



भारतीय विज्ञान शिक्षा एवं अनुसंधान संस्थान मोहाली

(शिक्षा मंत्रालय का एक स्वायत्त संस्थान, भारत सरकार के अधीन)

सैक्टर-81, नॉलेज सिटी, पो.ओ. मनौली, एस.ए.एस. नगर, मोहाली, पंजाब-140306

INDIAN INSTITUTE OF SCIENCE EDUCATION AND RESEARCH MOHALI

(Established By Ministry of Education, Govt. of India)

Sector-81, Knowledge city, PO-Manauli, SAS Nagar Mohali-140306, Punjab



NAME OF WORK: AMC OF 66/11 KV SUB STATION AT IISER MOHALI.



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Tender Form Cost- Rs. 590/-

Tender Ref. No.: IISER/EE-EO/23-24/AMC-05

Date: 24.08.2023

Notice Inviting Tender

1. The Executive Engineer on behalf of the Director, IISER Mohali, invites online bids under two bid system i.e. technical bid and financial bid through E- Central Public Procurement Portal i.e. <https://eprocure.gov.in/eprocure/app> from eligible contractor for the work mentioned below.

Name of work:- AMC of 66/11 KV Sub Station at IISER Mohali.

Tender Ref No	:	IISER/EE-EO/23-24/AMC-05
Estimated cost	:	INR 8,60,905/- (Inclusive GST)
Earnest Money	:	INR 17,300/-
Tender Form Cost	:	INR 590/-
Stipulated period of work :	:	One Year and extendable on the same rates and terms & conditions as stipulated in DNIT for further period of two years (1+1) on satisfactory completion of AMC for the first year and upon mutual consent

Critical Date Section

S. No	Particular	Date	Time
1.	Tender publishing date and time	24.08.2023	06:55PM
2.	Tender documents download start date and time	24.08.2023	06:55PM
3.	Bid submission start date and time	24.08.2023	06:55PM
4.	Bid submission end date and time	02.09.2023	03:00PM
5.	Technical bid opening date and time	04.09.2023	09:00AM

2. Tender document may be downloaded from the website of E-Central Public Procurement portal (<https://eprocure.gov.in/eprocure/app>) and www.iisermohali.ac.in . Tender should be submitted online along with valid documents of eligibility criteria within the date mentioned above.
3. The Director, IISER Mohali shall be the “Accepting Authority” hereinafter referred to as such for the purpose of this contract.
4. For any information, other modifications and/or corrigendum may kindly visit IISER Mohali website <http://www.iisermohali.ac.in> and also publish on <https://eprocure.gov.in/eprocure/app>.

SUBMISSION OF TENDER:

Tender shall be submitted by the Bidders in two parts:

(i) Technical Bid. – Cover I (ii) Financial Bid. - Cover II

The two bid system will be followed for this tender. In this system the bidder must submit bid **on line at E-Procurement Portal(i.e. <https://eprocure.gov.in/eprocure/app>)** his offer in two covers. "**Cover No. 1- Technical Bid along with requisite fee details and all forms under seal and signature of Bidder**" mentioned below and "**Cover No.2 - Financial Bid**" respectively.

1. Please note that installation i.e. labour expenses for installation of spare parts/consumables/replacement of faulty parts from time to time will be agency's responsibility even if the parts are not purchased through the same firm executing AMC. The same is covered under the scope of AMC.
2. Some of the parts/consumables/jobs which are chargeable extra are appended in a separate list. The firm should quote for per unit rate of the listed items.

The **Cove I** (Technical Bid) shall consist of following:

- i) **Earnest Money** -The bidder shall furnish as part of its bid, an EMD of Rs.17,300/- (Rupees seventeen thousand and three hundred only). The EMD is to be submitted through Demand Draft of any Scheduled / Nationalized Bank (drawn in favour of “Registrar, IISER, Mohali”) payable at Mohali.
- ii) **Cost of Tender Form** - The Cost of Tender Form Rs.590/- is to be submitted through Demand Draft of any Scheduled / Nationalized Bank (drawn in favour of “Registrar, IISER, Mohali”) payable at Mohali.

Note - The original payment instrument like Demand Draft of any Nationalized Bank against Earnest Money and Cost of Tender Form sent to the address- **IISER Mohall, Sector-81, knowledge City, PO- Manauli, SAS Nagar Mohal1140306, Punjab** by post/speed post/courier/by hand before bid opening date & time

iii) **Important Documents uploads in .pdf format only:-**

- a) Scanned copy of DD of EMD and Cost of Tender Form. MSME certificate in lieu of DD has to be relevant to the work.
- b) Scanned copy of IT Return for the last three financial years.
- c) Scanned copy of valid GST & PAN Number
- d) Scanned copy of Tender Accept Letter

The Cover II (Financial Bid) shall consist of following:

- * Schedule of price bid of in the form of BoQ_XXXXX.xls (Will be formulated according to the type of work)

-sd-
Executive Engineer
Head IWD, IISER Mohali

**INDIAN INSTITUTE OF SCIENCE EDUCATION
AND RESEARCH (IISER) MOHALI
NOTICE INVITING TENDER FOR
“AMC of 66/11 KV Sub Station AT IISER, MOHALI (PUNJAB).”**

1. E-tender are invited on the behalf of Director IISER Mohali from the contractors for the work of “AMC of 66/11 KVA Sub Station at IISER Mohali, Sector-81, SAS Nagar,” Punjab.

Estimated cost : Rs.8,60,905/-

Earnest Money: Rs.17,300/- favoring Registrar, IISER Mohali and payable at Chandigarh.

2. This contract document consists of schedule of quantities, quotation form, brief specifications, can be had at a cost of Rs.590/- from the office of the undersigned OR can be downloaded from web site www.eprocure.gov.in & www.iisermohali.ac.in. Bidder who download the documents from web site are required to submit separately Demand Draft of Rs.590/- favoring Registrar, IISER Mohali and payable at Mohali.

3(A). The quotations shall be received by the undersigned by **03:00 PM on 02.09.2023 (02nd day of September 2023)** and cover No.1 only containing earnest money, conditions and bid documents shall be opened on the next working day at **09:00AM**. No consideration will be given to a quotations received after the above stipulated time and date. Eligibility related documents shall be evaluated for criteria stipulated at 3(B) and agencies/contractors will accordingly be qualified/disqualified by the competent Authority. The financial bid (Cover No 2) of qualified bidder shall then be opened at notified time, date. The rates of each items must be quoted in figures and words.

3(B). Contractors who fulfill the following criteria shall be considered by IISER Mohali for technical evaluation (if required) and opening of commercial bids:

I). Contractors/firms should have successfully completed during last 7 years ending last day of the month previous to the one in which the bidding are invited, either three similar works costing not less than 40% or two similar works costing not less than 60% and one similar work costing not less than 80% of the estimated cost of the work.

Similar work means:- AMC of LT or HT Sub Station.

II). Average annual financial turn over during the last 3 (three) years ending 31st March of the previous year should at least be 100% of the estimated cost of work.

III). Not incurred loss in more than two years during the last five years ending 31st March of the previous year.

4. The time allowed for the completion of one year, which shall be extended for further one plus one year on mutual consent to be reckoned from the seventh day of date of written order to commence the work.17,300/- in the form of demand draft only drawn in favour of the “Registrar, IISER Mohali” payable at Mohali. Any quotation not accompanied by such earnest money will not be opened. The earnest money in the shape of demand draft/bank guarantee of successful bidder will be adjusted towards initial security deposit.

5. The contractor will submit his quotation after examining the whole of the documents, condition of the contract, clauses of contract, agreement specifications and drawings etc. He may familiarize himself with the site conditions, if he desires so.

6. The offer shall remain valid for 120 days from the date of submission of bids. The value of the quotation shall be valid for any variation upto 30 percent of the contract value of said work. Any item can be withdrawn or substituted without any claim from the contractor.

7. If any bidder whose bid is accepted fails to undertake the work as per terms of the contract within ten days to be reckoned from the date of issue of allotment letter, the earnest money deposited by him will be forfeited.

8. The Engineer-In-charge does not bind himself to accept the lowest or any quotation and reserves the right to reject any or all quotations without assigning any reason.
9. Canvassing in connection with quotations is strictly prohibited and the quotations submitted by the contractor who resorts to canvassing will be liable to rejection.
10. The undersigned will not reimburse any expenditure, whatsoever, that may be incurred by bidders for the preparation and submission of quotations.

11. This notice inviting quotations, form the part of the contract agreement to be executed by the successful bidder with the Engineer In charge.
12. All the correspondence on the above quotation shall be addressed to undersigned.
13. The Institute reserves the right to accept or reject any quotation without assigning the reasons thereof.

GENERAL CONDITIONS OF THE TENDER

1. The rates shall be quoted in the enclosed schedule of quantities and duly signed by the contractor.
3. Rates to be exclusive of GST.
3. Rates to remain firm during the duration of work as well as for the extended period, if any. No escalation in rates will be allowed in any circumstances.
4. The contractor shall comply with all statutory requirements in respect of said work.
5. The work shall be for the period of one year, which shall be extended for further one year on mutual consent to be reckoned from the day of issue of award letter.
6. All work to be carried out as per specifications stipulated in DNIT.
7. Work to be executed in accordance with CPWD general conditions of contract and all payments/guarantee/security/and other conditions as deemed necessary shall be governed in accordance with it.
8. EMD amounting to Rs.17,300/- in favour of Registrar IISER, Mohali payable at Chandigarh.

**INDIAN INSTITUTE OF SCIENCE EDUCATION
AND RESEARCH MOHALI
INSTITUTE WORKS DEPARTMENT
E-TENDER NOTICE**

IISER/EE-EO/23-24/AMC-05

Dated : 24.08.2023

The Executive Engineer, IWD, IISER Mohali on behalf of Director, IISER Mohali invites online item rate tender from empanelled contractors of IISER Mohali for the following electrical work:-

Sl. No	Name of work and location	Estimated cost put to tender (InRs.)	Earnest Money (InRs.)	Period of Completion (in Month)	Last date & time of submission of tender	Period during which EMD, Cost of Tender Document, e-Tender Processing Fee and other Documents shall be submitted	Time & date of opening of tender
1	Annual maintenance contract for 66/11 KV Substation.	8,60,905/-	17,300/-	12 Months	Upto 3:00 PM on 02.09.2023	After last date and time of submission of tender and upto 09:00 AM on 04.09.2023	At 09:00 AM on 04.09.2023

The E-tender documents is available on www.eprocure.gov.in

Name of work Annual maintenance contract for 66/11 KV substation.

The following equipments are covered under the scope of Annual Maintenance Contract for 66kV Sub-station.

Note: The item/ equipment's not mentioned in the above list but necessary for smooth functioning of sub-station shall also be covered in the scope of work.

S. No.	Description	Quantity
1.	66/11 KV , 6.3/8 MVA three phase power transformer.	2 Nos
2.	72.5 KV 31.5 KA 1600 Amp SF6 ckt breaker.	3 Nos
3.	72.5 KV 31.5 KA 1250 Amp isolators without earth switch.	6 Nos
4.	72.5 KV 31.5 KA 1250 Amp isolators with earth switch.	1 No
5.	60 KV ZnO surge arresters (gapless)	9 Nos
6.	Instrument transformers :	
a)	72.5 KV 31.5 KA CTs of ratio 300-150/1-1 accuracy class 0.2,0.2 ,burden 20VA,20VA	3Nos
b)	72.5 KV 31.5KA CTs of ratio 150-75/1-1-1-1 of accuracy class 0.2, PS,PS,PS, burden 20VA, 20VA,20VA,20 VA	6Nos
c)	72.5 KV PTs of ratio 66KV/√3, 110V/√3,110V/√3 of accuracy class 0.2,0.2 burden 50VA, 50VA	3Nos
d)	72.5 KV PTs of ratio 66KV/√3,110V/√3, 110V/√3 of accuracy class 0.2-3P,0.2-3P, burden 50VA,50VA	6Nos
7.	Power cables (Aluminium, armoured)	
a)	11KV (earthed) XLPE 3C X 185 Sq mm	600 mtrs
b)	11KV (earthed) XLPE 3C X 35 Sq mm	75 mtrs
c)	1.1 KV XLPE 3.5C X 70 Sq mm	150 mtrs
d)	1.1 KV XLPE 3.5C X 25 Sq mm	100 mtrs
e)	1.1 KV XLPE 4 X 6 Sq mm	800 mtrs
f)	1.1 KV XLPE 1 X 10 Sq mm	50 mtrs
8.	FRLS Control cables (copper, armoured)	
a)	12C X 4 Sq mm	1000 mtrs
b)	10 C X 2.5 Sq mm	400 mtrs
c)	4C X 4 Sq mm	1500 mtrs
d)	4C X 2.5 Sq mm	500 mtrs
9.	12 KV 12 Panel VCB switch board	1 Set
10. a)	220V 100Ah battery	1 Set
b)	10A/20A battery charger for 220V,100Ah battery.	1 Set
11.	11/0.4,63 KVA dry type station transformer	1 Set
12.	25KVA, 3 Phase DG set with sound proof enclosure	1 Set
13.	LT Switchgear	
a)	415V ACDB	1 Set
b)	200V DCDB	1 Set

14.	72.5 KV Control & Relay panel	
a)	Incoming line panel	01 no
b)	Transformer panel	2 No
15.	Switchyard erection material like conductor, earth electrode, earth mesh of complete switch yard and earthing connection to all equipments, lightning protection of switchyard (earth wire screen) disc insulators, hardware fitting, connectors, fire fighting system of transformers.	
16.	Gantry towers and beams for switchyard and equipment and support structure for all equipments.	
17.	Bay marshalling kiosks	3 Nos

Note- The above mentioned quantities are approximate. The contractor is advised to visit the Sub Station and take review before quoting.

Terms & Conditions :

1. In the Contract (as herein after defined) the following definitions, words and expressions shall have the meaning here by assigned to them except where the context otherwise required.
 - i) Institute shall mean the Indian Institute of Science Education and Research (IISER), Mohali
 - ii) The President shall mean the Director, IISER Mohali.
 - iii) The Engineers In-charge, who shall administer the work jointly, shall mean the Executive Engineer..
 - iii) Government or Govt. of India shall mean the Indian Institute of Science Education and Research represented by its Director.
 - V) Accepting authority shall mean the Director, IISER Mohali or his authorized representative.
 - vi) Executive Engineer shall mean the Executive Engineer of the Institute, who as overall In-charge and head of the Institute Works Department shall direct the contract.
 - vii) Site Engineers shall mean the Assistant Engineer(Electrical)for Electrical & Air-conditioning works, appointed by the Institute Works Department.
2. Contractor has to arrange laboratory testing as required during the currency of work on his own and nothing extra will be paid on this account. The lab should be an approved and reputed one otherwise the tests conducted would be treated as null & void.
3. Carrying out liasoning with OEMs of individual equipments will be the sole responsibility of the agency. However, in case of any delay in repair etc. by the OEM, the agency should keep the Engineer in charge well informed from time to time. Any OEM engineer visit charges are chargeable separately to IISER but only after prior approval. Whenever required, the contractor will also have to do liasoning with external government agencies like the power com PSPCL or any other agency which is associated with the operation of the 66KV substation.
4. The equipment as mentioned in list on previous page as well as equipment not mentioned in the list but are important for Substation operation are covered in the scope of maintenance contract.
5. The installation shall be maintained in the existing original condition/position. The installation is running quite satisfactory at present. The contractor shall be solely responsible for maintenance and up keep of the equipment in good condition.
6. Certain items required for maintenance such as tools & instruments, CTC, cloth, sand paper, nut and bolts with washer(S.S.), petroleum jelly, lubricating oil, greases, HRC fuses for control supply shall be covered in scope of work. All other maintenance items and spare parts shall be provided by the Institute, like transformer oil, gaskets, silica gel, HT/LT breaker spares, control panel spares, transformer spares, paint etc.
7. Other necessary jobs to be carried out are transformer oil dehydration, filtration and centrifuging of oil (as and when required upon prior intimation) with oil testing and reports, checking of earthings once every six months, fault simulation and kit testing of 11KV VCBs once a year, 66KV panel and breaker testing once a year, all VCBs servicing, cleaning, greasing once a year. Suitable reports showing test results must be provided. All these jobs except transformer oil dehydration/filtration/centrifuging are under the scope of AMC along with any other tests/service job as deemed necessary and which are must for enhancing the equipment life. Cost of transformer oil dehydration/filtration/centrifuging shall be borne by the Institute.

8. A suitable complete shutdown shall be given as per requirement for preventive maintenance of the complete system. All the equipments should be thoroughly checked & maintained for proper functioning/operations of the equipment. All relays have to be checked and calibrated once a year. Prior intimation by the contractor is necessary for power shutdown.
9. Cleaning of complete yard including minor painting of structure of complete yard, along with periodic grass root removing as required.
10. All maintenance work to be carried out as per the recommendations of the respective OEMs of the equipments.
11. The substation DG set of 25 KVA capacity is also to be taken care of by the contractor. Any minor defect or abnormality arising in the DG set has to be rectified by the contractor. Any spare part/service consumable cost for this would be borne by the Institute, however OEM engineer visiting charges for DG set upto Rs. 10,000/- and minor consumables in routine have to be paid by the contractor.
12. All the other repair works/spare parts/consumables not mentioned as free of Cost except given in the contract, will be carried out/purchased by the Institute at its own cost.
13. The contractor shall ensure all quality control measures on different aspects of the AMC including materials, workmanship and correct methodologies to be adopted.
14. All materials brought by the contract or for use in the work shall be got checked from the Engineer-in-Charge or his authorized representative of the work on receipt of the same at site before use.
15. The contractor shall be fully responsible for the safe custody of the materials issued to him even if the materials are in double lock and key system
16. Some restrictions may be imposed by the security staff etc. on the working and for movement of labour, materials etc. The contractor shall be bound to follow all such restrictions/instructions and nothing extra shall be payable on account of the same.
17. The contractor shall fully comply with all legal orders and directions of the Public or local authorities or municipality and abide by their rules and regulations and pay all fees and charges for which he may be liable in this regard. Nothing extra shall be paid/reimbursed for the same.
18. The contractor shall take instructions from the Engineer-in-charge for stacking of materials. No material shall be stacked/collected in areas where other buildings, roads, services, compound walls etc. are to be constructed. The contractor shall maintain in perfect condition, all portions executed till completion of the entire AMC allotted to him. The contractor shall maintain the fire fighting and detection system of the electrical equipment like transformers only. Any repair cost like parts and labour, OEM visit charges pertaining to this will be borne by the Institute. The substation building fire alarm/detection/fighting is not under the scope of this contract. The contractor is advised to follow the approved makes list mentioned in this tender for electrical parts/equipment. Because of appropriate reason some other make can also be installed with prior written or verbal approval of the engineer in charge.
19. The contractor should attend any breakdown within 2-3 hrs after reporting.
20. The firm must obtain HT/LT electrical works licence from Government agencies like state electricity board/UT. The agency must give undertaking for the same.
21. The contractor must have original equipment testing kit of OEM like ABB,L&T, CG etc. of which equipment are installed in the substation.
22. All damaged/worn out parts replaced during AMC should be returned to the Engineer in charge.
23. No equipment should be unmounted from the panel and taken out from the Institute without a proper Gate Pass issued by the Engineer In charge.
24. In case of any damage due to mishandling of the installation, recovery shall be made from the bill/performance guarantee.
25. The attending technician should be in possession of all tools and equipments to be used during the maintenance work and the same would be provided by the agency.
26. The contractor or his workers shall not misuse the premises allotted to them for any purpose other than for which the contract is awarded.
27. Cleaning of the premises, floor etc after work completion will be the responsibility of the agency.

28. All electrical works should comply with Indian Electricity Act 2003 and Indian Electricity Rules 1956.
29. The contractor has to deploy more manpower, if required, for attending breakdown and completing breakdown work in minimum possible time for which no extra payment would be made.
30. Measurement of earth resistance for all earthing points along with checking of earth pits, earthing strips have to be carried out at least every six months.
31. In case any shutdown is required for carrying out the AMC work, then the same should be informed to the Engineer in charge well before hand and a shutdown should be carried out only after obtaining the necessary approval.
32. Any displacement, relocation of the substation equipment should be avoided by the firm.
33. All necessary drawings, SLDs, Manuals etc will be provided to the firm on demand.
34. Minor painting work will be free of cost and under the scope of AMC, however major painting work will be on chargeable basis.
35. The firm should finish the work in stipulated time. Any extra labour incurred in meeting the work deadlines shall not be chargeable and will be the firm's liability.
36. The contractor shall comply with all statutory requirements in respect of said work.
37. The quantities as mentioned in the BOQ can be increased or decreased as per the requirement of work.
38. All material to be used in the work will have to be approved by the Engineer -in- Charge or his authorized representative.
39. All urgent calls and complaints should be attended within 4 hours, round the clock.
40. One skilled trained substation technician with minimum ITI (Electrical qualification), good knowledge of HT/LT substations and network, to be deputed 9am to 5 pm , 6 days a week for proper watch and upkeep of the HT substation. His duty would be to oversee substation operation, carry out any fault rectification, attending to any emergency/faults/outage, supervision and/or execution of AMC related works, etc. The same is under the scope of AMC.
41. The agency is expected to undertake additional maintenance works in addition to the minimum stipulated which are necessary for proper upkeep and operation of the substations under the scope of AMC itself. The scope of AMC stipulated above is just a rough guide.
42. The agency must bring Specialised tools and tackles by itself whereas general and minor ones shall be provided by the Institute.
43. Items and works that are separately chargeable as mentioned would be executed on need basis.
44. Unlimited breakdown visits are under the scope of AMC and the agency should visit the premises within 3 hours of receipt on any breakdown (during working hours) call to attend. During odd hours like late night, the agency should visit not later than start of next day.
45. All attending personnel are employees of the contractor/agency and therefore all personnel related issues like ESI/PF/wages etc are liabilities and responsibility of the contractor/agency.
46. AMC charges will be payable quarterly after satisfactory completion of work and certification by Engineer in Charge with deduction of 2.5% amount as security deposit from each running bill which will be released after successful completion of AMC period and payment of final bill.
47. The annual maintenance contract rates will be same for one year which can be extended for a further period of one plus one year on satisfactory performance by the agency as mutually agreed.
48. In case of non-satisfactory performance, AMC will be terminated; security amount deposited will be forfeited along with EMD.

SCOPE OF WORK UNDER IISER

1. Transformer oil replacement/topping up of oil, filtration, dehydration, silica gel replacement, other spare parts etc. will be provided by the agency on chargeable basis.
2. Replacement of defective components (spares to be provided by IISER) or on payment basis if provided by agency. All parts/consumables/jobs which are chargeable extra are appended as list of spares/consumables etc.
3. Minimum quantity of spares (like release, pole assembly, Mechanism, trip coils) to be maintained at our end.
4. In case any shortage/fault of equipment or need of additional equipments is felt by the firm then the same should be brought to the notice of the engineer in charge and can be installed after obtaining the necessary permission, on chargeable basis.
5. In case, a fault is found in some power cable supplying power to the panel, the same can be repaired by the firm or subletted to some other firm by the contracting firm, on chargeable basis.
6. OEM engineer visit is payable separately upon submission of quotation by the agency and its approval by Competent authority of the Institute.
7. Any equipment or quantity outside the scope of BOQ to be checked/repaired on chargeable basis

EQUIPMENT SPECIFIC SCOPE OF WORK UNDER CONTRACTOR :

(A) Transformer :-

- a. Minor testing and operation checking of HT and LT circuit breakers which ever required has to be carried out every month.
- b. Transformer should be cleaned and checked for oil leakage, oil level, loose connection, dirt, flash-over etc or any other abnormality as necessary.
- c. All transformer protections, relays, earthings etc to be checked.
- d. Minimum three visits per quarter are compulsory.

(B) Circuit Breakers :-

Following inspection has to be carried out in HT/LT circuit breaker, only malfunctioning LT circuit breakers to be checked, check items as follows:

1. Visual inspection of component ACB to assess condition.
2. Cleaning of ACB with cleaner.
3. Removal of old grease and re-greasing the same with special grease.
4. Check the condition of arcing contact and gap b/w fixed and moving contacts.
5. Checking tripping of ACB through Protection release.
6. Checking presence and proper tightening of hardware

7. Checking presence of all Cir Clips.
8. Checking condition of ACB wiring.
9. Checking proper closing of all poles by taking impression etc.
10. Checking condition of Arc Chutes.
11. Checking ACB opening through Y/U coil.
12. Checking ACB opening through Y/O coil.
13. Checking ACB opening through Y/C coil.
14. Setting of release as per the load.
15. Checking main operating mechanism and replacing it in case of any failure (spares to be provided by IISER).
16. Removing the breaker cradle or fixed breaker from the panel i.e. dismantling the ACB from bus-bars / fixed breakers will be in your scope.
17. Minor cleaning and servicing of ACBs at site. Repair and overhauling is payable separately.
18. Providing test reports of the breakers from OEM approved testing kits for LT breakers.

(C) Panels :-

1. Health check-up of electrical panel, wiring and control panel, inspect for any black marks and loose connections of contacts.
2. Inspect the proper setting of all meters, CT's and PT's based on customer requirement in electrical panel.
3. Check the fastening of all switch gears in electrical panel.
4. Checking and re-tighten any loose bolts and nuts in proper sequence in case of bus-bar & cable inside the panel only in electrical panel
5. Checking of the breaker tripping mechanism / function manually in electrical panel.
6. Check the earth links (earthings) to the panels for loose connection in electrical panel.
7. All breakers to be serviced regularly, their operation to be checked and the contacts to be free from carbon deposits / dust etc. in electrical panel.
8. Check for adequacy of ventilation and clean the intake and exhaust filters / louvers as required in electrical panel.
9. Check for proper operation of power factor correction equipment if installed in electrical panel.
10. Checking of IR/ER of all earthings and appropriate equipment.
11. PLC inspection and validation whenever required (separately chargeable).
12. All equipment and panels to be cleaned on regularly intervals for dust/pests etc.

Special conditions for Safety at Work Site :

1. It is wholesome responsibility of the contractor to ensure that all his working personnel at site are adhering to the laid down standard safety norms and practices as laid down. The Contractor should follow the following General Guidelines governing the safety rules as laid down under:
2. Smoking is strictly prohibited at workplace.
3. No body is allowed to work without wearing safety helmet. Chin strap of safety helmet shall be always on. Drivers, helpers and operators are no exception.
4. No one is allowed to work at or more than three meters height without wearing safety belt and anchoring the lanyard of safety belt to firm support preferably at shoulder level.
5. No one is allowed to work without adequate foot protection.
6. All safety appliances like Safety shoes, Safety gloves, Safety helmet, Safety belt, Safety goggles etc. shall be arranged by the contractor before starting the job.
7. Adequate illumination at workplace shall be ensured before starting the job at night.
8. Ladders being used at site shall be adequately secured at bottom and top. Ladders shall not be used as work platforms.
9. Other than electricians no one is allowed to carry out electrical connections, repairs on electrical equipment or other jobs related thereto.
10. Inserting of bare wires for tapping the power from electrical sockets is completely prohibited.
11. The technicians must wear all protective gear at the site at all times for their own safety.
12. Only trained and qualified technicians/engineers shall be allowed to carry out repair and maintenance works.
13. It shall be ensured by the contractor that no electric live wire is left exposed or unattended to avoid any accidents in this regard.
14. All the company's attending technicians should take all necessary precautions while carrying out the AMC work. All protective gear and equipment should be used and should be in good condition. No compromise on safety should be allowed.
15. Since there is high voltage in the substation, safety of personnel should be the topmost priority and sole responsibility of the contractor. In case of any accident/mishap which may involve bodily damage or loss of life of the personnel, IISER shall in no way be held responsible and will not be liable to provide any type of compensation to any party whatsoever. Hence, all standard safety practices will have to be followed.

Duration:

The annual maintenance contract rates will be same for one year which can be extended for a further period of two years (1+1) on satisfactory performance by the agency and as mutually agreed.

Tentative Schedule of Maintenance

1	Transformers	weekly	<ol style="list-style-type: none"> 1.Clean the transformer with cotton rags. 2.Check that temperature rise is reasonable. 3.Check the oil level of transformer. 4.Check that air passages are free 5. Check colour of silica gel.
		Quarterly	<ol style="list-style-type: none"> 1.HT and LT Bushing:Examine for crakes and dirt deposits, clean or replace. 2.Oil in Transformer : Check for dielectric strength and water content. 3.Cooling fan bearings, motors and operating mechanism:Lubricate bearings, Examine contacts, check manual control and interlocks.
		Half yearly	<ol style="list-style-type: none"> 1.Oil cooler :Test for pressure, leakage 2.Oiling and greasing of operating mechanism etc
		yearly	<ol style="list-style-type: none"> 1.Oil in Transformer:Check for acidity and sludge, filter if required. 2.Gasket joints:Tighten the bolts evenly to Avoid uneven pressure. 3.Cable boxes:Check for sealing arrangements for filling holes. <p>Examine: Compound for cracks. Replace the gasket if leaking.</p> <ol style="list-style-type: none"> 4.Relay,Alarms,their circuitsetc.:Examine Relay and alarm contacts, their operation, fuse :etc, check relay accuracy etc.Clean the components and: replace contacts and fuses if necessary. 5.Earth resistance:Record the value of earth resistance of earth pits. 6.Silica gel: Replacement of silica gel and cup oil. 7.Buchholze relay magnetic oil gauge:Check its operation, control circuit and repair/replace required.
2	Outdoor type SF6 Breaker and isolators	weekly	<ol style="list-style-type: none"> 1.Checking of Indicating lamps,gas pressure, earthing connection etc. 2.Cleaning of metallic enclosure.
		Quarterly	<ol style="list-style-type: none"> 1.Checking of operation. 2.Checking of SF6 pressure checking. 3.Cleaning of polycons of breaker.
		Half yearly	<ol style="list-style-type: none"> 1.Cleaning of contacts of isolators, and inserting petroleum jelly in contacts, 2.Oiling and greasing of operating mechanism etc
		yearly	<p>Checking of control circuits and its accessories i.e. aux contactors, coils, repair/replace if required.</p>
3	Lightening arrestors	weekly	<ol style="list-style-type: none"> 1.Visual check, leakage current counter reading to be recorded.
		Quarterly	<p>Cleaning of external insulations.</p>

		Half yearly	Checking and tightness of connections,
		yearly	Checking earthing connection upto earthpit and recording the earth pit value.
4	Overhead busbar	weekly	Visual checks for external damage of OH bus bar,connecting clamps, insulators etc.
		Quarterly	Damaged clamps,insulators and nutbolts etc. shall be replaced
		Half yearly	Checking of overhead structure earth connections and tighten them.
		yearly	1.Sagging of overhead busbar if required including tightening of clamps. 2.Testing of earthpit value of structure earthing pits. 3.Cleaning of Insulator string.
5	HT switchgear panel indoor type	weekly	1.Cleaning of panel externally. 3.Check for proper closing of panel so that no space should be left which may allow pest to enter
		Quarterly	1.Checking of indicating lamps,Ammeter, voltmeter alongwith selector switches i/c replacement of defective ones. 2.Checking of Operation of breakers for trip/close. 3. Cleaning of panel internally.
		Half yearly	1.Checking of interlocking. 2.Checking of control circuit and its accessories(I.E.aux contacts,connections, coils etc.) 3.Visual Check of earth connections and tightening if reqd.
		yearly	1.Checking,tightening and upkeeping the insulation of main busbar and cable connection. 2.Oil and greasing of operating mechanism. 3.Cleaning of contacts with CTC,indicating devices,voltmeter,ameter,selector switch etc.and replace if required. 4.Checking of CTandPT'setc. 5.Checking of SF6 gas pressure switch operation. 6.Checking and recording of earth resistance value.
6	Relay and control panel	weekly	1.Cleaning of panels externally 2.Checking and replacement of indicating lamps if required.
		Quarterly	1.Cleaning of panel internally with vacuum cleaner. 2.Checking of Aux contractor. 3.Check all fuses and contracts replace/repair if required.
		Half yearly	1.Checking of Earth connection of panels. 2.Check operation of auxiliary contractors. 3.Checking CTs&PTs connections.

		yearly	<ol style="list-style-type: none"> 1. Checking and tightening of all connections. 2. Checking and servicing of all contactors and relays, repair/replace if required. 3. Checking of earth resistance value. 4. Checking, calibrating and repairing of all meters/relays. 5. To check contacts of fuses, repair/replace if required.
7	AC DB Panel	weekly	<ol style="list-style-type: none"> 1. Cleaning of panel externally 2. Visual check of panel meters. 3. Checking indicating lamps replace/repair if required.
		Quarterly	<ol style="list-style-type: none"> 1. Cleaning of the panel internally with vacuum cleaner. 2. Check of switch contacts 3. Checks all fuses and contacts, replace/Repair if required.
		Half yearly	<ol style="list-style-type: none"> 1. Checking of Earth connection of panels. 2. Checking and repairing of operating mechanism of SFU/MCCB etc.
		yearly	<ol style="list-style-type: none"> 1. To check of all switches, contacts, tighten the connection, cleaning of contacts and insert petroleum jelly. 2. Checking of earth resistance value.
8	Battery charger	weekly	<ol style="list-style-type: none"> 1. Cleaning of battery charger and performing visual inspection for any abnormality. 2. Checking of batteries i.e. electrolyte levels, sulphation of contacts. 3. Checking indicating lamps, replace/repair if required.
		Quarterly	<ol style="list-style-type: none"> 1. To check Voltage of each battery and record. 2. To check operation of charger (Boost+ float.)
		Half yearly	<ol style="list-style-type: none"> 1. To check value of specific gravity of electrolyte of each battery 2. To remove sulphation and insert petroleum jelly. 3. Connection tighten of battery charger
		yearly	<ol style="list-style-type: none"> 1. Internally cleaning with vacuum cleaner. 2. Tightening of all connections. 3. Checking of the operation of all switches.

Note : The above list is only indicative for the jobs to be carried out by the contractor and IISER. Any other works, as deemed necessary, shall also be carried out. Final Schedule of maintenance to be mutually decided.

2.0 SWITCH FUSE UNITS

2.1 Switch fuse units, incorporated in switchboards wherever required shall conform in all respects to IS 13947 : 1993. Switch fuse units shall be suitable for 415 Volts 3 Phase 50 HZ AC supply and shall be suitable for AC - 23 A duty.

Unit housing shall be of robust construction designed to withstand arduous conditions. Sheet steel used shall be given rigorous rust proofing treatment before fabrication and painting Units shall have double break per phase in order to isolate fuse links when the switch is in OFF position.

Operating mechanism of units shall be crisp and positive in action with quick- make and quick-break silver plated contacts. Operating handle shall be suitable for rotary operation unless otherwise specified. Position of handle such as ON and OFF shall be clearly indicated.

All live parts inside the switch fuse units shall be shrouded to prevent any accidental contact.

All the terminals shall be liberally designed. All units above 100 A shall be provided with integral cable sockets.

All switch units shall be provided with suitable interlocks such that the door of the switchboard panel shall not open unless the switch is in OFF position. Provision for padlocking the switch in OFF position shall also be provided.

Routine and type tests as per IS 13947 : 1993 shall be conducted at works and test certificates furnished.

3.0 MOULDED CASE CIRCUIT BREAKERS

- i) Moulded case circuit breakers (MCCB) or fuse free breakers, incorporated in switchboards wherever required, shall conform to IS 13947 : 1993 in all respects. MCCBs shall be suitable either for single phase 240 Volts or 3 Phase 415 Volts AC 50 HZ supply.
- ii) MCCB cover and case shall be made of high strength heat resisting and flame retardant thermosetting insulating material. Operating handle shall be quick make/break, trip - free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of thermal/magnetic type provided on each pole and connected by a common tripe bar such that tripping of any one pole causes three poles to open simultaneously. Thermal/magnetic tripping device shall have IDMT characteristics for sustained over loads and short circuits.
- iii) Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.

iv) MCCBs shall be provided with following accessories, if specified in drawings/schedule of quantities :

- Under voltage trip
- Shunt trip
- Alarm switch
- Auxiliary switch

MCCBs shall be provided with following interlocking devices for interlocking the door a switch board.

- Handle interlock to prevent unnecessary manipulations of the breaker.
- Door interlock to prevent door being opened when the breaker is in ON position
- Deinterlocking device to open the door even if the breaker is in ON position.

MCCBs shall have rupturing capacity as specified in drawings/schedule of quantities.

4.0 METERING, INSTRUMENTATION AND PROTECTION.

The switchboard shall have required current and potential transformers as per schedule of quantities for metering and protection. The transformers shall comply to relevant ISS and class of accuracy required for metering and protection. Separate sets of CTs shall be provided for metering and protection.

4.1 Current Transformers

C/Ts shall conform to IS 2705 (part -I, II and III) in all respects. All C/Ts used for medium voltage application shall be rated for 1 kV. C/Ts shall have rated primary current, rated burden and class of accuracy as specified in schedule of quantities/drawings. Rated secondary current shall be 5A unless otherwise stated. Minimum acceptable class for measurement shall be class 0.5 to 1 and for protection class SP 10. C/Ts shall be capable of withstanding magnetic and thermal stresses due to short circuit faults of 31 MVA on medium voltage. Terminals of C/Ts shall be paired permanently for easy identification of poles. C/Ts shall be provided with earthing terminals for earthing chassis, frame work and fixed part of metal casing (if any). Each C/T shall be provided with rating plate indicating:

- Name and make
- Serial number
- Transformation ratio
- Rated burden
- Rated voltage
- Accuracy class

CTs shall be mounted such that they are easily accessible for inspection, maintenance and replacement. Wiring for CT shall be with copper conductor PVC insulated wires with proper termination works and wiring shall be bunched with cable straps and fixed to the panel structure in a neat manner.

4.2 Potential Transformer

PTs shall conform to IS 3156 (Part-I,II and III) in all respects.

4.3 Measuring Instruments

Direct reading electrical instruments shall conform to IS 1248 or in all respects. Accuracy of direct reading shall be 1.0 of voltmeter and 1.5 for ammeters. Other instruments shall have accuracy of 1.5. Meters shall be suitable for continuous operation between -10° C and $+50^{\circ}$ C. Meters shall be flush mounting and shall be enclosed in dust tight housing. The housing shall be of steel or phenolic mould. Design and manufacture of meters shall ensure prevention of fogging of instrument glass. Pointer shall be black in colour and shall have Zero position adjustment device operable from out side. Direction of deflection shall be from left to right. Suitable selector switches shall be provided for ammeters and volt meters used in three phase system. The rating type and quantity of meters, instruments and protective device shall be as per Schedule of Quantities /drawings

4.3.1 Ammeters

Ammeters shall be of moving iron type. Moving part assembly shall be with jewel bearings. Jewel bearings shall be mounted on a spring to prevent damage to pivot due to vibrations and shocks. Ammeters shall be manufacture and calibrated as per IS 1248

Ammeters shall normally be suitable for 5 A secondary of current transformers.

Ammeters shall be capable of carrying substantial over loads during fault conditions.

4.3.2 Voltmeters

Voltmeters shall be moving iron type range of 3 phase 415 volt voltmeters shall be 0-500. Volt meters shall be provided with protection fuse.

4.3.3 Watt meter

Wattmeter shall be of 3 phase electro dynamic type and shall be provided with a maximum demand indicator if required.

4.3.4 Power factor meters

3 phase power factor meters shall be of electro dynamic type with current and potential coils suitable for operation with current and potential transformers provided in the panel. Scale shall be calibrated for 50% lag - 100% - 50% readings. Phase angle accuracy shall be $\pm 4^{\circ}$.

4.3.5 Energy and reactive power meters

Trivector meters shall be two element, integrating type, KWH, KVA, KVARH meters. Meters shall conform to IEC 170 in all respects. Energy meters, KVA, and KVARH meters shall be provided with integrating registers. The registers shall be able to record energy consumption of 500 hours corresponding to maximum current at rated voltage and unity power factor. Meters shall be suitable for operation with current and potential transformers available in the panel.

4.4 Relays

Protection relays shall be provided with flag type indicators to indicate cause of tripping. Flag indicators shall remain in position till they are reset by hand reset. Relays shall be designed to make or break the normal circuit current with which they are associated. Relay contacts shall be of silver or platinum alloy and shall be designed to withstand repeated operation without damage. Relays shall be of draw out type to facilitate testing and maintenance. Draw out case shall be dust tight. Relays shall be capable of disconnecting faulty section of network without causing interruption to remaining sections. Analysis of setting shall be made considering relay errors, pickup and overshoot errors and shall be submitted to Engineer in charge for approval.

4.4.1 Over current relays

Over current relays shall be induction type with inverse definite minimum time lag characteristics. Relays shall be provided with adjustable current and time settings. Setting for current shall be 50 to 200 % insteps of 25%. The IDMT relay shall have time lag (delay) of 0 to 3 seconds. The time setting multiplier shall be adjustable from 0.1 to unity. Over current relays shall be fitted with suitable tripping device with trip coil being suitable for operation on 5 Amps.

4.4.2 Earth fault relay

Same as over current relay excepting the current setting shall be 10% to 40% in steps of 10%.

4.4.3 Under voltage relay

Under voltage relays shall be of induction type and shall have inverse limit operation characteristics with pickup voltage range of 50 to 90% of the rated voltage.

4.5 Power factor correction capacitors

Power factor correction capacitors shall conform to IS 2834 in all respects. Approval of insurance association of India shall be obtain if called for. Capacitors shall be suitable for 3 phase 415 volts 50 HZ supply and shall be available in single and three phase units of 5,10,15,20,25 and 50 kVAR sizes as per requirements. Capacitor shall be usable for indoor use, permissible overloads being as below.

Voltage overloads shall be 10% for continuous operation and 15% for six hours in a 24 hours cycle.

Current overloads shall be 15 % for continuous operations and 50% for six hours in a 24 hours cycle.

Over load of 30% continuously and 45% for six hours in a 24 hours cycle.

Capacitors shall be hermetically sealed in sturdy corrosion proof sheet steel containers and impregnated with non inflammable synthetic liquid. Every element of each capacity unit shall be provided with its own built in silvered fuse. Capacitors shall have suitable discharge device to reduce the residual voltage from crest value of the rated voltage to 50 volts or less within one minute after capacitor is disconnected from the source of supply. The loss factor of capacitor shall not exceed 0.005 for capacitors with synthetic impregnates. The capacitors shall withstand power frequency test voltage of 2500 volts AC for one minute. Insulation resistance between capacitors terminals and containers when a test voltage of 500 volts DC is applied shall not be less than 50 meg.ohms.

5.0 MEDIUM VOLTAGE SWITCH BOARDS

5.1 GENERAL

All medium voltage switchboards shall be suitable for operation at three phase/three phase 4 wire, 415 volt, 50 Hz, neutral grounded at transformer system with a short circuit level withstand of 31 MVA at 415 volts or as per schedule of quantities.

The Switch Boards shall comply with the latest edition with upto date amendments of relevant Indian Standards and Indian Electricity Rules and Regulations.

5.2 SWITCH BOARD CONFIGURATION

The Switch Board shall be configured with Air Circuit Breakers, MCCB's, and other equipment as called for in the Schedule of Quantities.

The MCCB's shall be arranged in multi-tier formation whereas the Air Circuit Breakers shall be arranged in Single or Double tier formation only to facilitate operation and maintenance.

The Switch Boards shall be of adequate size with a provision of 25% spare space to accommodate possible future additional switch gear.

5.3 EQUIPMENT SPECIFICATIONS

All equipment used to configure the Switch Board shall comply to the relevant Standards and Codes of the Bureau of Indian Standards and to the detailed technical Specifications as included in this tender document.

5.4 CONSTRUCTIONAL FEATURES

The Switch Boards shall be metal enclosed, sheet steel cubicle pattern, extensible, dead front, floor mounting type and suitable for indoor mounting.

The Switch Boards shall be totally enclosed, completely dust and vermin proof. Synthetic rubber gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust and vermin proof to provide a degree of protection of IP 42. All doors and covers shall also be fully gasketed with synthetic rubber and shall be lockable.

The Switch Board shall be fabricated with CRCA Sheet Steel of thickness not less than 2.0 mm and shall be folded and braced as necessary to provide a rigid support for all components. The doors and covers shall be constructed from CRCA sheet steel of thickness not less than 1.6 mm. Joints of any kind in sheet metal shall be seam welded and all welding slag ground off and welding pits wiped smooth with plumber metal.

All panels and covers shall be properly fitted and square with the frame. The holes in the panel shall be correctly positioned.

Fixing screws shall enter holes tapped into an adequate thickness of metal or provided with hank nuts. Self threading screws shall not be used in the construction of the Switch Boards.

5.5 SWITCHBOARD DIMENSIONAL LIMITATIONS

A base channel 75 mm x 5 mm thick shall be provided at the bottom.

A minimum of 200 mm blank space between the floor of switch board and bottom most unit shall be provided.

The overall height of the Switch Board shall be limited to 2300 mm

The height of the operating handle, push buttons etc shall be restricted between 300 mm and 1800 mm from finished floor level.

5.6 SWITCH BOARD COMPARTMENTALIZATION

The Switch Board shall be divided into distinct separate compartments comprising

A completely enclosed ventilated dust and vermin proof bus bar compartment for the horizontal and vertical busbars.

Each circuit breaker, and MCCB shall be housed in separate compartments enclosed on all sides.

Sheet steel hinged lockable doors for each separate compartment shall be provided and duly interlocked with the breaker/switch fuse unit in "on" and "off" position.

For all Circuit Breakers separate and adequate compartments shall be provided for accommodating instruments, indicating lamps, control contactors and control fuses etc. These shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, busbars and connections.

A horizontal wire way with screwed cover shall be provided at the top to take interconnecting control wiring between vertical sections.

Separate cable compartments running the height of the Switch Board in the case of front access Boards shall be provided for incoming and outgoing cables.

Cable compartments shall be of adequate size for easy termination of all incoming and outgoing cables entering from bottom or top.

Adequate and proper support shall be provided in cable compartments to support cables.

Following minimum clearances to be maintained after taking into consideration connecting bolts, clamps etc.

i)	Between phases	32 mm
ii)	Between phases and neutral	26 mm
iii)	Between phases and earth	26 mm
vi)	Between neutral and earth	26 mm

5.7 SWITCH BOARD BUS BARS

The Bus Bar and interconnections shall be of electrolytic Copper/Aluminium and of rectangular cross sections suitable for full load current for phase bus bars and half rated current for neutral bus bar. The maximum current density for copper shall be 1.2 amps per sq. mm. and for Aluminium shall be 0.8 amp per Sq. mm. and suitable to withstand the stresses of a 31 MVA fault level or at 415 volts for 1 second or as per schedule of quantities. .

The bus bars and interconnections shall be insulated with insulation tape/ fiber glass.

The bus bars shall be extensible on either side of the Switch Board.

The bus bars shall be supported on non-breakable, non-hygroscopic insulated supports at regular intervals, to withstand the forces arising from a fault level of 31 MVA at 415 volts for 1 second.

All bus bars shall be colour coded.

All bus bar connections in Switch Boards shall be bolted with brass bolts, washers and nuts.

5.8 SWITCH BOARD INTERCONNECTIONS

All connections between the bus bars/Breakers/ shall be through solid copper strips of adequate size to carry full rated current and PVC/fibre glass insulated.

5.9 DRAW-OUT FEATURES

Air Circuit Breakers shall be provided in fully drawout cubicles. These cubicles shall be such that drawout is possible without disconnection of the wires and cables. The power and control circuits shall have self aligning and self isolating contacts. The fixed and moving contacts shall be easily accessible for operation and maintenance. Mechanical interlocks shall be provided on the drawout cubicles to ensure safety and compliance to relevant Standards. The MCCB's shall be provided in fixed type cubicles.

5.10 INSTRUMENT ACCOMMODATION

Instruments and indicating lamps shall not be mounted on the Circuit Breaker Compartment door for which a separate and adequate compartment shall be provided and the instrumentation shall be accessible for testing and maintenance without danger of accidental contact with live parts of the Switch Board.

For MCCB's instruments and indicating lamps can be provided on the compartment doors.

The current transformers for metering and for protection shall be mounted on the solid copper/aluminium busbars with proper supports.

5.11 WIRING

All wiring for relays and meters shall be with PVC insulated copper conductor wires. The wiring shall be coded and labelled with approved ferrules for identification. The minimum size of copper conductor control wires shall be 1.5 sq. mm.

5.12 CABLE TERMINATIONS

The cable terminations of the Circuit Breakers shall be brought out to terminal cable sockets suitably located at the rear of the panel.

The cable terminations for the MCCB's shall be brought out to the rear in the case of rear access switchboards or in the cable compartment in the case of front access Switch Boards.

The Switch Boards shall be complete with gland plates

5.13 SPACE HEATERS

The Switch Board shall have in each panel thermostatically controlled space heaters with a controlling 15 amp 230 volt switch socket outlet to eliminate condensation.

5.14 EARTHING

A main earth bar of G.I shall be provided throughout the full length of the Switch Board with a provision to make connections to earth stations on both sides.

5.15 SHEET STEEL TREATMENT AND PAINTING

Sheet Steel materials used in the construction of these units should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognised phosphating process or by using sand blasting method. The steel work shall then receive two coats of oxide filler primer before final painting. Castings shall be scrupulously cleaned and fettled before receiving a similar oxide primer coat.

All sheet steel shall after metal treatment be spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall be adequate.

5.16 NAME PLATES AND LABELS

Suitable engraved white on black name plates and identification labels of metal for all Switch Boards and Circuits shall be provided. These shall indicate the feeder number and feeder designation.

6.0 INSTALLATION

The foundations prepared as per the manufacturers drawings shall be levelled, checked for accuracy and the Switch Board installed. All bus bar connections shall be checked with a feeler gauge after installation. The cable end boxes shall be sealed to prevent entry of moisture. The main earth bar shall be connected to the sub-station earths.

A 15 mm thick rubber matting of approved make on a 100 mm high timber platform shall be provided in front of and along the full length of the Switch Board. The width of the matting shall be 1000 mm. The rubber mat shall withstand 15 KV for 1 minute and leakage current shall not exceed 160 mA/sq. metre.

After installation the Switch Board shall be tested as required prior to commissioning.

7.0 OUTDOOR TYPE DISTRIBUTION FEEDER PILLARS

The feeder pillar shall be of the floor mounting type, totally enclosed, and weather proof, conforming to ISI IP 54 incorporating phenolic moulded fuse fittings with high rupturing capacity cartridge fuse links having a certified rupturing capacity of not less than 35 MVA at 433 volts. The feeder pillar shall be suitable for 440 volts 3 phase 4 wires, 50 cycles AC supply.

The cubicle should be fabricated out of heavy gauge sheet steel of thickness not less than 2 mm thick with suitable side frame and stiffeners. Hinged doors of not less than 1.6 mm thick should be provided at the front and rear of the cubicle to provide access for installation, operation, tests and inspection. The rear door is provided to facilitate cable termination and the front door for inspection of fuses, to switch „ON“ and „OFF“ the switch as and when required. All doors should be fitted with dust excluding neoprene gaskets. The doors should also be fitted with suitable locking arrangement with lock to prevent unauthorized opening. The cubicle should be designed for mounting over cement concrete plinths by the roadside, and should be of substantial construction capable of withstanding the vibrations normally experienced due to vehicular traffic. The top of the feeder pillar is of slanting construction in all directions to prevent any collection of water due to rain. A gland plate is provided at the bottom of the feeder pillar (removable) for mounting the cable glands. The feeder pillar shall be fitted on an angle iron pedestal at the bottom covered with sheet metal from all the four sides which facilitates cable bending etc specially with aluminium cables. Two lifting hooks shall be provided at the top. A door switch shall be provided in the feeder pillar so as to switch „ON“ and „OFF“ the lamp fixed in the brass batten holder below the top sheet of the pillar.

The sheet steel materials used in the construction of the cubicle should have undergone a rigorous rust proofing process comprising alkaline degreasing, descaling in dilute sulfuric acid solution and recognised phosphating process. After metal treatment, the interior of the cubicle should be painted with two coats of air-drying red lead primer followed by two coats of air drying anti-condensation paint. The exterior of the cubicle should be painted with two coats of staving red oxide primer followed by one coats of epoxy finishing paint. One final spray of epoxy paint shall be applied at the time of handing over the installation.

All the nuts, bolts shall be cadmium plated with spring washers. A minimum spacing from cable connection to the bottom of gland plate shall be 300mm.

The bus bars should be of electrical grade copper. They should be air insulated with adequate clearances between conductors and between conductors and earth. These should be colour coded to enable immediate identification of the phases and neutral. The current density for bus bars shall not be more than 1.0 amps per square mm. All bus bar joints and tapings should be of the clamped type as far as possible thereby avoiding drilling of holes on bus bars. The bus bars should be carried on supports made out of a suitable non-

inflammable and non-hygroscopic material such as Hylam, Permalin or Formica. Suitable insulating phase barriers should be provided to prevent accidental short-circuits during operation.

The fuse base contacts should be of copper comprising one top contact for bolting to the bus bar, one bottom contact for terminating the incoming or outgoing cable and a cable lug. The bottom contacts should be so designed that the cable tail from the cable gland to the cable lug is vertical and does not foul with any live parts in its run. The spacing between the respective fuse bases should not be less than 40mm.

The fuse carriers should be fitted as standard to all fuses to minimize accidental contact with live metal during inspection or maintenance. The carriers should be phenolic moulded, designed to accommodate HRC fuse-links and should incorporate a wedge action device for tightening the fuse-link to the base contact. This wedge action should be operated externally by insulated thumb screws giving uniformly high pressure contact and ensuring cool running under full load conditions, with positive location of the fuse-link tags on the base contact. The fuse-link shall not work loose due to vibration occurring from vehicular traffic.

A viewing aperture should be provided on the carrier to facilitate location of a „blown“ fuse. The fuse carriers should also be easily withdrawable in service. The design of the carrier should be such that carrier components do not carry any current and the contact is decided between fuse-link tag and base contact.

When incoming links are called for it should be possible to fit the carriers with solid links in lieu of fuses.

The neutral bus bar shall be rated at 100 % of the phase bus bars. The design should allow for neutral cable sockets to be fitted directly to the bus bars. A GI earth bar of size 40x5mm together with two cable eyes shall be provided for connections to earth pits. All the cables shall be terminated at ELEMEX terminal block and therefrom wiring shall be done with PVC insulated aluminum conductor cable to fuse units. The wiring shall be neatly bunched and shall be secured to wiring cradles.

A circuit cardholder to be made inside the front door and the card duly engraved / painted on aluminum / hylam sheet, Identification ferrules shall be used for incoming and outgoing cables.

AUTOMATIC FIRE DETECTION & ALARM SYSTEM

1.0 SCOPE

This specification covers the supply, installation, testing and commissioning of the Fire Detection Systems and generally comprise

- Provision of Smoke and Heat Detectors
- Provision of Manual Call Points
- Provision of Response Indicator Units
- Provision of Audio Alarm units

- Local and Main Control Unit for the System
- Public Address System

- Wiring between Detectors and Control Units to make the complete System

2.0 STANDARDS AND CODES

Specification for Smoke Detectors BS 5445 : 1984

Specification for Heat Sensitive Detectors
for use in automatic fire alarm Systems IS 2175 : 1977

Code of Practice for installation of automatic
Fire Alarm System using Heat sensitive type
Fire Detectors IS 2189: 1976

Code of Practice for Electrical Wiring
installations (System voltage not exceeding
660 volts) IS 732 : 1963

Automatic Fire Alarm Systems in buildings BS 3116 Part I

Control and indicating equipment BS 3116 Part IV

British Code of practice for installation and
servicing of Fire Alarm Systems CP 1019 : 1972

Underwriters Laboratory Specification for
Smoke Detectors UL 268

All equipment and the installation shall be as per the relevant Indian Standards Specifications. Where these Standards do not exist, the relevant British Standards or any other internationally accepted Standard shall apply.

3.0 IONISATION TYPE SMOKE DETECTORS

3.1 GENERAL

The Ionisation type Smoke Detectors shall be capable of sensing fire in the smoldering or the incipient stage. Smoke Detectors shall be sensitive to products of combustion of all materials like wood, paper, rubber, natural and synthetic fibres, plastic and common liquid hydrocarbons in accordance with the sensitivity requirements of BS 5445 Part 7 : 1984.

3.2 CONSTRUCTIONAL

FEATURES DETECTOR HEAD

The Smoke Detector enclosure shall be of white plastic moulded with high impact self extinguishing polycarbonate and shall be fitted to the base by a twist and lock action. Correct alignment of the electrical contacts in the base with the terminal pins of the Detector shall be ensured. The twist and lock action shall ensure a good electrical contact with the wiping action. Apertures in the Detector housing shall allow the free ingress of smoke through a stainless steel gauze and into the smoke sensing ionisation chamber.

IONISATION CHAMBERS

The Detector head shall incorporate two ionization chambers and twin radio active sources namely Americium 241 having a radio activity of less than 1.0 micro curies. The radio active source shall be mounted on a stainless steel electrode and shall be electrically insulated from the gauze and the chamber cage. The second radio active source shall be mounted on the underside of the stainless steel electrode. Air within the chambers shall be ionized by the radio active sources with the second being the sealed reference chamber in electrical series with the first - smoke sensing chamber. The gauze and the chamber cage shall provide electrical screening to the smoke sensing chamber.

DETECTOR BASES

The Detector bases shall be suitable for mounting directly on a 75 mm recessed round box or as required at the site. The bases shall have terminals which shall be suitable for receiving 1.5 sq mm PVC copper conductor or 2.5 sq mm PVC aluminium conductor cables. Access to the terminals shall be available from the front of the base after removing the Detector. A plastic cover shall be provided with each base to be fixed to the rear to eliminate the ingress of dust, water and insect into the Detector

LED INDICATION LAMP

A LED lamp shall be incorporated which shall normally flicker at the rate of six flashes per minute indicating alertness and shall turn steady when a fire is sensed enabling immediate identification of the Detector.

ELECTRONICS

The Printed Circuit Board electro tinned copper tracks shall be protected from corrosion by a green epoxy solder resist coating. The tracks and solder joints shall be protected against fungus growth by an insulating varnish coating.

The sensitive electronic components shall be protected by a high resistivity silicone encapsulation compound. All electronic components shall be electrostatically screened.

The electronic design and circuit shall provide the following safety devices:

- protection against high voltage spikes on the supply line
- protection against polarity reversal
- protection of the ionization chamber monitoring circuits from high voltage static discharges
- protection against high frequency transients
- detection of alarm at the control unit even in the event of LED failure
- protection against transient spikes on long lead lines to the remote indicators

DETECTOR WIRING

The Smoke Detector shall be suitable for 2 wire monitored supply.

OPERATIONAL PARAMETERS

The Detectors shall be suitable for operation at a maximum ambient temperature of 60 deg C. and a minimum of 0 deg C with a maximum relative humidity of 90%.

The Detector sensitivity shall remain constant and not vary with change in the ambient temperature, humidity, pressure or voltage by more than +/- 10%.

The performance of the Detectors shall not be effected by continuous air flows upto 10 meters per second.

The Detectors shall be suitably protected against the accumulation of dust and insects.
The Smoke Detectors shall comply to the requirements of BS 5445 Part 7 : 1984 and EN 54 Part 7 : 1984 for Vibration, Impact and Shock parameters.

The Smoke Detectors shall be designed and constructed to meet the requirements of IP 43.

DETECTOR TESTING IN SITU

It shall be possible to functionally test the Detector as well as assess its actual sensitivity without having to remove the same.

DETECTOR CERTIFICATION

The Smoke Detector shall be UL Listed and tested and approved by independent Authorities for certified compliance and acceptance to the relevant Standards. The Detectors shall be approved by the Local Fire Authorities and relevant documentation shall be supplied with the tender.

4.0 HEAT SENSITIVE RATE OF RISE CUM FIXED TEMPERATURE TYPE DETECTORS

4.1 GENERAL

The Heat Sensitive Detectors shall be of the rate of rise cum fixed temperature detection type and shall comply to the requirements of IS 2175 : 1977 and NFPA Standard 721. The detectors shall respond to a rate of rise in temperature of 8 deg C per minute and a fixed temperature of 57 deg C.

4.2 CONSTRUCTIONAL FEATURES

The Heat Detectors shall be of the plug-in type and shall be attached to the mounting plate by a twist and lock motion. The Detector body shall be of moulded plastic, white in colour. The electrical contacts and other moving parts of the Detector shall be enclosed in such a manner that will afford protection against moisture, dust, insects and other foreign matter. All make and break contacts shall be of silver or any other metal or alloy of equivalent characteristics.

The body and other parts shall be made of material inherently resistant to corrosion. Any adjustments made at the factory shall be sealed and all adjustment screws shall be provided with a reliable means of locking to avoid disturbance of the adjustments in transit. In addition, the means of adjustment shall be rendered inaccessible to prevent tampering when the Detector is being installed or during its operation.

4.3 MOUNTING PLATES

All Detectors shall be installed on mounting plates moulded from white self extinguishing thermoplastic. The Detector shall be attached to the mounting plate with a twist and lock motion. The mounting plate shall be suitable for installation on a 75 mm round recessed box.

4.4 DETECTOR OPERATION

The Detector head shall house a thermostat or a fusible alloy as a fixed temperature element. When activated the external heat collector shall drop to provide a visual confirmation that the fixed temperature element has operated.

A pneumatic element shall sense the rate of rise in temperature by expansion of air within a sealed chamber faster than it can escape through the calibrated vent. The resultant increase in pressure shall depress a diaphragm causing the electrical contacts to close a circuit and trigger an alarm. The rate of rise element shall be of the self restoring type.

4.5 DETECTORS APPROVALS

The Detectors shall meet the performance requirements as per Clause 5 of IS 2175 : 1977 and/or other International Standards. The Detectors shall be UL Listed and FM approved and shall meet the approval requirements of the Local Fire Authorities. Test certificates from independent authorities and the approvals for the Detectors shall be furnished with the tender.

5.0 HEAT SENSITIVE FIXED TEMPERATURE TYPE DETECTORS

5.1 GENERAL

The Heat Sensitive Detectors shall be of the fixed temperature detection type and shall comply to the requirements of IS 2175 : 1977 and NFPA Standard 721. The detectors shall respond to a fixed temperature of 57 deg C. or 94 deg C as specified.

5.2 CONSTRUCTIONAL FEATURES

The Heat Detectors shall be of the plug-in type and shall be attached to the mounting plate by a twist and lock motion. The Detector body shall be of moulded plastic, white in colour. The electrical contacts and other moving parts of the Detector shall be enclosed in such a manner that will afford protection against moisture, dust, insects and other foreign matter. All make and break contacts shall be of silver or any other metal or alloy of equivalent characteristics.

The body and other parts shall be made of material inherently resistant to corrosion.

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The Detectors shall meet the performance requirements as per Clause 5 of IS 2175 : 1977 and/or other International Standards. The Detectors shall be UL Listed and FM approved

and shall meet the approval requirements of the Local Fire Authorities. Test certificates from independent authorities and the approvals for the Detectors shall be furnished with the tender.

6.0 MANUAL CALL POINTS

Manual Call Points shall consist of a push button switch housed in a dust tight sheet steel enclosure of 1.5 mm thick sheet to manually initiate audio visual alarms. The front shall be sealed with a breakable glass cover fixed in such a way that the actuating push button is kept depressed as long as the glass is intact and released automatically when the glass is broken. The front face of the Manual Call Box shall have an area not less than 5000 sq mm and the element shall have an exposed area of not less than 1600 sq mm in the shape of a square or a rectangle.

A small steel hammer shall be attached to the assembly with a steel chain to facilitate breaking of the glass front. The Manual Call Box shall be suitable for surface or recessed mounting as required. The words "IN CASE OF FIRE BREAK GLASS" 5 mm high shall be painted in red on the front face.

7.0 RESPONSE INDICATOR

The Response Indicator shall consist of a red LED mounted in a sheet steel enclosure of 1.5 mm thick sheet suitable for surface or recessed mounting on walls or partitions as required. These shall be connected to the Detectors in the enclosed area to indicate the status of the Detector. In normal circumstances the lamp shall flicker but in the event of the Detector inside the enclosed area sensing a fire, the lamp shall glow steadily.

8.0 ILLUMINATED SIGNS

The Illuminated Signs shall have the letters "FIRE EXIT" or "NO FIRE EXIT" painted in red on a white perspex sheet as the front face of a sheet steel enclosure constructed with 1.5 mm thick sheet. The perspex sheet shall be back lit with an integral battery back up facility so as to operate independent of the mains supply in the event of a mains failure. The preferred dimensions of the Illuminated Signs shall be 450 mm length and 225 mm height with 100 mm high lettering. They shall be suitable for surface or recessed mounting as required.

9.0 ALARM SIRENS

Electronic audio alarm sirens shall be suitable for operation on the DC supply of the System and will be actuated from the Main Control Panel in the event of a fire. These shall have a two tone modulated alarm signal for continuous service with an output of 100 dB at a distance of 3 metres.

10.0 MAIN CONTROL PANEL

10.1 GENERAL

The Main Control Panel (MCP) shall be centrally located and shall form the nerve centre of the total System. The MCP shall continuously monitor the status of each Fire Zone.

10.2 CONSTRUCTIONAL FEATURES

The MCP shall be metal enclosed, sheet steel cubicle pattern, dead front, floor/wall mounting type as required and suitable for indoor mounting.

The MCP shall be dust and vermin proof. Synthetic rubber gaskets shall be provided on all covers and doors to render the joints dust and vermin proof. All doors shall be lockable.

The MCP shall be fabricated from 2.0 mm CRCA thick sheet steel and shall be folded and braced to provide a rigid support. Joints shall be seam welded.

10.3 MAIN CONTROL PANEL CONFIGURATION

The MCP shall monitor the status of each Fire Zone and shall be configured to include:

- a) **Microprocessor** based electronic panel complete with a facia to provide the following indications and controls:
 - "FIRE" indication one per zone
 - "FAULT" indication one per zone
 - "FIRE TEST" push button one per zone
 - "ZONE ISOLATE" switch one per zone
 - "DETECTOR FAILURE - OPEN CIRCUIT - SHORT CIRCUIT" indication
 - "DETECTOR REMOVED" indication
 - "BREAK IN WIRING" indication with initiation of alarm

- b) Mother Board to control and monitor the entire System with audio/visual alarms and with a facia to provide the following controls and indications:
 - "MAINS ON" switch with indicating lamp
 - "SYSTEM ON" switch with indicating lamp
 - "MAINS FAILURE" indication
 - "BATTERY LOW" indication
 - "LAMP TEST" push button
 - "STANDBY ON" indication

- "SYSTEM RESET" push button
 - "ALARM CANCEL" push button
 - "TRICKLE BOOST" toggle switch
 - "AUDIO ALARM" selector switches for general and/or zone wise broadcast.
 - "AUTO/MANUAL" selector switch for the Illuminated Signs
- c) Power Supply for the System integral with the MCP. The power supply rating shall be adequate for the Detectors, Illuminated Signs and all other devices as required in the System.

The power supply unit integral with the Control Panel shall consist of a 230/24 volt step down transformer. The 24 volt secondary of the transformer shall be rectified through a silicon diode bridge rectifier unit and the D C output filtered to minimise ripples. The unregulated 24 volt DC supply shall be regulated for the electronic circuits and the power to the entire System.

- d) Screw type terminal blocks and cable glands for termination of all control wiring.
- e) Required potential free spare contacts/ or as called for in Bill Of Quantities.
- f) End of Line resistors as required by the System design shall be provided as a part of the Control Panel.
- g) Audio visual alarm unit with a provision to sound an alarm throughout the building from the Main Control Panel either as a general broadcast or selectively as may be required.

10.4 ELECTRONICS

The Printed Circuit Board electro tinned copper tracks shall be protected from corrosion by a green epoxy solder resist coating. The tracks and solder joints shall be protected against fungus growth by an insulating varnish coating.

The sensitive electronic components shall be protected by a high resistivity silicone encapsulation compound. All electronic components shall be electrostatically screened.

The electronic design and circuit shall provide protection against high voltage spikes on the supply line

All Printed Circuit Boards shall be mounted in the MCP such that they can be pulled out from the front without the need for disconnecting any wires and shall therefore be mounted on rails and plugged directly into connectors.

10.5 DISPLAY

The Main Control Panel shall be complete with a display showing the layout of each floor of the Building/s and each Fire Zone marked clearly thereon for ready identification with the Zone indications and controls. The Display Panel shall be integral with the MCP and shall be etched in colour on a white perspex sheet as approved by the Engineer in charge.

10.6 INTERNAL WIRING

All internal wiring shall be with 1.5 sq mm PVC insulated copper conductor wires colour coded and labelled with ferrules for easy identification. The wiring shall be properly bunched and harnessed. The wiring shall be done in a manner such that it is readily accessible from the front for maintenance.

10.7 SHEET STEEL TREATMENT AND PAINTING

Sheet steel materials used in the construction of the Panels should have undergone a rigorous rust proofing process comprising of alkaline degreasing, descaling in dilute sulphuric acid and a recognized phosphating process. The steel work shall then receive two coats of filler oxide primer before final painting.

All sheet steel shall after metal treatment be spray or powder painted with two coats of shade 692 to IS 5 on the outside and white on the inside. Each coat of paint shall be properly stoved and the paint thickness shall not be less than 50 microns.

10.8 NAME PLATES AND LABELS

Suitable engraved white on black name plates and identification labels shall be provided for identification of the Fire Zones as approved by the Engineer in charge.

11.0 REMOTE CONTROL PANELS

Remote Control Panels shall generally comply to the Specifications of the Main Control Panels as detailed in para 9 above. These shall be located remotely and will indicate the status of each Zone and the MCP but without any controls. The indications to be provided on the Remote Control Panel shall be :

- "FIRE" indication one per zone
- "FAULT" indication one per zone

- "DETECTOR FAILURE - OPEN CIRCUIT - SHORT CIRCUIT" indication one per
Zone

- "DETECTOR REMOVED" indication one per
Zone

- "BREAK IN WIRING" indication one per zone

- "MAINS ON" indicating lamp
- "SYSTEM ON" indicating lamp
- "MAINS FAILURE" indication
- "BATTERY LOW" indication
- "STANDBY ON" indication

12.0 BATTERY AND BATTERY CHARGER

Adequately rated 24 volt lead acid rechargeable DC battery with 12 hour autonomy shall be provided for the System. The capacity shall be such as to feed the full load of the Fire Detection System including the Illuminated Signs in the event of a mains failure. It shall be connected to the MCP via a mains failure relay.

The battery shall be complete with a Battery trickle charger set and shall be maintained in a charged condition with the constant trickle charge. It shall be possible to boost the charging of the battery by the manual operation of the trickle/boost toggle switch when 'Battery Low' indication is observed on the Main Control Panel.

The Battery capacity shall fully meet the requirements of Clause 5.2 of IS 2189.

13.0 WIRING

The wiring for the Fire Detection System shall in general comply with the requirements of IS 2189 : 1976 and IS 732 : 1963. The Detectors in each loop shall be wired upto the Main Control Panel with a 2 core 1.5 sq. mm. copper conductor or 2 core 2.5 sq mm aluminium conductor FRLS PVC insulated 660/1100 volt grade wires in concealed or surface conduit as required. Crimped terminations shall be used throughout the System.

14.0 TEST CERTIFICATES

Type test certificates from a recognized independent agency shall be furnished for all the equipment. The equipment shall comply to the requirements of the Indian, International Standards, Fire Insurance Authorities and all National and Local Regulations in force.

15.0 SENSITIVITY ADJUSTMENTS

The sensitivity of all Detectors shall be set/adjusted by the Supplier to suit the site conditions.

16.0 INSTALLATION, COMMISSIONING AND ACCEPTANCE TESTS

The following installation, commissioning and acceptance tests shall be conducted by the Contractor and shall be apart from the Standard/Routine tests prescribed and normally conducted by the Supplier. These tests shall be carried out as a part of the installation irrespective of whether or not these are covered by the Standard/Routine tests.

INSTALLATION TESTS

- After installation of the Detector Bases and prior to installation of the Detectors, the wiring shall be tested for continuity and insulation resistance. A high voltage insulation meter 500 to 1000 volts shall be used to measure the insulation resistance between each conductor and between each conductor and earth. The value of insulation resistance shall not be less than 1 Mega ohm.
- The insulation resistance of the wiring to the Response Indicators shall also be checked as above prior to the installation of the Indicators.

COMMISSIONING AND ACCEPTANCE TESTS

Each zone shall be tested by a test fire or by a heat source on all or any one or more of the Detector selected by the Engineer in charge. The time required for detection shall be noted and shall be within prescribed limits.

- Each alarm circuit shall be energised separately and the sound level reading taken to check for conformity with the minimum standards.
- Open circuit and removal of a Detector from a detection circuit shall be tested.
- Short circuit operation for each detection circuit will be tested
- Tests to prove satisfactory operation of the system shall be conducted simulating the conditions of
 - * Mains Failure
 - * Battery disconnection
 - * Open circuit and short circuit conditions of each alarm circuit

The results of all the tests conducted shall be so recorded and approved by the Engineer in charge prior to acceptance of the System.

17.0 AUTHORITIES AND APPROVALS

The work shall conform to the requirements and provisions of the relevant Government Acts, Regulations and Bye Laws of the Local Authorities. The Contractor shall give all notices as required under the said Acts, Regulations and Bye Laws.

The Contractor shall submit applications, drawings etc. as required and obtain approval, licenses and sanctions thereof from Delhi Fire Services and any other Statutory Authorities. The Contractor shall obtain the final completion certificate from

the concerned authorities to enable the Engineer in charge to commission the installation.

The Contractor shall be responsible for the payment of all fees etc. to be paid to the relevant Authorities and the Engineer in charge shall refund the same to the Contractor on submission of receipts in original.

The work shall not be deemed to be complete until the above approvals, licenses, sanctions etc. have been obtained by the Contractor.

SPECIFICATION FOR LT PANEL/ SWITCHGEAR

2.01.00 CONSTRUCTION:-

- 2.01.01 Switchgear enclosure shall conform to the degree of protection IP4x minimum thickness of sheet metal used shall be 2 mm.
- 2.01.02 The switchgear shall comprise a continuous line up of single / Multi-tire cubicles. The installations of circuit breakers however shall be limited to the bottom two tires only.
- 2.01.03 The design shall be of fully compartmentalized execution with metal/ insulating portions. Working height shall be limited between 750 mm to 1800 mm from the floor level.
- 2.01.04 Each breaker shall be housed in a separate cubicle, complete with an individual front access door; each vertical section shall have a removable back cover. All doors & covers shall be gasketed.
- 2.01.05 Switchgear cubicle shall be so sized as to permit closing of the front access door when the breaker is pulled out to ISOLATED position.
- 2.01.06 All switchgear, lamps & indicating instruments shall be flush mounted on the respective cubicle door whereas relays & other auxiliary devices of any may be mounted on a separate cubical.

2.02.00 BUS AND BUS TAPS

- 2.02.01 The main buses & connections shall be of high conductivity aluminium alloy, as per IS : 5082 sized for specification current rating with maximum temperature limited to 85 degree C (i.e., 35 degree C rise over 50 degree C ambient). Bus bars shall be designed for a maximum current density of 0.8A/ sqmm.
- 2.02.02 All bus connections shall have adequate contact pressure which should be ensure by means of two bolt connections with plain & spring washers locknuts. Bimetallic connections between dissimilar metals.
- 2.02.03 Bus connections shall be fully insulated for working voltage with adequate phase / ground clearances.

Insulating sleeves for bus bars & surrounds for joints shall be provided.

Bus insulator shall be flame-retardant, track resistant type with high creep age surface.

- 2.02.04 All buses & connections shall be supported & braced to with stand the stresses due to maximum short circuit current & also to take care of any thermal expansion.
- 2.02.05 Bus-bars shall be sleeved in colour coded manner for easy identification & so located that the sequence RYB shall be from left to right, top to bottom of front to rear, when viewed from the front of switchgear assembly.

2.02.06 Bolted disconnected links shall be provided from all incoming & outgoing feeders for isolation of neutral, if necessary.

2.03.00 CIRCUIT BREAKER

2.03.01 Circuit breaker shall be three poles, single throw, air breaker type with stored energy, trip free mechanism & shunt trip. The circuit breaker of the outgoing feeder shall have an in built microprocessor base release, short circuit, over current & earth fault protection release.

2.03.02 Circuit breakers shall be draw out type, having SERVICE, TEST & ISOLATED position with positive indication for each position along with in built relay unit.

2.03.03 Circuit breaker of identical rating shall be physically & electrically interchangeable.

2.03.04 Circuit breaker shall be motor wound spring charged mechanism, motor voltage should be 240 V AC. For motor wound mechanism, spring charging shall take place automatically after each breaker closing operation. One open close-open operation of the circuit breaker shall be possible after failure of power supply to the motor. Power supply for this motor shall be taken from the output of auto changeover.

2.03.05 Mechanical safety interlocking shall be provided to prevent the circuit breaker from being racked in or out of the service position when the breaker is closed.

2.03.06 Automatic safety shutters shall be provided to fully cover the female primary disconnects when the breaker is withdrawn.

2.03.07 Each breaker shall be provided with an emergency manual trip, mechanical ON-OFF indicator, an operation counter & mechanism charge/ discharge indicator.

2.03.08 In additional to the auxiliary contacts required for normal breaker operation & indication, each breaker shall be provided with following for interlocking purpose:-
a) Position/ cell switch with 4 NO. + 4 NC contacts. These shall be available as spare for automation work.
Control Supply :- 230V AC for closing,
Tripping & indication lamps.

b) Auxiliary switch, with 6 NO+ NC contact, mounted on the stationary portion of the switchgear & operated mechanically by a sliding level from the breaker, in SERVICE position. These shall be available as spare for automation work.

2.03.09 Limit / auxiliary switches shall be convertible type, that is, suitable for changing NO contact to NC & Vice-Versa.

2.04.00 MOULDED CASE CIRCUIT BREAKERS

2.04.01 Moulded case circuit breakers (MCCB) or fuse free breakers, incorporated in switchboards wherever required, shall conform to IS 13947 : 1993 in all respects. MCCBs shall be suitable either for single phase 240 Volts or 3 Phase 415 Volts AC 50 HZ supply.

MCCB cover and case shall be made of high strength heat resisting and flame retardant thermosetting insulating material. Operating handle shall be quick make/break, trip - free type. Operating handle shall have suitable ON, OFF and TRIPPED indicators. Three phase MCCBs shall have a common handle for simultaneous operation and tripping of all the three phases. Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be of microprocessor based electronic type provided on each pole and connected by a common tripe bar such that tripping of any one pole

causes three poles to open simultaneously. Electronic tripping device shall have IDMT characteristics for sustained over loads and short circuits.

Contact trips shall be made of suitable arc resistant sintered alloy. Terminals shall be of liberal design with adequate clearances.

MCCBs shall be provided with following accessories, if specified in drawings/schedule of quantities :

Shunt trip
Alarm switch
Auxiliary switch

MCCBs shall be provided with following interlocking devices for interlocking the door a switch board.

Handle interlock to prevent unnecessary manipulations of the breaker.
Door interlock to prevent door being opened when the breaker is in ON position
Deinterlocking device to open the door even if the breaker is in ON position.

MCCBs shall have rupturing capacity as specified in drawings/schedule of quantities.

- 2.04.02 MCCB shall be triple pole air break.
- 2.04.03 The MCCB shall have a quick - make, quick - break mechanism operated by a suitable external rotary handle, complete with position indicator this handle shall have provision for pad locking in ON & OFF position.
- 2.04.04 MCCB should have microprocessor base electronic release with over current, earth fault & short circuit protection equivalent to L&T 'D' since with RC-10 release.

2.05.00 CONTROL & INDICATION :-

The circuit breaker shall be wired up wired up for both local & remote operation. A local- remote selector switch shall be provided for this purpose. Each breaking cubicle shall be equipped with following :-

- 2.05.01. One (1) Test- neutral - service selector switch stay put type with test/ service position pistol grip handle & key interlock for breaker marked 'E'.
- 2.05.02. Two (2) heavy duty, oil tight push buttons for TRIP & CLOSE.
- 2.05.03. Three (7) LED indicating lights on front of compartment :-
 - GREEN : breaker open & spring charged
 - RED : Breaker close
 - AMBER : Trip / circuit healthy condition
 - WHITE : Control supply failure
 - Phase indication : One Red, One Blue & One Yellow
 - 1 NO & 1 NC should be provided for status monitoring of the remote / local position.
- 2.05.04 Lamps shall be low watt, LED type lamp & lens shall be replaceable from the front.
- 2.05.05 The general scheme of connections for control, interlock & protection shall got approved before fabrication of panel.

2.06.00 FUSES :-

- 2.06.01 Fuses shall be HRC, preferably link type with a minimum interrupting capacity equal to the short circuit current.

2.06.02 Fuses shall be furnished complete with fuse base & fittings of such as to permit easy & safe replacement of fuse element. Visible indicated indication shall be provided on blowing of the fuse.

2.07.00 CURRENT TRANSFORMER :-

2.07.01 Current transformer shall be cast- resin type. All secondary connections shall be brought out to terminal blocks where or delta connection will be made.

2.07.02 Ratings :

for incomers and buscoupler

1500-750/5+5 : 3 sets

For out goings :

800-400/5+5 : 4 sets

600-300/5+5 : 4 sets

400-200/ 5+5 : 2 sets

2.07.03 Accuracy class of the current transformers shall be :-
a.) Class 5P10 for other relaying (protection).
b.) Class 1.0, ISF < 5 for metering.

2.08.00 RELAYS :-

2.08.01 Relays shall be of drawout design with built in testing facilities. Small auxiliary relays may be in non drawout execution.

2.08.02 Relay shall be rated for operation on 5 Amp secondary current & 110 / 220 V secondary voltage ; number & rating of relay contacts shall suit the job requirements.

2.08.03 The contractor shall furnish, install & co-ordinate all relays to suit the requirements of protection & interlock & as broadly indicated in the annexure & drawings.

2.09.00 METERS (DIGITAL DISPLAY):-

2.09.01 Indicating instruments shall be switch board type & accuracy class of 2% .

2.09.02 All Digital Watt-hour meter shall be provided , Alternatively, they may have test block to facilitate testing of meter without disturbing C.T. or V.T. secondary connections.

2.09.03 Each breaker shall be with volt meter, amp meter with selector switches & KWH meters. Only out going feeders will be relaxed from voltmeters.

2.10.00 SECONDARY WIRING :-

2.10.01 The switchgear shall be fully wired at the factory to ensure proper functioning of control, protection, & interlocking schemes.

2.10.02 Fuses & links shall be provided to permit individual circuit isolation from bus wires without disturbing other circuits. All spare contacts of relays, switches & other devices shall be wired upto terminal blocks.

2.10.03 Wiring shall be done with FRLS PVC flexible, 650V grade, PVC insulated switchboard wires with solid copper conductors of 2.5 sqmm for voltage circuits alongwith numbered ferrules.

2.10.04 Each wire shall be identified, at both ends, with permanent markers bearing wire numbers as per contractors wiring diagrams.

- 2.10.05 Wire terminations shall be made with crimping type connectors with insulating sleeves. Wire shall not be spliced between terminals.

2.11.00 TERMINAL BLOCKS

- 2.11.01 Terminal blocks shall be 660V grade box clamp type with marking strips, similar to ELMEX 10 sqmm of equal. Terminals for C.T. secondary leads shall have provision for shorting.
- 2.11.02 Not more than two wires shall be connected to any terminals equal in number to 20% active terminals shall be furnished.
- 2.11.03 Terminal blocks shall be located to allow easy access. Wiring shall be so arranged that individual wires of an external cable can be connected to consecutive terminals.

2.12.00 CABLE TERMINATION :-

- 2.12.01 Switchgear shall be designed for cable entry from the bottom. Sufficient space shall be provided for each of termination & connection.
- 2.12.02 All provision & accessories shall be furnished for termination & connection of cables, including removable gland plates, cable supports, crimp type tinned copper/ aluminium lugs, brass compression gland with tapered washer (power cable only) & terminal block.
- 2.12.03 Gland plate shall be minimum 4 mm thick.

2.13.00 BUS DUCT CONNECTION :-

- 2.13.01 Bus duct connections, where specified shall be furnished along with transportation of panel. Bus duct connections shall be generally from the top.
- 2.13.02 All connecting bus work shall have the same continuous rating as associated switchgear bus & shall be fully braced for the listed short circuit current.
- 2.13.03 All provision such as matching flange & other accessories shall be furnished for connection to bus duct if any, being supplied by this purpose will be furnished by contractor.

2.14.00 GROUND BUS :-

- 2.14.01 A ground bus, rated to carry maximum fault current, shall extend full length of the switchgear.
- 2.14.02 The ground bus shall be provided with two bolt drilling with GI bolts & nuts at each to receive 50 x 6mm GI flat.
- 2.14.03 Each stationary unit shall be connected directly to the ground bus. The frame of each circuit breaker & drawout VT unit shall be grounded through heavy multiple contacts at all times except when the primary disconnecting devices are separated by a safe distance.
- 2.14.04 Whenever the schematic diagrams indicate a definite ground at the switchgear, a single wire for each circuit thus grounded shall be run independently to the ground bus & connected thereto.
- 2.14.05 C.T. & V.T. secondary neutrals shall be earthed through removable links so removed without disturbing others.

2.15.00 NAMEPLATES :-

- 2.15.01 Nameplates of approved design shall be furnished at each cubicle & at each instrument

& device mounted on or inside the cubicle.

- 2.15.02 The material shall be lamicaid or approved equal, 3mm thick with white letter on black background.
- 2.15.03 The name plate shall be held self-tapping screws. Nameplate size shall be minimum 20 x 75 mm for instrument device & 40 x 150mm for panels.
- 2.15.04 Caution notice suitable metal plate shall be affixed at the back of each vertical panel.

2.16.00 SPACE HEATERS PLUG SOCKETS :-

- 2.16.01 Each vertical section shall be provided with thermostat controlled space heater & 5A, 3 pin plug socket.
- 2.16.02 Cubical heater, plug-socket circuit shall have individual switch fuse units.

2.17.00 A.C. /D.C. POWER SUPPLY :-

- 2.17.01 The following power supplied will be made available to the switchgear :
240 A.C. Supply : Two Feeders
The DC supply required for control purposes is to be obtained in each module through a rectifier arrangement, which will convert the 250V AC supply to 110V DC. The equipment necessary for this rectification including protective relaying as per the approved drawing are also to be included.
- 2.17.02 Isolating switch fuse units shall be provided at each switchgear for the incoming supplies, 2-pole, single throw for A.C. & 2-pole, double throw for D.C. Bus-wires of adequate capacity shall be provided to distribute the incoming supplies to different cubicles. Isolating switch-fuse units shall be provided at each cubicle for AC/DC supplies.
- 2.17.03 AC load shall be so distributed as to present a balance loading on three-phase supply system.

2.18.00 PAINTING :-

- 2.18.01 All surface shall be sand blasted, pickled & grounded as required to produce a smooth, clean surface free of scale, grease & rust.
- 2.18.02 After cleaning, the surface shall be given a phosphate coating followed by 2 coats of high quality prime & stove after each coat.
- 2.18.03 The switchgear shall be finished in light gray (IS shade # 631) with two coats of synthetic enamel paint.
- 2.18.04 Sufficient quantity of touch- up paint shall be furnished for application at site.

3.00.00 SPECIAL TOOLS & TACKLES :-

- 3.00.01 A set of special tools & tackle (manual charging handle & operating handle trolley for lifting outside breaker for maintenance) which are necessary or convenient for erection, commissioning, maintenance & overhauling of the equipment shall be supplied.
- 3.00.02 The tools shall be shipped in separate containers (Tool Box) clearly marked with the name of the equipment for which they are intended.

4.00.0 SPARES :-

4.00.01 The bidder shall submit list of recommended spare parts for three (3) years satisfactory & trouble free operation indicating the itemized price of each item of the spares.

5.00.00 DRAWINGS, DATA & MANUALS :-

5.01.00 To be furnished for approval after award of work.

- a.) General arrangement drawing showing constructional features, space required in front for withdrawals, power & control cable entry points etc.
- b.) Details of materials with specifications.
- c.) Typical foundation plan & loading.
- d.) Typical breaker control schematic.
- e.) Matching flanges & terminals for the bus termination.
- f.) Type test reports on circuit breaker.
- g.) Technical leaflet on
 - i. Circuit breaker
 - ii. Instrument transformers
 - iii. Relays, meters, switches etc.
- h.) Single line diagram
- i.) Control schematics
- j.) Wiring diagram

5.02.00 Instruction manuals of switchgear & individual equipment :-

The manual shall clearly indicate the installation method, checkup & tests to be carried out before commissioning of the equipment.

5.03.00 The bidder may note that the drawings, data & manuals listed here in are minimum requirements only the bidder shall ensure that the other necessary write-ups, curves & information required to fully describe the equipment are submitted with his bid.

CIRCUIT BREAKER

Make	- As per approved make.
Type	- Microprocessor release air circuit breaker
Rated voltage	- 415 Volts
Rated frequency	- 50 Hz
Rated current	- 1600/(Icu=Icf=1sec 50 kA) 800A(Icu=Icf=1sec 50 kA)
No. of pole	- 3
Aux. Voltage for trip/close coil	- 110 V DC
Motor for spring charging Voltage	- 240 V AC
Protection unit	- Equivalent to SR-18G with fault indication & thermal masonry.

Interlocking arrangement electrically & mechanically with bus coupler & incomer.

PROTECTION (FOR LT SUPPLY 415V PANEL)

The minimum protection to be provided for different type of circuit are listed below :-

INCOMING FEEDER :-

- (i) 2 over current +E/F relay microprocessor based alongwith the element of instantaneous o/c & E/F protection.

BUS COUPLER :-

- (i) 3 O/C relay microprocessor based
All inverse time O/C relay shall be 3 sec. Version.

All definite time O/C relay shall have adjustable time range of 0-6 Sec.

Apart from protection relays each breaker shall be provided with auxi. Contact multiplier relay, anti pumping relay, trip supervision relay, lockout relay test terminal block. These relay shall be hand reset.

SPECIFICATION FOR LT BUS DUCT

1.00.00 Design Criteria

- 1.01.00 The LT non phase segregated bus duct serve as a interconnection between the LT switchgear and outdoor LT transformer.
- 1.02.00 The LT bus ducts will be installed partially indoor and partially outdoor in a hot, humid and tropical atmosphere. All panels associated.
- 1.03.00 Bus duct associated equipment and wiring shall be provided with tropical finish to prevent fungus growth. All ventilation openings shall be screened and drains shall be filtered to prevent entrance of dust and insects.
- 1.04.00 For continuous operation at specified ratings, temperature rise of the bus duct and auxiliary equipment shall be limited to the site permissible values stipulated in relevant standards and / or this specification.
- 1.05.00 Bus duct and auxiliary equipment shall be capable of withstanding the mechanical forces and thermal stresses of the short circuit currents listed in the annexure without any damage or deterioration of material.
- 1.06.00 The bus ducts shall be self cooled and shall not be equipped with blower or any other type of forced ventilation.
- 1.07.00 Bus duct enclosure shall be of sheet steel.

2.00.00 Specific Requirements.

2.01.00 General

- 2.00.01 The LT bus duct shall be non phase segregated enclosure type.
- 2.00.02 The layout of the bus ducts shall be generally in accordance with enclosed drawings. The details shown however are only typical. Bidder may propose changes to suit his particular design.
- 2.00.03 All parts and accessories shall have appropriate match mark and part numbers for easy identification and installation at site.

2.02.00 Enclosure

- 2.02.01 Phase shall be enclosed in weather proof, dust-tight, enclosure of sheet steel fabricated type conforming to degree of protection of IP 55.
- 2.02.02 Circumferential neoprene rubber gaskets shall be provided for dust tight joints with adjacent enclosure section.
- 2.02.03 The bus enclosure shall have extended bellows or equivalent means to allow for temperature changes and vibrations. Flexible joints shall be provided in enclosures at all points where the bus duct terminates at equipment to withstand vibration, expansion/contraction and at suitable intervals in any straight run of the bus duct where expansion and contraction would otherwise result in stress in the supporting structures.

- 2.02.04 All outdoor bus enclosures shall be so designed & constructed as to prevent accumulation of rain water on top sheet. Similarly all gasketed flanged joints shall be suitably protected against direct splashing of rain water in case of outdoor runs.
- 2.02.05 Suitable inspection openings shall be provided for access to support insulators, bus joints, transformer terminals, switchgear terminals etc. All inspection openings shall have reliable sealing arrangement with neoprene gaskets.
- 2.02.06 Seal-off bushings complete with wall frame and support plates shall be provided where the bus duct penetrates the building wall. The seal is to prevent free exchange of air between indoor and outdoor portions of the bus duct.
- 2.02.07 Silica-gel breather shall be provided on both indoor and outdoor portions of the bus duct.
- 2.02.08 Filtered drains for drainage of condensate shall be provided at the lowest points and at such locations where accumulation of condensate can be expected.
- 2.02.09 Shipping length of the bus duct shall be not more than three (3) meters in length.

2.03.00 Bus Conductor

- 2.03.01 The bus conductor shall be of high conductivity, aluminium alloy, supported on wet process porcelain insulators.
- 2.03.02 The bus conductor shall be designed for bolted connections throughout the run.
- 2.03.03 Flexible connections shall be provided between bus sections to allow for expansion and contraction of the conductor. Flexible connections shall also be provide at all equipment terminations.
- 2.03.04 All contact surfaces shall be silver plated to ensure an efficient and trouble-free connection. All connection hardware shall be non-magnetic and shall have high corrosion resistance.

2.04.00 Discount Link

- 2.04.01 Removable bolted discount link shall be provided in the bus where shown on the drawing for the purpose of isolation.
- 2.04.02 Discount link shall consist of a removable section of conductor and shall be so constructed as to permit easy removal or reinsertion without alignment difficulties.

- 2.04.03 The bus on both sides of the link shall be rigidly supported so that the disconnect link is equal in mechanical strength to any other section of the bus.

A minimum clearance of 300mm (12") shall be provided between the disconnected bus sections with the link removed.

2.05.00 Insulators

- 2.05.01 Bus support insulators shall be interchangeable, high creep, high strength, wet process, fine glazed porcelain. Alternatively good quality cast resin insulators.
- 2.05.02 Insulator shall be mounted in such a way so as to permit easy removal or replacement without disassembly of the bus. The insulator mounting plate shall be designed for cantilever loading to withstand the short circuit.
- 2.05.03 The conductor shall be fastened on the insulator through fixed and slip joints so as to allow conductor expansion or contraction without straining the insulator.
- 2.05.04 Space heater shall be provided preferably located near to each insulator to avoid moisture condensation within bus-duct. No and wattage rating of space heater shall be decided by the tenderer.

2.06.00 Connections & Terminations

- 2.06.01 All matching flanges, seal off bushings, gaskets, fittings, hardware and supports required for termination of the bus duct at the switchgears, transformers shall be furnished.
- 2.06.02 In this connection the contractor is required to coordinate through the engineer with the suppliers of the switchgear, transformers with regard to connection details, mechanical and thermal stresses.
- 2.06.03 Flexible connections both for conductor and enclosure shall be furnished.
- a) At all equipment termination to provide for misalignment upto 25mm (1") in all directions.
 - b) Between bus duct supported from building steel to prevent transmission of vibration.
- 2.06.04 The equipment terminal connections shall be readily accessible and shall provide sufficient air gap for safe isolation of equipment during testing.
- 2.06.05 If the material of bus conductor and that of the equipment terminal connectors are different then suitable bi-metallic connectors shall be furnished.

2.07.00 Grounding

2.07.01 A separately run 50x6mm GI flat suitably clamped along the enclosure shall be used as the ground bus. All parts of the bus enclosure supporting structures and equipment frames shall be bonded to above ground bus.

2.07.02 Ground pad shall be bolted type to accommodate 50x6mm galvanized steel flats. Complete with suitable tapped holes, bolts and washers.

2.08.00 Supporting Structures

- 2.08.01 All supporting structures required for hanging and/or supporting the complete bus duct shall be furnished. These include all members, indoor/outdoor posts, bolts, shims, base plate, beams, hangers, brackets, bracings and hardware.
- 2.08.02 All buses shall be adequately supported and braced to successfully withstand normal operation, vibration, thermal expansion, short circuit forces and all specified design loads.
- 2.08.03 Supports shall be designed to provide tolerance of 12mm (1/2") in the horizontal and vertical directions.
- 2.08.04 All steel members shall be hot dip galvanized after fabrication. All hardware shall be of high strength steel with weather resistant finish.
- 2.08.05 Concrete foundation, building steel, concrete, inserts/plates will be provided by the owner.

The contractor shall co-ordinate with the owner for this purpose giving well in advance the details of his requirements so as to enable the owner to arrange for the same in time.

2.09.00 Wiring

- 2.09.01 All wiring for space heaters shall be done with insulated stranded copper conductor of not less than 2.5 sqmm cross section. Each wire shall be identified at both ends with wire designation as per contractor's wiring diagram and shall be brought out to a terminal box outside the bus duct.
- 2.09.02 Terminal blocks shall be box-clamp type Elemex 10 sqmm with marking strips or approved equal.
- 2.09.03 At least 20% spare terminals shall be furnished in the terminal block.

2.10.00 Name Plate

- 2.10.01 Suitable name plate shall be furnished with each piece of equipment.
- 2.10.02 Materials for name plate shall be plastic/lamicoid, 3mm thick, using white letters on black background.

2.11.00 Finish

- 2.11.01 Except for supporting steel structures which shall be galvanized, all equipment shall be finished with a undercoat of high quality primer followed by two coats of synthetic enamel paints.
- 2.11.02 The interior surface finish shall be as per manufacturer's standard. The shade of exterior surface finish will be battle ship gray shade 632 as per IS-5.
- 2.11.03 Pretreatment consisting of degreasing, derusting etc. shall be done on all fabricated parts before painting or galvanizing.
- 2.11.04 Paints shall be carefully selected to withstand heat and weather conditions. The paint shall not scale-off or crinkle or get removed by abrasion due to normal handling.
- 2.11.05 Sufficient quantities of all paints and preservatives required for touching up at sites shall be furnished.

APPROVED MAKES LISTS *

1.	Conduit pipe painted inside & outside 16 SWG ISI marked.	BEC M-Kay AKG S.K. (E.R.W.)
2.	Conduit Accessories & Junction boxes	All made out of 16G MS sheet All made out of 14G MS sheet
3.	Wires PVC insulated and PVC sheathed FR/ FRLS /control wires (IS marked)	Finolex Havells R.R. Kabel KEI Gloster
4.	PVC/XLPE insulated LT cables	Universal Gloster KEI Havells
5.	XLPE insulated HT cables	Universal Gloster KEI Havells
6.	Modular switches and sockets	Legrand (ARTEOR) ABB L&T MK Honeywell (wrap around plus)
7.	Flush type switch and sockets	Anchor Kinjal SSK Havells Reo
8.	Air circuit breaker	L&T ABB Siemens C & S
9.	Fuse switches Unit/Switch Fuse Unit & HRC fuses	L&T Siemens Havells C & S
10.	Distribution boards MCB	Legrand Siemens ABB C & S
11.	Loose wire box for distribution boards	Legrand Siemens ABB C & S
12.	Lighting fixtures & LED fixtures	Philips Crompton Decon Wipro Havells
13.	Fluorescent/ CFL lamps/LED	Philips Crompton Osram Wipro
14.	Ceiling Fans / Wall Fan/ Cabin Fan	Havells

		Orient Usha Bajaj
14 (a)	Air Circulator	Bajaj Havells Almonard Crompton
15.	MCB's	Legrand ABB Siemens C & S
16.	MCCB	Legrand Siemens L&T ABB C & S
17.	Exhaust fan	Almonard Alstom Crompton
18.	Cable lug	Ascon (Heavy gauge) Jainson Dowells
19.	Lamp Holder (Brass)	Kay SSK Kinjal
20.	Safe trip/RCCB/ELCB	Legrand ABB Siemens C & S
21.	GI pipe `B' class	Prakash Surya Jindal
22.	Electrical Switchboards / feeder pillar/LT panel	Milestone Switchgear Pvt. Ltd Neptune Systems Pvt. Ltd. Tricolite Electrical Industries
23.	Telephone wires/Telephone Cable / jelly filled telephone cables	Finolex Delton Havell's R.R. Kabel
24.	Telephone tag blocks	Krone Pouyet
25.	Telephone outlet	MK Electric Legrand (Mosaic) Crabtree (Piccadilly)
26.	GI raceways	Milestone Engineering Legrand MDS Neptune Systems Pvt. Ltd. MK
27.	PVC raceways	Legrand MK
28.	Panel meters	L&T Rishab AE Secure Conzerv C & S

29.	Current transformer	Gilbert Maxwell Kappa AE
30.	Selector switch	L&T Kaycee Siemens C & S
31.	Protective relays	ABB C & S
32.	Electronic Energy Meter	Enercon Anchor L&T HPL Konzerv Secure
33.	Changeover switch	L&T HPL Havells C & S
34.	Electronic ballast	Philips Wipro Bajaj Decon Crompton Havells
35.	DLP plastic trunking	Legrand MK
36.	Geysers	Recold Venus Usha Lexus Sphere hot
37.	Smoke / Heat detectors	Apollo System Sensor Agni
38.	Manual Call Point	PRD Systems-Tek Simplex System Sensor Agni
39.	Response indicators	PRD Systems-Tek Simplex System Sensor Agni
40.	Fire Exit Signs	Systems-Tek Simplex Agni
41.	Fire Control Panel	Systems-Tek Morley Agni
42.	Speaker/Hooter	Systems-Tek Philips Agni
43.	Occupancy sensors/ movement sensor	Legrand Philips

		Wipro
44.	Tower Light	ligman Simes Bega
45.	HT/LT transformers	ABB Schneider CGL (Crompton Greaves Ltd.)
46.	HT SF-6 circuit breakers/VCB	Siemens ABB CGL
47.	Programmable Logic Controller(PLC)	Siemens Allen-Bradley Schneider
48.	Earthing (Chemical Earthing) Plate Earthing	JMV As per CPWD Norms
49.	Octagonal Pole	Bajaj Crompton Phillips
50.	11 kV HT panel I/c relay	CGL Schneider ABB
51.	Control Relay Panel	CGL Schneider ABB
52.	Lightning Arrestor	ABB Alltec JMV
53.	Temp. Gauge	Guru
54.	Gate Valve	Leader Sant
55.	Electrical Backup	Spare hot Racold
56.	PVC Tank	Syntex Polycon
57.	Thermostat	ISI Marked
58.	Flat Collector Plate	Solocrome Tata BP Racold
59.	S.S Sheet	Jindal / National

Note : If any item is unavailable in the market from the above list then the make other than listed above can be installed only with prior approval from the Institute Engineer in charge.

Annexure-A

TENDER ACCEPTANCE LETTER
(To be given on Company Letter Head)

Date:

To,
Executive Engineer
IISER Mohali

Sub: Acceptance of Terms and Conditions of Tender.

Tender Reference No.: **IISER/EE-EO/23-24/AMC-05**

Name of Tender/Work:- AMC of 66/11 KV Sub Station at IISER Mohali

Dear Sir

1. I/We have downloaded/obtain the tender documents(s) from the above mentioned Tender/Work from the website(s) namely as per your advertisement, given in the above mentioned website(s).
2. I/We hereby certify that I/We had read the entire terms and conditions of the tender documents (including all documents like annexure(s), schedule(s), etc.) which from part of the contract agreement and I/We shall abide hereby by the terms/conditions/clauses contained therein.
3. The corrigendum(s) issued from time to time by your department/organization too have also been taken into consideration, while submitting the acceptance letter.
4. I/ We hereby unconditionally accept the tender conditions of above mentioned tender document(s) in its totality/entirety.
5. In case any provision of this tender are found violated, then your department/organization shall without prejudice to any other right or remedy be at liberty to reject this tender/bid including the forfeiture of the full said earnest money deposit absolutely.

Yours Faithfully,

(Signature of the bidder, with official seal)

