BHARAT HEAVY ELECTRICALS LIMITED
CENTRALISED STAMPING UNIT
Jagdishpur

Tender for supply and installation for plant road and boundary wall lighting at Jagdishpur

Tender Enquiry No: BHE/CSU/CVL/11

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BILL OF QUANTITIES & PRICE SCHEDULE

BHARAT HEAVY ELECTRICALS LIMITED
(A GOVERNMENT OF INDIA UNDERTAKING)
CENTRALISED STAMPING UNIT
Industrial Area
Jagdishpur (UP) 227817

Centralised Stamping Unit, Jagdishpur

BILL OF QUANTITIES AND PRICE SCHEDULE (Plant Road & Boundary Wall lighting)

Item Nos.	Description of item for supply and installation for plant road and boundary wall lighting at Jagdishpur	UNIT	Qty.	RATE		AMOUNT(Rs)
				In Figures ,Rs	In Words, Rs	
	For All the items specified below, the scope of work shall be as per tender specification, construction drawings and as directed by the engineer including all materials, labour, consumables, T & Ps ,IMTEs, supply and approval of samples,painting, RCC civil foundation for poles including all necessary civil works for erection of lighting poles , holding arrangement of lights on boundary wall as per drawing to achieve required illumination/ lux level within the plant premises etc and also including supply of one no wheel mounted maintenance ladder for street lighting poles for the following--					
1	**Plant road and boundary wall lighting**					
1.1	Supply and fixing of 9.5mm steel tubular lighting pole (heavy duty) 8m high above ground level embedded approx 1.5m in RCC foundation underground.of 1:3:6 or equivalent concrete with nominal reinforcement including finishing of foundation complete. (foundation shall be paid under item 1.5 below).	No.	60			
1.2	Supply and fixing of light of 400 Watts with hard ward MCB ,outdoor type IP-56 protection enclosures	No.	60			
1.3	Supply and fixing of light of 250 Watts with outdoor type IP-56 protection enclosures with necessary holding arrangement on boundary wall as per drawing	No.	45			
1.4	Supply, Laying & Termination of LT cable of 25 Sq.mm ALU Arramard,60 A, 1.1kV, from main PCC to Campus/Security Light	Mt.	5500			
1.5	RCC foundation work, painting etc. of Lighting Pole	No.	60			
1.6	Supply of one no. heavy duty wheel mounted pole maintenance ladder for lighting pole maintenance	No.	1			
					Grand Total=	

BHARAT HEAVY ELECTRICALS LIMITED
CENTRALISED STAMPING UNIT
Jagdishpur

Tender for supply and installation for plant road and boundary wall lighting at Jagdishpur

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SECTION V

TECHNICAL SPECIFICATION

SPECIFIC TECHNICAL REQUIREMENTS

BHARAT HEAVY ELECTRICALS LIMITED
(A GOVERNMENT OF INDIA UNDERTAKING)
CENTRALISED STAMPING UNIT
Industrial Area
Jagdishpur (UP) 227817

SECTION V
SPECIFIC TECHNICAL REQUIREMENTS

1.0 GENERAL

This section covers specific technical requirements of contract and should be read in conjunction with BOQ and other sections of the contract. In case of any conflict between the contents of BOQ and technical Specifications , BOQ will prevail over technical specification.

The following sections of technical specification may be read for such clauses which are relevant to this tender.

2.0 FREE ISSUE MATERIALS

Nothing shall be supplied as free issue material by BHEL.

3.0 DISMANTLING OF EXISTING STRUCTURES

The contractor will have to carryout dismantling of buried/ semi buried structures, if any, encountered within the battery limit and disposal of it within plant boundary as directed by BHEL at no extra cost to BHEL.

4.0 STATUTORY REQUIREMENTS

Bidder shall comply with all the applicable statutory rules pertaining to Factories Act. Fire Safety Rules of Tariff Advisory Committee, Water Act for pollution control, Explosives Act, etc.Provisions of safety, health and welfare according to Factories Act shall be complied with. Statutory clearances and norms of State Pollution Control Board shall be followed.Bidder shall obtain approval of electrical drawings from concerned authorities before taking up the work.

5.0 WORKMANSHIP

Workmanship shall be of the best possible quality and all work shall be carried out by skilled workmen except for those which normally require unskilled persons. Welding shall be done by experienced and certified welders in proper sequence using necessary jigs and fixtures. Fabrications shall be done in shops having proper equipment for accurate edge planning and milling of column shall ends, base late surfaces etc. and shaping and dimensioning of anchor bolt assembly, inserts and other misc. items. In addition to the requirement specified above, if the bye-laws of the local Govt., Municipal or other authorities require the employment of licensed or registered workmen for various traders, the contactor shall arrange to have the work done by such registered or licensed personnel. In case of manufactured materials, the Contractor shall have, with no additional cost the owner, the services of the supervisors of the manufacturers to achieve that the work is being done according to the manufacturer's specifications.

6.0 TEMPORARY WORK

All scaffoldings, staging, temporary bracing and other necessary temporary work required for proper execution of the Contract shall be provided by the Contractor at his own cost and inclusive of all materials, labour, supervision and other facilities.

The layout and details of such Temporary work shall have the prior approval of the Engineer as agreed, but the Contractor shall be responsible for proper strength and safety of the same. All Temporary work shall be so constructed as not to interfere with any permanent work or with the work by other agencies. If it is necessary to remove any of the temporary work at any time to facilitate execution of the work or with the work of other agencies, such removal and re-erection, if required, shall be carried out by the Contactor at the discretion of the Engineer without any delay and any extra cost on this account shall be borne by the Contractor.

7.0 INTERFACE WITH STRUCTURES UNDER OTHER'S SCOPE

a) In cases of interface e.g. structures under other's scope of supply being supported on structures under scope of this contractor, the same will be discussed and suitably addressed.

b) Modification in layout of foundation/structure during detail engineering stage may be necessary to avoid fouling with those under other's scope. Necessary changes on this account will be made without any extra cost to Owner.

c) Necessary engineering is to be done and provisions are to be kept accordingly by the Contractor to construct foundations/underground structures, etc. without disturbing/ endangering the constructions done under the scope of other contracts.

8.0 INSPECTION, TESTING AND QUALITY CONTROL FOR ELECTRICAL WORKS

Sampling and testing for major items of electrical works shall be carried out in accordance with the requirements of this specification and field quality plan (FQP).
The bidder shall submit for BHEL's approval a detailed field quality assurance programme for electrical works before starting of the construction work. This shall include frequency of sampling and testing nature/type of test, method of test, setting of a testing laboratory, arrangement of testing apparatus/equipment, deployment of qualified/experienced manpower, preparation of format for record, Field Quality Plan, etc. Tests shall be done in the field and/or at a laboratory approved by the Engineer and the Bidder shall submit to the Engineer, the test results in triplicate. In addition, the bidder shall furnish the original test certificate from the manufacturer's of various materials to be used in the construction.

If any work found to be of inferior quality or sub-standard, the same shall be dismantled and shall be redone as per approved quality or relevant standard. BHEL reserve the rights to reject the work of inferior quality. All expenses on account of dismantling and rework shall be born by contractor.
The contractor's finally accepted rates shall include cost of such field tests with standard equipments and IMTEs

9.0 CONSTRUCTION / ERECTION METHODOLOGY

- All fabrication and erection activities of structural steel shall be carried out using automatic submerged arc welding machines, cutting machine, gantry cranes, crawler / wheel mounted heavy cranes and other equipments like heavy plate bending machines, shearing machines, lathe, milling machines etc. Use of derricks shall not be permitted.
- All handling of materials shall be with cranes. Heavy tailors shall be used for transportation.
- Mechanized modular units of scaffolding and shuttering shall be used.

- Grouting shall be carried out using hydraulically controlled grouting equipment.
- All finishing items shall be installed using appropriate modern mechanical tools.
- Manual punching etc. shall not be permitted.
- Heavy duty hoist for lifting of construction materials shall be deployed.
- Compressors for cleaning of foundations and other surfaces shall be used.
- All persons working at site shall be provided with necessary safety equipment and all safety aspects shall be duly considered for each construction/erection activity. Moreover, only the persons who are trained in the respective trade shall be employed for executing that particular work.
- Fabrication and Erection of all fabricated columns shall be done in single piece unless otherwise provided for in the approved drawings. Main columns of the power house building can have maximum of one number of the erection splice. All shop and site splice shall suitably staggered. The erection splice shall be provided with full strength splice cover plate over the butt weld. Contractor shall submit the erection scheme for the erection of all type of structures and carryout the erection work only after approval of the scheme by the owner.

11.0 FIELD LABORATORY FACILITIES AT SITE FOR MATERIAL TESTING:

Contractor shall provide field testing facilities at site laboratory built by the contractor

12.0 MAKE OF BOUGHT OUT MATERIAL:

Contractor shall supply bought out items as per the list attached at **annexure-A-1** of this section.

13.0 SPECIFIC TECHNICAL REQUIREMENT FOR ELECTRICAL WORKS FOR BUILDINGS :

- All electrical fittings shall be concealed in walls ,floors and roofs.
- Telephone, cable wires shall be provided in each room.
- Fittings shall be of superior make.

14.0 OTHER TECHNICAL REQUIREMENT FOR ELECTRICAL WORKS

Contractor shall ensure **deployment of Qualified & Experienced Safety Engineer / Officer** at site. **It may be noted that non-compliance to this will result in penal action as may be decided by the competent authority of BHEL**.

Some of the common safety rules to be followed during working are as follows

- No outsider is allowed to enter construction area without permission.
- No body is allowed to enter at construction site without Safety Shoe.
- Never enter work area without Safety helmet & chin strap in place.
- No climbing/working allowed without proper safety belt above 2 m. height.
- Do not exceed the speed limit 25 Kmph within premises.
- No debris obstacles allowed on the roads & passages.
- All accidents/incidents to be reported to site Incharge.
- Do not walk on pipelines or false ceiling.
- Maintain good Housekeeping at work site.
- No photography/ Videography allowed without permission

- Risk factor in construction is approximately 3 times the manufacturing sector.
- 85% of the workforce is drawn from rural background. They lack technical perspective & relevant industrial common sense. Safety awareness to be developed among these workers employed by Sub-contractors.
- Infrastructure to be developed for carrying out jobs properly in a safe manner.
- All Site supervisors & engineers (including subcontractor's) must be imparted structured training on construction safety before start of the job & record to be maintained.
- Availability of qualified & trained Site Engineer at site during all working hours.
- Site Safety training to be imparted to all workers & plan to be made to cover every worker.
- Tools box talk (5-15 minutes) by supervisor prior to commencement of any job.
- All accident / incidents(Near Miss) to be reported & investigated.(formats & procedure should be finalized)
- Daily Safety Checking by Each Site Engineer along with Safety engineer.
- Weekly co-ordination meeting of all Safety engineers with BHEL safety officer.
- Monthly safety meeting with Site In-charges.
- Reports: Weekly/monthly/annual SHE report format should be finalized.
- All Safety equipment must be ISI marked & checked by Safety officer before use.
- Tag system for erection & use of scaffoldings.
- Bamboo/wooden Scaffolding material not allowed.
- LPG cylinders not allowed for gas cutting.
- Good House keeping. Separate waste bins to be used for flammable & non flammable material.
- Safety awareness programs for workers by display of boards, posters, competitions, talks etc.
- Deployment of Safety Supervisors for every 250 workers and part there of at work site.
- Display of List of First Aid trained persons.
- Testing certificates for lifting tools & tackle.
- Provision & maintenance of fire extinguishers at construction site & material stores.
- Display of emergency telephone numbers at various locations.
- For work in confined space use 24 V lamp fitting & use tools with air motors or electric tools with max. 24 V.
- For confined space entry Gas test must be done before & at regular intervals.
- Checking & tag of equipment like grinding machine, welding machine, gas cutting set etc. by supervisors before use.

Further, the contractor is required to provide proper Safety Net System wherever the hazard of fall from height is present as per instructions of BHEL Engineer at site. The safety net shall be fire resistant, duly tested and shall be of ISI mark and the nets shall be located as per site requirement to arrest or to reduce the consequences of a possible fall of persons working at different heights

15. ERECTION

15.1 All works such as cleaning, checking, levelling, aligning, assembling, temporary erection for alignment, dismantling of certain equipment for checking, cleaning, surface preparation, fabrication at site, cutting, grinding, straightening, blue matching, chamfering, filing, chipping, drilling, machining, surface grinding, shaping, fitting up etc. as may be applicable in such erection works are to be treated

as incidental to erection and necessary to complete the work satisfactorily and shall be carried out by the contractor as part of the work.

15.2 Any fixtures, scaffolding materials, concrete block supports, steel structures required for temporary supporting, for pre-assembly or checking, welding, lifting and handling during pre-assembly and erection shall be arranged by contractor at his cost.

15.3 The following provisions cover the technical requirements for some of equipment installation. The brief idea about the work involved is indicated below however the work is to be carried out in accordance with the recommendations of the equipment manufacturer drawings, documents furnished to the contractor by BHEL or as directed by BHEL Engineer.

16.0 **LT OIL FILLED SERVICE TRANSFORMERS :**

Scope of work includes checking and preparation of foundation surface, erection of accessories and auxiliaries, carrying out minor modification wherever required; Preparation of oil and oil filling under vacuum, dry out of transformer, testing of transformer, oil and other auxiliaries, laying of cable trays upto marshalling box, cabling upto marshalling box and termination for auxiliaries, earthing of accessories to earth conductor / riser, testing of all auxiliaries, pre-commissioning and back charging of transformers.

Painting of Transformer***(Including supply of paint),*** as approved by BHEL Engineer

17.0 PANELS – POWER , CONTROL & RELAY (LTMCCs , GRP / GCPs ,Unit Aux Control Board and Station Aux Control Board etc.)

Erection at site / control room including chipping of floor, fabrication and fixing of base channel frame, levelling & alignment with spirit level, welding the base channel to the embedded plates / channels, grouting , fixing of anti-vibration pads, termination of inter panel connections, mounting / connections of loose instruments, inter panel bus bar connections, commissioning including loop checking, system checking, and putting necessary controls on automatics. ***Tenderer may note that fabrication / fixing / painting of base channel(Including supply of paint),/ suitable steel stool, if required, is included under the scope of this work. Contractor will be paid for fabrication / erection as per applicable rates for structural steel fabrication / erection.***. Checking of internal wiring, rectification, testing and calibration of equipment mounted inside is in the scope of contractor. The contractor may have to change / replace items found faulty without any extra cost, however materials for this shall be provided by BHEL. Mostly panels will be delivered fully wired. However wherever required termination of loose wires , bus wires is to be done. Canopy for panels will be supplied loose & shall be installed by the contractor after erection of panels. The cleaning of panels have to be done with electrical vacuum cleaner, besides conventional cleaning with brush etc. The drilling of holes in the gland plates for cable entry shall be part of panel erection. All blank holes / gaps in the gland plates / boxes etc. shall be properly sealed. The base frames shall be painted suitably. The contractor shall carry out the plugging and sealing of left out holes in the gland plates and other openings at the bottom of panels at his own cost by using fire retardant mortar or good quality sealing material as advised by BHEL **. Any minor alterations required in the bus bar arrangement, wiring in the panels/ cubicles shall also form part of the work. During testing,**

commissioning, some equipment / modules may need replacement / repairs. All such replacements / repairs and assistance during commissioning and running of the unit till handing over to the Customer are part of the scope as some of the test / commissioning will have to be done after the machine is running on various loads.

Touch-Up Painting with paint***(Including supply of paint),*** as approved by BHEL Engineer .

18.0 CABLE RACK AND TRAY

Cable trays shall be supplied either ladder, prefabricated, slotted or duct type. **Cost of cable tray erection as per BOQ Cum Rate Schedule shall include fabrication of supports to suit site requirement, fixing of support in position by welding as per Engineers instruction , erection and fixing of cable trays and racks by welding or by bolts and nuts. No separate payment will be released for fabrication / fixing / painting of support structure for cable trays*(Including supply of paint),*. shall be released after completion of cable tray erection / reconciliation of total material used in fabrication / erection of cable tray supports.** Jointing of trays can be carried out by bolting / welding as per direction of Engineer. Contractor shall carryout cutting of tray only by Hacksaw for obtaining proper routing from standard lengths supplied. Materials for support fabrication like flats, channels, angles etc. shall be supplied by contractor free of cost. The cutting & welding points on trays will be painted by primer & Al paint by the contractor including supply of paint within the erection price and no extra cost to BHEL. These cable trays may also be required for laying copper tubing, plica type / GI flexible conduits, local cabling and metal temp. thermocouples.

Beside above angels / channels of various sizes may have to be fabricated / erected, for use as cable trays, from structural steel to be supplied by contractor free of cost.

In many cases, trays are supplied with tray covers. These covers have to be erected after completion of bottom cable tray and lying of cables etc. The covers are to be properly secured on the bottom trays and no separate payment will be made for putting these covers. If required, GI / Al strip clamps are to be used.

19.0 CABLE LAYING

Laying, dressing & clamping (by Nylon / PVC ties or Aluminium strips or any other method specified by BHEL Engineer) of the cables in the cable trays / angles. The final dressing of cables on cable trays not erected by contractor shall also be done with Nylon Cord / Aluminium strip. Cost of cable laying as per BOQ Cum Rate Schedule shall include the cost of Nylon / PVC ties & Aluminium strip required for dressing / clamping.

The cable run number shall be provided by punching Aluminium Tag plates and tying suitably with nylon ties (at both ends and at regular intervals as advised by BHEL Engineer) which shall be arranged by contractor at his cost. Nylon / PVC ties & Aluminium strip required for cable tags shall have to be provided by the Contractor.

While laying cables, existing cable tray covers and false flooring may require to be removed and re-fixed. The same has to be done at no extra cost to BHEL

20.0 CABLE TERMINATION

a) Termination Of HT Cables Only Shall Be Measured And Paid Separately As Per Quoted / Accepted Rate Of Respective Item Of BOQ CUM Rate Schedule.

b) For Cables Other Than HT Cables , The Cost Of Cable Laying As Per BOQ Cum Rate Schedule Shall Also Include The Cost Of Termination With Suitable Crimping Type Lugs Including Supply Of Ferrules (for cross / direct ferruling as per BHEL instructions). Drilling of holes in gland plates of HT / LT switchgear, transformer, control panels, JBs etc as per requirement shall also be part of cabling at no extra cost to BHEL.

c) The contractor shall carryout insulation testing, simulation testing etc. as per the instructions of Engineer at site.

d) Screen of signal cables shall run in insulated sleeve (to be arranged by contractor at no extra cost) and shall be terminated as per the instructions of the BHEL Engineer.

21. JUNCTION BOX, PUSH BUTTONS ETC

Includes supply ,fabrication / fixing / painting of stands for junction boxes / push buttons / frame mounted panels etc will be included in quoted / accepted price of respective item. **Tenderer may note that fabrication / fixing / painting of stands for junction boxes / local push buttons / indication boxes etc. will be included in quoted / accepted price of respective item. No separate payment will be released for fabrication / erection of these stands.**

22 RIGID PIPE/CONDUITS

Cutting / threading of standard lengths of conduits, laying on fabricated supports or on floor, using screwed fittings, clamping, sealing of open ends. Approved Good quality sealant shall be used to make the joint water proof.

23 PLICA FLEXIBLE CONDUIT

Laying of conduits in cable trays, end connection with instrument / J.B. / panel, using suitable connectors / unions etc. . Suitable thread / Plica sealant shall be used to make the conduit system water proof. Aluminum painting, clamping and tagging in tray / angle forms part of erection job

24 EARTHING

Earthing work mainly involves laying and tack welding of conductors on columns / beams at every one meter interval and bolted connections with equipment at least at two points. Low hydrogen content electrodes shall be used for welding. All the galvanized items shall be given surface treatment (by thoroughly cleaning with sand paper and / or cotton cloth to make the surface clean, smooth & free from any type of spots) at the welded joints & the places where galvanizing has been damaged. Welded joints shall be applied with two coats of cold zinc paint whereas portions with damaged galvanizing shall be applied with single coat.

- Any cutting of masonry work, which is necessary shall be done by the contractor at his own cost and shall be made good to match the original

work. The Contractor shall obtain prior approval before cutting any masonry / concrete work.

- Conduits shall be thoroughly cleaned before pulling in the cable.
- Pipes sent in standard length shall be cut to suit the site conditions and the layouts. Tubes or pipes wherever deemed to be convenient will be sent in running lengths with sufficient bends. Bends upto 80 mm Nb will have to be fabricated at site.
- In case of Transformers if any leakage / sweating is observed from field assembled / shop assembled gasket joints, valves, welded joints the same shall be attended by the contractor including draining of oil, refilling of oil & centrifuging if required at no extra cost to BHEL till handing over period. Sealing compound and any other consumable, if needed, shall be arranged by the contractor with in the quoted rates.
- Calibration log-sheets / history cards of all the instruments, panels, drives, relay testing etc. under the scope shall be recorded and submitted on BHEL approved formats. Proper logging will form a part of calibration / erection activity for the purpose of monthly running bills payments.
- The contractor shall use only SHEARING machine or HACKSAW for cutting angles, flats, channels and trays. No gas cutting is permitted . Drill machine shall be used for drilling holes.
- The contractor should note that after execution of work they will hand over marked up drawings "as erected" drawings to BHEL Engineer at site for preparation of firm "as built" drawings. "As erected" drawings will bear the signature of BHEL Engineer and contractor.
- The contractor shall paint the name / put tag numbers on all the equipment / instruments / cables etc. erected by him. Materials for tagging shall be supplied by the contractor . Contractor at his cost shall also arrange the adhesive etc.
- Contractor shall fabricate and erect stands / supports for Junction boxes, push button stations, fixing of push button and plugging of holes in JB's. This is considered inclusive in the item erection.
- DRIP SHIELDS shall be fabricated for all field mounted panels / instruments / instrument racks / JB Racks / control cabinets etc. The fabrication forms part of erection work.
- The motors and motorized valves actuators and solenoid valves will be erected and commissioned by other agency. However, if required electrical commissioning, of motorized valves may have to be carried out, wherever required, against this contract , payment of which shall be made as per applicable item of the Rate schedule.

16.0 TESTING, PRE-COMMISSIONING, COMMISSIONING AND POST- COMMISSIONING.

16.1 Site testing shall be required for all equipment installed by the contractor to ensure proper installation, setting, connection and functioning in accordance with drawings, specifications and manufacturer's recommendations.

16.2 Commissioning protocols are to be prepared as advised by BHEL Engineer for getting approved by customer/ Consultant.

16.3 Testing, and pre-commissioning checks shall be as per relevant codes / practices and BHEL drawings / specifications/ approved commissioning Protocols and same shall include, but not be limited to the following :

(I.) TRANSFORMERS

(a) Insulation resistance and earth resistance checks.
(b) Oil testing like BDV of oil of each drum before pouring, after processing and in the course of dry out, moisture content tests as and hen required. Provision should be made for preparation of oil in a separate tank before filling in the main transformer tank.
(c) Checking of Buchholz Relay, oil level indicator PRV, calibration of OTI, WTI etc.
(d) Winding resistance, vector group, turns ratio test on different taps, magnetising current, core balance check etc.
(d) After installation the contractor will get oil samples tested at an accredited test lab as per relevant IS as advised by BHEL Engineer and submit the test results, in case the test results are found unsatisfactory the tests will be got repeated by the contractor after reprocessing of oil & submitted to BHEL for approval/acceptance.
(e) Turns ratio, polarity, insulation resistance and winding resistance checks on all CT's.

(II.) CONTROL & PROTECTION PANELS

(a) Checking of complete wiring and insulation resistance.
(b) IR test and loop checking of all field wiring in the panel.
(c) Checking of all protection, metering and indicating schemes.
(d) Calibration of all indicating and measuring instruments, relays, timers.
(e) Checking of all auxiliary schemes e.g. space heating, illumination.
(f) Checking of operation of all relays, switches and other indicators.
(g) Commissioning of total scheme including relevant internal equipment.
(h) Carrying out suitable modifications as per system requirement.
(i) Carrying out primary injection, secondary injection, stability checks etc.

16.4 In case any defect is noticed during tests, trial runs and commissioning such as loose components, undue noise or vibration, strain on connected equipment etc. the contractor shall immediately attend to these defects and take necessary corrective measures. If any readjustment and realignment are necessary, the same shall be done as per Engineer's instructions including repair, rectification and replacement work by the contractor at his cost. The parts to be replaced shall be provided by BHEL.

16.5 During this period, though the BHEL's staff / Consultant appointed by BHEL will also be associated in the work, the contractor's responsibility will be to arrange for the complete requirement of supervision , labour , consumable, T&P and IMTEs required till such time the commissioned units are taken over by the BHEL's customer.

16.6 During commissioning activities and for carrying out various tests, special instruments etc , have to be temporarily erected and commissioned to suit the commissioning activities. Contractor will provide the necessary equipment. Contractor has to carry out the erection, calibration, dismantling of the same. After completion of activities the temporary systems have to be removed and to be taken back at no extra cost to BHEL.

16.7 During erection of various equipment, prior to commissioning and after commissioning, protocols have to be made with BHEL's customer. The proforma and formats as approved have to be printed by the contractor in adequate numbers. The pre-commissioning activities will start with various trials, commissioning

operations shall continue till units are handed over to customer. Simultaneous commissioning activities will be progress in various areas, checking of equipment erected, making ready for trial runs, all these works need specialised gangs including electricians / instrument technicians in each area to render assistance to BHEL commissioning staff. Contractor shall earmark separate manpower for various commissioning activities. The manpower shall not be disturbed or diverted.

16.8 It shall be the responsibility of the contractor to provide workmen of various categories in sufficient numbers along with Engineers/ Supervisors including necessary consumables, T&P etc. during pre-commissioning, commissioning and post commissioning period for commissioning of equipment and attending any problem in equipment erected by the contractor till handing over. The rates quoted shall include all these contingencies also.

16.9 It shall be specifically noted that the above employees of the contractor may have to work round the clock alongwith BHEL commissioning Engineer and hence overtime payment by the contractor to his employees may be involved. The contractor's accepted rates shall be inclusive of all these factors also.

16.10 In case, any rework is required because of contractor's faulty erection which is noticed during commissioning , the same has to be rectified by the contractor at his cost. If any equipment / part is required to be inspected during commissioning, the contractor will dismantle / open up the equipment / part and reassemble/redo the work without any extra claim.

16.11 During commissioning, opening and closing of valves, attending to leakage, changing of gaskets, modifications in wiring, realigning of equipment, re-calibration of instrument, attending to leakage, minor adjustments of erected equipment may arise. The accepted rates shall include all such works.

17.00 FINISH PAINTING

17.1 All equipment within the scope of these specifications shall be received duly painted. The type of painting to be carried out is specified. For panels , during storage and handling the same may get peeled off / damaged / deteriorate. All such surfaces are to be thoroughly cleaned and to be touch up painted with suitable approved primer / finish paint matching with shop paint / approved final colour. **Besides above two coats of approved primer paint and at least two coats of approved finish paint to get the desired dry film thickness, is to be applied on various loose equipment and all steel structures fabricated and erected at site**. All paints, tools and other consumables including scaffolding materials required for painting shall be arranged and provided by contractor within the quoted rates. Paint and other materials so purchased shall be ISI marked and painting should be as per colour scheme and quality approved / specified by Engineer. Valid Test certificate for the paint so supplied shall be made available before use of the same on work. The contractor shall provide legend on equipment in size specified by Engineer. Letter writing shall be done in Hindi / English or in both language. The printer have to under go test and only qualified painters will be allowed to work.

17.2 Certain equipment shall require spray painting (touch up). The contractor shall make arrangements of the required equipment for spray painting of such equipment ***Including supply of paint,*** at his own cost. Spray painting at the job site shall be permitted only at times and locations approved by the owner / Engineer.

Annexure-"A-1"

INDICATIVE LIST AND SPECIFICATIONS OF APPROVED MAKE OF BOUGHT OUT MATERIAL TO BE ARRANGED BY THE CONTRACTOR AT HIS OWN COST

The following list may be read in conjunction with the relevant make/ makes of materials mentioned in the BOQ or elsewhere in this tender document.

AA) Wiring Materials & Light of
Manufacturing Building

S.N.	Particulars	Technical Specifications	Make
1.	MS tray 300mm width made by perforated angle	300mm width Supply & fixing	
2.	Slotted angle 25mmx25mmx3mm support for cable tray	--do--	
3.	Nut-Bolt and washer 12mmx6mm	GI quoted	
4.	PVC pipe dia 25mm thick 2mm	2mm thick heavy duty	
5.	PVC junction box 25mm	--do--	
6.	Ceiling rose	--do--	
7.	PVC Elbow 25mm	--do--	
8.	MCB box 8 way (TPN) double door	TPN double door powder quoted IP 54 insulated surface mounting with transparent cover/door	Legrand/ABB/L&T
9.	MCB 10Amp. single phase	10KA BC	Legrand/GE/ABB/L&T
10.	Casing Patti PVC 25mm	2mm thick heavy duty	
11.	PVC bend 25mm	--do--	
12.	Casing PVC 25mm 'T'	--do--	

S.N.	Particulars	Technical Specifications	Make
13.	Casing Konia 25mm	--do--	
14.	PVC Gully	--do--	
15.	Steel screw 34/8mm	35/8mm nikkled	
16.	Copper wire 6sq.mm multi-stand/multi-layer – FR grade	1.1KV grade FR	Finolex/Polycap /National
17.	Copper wire 4sq.mm multi-stand/multi-layer – FR grade	--do--	--do--
18.	Copper wire 2.5sq.mm multi-stand/multi-layer – FR grade	--do--	--do--
19.	Copper wire 1.5sq.mm multi-stand/multi-layer – FR grade	--do--	--do--
20.	Flexible pipe 25mm	2mm thick ISI mark	
21.	MCB 16Amp. single phase	10KV BC	Legrand/GE/ABB/L&T
22.	Power box PVC casing 16 Amp.	2mm thick	
23.	Integral industrial medium highway lights 150watt	Except bulb, 150watt. hight revenues, high pressure	GE/Philips
24.	Lamp 150watt.	--do--	--do--
25.	Labour charges for wiring-cable tray fittings and light, power point fittings	Complete wiring tray making hanging fixing light fan	

BB) Light Control Panel Manufacturing Bay-1A

S.N.	Particulars	Technical Specifications	Make
	Panel (as per single diagram hall no.1)	Custom built panel CRC sheet, clad, dust	

S.N.	Particulars	Technical Specifications	Make
		and vermin proof floor mounted type comprise with aluminium bus-bar 250Amp. 3.5 phase neutral wires, Lugs, insulators and engineering. CPRI approved panel builders.	
A.	**Details of incoming and outgoing fitters switch gears**		
1.	Incoming MCCB 200Amp.	4 pole, 35 KA BC	Legrand/GE/ABB/L&T
2.	Metering set (CT 250/5 Volt meter, Amp meter and sector switch)	96x96mm CT operated meter with sector switch and control	
3.	MCB 63Amp. 4 pole	'C' curve	Legrand/GE/ABB/L&T

CC) Light Control Panel Manufacturing Bay 2A-1B

S.N.	Particulars	Technical Specifications	Make
	Panel (as per single diagram hall no.2&3)	Custom built panel CRC sheet 14SWG/16SWG, clad, dust and vermin proof floor mounted type comprise with aluminium bus-bar 250Amp. 3.5 phase neutral wires, Lugs, insulators and engineering. CPRI approved panel builders.	
A.	**Details of incoming and outgoing fitters switch gears**		
1.	Incoming MCCB 200Amp.	4 pole, 35 KA BC	Legrand/GE/ABB/L&T

S.N.	Particulars	Technical Specifications	Make
2.	Metering set (CT 250/5 Volt meter, Amp meter and sector switch)	96x96mm CT operated meter with sector switch and control	
3.	MCB 63Amp. 4 pole	'C' curve	Legrand/GE/ABB/L&T

DD) **11/0.4 KV 2000KVA ELECTRICAL BUILDING & POWER SUB STATION**

Sl.No.	Particulars	Technical Specification	Make
1.	Over Head Line 0.8 KM Approx	Supply & fixing steel tubular pole 9.5meter long designated 410. SP-28 in 1:3:6 cement concrete foundation include excavation back filling etc. complete in all respect. Over head aluminium mink (3 phase 11KV) conductor code.	
2.	11 KV Grade XLPE Aurmard 3 core cable -185 Sq.mm	XL.PE-11KV 3 core 185 Sq.mm.	
3.	End Termination Kit For 11 KV 185 Sq.mm Heat Shrinkable type 9 Indoor type + 1 Outdoor type	Mahindra Hot set made 11 KV grade joint kit	
4.	11 KV grade 21 KA - 630 Amp. RMU Unit One Incoming + Two Out going VCB	IP-54 category 11KV grade indoor type front opening floor mounted	
5.	Transformer outdoor type - 2000 KVA 11/0.40 KV with OLTC/RTCC, AVR	Transformer 2000KVA 0/0.40KV with OLTC RTCC outdoor type H.T. side cable termination box LT side bus bar termination+ Bocouse rely temperature and oils indicators.	
6.	DG Set 1000 KVA -0.40 KV Grade with PMG & SYN, AMF Panel (Super Silent Type)	DG set 1000KVA 0.40KV grade with PMG/SYN. AMF panel super silent type.	

Sl.No.	Particulars	Technical Specification	Make
7.	PCC Panel as details of Single line Diagram- (Sl.No. EL-01), details given below -	PCC factory fabricated and wired metal clad dust and vermin proof mounting instruments chamber shall be separate and shall comprise of flush type a meter volt meter selector switch suitable CT metering class – the board shall have suitable electrolytic Al. bus bar 3200 AMP 3.5 phase as per IS 8623 insulated with heat shrink sleaving and mounted on non hygroscopic supports shush as DMC/CMC the panel shall be fabricated with CRCA sheet with a minimum thickness of 1.6mm/2mm switch board shall be of cat IP-54. CPRI approved panel builder. **Interlock –** DC source ACB 3200Amp. EDO, power source transformer no. 1 (2000KVA) ACB 3200Amp. EDO, transformer no. 2 (2000KVA) power source ACB 3200Amp. EDO bus coupler ACB interlocked electrical and mechanical to be required. **Interlock Motive –** At a time one source ACB shall be in on condition.	
	EQUIPMENT DETAILS		
	(a) ACB - EDO type 3200Amp, 4 Pole- 50 KA with Micro Processor release	Micro processor protection . O/L, S/C, E/F with time delay.	GE/L&T/Legrand
	(b) ACB EDO type 3200 Amp, 4 Pole - 50 KA	Micro processor protection . O/L, S/C, E/F with	

Sl.No.	Particulars		Technical Specification	Make
		without release	time delay.	
	(c)	Out going ACB MDO Type 1250Amp, 3 Pole -50KA with Micro Processor Release	Micro processor protection . O/L, S/C, E/F with time delay.	
	(d)	Capacitor panel out going 1600 Amp, 3 Pole-50 KA, MDO Type ACB with Micro Processor Release	Micro processor protection . O/L, S/C, E/F with time delay.	GE/L&T/Legrand
	(e)	MCCB, 4 Pole -50 KA 250 Amp.		GE/L&T/Legrand
	(f)	Multi Function METER	96mm x 96mm L.E.D. Display	
8.	Bus duct 3200 Amp., 3.5 Phase with aluminium Bus Bar		3200Amp. IP-56 Cat out door type	
9.	Earthing (G.I.) for HT Transformer/ Switch/HT Panel/LT Panel		GI strip 50mmx6mm electrode size 900x900x3mm as per attached.	
10.	APFC panel with heavy duty capacitor – 1000Kvar		50 Kvar, 25Kvar. MPPH type capacitor micro processor PF rely. manual switching system. Bank conf. 1:2:3 each bank AMP meter 96x96mm.	GE/L&T/Legrand

EE) Wiring Material of Electrical Building & Power Sub Station

S.N.	Particulars	Technical Specifications	Make
1.	Copper wire 4sq.mm multi-stand/multi-layer – FR grade	1.1 KV grade FR	
2.	Copper wire 2.5sq.mm multi-stand/multi-layer – FR grade	--do--	
3.	Copper wire 1.50sq.mm multi-stand/multi-	--do--	

S.N.	Particulars	Technical Specifications	Make
	layer – FR grade		
4.	Copper wire 1.00sq.mm multi-stand/multi-layer – FR grade	--do--	
5.	Telephone wire 4 pair	Screen protected	
6.	PVC pipe 25mm dia. thick 2mm	2mm thick ISI mark	
7.	PVC bend 25mm thick 2mm	--do--	
8.	PVC bend 25mm thick 2mm but deep type	--do--	
9.	PVC bend 25mm	--do--	
10.	CI box 12"x10"	Factory make	
11.	CI box 7"x4"	--do--	
12.	CI box 4"x4"	--do--	
13.	Mica sheet 13"x11"	ISI mark	
14.	Mica sheet 8"x5"	--do--	
15.	Mica sheet 5"x5"	--do--	
16.	Switch on – off 6 Amp.	Piano type	
17.	Socket 6 Amp. 5 pin	5 pin	
18.	Switch on – off 16Amp.	Piano type	
19.	Socket 16Amp. 5 pin	5 pin	
20.	Button holder	State type	

S.N.	Particulars	Technical Specifications	Make
21.	Ceiling rose	5 Amp.	
22.	MCB box 3way	TPN Powder quoted double door	
23.	MCB 63Amp. TPN	'B' curve 20 KA BC	
24.	MCB 32Amp. SP	10 KA BC	
25.	MCB 25Amp. SP	--do--	
26.	Round mica sheet	ISI mark	
27.	Double T/L fittings	industrial type copper choke ballast	
28.	Ceiling fan 48"	wall bearing type	
29.	Exhaust fan 300mm	wall bearing type	
30.	Cabin fan 18"	450mm dia.	
31.	Fan dimmer	300watt flush mounted	
32.	Fan box MS	3mm thick	
33.	PVC gully		
34.	Steel screw	Nikkled	
35.	Brass screw 1.5"		
36.	Brass screw 2.5"		
37.	Steel screw 1.5"		
38.	Steel screw 2.5"		

S.N.	Particulars	Technical Specifications	Make
39.	Steel nail 1"	Nikkle	
40.	PVC tape	¾" width self adhesive	
41.	Telephone jack	flush mounted	
42.	Labour charge	complete wiring light fixing and fan hanging.	

FF) Wiring Materials & Light of **Security Bldg.**

S.N.	Particulars	Technical Specifications	Make
1.	Copper wire 2.5sq.mm multi-stand/multi-layer – FR grade	1.1 KV grade FR	Finelex/Polycap
2.	Copper wire 1.5sq.mm multi-stand/multi-layer – FR grade	--do--	--do--
3.	Copper wire 1.00sq.mm multi-stand/multi-layer – FR grade	--do--	--do--
4.	Telephone wire 4 pair	Screen protected	
5.	PVC pipe 25mm dia. thick 2mm	2mm thick ISI mark	
6.	PVC bend 25mm thick 2mm	--do--	
7.	PVC junction box 25mm	--do--	
8.	MS Fan box	3 to 4mm thick	
9.	Ceiling fan	Double wall bearing	
10.	6Amp. switch	on off Piano type	
11.	6Amp. socket	5pin	
12.	16Amp. switch	--do--	

S.N.	Particulars	Technical Specifications	Make
13.	16Amp. socket	--do--	
14.	Telephone jack	Flush mounted	
15.	Internet jack	--do--	
16.	T/L fittings wall mounted type	box fittings copper ballast	
17.	Button holder	State type	
18.	Ceiling rose	5Amp.	
19.	CI box 8"x10"	Factory made	
20.	CI box 7"x4"	--do--	
21.	Mica sheet 9"x11"	ISI mark	
22.	Mica sheet 8"x5"	--do--	
23.	Mica sheet 5"x5"	--do--	
24.	CI box 4"x4" (double door)	Factory made	
25.	MCB box	--do--	
26.	MCB 40Amp. DP	10 KV BC	
27.	MCB 20Amp. SP	--do--	
28.	Brass screw	2"	
29.	Brass screw	2.5"	
30.	Cup washer		
31.	Telephone wire 4 pair	Screen protected	
32.	PVC tape	3/4 " width self adhesive	
33.	Fan dimmer	300watt flush mounted	
34.	Labour charge	Complete wiring cable laying fan and light hanging and fixing.	

S.N.	Particulars	Technical Specifications	Make

GG) Wiring Materials & Light of **Gents/Ladies Toilet**

S.N.	Particulars	Technical Specifications	Make
1.	Wall mounted box type TL fitting	Single box type copper choke 40 watt wall fitting type	
2.	Wall bracket light	18 watt CFL fitting	
3.	Switch board	10 module /12 module	
4.	Geyser	15Liter vertical type	
5.	Basin light	18watt CFL IP-56	
6.	Exhaust fan	20mm dia. 90RPM	
7.	Out door light	IP-56 class mounted wall mounted type	
8.	Socket 16Amp. 5 pin	5 pin flush mounted	
9.	Copper wire 15mm dia.	Multi stand/multilayer 1.1KV grade	
10.	Copper wire	Multi stand/multilayer 1.1KV grade	
11.	Copper wire 2.5 5mm dia.	Multi stand/multilayer 1.1KV grade	
12.	6Amp. Pino type on-off switch		
13.	Modular outer+inner	10 module 3mm thick PVC /12module	
14.	Switch board	MS box 3mm thick	
15.	Switch board outer + inner	4modules PVC	
16.	Switch socket 5 pin 16Amp. combined.	2mm thick ISI mark	

S.N.	Particulars	Technical Specifications	Make
17.	PVC pipe 2mm thick dia. 25mm	2mm thick ISI mark	
18.	PVC bend 2mm thick dia. 25mm	2mm thick ISI mark	
18.	6Amp. 5 pin socket	Flush mounted	

HH) Main PCC panel of
Administration Building

S.N.	Particulars	Technical Specifications	Make
1.	MCCB 250Amp. TP	35KA 415 Volt	
2.	MCCB 63Amp. TP	--do--	
3.	MCCB 125Amp. TP	--do--	
4.	Metering set	96x96mm C.T. ratio 250/5 metering class	
5.	Panel (as per single circuit diagram)	Custom built panel CRC sheet, 14SWG/16SWG clad, dust and vermin proof floor mounted type comprise with aluminium bus-bar 250Amp. 3.5 phase neutral wires, Lugs, insulators and engineering. CDRI approved panel builder.	
	Ground Floor		
1.	Copper wire 6sq.mm multi-stand/multi-layer – FR grade	1.1KV grade FR grade	
2.	Copper wire 4sq.mm multi-stand/multi-layer – FR grade	--do--	
3.	Copper wire 2.5sq.mm multi-stand/multi-layer – FR grade	--do--	
4.	Copper wire 1.5sq.mm multi-stand/multi-layer – FR grade	--do--	

S.N.	Particulars	Technical Specifications	Make
5.	Copper wire 1.00sq.mm multi-stand/multi-layer – FR grade	--do--	
6.	Telephone wire 4 pair		
7.	PVC pipe 25mm dia. thick 2mm	2mm thick	
8.	PVC bend 25mm thick 2mm	--do--	
9.	PVC junction box 25mm	--do--	
10.	PVC junction box 25mm deep type	--do--	
11.	Fan box (metal)	3mm thick	
12.	Metal box 4 module	--do--	
13.	Metal box 10 module	--do--	
14.	Metal box 12 module	--do--	
15.	AC box 32Amp.	--do--	
16.	Outer +inner 4 module	--do--	
17.	Outer +inner 10 module	--do--	
18.	Outer +inner 12 module	--do--	
19.	6Amp. on of switch	--do--	
20.	6Amp. socket	--do--	
21.	15Amp. socket	--do--	
22.	15Amp. on of switch	--do--	
23.	Metal box 2 modular	--do--	
24.	Outer+inner box 2 modular	--do--	
25.	Telephone Jack	--do--	
26.	Internet Jack	--do--	

S.N.	Particulars	Technical Specifications	Make
27.	Fan dimmer	--do--	
28.	MCB 10Amp. SP	10KV BC	
29.	MCB 16Amp. SP	--do--	
30.	MCB 40Amp. TPN	--do--	
31.	MCB 63Amp. TPN	--do--	
32.	MCB box (double door) 4 way SP	Double door	
33.	Tube light fittings wall mounted 40watt	Copper choke	
34.	Down light 18 watt	PLL/CFL	
35.	Down light 600mmx300mm 18 watt PLL optics mirror reflector type	PLL/Copper/Bleats	
36.	Wall bracket light	CFL 18 watt	
37.	Exhaust fan 18"	900 RPM	
38.	PVC tape	Steel grip self adhesive	
39.	PVC gully		
40.	Screw 1½"		
41.	Brass screw 1½"		
42.	Brass screw 2½"		
43.	Foot light fitting	Food light 6"x4" width 6 watt CFL	
44.	DB 12 way TPN (double door)	TPN double door	
45.	MCB 32Amp. DP	10KA, BC	
46.	MCB 16Amp. DP	--do--	
47.	Ceiling fan 48"	Medium speed	
48.	Basin light	18 watt CFL IP-56	

S.N.	Particulars	Technical Specifications	Make
49.	Ceiling rose		
50.	Labour charges	Complete wiring, light, exhaust fan, hanging and fixing	
	First Floor		
1.	Copper wire 6sq.mm multi-stand/multi-layer – FR grade	1.1KV grade FR grade	
2.	Copper wire 4sq.mm multi-stand/multi-layer – FR grade	--do--	
3.	Copper wire 2.5sq.mm multi-stand/multi-layer – FR grade	--do--	
4.	Copper wire 1.5sq.mm multi-stand/multi-layer – FR grade	--do--	
5.	Copper wire 1.00sq.mm multi-stand/multi-layer – FR grade	--do--	
6.	Telephone wire 4 pair	2mm ISI mark	
7.	PVC pipe 25mm dia. thick 2mm	--do--	
8.	PVC bend 25mm thick 2mm	--do--	
9.	PVC junction box 25mm	--do--	
10.	PVC junction box 25mm deep type	--do--	
11.	Fan box (metal)	3mm thick MS	
12.	Metal box 10 module	--do--	
13.	Metal box 4 module	--do--	
14.	AC box 32Amp.	Factory made	
15.	Outer +inner 10 module /12 module	MS 3mm thick	
16.	Outer +inner 4 module	3mm thick MS	
17.	6Amp. on off switch	Piano type	

S.N.	Particulars	Technical Specifications	Make
18.	6Amp. on off switch socket	High pin	
19.	16Amp. on off switch	Piano type	
20.	16Amp. socket 5 pin	5 pin	
21.	Telephone jack	Flush mounted	
22.	Internet jack	Flush mounted	
23.	Fan electronic dimmer flush mounted	Flush mounted 300 watt	
24.	MCB 16Amp. SP	10KA BC	
25.	MCB 20Amp. SP	--do--	
26.	MCB 32Amp. SP	--do--	
27.	MCB 63Amp. TPN	'C' curve	
28.	MCB box 4 way SP (double door)	Powder quoted factory made	
29.	Ceiling down light 600mmx300mm PLL light 18 watt x 2nos.	18 watt PLL copper ballast	
30.	Ceiling down light CFL 18 watt	18 watt CFL	
31.	Wall bracket light	--do--	
32.	Basin light 300mm	18 watt CFL, IP – 56	
33.	Exhaust fan 18"	1400 RPM	
34.	Wall mounted fan	450mm dia.	
35.	Call bell	Battery operated	
36.	Call bell switch	MK type	
37.	Chandelier (Jhumar)	600mm dia.	
38.	Foot light fittings	150mmx100mm CFL 4 watt	
39.	PVC gully	100mmx3mm	

S.N.	Particulars	Technical Specifications	Make
40.	Steel screw 1.5"	Nikkled	
41.	Brass screw 1.5"		
42.	Brass screw 2.5"		
43.	Cup washer		
44.	PVC Tape	3/4 " self adhesive	
45.	SDF 125Amp. in SS enclosure with fuse	with 125Amp. fuse	
46.	DB 12 way TPN (double door)	Power quoted double door	
47.	MCB 32Amp. DP	10KA BC	
48.	Ceiling fan 48"	48"	
49.	Fan dimmer flush mounted	300 watt flush mounted	
50.	Ceiling rose	5 Amp.	

18. 0 HT/LT Cable Schedule

S.N.	Cable No.	Cable Size	Load	From	To	Nos. of Run	Each Run (length) in Mt.	Length (approx) in Mt.	Voltage Grade	Remarks
1.	BH-01	185 Sq.mm 3 core x LPE armord	105A	POLE	RMU	01		40	11KV	11000 Volt
2.	BH-02	185 Sq.mm 3 core x LPE armord	105	RMU	TR-1	01		30	11KV	11000 Volt
3.	BH-03	185 Sq.mm 3 core x LPE armord	105	RMU	TR-2	01		30	11KV	11000 Volt
	LT	**CABLE**								
4.	1	240 x 3½ Core ALU Arramard	150A	Main PCC	Admin. Building	01		200	1.1KV	1100 Volt
5.	2.	150 x 3½ Core ALU Arramard	35	Main PCC	Security Building	01		250	1.1KV	1100 Volt
6.	3.	25 x 3½ Core ALU Arramard	25	Admin. Bldg. Panel	Toilet Block	01		45	1.1KV	Grade
7.	4.	120 x 3½ Core ALU Arramard	120A	Main PCC	Manufacturing Hall-1 Light Panel	01		90	1.1KV	--do--
8.	5.	120 Sq.mm ALU Arramard	140A	Main PCC	Manufacturing Hall 2/3, Light Panel	01		120	1.1KV	--do--
9.	6.	25 Sq.mm ALU Arramard	60A	Main PCC	Campus/Security Light	01		3500	1.1KV	--do--
10.	7.	240 Sq.mm x 3½ core ALU Arramard	600A	Main PCC	1A- Bay PDB	03	125	375	1.1KV	--do--
11.	8.	240 Sq.mm x 3½ core ALU Arramard	800A	Main PCC	2A-Bay PDB	04	100	400	1.1KV	--do--
12.	9.	240 Sq.mm x 3½ core ALU Arramard	600A	Main PCC	1B-Bay PDB	03	350	1050	1.1KV	--do--
13.	10.	95 Sq.mm x 3½ core ALU Arramard	70A	Bay-1A	Compressor 2Nos.	02	120	240	1.1KV	--do--

19.0 QUALITY PLAN FOR OUT DOOR LT FEEDER PANEL/ TRANFORMER

INDENT NO. Cable /HT Switch RMU

S.N.	Component & Operation	Characteristics	Classification	Type of Check	Quantum	Reference Document	Acceptance Norms	Format of Record	Agency
01.	**Raw Material**								
	a) MS sheet used for frame, doors & gland plates	i) Sheet thickness	Major	Measurement.	100%	P.O./Appd. Drg/ Tech. Specn.	P.O./Appd. Drg/Tech. Specn.	Logbook	Mfr.
		ii) Surface Finish	---do---	Visual	---do---	Mfr. standards	Mfr. standards	---do---	---do---
		iii) Flatness	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	b) Channels/ base frame	Dimensions	Major	Meas.	100%	P.O./Appd. Drg/ Tech. Specn.	P.O./Appd. Drg/Tech. Specn.	Logbook	Mfr.
	c) Bus Bars	i) Dimensions	Major	Meas.	100%	P.O./Appd. Drg/ Tech. Specn.	P.O./Appd. Drg/Tech. Specn.	Logbook	Mfr.
		ii) Mechanical properties	Major	TC review	1 pc. /lot	---do---	---do---	Test Report	Mfr.
		iii) Electrical Properties	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		iv) Chemical analysis	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	d) Bus Bar support insulators & sleeves	HV test and properties	Major	Elect. Mfr. TC	Random	P.O./Appd. Drg/ Tech.	P.O./Appd. Drg/ Tech. Specn. /Mfr.	Logbook /TC	Mfr.

S.N.	Component & Operation	Characteristics	Classification	Type of Check	Quantum	Reference Document	Acceptance Norms	Format of Record	Agency
						Specn. /Mfr. standards	standards		
	e) ACB	i) Make	Major	Visual	100%	P.O./Appd. Drg/ Tech. Specn.	P.O./Appd. Drg/ Tech. Specn.	Logbook	Mfr.
		ii) Type	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		iii) Coil Voltage	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		iv) Rating	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		v) Type tests	---do---	TC review	100%	---do---	---do---	Test reports	---do---
	f) MCCB	i) Make	Major	Visual	100%	P.O./Appd. Drg/ Tech. Specn.	P.O./Appd. Drg/ Tech. Specn.	Logbook	Mfr.
		ii) Rating	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	g) Energy meter	i) Make	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		iii) Rating and Accuracy class	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	h) Selector & toggle switches	i) Make	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		ii) Rating	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	i) Isolator	i) Make	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		ii) Rating	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	j) Ammeter & Voltmeter	i) Make	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		ii) Range	---do---	---do---	---do---	---do---	---do---	---do---	---do---

S.N.	Component & Operation	Characteristics	Classification	Type of Check	Quantum	Reference Document	Acceptance Norms	Format of Record	Agency
	k) Current Transformer	i) Make	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		ii) Type, Rating and accuracy class	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	l) Indicating Lamps	i) Make	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		ii) Rating	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	m) Fuses and Links	i) Make	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		ii) Rating	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	n) Relays	i) Make	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		ii) Rating	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	o) Terminal blocks	i) Make	Major	Visual	100%	P.O./Appd. Drg/ Tech. Specn.	P.O./Appd. Drg/ Tech. Specn.	Logbook	Mfr.
		ii) Rating	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	p) Gaskets	i) Make	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	q) Control Wire	i) Make	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		ii) Type	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		iii) Size	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		iv) Rating	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	r) Fasteners	Galvanization	---do---	---do---	---do---	---do---	---do---	---do---	---do---
2.	**In Process Inspection**								
	a) Fabrication of enclosure	i) Dimension	Major	Measur.	100%	Tech. Specn./Fab. drg.	Tech. Specn./Fab. drg.	Logbook	Mfr.

S.N.	Component & Operation	Characteristics	Classification	Type of Check	Quantum	Reference Document	Acceptance Norms	Format of Record	Agency
		ii) Sheet alignment	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		iii) Position of insulator mounting arrangements	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	b) Painting	i) Shade	Major	Visual	100%	Tech. Specn./appd. drg.	Tech. Specn./appd. drg.	Logbook	Mfr.
		ii) Paint Thickness	---do---	Measur.	Random	---do---	---do---	---do---	---do---
	c) Installation of Components	Completeness	Major	Visual	100%	Tech. Specn./appd. drg.	Tech. Specn./appd. drg.	Logbook	Mfr.
	d) Bus Bar Bending	Dimension	Major	Measur.	100%	Tech. Specn./appd. drg.	Tech. Specn./appd. drg.	Logbook	Mfr.
		Cracks at the folded surface	---do---	Visual	---do---	---do---	No cracks	---do---	---do---
	e) Control wiring	i) Continuity	Major	Measur.	100%	Tech. Specn./appd. drg.	Tech. Specn./appd. drg.	Logbook	Mfr.
		ii) Ferruling/ dressing	---do---	Visual	---do---	---do---	---do---	---do---	---do---

S.N.	Component & Operation	Characteristics	Classification	Type of Check	Quantum	Reference Document	Acceptance Norms	Format of Record	Agency
	f) Functional Checks	Operation	Major	Functional	100%	Tech. Specn./appd. drg.	Tech. Specn./appd. drg.	Logbook	Mfr.
3	**Final Inspection**								
	a) Panel & Base Frame	i) Dimension	Critical	Measure.	100%	Tech. Specn./appd. drg.	Tech. Specn./appd. drg.	Inspection Report	Mfr.
		ii) Sheet and paint thickness	---do---	---do---	Random	---do---	---do---	---do---	---do---
		iii) Painting and General finish	---do---	---do---	100%	---do---	---do---	---do---	---do---
	b) Bus Bar	i) Dimensions	Critical	Measur.	100%	Tech. Specn./ Appd. Drg.IS	Tech. Specn./ Appd. Drg.IS	Inspection Report	Mfr.
		ii) Clearance	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	c) Verification of all components	i) Make	Critical	Visual	100%	Tech. Specn./ Appd. Drg./PO	Tech. Specn./ Appd. Drg./PO	Inspection Report	Mfr.
		ii) Rating	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		iii) Test Reports	---do---	---do---	---do---	---do---	---do---	---do---	---do---
	d) Functional Checks on panels	i) Operation and Relay testing	Critical	Functional	100%	Tech./Appd. drg.	Tech./Appd. drg.	Inspection Report	Mfr.
		ii) IR test	---do---	Elect.	---do---	---do---	---do---	---do---	---do---

S.N.	Component & Operation	Characteristics	Classification	Type of Check	Quantum	Reference Document	Acceptance Norms	Format of Record	Agency
		iii) HV test	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		iv) Protection and interlock testing and indications	---do---	Functional	---do---	---do---	---do---	---do---	---do---
		v) Sealing/ IP test	---do---	Visual	---do---	---do---	---do---	---do---	---do---
		vi) Cabling, dressing termination and ferruling	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		vii) Internal illumination and ferruling	---do---	---do---	---do---	---do---	---do---	---do---	---do---
		viii) Earthing arrangement & continuity test	---do---	Elect.	---do---	---do---	---do---	---do---	---do---
		ix) Functional checks of components	Critical	Functional	100%	Tech. Specn./Appd. drg.	Tech. Specn./Appd. drg.	Inspection Report	Mfr.
		x) Lifting, locking and cable clamp arrangements	---do---	Visual	---do---	---do---	---do---	---do---	---do---

S.N.	Component & Operation	Characteristics	Classification	Type of Check	Quantum	Reference Document	Acceptance Norms	Format of Record	Agency
		xi) Display of name plate & Danger Board notice	---do---	---do---	---do---	---do---	---do---	---do---	---do---
4.0	**Final Document review and Marking**	Review of relevant documents, test reports and calibration certificates	Critical	Doc. review	100%	Tech. Specn./ Appd. drg.	Tech. Specn./ Appd. drg.	Inspection Report	Mfr.
	Cable	Type	------	TC review	100%	Test TC	----	----	----
	Transformer	Type	------	Visual	100%	Test/TC	P/O	Test	Testing at your work
	RMU 11KVAR GRADE		Major	Visual	100%				TC

Note –

1. All the critical tests shall be witnessed during PDI.
2. Vendor has to submit the Quality Plan inline with this RQP for review and approval of BHEL.
3. Bought out items shall be of reputed standard make and subject to owner's approval.
4. Manufacturer's TC to be submitted for review
5. Calibration certificates to be submitted