioxide portable extinguisher.

3.1.1 SCOPE

The design, engineering, manufacture, testing at manufacturer's works, supply at the site of the equipment, outlined hereinafter, complete with all materials and accessories, are in the Bidder's scope of work. The scope of the work under the contract shall be deemed to include all such items, which although not specifically mentioned in the bid documents and/or in the bidder's proposal, but are required to make the equipment/system complete for its safe, efficient, reliable and trouble free operation, unless the same is specifically excluded from the Bidder's scope of work under clause 3.2 of this section.

3.1.2 Scope of supply

a. The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Special Conditions of Contract, Technical Specifications, and Drawings.

b. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Purchaser and valued at the rates and prices bid in the priced Bill of Quantities.

c. A rate or price shall be entered against each item in the priced Bill of Quantities. The cost of Items against which the Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities.

d. The whole cost of complying with the provisions of the Contract shall be included in the Items provided in the priced Bill of quantities, and where no Items are provided, the cost shall be deemed to be distributed among the rates and prices entered for the related Items of Work.

e. General directions and descriptions of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. References to the relevant sections of the Contract documentation shall be made before entering prices against each item in the priced Bill of Quantities.

f. Miscellaneous items like hardware, fixtures etc. shall be deemed to be included under the relevant BOQ items and bidders shall consider the same while quoting for BOQ items.

BILL OF MATERIAL

HYDRANT SYSTEM		
SL. NO.	**ITEM DESCRIPTION**	**QUANTITY**
1.1	SINGLE HEADED EXTERNAL HYDRANT VALVE SS CONSTRUCTION (IS:5290, TYPE-A) 63NB	7 NOS.
1.2	RRL FIRE HOSE 63 MM DIA X 15 MTRS LONG WITH SS COUPLING (IS: 636 (TYPE-A))	14 NOS.
1.3	SS BRANCH PIPE WITH NOZZLE	7 NOS.
1.4	MS FABRICATED GLASS FRONTED EXTERNAL HOSE CABINET	7 NOS.
1.5	ABOVE GROUND MS PIPE (AS PER IS: 1239 PART-1, MED. GR.)	
1.5A	150NB	50 MTRS
1.5B	100NB	220 MTRS
1.5C	80 NB	30 MTRS
1.6	CI GATE VALVE	
1.6 A	150 NB	1 NO.
1.6 B	100 NB	2 NO.
ADDRESSABLE FIRE DETECTION & ALARM SYSTEM		
2.1	ADDRESSABLE MULTISENSOR SMOKE DETECTOR	10 NOS

2.2	ADDRESSABLE MANUAL CALL POINT	5 NOS.
2.4	CONTROL RELAY MODULE	5 NOS.
2.5	ARMOURED SCREENED AND TWISTED PAIR FRLS TYPE CABLE WITH COPPER CONDUCTOR	1000 MTRS
PORTABLE FIRE EXTINGUISHER		
3.1	CARBON DIOXIDE TYPE PORTABLE EXTINGUISHER (4.5 KG CAPACITY)	5 NOS.

- *Above prices shall include,* ***supply of Paints/ wrapping coating material to be applied on pipes/ items*** *of all hardware & pipe fittings etc.*

3.2 Exclusions

i. Supply of power and control cables except the cables for fire detection and alarm system. *The bidder shall furnish* ***quantity*** *and* ***type*** *of cables required complete system in their respective bids.*

3.3 OPERATION & MAINTENANCE (O&M) MANUAL

Operation and Maintenance manuals shall be specifically complied for the project by the bidders. The draft O&M manual shall be submitted within 20 weeks after award of contract. The O&M manual shall contain the following information:

a. Description of the system and equipment with design particulars.
b. Instruction for operation, maintenance and repair.
c. Recommended inspection practices and inspection schedule.
d. Ordering information for all replaceable parts.

3.4 Inspection & Testing

All the equipments shall be inspected prior to dispatch in line with relevant IS, approved GTP/ drawing and technical specification.

ANNEXURE- 'A'

Cable Sizes being procured by BHEL for Sub-Station

1	2C X 2.5 sq mm PVC/Cu Control Cable
2	4C X 4 sq mm PVC/Cu Control Cable
3	4C X 6 sq mm PVC/Cu Control Cable
4	5C X 2.5 sq mm PVC/Cu Control Cable
5	10C X 2.5 sq mm PVC/Cu Control Cable
6	14C X 2.5 sq mm PVC/Cu Control Cable
7	19C X 2.5 sq mm PVC/Cu Control Cable
8	2C X 6 Sq.mm XLPE/Al Power Cable
9	4C X 6 Sq.mm XLPE/Al Power Cable
10	3.5 C X 35 sq mm XLPE/Al Power Cable
11	3.5 C X 70 sq mm XLPE/Al Power Cable
12	3.5 C X 120 sq mm XLPE/Al Power Cable
13	1 C X 50 sq mm XLPE/Al Power Cable
14	1 C X 150 sq mm XLPE/Al Power Cable
15	1 C X 630 sq mm XLPE/Al Power Cable

SECTION - 2

EQUIPMENT SPECIFICATION

2.0 CODES AND STANDARDS

The design, manufacture, inspection and testing of complete system shall comply with the latest applicable Indian/British/American standards. The equipment shall conform to the latest edition to the following standards:

a. "Fire Protection Manual" - Issued by the Regional Committees of Tariff Advisory Committee (TAC).

b. Underwriters Laboratories of USA

c. LPCB – United Kingdom

d. National Fire Codes of National Fire Protection Association (NFPA) of USA.

e. IS: 3034 -Code of practice for firefighting of industrial buildings: Electrical generating and distributing stations.

f. IS: 2189- Code of practice for selection, installation and maintenance of automatic detection and alarm system.

2.1 GENERAL DESIGN AND CONSTRUCTIONAL REQUIREMENT

It is not the intent to specify herein all the details of design and manufacture. However the equipment and the system shall conform in all respects to high standards of design engineering and workmanship and shall be capable of performing the required duties in a manner acceptable to purchaser /Owner who will interpret the meaning of drawings and specifications and shall be entitled to reject any work or material which in his judgment is not in full accordance herewith.

2.2 EQUIPMENT DETAILS OF HYDRANT SYTEM

- Pipes

1. *Normally filled with water:*

Mild steel as per IS 1239(Part-I) medium grade (upto 150NB) & as per IS 3589 Gr.410 (above 200NB) or equivalent.

Buried pipes shall be wrapped and coated as per IS 10221 (min thickness 4 mm).

- Single headed hydrant valve shall be of Stainless steel construction types A conforming to IS 5290.
- Fire Hoses shall be non-percolating type as per IS 636 type A or equivalent.
- Branch pipes shall be of stainless steel construction of straight jet type as per IS 903.

- Hose boxes shall be pedestal mounted, MS construction with front glass door.
- All fittings shall be as per relevant IS/BS codes and approved by TAC.
- All flanges and counter flanges shall conform to ANSI B 16.5 Cl. 150.

2.3 SHOP TESTS

2.3.1 SHOP TESTS

All acceptance and routine tests in accordance with relevant IS codes/standards shall be carried out by the contractor/manufacturer. Charges for all these routine and acceptance tests for all the equipment & components shall be deemed to be included in the bid price.

Contractor shall submit the QP for all such equipments calling inspection/ testing for purchaser's approval. This Owner/Purchaser approved QP shall be the basis of inspection/ testing.

SECTION - 3
GENERAL TECHNICAL REQUIREMENTS

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, equipment and services covered under other sections and; is 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 SITE INFORMATION

	Particulars	
a)	Customer/ Purchaser/ Owner	BSPGCL/BHEL/BSPGCL
b)	Engineer/ Consultant	Steag Energy Services (India) Pvt Ltd
c)	Project Title	220 kV Switchyard at Barauni TPS
d)	Location	Barauni / Bihar
e)	Postal Address	Shall be furnished to successful bidder
SITE CONDITIONS		
a)	Max. ambient air temp.	42.4° C
b)	Min. ambient air temp.	8.4° C
c)	Max. design ambient temp.	50° C
d)	Min. design ambient temp.	5° C
e)	Max. RH	100 %
f)	Min. RH	---
g)	Height above MSL	Less than 1000 m
h)	Pollution Severity	Shall be furnished to successful bidder
i)	Seismic Zone	Zone – IV as per IS 1893
WIND DATA		
a)	Site Wind Pressure	50 m / sec
b)	Average Annual Rainfall	1119.1mm (Max. rain fall in 24 hrs is 352.8 mm)

3.2 INSTRUCTION TO BIDDERS

The bidders shall submit the technical requirements, data and information as per the technical data sheets, provided in Section-4.

The bidders shall furnish catalogues, engineering data, technical information, design documents, drawings etc fully in conformity with the technical specification.

It is recognised that the Contractor may have standardised on the use of certain components, materials, processes or procedures different than those specified herein. Alternate proposals offering

similar equipment based on the manufacturer's standard practice will also be considered provided such proposals meet the specified designs, standard and performance requirements and are acceptable to the Purchaser. Unless brought out clearly, the Bidder shall be deemed to conform to this specification scrupulously. All deviations from the specification shall be clearly brought out in the respective schedule of deviations. Any discrepancy between the specification and the catalogues or the bid, if not clearly brought out in the schedule, will not be considered as valid deviation.

Wherever a material or article is specified or defined by the name of a particular brand, Manufacturer or Vendor, the specific name mentioned shall be understood as establishing type, function and quality and not as limiting competition.

Equipment furnished shall be complete in every respect with all mountings, fittings, fixtures and standard accessories normally provided with such equipment and/ or needed for erection, completion and safe operation of the equipment as required by applicable codes, though they may not have been specifically detailed in the Technical Specifications unless included in the list of exclusions. Materials and components not specifically stated in the specification but which are necessary for commissioning and satisfactory operation of the switchyard unless specifically excluded shall be deemed to be included in the scope of the specification and shall be supplied without any extra cost. All similar standard components/parts of similar standard equipment under supply shall be inter-changeable with one another.

The Contractor shall supply type tested (including special tests as per tech. specification) equipment and materials. The test reports shall be furnished by the Contractor, along with equipment/ material drawings. In the event of any discrepancy in the test reports, (i.e., if any test report is not acceptable due to any design/ manufacturing changes or due to non-compliance with the Technical Specification and/ or applicable standard), the tests shall be carried out without any additional cost implication to the PURCHASER. The PURCHASER reserves the right to get any or all type/tests conducted/repeated.

3.3 STANDARDS

The works covered by the specification shall be designed, engineered, manufactured, built, tested and commissioned in accordance with the Acts, Rules, Laws and Regulations of India.

The equipment to be furnished under this specification shall conform to latest issue (with all amendments) of specified standards.

In addition to meeting the specific requirement called for in Sections 1 and 2 of the Technical Specification, the equipment shall also conform to the general requirement of the applicable standards, which shall form an integral part of the specification.
The Bidder shall note that standards mentioned in the specification are not mutually exclusive or complete in themselves, but intended to complement each other.

When the specific requirements stipulated in the specifications exceed or differ from those required by the applicable standards, the stipulation of the specification shall take precedence.

Other internationally accepted standards, which ensure equivalent or better performance than that specified in the standards referred, shall also be accepted. The bidder shall submit copies of such standards.

In case governing standard for the equipment is different from IS or IEC,, the salient points of difference shall be clearly brought out in the offer along with English language version of standard or

relevant extract of the same. The equipment conforming to standards other than IS/IEC shall be subject to Purchaser's / owner's approval.

The bidder shall clearly indicate in his bid the specific standards in accordance with which the works will be carried out.

3.4 SERVICES TO BE PERFORMED BY THE EQUIPMENT BEING FURNISHED

All equipment shall also perform satisfactorily under various other electrical, electromechanical and meteorological conditions of the site of installation All equipment shall be able to withstand all external and internal mechanical, thermal and electromechanical forces due to various factors like wind load, temperature variation, ice & snow, (wherever applicable) short circuit etc for the equipment. The equipment shall also comply to the following:

a) All outdoor EHV equipment except marshalling kiosks shall be suitable for hot line washing.
b) To facilitate erection of equipment, all items to be assembled at site shall be "match marked"'.
c) Piping, if any, between equipment control cabinet and operating mechanism to marshalling box of the equipment shall bear proper identification to facilitate the connection at site.

3.5 ENGINEERING DATA

3.5.1 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 equipment and materials, clearances and spaces required for installation and interconnections between various portions of equipment and any other information specifically requested in the specifications.

Each drawing submitted by the Contractor shall be clearly marked with the name of the Purchaser, the unit designation, the specifications title, the specification number 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 Purchaser, if so required.

The review of these data by the Owner will cover only general conformance of the data to the specifications and documents, interfaces with the equipment provided under the specifications, external connections and of the dimensions which might affect substation layout. Owner may not indicate a thorough review of all dimensions, quantities and details of the equipment, material, any devices or items indicated or the accuracy of the information submitted. This review and /or approval by the Owner shall not be considered by the Contractor, as limiting any of his responsibilities and liabilities for mistakes and deviations from the requirements, specified under these specifications and documents.

All manufacturing and fabrication work in connection with the equipment prior to the approval of the drawings 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 Purchaser. Approval of Contractor's drawing or work

by the Purchaser shall not relieve the contractor of any of his responsibilities and liabilities under the Contract

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

3.5.2 Approval Procedure

The scheduled dates for the submission of these as well as for, any data/ information to be furnished by the Purchaser would be discussed and finalised at the time of award. The following schedule shall be followed generally for approval.

	Stage	No. of copies	Submission Schedule /Remarks
i)	Initial Submission Drawings, Data sheets, Type test Reports and O & M Instructions (in case of standard products)	5	As per agreed schedule
ii)	Resubmission, if required	5	Within 3 (three) weeks from date of comments including both ways postal time
iii)	Approval or comments		Within 3(three) weeks of receipt of resubmission.
iv)	Furnishing of distribution copies of drawings in bound volume	See remark	2 Weeks from the date of final approval Five (5) copies for each substation plus two (2) copies for corporate centre.
v)	Furnishing of distribution copies of type test reports in bound volumes	See remark	2 Weeks from the date of final approval One (1) copies for each substation plus two (2) copies for corporate centre.
vi)	Furnishing of distribution copies of Routine test reports	See remark	2 Weeks from the date of final approval One (2) copies for each substation
vii)	Furnishing of instruction/ operation manuals	See remark	As per agreed schedule Four (4) copies for each substation plus three (3) copies for corporate centre.
xi)	CD-ROM/ Optical Disc of all 'As - built drawings/ design documents	See remark	on completion of works one (1) set for each substation plus two (2) set for corporate centre.

NOTES:

a) The contractor may note that all re-submissions must incorporate all comments given in the prior submission by the Purchaser. Adequate justification for not incorporating the same must be submitted, failing which the submitted documents may be returned.

b) The drawings, which are required to be frequently referred during execution, should be submitted on cloth lined paper. The list of such drawings shall be finalised with the Contractor at the time of Award.

c) All major drawings shall be submitted in Auto Card Version 12 or better.

d) The instruction Manuals shall contain full detailed drawings of all equipment being supplied under this contract, their exploded views with complete instructions for storage, handling,

erection, commissioning, testing, operation, trouble shooting, servicing and overhauling procedures.

e) If after the commissioning and initial operation of the installation, the instruction manuals require any modifications/ additions/ changes, the same shall be incorporated and the Contractor shall submit the updated final instruction manuals to the Purchaser.

f) The Contractor shall furnish to the Purchaser, spare parts catalogues also.

3.6 COLOUR SCHEME

All steel structures, plates, etc. shall be painted with non-corrosive paint on a suitable primer. It may be noted that normally all Purchaser's electrical equipment in Purchaser's switchyard are painted with shade 697 of IS 5. All the indoor cubicles shall be of same colour scheme. For other miscellaneous items, the Purchaser will approve colour scheme.

3.7 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 favourable to the growth of fungi and mildew. The indoor equipment located in non-air-conditioned areas shall also be of same type.

One or more adequately rated thermostatically controlled heaters, suitable for continuous operation at 240-V supply, shall be provided to maintain temperature so as to prevent condensation in any compartment. On-off switch and fuse shall also be provided. The surface temperature of the heater assembly shall be restricted to a value which will not shorten the life of the heater sheaths or the wire insulation or other components in the compartment. The heaters shall be installed in the compartment and electrical connections shall be made sufficiently away from the heaters to minimize deterioration of supply wire insulation. The heaters shall be designed to prevent any contact between the heater wire and air. The design and construction of the heater shall be to approval.

Besides the space heaters, special moisture and fungus resistant varnish may be applied to parts, which may be subjected to or predisposed to the formation of fungi due to presence or deposit of nutrient substances. The varnish shall not be applied to any surface or part where the treatment will interfere with the operation or the performance of the equipment.
The compartments may be provided with ventilation openings, if required. These openings shall be covered with fine wire mesh of brass to prevent ingress of insects and minimise the entry of dirt and dust. Openings in outdoor equipment shall be provided with shutter type blinds.

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

The minimum requirements for panels are as follows:

a) Installed out door: IP- 55
b) Installed indoors in air-conditioned area: IP-31
c) Installed in covered area: IP-52
d) Installed indoors in non air-conditioned area where possibility of entry of water is limited: IP-41.
e) For LT Switchgear (AC & DC distribution Boards): IP-52.

3.8 RATING PLATES, NAME PLATES AND LABELS

Each main and auxiliary item of substation shall have, permanently attached to it in a conspicuous position, a rating plate of non-corrosive material. Upon this plate, shall be engraved manufacturer's name, year of manufacture, equipment name, type or serial number together with details of the loading conditions under which the item in question has been designed to operate, and such diagram plates as may be required by the Purchaser. The rating plate shall be according to IEC recommendations.

All such nameplates, instruction plates, rating plates shall be bilingual with Hindi inscription first followed by English. Alternatively two separate plates, one with Hindi and the other with English inscription, may be provided.

3.9 QUALITY ASSURANCE PROGRAMME

To ensure that the equipment and services under the scope of this Contract, whether manufactured or performed within the Contractor's Works or at his Sub-contractor's premises or at the Purchaser's site or at any other place of Work, are in accordance with the specifications, the Contractor shall adopt a suitable quality assurance programme to control such activities at all points, as necessary. Such programme shall be outlined by the Contractor and shall be finally accepted by the Purchaser after discussions before the award of Contract. A quality assurance programme of the contractor shall generally cover the following:

(a) Contractor's organisation structure for the management and implementation of the proposed quality assurance programme:
(b) Documentation control system;
(c) Qualification data of bidder's key personnel;
(d) The procedure for purchases of materials, parts components and selection of sub-Contractor's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
(e) System for shop manufacturing and site erection controls including process controls and fabrication and assembly control;
(f) Control of non-conforming items and system for corrective actions;
(g) Inspection and test procedure both for manufacture and field activities;
(h) Control of calibration and testing of measuring instruments and field activities;
(i) System for indication and appraisal of inspection status;
(j) System for quality audits;
(k) System for authorising release of manufactured product to the Purchaser
(1) System for maintenance of records;
(m) System for handling storage and delivery; and
(n) A quality plan detailing out the specific quality control measures and Procedures adopted for controlling the quality characteristics relevant to each item of equipment furnished and/or services rendered.

The Purchaser or his duly authorised representative reserves the right to carry out quality audit and quality surveillance of the system and Procedure of the Contractor/'his vendors quality management and control activities.

On completion of erection of the equipment and before charging, each item of the equipment shall be thoroughly cleaned and then inspected jointly by the Purchaser and the Contractor for correctness and completeness of installation and acceptability for charging, leading to initial pre-commissioning

tests at Site. The list of pre-commissioning tests to be performed shall be included in the Contractor's quality assurance programme.

3.10 Quality Assurance Documents

The Contractor shall be required to submit the following Quality Assurance Documents within three weeks after despatch of the equipment.

All Non - Destructive Examination Procedures, stress relief and weld repair. Procedure actually used during fabrication and reports including radiography interpretation reports.
Welder and welding operator qualification certificates Welder's identification list, listing welder's qualification procedure and welding identification symbols.
Raw material test reports on components as specified by the specification and/or agreed to in the quality plan.
Stress relief time temperature charts/oil impregnation time temperature charts
Factory test results for testing required as per applicable codes/mutually agreed quality plan/standards referred in the technical specification.
The quality plan with verification of various customer inspection points (CIP) as mutually agreed and methods used to verify the inspection and testing points in the quality pain were performed satisfactorily.

3.11 INSPECTION, TESTING & INSPECTION CERTIFICATE

The Purchaser, his duly authorised representative and/or outside inspection agency acting on behalf of the Purchaser shall have at all reasonable times free access to the Contractors premises or Works and shall have the power ,at all reasonable times to inspect and examine the materials and workmanship of the Works during its manufacture or erection if pert of the Works is being manufactured or assembled at other premises or works, the Contractor shall obtain for the Engineer and for his duly authorised representative permission to inspect as if the works were manufactured or assembled on the Contractor’s own premises or works.inspection may be made at any stage of manufacture, despatch or at site at the option of the Purchaser and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.

The reports for all type tests and additional type tests as per technical specification and shall be furnished by the Contractor along with equipment/material drawings. The type tests conducted earlier should have either been conducted in accredited laboratory (accredited based on ISO/IEC Guide 25/17025 or EN 45001 by the national accreditation body of the country where laboratory is located) or witnessed by the representative(s) of BSPGCL or Utility. The test-reports submitted shall be of the tests conducted within last 5 (five) years prior to the date of bid opening i.e. 24.09.2013. In case the test reports are of the test conducted earlier than 5 (five) years prior to the date of bid opening, the contractor shall repeat these test(s) at no extra cost to the purchaser.

In the event of any discrepancy in the test reports i.e. any test report not acceptable due to any design/manufacturing changes (including substitution of components) or due to non-compliance with the requirement stipulated in the technical specification or any/all additional type tests not carried out without any additional cost implication to the Purchaser.

The purchaser intends to repeat the type tests and additional type tests on transformers, reactors, cables and battery chargers for which test charges shall be payable as per provision of contract. The price of conducting type tests and additional type tests shall be included in Bid price and break up of these shall be given in the relevant schedule of Bid Proposal sheets. These type tests charges would be

considered in bid evaluation. In case the bidder does not indicate charges for any of the type tests or does not mention the name of any test in the price schedules, it will be presumed that the particular test has been offered free of charge. Further, in case any bidder indicates that he shall not carry out a particular test, his offer shall be considered incomplete and shall be liable to be rejected.

All equipment being supplied shall conform to type tests and shall be subject to routine tests in accordance with requirements stipulated under respective sections. Purchaser reserves the right to witness any or all the type tests. The Contractor shall intimate the Purchaser the detailed programme about the tests at least three (3) weeks in advance in case of domestic supplies & six (6) weeks in advance in case of foreign supplies. Purchaser reserves the option for getting any or all the type tests repeated on the equipment. The Contractor shall also submit type test procedure for approval of the Purchaser.

The Contractor shall give the Purchaser/inspector thirty (30) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account except for the expenses of the inspector. Unless witnessing of the tests is virtually waived, the Purchaser/ inspector will attend such tests within thirty (30) days of the date of which the equipment is notified as being ready for test/ inspection, failing which the Contractor may proceed with the test which shall be deemed to have been made in the Inspector's presence and the Contractor shall forthwith forward duly certified copies of test reports in triplicate to the Inspector.

The Purchaser or Inspector shall, within fifteen (15) days from the date of inspection as defined herein, give notice in writing to the Contractor, of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give due consideration to such objections and shall either make the modifications that may be necessary to meet the said objections or shall confirm in writing to the Purchaser/ inspector giving reasons therein, that no modifications are necessary to comply with the Contract.

When the factory tests have been completed at the Contractor's or Sub-Contractor's works, the Purchaser/ inspector shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the Purchaser/inspector, the certificate shall be issued within fifteen (15) days of receipt of the Contractor’s Test certificate by the Engineer/ Inspector. Failure of the Purchaser/inspector to issue such a certificate shall not prevent the Contractor from proceeding with the Works. The completion of these tests or the issue of the certificate shall not bind the Purchaser to accept the equipment should it, on further tests/ after erection, be found not to comply with the Contract. The equipment shall be dispatched to site only after approval of test reports and issuance of MICC by the Purchaser.

In all cases where the Contract provides for tests whether at the premises or at the works of the Contractor or of any Sub-Contractor, the Contractor except where otherwise specified shall provide free of charge such items as labour, materials, electricity, fuel, water, stores, apparatus and instruments as may be reasonably demanded by the Purchaser /Inspector or his authorised representative to carry out effectively such tests of the equipment in accordance with the Contract and shall give facilities to the Purchaser Inspector or to his authorised representative to accomplish testing.

The inspection by Purchaser and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed quality assurance programme forming a part of the Contract.

The Purchaser will have the right of having at his own expenses any other test(s) of reasonable nature carded out at Contractor's premises or at site or in any other place in addition of aforesaid type and routine tests, to satisfy that the material comply with the specification.

The Purchaser reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipment for these tests shall be provided by the Purchaser

3.12 FINISHING OF METAL SURFACES

All metal surfaces shall be subjected to treatment for anti-corrosion protection. All ferrous surfaces for external use unless otherwise stated elsewhere in the specification or specifically agreed, shall be hot-dip galvanized after fabrication. High tensile steel nuts & bolts and spring washers shall be electro-galvanized to service condition 4. All steel conductors including those used for earthing/ grounding (above ground level) shall also be galvanized according to IS: 2629.

3.12.1 HOT DIP GALVANISING

The minimum weight of the zinc coating shall be 610 g/ m^2 and minimum thickness of coating shall be 85 microns for all items thicker than 6mm. For items lower than 6mm thickness requirement of coating thickness shall be as per relevant ASTM. For surface which shall be embedded in concrete, the zinc coating shall not be less than 610 g/ m^2.

The galvanised surfaces shall consist of a continuous and uniform thick coating of zinc, firmly adhering to the surface of steel. The finished surface shall be clean and smooth and shall be free from defects like discoloured patches, bare spots, unevenness of coating, spelter which is loosely attached to the steel globules, spiky deposits, blistered surface, flaking or peeling off, etc. The presence of any of these defects noticed on visual or microscopic inspection shall render the material liable to rejection.

After galvanizing no drilling or welding shall be performed on the galvanized parts of the equipment excepting that nuts may be threaded after galvanizing. Sodium dichromate treatment shall be provided to avoid formation of white rust after hot dip galvanisation. The galvanized steel shall be subjected to six one-minute dips in copper sulphate solution as per IS-2633.

Sharp edges with radii less than 2.5 mm shall be able to withstand four immersions of the Standard Preece test. All other coatings shall withstand six immersions.

Following galvanizing tests shall essentially be performed as per relevant Indian Standards.

- Coating thickness
- Uniformity of zinc
- Adhesion test
- Mass of zinc coating

Galvanised material must be transported properly to ensure that galvanised surfaces are not damaged during transit. Application of zinc rich paint at site shall not be allowed.

3.12.2 PAINTING

All sheet steelwork shall be degreased, pickled, phosphated in accordance with the IS-6005 "Code of practice for phosphating iron and sheet". All surfaces, which will not be easily accessible after shop assembly, shall beforehand be treated and protected for the life of the equipment. The surfaces, which are to be finished painted after installation or require corrosion protection until installation, shall

be shop painted with atleast two coats of primer. Oil, grease, dirt and swaf shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying.

After phosphating, thorough rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying. The phosphate coating shall be sealed with application of two coats of ready mixed, stoving-type zinc chromate primer. The first coat may be 'flash dried" while the second coat shall be stoved.

After application of the primer, two coats of finishing synthetic enamel paint shall be applied, each coat followed by stoving. The second finishing coat shall be applied after inspection of first coat of painting.

The exterior colour of the paint shall be as per shade no. 697 of IS -5 and inside shall be glossy white. Each coat of primer and finishing paint shall be of slightly different shade to enable inspection of the painting. A small quantity of finishing paint shall be supplied for minor touching up required at site after installation of the equipment.

In case the Bidder proposes to follow his own standard surface finish and protection procedures or any other established painting procedures, like electrostatic painting etc., the procedure shall be submitted along with the Bids for Purchaser's review & approval.

3. 13 AUXILIARY SUPPLY

The sub-station auxiliary supply is normally met through a system indicated under section-5 having the following parameters. The auxiliary power for station supply, including the equipment drive, cooling system of any equipment, air-conditioning, lighting etc shall be designed for the specified Parameters as under. The DC supply for the instrumentation and PLCC system shall also conform to the parameters as indicated in the following.

Normal Voltage	*Variation in Voltage*	*Frequency in HZ*	*Phases*	*Neutral connection*
415V	*+/- 1 0%*	*50 +/- 5%*	*3/4-Wire*	*Solidly*
240 V	*+/- 1 0%*	*50 +/- 5%*	*1 /2-wire*	*Earthed.*
220V	*240-190 V*	*DC*	*2-wire*	*Isolated*
50 V	*53- 41.5 V*	*DC*	*2-wire*	*+ve -earthed*

Combined variation of voltage and frequency shall be limited to +/- 10%.

3.14 CONTROL CABINETS, JUNCTION BOXES, TERMINAL BOXES & MARSHALLING BOXES FOR OUTDOOR EQUIPMENT

All types of boxes, cabinets, etc. shall generally conform to & be tested in accordance with IS-5039/ IS 8623, IEC: 439, as applicable, and the clauses given below:

Control cabinets, junction boxes, Marshalling boxes and terminal boxes shall be made of sheet steel or aluminium enclosure and shall be dust, water and vermin proof. Sheet steel used shall be at least 2.0-mm thick cold rolled or 2.5 mm hot rolled. The box shall be properly braced to prevent wobbling. There shall be sufficient reinforcement to provide level surfaces, resistance to vibrations and rigidity during transportation and installation. In case of aluminium enclosed box the thickness of aluminium

shall be such that it provides adequate rigidity and long life as comparable with sheet steel of specified thickness.

Cabinet/boxes shall be free-standing, floor-mounting type, wall mounting type or pedestal mounting type as per requirements. Cabinet/boxes shall be provided with double hinged doors with padlocking arrangements. The distance between two hinges shall be adequate to ensure uniform sealing pressure against atmosphere. The quality of the gasket shall be such that it does not get damaged/cracked during the operation of the equipment.

All doors, removable covers and plates shall be gasketed all around with suitably profiled EPDM gaskets. The gasket shall be tested in accordance with approved quality plan. The quality of gasket shall be such that it does not get damaged/cracked during the ten years of operation of the equipment or its major overhaul whichever is earlier. All gasketed surfaces shall be smooth straight and reinforced if necessary to minimise distortion and to make a tight seal. Ventilating Louvers, if provided, shall have screen and filters. The screen shall be fine wire mesh made of brass.

All boxes/cabinets shall be designed for the entry of cables from bottom by means of weather proof and dust-proof connections. Boxes and cabinets shall be designed with generous clearances to avoid interference between the wiring entering from below and any terminal blocks or accessories mounted within the box or cabinet. Suitable cable gland plate projecting at least 150 mm above the base of the marshalling kiosk/box shall be provided for this purpose along with the proper blanking plates. Necessary number of cable glands shall be supplied and fitted on this gland plate. The gland shall project at least 25mm above gland plate to prevent entry of moisture in cable crutch. Gland plate shall have provision for some future glands to be provided later, if required. The Nickel- plated glands shall be dust-proof, screw on & double compression type and made of brass. The gland shall have provision for securing armour of the cable separately and shall be provided with earthing tag. The glands shall conform to BS: 6121.

A 240-V, single phase, 50 Hz, 15-A AC plug and socket shall be provided in the cabinet with ON-OFF switch for connection of hand lamps. Plug and socket shall be of industrial grade. For illumination, 20-W fluorescent tube or a 15-W CFL shall be provided. The switching of the fittings shall be controlled by a door switch.

All control switches shall be of rotary switch type and Toggle/piano switches shall not be accepted.

Positive earthing of the cabinet shall be ensured by providing two separate earthing pads. The earth wire shall be terminated on to the earthing pad and secured by the use of self- etching washer. Earthing of hinged door shall be done by using a separate earth wire.

The bay marshalling kiosks shall be provided with danger plate and a diagram showing the numbering/connection/ferruling by pasting the same on the inside of the door.

Tests

a) In addition to routine tests as per IS 5039, following routine tests shall also be conducted:

i) Check for wiring

ii) Visual and dimension check

b) The enclosure of bay marshalling kiosk, junction box, terminal box shall be type tested for IP-55 as per IS: 13947. After IP-55 test, 2.5 kV rms for 1 (one) minute, insulation resistance and functional tests shall be carried out.

A canopy and sealing arrangements for operating rods shall be provided in Marshalling Boxes control cubicles to prevent ingress of rain water.

3.15 AUXILIARY SWITCHES

The auxiliary switches shall conform to following type tests:

(a) Electrical endurance test - A minimum of 2000 operations for 2 A DC with a time constant greater than or equal to 20 millisecond with a subsequent examination of mV drop/visual defects/temperature rise test.
(b) Mechanical endurance test. A minimum of 1, 00,000 operations with a subsequent checking of contact pressure test/ visual examination.
(c) Heat run test on contacts.
Insulation Resistance Test/HV test (2.5 kV for one minute)

3. 16 TERMINAL BLOCKS AND WIRING

Control and instrument leads from the switchboards or from other equipment will be brought to terminal boxes or control cabinets in conduits. All inter-phase and external connections to equipment or to control cubicles will be made through terminal blocks.

Terminal blocks shall be 1100-V grade and have continuous rating to carry the maximum expected current on the terminals. Those shall be of moulded piece, complete with insulated barriers stud type terminals, washers, nuts and lock nuts. Screw clamp, overall insulated, insertion type, rail mounted 'terminals can be used in place of stud type terminals. But preferably the terminal blocks shall be non-disconnecting stud type equivalent to Elmex type CATM4, Phoenix, cage-clamp-type of Wago or equivalent.

3.17 FIRST FILL OF CONSUMABLES, OIL AND LUBRICANTS

All the first fill of consumables such as oils, lubricants, filling compounds, touch up paints, soldering/brazing material for all copper piping of circuit breakers and essential chemicals etc. which will be required to put the equipment covered under the scope of the specifications, into successful Operation, shall be furnished by the Contractor unless specifically excluded under the exclusions in these specifications and documents.

3.18 PACKAGING & PROTECTION

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 Owner / Purchaser, the supplier 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. While packing all the materials, the limitation from the point of view of availability of Railway wagon sizes in India should be taken into account. The supplier shall be responsible for any loss or damage during transportation, handling and storage due to improper packing. Any demurrage, wharfage and other such charges claimed by the transporters, railways etc. shall be to the account of the supplier.

All coated surfaces shall be protected against abrasion,impact,discolouration 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 and pipings and conduit equipment connections shall be properly sealed with suitable devices to protect them from damage.

3.19 TESTING AND COMMISSIONING

An indicative list of tests is given below. Supplier shall perform any additional test based on specialities of the items as per the filed O.P./Instructions of the driven equipment supplier or Owner / purchaser without any extra cost to the owner / Purchaser. The supplier shall arrange all instruments required for conducting these tests alongwtwith calibration certificates and shall furnish the list of instruments to the Owner / Purchaser for approval.

Insulation resistance.

Phase sequence and proper direction of rotation.

Any motor operating incorrectly shall be checked to determine the cause and the conditions corrected.

SECTION 4

GUARANTEED TECHNICAL PARTICULARS

LIST OF TECHNICAL DATASHEETS

In this section Technical Datasheets (TDS) of various equipment/items and system drawings that are required to be generated is furnished herewith. List of datasheets/drawings and numbers to be accorded is also given below.

The list furnished here is tentative and additional documents may be required during detailed engineering.

List of Data Sheets		
S N	**Item Description**	**BHEL's Doc. No.**
01.	TDS for M.S Pipes & Fittings	TB-DS-374-552-01
02.	TDS for Hydrant Valves/ Branch pipe with nozzle/Hose pipe/ Hose box	TB-DS-374-552-02
03	TDS for Wrapping Coating	TB-DS-374-552-03
04.	TDS for Gate Valves	TB-DS-374-552-04
05.	TDS for CO_2/ DCP type portable extinguisher	TB-DS-374-552-05
06.	TDS for Air release valve	TB-DS-374-552-06
07.	TDS for Twisted Pair Control Cable	TB-DS-374-552-07
08.	TDS for Fire Detection items	TB-DS-374-552-10
09.	BOQ	TB-BQ-374-552-11
List of Drawings		
01.	P & I Diagram	TB-DRG-374-552-01
02.	Fire Water Piping Layout	TB-DRG-374-552-02
03.	Fire Alarm & Detection system for Bay control room	TB-DRG-374-552-03

SECTION- 5

ENCLOSURES TO SPECIFICATION

SCHEDULES TO BE FILLED UP BY THE BIDDER

Schedule 1 **Schedule of Deviations**

Schedule 2 **Schedule of past experience and qualifying requirements**

Schedule 3 **Details of contact persons (technical & commercial)**

Schedule 4 **Enclosures to Specification**

a. **ANNEXURE-A Drawings**

SCHEDULE-1

SCHEDULE OF TECHNICAL DEVIATION

The following are the deviations / variations / exceptions from the specification:

Section	Clause No./ Page No.	Statement of deviation/ Variations/Exceptions

1) In case, this schedule is not submitted, it will be presumed that the equipment /material to be supplied under this contract is deemed to be in compliance with the specification.

2) If there is NIL deviation, even then the format to be filled as **NIL DEVIATION**

3) Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

Place — Signature of the authorized representative of Bidder

Name ----------

Date — Designation----------

Company seal----------

SCHEDULE – 2

SCHEDULE OF PAST EXPERIENCE AND QUALIFYING REQUIREMENT

Following is the list of earlier orders executed by us for supply of equipment / material of Similar nature over the last past five years:

S.No.	Item	Brief rating	Qty	customer	Date of order	Date of supply	Order value

Place

Date

Signature of the authorized representative of Bidder

Name----------

Designation----------

Company seal ----------

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

SCHEDULE-3

DETAILS OF CONTACT PERSON BOTH TECHNICAL AND COMMERCIAL

Name

Address for correspondence

Phone No.

Fax No.

Email

Place

Date

Signature of the authorized representative of Bidder

Name----------

Designation----------

Company seal ----------

Note: Continuation sheets of like size and format may be used as per the Bidder's Requirement and shall be annexed to this schedule.

SCHEDULE – 4

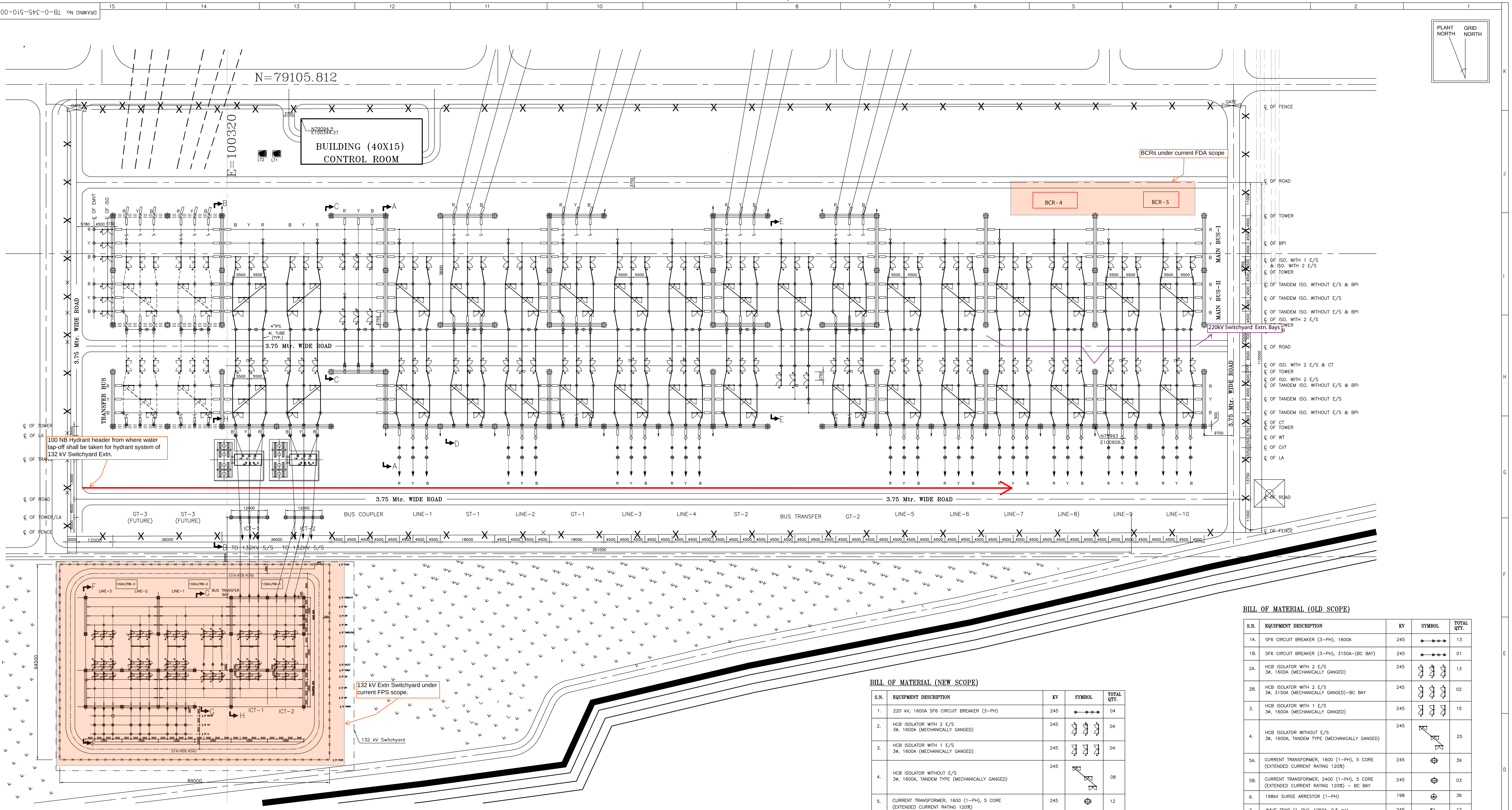
ENCLOSURES TO SPECIFICATION

(ANNEXURE-A)

DRAWINGS

1. LAYOUT PLAN FOR 220/132 KV SWITCHYARD
   DRG. NO. TB-0-374-510-026 R0
2. FIRE WATER PIPING LAYOUT OF EXISTING 220KV SWITCHYARD
   DRG. NO. TB-0-345-552-002 R1

FIRST ANGLE PROJECTION (ALL DIMENSIONS ARE IN MM.)



BILL OF MATERIAL (NEW SCOPE)

S.N.	EQUIPMENT DESCRIPTION	KV	SYMBOL	TOTAL QTY.
1.	220 kV, 1600A SF6 CIRCUIT BREAKER (3-PH)	245		04
2.	HCB ISOLATOR WITH 2 E/S 3ø, 1600A (MECHANICALLY GANGED)	245		04
3.	HCB ISOLATOR WITH 1 E/S 3ø, 1600A (MECHANICALLY GANGED)	245		04
4.	HCB ISOLATOR WITHOUT E/S 3ø, 1600A, TANDEM TYPE (MECHANICALLY GANGED)	245		08
5.	CURRENT TRANSFORMER, 1600 (1-PH), 5 CORE (EXTENDED CURRENT RATING 120%)	245		12
6.	198kV SURGE ARRESTOR (1-PH)	198		12
7.	WAVE TRAP (1-PH), 1600A, 0.5 mH	245		08
8.	4400pF CAPACITOR VOLTAGE TRANSFORMER (1-PH)	245		12
9.	BUS POST INSULATOR	245		28
10.	145kV, 1250A 3-PHASE, SPRING OPERATED SF6 CIRCUIT BREAKERS SUITABLE FOR 3-PHASE OPERATION.	145		06
11.	145kV, 1250A 3-PHASE, DOUBLE BREAK ISOLATOR (MECHANICALLY GANGED MOTOR OPERATED) WITH TWO E/S (MANUALLY OPERATED)	145		07
12.	145kV, 1250A 3-PHASE, DOUBLE BREAK ISOLATOR (MECHANICALLY GANGED MOTOR OPERATED) WITH ONE E/S (MANUALLY OPERATED)	145		05
13.	145kV, 1250A 3-PHASE, DOUBLE BREAK ISOLATOR (MECHANICALLY GANGED MOTOR OPERATED) WITHOUT E/S	145		05
14.	145kV, 1-PHASE 5 CORE CURRENT TRANSFORMER	145		18
15.	145kV, 8800 pF, $\frac{132}{\sqrt{3}} / \frac{0.110}{\sqrt{3}} / \frac{0.110}{\sqrt{3}} / \frac{0.110}{\sqrt{3}}$kV, 1-PHASE CAPACITOR VOLTAGE TRANSFORMER	145		12
16.	120kV, 1-PHASE SURGE ARRESTERS ,10KA,CLASS-3	145		09
17.	145kV, 1250A, 0.5mH, 1-PHASE WAVE TRAP	145		01
18.	145kV, 1-PHASE BUS POST INSULATOR	145		20

BILL OF MATERIAL (OLD SCOPE)

S.N.	EQUIPMENT DESCRIPTION	KV	SYMBOL	TOTAL QTY.
1A.	SF6 CIRCUIT BREAKER (3-PH), 1600A	245		13
1B.	SF6 CIRCUIT BREAKER (3-PH), 3150A-(BC BAY)	245		01
2A.	HCB ISOLATOR WITH 2 E/S 3ø, 1600A (MECHANICALLY GANGED)	245		13
2B.	HCB ISOLATOR WITH 2 E/S 3ø, 3150A (MECHANICALLY GANGED)-BC BAY	245		02
3.	HCB ISOLATOR WITH 1 E/S 3ø, 1600A (MECHANICALLY GANGED)	245		15
4.	HCB ISOLATOR WITHOUT E/S 3ø, 1600A, TANDEM TYPE (MECHANICALLY GANGED)	245		25
5A.	CURRENT TRANSFORMER, 1600 (1-PH), 5 CORE (EXTENDED CURRENT RATING 120%)	245		39
5B.	CURRENT TRANSFORMER, 2400 (1-PH), 5 CORE (EXTENDED CURRENT RATING 120%) - BC BAY	245		03
6.	198kV SURGE ARRESTOR (1-PH)	198		36
7.	WAVE TRAP (1-PH), 1250A, 0.5 mH	245		12
8.	4400pF CAPACITOR VOLTAGE TRANSFORMER (1-PH)	245		18
9.	EMVT (1-PH)	245		06
10.	BUS POST INSULATOR	245		91
11.	220/132KV, 150MVA ICT	220/132		02
12.	120kV SURGE ARRESTER (1-PH)	120		06

NOTE :-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. SYSTEM PARAMETERS

S. NOS.	DESCRIPTION	UNIT	220	132
1.	NOMINAL SYSTEM VOLTAGE	kV	220	132
2.	HIGHEST SYSTEM VOLTAGE	kV	245	145
3.	BASIC IMPULSE LEVEL	kVP	1050	650
4.	POWER FREQUENCY WITHSTAND	kVrms	460	275
5.	SWITCHING IMPULSE WITHSTAND VOLTAGE	kVrms	NA	NA
6.	CREEPAGE DISTANCE (MINIMUM)	mm/kV	25	25
7.	SYSTEM FAULT LEVEL FOR 1 SEC	kA	40	31.5

3. CONDUCTOR DETAIL

S. NOS.	DESCRIPTION	220	132
1.	MAIN BUS	QUAD MOOSE ACSR	TWIN MOOSE ACSR
3.	EQUIPMENT INTERCONNECTION	4"IPS Al. TUBE/TWIN MOOSE ACSR OD=114.30mm ID=97.18mm	SINGLE/TWIN MOOSE ACSR
4.	JUMPER /DROPPERS	TWIN MOOSE ACSR	SINGLE/TWIN MOOSE ACSR
5.	SHIELD WIRE	7/3.66 GALVANISED STEEL (10.98mm DIA)	

4. ALL THE BUS BARS, STRUNG BUSES & EQUIPMENTS ARE PROTECTED FROM 7/3.66 GALVANISED STEEL WIRE.
5. DURING ERECTION 3 NOS. FOUNDATION FOR WAVE TRAP IN EACH FEEDER BAY OF 220KV AND 132kV SWITCHYARD TO BE CASTED. ONLY 2 NOS. WAVE TRAP IN 220 kV 1 NO. IN 132 kV PER FEEDER BAY WILL BE UTILISED DURING COMMISSIONING AS PER PLCC REQUIREMENT AND AFTER NECESSARY TESTING.
6. SUPPLY AND STRINGING OF LINE CONDUCTOR, SHIELD WIRE, INSULATOR AND HARDWARE BETWEEN DEAD END TOWER AND SUBSTATION TERMINAL GANTRY ARE NOT IN BHEL SCOPE. HOWEVER, JUMPERING FOR THE RESPECTIVE EQUIPMENT & SHIELDING REQUIREMENT FOR PROTECTION OF LIVE EQUIPMENT AND JUMPERS SHALL BE IN BHEL SCOPE.
7. ALL EQUIPMENT STRUCTURE (EXCEPT CIRCUIT BREAKER) ARE PIPE TYPE.
8. SCOPE : AS FOLLOWS:
(a). NEW SCOPE : BAYS INSIDE CHAIN DOTTED LINE.
(b). OLD SCOPE : BAYS OUTSIDE CHAIN DOTTED LINE.

CLEARANCE TABLE :-

MINIMUM CLEARANCE TABLE	220kV	132kV
PHASE TO PHASE (PP)	2100mm	1300mm
PHASE TO EARTH (PE)	2100mm	1300mm
SECTION CLEARANCE (SC)	5000mm	3800mm
HEIGHT OF TUBE CENTRE LINE OF FIRST LEVEL FROM PLINTH LEVEL	5500mm	4600mm
GROUND CLEARANCE TO NEAREST PART NOT AT EARTH POTENTIAL OF AN INSULATOR SUPPORTING LIVE CONDUCTOR	2550mm	2550mm

LEGEND :-

- A — PRESENT SCOPE (BY BHEL)
- B — ADDITIONAL SCOPE, UNDER CHAIN DOTTED (BY BHEL)
- C — FUTURE SCOPE (BY CUSTOMER)
- D — 10.98mm G.S. WIRE
- E — GATE
- F — FENCE
- G — TENSION STRING INSULATOR
- H — SUSPENSION STRING INSULATOR
- I — CORONA END BELL
- J — ROAD

NAME OF CUSTOMER	BIHAR STATE POWER GENERATION COMPANY LIMITED
NAME OF CONSULTANT	STEAG ENERGY SERVICES (INDIA) PVT. LTD.
JOB NO. - 374	xzkgd@ifj;kstuk dk uke
STATUS OF DRAWING - CONTRACT	NAME OF PROJECT 2 X 250MW BARAUNI THERMAL POWER STATION
DISTRIBUTION OF PRINTS	Hkkjr gsoh bysfDVªdYl fyfeVsM ~V~kalfe'ku ifj;kstuk foHkkx BHARAT HEAVY ELECTRICALS LTD. TRANSMISSION PROJECTS DIVISION

	uke/NAME	gLrk/SIGN.	fnu/DATE
DRAWN	PR		20.12.13
CHECKED	PR		20.12.13
APPROVED	MK		20.12.13

foHkkx DEPT. — dksM CODE — vuqikr / SCALE 1 : 450 — dkMZ dksM CARD CODE

'kh"kZd/TITLE: LAYOUT PLAN FOR 220/132 KV SWITCHYARD

DRAWING NO. TB-0-374-510-002 — REV. 00 — SHEET No. 01 — NEXT SHEET 02

DRAWING No. TB-0-345-510-002

DO NOT SCALE. IF IN DOUBT, ASK.

ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED

DRAWING NO. TB/DWG/345/552/002

PLANT NORTH / GRID NORTH

HYD

TRANSFORMER YARD

BUILDING (40X15) CONTROL ROOM

HVWS SPRAY TAPPING FROM
E – 100630.00
N – 79110.80

3.75 Mtr. WIDE ROAD

TRANSFER BUS

MAIN BUS–I

MAIN BUS–II

150NB HYDRANT SYSTEM YARD HEADER (A.G.)

200NB HVW SYSTEM YARD HEADER (A.G.)

100NB HYDRANT SYSTEM YARD HEADER (A.G.)

HUME PIPE 300NB

GV1 GV2 GV3 GV4

ICT–1 ICT–2 BUS COUPLER LINE–1 GT–1 LINE–2 ST–1 LINE–3 LINE–4 GT–2 BUS TRANSFER ST–2 LINE–5 LINE–6 LINE–(FUTURE) LINE–(FUTURE)

TO 132KV S/S

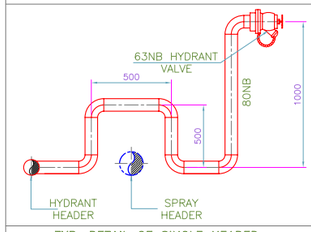
LEGEND

SYMBOL	DESCRIPTION
	HVW SPARY HEADER (A.G.)
	HVW SPARY HEADER (U.G.)
	HYDRANT HEADER (A.G.)
	HYDRANT HEADER (U.G.)
	EXISTING YARD HEADER
	RISE\DROPE
	GATE VALVE (NORMALLY OPEN)
	DELUGE VALVE (WITH HOUSING)
	HUME PIPE
	SINGLE HEADED HYDRANT VALVE (SH)
HB	HOSE BOX
	REDUCER

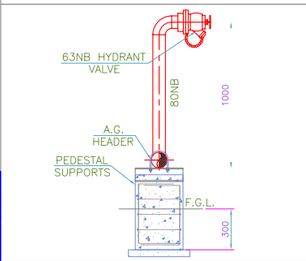
ABBREVIATIONS

SYMBOL	DESCRIPTION
C.O.P.	CENTER OF PIPE
B.O.P.	BOTTOM OF PIPE
EL.	ELEVATION
FGL	FINISH GROUND LEVEL
FFL	FINISH FLOOR LEVEL

TYP. DETAIL OF SINGLE HEADED HYDRANT VALVE AT ABOVE GROUND DETAIL–Y



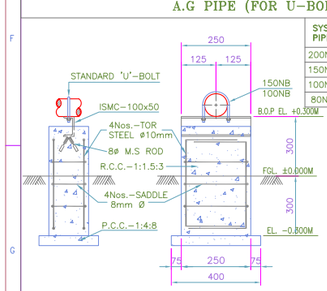
TYP. DETAIL OF SINGLE HEADED HYDRANT VALVE AT ABOVE GROUND



BHEL CAT–I
APPROVED
This Approval does not relieve the Sub-Contractor of his responsibilities under the contract.
SIGNED DATE 27.05.13
Transmission Projects Engineering Management

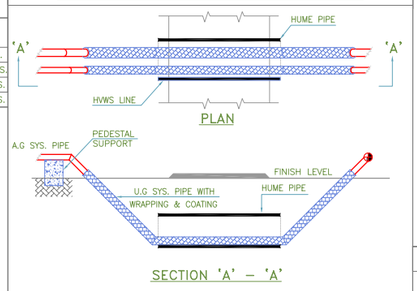
APPROVED
Release distribution prints.
steag
Digitally signed by Neeraj Dwivedi
DN: cn=Neeraj Dwivedi, o=STEAG Energy Services (India) Pvt Ltd., ou=Engineering, email=nk.dwived@steag.in, c=IN
Date: 2013.06.20 10:48:56 +05'30'
ETG025-BHEL-3-M-13-2247

PEDESTAL SUPPORT DETAIL FOR A.G PIPE (FOR U–BOLT)

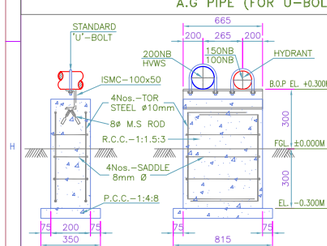


SYS. PIPE	DISTANCE BETWEEN TWO SUPPORT	QTY.
200NB	3500mm	7 NOS.
150NB	3500mm	108 NOS.
100NB	3500mm	33 NOS.
80NB	3500mm	29 NOS.

ROAD CROSSING DETAIL FOR TRANSFORMER



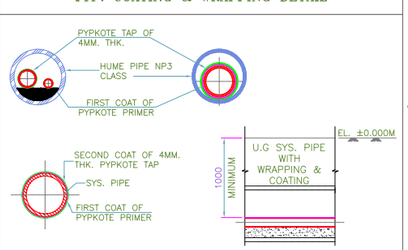
PEDESTAL SUPPORT DETAIL FOR A.G PIPE (FOR U–BOLT)



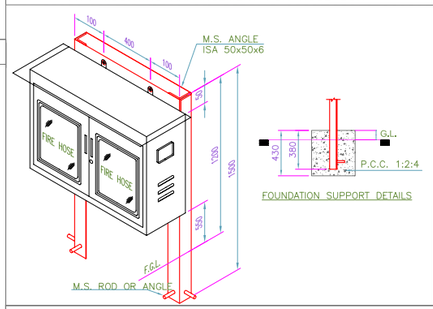
SYS. PIPE	DISTANCE BETWEEN TWO SUPPORT	U BOLT SIZE	QTY.
200NB	3500mm	M12	16 NOS.
150NB	3500mm	M10	

SYS. PIPE	DISTANCE BETWEEN TWO SUPPORT	U BOLT SIZE	QTY.
200NB	3500mm	M12	87 NOS.
100NB	3500mm	M10	

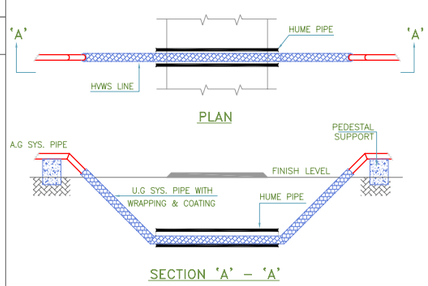
TYP. COATING & WRAPPING DETAIL



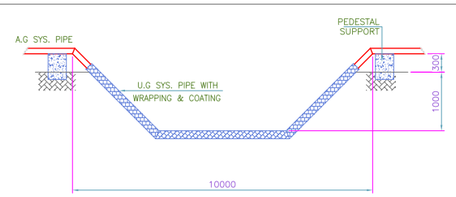
TYP. MOUNTING ARRANGEMENT FOR HOSE BOX



TYP. ROAD CROSSING DETAIL



DETAIL–X



BILL OF MATERIAL

SR.NO	NAME	SIZE (mm)	MOC	DESCRIPTION	QTY.
1	PIPE (A.G)	200NB	M.S.	6.35 MM THK.	420 Mtrs.
2	PIPE (U.G)	200NB	M.S.	6.35 MM THK.	54 Mtrs.
3	PIPE (A.G)	150NB	M.S.	IS:1239–MEDIUM (PART–1)	462 Mtrs.
4	PIPE (U.G)	150NB	M.S.	IS:1239–MEDIUM (PART–1)	78 Mtrs.
5	PIPE (A.G)	100NB	M.S.	IS:1239–MEDIUM (PART–1)	420 Mtrs.
6	PIPE (U.G)	100NB	M.S.	IS:1239–MEDIUM (PART–1)	54 Mtrs.
7	PIPE (A.G)	80NB	M.S.	IS:1239–MEDIUM (PART–1)	132 Mtrs.
8	PIPE (U.G)	80NB	M.S.	IS:1239–MEDIUM (PART–1)	18 Mtrs.
9	SINGLE HEADED HYDRANT VALVE	63NB	S.S.	IS:5290, Type–A	22 Nos.
10	HOSE BOX	–	M.S.	16 S.W.G. WITH 3 MM THICK GLASS	22 Nos.
11	HOSE PIPE	63NBx15 M	–	IS:636 (RRL,TYPE–A)	44 Nos.
12	BRANCH PIPE WITH NOZZLE	63NB	S.S.	IS:903	22 Nos.
13	GATE VALVE	100NB	C.I.	BS:5150 RISING SPINDLE TYPE (PN–1.6)	02 Nos.
14	GATE VALVE	150NB	C.I.	BS:5150 RISING SPINDLE TYPE (PN–1.6)	02 Nos.
15	HUME PIPE (100NB,150NB)	300NB	R.C.C.	NP3 CLASS	40 Mtrs.
16	HUME PIPE(200NB)	400NB	R.C.C.	NP3 CLASS	10 Mtrs.
17	HUME PIPE(200NB & 100NB)	600NB	R.C.C.	NP3 CLASS	5 Mtrs.

REFERENCE DRAWINGS

(1) REF. CLIENT BASE DRAWING NO.
  (A) LAYOUT FOR 220KV SWITCHYARD DRAWING NO.– TB–0–345–510–006 – R1
(2) REFER MASS DRAWING NO.
  (a) TB/DWG/345/552/003 – HVWs System for 150 MVA BHEL Make Tra.–Plan, Elevation & Side View
  (b) TB/DWG/345/552/004 – HVWs System for 150 MVA BHEL Make Tra. Isometric View
  (c) TB/DWG/345/552/005 – HVWs System for 150 MVA BHEL Make Transformer –Pylon Support Details

NO COMMENTS

NOTES

1) ALL DIMENSIONS ARE IN MM AND ELEVATIONS IN METER UNLESS OTHERWISE SPECIFIED.
2) MINOR MODIFICATIONS IN LAYOUT MAY BE DONE TO SUIT SITE CONDITIONS & MAINTAIN ELECTRICAL CLEARANCES.
3) DETAILS & LOCATION OF DV HOUSING SHOWN INDICATIVE AND SHALL BE FINALIZED AS PER ACTUAL SITE CONDITION AT THE TIME OF ERECTION.
4) –FOR A.G M.S. PIPE 2 COATS OF RED PRIMER + 2 COATS OF SYNTHETIC ENAMEL– P.O. RED
  –FOR U.G PIPE PYPKOTE OR EQUIVALENT TYPE PROTECTION AS PER IS: 10221 FOR UNDER GROUND PIPES.
  THE THICKNESS OF WRAPPING & COATING SHALL BE 4mm.

REV.	DATE	DESCRIPTION	DRAW.	CHKD.	APPD.
1.	28.05.2013	REVISED AS PER STEG COMMENTS RECEIVED ON DATE–25.04.13	JAY P.	VIPUL	BHAVIN

For Approval ☑ For Office Use ☐ For Bid Purpose ☐
For Information ☐ For Fabrication ☐ For Erection ☐

FIRE FIGHTING CONTRACTOR

MEHTA & ASSOCIATES
FIRE PROTECTION SYSTEMS PVT. LTD.
402–403, SACHET, OPP. BALAJI GARDEN RESTAURANT ; PRERNATIRTH DERASAR ROAD, SATELLITE, AHEMDABAD – 380 015.

PURCHASER : M/S BHARAT HEAVY ELECTRICALS LTD. TBG – NEW DELHI

CONSULTANT: STEAG ENERGY SERVICES (INDIA) PVT. LTD.

CUSTOMER : BIHAR STATE ELECTRICITY BOARD

P.O. NO. :– 312P386 DT. 12.03.13

PROJECT :– FIRE PROTECTION SYSTEM FOR 220 KV SWITCH YARD AT BARAUNI TPS (2 * 250 MW)

	NAME	DATE
DRAWN BY	ANKIT	12–04–2013
DESIGNED BY	JAY G	12–04–2013
CHECKED BY	BHAVIN	13–04–2013
APPROVED BY	VISHAL	13–04–2013

THIRD ANGLE PROJECTION | SCALE 1:600

TITLE :– FIRE WATER PIPING LAYOUT

DRAWING NO. TB/DWG/345/552/002 | REV. 1

SHEET NO. 1 OF 1 | NO.OF SHTS. ––

SIZE–A1

FILE PATH –FILE : \\10.0.0.235\engg\Projects\501–520\517 – BHEL_BSEB BARAUNI TPS\Extn_1\Drgs\Mechanical\Hydrant system\TB–DWG–345–552–002_R1 Fire Water Piping Layout