

 GUJARAT GAS	SCOPE OF WORK <u>Civil, Interior, Electrical & Allied Services for Mundra Office</u>
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REV. NO	REVISION DESCRIPTION	DATE OF ISSUE

NAME OF COMPANY	GUJARAT GAS LTD.		
	NAME	DESIGNATION	SIGN and DATE
PREPARED BY			
REVIEWED BY			

RECOMMOD BY			
APPROVED BY			

PART-A

SCHEDULE OF RATES:

”Rate means the sum calculated in accordance with the scheduled rates for the full and entire execution and completion of the work subject to such addition there to or deduction there from as may be made in the provision of Scope of contract. Rates are exclusive of all taxes & applicable duties.

The Schedule of Rates should be read in conjunction with all the other sections of the tender. The rates applicable at all sites/location mentioned herein or where ever Owner operates his network.

The Contractor shall be deemed to have studied the Specifications and details of work to be done with Time Schedule and to acquaint him of the condition prevailing at site.

No additional payment shall be paid by the Owner to Contractor on account of escalation charges either for rise in cost of materials or on revision of minimum wages during the contract period.

OWNER SUPPLIED GOODS:

For the purpose of the services, Owner shall supply the following to the Contractor for the **execution of the work mentioned herein:**

Water Supply at one point at Site (Mundra Office)

Material storage space at Site (Mundra Office)

Electricity at one point at Site (Mundra Office)

DRAWINGS:

The Contractor shall submit drawings and documents as per the distribution schedule as mutually discussed at the time of kick-off meeting & as prescribed by Owner’s Engineer. In addition to the hard copies, the Contractor shall also send all drawings/ documents through e-mail as well as deliver a soft copy of all the final drawings/documents in CD.

Owner shall return to the Contractor one (1) set of all drawings/ documents with their approval/comments, if any. The Contractor shall correct his drawings/documents to conform to the comments made by Owner and resubmit the corrected drawings/ documents within two (2) weeks in the same manner as stated above. The approval of Owner shall not relieve the Contractor from any of his obligations and responsibility to perform the work conforming to the specification unless the Owner issues a written amendment to the specification. After approval of the drawings/documents, final drawings/documents shall be certified as “Approved for Construction” and shall be submitted in quantities as specified above for distribution purpose. Should any minor revision be made after “Approval”, the Contractor shall redistribute the drawings/documents in the same procedure stated above. A number, date and subject in a revision block provided in the drawings/ documents shall mark every revision.

Five (5) copies each of the drawing (those drawings which are not prepared by the Contractor but given to him by the Owner for execution of work by the Contractor) marked “As Built” shall be returned immediately upon completion of the job by the Contractor and duly marked with the needed modifications/ alterations made at Site, in accordance with the Engineer’s approval. Similarly, Five (5) sets of “As Built” drawings for drawings prepared by the Contractor immediately upon completion of the corresponding work/works shall be furnished.

Any work shown on the drawing and not particularly described in the specification shall also be included by the Contractor in his bid and the omission either from the drawings or specifications of any detail of Work necessary and obviously intended shall not relieve the Contractor from performing such Work.

The Contractor shall take approval of designs and drawings before commencement of civil & interior work of the sites. The Contractor at his own cost, if any discrepancy arises shall rectify any civil & interior work done prior to approval of drawings. No extension of delivery period shall be granted on this account.

The Contractor shall be responsible for and shall pay for any alteration of the work due to any discrepancies, errors and omissions in the drawings/BOQ or other particulars, supplied by him, whether such drawings or particulars have been approved by the Owner or not, unless such discrepancies, errors or omissions are due to inaccurate information or particulars furnished to the Contractor by the Owner.

If any dimensions figured upon a drawing or a plan differ from those obtained by scaling the drawing or plan, the dimensions as figured upon the drawing or plan shall be taken as correct.

INSPECTION:

Owner reserves the right for inspection and ordering corrective actions at any stage of any activity being executed and the quality of the material / services supplied by the contractor under this contract. If it is found that work is not done as per the requirements specified here-in, the corrective actions shall be implemented by the Contractor up to the satisfaction of Owner site supervisor to ensure that all the specified requirements of this tender are properly attended to. In addition, in-case materials supplied shall be as per the specifications mentioned in the tender. In case the material is not as per the standards mentioned the contractor shall replace the same at his own cost, without affecting the project timelines. The Contractor from his side shall nominate an inspector to carry out regular inspection of all the activities and for co-ordination of quality related issues with Owner. Whenever a written communication is done from Owner side for non-conformance to the requirements specified here-in, the contractor shall submit in writing, the action plan to prevent re-occurrence of such non-conforming act in future.

HANDLING OF MATERIALS:

Contractor shall carry out the work in accordance with Owner HSE procedures, permit, and proper equipment for loading / unloading of the material [s].

In case any material[s] is damaged in loading / transit / unloading at site, the Owner reserves the right to reject the entire / part of the material.

MATERIAL RECONCILIATION - **Not Applicable**

ALLOWANCES - **Not Applicable**

CHANGES:

Owner reserves the right, at any time and from time to time to direct changes to the Scope of Work and Contractor agrees to promptly effect such changes. Owner shall equitably adjust any difference in price or time for performance resulting from such changes after receipt of documentation in such form and detail as Owner may direct.

INTELLECTUAL PROPERTY:

All the drawings provided by Owner will be an intellectual property of Owner and will be shared by the contractor to anyone.

PART - B

TECHNICAL SCOPE & SPECIFICATION

DETAILS OF SERVICES:

Civil & Interior Work at Mundra Office

1. CONTRACTOR'S SCOPE OF WORK

General:

The Scope/Specification cover the minimum specified requirement for the various activities to be carried out by the Contractor toward the job and related work at the aforesaid site.

Contractor shall, with due care & diligence, execute the work in compliance with all laws, by laws, ordinances, regulation etc. and provide all services and labour inclusive of supervision thereof.

All the materials, equipment, appliances or other things of whatsoever nature required in or about the execution of the work, whether of temporary or permanent nature shall be provided by the Contractor.

Before starting of work at site, Contractor shall himself familiarize for the work having obtained approval/clearance from Owner.

Without limiting the generality thereon, Contractor shall do all work necessary at each of the job which is complete in all respect with site restoration.

Before Starting of Job, Contractor shall ensure that tool box talk with Work In charge and identified work related site specific risk assessment is done at all location.

Communications:

Contractor shall provide mobile phone to his supervisory staff, so effective communication from site to Owner office can be done effectively.

All persons engaged by the Contractor shall be the Contractor's own employee and they will claim no privileges from Owner. The Contractor will be directly responsible for the administration of his employee as regard general discipline and courteous behaviors.

Contractor shall submit the list of qualified experienced manpower along with pass port size color photograph to the Owner Engineer In charge before starting of work. Only listed manpower shall be allowed for Civil Construction work.

Contractor shall accomplish the designated job within the specified time duration for fulfillment of the target.

In case of any hazard like fire, leakage etc. due to gross negligence of the Contractor, Owner reserves the right to impose penalty up to actual damage cost and or termination of Work Order depending upon the gravity of the situation.

Contractor shall report every day in the morning for planning of work.

Contractor shall sort out the queries, if any during the inspection within time frame.

Communication to Owner as per contingency plan in case of any accident during execution of job.

For excavation work, the barricading should be provided as required.

Contractor shall not change personnel frequently & in absence, proper trained, certified & known person only to be deployed as replacement and shall also maintain minimum strength of manpower as per the requirement

For Civil activities, Contractor shall ensure uninterrupted manpower supply, if the new person comes, necessary formalities to be carried out like checking of competency level, training, safety awareness etc. with the help of Owner Engineer-in-charge.

Contractor shall ensure that assigned work shall not be disturbed, due to deputed manpower.

Contractor shall ensure availability of its personnel as required by the Owner engineer in-charge.

While carrying out the job all deputed persons shall follow safety rules & regulation of Owner.

Contractor must refer medical emergency management policy of Owner to handle any medical emergency on site.

If the work is not done as per Owner Satisfaction level then contractor shall do the necessary rework at his own cost.

Contractor will get health check-up of his crew as per recommendation/ guidelines of Owner before starting of job and submit the reports / fitness certificate of Registered Medical Practitioner (Industries). He shall conduct the same of new members added to his team as and when

Work Planning:

Contractor shall notify the Owner Engineer (Engineer) nominated for the purposes of the P.O., about all the activities planned for the day, with the Daily Progress Report (DPR) and the same shall have to reach latest by 9.15 am every day. The Contractor shall not commence any work on any given day without intimating the Engineer.

Emergency Response Plan:

In case of any injury or an accident at the site, the contractor shall immediately inform the Engineer of the incident and further take immediate steps to take the injured person(s) to any of the Owner nominated hospitals.

Pre-Employment Checks:

Contractor shall ensure thorough pre-employment checks on the conduct and ethics of all it's employees and staff to avoid inappropriate hiring of contract employee / staff.

CONTRACTOR'S SCOPE OF SUPPLY

All consumable material as per BOQ (bricks, gravel, cement, paints, steel bars etc.) and other items and equipment used for civil renovation work.

All Tools-tackles, equipment, consumables, skilled manpower, vehicles with fire extinguisher, PPEs, barricading material.

Diesel / Electric concrete mixer and concrete vibrator in case contractor is not using RMC for RCC construction. Hand compaction of concrete shall not be allowed.

All grouting material required and specified as per drawings and instruction of Engineer-In-charge.

All other materials though not specified above but required for the completion of the work as per specification, drawings and instructions of the engineer-in-charge.

Contractor shall arrange for proper vehicle with adequate space for material/equipment transportation. Contractor shall follow all HSE requirements as directed by Owner for transportation of manpower, material and machines/equipment at sites.

OWNER'S SCOPE OF SUPPLY

Owner shall provide work schedule/ planning to the contract prior to execution of work.

Owner shall provide detailed drawings for civil work.

Owner shall provide necessary formats for reporting.

Owner shall provide permission (if required) from third party/Muni. Corp./other agencies

Owner shall provide Work Permit to perform the job.

Owner shall provide Technical Assistance as and when required.

Owner shall inform Contractor about Risk Associated with the job & its control measure.

Owner shall provide competency training related to their work to contractor employees.

Owner shall provide information about HSE, Statutory & additional requirements to be fulfilled by contractor at Owner prior to commencement of the necessary guidelines in servicing of equipments.

Owner shall provide electricity & water supply for the work at the site.

SPECIFICATION OF WORK

As mentioned in the **BOQ** whereas detailed technical specification is elaborated under Part B.

SPECIAL CLAUSE

In case of any discrepancy regarding the interpretation of the specifications and general conditions, the decision of Owner Engineer-in-charge shall be final and binding on the contractor.

Only steel Scaffolding & Shuttering shall be used in the construction. Cup-Lock system, H-Frames type scaffolding to be used for roof heights higher than 2m. For regular heights of the roof Steel props (heavy duty) shall be used under the primary & secondary beams for supporting the roof shuttering. Standard spans also can be used in the support system. The steel formworks shall also be used for beams and columns shuttering.

Contractor shall not be allowed the use of Bamboo supports anywhere in the construction site for any type of construction.

Contractor shall use good quality steel scaffolding. Any steel scaffolding material / fittings found to be rusted / worn out or not fit for use shall be summarily rejected by the engineer-in-charge.

Steel / FRP Scaffolding shall be essentially used for brickwork at heights, all outside plastering and painting works on the building. Bamboo type scaffolding shall not be allowed anywhere.

No Bulkage of the soil shall be paid by the company in case of the disposal or elsewhere.

For any QA/QC test carried out, the reports shall be submitted to Owner for review and approval.

Contractor shall attach the laboratory test reports, as applicable, along with bills while claiming the items / quantities admissible for lab tests, duly checked and verified by the site in-charge / engineer.

In case the contractor is working in the night hours then proper arrangement for adequate lighting shall be done by him. All such costs shall be assessed and taken care of by the contractor.

Specific Terms & Conditions:

Contractor shall carry out Civil & Interior Construction Work at GGL Office as per the requirement of Owner

Contractor shall depute dedicated team as per the requirement to complete the Project as per the timelines.

Contractor shall arrange scaffolding material as per the specification/standards of Owner HSE standards.

Excess materials from the site shall be removed and transported from the site. Also the site should be properly cleaned up after completion of the job.

Construction shall be carried out as per site situation in consultation with Owner site engineer.

Contractor shall arrange at his own expense for any diversion to manual traffic or any other utility as required during the course of job.

Contractor shall ensure housekeeping on daily basis of the affected area as on the end of the particular day work as per the directive from Owner Engineer-In-Charge.

Contractor shall carry out work as per the safe operating practices and hand over in proper operating condition.

All the responsibility for the completion of job will be in the contractor's scope.

Contractor must give a certificate about quality after completion of the work jointly signed by the Owner Representative and Contractor's representative.

Contractor shall be responsible to arrange water storage (where required) & cables and switch boards for electricity at his cost for execution of work entrusted to him.

Contractor shall arrange consumables and necessary tools & tackles, consumables, equipments, barricades, signboards, first aid box etc. for the work.

Contractor shall arrange for spreading of quarry spoil over the affected areas on trench after backfilling as per the directive from Owner Engineer-In-Charge.

Contractor shall depute (for full time) Qualified and Experienced Civil engineer to undertake supervision of Civil work as well as HSE related activities of project. He shall be reporting to Owner Representative / project in charge.

Details of Minimum Manpower Required

Sr. No.	Manpower	Quantum Required	Qualification	Experience
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1	Site in Charge	1 no per contract	BE/Diploma Engineer Civil	At least 5 yrs.
4	Unskilled Labour	Requirement as per the nature of Civil and other Job	Training will be given by Vendor	-

SECTION FOR ELECTRICAL AND RELATED ACCESSORIES

The scope and requirements as provided below is for supply, installation, testing & commissioning of Electrical & Allied services (Electrical, IT Network, Fire Alarm System, Access Control System, Public Address System, CCTV etc.) as per standard practice.

GENERAL SCOPE :

Contractor or his supervisor shall collect the schedule of work from GGL's Engineer-in-charge.

For any work covered under company's work permit system, as informed by the Engineer-in-charge, the contractor shall collect the work permit or extension of work permit from Engineer-in-charge at GGL office.

Contractor shall ensure safe transportation of material from his Warehouse to the concerned site.

Contractor shall properly cordon the site area at the time of work.

Contractor shall make necessary arrangements for safe custody of material in his warehouse and on site. The responsibility for security & storage of materials at site rest with contractor only.

Contractor needs to perform his job within the duty hours agreed with owner. For any job at the location, his entry time and outgoing time needs to be recorded by himself in his Service Report as well as the GGL station Register available with the security.

Contractor shall arrange for timely submission of RA bills as per the schedule decided by GGL.

Contractor shall not allot subcontract for any or part of the above job without prior approval from GGL.

Contractor shall be subjected to performance evaluation twice in a year by OWNER and joint action plan must be prepared for improvement areas.

Contractor shall do all work necessary for each of the job, which is completed in all respect with site restoration.

Contractor shall use proper equipment for loading / unloading of the material[s].

In case any material[s] is damaged in loading / transit / unloading at site, the GGL reserves the right to reject the entire / part of the material.

B. GENERAL TECHNICAL SPECIFICATIONS FOR ELECTRIC WORKS

1. DETAILS OF SERVICES:

End to End IT Infrastructure at GGL Office for LAN Connectivity

Voice connectivity

VC / Meeting Room LAN & display connectivity

CONTRACTOR'S SCOPE OF WORK

Specific Terms & Conditions:

Contractor shall carry out Laying, Implementation, testing, labeling of UTP, raceway, VGA cables around new office.

Contractor shall depute dedicated team with project manager to complete project as per our GGL timeline.

Excess materials from the site shall be removed and transported from the site. Also the site should be properly cleaned up after completion of the job.

Project activities shall be carried out as per site situation in consultation with GGL.

Contractor will Co-ordinate with all existing contractors at site for smooth implementation, so nothing is stuck up and if anything is not moving then escalate the same and ensure timely implementation

All the responsibility for the completion of job will be in the contractor's scope.

Contractor must give a certificate about quality after completion of the work jointly signed by the GGL Representative and Contractor's representative.

Contractor shall arrange consumables and necessary tools & tackles, consumables, equipment, barricades, signboards, first aid box, etc for the work.

Contractor will Co-ordinate with all existing contractors at site for filling up holes, raceways, furniture fine tuning etc., So that patching work is ensured by contractor.

GENERAL INSTALLATION PRACTICE REQUIREMENTS

Contractor has to check for Safe & Lockable Storage Space for the Material & Toolkits & ensure that toolkit contains all the required tools to do the installation.

Contractor has to check for Gate Passes / ESI formalities (if required) & close them for compliance at the earliest.

Contractor has to ensure that Field Team has got full Understanding of the BOQ & verify the supplied material as per Part No. / Qty etc.

To identify the best possible Cable Route Path For each Segment keeping in mind the aesthetics of the site & with approval of the customer's representative.

Contractor to finalize the labeling scheme keeping in mind customer's feedback so as to easily identify all the cables. The scheme should be short as far as possible & self-explanatory.

Contractor finalizes the Rack Elevation Diagram i.e. Position of Patch Panels / Jack Panels, Active Component, Voice Termination Kit, Fiber Termination Enclosure (LIU) etc. & Get Approved from the customer's representative.

To measure the cable lengths for all the segments. Keep additional cable inside the Rack / clamp on walls / keep below false floor / keep above false ceiling for routing & Termination.

UTP CABLE INSTALLATION GUIDELINES

The Contractor shall be certified Structured Cabling Vendor in order that the final installation be certified in accordance with the Vendors warranty requirements.

The contractor is responsible for the provision of all tools required to fulfil his installation obligations in accordance with task at hand at his cost. This includes specialist tools such as drills Machine, Impact Tools, Pliers, Cutters, Tool Punch, and Hammer etc.

All cable reels are to be visually inspected for damage incurred during shipping and transit prior to installation.

Cable and connecting components found to be damaged or defective prior and during the installation process are to be brought to the Notice of respective person immediately & returned back it to respective Person.

It is expected that installed products be capable of supporting voice and data communications applications as per Standards.

Contractor has to ensure that Field Team have got full Understanding of the BOM & verify the supplied material as per Part No. / Qty etc.

Contractor is responsible for Identification of Each Node Location (Be it Data / Voice) with respect to Height from the Finish Floor Level. / Distance from the Corner of the wall etc. & to Mark physically on site in presence of the customer's

representative

To finalize the encasing raceway type at different pathways e.g. PVC cap on casing inside the rooms & PVC Pipes in the Passages / Corridors / below False Flooring / above false ceiling etc. with the customer's representative.

To finalize the feruling scheme keeping in mind the customer's feedback so as to easily identify all the cables at the rack side. The scheme should be short as far as possible & self-explanatory.

To Check for the Farthest Node Location Cable Length. It should not exceed 90.00 Meters Length. To check for the Cable Path inside the Furniture if in case.

To measure the cable lengths for all the Nodes from Node to Rack Location. Keep additional cable inside the Rack for routing & Termination.

Cable being pulled in should be handled by no less than 2 individuals at all times in order to avoid damage to the cable by means of kinks, twisting along its own axis, getting snagged etc. It is recommended that 3 installers co-operate in the pulling in of any given cable run, 1 on each end and another in the middle or positioned near any obstructions to feed slack and thus avoid undue stress on the cable.

Care should be taken not to score conductors during the removal of the outer insulating sleeve of the cable when preparing to terminate pairs.

Cable bends are to be kept to 25mm at minimum at all times (installed).

During the installation process, installers are required to visually inspect cable and connecting hardware components for damage. If such damage is found, e.g. tears in the outer jacket of the cable, severe kinks as identified by white/grey bands of discoloration on cable jacket, these components are to be replaced immediately.

No more than 13mm of wire may be exposed for the purposes of termination.

All cabling shall be clearly feruled at both ends to the rear of the point of termination no more than 100mm from such a termination point.

All patch panel ports and workstation outlets shall be clearly labelled by means of appropriately secured printed labels (hand written labels are not acceptable). All patch and workstation outlet cables shall be clearly labelled by means of an appropriately secured printed label.

Where support structures are used, such structures are to provide support at a maximum of 1.5 meters along the length of the run as to avoid cable tension as a result of the cumulative weight of such cable acting upon itself at the next point of support.

The surface of such support structures e.g. Cable hangers will not pose a risk of damaging cable due to sharp edges or angular surfaces which would act against the symmetry of wire pairs within the cable or a risk to installers e.g. Cuts.

Cable ties are to be used at set intervals of 300mm for all cable bundles thus presenting a uniform appearance.

Under no circumstances shall any cable/s hang unsupported, vertical runs are to be supported are no greater than 300mm intervals.

Where purpose-installed conduits are to be used for structured cabling, such conduits may never be filled beyond 40% of capacity and should bend at a radius of no less than 6 times the outside diameter of such conduit, nor shall more than two 90 degree bends along the total span of such a conduit.

Cable may be laid adjacent to sources of interference such as 240V electrical branch circuits with a minimum separation of 1 foot. At no point may data cabling cross the path of any power or broadband cable, fluorescent lighting unit (where suspension is used as a means of separation) at an angle less or greater than 90 degrees.

The installer is to ensure that electrostatic devices such as photocopiers and sources of radiation such as x-ray devices, radio transmitters, their antennae and associated broadband cables are to be avoided when routing cable.

To ensure maximum efficiency for all installation projects, well-trained field installers should understand the fundamental techniques necessary for handling high performance cabling.

The first step in the process is cutting the proper length of cabling and ensuring that you have adequate margin for attaching

the connectors without creating problems by leaving excess cabling at the termination point. Typically, it's a good practice to leave approximately 18 inches of cabling at the wall outlet. The amount of cabling at the wiring cabinet end will depend on the specific installation requirements, but you should typically leave only enough slack to fit neatly within the wire management structure.

When cutting the cable it's important to use snips that provide a good clean cut every time. The tool should also be ergonomically suited for repeated usage without undue fatigue or stress to the user. The use of a blade with a serrated edge can help keep the cabling jacket from slipping along the blade face during the cutting process. When using snips equipped with a smooth blade you run the risk of cutting yourself while trying to hold the cabling in place for a clean cut. Another important feature to look for in a good snip is an elongated handle, which allows you to easily exert the needed pressure using the palm of the hand rather than your fingers.

CONTRACTOR'S SCOPE OF SUPPLY

This is complete requirements for LAN infrastructure at new office for LAN, Voice, and VGA cabling, Vendor has to ensure:

Own end to end activities for complete IT infrastructure

Installation of new LAN , Voice & all cabling

All the materials, equipment, appliances or other things of whatsoever nature required in or about the execution of the work, whether of temporary or permanent nature shall be provided by the Contractor.

Before starting of work at site, Contractor shall himself familiarize for the work having obtained approval/clearance from GGL. Vendor need to identify risks for the sites before starting activity.

Without limiting the generality thereon, Contractor shall do all work necessary at each of the job which is complete in all respect with site restoration.

Before Starting of Job, Contractor shall ensure that tool box talk & Site specific Risk Assessment with Work In charge and identified work related site specific risk assessment is done at every location. Contractor has to attend the safety training provided by GGL HSE Team.

Contractor is required to validate the BOQ and its related details so that there are no deviations in the project (In terms of specifications mismatch, functionality, objective of the project)

Contractor shall carry out the route survey for any activity he will provide diagrams to owner for Approval of routes before carrying out activity.

Contractor shall Lay / connect the Cables as per attached Sheet of Structure Cabling Standards of GGL.

Needless to mention that all cables should be routed via proper Casing/ piping/ Raceways only, and Quality of the Material should be the best and Precision make (MMS Quality) wherever is possible.

Contractor shall take care of office Interior, while laying cables

Contractor shall ensure fill up all holes/ Partitions, cementing work, which they have done during execution of project. And they need to take permission before doing any civil work as per GGL procedure and policy.

Contractor shall ensure detailed documentation for Individual sites like patching details, Raceway layouts, Diagrams, numbering, Cable length, Test reports, numbering etc.

Contractor shall check the connectivity through AMP testing methodology & provide test certification.

COMPANY'S SCOPE OF SUPPLY

GGL shall provide work schedule / planning to the contract prior to execution of work.

GGL shall provide detailed drawings for site.

GGL shall provide list of locations for work.

GGL shall provide necessary formats for reporting.

GGL shall provide permission (if required) from third party.

GGL shall provide Work Permit to perform the job.

GGL shall provide Technical Assistance as and when required.

GGL shall provide information about HSE, Statutory & additional requirements to be fulfilled by contractor at GGL prior to commencement of the necessary guidelines in servicing of equipment.

GGL shall provide water, electricity for the work at the site.

GGL shall provide Switches & Router at Site.

GGL IM Cabling Specifications

This document guides for cabling standard for GGL locations. This will help to Understand GGL cabling environments.

Copper Cabling Specifications

Voice & Data station cable shall have the following specifications:

Wire	24 AWG
Pair/conductors	Four pair

Performance	CAT6 350MHZ
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No. of Drops

All workstations to have 2 data drops and 1 voice drop

Copper & Fiber Cabling Installation

Conduit sleeves shall be placed where cables penetrate walls. Conduit shall also be used to bring copper cable down. All conduit sleeves shall have bushings.

UTP cabling need not be open and it has to be routed via appropriate raceway as applicable per location

Raceway

Casing capping

Flexi pipe –

Cables shall not be tie wrapped or secured in a fashion that causes damage to the copper cable.

Copper cable is installed in accordance to all current TIA/EIA guidelines.

Each cable shall be tagged / labeled at each end.

Each identifier shall be unique.

Components shall be marked where they are administrated (label at all punch down points, panels, blocks, outlets, etc.)

Moves, adds or changes require that all applicable labels, records and reports shall be updated.

All pathways (conduits, trays, etc.) shall be labeled

All PVC Channels and piping will be precision make only.

All fibers should be routed via HDPE pipe only and outside premises should be routed via cable tray.

Server Room

There should be three AC units for running in 8 hr shift with auto switch over mechanism installed

The AC should be of industrial grade and not retail ones

The AC capacity needs to consider the servers + UPS heat out output alongwith the ambient temperature in the room

Temperature sensor should be installed for showing

1. Outside office temperature

2. Inside Server room temperature

3. Inside office temperature

All the cables need to be tagged

1. Underlying power and LAN cables need to be tagged with ferule at both the ends and also at 10 mtr internal
2. Jack Panel patch cords need to be tagged separately / differently at both the ends
3. Cable coding has to be different for LAN, Voice, UPS Power and RAO power
4. Vendor will need to provide LAN cabling diagram separately along with the tagging clearly mentioned

There should be individual MCB for each category power socket to ensure that maintenance can be done on specific category of sockets without disturbing other categories

6 sets of One RJ45 LAN points also to be provided along with 15 AMP plug point across the server four walls

Separate earthing for server room

provision for at least 1 additional Jack panel for Data and one for Voice just below the respective panels

Server room fire control system should be separate

Vendor need to install piping for FM200 based cylinders along with portable fire extinguishing cylinders within the server room

The false flooring height vs door vs stairs to the DC need to be considered to ensure that there is minimum risk and maximum convenience

The racks needs to be installed in the rear end to allow free space in front for maintenance and equipment handling

The ceiling also should be with the water seepage protection

Server room entry should be with a fire retardant door of 1200mm with a small glass window

The Power cabling and Network cabling should be terminating in separate corners to facilitate maintenance of both simultaneously

Server room CCTV has to be true High Definition 1920 x 1080 with IR and clear identification within server room

The Rack should have a power strip (of 15 amp multi plug x 10 power points) on one side and another power strip (of 15 amp multi plug x 10 power points)

Patch cord for racks should be of adequate length to connect between both racks from under the floor routing only and not across the rack in open

General

There should be double space in the duct to accommodate more cables or facilitate maintenance

Should be able to accommodate 2 LAN points, two multi point 5 amp plugs, 1 HDMI port and one RCA with Audio and Video jacks in straight strip and not congested box shape.

Conduit should be able to allow up to three HDMI cables up to the projector along with 2 RCA cables (1 from table and another from VC)

UPS cabling in the server room, users PC, printers and common printers will be done by the contractor

All LAN cabling will be done by the contractor as per the specifications provided above

A testing report for all the patch cords should be submitted to GGL

The Racks, UPS, EPABX, Fire system, Lights, CCTV, Power points, Lan points will be done by the contractor as per the specifications provided above

The cabling duct will be consolidated however with partition for LAN, Power and Voice to prevent electronic interference across. It should be easily maintainable duct considering future expansion

All patch cords have to be factory crimped and lockable; Min 2 mtr patch cords to be considered for server room and for end-user 1.5 mtr can be considered. 20% surplus cable should be provided. The patch cord specifications (Speed + Capacity) have to match the LAN cabling

All LAN cabling and patch cords should fully comply and support the PoE (Power over Ethernet)

Ceiling LAN points 4 corners, 4 middle of the walls and 1 in the center of the ceiling = total 9 LAN points along with 5A UPS point

Music box Should have 2 fans for inlet and 2 fans for outlet

VC Glass box also to be provided by vendor same as installed in Existing location

For common printers The provision should be for full floor height printers along with 2 wooden trays installed in that area to facilitate paper keeping

Copper Cabling Termination Panels

All twisted pair cables (Voice and Data) are to be terminated on patch panels

Fig – 1 Voice, Fig 1 – Data



Layout of patch panels shall be made to be space conscious as well as logical in the separation of cables.

All patch panels are to be marked according to their cable address and all designation strips are to be filled out according to pair address.

Cable management is required for the proper routing and organization of all patch cords.

GGL lays dual port at each desk, One point is kept primary and second is kept as secondary in case we require additional points in future or first point goes down

Secondary points are terminated on jack panel and patch cords are routed from Jack panel, But not terminated at switch end.

Voice Cable termination from Jack Panel to User desk and terminate in crone box.

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Color scheme for structure cabling

Data cabling & I/O – Black color
Voice cabling & I/O – Yellow color
Server Primary cable – Red color
Server secondary cable – Blue color

Copper Cable Testing, Certification, and Warranty

The contractor shall test the entire network cabling system after installation. After installation, all cables shall be tested and certified for performance at their transmission level:-i.e.- CAT6E

Cabling should support the data signal across distance it runs in premises without any data loss or corruption.

Any cable run that does not pass each and every criterion shall not be accepted.

The contractor shall provide a report of all circuits that were successfully tested as part of the acceptance criteria.

Product Warranty and System Assurance Warranty of 25 years for this structured cabling system shall be provided.

Approved Wiring Solutions

AMP – Tyco

Documentation

The contractor shall provide complete documentation and diagrams for all the cabling and the patch panels

All raceway diagrams must be published as part of documentation

The contractor shall provide detail patching details as per GGL format

Vendor has to follow documentation for GGL HSE work permit

All drawings have to be available in Auto cad, Visio and PDF

C. MODE OF MEASUREMENT

The wires, conduits and raceways shall be measured in rmt whereas the outlet sockets, junction boxes and tag blocks shall be measured in units.

CONVENTIONAL FIRE ALARM SYSTEM**THE SPECIFICATION COVERS GENERAL REQUIREMENTS OF MICROPROCESSOR BASED FIRE ALARM CONTROL AND INDICATING EQUIPMENT.**

The Fire detection system shall comprise of a central unit, connected by two wires to field devices. Including fire detection devices, alarm devices and control devices, located throughout the protected building area. The control unit shall continuously monitor the status of all sensing devices, and initiate action when a fire or smoke, Heat condition is present. The alarm management shall be field configurable from the control panel via a key pad to enable the system and to permit future changes. This configuration shall be maintained under power failure conditions.

The Fire alarm panel shall be designed to communicate with the sensors and field devices. It shall be a microprocessor based unit, and shall incorporate all hardware and software to enable it to make decisions upon information received from sensors, and operate appropriate outputs to initiate required alarm and signals. The panel shall comply with IS 2189 code of practice. The control unit shall have a front panel comprising of indicating LED's, control keyboard, and LCD display. The panel shall have 20x4 characters LCD monitoring & programming setup through menu option.

Alarm and Fault signalling and its annunciation shall be capable of zone wise by means of LED and LCD display. The panel shall be capable to do and indicate the zone wise disablement. The LCD message shall have priority when there is multiple even persists; Alarm should have higher priority than Fault. However, it must be possible to view all other events currently in the system, including, alarm, fault and disable.

The visual indications must be arranged so that the different warning are clearly distinguished.(i.e. amber for fault, red for alarm) The internal audible signal device may be the same for all alarms, but either tone variation shall be used to differentiate the signals. Outputs shall be provided for audible alarms, control functions and remote repeater.

The panel shall have number of zones as required by site conditions (tenderer shall specify the number of zones). The zones must be fully field programmable to permit sensors to be allocated to any zone. Each zone shall be identified by a 40 character text label displaying on the LCD display. This shall be field programmable. The panel must provide facilities for the operator to inspect the zoning configuration, and inhibit, or activate devices. Facilities must be provided for

identifying all active and inhibited Zones and all connected zone types. Event Logging for Fire and Fault is available in the panel with 70 counts with date and time.

Panel Indicators

All visual indicators shall be LED's and no incandescent lamps are to be used.

The following LED's must be provided:

Zone wise Fire
Zone wise Open
Zone wise Short
Zone wise Isolate
System ON.
AC Power ON.
Battery ON.
Charger ON
Low Battery
Hooter Fault.
Auxiliary isolate
Silenced.

Panel Displays

The LCD text display must be able to simultaneously display a minimum of the following information in each display mode.

Zone Display Mode:

- Type of alarm (Fire / Fault)
- Alarm count
- Total number of alarms
- 40 Character location message

Panel Controls

The panel is to incorporate a keyboard with the following functions:

Alphanumeric keyboard
System reset button
silence alarm button
Menu button
Enter button
Left / Right Arrow button

The panel shall have potential free contact form C relay (2 for fire and 1 for fault)

Optionals: zone wise Relay & zone wise Sounder, MODBUS Converter, TCP/IP module, CMS Software provided based on requirement. Repeater panel provision is available in the panel.

Technical Specifications:

Power

220-240 VAC, 50 Hz.

Wire size: 1.5 Sq. mm with 600V insulation

Battery (Lead Acid only)

Charging Voltage: 27.9 VDC.

Charging Capacity: 7 Amp Hour Battery Max.

System Quiescent Current: 50mA + (4.2mA per zone)

Initiating Device Circuits (Zone Circuit)

All zones are Class B wiring supervisory

Normal Operating Voltage: Nominal 24 VDC
Alarm Current: 20 -35mA threshold
Short Circuit Current: 40mA Maximum
Loop resistance: 50 ohms Maximum
End-Of-Line Resistor: 4.7K, 1/4watt
Standby Current: 6.8mA (2.4mA for Detectors)

Notification Appliance Circuits (Sounder/Hooter Circuit)

Class B wiring Supervisory
Operating Nominal Voltage: 24 VDC
Hooter (NACs) output: 0.5A
End-Of-Line Resistor: 4.7K, 1/4watt

Remote Outputs

Fire Contact (C, NO, NC): 220v AC @ 0.5A/30v DC@ 1A
Fault Contact (C, NO, NC): 220v AC @ 0.5A /30v DC@ 1A (Optional)

24 VDC Power For remote devices

Operating Voltage: 24VDC, 500mA Max.

Manual Call Point

The Manual Call Point shall be Conventional type to define the location.

Activation of Manual Call Point shall initiate operation of the alarm detection circuit. The manual station shall have normally open fire alarm and annunciator contacts and these contacts shall close on activation.

The Manual Call Point shall be with a breakable front glass.
The housing for the switch could be mild steel / fire resistant plastic.
The switch rating shall be for minimum 1 amp.
There shall be a 5 mm RED LED to glow if the Call Button is activated.
The cable termination in the call button shall be with 6A rated terminals.
It shall be compatible with all type of conventional to the panel.

Repeater Panel:

Repeater panel shows the same indications of all main panels. The repeater panel which give's all main panels' information in one single repeater panel is located in the security room.

The repeater panel will support 128 zones of various zone panels the main panel zones not exceed more than 128 zones to monitor in a single location.

Photoelectric Smoke Detector:

This conventional detectors are designed to work with all conventional Panel. These detectors are low profile and have dual LED's for 360O visual indication. The LED's are blinking in normal operating condition whereas the steady state indicates fire status. It has an unique protocol chamber designed to sense smoke produced by wide range of sources of combustion. The detectors sensitivity can be programmed via FACP. It has a unique drift compensation feature where in detector adjusts its normal reference based on environment conditions.

Features:

UL listed.
Dual LED's for 360 visibility.
Advanced detection and communication protocol.
Easy installation and maintenance.
Sleek low-profile housing design.
Regular 100mm base.

Electrical Specifications:

Operating Voltage : 9 ~ 33V DC
Operating Temperature : -10 C to 37.8 C

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Humidity : 0 - 95% RH, non-condensing
Reset Voltage : less than 1V
Start-Up Current: 120 μ A.
Alarm Current: 40 mA.(Max).
Remote Output : 15mA maximum open collector
Smoke Sensitivity : (1.96 ± 0.76) % / ft
Air Velocity : 0 - 4000 fpm.

Mechanical Specifications:

Height : 46 mm with base
Diameter : 100 mm dia
Weight : 130g with base
IP Rating : IP - 42

Heat Detector:

This conventional detectors are designed to work with all conventional Panel. These detectors are low profile and have dual LED's for 360O visual indication. The LED's are blinking in normal operating condition whereas the steady state indicates fire status. The detector is a fixed cum rate of rise heat detector using a thermistor. These detectors will raise an alarm when the detector reaches 59O (Fixed) or when the change in temperature exceeds the rate of rise of 11O C / min.

Features:

UL listed.
Dual LED's for 360 visibility.
Advanced detection and communication protocol.
Easy installation and maintenance.
Sleek low-profile housing design.
Regular 100mm base.

Electrical Specifications:

Operating Voltage : 9 ~ 33V DC
Reset Voltage : less than 1V
Start-Up Current : 120 μ A.
Alarm Current : 40 mA (Max)
Remote Output : 15 mA maximum open collector
Thermal Rating : 59 OC (138 OF)
Rate of Raise of Temp : 11.1OC / min (20OF/min)
Smoke Sensitivity : (1.9 ± 0.76) % / ft
Air Velocity : 0 - 4000 fpm.
Operating Temperature : -10 OC to 37.8 OC
Humidity : 0 - 95% RH, non-condensing

Mechanical Specifications:

Height : 46 mm with base
Diameter : 100 mm dia
Weight : 130g with base
IP Rating : IP - 42

Multi Detector:

This conventional detectors are designed to work with all conventional Panel. These detectors are low profile and have dual LED's for 360OC visual indication. The LED's are blinking in normal operating condition whereas the steady state indicates fire status. The detector is a fixed cum rate of rise heat detector using a thermistor. These detectors will raise an alarm when the detector reaches 59 OC (Fixed) or when the change in temperature exceeds the rate of rise of 11 OC / min.

Features:

UL listed.
Dual LED's for 360 visibility.
Advanced detection and communication protocol.

File No: GGL-F&A,IR & Admin-2025-12-151677

Easy installation and maintenance.
Sleek low-profile housing design.
Regular 100mm base.

Electrical Specifications:

Operating Voltage : 9 ~ 33V DC
Reset Voltage : less than 1V
Start-Up Current : 120 μ A.
Alarm Current : 40 mA (Max)
Remote Output : 15 mA maximum open collector
Thermal Rating : 59OC (138 OF)
Rate of Raise of Temp : 11.1 OC / min (20 OF/min)
Smoke Sensitivity : (1.9 $\pm$ 0.76) % / ft
Air Velocity : 0 - 4000 fpm.
Operating Temperature : -10 OC to 37.8 OC
Humidity : 0 - 95% RH, non-condensing

Mechanical Specifications:

Height : 46 mm with base
Diameter : 100 mm dia
Weight : 130g with base
IP Rating : IP - 42

Mini Horn:

Mini horn sounders are designed to simplify installations to provide primary and secondary for fire and security applications. These are ideal where smaller notifications devices is desired. The horns can be flush / ceiling mounted with / without back box.

Features:

Slim and Sleek
Wall or Ceiling mountable
Mini Horn with BackBox
24VDC Operation
They are used in Fire, Burglar & Emergency Alarm System.

Electrical Specifications:

Operating Voltage : 24V DC
Operating Current : 40mA
Sound Level : 85dB@1m
Operating Temperature: 0 - 49° C / 32-120° F.
Sounder Type : Piezo Electric Type
Tone Type : Fire Engine Siren
Material : ABS Plastic
Colour : Red
Dimensions : 96 H mm X 76 L mm X 28 D mm
Back Box : 95 H mm X 75 L mm X 58 D mm
Mounting Type : Surface / Flush Mount

IP BASED CC TV SYSTEM

DESCRIPTION IN GENERAL

The CCTV Vendor shall supply, install and commission a IP Camera based CCTV system with the objective shall be to provide High degree of Electronic surveillance system to **Mundra Office**.

The purpose is to monitor & supervise the entire area for security purposes, as well as the record and inform officials on unwanted, untoward incidents. It is also essential to have recorded images to be stored at least for 60 days of all critical area's to facilitate investigations of a reported case.

The Hardware required for the System including servers, workstations, monitors, networking components, cables, connectors, conduits, power supplies etc. will be in vendor's scope.

Should the Bidder need IT or Networking hardware more than what is budgeted for and provided for in the tender, then the Bidder needs to inform the tender committee / Consultants in writing on the same along with the Tender BID and include the same in his bid price.

Any additions to the Take off Quantities given in the tender, if required by the Bidder at the tender Stage will need to be spelt out by the Bidder at the time of the Bid itself.

It is expected that the Bidder provides a system configuration wherein Main Directory shall be loaded on one of the Primary Server hardware provided.

It is expected that the Bidder provides a system configuration wherein Main Directory shall be loaded on Server hardware provided.

Strategically placed video surveillance cameras shall enhance security by providing continuous monitoring of all parts of the premises.

All equipment and materials used shall be standard components that are regularly manufactured and used in the system.

All systems and components shall have been thoroughly tested and proven in actual use.

APPLICABLE STANDARDS

Original Equipment Manufacturer Standard

APPROVALS

All the cameras should be

CE Compliant and
UL Listed and
FCCB

SPECIFIC REQUIREMENTS:-

All the vendors must attach the point by point compliance for below specification in their technical bid. **Offers without the compliance will not be considered.**

The product described in this specification is (IP) based Digital Video Management (DVM) System.

The proposed solution shall not require proprietary computer, server and network or storage hardware.

The proposed system shall be of a manufacturer with as minimum of five (5) years of experience and offerings in the IP network video software market, the letter stating the same should be submitted by the manufacturer.

The DVM database and video storage shall be based on SQL Server 2005 or better

Failover directory should be a basic feature of the DVM all the related licenses should be included in offer.

Failover recording capabilities shall be a basic feature of the DVM and should be included in offer.

Redundant recording capabilities shall be a basic feature of the DVM and should be provided if required.

The DVM system shall be based on the latest in software programming technology Microsoft .NET frame work or better.

The DVM approved IP cameras shall provide the ability to be powered by power over Ethernet (PoE) 802.3af option.

The DVM shall be able to support all cameras at the up to 25 frames and full resolution as per camera specifications.

The DVM should support any of the following Video Analytics Features selected outdoor cameras.

Trip wire detection
Loitering detection
Stolen object detection
Object left detection
Operator selected object tracking

The DVM video storage shall be capable of storing video for a period of 30 days available for on line access – the license provided with the Tender Offer shall be for unlimited storage capability.

The DVM Storage solution shall be as minimum set at RAID-5 configuration
Storage system shall be of Direct Attached Storage (DAS) systems Network Attached Storage (NAS) systems and / or Storage Area Network (SAN) Systems.

The DVM shall be based on high quality Dual MPEG-4/H.264 IP cameras. JPEG, MJPEG, Wavelet, or any other image based video compression will not be considered as approved equal due to the high network bandwidth associated with these types of digital video compression.

Each Camera shall provide dual video streaming technology providing independent settings per stream.
A viewing stream of up to 25 fps and 720p video resolution and a recording stream of up to 25fps and upto 720p video resolution as per client / consultants Briefing on the same.
The system shall be flexible and allow bandwidth selection between 64Kb to 4Mb per stream.
When both the viewing stream and the recording stream are set at the same FPS and resolution the camera shall send on the network a single multicast stream this shall help reduce network bandwidth.

The DVM shall have a capacity to switch and control all the current cameras. It should be expandable to unlimited cameras in future.

The system shall allow the recording, live monitoring, playback of archived video audio, and data simultaneously.

The DVM shall provide file export tool for export the native video format with all video protections (e.g. watermark, encryption) and the ability to play this video on a standard computer.

The native file format video player shall show the status of the video authentication as available with the original file format.

The IP Based DVM shall provide file export tool for export of single frames of video in J-PEG and BMP file formats and for export of motion video files in AVI file format for transport and playback on computers utilizing a Windows environment.

The Client shall provide the required computers for the DVM client and servers, these computers shall be of the most current state of the art technology available at the time of installation and as minimum shall be better than the minimum requirements specified by DVM system manufacturer as well as tender specifications.

AA. DIGITAL VIDEO MANAGEMENT SERVER SOFTWARE.

The DVM software shall consist of an MS-SQL 2005 or better based Main and failover Directory Database Server, Archive Server for audio and video, Failover recording, Digital Virtual Matrix, Incident Reports, Alarm Management, reporting tools and Watchdog modules. All the related software licenses should be the part of the offered system.

The DVM Server shall maintain a catalogue of settings for all the client, servers, and IP cameras in the system
The DVM shall enable the client to dynamically create connections between any camera on the digital monitors (audio, video, serial ports and digital I/Os)

The DVM shall provide the client seamless operation of all cameras available in the system regardless of the actual connection to different archive servers.

c) The DVM shall detect signal loss and have the capability to alert the systems administrator

The DVM Archive Server shall offer the capability to be installed multiple servers software on multiple Computer Servers to enable distributed archiving architecture on the LAN or WAN.

The DVM Archive Server, for video and audio, shall support and manage (90) camera connections from IP cameras each at 25FPS PAL and 4CIF/VGA resolution (704x576PAL) and (120) cameras at 25FPS PAL and 2CIF resolution (352x288 PAL), 170 cameras at 25FPS and CIF resolution.

The DVM shall be able to set each camera frame rate, bit rate and resolution independently from other cameras in the system, and altering these settings shall not affect the recording and display settings of other cameras.

The DVM shall utilize multicast network communication for video monitoring.

Unicast based equipment will not be considered as an approved equal for alternate system.

The DVM shall be a software based solution, and shall not require proprietary hardware for video and audio recording servers.

The DVM shall have a built-in Digital Video Matrix Switcher functionality without the need of any additional software license.

The Virtual Matrix Switch shall provide a full matrix operation of IP video to digital (computer) screens or analog monitors using Decoders.

The Virtual Matrix Switch shall have the capability of creating camera sequences with the following functionalities:

The DVM shall support web based clients connecting to the DVM system via the Internet.

The DVM shall support a built-in Watchdog module

The Watchdog shall monitor operation of all services and automatically restart them if they are malfunctioning.

The Watchdog shall be responsible for restarting the application or in a last resort restart the server in case of malfunction of software components.

The DVM shall be based on a true open architecture that allow for use of non-proprietary PC and storage hardware that shall not limit the storage capacity and shall allow for gradual upgrades of recording capacity.

The DVM Server shall be of the most recent computer technology and shall cover the DVM requirements.

To provide an advanced and reliable system the operating system shall be Windows 2003- Server level (Win XP pro will not be considered as approved equal) or higher.

The DVM shall provide alarm dry contact interfaces to allow for any alarm input initiating any action in the DVM system.

a) The DVM shall transmit dry contact information over the IP Digital Transmission Network.

The DVM shall provide a serial interface for alarm input to allow for any alarm input initiating any action in the DVM system.

a) The DVM shall transmit alarm serial information over the IP Digital Transmission Network.

The DVM Shall support full duplex audio communication and transmission signals over the IP Digital Transmission Network without the need of any additional license.

The DVM shall provide a reporting utility for tracking but not limited to the following options. Video and images shall be stored with reports for documenting events.

Alarms, Incidents, Operator logs, Service requests

The Email Alert should be generated in responds to alarms triggered in DVM software and sends out email alerts to a preconfigured list of recipients.

It should be possible to export the settings of various entities within the DVM i.e Archiver, Directory, cameras etc.. It

should be possible to print these reports.

It should be possible to get reports on past events by querying the audit databases. It should allow the search by User Logon, Entity Configuration, Incident, Alarm, Application Failure, and Equipment Failure.

It should prove the tool to create the case document which should include Archive Video, Photos, Text and other file attachments.

The DVM shall provide alarm management module without the need of any additional license.

The alarm management shall be able to set any monitor or groups of monitors to automatically display cameras in response to alarm inputs.

The alarm management shall be able to reset automatically or manually alarmed video.

The alarm management shall allow for multiple modes of alarm handling capability, these modes to be programmed within the same system.

The DVM shall have support an Internet Gateway server application without the need of any additional license

The Internet Gateway server shall allow clients to view good quality video streams from remote locations, over the internet, over firewall and proxies

The Internet Gateway server shall manipulate the video data to adjust the video stream type and properties to the connection type

The Internet Gateway server shall support all video stream types, including live, archive, instant replay, video sequences, and video on alarm.

The Internet Gateway server shall have only one TCP port exposed to the internet, thus masking the video servers, encoders and cameras from direct connections coming from external networks.

The Internet Gateway server, in collaboration with the Gateway server, shall provide remote users full functionality in a transparent way; the remote user will use the system normally despite the fact that the connection goes through the Internet Gateway

BB. DVM CLIENT

The DVM client shall consist of Administrator Tool application, a Monitoring application and remote monitoring application.

The DVM client shall perform the following applications simultaneously without interfering with any of the Archive Server operations (Recording, Alarms, etc.):

Live display of cameras

Play Live audio

Broadcast audio to remote locations

Live display of camera sequences

Live display of stitched and/or panoramic camera views

Playback of archived video and audio

Playback of stitched and/or panoramic camera clips

Retrieval of archived video and audio

Instant Replay of live video and audio

Instant Replay of stitched and/or panoramic camera clips

Use of graphical controls (maps)

Configuration of system settings

Execution of system macros.

The DVM client applications shall support any form of IP network connectivity, including: LAN, WAN, VPN, Internet, and Wireless

The DVM client applications shall support IP Multicast (UDP) and Unicast (UDP) video and audio streaming.

The DVM client applications shall automatically adapt to the network topology and use the best available method to receive streaming video.

The DVM client applications shall provide an authentication mechanism, which verifies the validity of the user.

DVM Client Monitor Application:

The Client Monitor application shall allow for live monitoring of video and audio.

The Monitor shall enable view of 1 to 25 video tiles simultaneously on a single SVGA (1024x768) monitor at 30fps per camera.

The Monitor shall enable view of up to 25 video tiles simultaneously on a single monitor and shall provide the ability to connect up to four (4) monitors to a single computer supporting multiple SVGA (1024x768) monitor outputs.

The IP Based DVM Shall provide as minimum on each of the VGA monitors independently the following tile views:

Full screen, Quad, 3x3, 4x4, 5x5, 1 + 9 (One large and 9 small view), 1+11 (One large and 11 small view), 1+12 (One large center tile and 12 small view), 1+15 (One large and 15 small view), And more

The Client monitor shall enable playback of audio independently from video. The monitor shall enable the user to work with multiple Audio layouts containing collections of microphones, speakers and audio clips.

The Client monitor shall enable playback of audio mixed from both live and archived audio sources, allowing the user to control the volume of each source independently as well as mute them or record them manually.

The Client monitor application shall enable broadcast of audio from the user workstation to multiple speaker or other audio out resources simultaneously. This shall be available using a simple microphone connected to the user workstations sound card.

The DVM Monitor application shall allow operators to view an instant replay of any camera or audio input (microphone).

The operator shall be able to define the amount of time he wishes to go back from a predefined list or through a custom setup period.

The operator shall be able to control the playback with play, pause, forward, and speed buttons.

The DVM Monitor application shall allow operators to add bookmarks to recorded clips of video or audio

The operator shall be able to choose and trigger an action from a list of available actions included but are not limited to:

- i View camera in a video tile
- ii View camera on a Decoder (analog monitor)
- iii View Map or procedure in a video tile
- iv Starting/stopping PTZ pattern
- v Go to PTZ Preset
- vi Sending alert messages
- vii Send/receive messages through a serial data stream

The DVM Monitor application shall display all cameras attached to the system regardless of their physical location on the network.

The DVM Monitor application shall display all camera sequences created in the system.

The DVM Monitor application shall allow for unlimited cameras sequences, which can be run independently of each other on either digital monitor tiles or analog CCTV monitors.

The DVM Monitor application shall allow operators to control (Pause/Play, skip forwards, skip backwards) Camera Sequences, without affecting other operators' ability to view and control the same sequence.

The DVM Monitor application shall display all cameras, sequences and analog monitors in a logical tree.

The DVM Monitor application operator shall be able to drag and drop a camera from a tree of available cameras into any video tile or an analog monitor icon for live viewing.

The DVM Monitor application operator shall be able to drag and drop a camera sequence from a tree of cameras into any video tile or an analog monitor icon for live viewing.

o) The DVM Monitor application shall support Graphical Site Representation (Maps) functionality, where digital maps are used to represent the physical location of cameras and other devices throughout facility.

The DVM Maps shall have the ability to contain hyperlinks to create a hierarchy of interlinked maps.

The DVM Maps shall be able to import maps from any graphical software supporting BMP, JPEG and/or GIF image formats.

The DVM Monitor application operator shall be able to drag and drop a camera from a map into a video tile for live viewing.

i The operator shall be able to click on an icon in a map to initiate PTZ camera preset, run PTZ pattern, view camera in an analog monitor or send an I/O stream.

The DVM Monitor application shall support the procedure functionality, where procedures can be triggered to appear during a certain event and can be used to provide detail written or verbal instructions to the operator as to the actions to be taken.

The DVM Monitor application shall support digital zoom on a fixed camera's live and recorded video streams

The DVM client shall provide the following video analytics alarm options:

Trigger alarms or events to draw the user attention

Provide a meaningful text description of the event.

Provide OSD graphics to depict the analytics event, including the participating objects, event location, motion directions and more.

Provide the above OSD graphics on live video, archived video and JPEG images

Support automatic tagging/book-marking of analytics events

Support search of analytics events history.

The Client Workstation shall have dual redundant 1 G (1000Mb) network interface and shall operate on 100/1000 Ethernet networked and shall be of the most current technology available by a major brand name manufacturer of computers and servers.

The DVM Monitor application shall provide management and control over the system using a standard PC, mouse, keyboard and CCTV Joystick controller. The vendors should provide joystick controller as an integrated part of each client workstation.

The DVM client shall be able to use multiple CCTV keyboards to operate the entire set of cameras throughout the system, including cameras of various manufacturers' brands, including their PTZ functionalities (i.e.: one keyboard manufacturer controls other manufacturer's dome or vice-versa).

The DVM client shall allow for a CCTV keyboard to be attachable directly to the PC running the DVM client application via its serial port.

The DVM client CCTV Keyboard Interface shall provide full PTZ control.

The operator shall be able to control pan-tilt-zoom, iris, focus, dome relays and dome patterns

The DVM client software shall allow the operator to access the PTZ configuration menus with no need of additional hardware.

This shall prioritize which operator has control over a camera vs another operator trying to control the same camera at the same time.

The DVM client CCTV Keyboard Interface shall provide full video matrix operations

D ALARM MANAGEMENT

1 The IP based DVM shall provide alarm management and reporting module

2 The IP based DVM shall notify a user on any alarm set in the system

3 The DVM user shall be able to support multiple alarms

4 The DVM system administrator shall be able to set for each user the maximum alarms to be viewed at one time

5 The DVM user shall be able to forward alarms to other users

6 The DVM alarm management shall keep audit trail of all alarm and operators related operations in a separated database.

7 The DVM alarm database shall provide multi time schedule support and shall be able to save the alarm database for different period of time as the recorded video schedule.

Hardware Compliance

IP Based Dome Cameras

IP Based Dome Cameras shall have following feature:

1/3" CCD/CMOS, Progressive Scan
HD 720P, Dual H.264 streaming, 25 FPS, 3mm-9mm varifocal lens, 0.05 lux Colour, Tamper detection, 3D Noise reduction, PoE & standard 12VDC/24VAC power input, Automatic Gain Control, BLC, White balance: On/Off
Manual pan/tilt adjustment up to 360/180 deg
S/N Ratio: >50db
Compression: Dual stream H.264 and/or MPEG-4 user configurable (One H.264 for recording and one MPEG-4 for live view or any desired combination), ISO standard.
Unicast and Multicast support
Frame Rate : Adjustable 1-25FPS for PALs
Resolution: Adjustable from 320 x 240 to 640 x 480 or better, with capability of streaming 640 x 480 @ 25FPS and configurable compression to H.264 or MPEG4 independently for both streams.
Bandwidth : 64Kbps to 6Mbps
Built-in Multi-zone motion detection
Unicast, Multicast, RTP, TCP, UDP, HTTP, IGMP, ICMP, DHCP, DNS
Flash memory for upgrade of video codec and application firmware over the network through web access
10/100 Base-T Auto sensing, Half/Full Duplex (RJ45)
2 potential free alarm inputs, 1 Relay out
Power : 802.3af class 3 PoE and 12VDC/24VAC auto sensing
Operating Temp: 0° C to 50° C
Mount: Surface
Humidity : 90% (Non-condensing)
UL and CE and FCC

High Configuration Client Workstation

The SVMS computer Client shall be of Dell, HP or IBM make. Cases where the DVM OEM directly supplies the Server shall be acceptable on approval from Consultant / Client.
The SVMS client shall be of the most recent computer technology and shall cover the SVMS minimum requirements.
i7 Processor , 2.66GHz, 12M, 6.4GT/s, 4 x 4 GB or more of RAM, Microsoft® Windows XP PRO SP2 with Windows 7 Business License
60 GB 10 KRPM 3 Gbps HD for OS.
Windows 7 64bit, DVD/RW, Joystick controller,
Two NVS 315 or higher version, 1024MB DDR3 or better; DVI Graphics Card to support 4 multiplexed Monitors on One CCTV Client.
With different content possibility on each of the monitor i.e Multiplexed, Alarm, Maps, sequence or any combination. Also Support Drag-n-drop of images by using connected mouse device.
Network Interface Card - 10/100/1000 MB
DVD-R/W
Min 2 Year Next Business Day On Site Hardware Warranty from OEM

TESTING & COMMISSIONING

Sr No	Description	Visual	Test Readings	Documentation
1	All cables are tested for continuity, insulation, resistance etc.		√	√
2	System installation proper as per drawing	√		

3	Carry out visual checks on all cameras, cables, camera housing etc., to ensure they are clean and free from any mechanical damage	√		
4	Check for proper termination & feruling	√		
5	Check input A/C supply voltage		√	
6	Check Input supply DC voltage at every camera.		√	
7	Check all cameras' signal on monitor. Also check for clarity, sharpness of the picture.	√		
8	Check PTZ controls of PTZ camera	√		
9	Check recording / playback FRAME RATE	√	√	
10	Check server software & client software is installed without any bugs.	√		√
11	Set programming of all cameras through software.	√		√
12	Check remote viewing of cameras on internet/WAN	√		

DOCUMENTATION

The CCTV system contractor, upon completion of the commissioning activity, shall hand over the system to the customer.

At the time of hand over, the contractor shall provide the customer with the following documentation:

Copy of detailed report

Component and equipment list

Product description sheets

System design drawing(s)

System schematic diagram(s)

System operating manual

HANDOVER

Prior to final acceptance, the installing contractor shall provide complete operation and maintenance instruction manuals to the owner. All aspects of system operation and maintenance shall be detailed, including wiring diagrams of all circuits, a written description of the system design, sequence of operation and drawing(s), illustrating control logic and equipment used in the system. Checklists and procedures for emergency situations, maintenance operations and procedures shall be included in the manual.

TRAINING

General

The contractor shall provide the customer with details of the training required by personnel to operate and maintain the CCTV system.

The Contractor and the customer shall jointly agree the number of staff to attend the training courses.

MAINTENANCE

Routine maintenance should be carried out in accordance with customer's requirements. All performance checks undertaken should be recorded in the system log book.

As a minimum, the following performance checks must be undertaken on each maintenance visit.

Remove dust and dirt from the camera enclosures (Inside & outside) exterior using a soft brush or a lint cloth. A solvent which is harmless to the finishes of metal and plastic may be applied to more stubborn stains.

Examine the exterior of the enclosure for any signs of damage or loose cable glands and rectify any faults found.

Remove any dust or dirt from the interior of the camera & DVR using a soft brush or a vacuum cleaner.

Examine the printed circuit boards for signs of over heating, dry joints and/or damaged tracks

PUBLIC ADDRESS SYSTEM

GENERAL SYSTEM REQUIREMENTS:

The voice alarm system shall be the integrated solution for BGM and EVAC. The voice alarm system shall be designed for public address and emergency evacuation. All the essential EVAC functionality – such as system supervision, spare amplifier switching, loudspeaker line surveillance, digital message management and a fireman's panel interface – shall be combined.

The system shall provide for emergency call (EMG), business call and BGM audio, up to 60 zones, 8 call stations and two remote control panels.

The voice alarm system shall be a one channel/two channel system. It shall be compatible with BGM sources and 100 V booster amplifiers. It shall be capable of connecting to EVAC compliant loudspeakers and accessories for an integrated public address and voice alarm solution.

The system shall be fully IEC 60849 compliant.

It shall have full system supervision, loudspeaker line impedance supervision, a supervised emergency microphone on the front panel and a supervised message manager for at least 200 pre-recorded messages and chimes.

It shall be possible to merge messages to allow even more flexible use of pre-recorded announcements and evacuation messages. It shall be possible for each message to have any length within the total available capacity.

The memory shall have a capacity of 16 MB. It shall be possible to upload from a PC via USB into the memory, after which the unit shall operate without PC connection.

The standard WAV-format shall be used for the messages and sample rates of 8kHz up to 24kHz with 16-bit word length (linear PCM) shall be supported.

Volume override relay contacts shall be provided for each zone separately for overriding local loudspeaker volume controls. All current override schemes shall be supported (3-wire and 4-wire override schemes i.e. standard 24V and failsafe). Upon a call or an activated trigger input these contacts shall be activated for the appropriate zones, together with an additional voltage free contact (Call Active) for control purposes.

A 24Vdc output shall be available to supply power to external relays, so no external power supply shall be required for that purpose. A LED VU-meter shall allow for monitoring of the master output.

The maximum allowed total cable length between the controller and the last router in the chain shall be 1000 meters.

The maximum allowed total cable length between the controller and the last call station in the chain shall be 1000 meters. The maximum allowed total cable length between the controller and the RC panel shall be 1000 meters.

The controller and each connected router shall have 12 trigger inputs to start business and emergency messages. Each shall be configurable for a message consisting of a sequence of up to 8 wave files.

It shall be possible for wave files to be used in different combinations with other messages, optimizing flexibility and used storage space.

The messages shall be merge able to allow even more flexible use of pre-recorded announcements and evacuation messages. The system will be configured for 24 zones, expandable to up to 60 zones using additional six zone routers. Up to 8 call stations shall be connectable. Interconnections shall be made using standard RJ45 connectors and CAT5 cable.

It shall be possible to connect 1000 watts booster amplifier per router. The audio output shall use standard analog audio 100 V line switching for full compatibility with public address equipment and EVAC-compliant loudspeakers. The system shall be configured using DIP switches for basic functionality and a PC for more advanced functions. It shall be possible to specify 16 priority levels.

A built-in 240 W booster amplifier shall provide the power for the emergency call channel and BGM. It shall be possible to add additional booster amplifiers as spare, to provide two-channel operation or if the total power requirement exceeds 240 W (maximum 1000 W per 6 zones).

The maximum/rated output power of the internal booster shall be 360 W / 240 W. max mains inrush current shall be 8A @ 230 Vac / 16A @ 115 Vac

All control equipments should operate on Mains voltage which will be either 230Vac or 115Vac, $\pm 15\%$, 50 / 60Hz (selectable)

The power supply voltage range shall be 18 – 24V with a current consumption of less than 50 mA.

Power consumption of the Central Control Unit shall not exceed 600 Watts, and that of the Matrix shall not exceed 50Watts.

In case of Power failure Battery backup facility should be available and the battery voltage shall be 24Vdc, $\pm 20\%$ / $\pm 10\%$.

The nominal sensitivity shall be 85 dB SPL (gain preset 0dB).

The nominal output level shall be 700 mV.

The maximum allowable sound pressure level shall be 110 dBSPL.

The microphone shall have a limiter. The distortion shall be less than 0.6% at maximum input.

The equivalent input noise level shall be no more than 30 dB SPL. The frequency range shall be 100Hz – 16kHz.

The speech filter shall be a 315 Hz, high-pass, 6 dB/oct filter. The output impedance shall be 200 Ohms. The stem length with microphone shall be 390 mm.

All low level connections and volume override shall be on MC1,5/XX-ST-3,5 type connector blocks.

All high level connections except mains shall be on MSTB 2,5 /XX-ST.

The input contact shall have supervision based on a series and parallel resistor.

All control equipments shall be rack mountable with removable rack mounts. The matrix shall be not higher than 2U. The controller shall be not higher than 3U. The rack mounting kit shall be included.

The operating temperature range shall be -10°C to $+55^{\circ}\text{C}$. The storage temperature range shall be -40°C to $+70^{\circ}\text{C}$.

The system shall comply to the following standards:

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EVAC compliance	acc. to IEC 60849
EMC emission	acc. to EN 55103-1
EMC immunity	acc. to EN 55103-2
Safety	acc. to EN 60065

CENTRAL CONTROL UNIT SPECIFICATION

As the basis of the voice alarm system, the Central control unit shall have all the essential functionality for compliance with IEC 60849 standard, including full system supervision, loudspeaker line impedance supervision, a supervised emergency microphone on the front panel and a supervised message manager.

Frequency response shall be 60 Hz – 18 kHz (+1/-3 dB, @ -10 dB ref. rated output. The distortion shall not exceed 1% at the rated output, 1 kHz.

Control unit shall have tone controls to allow for adjustment of the BGM sound.

It shall have separate bass and treble controls.

The controller shall have two BGM source inputs and a mic/line input with configurable priority, speech filter, phantom power and selectable VOX activation.

It shall be possible to select 16 priority levels for microphone, call stations and trigger inputs for optimum system flexibility. It shall have two connectors to connect call stations. It shall have 12 input triggers with 6 supervised trigger inputs.

Furthermore it shall have one record output on cinch connectors.

The trigger outputs shall be on floating relays with a rating of 250V @ 7A.

The controller shall have an emergency active relay, a fault relay and two general purpose relays, for control purposes. The fault relay shall be failsafe.

The output section shall have six transformer-isolated 100 V constant voltage outputs for driving 100 V-loudspeakers in six separate zones.

All zones shall be individually selectable from the front panel and the BGM output level in each zone shall be individually settable in 6 steps.

The BGM output shall be connected to the 70V line, thus it shall be possible to connect a total load of 480 Watts in a two channel system combined with a 480 Watt booster.

The output of the booster shall be also available as a separate output on 100V and 70 V. A separate 100 V Call Only output shall be provided for addressing an area where BGM is not required but where evacuation announcements are. Six configurable volume override output contacts shall be available for overriding local volume controls during priority calls. A LED VU-meter shall monitor the output.

MATRIX SPECIFICATION:

The Matrix shall be an expansion unit adding 6 zones as well as 12 input- and 8 output contacts to the voice alarm system. It shall be able to use the booster built in the central control unit.

It shall provide outputs and inputs for one or two boosters in a multi amplifier for one- or two-channel system.

It shall provide dual channel operation for calls and BGM simultaneously to a maximum of six different zones, using two booster amplifiers.

Also single channel operation shall be possible with only one booster.

The matrix shall have a set of relays for zone-switching the power amplifier output(s) to different loudspeaker groups.

Each of the zones shall be switched between the call channel (upon call-station selection or all-call microphone or emergency activation), the BGM channel (upon front panel selection), or off.

The zone power handling capacity of the matrix shall be 1000 Watts.

The router shall also have 12 input triggers. 6 triggers shall be supervised for EMG purposes.

PAGING STATION SPECIFICATION:

The 6-zone paging station shall be a stylish high quality call station with a stable metal base, a flexible microphone stem and a unidirectional condenser microphone.

It shall be intended for making calls to selected zones.

The special design shall allow for neatly flush mounting in desk tops.

Using dip switches on the bottom of the call station, the call station ID shall be selectable. The call station shall have selectable gain, speech filter and limiter for improved intelligibility.

On each call station it shall be possible to select 6 zones with the possibility to connect a paging station keypad to increase the number of zones or zone groups that can be selected.

It shall have LED indications for zone selection, fault and emergency state.

The call station extension shall provide seven additional zone and zone group keys

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On each paging station shall be possible to select 6 zones with the possibility to connect up to 8 call station keypads to increase the number of zones or zone groups that can be selected. Selected zones are indicated with LEDs on the call station, three additional LEDs give visible feedback on the active state of the microphone and the system. Green indicates microphone active, amber indicates that the system has detected a fault (IEC 80649) and red indicates that the system shall be in the emergency state.

LOUD SPEAKER CEILING MOUNT:

Recess mount speaker with metal grill, designed in accordance with IEC268-5 Power handling capacity standards. CE conformity. Safety according to EN60065. Ball-proof according to DIN 18032-3. Complete with metal fire dome, with following specifications:

Maximum power : 9 watts

RMS: 6 watts. Tappings at 6/3/1.5w

SPL: 99dB

At 6w/1watt (1kHz at 1 mtr)

Rated impedance: 1667 ohm

2 pole push-in terminal block

SURFACE MOUNT SPEAKER:

Suitable for speech and music reproduction. Metal enclosure designed to mount on surface or for recess mount. Conforming to CE and safety according to EN60065 and Evacuation compliance to BS5839-8 complete with back box with following specifications:

Maximum power: 9 watts

RMS: 6 watts with tapping at 6/3/1.5/0.75 watts.

SPL: 102dB at 6 watts /1w (1kHz, 1mtr)

Frequency: 150 Hz to 20kHz.

Impedance: 1667 ohm with 3 pole screw connector.

AMPLIFIER:

19 inch rack mounting 2U high metal housing with dual priority switching.

Inputs for 100 volts slave operation.

Level controls for input 1 and 2.

240 watts RMS

Frequency range: 50Hz to 20kHz

Distortion: <1% at rated output power, 1kHz

Inputs and outputs available at 100volts.

Direct output : 100 volts / 70 volts and 8 ohm.

Operation: 230 volts AC and 24VDC

BGM SOURCE:

Back ground music source consisting of DVD/CD/MP3 player with USB input and a separate FM player.

Simultaneous operation of player and FM set

2 CORE CABLE

2 core 1 Sq mm Multi Stranded Overall PVC Cable of any Standard Make

This will be laid in the Pre-laid Conduits

VOLUME CONTROL SWITCH

12/36/100 watts 100 volts volume control with override relay.

Suitable for 3 and 4 wire system.

Continuous rotating system

Self-extinguishing according to UL 94

Safety according to EN60065 certification

Five attenuation steps

Frequency response: 50Hz to 20kHz

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Consumption: 20mA at 24VDC
Mounts on MK switch panel

ACCESS CONTROL SYSTEM

The functional requirements of the Access Control System (ACS) shall be as follows:

It shall provide means to configure control access to nominated doors and to secured areas of premises by configuring the access privileges stored in Access Door Controllers (ADC). These privileges define the access right of cards presented at readers.

It shall support distributed architecture with central monitoring and control. If communication to the central control fails, the ACS shall continue providing access based on the predefined security configuration. Until communication is regained, all event logs and alarms shall be stored locally (based on ADC capacity). These events shall be sent to the central control when the communication is regained.

It shall have peer-to-peer communication for inputs and outputs from the ADCs.

It shall have multiple supervised inputs. The dynamic status of each input shall be continuously monitored and each change should be reported immediately.

It shall provide programmable inputs, i.e. the ability to apply a variety of conditions to the way in which these inputs are monitored. These conditions shall be expressed in definite terms.

It shall be able to produce and communicate various types of outputs (Audible sirens, relay switching etc.) based on the above definition. These outputs shall be standard in terms and shall be interfaced as inputs to other Building Management System.

ACS communications should support RS232, RS485, TCP/IP, dial up modems.

All data over the network between the ADC and the Server end shall be encrypted if required.

All ACS software/firmware upgrades shall be downloadable through the network to the ADC.

Shall provide a fully integrated ACS application that shall utilize a user friendly Windows Graphical User interface. It shall utilize keyboard and mouse operations with graphical presentations of screen information. ACS operators/administrators shall be able to change the look and feel of the applications according to their personal taste.

Shall provide a fully integrated report generator wizard. The wizard should provide the possibility to view and print any part of the ACS information (not only history). It should also allow filtering and ordering by any field. It should also provide storage of user defined reports.

The following features shall be part of the ACS application:

- a) Time Zones with intervals.
- b) Access Levels
- c) Access Groups
- d) Holidays
- e) Database segmentation
- f) Field hardware communication
- g) Field hardware configuration
- h) Area controls with local & global Anti-Passback
- i) Global input/output event linkage

- k) Alarm and event logging
- l) Scheduling
- m) Multiple card formats
- n) Context sensitive help
- o) Monitor zones
- q) Text instructions
- s) Alarm priorities
- t) Alarm event mapping
- u) System download

The ACS shall provide the following alarm features:

- a) Alarm enunciation configuration
- b) Alarm handling & reporting
- c) Current status indication
- d) Alarm priorities
- e) Alarm acknowledgement & processing with valid comments
- f) Optional real-time, time lapse and live video user verification
- g) Trace functions for cards
- h) Test modes for alarm inputs
- i) Manual overrides
- j) Video interfacing
- k) Real time dynamic graphical maps
- l) Alarm sorting capabilities
- m) Guard tour interface

1.14 The following minimum features shall be part of card enrolment and personal data management:

- a) Creating and maintaining cardholder database with image attributes
- b) Modify existing field names of cardholder form
- c) Assigning of access level
- d) Bulk assignment/modification/deletion of access levels
- e) Record searching

1.15 In addition to the ACS and Alarm functions previously defined, following modules shall be part of the ACS, as standard or optional:

- a) Time & Attendance module
- b) Bio-Identification module
- c) Badge printing module

Access Control General Features

The Access Control System shall allow global functions:

- a) Global Anti-Passback with or without PC.
- b) Area definition.

c) Input/output linking between different controllers.

In a case of global communication failure, each door controller shall grant access considering the complete card number (site code included), i.e. downgraded mode shall not exist.

The hardware should be equipped with an optional secondary communication interface in the case of communications failure, enabling communication to proceed in case the main network is down.

When a new ADC is being defined by the operator, the software shall automatically define, according to the controller type, all its components: readers, inputs and relays. The following basic controller parameters should also be automatically defined and configured: door alarm input, door open time, request to exit input, reader weekly program. The newly created reader should be automatically added to the default access group which allows door pass on all doors, at any time

The Access Control and Security Management system (ACS) shall provide a number of security automation functions including the ability to regulate access through specific doors and gates to secured areas.

The ACS functions are categorized into the following:

- a) Access Control system
- b) Alarm Monitoring system
- c) Attendance recording system
- d) Biometric Verification
- e) Guard Patrol system
- f) Lift (elevators) control system
- g) Parking Management system
- h) Video Surveillance & Recording system
- i) Integration with intelligent perimeter Security
- j) Card designing and printing facility.

The ACS shall be developed so that all modules (access control, alarm monitoring, digital video, intrusion detection, etc.) shall seamlessly integrate into a single application with GUI.

The ACS shall be modular in nature and easily expandable without any hardware/software limitations.

The ACS shall support many Clients / Workstations with all functionality available from client / workstation on the network

The ACS shall utilize a single seamless integrated relational database for all functionality.

The data archival and back up shall be part of the system architecture and process.

The ACS shall support Microsoft Windows XP/2003/Vista/Win7 operating systems.

The ACS shall be expandable to support an unlimited number of field devices and integrated client workstation.

The alarm monitoring client workstation shall be able to connect to, and monitor, field hardware devices, such as card readers and Access Door Controller (ADC).

The ACS shall provide graphical map display that shall allow administrators/users to import customized map backgrounds of the facility and position custom symbols on these maps.

The ACS shall allow monitoring intrusion detection alarms inside the ACS alarm monitoring with the facility of arming and disarming the devices.

The ACS shall be designed to perform a wide variety of feature rich functions as part of an integrated security automation

and management system.

Alarm & access events shall be integrated with video system and shall be hardwired with various sub-systems.

The ACS shall support a fault tolerant server and redundant database architecture.

In the event of a server failure, the system shall automatically switch over to a backup server from the primary server without impeding the operation of the ACS.

The ACS shall support server clustering architecture.

In case the communication path between the ACS database server and the ADC is broken, the data shall be stored in a temporary queue and shall be automatically downloaded once the communication is restored.

Cardholder Definition

Each cardholder can be validated or invalidated.

Each cardholder can be validated for a given period by setting the start date and end date. The system shall automatically update the database and the controllers within 30 minutes (default) of the relevant change.

The ACS shall allow defining 3 types of cardholder: Employee, Guard, and Visitor. The software shall provide separate views for viewing guards and visitors. This is to enable defining operators that can see only these card holders types.

Each cardholder can be assigned with a different card for each reader technology (Magnetic, Wiegand, etc.)

It shall be possible to associate a cardholder picture by attaching a photo file or by taking a still image using a web cam or other camera. The picture taking process must be operated directly from within the access control software.

It shall be possible to assign one or more access groups for each cardholder.

Each cardholder can have a different weekly program on each reader. This weekly program can be mutual to all members of the access group. Alternatively each cardholder can have a personal weekly program to be used where no mutual weekly program was selected.

The ACS shall allow reader authorization exceptions for limited period. These exceptions should override the access group definitions within the defined times.

The ACS shall allow attaching scheduled changes in access groups.

The ACS shall allow assigning escort privileges or 'must be escorted' to the cardholder

The ACS shall allow assigning supervisor status per cardholder. Only cardholder defined as 'supervisor' may escort those cardholders defined as 'must be escorted'.

The ACS shall allow defining a personal cardholder privilege to avoid anti-passback restrictions.

The ACS shall allow providing last reader name where the cardholder passed including the date/time of the event.

The ACS shall allow setting cards status to: Used, Free, Canceled, Lost or Stolen.

Allow creating of two or more cardholders with the same first name and last name. The distinction in these cases shall be based on a special administrative number.

Badge printing shall be an integral part of the cardholder screen. It should allow creating and designing unlimited number

of badge layouts.

Fingerprints enrolment shall be an integral part of the cardholder screen. Each cardholder can have up to 2 stored finger templates. One of these templates can be defined as 'duress finger'. For each template the operator can select the required security level threshold.

Each cardholder can have a Personal Identity Number (PIN) to be used on readers with keypad.

Each cardholder can have a personal crisis level, which allows him to access reader with a crisis level inferior or equal to his own. Changing the Crisis level of one or several readers must be done via one protocol message to the ADCs. This would allow changing the whole array of access rights in the whole site within few seconds in a case of major crisis such as fire, robbery, attack, etc.

It shall be possible to allocate each cardholder with a lift program, which is a list of floors (in fact, relays) to be activated when he/she passes a reader defined as a 'lift reader'.

When the operator deletes a cardholder– the program should not remove him from the database. Instead the program should mark him as 'deleted', and hide him from the list of cardholders (unless the user explicitly asks to show the deleted ones). Following the deletion his/her badge should be de-allocated. Operator should be able to revert a cardholder status back to normal. There should be a special option to use when the final removal of deleted cardholders is required.

The cardholder screen should include, in addition to the standard information fields (address, phone, etc.) an option to create an unlimited number of customized fields. E.g. height, eye color, army rank, etc.

The system should include a location status screen providing the location of every cardholder in the site. This screen should allow viewing, for each defined area (and sub area), the real time list of cardholders currently present in the area and show their total count. The areas and sub areas should be shown in a tree view.

Report Generator Wizard

The system should include an advanced report wizard enabling the user to issue reports for logged events, alarms and all system components: controllers, readers, access groups, cardholders, etc. Reports should support filter by any field. Operator should be able to create and design custom-made reports and save their layout and filter rules for future use. All reports should support export to external files in known formats: RTF (MS-Word), PDF, HTML, XLS (MS-Excel), TIF, TXT (Text).

These reports shall be able to be filtered to show requested times, dates, events and/or monitor points, doors, relays, inputs, operators, card users, controllers as pre-programmed by the user.

The system should allow automatic print/preview/export any user defined report containing the current updated values (e.g., recent events). The trigger for the report print/preview/export may be either a selected event or a pre-defined schedule.

A report can be saved with its filtering rules as defined by the operator so the next time it will show the corresponding latest records.

The system should provide Time & Attendance (T&A) report. For each reader it should be possible to define whether it is IN, OUT, or None (i.e., its event should not be included in the attendance report. The T&A report should contain the total work hours for each cardholder based on all the relevant access events. Operator should be able to add and correct missing IN/OUT access events.

Minimum system capacities and features:

SYSTEM CAPABILITY	
Number of cards	2,000 - 250,000
On line remote site	LAN/WAN, dial up modems
Door controllers (RS-485)	Unlimited

Door controller RS-485 Loops	Unlimited
Door controllers (TCP/IP)	Unlimited
Card readers	Unlimited
Keypads	Unlimited
Monitored points (inputs)	Unlimited
Door lock outputs	Unlimited
Lift floors	64 per controller
Access Groups	Unlimited
Daily Schedule of 4 Intervals each	255 Max.
Weekly Schedule of 7 daily Schedules + holiday	127 Max.
Holidays and Special Days	180
Operator workstations (MS-Access)	1 to 8 (Windows 2000/XP/Vista/Win7)
Operator workstations (MS-SQL)	Up to 200 (MS-SQL Server 2000/2005)
Multi Software Operators	Yes
System Operator User/Passwords	Unlimited
Operator Security Levels	Unlimited
Multiple operator languages	Unlimited
Number of printers	Limited by network
User Defined Cardholder Fields	Unlimited
FUNCTIONS & FEATURES	
Cardholder Database Import	ODBC compliant (Access, Excel, etc.)
Anti Passback	Local/Timed/Global w/ & w/o PC
Advanced Report Wizard	View/print/edit layout
User Defined Reports	Yes
Operating System / Compatibility	Windows 2000/XP/Vista/Win7
Remote Management/Dial-up	Yes
Database	Access/MS-SQL
Integrated Badge Printing	View/print/edit layout
Cardholder ID Photo Capture	Yes
Real Time Photo Display	Yes
Guard Patrol	Yes
Parking Management	Yes
Lift Management	Yes
Multi-Site, Multi-Polling	Yes
Multi-Tenant	Yes
Integrated Biometric	Yes
CCTV Integration	Yes
DVR History Recording And Playback	Yes
ADVANCED FEATURES	
Counting/de-counting	Yes
Action and Process control	Yes
Time and attendance report	Yes
Operator response (dispatch) instructions	Unlimited
Visitor Management	Yes
Translation Tool for Software Localization	Yes
Duress keypad code	Yes
Duress Finger	Yes
Crisis Levels	8
Real time cardholders & cars location	Yes
Communication Encryption	Yes

User Defined Encryption Password	Yes
ALARMS AND GRAPHICS	
Site maps	Yes
Icons Representing Inputs/Relays/Doors	Yes
Real Time Animated Icons	Yes
Icons Tooltips	Yes
Alarm priority levels	9
Global Reflex Triggering	Yes. w/ & w/o PC
CONTROLLER	
Readers	2 or 4
Inputs	Up to 16 supervised
Outputs	Up to 64
Communication port	Up to 3
TCP on board	Yes
Max. Number of Events in Controller Memory	360,000
PoE connection	Yes
DIN Rail support	Yes
Readers Sabotage Detection	Yes
Reader Multi Technology Support	Yes

5 FACTORY ACCEPTANCE TEST FOR ALL BOUGHT OUT ITEMS

Client, his consultant and their authorized representative shall have the right to inspect and test or get inspected and tested the goods at the works of the Seller or its sub suppliers any time during manufacture and prior to dispatch and to inspect within a reasonable time after arrival of goods at the ultimate destination and during and after erection, testing and commissioning. The goods shall not be deemed accepted until after the said inspection, testing and commissioning and signing of the Acceptance Certificate. Failure to make any inspection of or payment for or acceptance of goods shall in no way impair client right to reject non-conforming goods or to avail itself of any other remedies to which client may be entitled, notwithstanding client knowledge of the nonconformity, its substantiality in the case of its discovery. In the event of failure of Seller to remove the rejected goods within the time allowed, client shall have the right to dispose of the same at the seller's risk and cost. During the time the rejected goods lie with client awaiting removal by the seller, they will so lie at the seller's risk. All goods rejected by client after receipt at the destination shall be removed by the seller within a reasonable time allowed by client, not exceeding 30 (thirty) days at seller's expense and risk.

The Seller will permit client Inspectors, Consultant and their authorized representatives free access during normal working hours to his works, godown, storage or loading spot etc. and will give them all necessary assistance to perform their task including free use of all accessories, testing and control instruments. The seller shall ensure that the same facilities are granted by his sub-suppliers.

Unless specifically stated to the contrary in the order, all expenses relevant to the preparation and performance of testing, inspection and preparation of any test reports or certificates shall be borne by the Seller EXCEPT for the salaries, fees, traveling, lodging and boarding expense of the Consultant's / client's representatives. However, if the visit duration of PDA / client's representatives is extended for the reasons not attributable to PDA / client, the cost of the extended period of visit shall be borne by the seller.

The sellers shall carry out tests related to performance tests as described in the specifications and specified in the order. All such performance tests shall be at supplier costs. Supplier shall also provide all the tests certificates and documents as demanded by the Inspector for his satisfaction that the order has been executed as per PO specifications. All such certificates, documents in original shall be submitted to the Client before dispatch of material. The goods shall be dispatched from suppliers shop only after written confirmation from clients / or its authorized representative.

The contractor shall consider all cost towards inspection of goods by consultant / EIC at factory / manufacturers works prior to shipping for 2 persons. (Travelling (2nd AC) / stay etc complete)

6 SAFETY CODE

1. Suitable scaffolds shall be provided for workmen for all work that cannot safely be done from the ground, or from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra labour shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and handhold shall be provided on the Ladder and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal and 1 vertical).

2. Safe means of access shall be provided to all working platform and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 meters in length. Width between side rails in a rung ladder shall in no case be less than 30 cm. for ladders upto and including 3 meters in length. For longer ladders this width shall be increased atleast 6 mm. for each additional 30 cm. of length. Uniform step spacing shall not exceed 30 cm.

Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites shall so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lightest to protect public from accidents and shall be bound to bear expenses of defence of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the contractor be paid to compromise any claim by any such person.

3. Demolition: Before any demolition work is commenced and also during the process of the work: -

- a) All roads and open areas adjacent to the work site shall either be closed or suitably protected.
- b) No electric cable or apparatus, which is liable to be a source of danger over a cable or apparatus used by operator, shall remain electrically charged.
- c) All practical steps shall be taken to prevent danger to persons employed, from risk or fire or explosion or flooding. No floor, roof, or other part of a building shall be so overloaded with debris or any materials as to render it unsafe.

4. All necessary personal safety equipment as considered adequate by the Engineer-in-charge shall be available for use of persons employed on the site and maintained in a condition suitable for immediate use; and the contractor shall take adequate steps to ensure proper use of equipment by those concerned.

- a) Those engaged in handling any material, which is injurious to eyes, shall be provided with protective goggles.
- b) Those engaged in welding works shall be provided with welder's protective-shields.
- c) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
- d) The contractor shall not employ male or female labour below the age of 18 years.

5. When work is done near any place where there is risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

6. Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following:

- a) (i) These shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good repair and in good working order.

(ii) Every rope used in hoisting or lowering materials or as a means suspension shall be of durable quality and adequate strength, and free from patent defects.

- b) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine including any scaffold winch or give signals to operator.

c) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or lowering or as means of suspension, safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of testing.

d) In case of a departmental machine, safe working load shall be notified by the Engineer-in-charge. As regards contractor's machines the contractor shall notify safe working load of each machine to the Engineer-in-charge whenever he brings it to site work and get it verified by the Engineer-in-charge.

7. Motors gearing, transmission, electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards; hoisting appliances shall be provided with such means as will reduce to the minimum risk of accidental decent of load adequate precautions shall be taken to reduce to the minimum risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations, which are already energized, insulating mats working apparel such as gloves, sleeves and boots as may be necessary, shall be provided. Workers shall not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.

8. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near places of work.

9. These safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent place at the work spot. Persons responsible for ensuring compliance with the safety code shall be named therein by the contractor.

10. To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the contractor shall be open to inspection by the Engineer-in-charge or his representatives and the Inspecting Officers.

11. Notwithstanding the above conditions 1 to 14 the contractor is not exempted from the operation of any other Act or Rule in force.

12. If the height at which the contractor is working is more than 12 feet then the staff should wear safety helmet and tie himself with softy belt, client/ architect have all right to ask the contractor to stop work if the safety condition are not fulfilled.

TESTING OF INSTALLATION

7.0 SCOPE

This chapter describes the details of tests to be conducted in the completed internal electrical installations, before commissioning.

GENERAL

7.1.1 Tests

On completion of installation, the following tests shall be carried out:-

Insulation resistance test.

Polarity test of switch.

Earth continuity test.

Earth electrode resistance test.

7.1.2 Witnessing of tests

Testing shall be carried out for the completed installations, in the presence of and to the satisfaction of the Engineer-in-charge by the contractor. All test results shall be recorded and submitted to the Department.

7.1.3 Test instruments

All necessary test instruments for the tests shall be arranged by the contractor if so required by the Engineer-in-charge.

7.2 INSULATION RESISTANCE

7.2.1 The insulation resistance shall be measured by applying between earth and the whole system of conductors, or any section thereof with all fuses in place, and all switches closed, and except in earthed concentric wiring, all lamps in position, or both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure, provided it need not exceed 500 volts for medium voltage circuits. Where the supply is derived from a three wire D.C, or a polyphase A.C. system, the neutral pole of which is connected to earth either directly or through added resistance, the working pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.

7.2.2 The insulation resistance shall also be measured between all the conductors connected to one pole, or phase conductor of the supply, and all the conductors connected to the neutral, or to the other pole, or phase conductors of the supply with all the lamps in position and switches in "off" position, and its value shall be not less than that specified in sub-clause 16.2.3.

7.2.3 The insulation resistance in mega ohms measured as above shall not be less than 12.5 mega ohms for the wiring with PYC insulated cables, subject to a minimum of 1 mega ohm.

7.2.4 Where a whole installation is being tested, a lower value than that given by the formula, subject to a minimum of 1 mega ohm, is acceptable.

7.2.5 A preliminary and similar test may be made before the lamps etc. are installed, and in this event the insulation resistance to earth should not be less than 25 mega ohms for the wiring with PYC insulated cables, subject to a minimum of 2 mega ohms.

7.2.6 The term "outlet" includes every point along with every switch, except that a switch combined with a socket outlet, appliance or lighting fitting is regarded as one outlet.

7.2.7 Control rheostats, heating and power appliances and electric signs may, if required, be disconnected from the circuit during the test, but in that event the insulation resistance between the case or frame work, and all live parts of each rheostat, appliance and sign, shall be not less than that specified in the relevant Indian Standard Specifications, or where there is no such Specification, shall be not less than one mega ohm.

7.3 POLARITY TEST OF SWITCH

7.3.1 In a two wire installation, a test shall be made to verify that all the switches in every circuit have been fitted in the same conductor throughout, and such conductor shall be labeled or marked for connection to the phase conductor, or to the non-earthed conductors of the supply.

7.3.2 In a three wire or a four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted in a conductor which is labeled, or marked for connection to one of the phase conductors of the supply.

7.3.3 The installation shall be connected to the supply for testing. The terminals of all switches shall be tested by a test lamp, one lead of which is connected to the earth. Glowing of test lamp to its full brilliance, when the switch is in "on" position irrespective of appliance in position or not, shall indicate that the switch is connected to the right polarity.

7.4 TESTING OF EARTH CONTINUITY PATH

The earth continuity conductor, including metal conduits and metallic envelopes of cables in all cases, shall be tested for electric continuity. The electrical resistance of the same along with the earthing lead, but excluding any added resistance, or earth leakage circuit breaker, measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

7.5 MEASUREMENT OF EARTH ELECTRODE RESISTANCE

7.5.1 Two auxiliary earth electrode, besides the test electrode, are placed at suitable distance from the test electrode (see figure 14). A measure current is passed between the electrode 'A' to be tested and an auxiliary current electrode 'C', and the potential difference between the electrode 'A' and auxiliary potential 'B' is measured. The resistance of the test

electrode 'A' is then given by:

$$R=V/I$$

Where,

R	-	Resistance of the test electrode in ohms,
V	-	Reading of the voltmeter in volts.
I	-	Reading of the ammeter in amps.

7.5.2 (i) Stray currents flowing in the soil may produce serious errors in the measurement of earth resistance. To eliminate this, hand driven generator is used.

(ii) If the frequency of the supply of hand driven generator coincides with the frequency of stray current, there will be wandering of instrument pointer. An increase or decrease of generator speed will cause this to disappear.

7.5.3. At the time of test, the test electrode shall be separated from the earthing system.

7.5.4 The auxiliary electrodes shall be of 13 mm diameter mild steel rod driven upto 1 m into the ground.

7.5.5 All the three electrodes shall be so placed that they are independent of the resistance area of each other. If the test electrode is in the form of a rod, pipe or plate, the auxiliary current electrode 'c' shall be placed at least 30 m away from it, and the auxiliary potential electrode 'B' shall be placed mid-way between them.

7.5.6 Unless three consecutive readings of test electrode resistance agree, the test shall be repeated by increasing the distance between electrodes A and C upto 50 m, and each time placing the electrode B midway between them.

7.5.7 On these principles, "Megger Earth Tester", containing a direct reading ohm-meter, a hand driven generator and auxiliary electrodes are manufactured for direct reading of earth resistance of electrodes.

7.6 TEST CERTIFICATE

On completion of an electrical installation (or an extension to an installation), a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as given in Appendix 'E' in addition to the test certificate required by the local Electric Supply Authorities.

8 FORM OF COMPLETION CERTIFICATE

I/We certify that the installation detailed below has been installed by me/us and tested and that to the best of my/our knowledge and belief it complies with Indian Electricity Rules, 1956, as well as the C.P.W.D. General Specifications of Electrical Works 2004.

Electrical installation at _____

Voltage and system of supply _____

1. Particulars of work:

a) Internal Electrical Installation

No.	Total Load:	Type or
system of wiring		

i) Light point

ii) Fan point

iii) Plug point

a) 3 pin 5 Amp.

b) 3 pin 15 Amp.

b) Others

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	Description	Hp/KW	Type of Starting
a)	Motors: i) ii) iii)		
b)	Other plants:		
c)	If the work involves installation of overhead line and/or underground cable.		
d)	i) Type & description of overhead line.		
	ii) Total length and no. of spans.		
	iii) No. of street lights and its description.		
b)	i) Total length of underground cable & its size.		
	ii) No. of joints: End joint: Tee joint: St. through joint:		

II) Earthing

i)	Description of earthing electrode.			
ii)	No. of each electrodes.			
iii)	Size of main earth lead.			
III)	Test results:			
a)	Insulation resistance			
i)	Insulation resistance of the whole system of Conductors to earth			Mega ohms
ii)	Insulation between the phase conductor and neutral			
	Between Phase R and neutral	-	-	Mega ohms
	Between Phase Y and neutral	-	-	Mega ohms
	Between Phase B and neutral	-	-	Mega ohms
iii)	Insulation resistance between the phase conductors in case of polyphase supply.			
	Between Phase R and Phase Y	-	-	Mega ohms
	Between Phase Y and Phase B	-	-	Mega ohms
	Between Phase B and Phase R	-	-	Mega ohms

Polarity test

Polarity of won linked single pole branch switches.

Earth continuity test

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Maximum resistance between any point in the earth continuity conductor including metal conduits and main earthingOhms

Earth electrode resistance

Resistance of each earth electrode

i)	-	-	-	-	Ohms
ii)	-	-	-	-	Ohms
iii)	-	-	-	-	Ohms
iv)	-	-	-	-	Ohms

Lighting protective system

Resistance of the whole of lighting protective system to earth before any bonding is effected with earth electrode and metal in/on the structure.....

Signature and name of
Junior Engineer (E) / AE (E)

Signature and name of the
Contractor

9 SPECIAL CONDITIONS OF CONTRACT

9.1 GENERAL

The complete Electrical Installation shall be carried out in strict accordance with the regulations of the electricity supply authority, Institution of Electrical Engineers, ISI Standards, fire Insurance Company insuring the building and national code of practice.

The standard conditions of contract are meant to amplify the specifications, schedule of quantities and drawings and the most stringent of the above shall apply should there be any ambiguity or inconsistency. The contractor should report the same to the Architect/Consultant and obtain clarification before submitting his tender.

All Equipments, cables etc. shall be adequately rated to suit the climatic conditions experienced in this country.

Clause in this specification shall apply equally throughout.

9.2 ORDERING

As soon as possible after the contractor receives written notification of the acceptance of his tender he shall order all the materials and equipment required to complete the contract. He shall submit to the consultant the detailed summary of all the orders placed, providing the details about the name of Supplier/Vendor, make of equipment, date of order and forecast of delivery date at site.

9.3 STANDARD OF MATERIALS

When the material and equipment is specifically described named in the specifications, it is so named or described

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for the purpose of establishing a standard of materials and workmanship to which the contractor must adhere. The Contractor must quote with the material as listed in the make of materials list attached later in the document. The Contractor may submit with his tender a list indicating any alternative make of material that he proposes to install. Before installing such a make the contractor shall take permission from the consultant. All materials condemned by the consultant as not approved for use are to be removed from the premises and suitable material shall be delivered and installed in their place at the expense of the Contractor. If alternatives are not offered during the tender stage then the contractor will be deemed to have submitted his tender based on all materials and equipment specified or shown on the drawings and therefore no alternative manufacturer or supplier of such material and equipment specified or shown will be considered after the contract is awarded if however the material or equipment specified or shown on the drawing is not available due to any genuine reason. The contractor shall prior to order get the written approval of the consultant for the particular material/equipment.

The Contractor shall be responsible for the safe custody of all material and shall insure them against theft damage by fire earthquake etc. A list of materials and equipment together with a sample of each shall be submitted to the consultant as directed by him within 30 days of the award of the contract.

All materials required for the works shall be new and the best of their respective kinds and shall be of uniform pattern. All materials shall be suitable for use in temperatures of 50°C with comparative humidity.

The protective finishes detailed as follows must be provided on all materials and apparatus used on this contract to ensure that no deterioration is caused by the local climatic conditions.

All materials shall be inspected by the Contractor to ensure that finishes are in accordance with these specifications.

- A. The interior fittings in all distribution boards and control units shall be properly painted.
- B. All holes in distribution boards and similar equipment shall be blanked off to protect from dust and vermin where ventilation is necessary holes are to be neatly covered.
- C. All cable entry holes on switchgears and similar equipment shall be fitted with PVC/Rubber Bushings.

The material supplied by the client or other agencies shall be properly inspected by the contractor before accepting so that any damage thereafter is the liability of the contractor.

9.4 WORKMANSHIP

The workmanship and method of installation shall conform to the best standard practice. All work shall be performed by skilled tradesman to the satisfaction of the Consultant/Architects. Helpers shall have qualified supervision.

Any work that in the opinion of the consultant does not conform to the best standard practice shall be removed and reinstated at the Contractor's expense permits certificates and licenses must be held by all tradesman for the type of work in which they are involved where such permits certificates and licenses exist under government legislation.

9.5 PROCEDURE

Throughout all stages of work the contractor shall maintain a close liaison with the consultant and with all other contractors involved in the work.

Site work shall commence immediately with the start of building work and shall proceed expeditiously in harmony with the building work so as not to delay the latter in any way. All plant to be supplied and work to be done under this specification shall be manufactured and executed in the manner set out in this specification or where not so set out the reasonable satisfaction of the consultant and all the contractors works on site shall be carried out in accordance with the such reasonable directions as the consultant may give.

The contractor in the interest of the work shall furnish a bar chart based on the chart furnished by the civil contractor stating all the starting and completion dates clearly in the format that consultant approves or in the format of the civil bar chart.

The contractor shall also furnish the time chart showing the material procurement marking the ordering date and the delivery date of the material on site. In case of delay in delivery of material at site the contractor may be asked to

furnish proper reason for the delay.

The contractor if at all feels necessary shall attach the drawing schedule requirements with the tender documents.

9.6 PERMITS

The Contractor shall obtain all necessary permits prior to work commencement for the excavation of cable trenches etc. in the areas where it is suspected that existing services are present the contractor shall carry out excavation work by hand. He shall also obtain the necessary permits from the respective authorities prior to working on major items of the switchgear. All application permits shall be made in writing with a copy to the consultant.

9.7 TEMPORARY AND TRIAL USAGE

It shall be understood and agreed that temporary and trial usage by the employer of any device, machinery, apparatus, equipment or any other work or materials supplied under this contract before final completion and written acceptance of the item by the employer it is further understood and agreed that the employer shall have privilege of such temporary and trial usage as soon as the contractor shall claim that the said work is completed and in accordance with the drawings and specifications and to the manufacturer's instructions and for such reasonable length of time as the consultant shall deem suitable for making a complete and thorough test of the apparatus or system under test.

No claim for the damage will be made by the contractor for the injury to or breaking of any parts of the works which have been placed under test whether this damage has been caused by weakness, flaw or inaccuracy of structural parts or by defective material or workmanship of any kind whatsoever.

9.8 CLEANING

Before operating any of the systems the contractor shall clean out all rubbish and dirt upon completion of the contract the contractor shall ensure that all items of plant are left in a clean and tidy condition.

9.9 SETTING OUT OF WORKS

The specification and schedule of rates shall be considered as part of this contract and any work materials shown on the schedule and not called for in the specifications or vice-versa shall be executed as if specifically called for in both.

The Contractor at his own expense shall set out all his hardworks and take all his measurements and dimensions required for the erection of his materials on site making and modifications in detail to the consultant before proceeding and must allow in his tender for all such modifications and for the provision of any sketches or drawings related there to.

The position of all DB's Panels, Cable routes, fixtures, Wiring Systems, Service Outlets and control Switches shown on the drawings are to be assumed as being correct for the purpose of tendering final positions of these must be agreed with the consultant before installation.

The data given here in and on the drawings is as exact as could be secured but its complete accuracy is not guaranteed. The drawings are for the guidance of the contractor, exact locations, distances and levels will be governed by the site conditions.

9.10 AS BUILT DRAWINGS / SHOP DRAWING

Contractor shall make all necessary shop drawings indicating conduit / cable tray routes / qtys / sizes; cable schedule, circuiting details etc complete before starting the works and get approval of consultant / EIC.

At the completion of the works and before issue of the certificate of virtual completion, the contractor shall submit to the consultant 4 sets (HARD AND SOFT FORMAT) of layout drawings drawn at approved scale indicating the complete wiring system as installed. These drawings must provide the following minimum information:

- A. Run and size of conduits, inspections, junction and pull boxes.
- B. Size of conductors in the conduits.
- C. Location and rating of sockets and switches controlling the light and power outlets.
- D. Location and details of distribution boards, mains, switches, switchgear, main panel and other particulars.
- E. A complete wiring diagram, as installed and schematic drawings showing all connections in the complete

electrical system.

- F. Location of outlets, junction boxes, sizes of various conduits for telephones.
- G. Location of all earthing stations, routes, sizes of all earthing conductors, manholes, layout of earth link strips, etc.
- H. Layout and particulars of all cables.
- I. Necessary drawings with prints for approvals from local / govt. authorities.

Above indicates the general requirement. However, contractor must include all information desired by the client and Architects/Consultants in the final as built documents. Guidance for the preparation of as built document shall be had from the consultant.

9.11 MANUFACTURER'S INSTRUCTIONS

Where manufacturer's have furnished specific instructions, relating to the materials used in this job for covering, paints etc. which are not specifically mentioned in this documents, manufacturer's instructions shall be followed.

9.12 GUARANTEE

At the close of the work and before issue of the final certificate of virtual completion. The contractor shall furnish written guarantee indemnifying the Architect/Consultant against defective materials and workmanship for a period as mentioned in the schedule of fiscal aspects. The contractor shall hold himself fully responsible for reinstallation or replacement, free of cost to client the following:

- A. Any defective work or material supplied by the Contractor.
- B. Any material or equipment damage or destroyed as a result of defective workmanship by the Contractor.

9.13 SAFETY OF MATERIAL

The Contractor shall provide proper and adequate storage facilities to protect all materials and equipment, including those issued by the owner against damage from any cause whatsoever.

9.14 COMPLETION CERTIFICATE

On completion of the Electrical Installation a certificate shall be furnished by the Contractor counter signed by the licensed supervisor, under whose direct supervision the installation was carried out. The certificate shall be in the prescribed form as required by the local authority. The contractor shall be responsible for getting the Electrical installation inspected and approved by the local authorities connected.

9.15 ENGINEER AND FOREMAN

The Contractor shall employ a competent fully licensed, qualified full time electrical Engineer and foreman to direct the work of Electrical Installation in accordance with drawings and specification. The foreman shall be available full time on site to receive instruction from Architect/Consultant or his nominee in the day to day activities throughout the duration of the contract the foreman shall correlate the progress of work in connection with all relevant requirements of the supply authorities.

9.16 LIASIONING WITH LOCAL SUPPLY COMPANY

The contractor shall be responsible for all the liaisoning work with the supply company. However, all the technical assistance required for the same may be furnished by the consultant. The contractor has to fill the necessary forms and submit test reports so as to ensure that the supply is available in time. The contractor shall prepare necessary drawings for the approval of the concern government departments and has to get the necessary permissions for supply and D.G. sets etc.

9.17 SPECIFICATIONS AND SCHEDULE

The specification and schedule of rates shall be considered as part of this contract and any work or materials shown on schedule and not called for in this specifications or vice versa shall be executed as if specially called for in both. The drawings indicate the extent and general arrangement of the fixtures, controlling switches, wiring system etc. and are essentially diagrammatic. The drawing indicates the points of termination of conduit runs and are suggestive of the routes to be followed.

9.18 SUPERVISION

Supervision shall be by a competent person experienced in the nature of the work to be undertaken. This person shall be available on site for the full period of works. The Engineer may demand at any time during the contract the replacement of the contractor's personnel who fails to satisfy this requirement of competent.

9.19 TOOLS AND EQUIPMENTS

The Contractor shall provide all necessary Jointing Equipment, tools, Portable power tools, test equipment etc which will be required to carry out the Electrical work. All the zarri work, except in unavoidable circumstances, shall be done with a zarri cutter.

This includes all heavy duty equipments such as Cranes, lorries, etc. for site delivery and fixing.

The contractor must have minimum following instruments:

- 1) 1000 / 500 V Meggar.
- 2) Clip on meter.
- 3) Earth tester.
- 4) Lux meter.
- 5) Zarri Cutter.
- 6) Multi Meter.
- 7) Drill machine upto 25 mm dia.
- 8) Ladders suitable for 30 ft. and above.
- 9) All safety equipment's like helmet, safety rope etc.
- 10) Complete set of spanners, screw drivers etc.

9.20 SITE STORAGE

The contractor shall be responsible for the safe storage of materials on site. This includes ensuring that all equipment is handed to the client in sound undamaged order.

The Contractor shall be responsible for safe storage of materials on site, and liable for their replacement. The Contractor would be required to maintain a watch man on site and shall remain Contractors Choice.

9.21 SPARES

The Contractor shall prepare a schedule of manufactures recommended for spares for one year maintenance.

9.22 OPERATING AND MAINTENANCE MANUALS

The Contractor shall furnish two sets of operating manuals which shall include services maintenance instructions and circuit diagram for each item of equipment.

9.23 SITE CONDITIONS

The Contractor shall take all necessary action to acquaint himself fully with site conditions. Any conditions at tendering stage will not be accepted.

After the contract is awarded the Contractor shall acquaint himself fully with existing services and obtain all necessary information to avoid any damage to the services during excavation etc.

9.24 LABELS AND NOTICES

On all switchgear identification name plates shall be fitted these will identify the substation and/ or outgoing ways. The labels shall be made on indestructible non deteriorating material with lettering engraved in black or white background except where otherwise specified. Fixing shall be by means of rivets or screws in addition to any adhesive. all labels shall be English/Hindi /mother language as directed by the Consultant. All pillars and mini feeder pillars in addition to identification labels shall have each way identified by a label to the same specification fitted in the feeder pillar. An indestructible "Danger 415 volts" plates should be fitted externally with a double flush danger signal. The letters to be 12 MM height minimum in signal red.

In addition each distribution board shall have a typed chart detailing particulars of the circuits controlled which shall be fixed to the inside of the door. The details shall include the circuit load, description, the type and rating of the protection device, and the cable size. A sheet of transparent rigid plastic shall be used to completely cover the chart to prevent damage.

9.25 PACKING AND RECEIPT OF MATERIAL

The contractor shall take every possible measure including appropriately strong packing, proper supervision of loading and offloading and proper transportation by the most suitable route to ensure the safe delivery to site of plant and equipment. The Contractor shall keep at site up-to-date record of all materials received and fully annotated with details of the carrier and condition of equipment on arrival.

9.26 RECORDING OF WORK

The contractor shall keep a diary and a set of drawing recording the progress of the works and details of all instruction received. These shall be available for the consultant upon request. The contractor's site representative will submit a written report every two weeks outlining the progress of the work including work completed to date. The review of the work completed and the bar chart submitted shall be done weekly and the difference in the two shall be submitted to be Consultant specifying the reasons for the difference.

On completion of work the contractor has to submit detailed reconciliation statement of all electrical materials. The loss of material shall be recovered at prevailing market rate for the material supplied by the client or other agency.

The contractor shall take permission from the employer before he takes all the unused material from the site on completion of work.

9.27 MARKING OUT

Routes and positions of systems, and positions of all electrical equipment shall be marked out by the contractor and approved by the Engineer before such items are installed.

These items shall be installed in the positions shown on the drawings, but reasonable variations may be made on site with the consent of Engineer.

9.28 FIXING

Screws fixing brick concrete or similar materials which necessitate plugging shall be made using steel woodscrews into plugs in rotary drilled holes.

Items of switch fuse gear, cable racks and trays etc. shall be fixed using corrosion resistant steel bolts fitted with expanding collars, e.g. 'Anchor Fastner' set into rotary drilled holes of the correct size all such bolts shall be provided with one number wide flange washer and one heavy spring washer.

9.29 CONTRACTORS RATES

The Contractors rates must be included the cost of transportation of materials to the site. All taxes such as GST, sales tax, Excise etc. the fixing or placing in position for which the items of work is intended to be operated.

The contractor shall quote in English, in words and figures, the amount tendered by him in the Form of Schedule of rates forming part of the tender document in such a way that interpolation is not possible. The amount for each item shall be worked out and entered and requisite totals given for all items. The tendered amount for the work shall be entered in the Tender and duly signed by the tenderer.

The contractor shall include in rates quoted all expenses (travelling / lodging / boarding) for inspection of goods at manufacturer's workshop for two persons from client / consultants office.

If some discrepancies are found between the rates in words and figures or the amounts shown in the tender following procedure shall be followed:

- a) When there is difference between the rates in figures and words, the rate in words shall be taken as correct.
- b) When the rate quoted by the tenderer in figures and words, tallies, but the amount is incorrect, the rate quoted by the tenderer shall be taken as correct.
- c) When it is not possible to ascertain the correct rate, in the manner prescribed above, the rate as quoted in the words shall be adopted.

The contractor shall be liable to furnish the rate analysis for the rates quoted by them, if the architect/consultants find the rates to be no workable and ask for the analysis.

Labour rates not quoted for the items / or rates for extra items shall be decided 15 days prior to the start of the work as per the procedure listed in schedule of fiscal aspects. However, looking to the urgency of the work, if it is required to execute the item without the settlement of rate, then the rate for the same item will be finalised before making the payment.

9.30 ARCHITECTS / CONSULTANTS DECISIONS

Matters not covered by the specification given in the contract as a whole shall be covered in the relevant ISI codes. If such codes for a particular subject have not been framed, the decision of the Architect/Consultant shall be final.

The work shall be carried out under the direction and supervision of the architect / consultant or their representative at site who shall guide the representative of contractor from time to time. On acceptance of the tender, the contractor shall intimate the name of the representative who would be supervising the construction and would be responsible for taking instructions for carrying out the work.

The Architects / consultants or their representative at site shall have access to the workshops of the successful tenderer so as to ensure themselves of the quality of material and workmanship.

The Architects / Consultants decision with regard to the quality of material and workmanship will be final and binding. Any material rejected by the Architect / Consultant shall be immediately removed by the contractor.

9.31 DEFECTS LIABILITY PERIOD

This period of 12 months, shall be in force from the date of "Virtual completion" and minor defects if any shall be corrected / rectified within 24 hours and major defects within 3 days which shall develop during this period. However, if the same are not rectified by the Contractor within the period mentioned above the clients with the concurrence of the Architects shall get the work done at the risk and the cost of the Contractor.

9.32 OCCUPYING PART AREAS

If the owner wants to occupy areas in part, the Contractor shall have to complete the work of these areas in consultation with the owner and handover the same to the employer without affecting any of the clause of the contract agreement.

9.33 TEMPORARY WIRING

Whenever any temporary wiring is done, it has to be done so that all precaution for safeties are taken and temporary wiring shall be done so that, it is not hazardous to anybody. Any accident due to temporary or permanent wiring or installation shall be the responsibility of the contractor and compensation shall be paid by the contractor to all the concerned.

VOLUME-II: SCHEDULE OF RATES

SCHEDULE OF RATES (SOR)

File No: GGL-F&A,IR & Admin-2025-12-151677

AS PER ATTACHED BOQ

VOLUME-III: TERMS & CONDITIONS

CONTRACT OWNER(S):

NAME	DEPARTMENT	EMAIL ID	CELL NUMBER

CONTRACT PERIOD (NUMBER OF MONTHS/ YEARS FROM DATE OF CONTRACT AWARD): Contractor shall complete the work within 45 days of award of contract. Detailed schedule shall be provided by Owner after award of contract.

MODE OF MEASUREMENT: Service report for the actual work done duly signed by GGL representative and contractor's service supervisor

DOCUMENTATION & REPORTING : CONTRACTOR shall submit the documents for installation, commission related to Electrical & Allied Services:

Supply, Installation, Testing & Commissioning of Electrical & Allied Services

Progress Report of daily work

Inspection and maintenance reports as per the format provided by GGL

Site evidence as per requirement of GGL in charge

Area of Concern/problem, impact and recovery action plan

5.1 HSE activities

HSE Reports (Hazards, near miss, etc.)

Training/HSE briefing records/Safety Passports etc.

Records of Closing of Non-Conformities

Waste Disposal records

MATERIAL RECONCILIATION- To be carried out along with the Owner's Representative

ALLOWANCES: NA

HANDLING OF MATERIAL: At most care shall be taken by contractor while handling/transporting of spares/materials.

HSE REQUIREMENTS & EXHIBIT

CONTRACTOR shall have arrangements as per plan like Emergency contact list, Medical Emergency, Site card etc.

CONTRACTOR shall ensure that the tools, instrument or other equipment to be used are fit for use and in safe working condition.

CONTRACTOR shall ensure that no work shall be executed during night time and adverse weather conditions, unless instructed by the owner.

Toolbox talk is conducted ensuring presence of each members from team for the following:

Activities planned for the day

Result of Site Specific Risk Assessment

Risk mitigation plan

Lesson learn sharing if any

Non conformity of last day

Dynamic Risk Assessment is carried out as the work progress and change of site conditions

The contractor shall fill up tool box talk & site specific risk formats before starting of job at any location and shall ensure

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following HSE aspects during any job.

Ensure each person on site having safety passport and PPE's.

Ensure for Tool Box Talk & Site Specific Risk Assessment before start up work.

Ensure to use the safety belts & scaffolding in case of working at height.

SCOPE OF WORK – ANNEXURES

ANNEXURE-I

GENERAL TECHNICAL SPECIFICATIONS CIVIL WORKS

These specifications cover the items of work in structural and non-structural parts of the works coming under purview of this document. All work shall be carried out in conformation with these specifications. These specifications are not intended to cover minute details. The work shall be executed in accordance with best modern practices. All codes and standards referred to in these specifications shall be the latest thereof.

The methods of measurement and payment shall be as described under various items and in the bill of quantities.

All defective works are liable to be demolished, rebuilt and defective materials replaced by the contractor at his own cost.

A - 1 Anti Termite Treatment:

Treatment shall be as per IS 6313 (part II) with a guarantee period of Ten years and to be carried out through approved specialized agency. no unprotected avenues entry is left open to the termites.

Chemicals used shall be chloropyriphs emulsifiable concentrates 20 Es as per IS 6313. 1 % concentration brought to site in sealed ISI mark container.

The top surface of the consolidated earth within the walls shall be treated with the chemical emulsion at the rate of 5 lit/sqm of the surface before the sand bed or subgrade is laid. If the filled earth has been well rammed and the surface does not allow the emulsion to seep through, holes upto 50 to 75 mm deep at 150 mm centers both ways may be made with 12mm dia. M.S. rod on the surface to facilitate absorption of the emulsion.

A hand pressure pump shall be used to carry out spraying operations to facilitate proper penetration of chemical into the earth.

The work shall be carried out to suit other relevant civil works.

Removing RCC / Brickwork / Plaster:

Dismantling brick masonry walls and partitions, plastered or un-plastered as per instructions including finishing the broken surface to match with the surrounding, removing the debris as directed within site, cutting the reinforcements if any etc., complete as directed. The dismantling of stone, masonry, BBCC, PCC and stone pitching would be measured under this item.

Dismantling the RCC beams, slabs, lintels, columns, pardi walls, platform, lofts, etc., including finishing the broken surface to match with the surrounding, removing the debris within site, including cutting the reinforcement if any etc., complete as directed.

PCC / RCC Work:

Providing and laying Plain and Reinforced cement concrete and Brick bat concrete. The work include providing, mixing, laying compacting curing, and necessary form works etc., complete for concrete work in strict accordance with the specifications and the drawings to the entire satisfaction of the Owner/Consultants.

All embedded items; buried piping and cables/conduits shall be inspected and approved before concrete is placed in position. It shall be the responsibility of the Contractor to see that all embedded and buried items remain in proper position while concreting is being done.

Unless otherwise specified, all work and materials shall conform to the latest version of IS: 456.

The ordinary concrete shall be in four grades designated as M 200, M 250 and M 300 with the suffix ordinary' added to it.

Where Ordinary Portland Cement conforming to IS: 269 is used, the 28 days compressive strength requirements shall be met at 7 days.

All types and brands of cement shall be subject to the approval of the Engineer-in-charge. Cement shall be generally ordinary Portland cement conforming to IS: 269.

Fine aggregates shall consist of natural sand, manufactured sand, or an approved combination thereof and shall conform to IS: 383. The grading zone of sand proposed for use shall be supplied by the contractor and got approved by the Engineer-in-charge.

The sand shall be of siliceous material, sharp, hard, strong and durable and shall be free from adherent coatings, clay, dust, alkali, organic material, deleterious matter, lumps, etc.

The fine aggregates shall generally have not more than 45% retained, between any two consecutive sieves and its fineness modulus shall not be less than 2.3 or more than 3.1.

Coarse aggregates shall consist of hard, strong, durable particles of crushed stone and shall be free from thin elongated soft pieces, organic or other deleterious matter. It shall not have adherent coatings. It will be from a source approved by the Engineer-in-charge.

Coarse aggregate shall conform to IS: 383.

In case of brickbat concrete, brickbats shall be used as coarse aggregate. Brickbat aggregate shall be broken from well-burnt and dense brick. It shall be homogeneous in structure and roughly cubical in shape. It shall be free from dirt of any other foreign material. The brickbats shall be of 40 mm to 50 mm size unless otherwise specified in the item. Under burnt or over burnt brick bats shall not be allowed.

Reinforcing steel shall be clean and free from loose mill scales, dust, loose rust and coats of paints, oil, grease or other coatings, which may impair or reduce bond.

Mild steel and medium tensile steel bars and hard drawn steel wire shall conform to the latest edition of IS: 432.

Bending of reinforcement shall be done in accordance with IS: 2502.

Water shall be clean and free from deleterious matter, such as oil, acid, alkali, chlorides and sulphates, sugar and vegetable matter. Only potable water shall be used directly from the supply mains.

Before proceeding to place the concrete, shuttering shall be realigned if necessary and water and the rubbish therein shall be removed by approved means.

The use of epoxy for bonding fresh concrete used for repairs will be permitted on written approval of the Engineer-in-charge. Epoxies shall be applied in accordance with the instructions of the Manufacturer. The cost of such repair when approved by the Engineer-in-charge shall be borne by the contractor.

The Contractor shall make arrangements to the satisfaction of the Engineer-in-charge for the storage of cement to prevent deterioration due to moisture and /or intrusion of foreign matter.

Coarse and fine aggregates shall be stacked separately in such manner as to prevent contamination by foreign materials.

Reinforcing steel shall not be stored directly on the ground. These shall be stored under cover and shall be protected from rusting, oil, grease and distortions.

The Contractor shall fabricate and/or fix up all the M.S. inserts, anchor bolts, anchor plates, pipe sleeves spouts, electrical conduits, fan hooks and junction boxes and other embedded items, as required at correct locations and elevations strictly in accordance with the drawings.

Immediately after compaction, concrete shall be protected against harmful effects of weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes and premature drying out. It shall be covered with wet sacking, hessian, or other similar absorbent material approved by the Engineer-in-charge soon after the initial set, and shall be kept continuously wet for a period of not less than 21 days from the date of placement. Masonry work over the foundation, concrete may be started after 48 hrs of its laying but the curing of concrete shall be continued for a minimum period of 21 days.

Masonry Work:

The work covered shall consist of providing and installing the above works as shown in the drawings and in accordance with the Specifications and shall generally conform to IS: 2212 and IS: 1905.

Bricks shall be of regular and uniform size, shape and colour, uniformly well burnt throughout but not over-burnt.

They shall have a frog of 10mm. Depth on one of their flat faces. They shall give a clear metallic ringing sound when struck.

Cement and sand shall be mixed in specified proportions for mortar. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

Bricks shall be soaked in water for a minimum period of one hour before use so that they will be saturated and will not absorb water from the mortar.

All brickwork shall be laid in English bond, even and true to line, plumb, level and all joints accurately kept. The bricks used on the face shall be selected whole ones of uniform size and with true rectangular face.

The brick shall be laid with stretchers in case of 110 / 115 mm brick wall.

These walls shall be constructed in cement mortar 1:4 and shall provide with RCC stiffeners of 155MM x 75 mm at every 1.5 meters and at corners unless otherwise specified. The RCC stiffener so provided shall have 4 Nos. of 6mm dia. horizontal rods with 6mm dia. Rings at 150mm c/s spacing. The binders in the brickwork shall run through such stiffener. The partition walls when constructed with RCC stiffeners shall be constructed in two stages i.e. in the first stage, the brick work upto stiffener level and after casting stiffener remaining height in second stage.

The brickwork shall be built in uniform layers, corners and other advanced works shall be raked back. Brickwork shall be done true to plumb or in specified batter.

Toothing (Zig-zag pattern) may be done where future extension is contemplated but shall be used as an alternative to raking back.

The thickness of joints shall not exceed 10 mm and this thickness shall be uniform throughout.

When fresh masonry is to be placed against existing surfaces of structures, these shall be cleaned of all loose material, roughened and wetted as directed by the Engineer so as to effect a good bond with the new work.

Green work shall be protected from rain by suitable covering. Masonry work in cement or composite mortar shall be kept constantly moist on all faces for a minimum period of seven days.

For a surface which is to be subsequently plastered or pointed the joints shall be squarely raked out to a depth of 15 mm while the mortar is still green. The raked joints shall be well brushed to

remove dust and loose particles and the surface shall be thoroughly washed with water, cleaned and wetted.

All brick work shall be measured in cubic meters/ (sq. meters in case of half brick masonry).

Plaster Work:

Surfaces to be plastered shall be thoroughly cleaned of all dust, moss, oil, and loose mortar. Joints shall be raked to a depth of 12mm minimum. Care shall be taken not to damage masonry edges while raking. All surfaces of concrete, old plaster and stone shall be roughened sufficiently for bond. Soft or crumbling brickwork and other surfaces shall be dismantled and re-made if required.

All surfaces to be plastered shall be thoroughly wetted for 24 hours before commencing plaster and shall be kept damp during the progress of work. Wetting shall be uniform and shall be ensured by damping evenly any dry patches before applying plaster. All preparatory work will be inspected by the Owner / Consultants and plastering shall not be commenced until all the preparatory works are approved by the Owner/Consultants.

Providing & Applying Cement plaster 12 mm thick

The surface to be plastered shall be washed with fresh clean water free from all dirt, loose material grease etc. and thoroughly wetted for 6 hours before plastering work is commenced. Concrete surfaces to be plastered shall be suitably roughened to provide necessary bond for the plaster.

The proportion of the mortar shall be as specified under the respective items of work. Cement shall be mixed thoroughly in dry condition and then just enough water added to obtain a workable consistency. The plaster shall be laid in a single coat. The mortar shall be splashed on the prepared surface with a trowel and finished smooth by trawling. The plastered surface shall be rubbed with iron plate till the surface shows cement paste. The work shall be in line and level. Curing of plaster shall be started as soon as the applied plaster has hardened enough so as not to be damaged. Curing shall be done by continuously applying water in a fine spray and shall be carried out for at least 7 days.

Providing and Applying 20 mm sand faced plaster

The surface to be plastered shall be washed with fresh clean water free from all dirt, loose material grease etc. and thoroughly wetted for 6 hours before plastering work is commenced. Concrete surfaces to be plastered shall be suitably roughened to provide necessary bond for the plaster.

This shall be applied in 2 coats. The first coat or the base coat shall be approximately 12 mm and shall be continuously carried out without break to the full length of wall or natural breaking points such as doors, windows etc.

The second coat shall be 6mm thick. Before application of the second coat, the base coat shall be evenly damped. This coat shall be applied from top to bottom in one operation and without joints, finish shall be straight, true and even.

B : Water Proofing:

For Toilet / WC:

Water proofing in toilets, bath & W.C. including Brick Bat Coba in all position consisting of specialized materials as per manufacturer's specifications and covering Ten years guarantee on requisite amount of stamp paper including all lead, lift, etc. complete. Measurements shall be taken as per actual measurements on site in cubic meter. The rate shall include for waterproofing plaster to all walls up to height of 600mm.

C : Plumbing Works :

All materials, fixtures and workmanship shall be in accordance with the relevant Indian standards specification and codes of practices otherwise specified hereunder.

Lift shall be measured from plinth level.

All Sanitary ware shall be of approved make and white in colour and of one piece construction.

All metallic fixtures like taps, Stopcocks, soap holder etc. shall be of CP brass and "L & K" or approved equivalent makes.

All wall fittings shall be fixed with pvc cleats and CP brass screw and Washers.

In addition to the sectional testing of water supply piping, contractor shall test installation on completion of the work to satisfaction of the engineer-in-charge.

Water Supply:**UPVC Threaded Pipes:**

High pressure uPVC threaded pipes as per ASTM-1785 (Threaded as per IS: 554)

For PVC compound grade equivalent to PVC 1120/2120 schedule 40 pipes and fittings.

Screwed uPVC pipe shall be jointed with screwed socket joints, using screwed fittings, elbows, tees, bends, unions, nipples, reducers, etc.

All pipes above ground shall fixed with PVC pipe clips/clamps, spacing as per manufacturer recommendation (no extra payment shall be made for clamps, hooks, cutting holes in walls, chasing and making good the same) All underground pipes shall have a minimum earth cover of 600mm or as directed by the Engineer-in-charge. (No extra payment shall be made for excavation in trenches refilling the same and removal of surplus earth.) before any pipes are covered up they shall be tested to a hydrostatic pressure 6 kg/ sq.cm.

In addition to the sectional testing of water supply piping, contractor shall test entire installation on completion of the work to the satisfaction of the engineer-in-charge.

The payment shall be made on running meter basis of the pipe laid. The rate included all the operation involved at all the stages of works.

Gun Metal Valve:

All full way gate valves shall be of heavy gunmetal and tested and shall be approved by the Engineer-in-charge. Valve shall confirm to IS: 778 size of valve chamber shall be as per item description of valve chamber shall be carried out as specified in specifications.

Drainage Work:

SRBC pipes, sockets and spigot ends, including necessary fitting i.e. Bends, Tees, Tees with door, Cleansing pipe, Sockets, Reducers, Plug, vent cowl etc. shall be of standard quality having pressure of 6kg/cm². Laying jointing as per manufacturer recommendation detail. The pipe shall be fixed 25 mm clear off the wall with M.S. holder bat clamps or as approved by the Engineer-in-charge. All hole on walls and floors shall be made good cement concrete m-150 grade and shall be leak proof. All soil and waste pipes shall be tested for leakage by hydraulic test.

Floor / Nanihi Trap:

Supply and fix in position. UPVC floor trap/ nahani trap shall be of standard quality Supreme/ Prince or equivalent make including square jali strips, laying jointing as per manufacturers recommendation etc. complete as directed.

Brick Masonry Manholes /Inspection Chamber / Valve Chamber:

Constructing manholes/ inspection chamber and valve chamber foundation concrete B.B.C.C. 1:3:6 (1 cement, 3sand, 6 brickbats 40 to 20mm nominal size) of the thickness of the bed concrete shall be 6" for manhole upto 5'-0" depth.

The walls of man hole /inspection chamber and valve chamber shall be carried out with good quality burnt bricks in cement mortar 1:5 the thickness of brick masonry shall be 230mm. The jointing face of such brick shall be well buttered with cement mortar before laying so as to ensure full joints.

Inside the wall shall be plastered 15mm thick with c.m. 1:5 and finished with floating coat of neat cement. All angles shall be rounded to 5 cm radius and all rendered internal surfaces shall have impervious finish obtained by using steel trowel. The external joints of masonry shall be finished smooth.

Channel shall be semi circular in the bottom half and of the diameter equal to the sewer. Above the horizontal diameter.

The sides shall be extended vertically to the same level, as the crown of the outgoing pipe and top edge shall be suitably rounded off. The branch channels shall also be similarly constructed with respect to the benching but at their junction with the main channel and appropriate fall suitably rounded off in the direction of flow in the main channel shall be done in cement concrete 1:2:4 rising at a slope in line from edge to channel. The channel chamber shall be plastered with cement mortar 1:2 and steel trowel; finish.

Sanitary Ware / Plumbing Fixtures: Chromium

Plated Cocks:

Bib cocks, stopcocks, Angle Cocks Flush Cocks, shall be chromium plated brass..

Wash Basin:

Wash hand basin shall be of approved make white glazed earthenware basin. This shall be fitted on C.I. or M. S. brackets the brackets shall be given

Two coats of white enamel paint or aluminum paint over a coat of primer.

The wall side shall be fixed wall flushed plaster or wall and the joint if any, shall be properly stopped with mortar and painted white. One pillar cock, one Angle cock, CP waste coupling, PVC connecting pipe with CP brass union, CP brass bottle trap, pvc waste pipe shall also be supplied and fitted with wash hand basin. The top of the rim of the wash hand basin shall be fixed at 800mm above finished floor level, unless otherwise specified.

Water Closet:

Wash down type glazed earthenware of approved makes white coloured water closet with integral 'P' or 'S' trap with soil pipe in cement mortar 1:1/ as per manufacturers recommendation. Including black seat and cover, brackets, joining of flush pipe, soil outlet including necessary fittings etc. Complete.

Urinals:

Urinal flat back (small) shall be of glazed earthenware of approved make white. These shall be mounted on walls. The flushing inlet pipe shall be CP brass 15mm dia. and PVC waste pipe 32mm dia with necessary fittings. Rawl plug with CP brass screws shall be used for fixing the urinal. Fixing shall ensure that no liquid is left over in pan after flushing unless otherwise indicated height above finish floor shall be 650mm. Urinals shall be connected to stop cock 15mm dia individually for flushing.

D: Flooring / Paving:

Providing and laying polished kotah stone flooring

Stone shall be of approved quality, size and uniform thickness, edges shall be chisel dressed and the top surface shall be machine polished with joints running true and parallel from side to side. Stones shall be laid on a bed of cement of lime mortar. The pattern of the flooring shall be as per the Architect's drawing. Thickness of mortar bedding shall be as specified in the item specification. The stone slabs shall be thoroughly wetted with clean water. Neat cement shall be spread over the mortar bed and the slabs shall be placed one by one keeping in check the level and line of the flooring. The slabs are then gently tapped with wooden mallet till it is firmly and properly bedded. There shall be no voids left. The joints shall not be more than 2 mm thick. The joints shall not smooth. If specification terrazzo filling of specified thickness shall be done in the joints between the kota stone slabs. The floor shall be kept covered with damp sand or water for a week. Stone shall be of sizes as specified. The stone shall be machine polished and then cleaned with oxalic acid. If the contractor is asked to mop the floor with kerosene and water by the engineer, the same be done without any extra cost. This shall be carried out daily at least for 10 times in 7 days.

This shall be measured in sq.mt. The rate shall include providing and laying, curing, machine polishing, cleaning etc. all complete.

Providing and laying kota stone in skirting & dado

The stone shall be of required sizes and the thickness shall be as mentioned in the item specification. The stones shall be pre-polished and machine cut. The stone's edges shall be dressed fine true, straight and at right angles to each other. The stones shall be fixed over cement mortar bed 1:4 (1 cement: 4 coarse sand). The joints are filled with ordinary cement and its hand and wax polished. The work shall be cured properly.

Providing & laying rough Machine cut kotah stone flooring

The stone shall be of specified thickness and size. The stones shall be placed on 40 mm thick CM bedding or lime mortar bedding and the joints shall be finished flush. The slope shall be maintained as given in the drawing or as directed.

Providing and laying white / Italian marble / Granite flooring

Stone shall be of approved quality, size and uniform thickness, edges shall be chisel dressed and the top surface shall be machine polished with joints running true and parallel from side to side. Stones shall be laid on a bed of cement of lime mortar. The pattern of the flooring shall be as per the Architect's drawing. Thickness of mortar bedding shall be as specified in the item specification. The stone slabs shall be thoroughly wetted with clean water. Neat cement shall be spread over the mortar bed and the slabs shall be placed one by one keeping in check the level and line of the flooring. The slabs are then gently tapped with wooden mallet till it is firmly and properly bedded. There shall be no voids left. The joints shall not be more than 2 mm thick. If specification terrazzo filling of specified thickness shall be done in the joints between the white marble stone slabs. The floor shall be kept covered with damp sand or water for a week. Stone shall be of sizes as specified. The stone shall be machine polished and then cleaned with oxalic acid. If the contractor is asked to mop the floor with kerosene and water by the engineer, the same be done without any extra cost. This shall be carried out daily at least for 10 times in 7 days.

Providing and laying vitrified / ceramic / glazed tiles in flooring, skirting and dado

The tiles in flooring and dado shall be of first class quality as specified in the item specification and shall be of standard size without warp and with straight edges true and even in shape and size and uniform colour. The tiles surface shall be of fine grained texture, dense and homogeneous. The thickness of the tile shall be as per the item specification. The tiles shall be submerged in water till the bubbles cease.

The rate quoted for flooring and dado work shall be inclusive of angles and corner pieces, cutting tiles for water points, such away that the point is in the junction of four tiles, electrical points etc.

E: Aluminum Window / Ventilators:

Sections

Sections for frames and shutters, interlocks etc., shall be extruded aluminium sections of Jindal or equivalent approved make.

Profile

Profiles of all sections shall be as shown in drawings or as approved by Owner.

Screws

Screws for fixing aluminium sections shall be brass oxidized and to be fitted at 14" c/c in staggered fashion and first screw to be at 8" from the edge on all sides. All screws shall be fixed with rawl plugs.

Fixtures

All internal fixtures shall be of aluminium. All members of frames shall be fixed with right angle aluminium cleats. Mitering for frames will be at 45° and shall be perfect without any gap.

Weather strip

EPDM/Neoprene/ (as approved) weather strips shall be provided at interlocks and meeting styles to make airtight enclosure after window is closed.

Locks and Fittings

They shall be of cast aluminium black anodized as per the approval of the Owner. All locks and fittings shall be of reputed make and approved by the Owner.

Anodizing

Thickness of anodizing at any point shall not be less than 20 microns. Anodizing shall be of uniform colour. No colour variation shall be acceptable and Anodizing color will be as per Architect/Owner requirement.

Sealing of Joints

All joints shall be sealed with gun grade weather silicone sealant of matching colour of Dow Corning or equivalent approved make. All mitred joints, jambs and screw position shall also be similarly sealed.

All aluminium sections confirm to HE 9 grade.

All other window details as per attached annexure.

Details of Aluminium windows & ventilators will be as per approved shop drawings by Architect/Owner.

F : False Ceiling :

All unevenness shall be rubbed down to smoothness with the paper and the surface shall be well dusted. The pores in the ceiling shall be filled up with filler made of paste and levelled.

It shall be formed by enclosing and bonding together a core of set gypsum plaster by two sheets of heavy paper. It shall offer high standard of safety, thermal efficiency and aesthetics. It shall be light in weight shall offer good fire resistance and shall render faster construction. It shall be suitably used in areas subjected to continuously damp or wet conditions, except bathrooms, where gypboard partitions shall be property protected by sites or other impervious materials. It shall be a non-resonant

material, rendering sound insulation. It shall be strong, durable and dimensionally stable. It shall offer a smooth surface which can be painted, tiled or wall papered. It shall block the passage of heat and shall retard the spread of fire it shall hide up to 60 db of sound, when erected in the proper manner.

Ceiling Tiles shall be made either from gypboard or from sugarcane fibers, as specified in the items.

They shall be resistant to fire, termites, fungus, wood boring, insects and other wood deteriorates. They shall be resistant to elimination due to moisture and cyclic changes in weather and humidity. They shall have high structural strength, good thermal insulation properties, thermal conductivity at mean temperature shall be 4.2 K.cal/cm./m~urhr.PC and good fire retardant properties. It shall have a density of 288 Kg/m'. 10% and shall weigh 3.71 Kg/m2. Whenever, P.F resin shall be used in bonding, good weather and boiling water proof properties shall be rendered under ISS and BSS specifications. They shall favorably absorb sound, rendering good acoustic properties.

Gypsum false ceiling

The Gypsum False ceiling shall be prepared with the below mentioned ingredients and other necessary materials: (I) Gypsum board (ii) supporting materials (iii) Screws.

Supporting system at distances specified by manufacture to be provided adjoining to walls/ ceilings as per requirement and make levelled properly to received gypsum false ceiling.

Necessary nails, screws, scaffolding etc to be required.

Shera Flexy Cellulose Fiber Cement Board False Ceiling / Panelling :

The Shera board ceiling shall be prepared with the below mentioned ingredients and other necessary materials: (I) flexy cellulose cement board manufactured by Shera (ii) supporting materials (iii) Screws.

No special tools are required. The products can be hit by normal nails like wood work, fastened by normal or self-drilling screws and cut by hand saw or electric power saw.

Fiber-cement flat sheet can be fixed to both timber and steel frames. The board must be supported at the edges and at intermediate positions with centers not exceeding 600 mm. The joints shall be on the center of support frame, which have spacing not more than 600 mm.

Fastener can be both nails and screw. It can be nailed directly to timber supports with round wire nails. The nail length shall be approximately 1-1.5". For the products over 8 mm. thicknesses, a pilot hole of 0.8 times the nail diameter must be predrilled.

Since Fiber-cement board is subjected to slightly dimensional changes, butt joint can be used in dry partitioning area or where the exposed joint appearance is acceptable. For better water protection, either acrylic or polyured sealant can be used to seal the gap of 3-5 mm.

Armstrong "Plain / Perforated Tiles Ceiling" (Exposed Grid System) "

The grid shall be of "Armstrong" make with 15mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 43mm and a load carrying capacity of 23.71 Kgs/M2. The T Sections have a Galvanizing of 120 grams per M2 & passed through 500 hrs of Salt test.

The tiles shall have Humidity Resistance (RH) of 100%, Fire Performance A2-s1.d0 in module size of 600 X 600 mm, suitable for Green Building application, with Recycled content of 50%.

The Tile & Grid system to be used as per the design drawing and shall carry a 15 year warrantee as a system.

G : Furniture Work :

Wood work

The carpentry and joinery work shall include the furnishing of all labour, materials, equipment, incidentals and appliances required to complete the work including the provision and installation of fastening devices and hardware in accordance with the drawings and the schedule of hardware.

The Contractor shall before proceeding with the work submit to the Architect for his approval complete samples of the various materials including hardware and fastening devices and shop drawings and large scale details covering all joinery work.

Joinery Materials

Finished wood work and joinery including frames for doors, door shutters etc. shall be of straight grained selected quality Ballarsha teak wood free from knots and other blemishes and imperfection. All finished woodwork and joinery shall be seasoned to not less than 10 % moisture content. All carpentry work shall be done by workmen skilled in this trade and the work shall be carried out with the use of proper tools. All joinery work shall be securely mortised and tenoned and glued with best quality waterproof glue. All sections and dimensions to be as shown on drawings. For all joinery work use of nails shall not be permitted, and wood screws of appropriate size and of approved make shall be used. Wherever practicable, means of fastening the various parts together shall be concealed. The frames shall be fixed to supports with threaded expansion bolts.

All work (both carpenter and joinery) shall be to the dimensions shown on drawings.

All interior wood finish, doors and cabinet work shall be smoothly treated and sanded at the building after erection, until the defects are entirely removed. Any material showing splits, sand paper or other defacing marks or other defects shall be rejected. All exposed wood and plywood shall be straight grained, of matched grain and color and shall be subject to approval by the Architect.

Installation

Door shutters shall be installed in position after the plaster in the section for which it is intended is sufficiently dry.

All interior and exterior doors shall be properly installed, level, plumb and true. Butt joints shall be avoided wherever possible; if unavoidable the joint shall be beveled. All exterior angles shall be mitered. Adjoining interior wood members shall match and harmonize.

Wood Frames for Doors, Glazing

Wood frames for door shutters where called for shall be of selected quality of best available teakwood as approved by architect, properly seasoned as described for joinery and free from knots, cracks and other defects. It shall have uniform color and straight grains. The frame member shall be of one piece and to the dimensions and profile shown on the drawings. All rebates rounding, moulding etc. shall be accurately made as per details. The frame shall be planed smooth to the correct dimensions as per drawings.

All joints shall be simple, neat and strong. All mortise and tenon joints shall fit in fully and accurately without wedging and shall be neatly done.

Before fixing the frame wall side of the frame shall be painted with Anti termite black Japan as approval by Engineer in charge/Architect. The framework shall be fixed to the supports through threaded expansion bolts or other means as called for in the drawings and as directed by the Architect/Engineer in charge.

Cabinet Works

General: Cupboards, wardrobes and all cabinet work shall be fabricated and assembled in the workshop as far as practicable and then brought inside the building ready to set in place. The various members shall be worked in the best manner known to the trade, mortised and tenoned, dowelled

blocked and glued together so as to avoid the use of nails as much as possible. The details shall be clearly followed, moulding clearly cut and meters accurately made.

Free edges of shutters, shelves, partitions, sides etc. shall be provided with first class teakwood edging, glued and nailed in approved manner.

Shelves, where shown fixed, shall be supported on aluminium or other cleats or in other manner as approved by the Architect. Adjustable shelves shall have brass sockets and pins as detailed on drawings.

Drawer bottom shall be of 6 mm commercial ply, unless otherwise shown. Drawer front sides and back shall be of first class teakwood. The drawers shall slide on metal bearers as shown on drawings.

Timber skirting where called for shall be of first class teakwood, cut to required sizes, planed smooth on visible faces and fixed in position in approved manner.

Cut-outs, opening, etc. shall be provided in the counters and cabinets to accommodate sinks, cooking ranges, pipes etc. as shown on drawings and as required at site.

Hardware Fittings

Hinges, handles, knobs, locks, ball catches, stoppers, stays, sliding gear and other hardware fittings for doors and windows and cabinet work shall be of the best quality and specified make as approved by the Architect. The number, size, etc. shall be as per the hardware schedule and as shown in the drawing.

Preservative Treatments

All wood work in contact with masonry shall be painted with approved asphalt or bitumen paint before placing; care shall be taken to keep exposed surfaces clear from tar etc. Tar felt shall be used to isolate wood from masonry wherever practicable. All concealed wood members in ceiling, partitions, cabinet work, etc. shall be treated fully and liberally with solignum before placing in position.

Built in Joinery

Where joinery work is specified to be built-in, it shall be the responsibility of the Contractor to ensure that the joinery works are set plumb and true and shall not be damaged or displaced by subsequent operations. The Contractor shall also provide and secure suitable anchors or other fixings, all as per drawings and details.

Plywood:

The plywood for general purpose shall conform I.S. 303-1975.

According to I.S. 303-1975 the plywood for general purpose shall be of three grades BWR, WWR and CWR, depending upon the adhesives used for bonding and veneers, and it will be further classified into six types namely AA, AB, AC, BB, BC and CC based on the quality of the two faces, each face being of three kinds namely, A, B and C, After pressing, the finished plywood more than 16 percent.

Thickness of plywood Boards:

TABLE

Board	Thickness	Board	Thickness	Board	Thickness	Board	Thickness
3 ply	3 mm	5 ply	5 mm.	7 ply	9 mm.	9 ply.	16 mm.
	4 mm.		6 mm.		13 mm.		12 mm.
	5 mm.		8 mm.		16 mm.	11 ply.	19 mm.

	6 mm.		9 mm.	9 ply	13mm.		22 mm.
							25 mm.

Water Proof (Weather Proof) Plywood

The plywood shall be from standard company, as approved by the Architect and Engineer in charge. It shall conform to IS: 7 1 0 1 976 and to the relevant Defence and Navy

Plywood shall be made from veneers of hard wood timbers and bonded with high quality BWP type Phenol formaldehyde Synthetic Resin Adhesive and hot pressed at high temperature and pressure, and further treated with a fixed type of preservative by vacuum cum pressure impregnation, to produce thin boards or heats of wood panels.

Plywood shall be waterproof, weather proof, boil proof, highly durable even against strenuous vulnerable uses. It shall resist the attack of termites, cockroaches, wood burrowers, fungus, mould, rot, decay and other wood destroying insects and marine organisms.

The moisture content shall be less than 10% and the plywood shall have high fire resistance and shall be free from any cracks, wraps, split etc., and shall have uniform strength all over the panel surface. It shall be used for marine structures, leather tanning tables, wall paneling, underpayment for kitchen and other furniture, subjected to heat and moisture.

Commercial Ply

The plywood shall be from standard company, as approved by the Architect and Engineer in charge. It shall conform to relevant I.S. Code.

Plywood shall be made from hard wood timbers, finished with selected species of timber, suitable for veneers and bonded with strictly controlled and evenly spread adhesives.

It shall be smooth and strong and shall be free from warping, cupping and twisting.

Laminates & Veneers:

Decorative Laminate:

It shall be obtained from standard company as approved by the Architect and Engineer in charge. It shall conform to relevant I.S. Code.

Laminate shall be made from hard wood timbers, finished with selected species of timber, suitable for veneers and bonded with strictly controlled and evenly spread adhesives. It shall be smooth and strong and shall be free from warping, cupping and twisting.

Decorative Veneers:

Decorative veneered plywood obtained from standard company as approved by the Architect and Engineer in charge. It shall be manufactured using veneers of the best quality timbers like Teak, Rosewood, Walnut, Laurel, White Cedar and many others.

They shall be available in flitch form as well as in lay on form, in sizes suitable to the furniture industry they shall be available either flat or quarter sliced, varying in thickness from 0.2 mm. to 1.5 mm. Lengths Shall vary up to 4 m.

Block Boards:

They shall be manufactured from well selected and seasoned hardwood timbers, used in study construction. They shall be usually bonded with Urea Formaldehyde, however against specific requirements, Phenol Formaldehyde bonded boards shall also be available. The block board shall be from Birla, Century, Anchor Plywood or equivalent, as approved by the Architect and Engineer in charge. It shall conform to relevant I.S. Code.

They shall be strong, weather and water proof and shall be ideally used for high quality furniture and exterior applications.

Teak wood:

The teak wood shall be of good quality as required for the item to be executed. When the kind of wood is not specifically mentioned, good Indian teak wood as approved shall be used.

Teak wood shall generally be free from large, loose, dead or cluster knots, flaws, shakes, warps, twists bends or any other defects. It shall generally be uniform in substance and of straight fibers as far as possible. It shall be free from rot, decay, harmful fungi and other defects of harmful nature which will affect the strength durability of its usefulness for the purpose for which it is required. The color shall be uniform as far as possible. Any effort like painting, using any adhesive or resins materials made to hide the defects shall render the pieces liable to rejection by the Engineer-in-charge.

All scantlings, planks etc. shall be sawn in straight lines and planes in the direction of grains and of uniform thickness.

First class teak wood:

First class teak wood shall have no individual hard and sound knots, more than 6 sq. cm. size and the aggregate area of such knots shall not be more than 1% of area of piece. The timber shall be closed grained.

Second Class Teak Wood:

No individual hard and sound knots shall be more than 15 Sq. cms. In size and aggregate area of such knots shall not-exceed 2% of the area of piece.

Non-teak wood:

The non-teak wood shall be chemically treated, seasoned as per IS Specifications and of good quality. The type of wood shall be got approved

The non-teak wood shall be free from large, loose and dead of cluster knots, flows, shakes warps bends or any other defect. It shall be uniform in substance and of straight fibers as far as possible. It shall be free from rot, decay harmful fungi and other defects of nature which effect the strength, durability or its usefulness for the purpose for which it is required. The color of wood shall be uniform as far as possible. The scantlings planks etc. shall be sawn in straight lines and planes in the direction of grain and uniform thickness.

The tolerance in the dimension shall be allowed as 1.5 mm. per face to be planed.

Wood Frames

All joints shall be simple, neat and strong. All mortise and tendon joints shall fit in fully and accurately without wedging and shall be neatly done.

Before fixing the frame wall side of the frame shall be painted with Anti termite black Japan as approval by Engineer in charge/Architect. The framework shall be fixed to the supports

through threaded expansion bolts or other means as called for in the drawings and as directed by the Architect/Engineer in charge.

Wooden Flush Door Shutters (Solid Core):

The solid core type flush door shutters shall be decorative or non-decorative type as specified in the drawing. The size and thickness of the shutter shall be as specified in drawings or as directed. The timber species for core shall be used as per I.S. 2202- (Part-I) 1980. The timber shall be free from decay and insect attack. Knots and knot holes less than half the width of cross-section of the members in which they occur may be permitted. Pitch pockets, Pitch streaks and harmless pin holes shall be permissible except in the exposed edges of the core members. The commercial plywood, cross-bands shall conform to I.S. 303-1275.

The face panel of the shutters shall be formed by gluing by the hot press process on both faces of the core with either plywood or cross-bands and face veneers. The hopping rebating opening of glazing, Venetian etc. shall be provided if specified in the drawing.

All edges of the door shutters shall be square. The shutters shall be free twist or warp in its plane. Both faces of the shutters shall be sand papered to smooth even texture.

The shutters shall be tested for

End immersion test: The test shall be carried out as per I.S. 2202 (part-I) 1980. There shall be no de-lamination at the end of the test.

The thick of the shutters shall be uniform throughout with a permissible variation of not more than 0.8 mm. when measured at any two points.

Particle Board:

The particle board used for face panels shall of best quality free from any defects. The particle boards shall be made with phenol maldehyde adhesive. The particle boards shall conform to IS: 3087 1965 "Specifications for wood particle board for general purpose. The size and the thickness shall be as indicated.

Particle board shall be made completely from Teakwood and shall be bonded with BWP type Phenol Formaldehyde synthetic resin to give a flat, strong and homogenized panel.

It shall be durable and shall have smooth surface so as to take any type of surface treatment, like polishing, painting, laminating or veneers. It shall be fire resistant, weather resistant, termite and insect resistant. It shall be dimensionally stable, structurally strong and acoustically superior.

MDF (Medium Density Fiber) Wood:

The MDF wood shall conform to IS: 12406 1988.

MDF wood shall be manufactured from wood fibers and synthetic resin binder to produce homogenous sheet material, having minimum density about 600 to 900 kg/m³. It shall have moisture content less than 8% and water absorption less than 12% at 24 hours soaking. It shall have modulus of rupture and tensile strength at least 60 N/mm² and 0.8 N/mm², respectively.

The screw withdrawal strength shall be minimum 3000 N. for face and 1800 N. for edge. It shall be highly resistant against termite, insects and it shall possess good heat and sound insulation. It shall be easily workable for molding, carpentry, routing etc. It shall be free from any cracks, wraps, splits etc. and shall possess uniform strength in all direction

Aluminum doors, Windows, Ventilators.

Aluminum alloy used in the manufacture of extruded window sections shall conform to I.S. designation HEA-WP of I.S.:733-1975 and also to I.S. Designation WVG-WP of I.S. 1285-1975. The Section shall be as specified in the drawing and design. The fabrication shall be done as directed.

The hinges shall be cast or extruded aluminum hinges of same type as in windows but of large size.

The hinges shall normal be of 50 mm. projecting type. Non-projecting type of hinges may also be used if directed. The handles of door shall be of specified in the drawing and design. A suitable lock for the operatable either from outside or inside shall be provided in double shutter door the first closing shutter have concealed aluminum alloy bolt at top and bottom The fabrication shall be done as directed.

Glass:

All glass shall be of the best quality free from specks, bubbles, smokes, veins, air holes blisters and other defects. The kind of glass to be used shall be mentioned in the item or specification or in the special provisions or as shown in detailed drawings. Thickness of glass panes shall be uniform. The specifications or different kinds of glass shall be as under.

Sheet Glass:

In absence of any specified thickness or weight in the item or detailed specifications of the item of work, sheet glass shall be weighing 7.5 Kg/Sq.m. for panes up to 600 mm x 600 mm.

For panes larger than 600 mm. x 600 mm. and up to 800 m. x 800 mm. the glass weighing not less than 8.75 Kg/Sq.m. shall be used. For bigger panes up to 900 mm. x 900 mm. glass weighing not less than 11.25 Kg/Sq.m. shall be used.

Sheet glass shall be patent flattened glass of best quality and for glazing and framing purposes shall conform to I.S.: 1761-1960. Sheet glass of the specified colors shall be used, if so shown on detailed drawings or so specified. For important buildings and for panes with any dimension over 900 mm. plate glass of specified thickness shall be used.

Polyester Films:

It shall of the best quality and conform to the relevant I.S. specifications.

It shall reject about 76% of the total solar energy, it shall reduce 97% of the harmful UV radiation. It shall eliminate 80% of the sun glare. Its trait makes the glass surface shatter resistant when bonded on to glass. It shall be free from all fire hazards. It shall be available in various reflective shades.

Acrylic Sheets:

Acrylic sheet be of thickness as specified in the item and of a specified shape and size as the case may be. Panels may be flat or curved. It shall be light in weight. It shall be colorless or colored or opaque as specified in the item. Colorless sheet shall be as transparent as the finest optical glass. Its light transmission rate shall be about 95%. Transparency shall not be affected for the sheets of larger thickness. It shall be extremely resistant to sunlight, Weather and low temperatures. It shall not show any significant yellowing or change in physical properties or loss of light transmission over a longer period of use. The sheet shall be impact resistant also. Sheets shall be available in complete range of standard transparent, translucent and opaque colors. Sheets shall be of such quality that they can be cut bent and jointed as desired. Solution for the joints shall be used as per the requirement of manufacturer.

Non Asbestos Cement Sheets

Non Asbestos cement sheets plain, corrugated or semi corrugated and curved shall be from Everest or equivalent, as approved by the Architect or Engineer in charge. It shall conform to IS: 459 1970. The thickness of the sheet shall be as specified in the item. The sheet shall be free from all defects such as cracks, holes, deformation, and chipped edge or otherwise damaged.

It shall have high tensile strength and high slenderness ratio.

The minimum nominal thickness of sheets shall be 6 mm. having covering efficiency of about 90% and weight 1518 Kg. /cm². The sheet shall be free from all defects such as cracks, holes, deformation, and chipped edge or otherwise damaged. The permissible bending stress shall be 130 Kg. /cm².

The accessories shall be of same thickness that of Non A.C. sheets. They shall be suitable for all the types of sheets and locations. They also shall be from approved manufacturer and shall be free from any defects. The fixing of Non A.C. sheets and accessories shall conform to IS: 730.

Fixtures and Fastenings:

General

The fixtures and fastenings, that is, butt, hinges, tee and strap hinges sliding door bolts, tower bolts, door latch, bath room latch, handles, door stoppers, casement window fasteners, casement stays and ventilators catch shall be from the standard company as approved by Architect and Engineer in charge as specified in the item or its specifications.

They shall be of iron, brass, aluminum, chromium plated iron chromium plated brass, copper oxidized iron, and copper oxidized brass or anodized aluminum as specified.

The fixtures shall be heavy, Medium or light type. The fixtures and fastenings shall be smooth finished and shall be such as will ensure ease of operation.

The samples of fixtures and fastenings shall be got approved as regards quality and shape before providing them in position.

Brass and anodized aluminum fixtures and fastenings shall be bright finished.

Holdfasts:

Holdfasts shall be made from mild steel flat 30 cm. lengths and one of the holdfasts shall be bent at right angle and two nos. of 6 mm. diameter holes shall be made in it for fixing it to the frame with screws. At the other ends. The holdfast shall be forked and bent at right angles in opposite directions.

Butt hinges:

Railway standard heavy type butt hinges shall be used when so specified. The strap hinges shall be manufactured from M. S. Sheet.

Siding door bolt (Andros)

The Andros as specified in the item shall be used and shall be got approved.

Tower bolts (Barrel Type)

Tower bolts as specified in the item shall be used as shall be used and shall be got approved.

Door Latch:

The size of door latch shall be taken as the length of latch.

Bathroom Latch

Bathroom latch shall be similar to tower bolt.

Handle

The size of the handles shall be determined by the inside grip length of the handles. Handles shall have a base plate of length 50 mm more than size of the handle.

Door Stopper

Door stoppers shall be either floor door stopper type or door catch type floor stopper shall be of overall size as specified as shall have rubber cushion.

Door Catch

Door catch shall be fixed as height of about 900 mm from the floor level so that one part of the catch is fitted on the inside of the shutter and the other part is fixed in the wall with necessary wooden plug arrangements for appropriate fixate. The catch shall be fixed 20 mimeses the face of the door for easy operation of catch.

Ventilator catches

The pattern and shape of the catch shall be as approved.

Pivot

The base and socket plate shall be made form minimum 3 mm thick plate and projected pivot shall not be less than 12 mm length and shall be firmly riveted to the base plate in case of brass pivot.

Thermal Insulation Products

Roofmate SL, an Extruded Polystyrene Board (popularly known as XPS) is a product made out from polystyrene by a special extrusion process technology in form of a factory made slabs of predetermined thickness like 25, 30, 40, 50 and 75 mm. Roofmate slabs are available in size of 1.25 x 0.6m having edges finished with Square, shi lap or tongue & groove type. Other varieties of

Extruded polystyrene for walls is Wall mate and Floor is Floor mate **Paints**

All the paints shall meet with the following general requirements:

Paint shall not show excessive setting in a freshly opened full can and shall easily be registered with a paddle to a smooth homogeneous state. The paint shall show no curdling, leveraging, caking or color separation and shall be free from lumps and skins.

The paint as received shall brush easily, possess good levelling properties and show no running or sagging tendencies.

The paint shall not skin within 48 hours in a three quarters filled closed container.

The paint shall dry to a smooth uniform finish free from roughness grit, unevenness and other imperfections.

Ready mixed paint shall be used exactly as received from the manufacturers and generally according to their instructions and without any admixtures, whatsoever.

Enamel Paints

The enamel paint shall satisfy all general requirements in specification of oil paints. Enamel paint shall conform to IS: 2933 1975. It shall offer variety of finishes like Glossy, Semi glossy, Pearl luster and Matt.

It shall be applied either by brush, roll or spray. It shall have a covering capacity of 13 to 18 Sq.mt. per coat depending on the surface to be painted. It shall be used both on metal and wood surfaces.

It shall have a viscosity of application of 60 to 65 seconds, if brush or roller is used and 30 to 40 seconds, if spraying is done. It shall have flash point at above 30° C. The drying time shall however vary with the ambient temperature and humidity.

Acrylic Emulsion:

It shall be used on both interiors and exteriors, on all different types of plaster, wooden surfaces, stone, brickwork, asbestos cement sheets, hard and soft boards, etc. It shall render rich smooth finish and shall provide a tough film that forms a suitable protector against all elements.

It shall be water soluble. It shall require no primer. On a well prepared surface, it shall be applied, after one coat of cement primer, in case it is an interior surface and waterproof cement coating, in case it is an Exterior surface. On a new but highly absorbent surface, a thin coat of the same shall be applied by adding Two parts of water by volume to two parts of Acrylic Emulsion by volume. On previously painted surfaces, One coat of the same shall be applied by thinning four parts of the emulsion with one or two parts of water. It shall be applied by brush, roller or spray. It shall have a covering capacity of 25 30 m²/liter, depending on the surface and shade used. It can be washed to remove the day-to-day dirt, after the surface has been painted, minimum for a month.

Oil Paints

The ready mixed paints shall only be used. However, if ready mixed paint of specified shade or tint is not available white ready mixed paint with approved strainer shall be allowed. In such a case, the Contractor shall ensure that the shade of the paint so allowed shall be uniform.

Textured Wall Finish

It shall be a two component finish. It shall be easily applicable using trowels and no special tools and training shall be required for application. The single coat application thickness shall be 1.5 mm thick, of color and texture, as approved by the Architect. It shall be weather and fade resistant, water and damp resistant, durable and highly washable. It shall be acid and alkali resistant, high abrasion resistant, nontoxic and shall be capable to taking any shape. It can be applied on wide variety of surface like cement mortar, plywood, plaster board, A.C. sheet, Asbestos board, gypsum plaster or any other materials, to get homogenous layer.

It shall be water soluble to avoid water contamination, incombustible and flexible. It shall be good fire resistant, anti-fungal, good impact resistant having adhesion strength more than 8 Kg/cm². There shall not be any development of hair line cracks and no peeling off shall occur, after the maximum drying time of 4 hours and curing period of 2 days.

Water Bound Distemper

It shall be available in dry powder form and shall be prepared by adding preferably warm water, in the Manner and proportion, as described by the manufacturer. It shall be applied by the conventional distemper brush to all plastered walls, ceilings and woodwork. It shall generally not require any primer, But if found necessary, a size coat made by an experienced painter from glue, soap and warm water and Distemper powder shall be applied. It shall offer a covering capacity of 13 16 m, per Kg. depending on the surface and shade used.

Cement Paints

It shall be manufactured from selected range of raw materials and a special cement, so that it shall be suitable for both indoors and outdoors. It shall be suitably used on concrete renderings, cement/sand Renderings, cement/lime/sand renderings, asbestos sheets, Fiber boards, brickwork, etc. It shall offer matt Finish. It shall require no primer and shall be water thinnable. It shall offer a covering capacity of 6 to 8 Sq.mt. per Kg., depending on the surface and shade used. It shall preferably not be applied under direct sunlight to avoid patchy effect.

Polyurethane Coatings

It shall be a three coat application, using a brush or a roller. It shall be available in variety of decorative finishes, i.e. in almost all shades and in glossy and matt finishes. It shall offer the following properties:

Adhesion to concrete surfaces. Sealing effect

against heavy rain. Good water vapour diffusion.

Weather resistance, color stability, gloss retention and chalk resistance.

Resistance to disinfectants, chemical, tire, radiation, acid gases, abrasion and wear. Low soil adhesion.

It shall be ideal for concrete, floor toppings, on calcium silicate brickwork, glass Fiber reinforced concrete, and wood Fiber. Plaster board, Fiber reinforced plasterboard. It shall absorb UV radiation and shall be easily cleaned of radioactive contamination. The ultraviolet part of the solar radiation shall not affect the coating and thereby shall be long lasting.

French polish

The French polish of required tint and shade shall be prepared with the below mentioned ingredients and other necessary materials.

Denatured spirit of approved quality iii) Chandra's (iii) Pigment. The French polish so prepared shall conform to IS: 348 1968.

Melamine Polish

It shall give silken, smooth finish. The Melamine polish shall have shade and shine, either satin or glossy as approved by the Architect. It shall be two component polish consisting of a base and

hardener. It shall be capable of protecting wood from moisture, heat, cold, scratches, stains, cigarette burns etc. It shall have excellent covering capacity. It shall be applicable to all wooden surface of every shape. It shall be applied using brush or spray gun. It shall require lesser time to dry and there shall be no cracks or peeling of the polish. There shall not be any undulation on the finished surface nor cracks at joints. It shall be of any desired shade as approved by the Architect. It shall have excellent color, shall be free flowing and shall have good levelling properties. It shall be durable and flexible to absorb cracks. It shall have resistant to scrubs, light rays, heat etc.

Acrylic Wood Polish

It shall be water resistant, heat resistant and scratch resistant.

It shall offer a silky smooth wood finish. It shall offer any desired shade like rosewood, amber. Mahogany, walnut etc. It shall have excellent covering capacity. It shall be applied to all wooden surfaces, of every shape. It shall give a tough and durable surface: it shall require lesser time to dry and shall cover a wider area. On application, it shall form a layer of acrylic which eliminates sanding the surface and therefore helps to reduce time and labor. It shall not require any special equipment to apply,

This shall be diluted as per manufacturer's instructions with clean water and not with turpentine. Pigmented priming coat (emulsion thinned with water) followed by three or more finishing coats of plastic emulsion paint. Pasted filler to be applied after every coat except the final finishing coat and sanded the surface on finishing shall present a flat velvety smooth/ pearl luster (semi-gloss) finish as specified.

Polyurethane Painting

The Polyurethane Painting shall be applied three coats. In case of interior application to interiors, one coat of penetrating primer, shall be applied by brush and subsequently, putty if necessary and lastly two coats of finish paint by brush or roller as per manufacturer's instructions.

Sandtex Matt Paint

The sandtex matt paint from Snowcem or equivalent applied in two coats with brush on exterior wall surface free from mortar droppings and other foreign matter and sand paper smooth.

PU Finish

The PU finish of required tint and shade shall be prepared with the below mentioned ingredients and other necessary materials: (I) Denatured spirit of approved quality (ii) Chadras (iii) Shellac (iv) Pigment (v) PU polish of approved co.

All unevenness shall be rubbed down to smoothness with the paper and the surface shall be well dusted. The pores in the wood shall be filled up with a filler made of paste of whiting in water or methlylated spirit (with a suitable pigment like burnt sienna or umber if required): Otherwise the polish will get absorbed and a good gloss will be difficult to obtain.

Specification for Custom Made Furniture Items

Cabinet (below Basin, Above Sink, / Desk Constructions :

Material:

The specification of any material is as per the standard specification mentioned in chepter-1

Construction & Fabrication

Rigid Knock down / Fix construction.

The structure must be done from approved Brand Plywood – 18, 12, 6 mm Thick as per detailed drawing with approved teak wood beading and Frame. Main body from 18mm thick ply. Make necessary arrangements for Electrical and Plumbing Connection where ever required.

Shutter Arrangement

Openable Shutters from 18mm thick ply as per detailed Drawing.

Each door must be provided with minimum 2 nos of Auto Hinges for smooth movement of door & less noise.

Top mounted channel for sliding shutter as per detailed drawing.

All drawers should be have two telescopic channels and must be from 18mm thick ply as per detailed drawing.

Locking & handle:

Snap on type aesthetically appealing die cast lock for safe locking.

Handle from Electrotherm Brass Handle with SS finish as per the approval of Architect

Finish:

Melamine polish on 4mm thick Veneer and wooden beading fix on all outer side of unit , Internal portion of unit-1 mm thick Plain color Laminate. Apply Silicon at joint with existing civil structure where ever required. Two coats of approved Primer with Antitermite chemical in necessary proportion as mentioned in product catalogue must be apply on the side adjoining to the wall or stone.

PU polish on 4mm thick Veneer and wooden beading fix on all outer side of unit , Internal portion of unit-1 mm thick Plain color Laminate as per detailed drawing. Apply Silicon at joint with existing civil structure where ever required. Two coats of approved Primer with Antitermite chemical in necessary proportion as mentioned in product catalogue must be apply on the side adjoining to the wall or stone.

Pantry Cabinet Bellow Sink Pantry

Cabinet Above Sink Modular Display

Board

The Structure must be done from approved brand of MS tube with proper powder coating to fix Plywood and Tag board – 18, 12, 6 mm Thick as per detailed drawing with approved wooden beading or frame. Main Structural body from heavy duty MS tube. Make necessary arrangements for Electrical Connection where ever required.

Caster

Approved Lockable caster wheel fixed with powder coated MS tube structure and hidden in Laminated or Veneer finished Ply box as per the approval of Architect

Finish

Approved colored and quality of Jute cloth on Tag board, which must be fix with 18mm thick ply.

Cabinet Bellow Basin

Rigid Knock down / Fix construction.

The Structure must be fixed by wooden studs on PCC, RCC, Brick or any wooden partition structure to fix Laminated or Veneered Ply wood shelves as per detailed drawing with approved type of wooden beading. The screw must not be visible.

Shelving's:

All sides and shelves must be 36mm thick from 18mm thick approved brand Waterproof plywood and veneer finished with approved type of wooden beading. The compartment must be from 12 mm thick ply with veneered finish. It must be fixed with the screw to the main MS structure or wall panelling as per the approval of Engineer in charge or Architect.

Approved shade of PU / Melamine polish on the Veneered surface and wooden beading of approved type.

Wooden Cladding on Wall / Ceiling:

Rigid Knock down / Fix construction.

The 45mm thick Panel must be made from 18mm thick ply and fixed by wooden studs on PCC, RCC, Brick or any wooden partition structure to fix Veneered finished Ply wood cladding as per detailed drawing with approved type of wooden beading. The gap between wall and Cladding will be up to 23cm. All edges must be wooden finished and match with the supported profile. The screw must not be visible.

Approved shade of PU / Melamine polish on the Veneered surface and wooden beading. Back side of Ply must be painted by two coat of primer.

File Cabinet With / Without Glass or Solid or Shutter:

Rigid Knock down / Fix construction.

The structure must be fabricated from approved Brand of Plywood – 18, 12, 6 mm Thick as per detailed drawing with approved wooden beading and Frame. Main body from 18mm thick ply. Make necessary arrangements for Electrical Connection where ever required. Apply Silicon at joint with existing civil structure where ever required.

Shutter & Shelves Arrangement

Openable Shutters from 12mm thick Glass with 10mm thick Aluminum Anodized frame as per detailed Drawing.

Each door must be provided with minimum 3 nos of Auto Hinges for smooth movement of door & less noise.

All shelves shall be have four SS bracket and must be from 12mm thick glass as per detailed drawing.

Grills:

Supply, installation, testing and balancing of powder coated extruded Aluminium grilles, as per the approved shop drawings and the specifications.

ALL continues grills with volume control dampers, backed enamel painted.

Annexure-----LIST OF IS CODES

DESCRIPTION**APPLICABLE STANDARDS**

Timber Door, Window & Ventilator Frames	IS:4021
Material & Workmanship for Wood Work	IS:883, IS:4021
Wood Flush Door Shutters (Solid Core Type)	IS:2202 (Part I) 1980
Timber Panelled & Glazed Shutters	IS:10032 (Part I & II)
Plywood & Tests	IS:303-1975
Particle Board	IS:3087-1965
Transparent Sheet Glass for Glazing & Framing Purpose	IS:1761-1960
Alluminium Alloy for Door/Window Frames	IS: DSGN. HEA
WP OF	
IS:733-1975, IS	
DSGN. WVG WP OF	IS:1285-1975
Sections	IS:1948
Anodizing	BS:1616-1961
Distemper & Oil Emulsion	IS:428
Enamel Paints	IS:2933-1975
Coat of Zinc Chromate	IS:104-1950
French Spirit Polish	IS:348-1968

NOTE: For the reference of all Codes and Standards, the latest version of the above specified Standards shall be followed. Wherever, such Standards are not specified for the construction material, equipment and method, the relevant Indian Standard Codes of Practice shall be followed. In the absence of Indian Standards corresponding British Standard (Codes of Practice or relevant American Standards shall be Followed.)

ANNEXURE-II

GENERAL TECHNICAL SPECIFICATIONS ELECTRICAL WORKS

L. T. PANELS / P.C.C. / M.C.C. –

TYPE OF PANEL:

All the PCC's / PDB's / MCC's shall be metal clad, totally enclosed, rigid, Wall / floor mounted, air - insulated, cubical type suitable for operation on three phase / single phase, 415 / 230 volts, 50 Hz.

The PCC's / MCC's shall be designed to withstand the and heaviest condition at site, with minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.

Should conform to Indian Electricity Act and rules (till last amendment) & approved as per FIA norms. APPLICABLE IS STANDARDS

METERS (MEASURING) FOR ANALOG METERS	IS:1248-1958
INSTALLATION AND MAINTENANCE OF SWITCH GEARS	IS:3072-1975
H.D. AIR BREAKER, SWITCH GEARS AND FUSES FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4047-1977
SELECTION, INSTALLATION AND MAINTENANCE OF FUSES UP TO 650 VOLTS	IS:8106-1966
GENERAL REQUIREMENTS FOR SWITCH GEAR AND GEAR FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4237-1967
DEGREE OF PROTECTION PROVIDED BY ENCLOSURES FOR LV S/GEARS	IS:2147-1962
INSULATED CONDUCTOR RATING	IS:8084-1972
ENCLOSED DISTRIBUTION FUSE BOARDS AND CUT-OUTS FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:2675-1983
FUSE WIRE USED IN RE-WEARABLE TYPE ELECTRIC FUSES UP TO 650 VOLTS	IS:9926-1981
CONDUCTOR FOR INSULATED ELECTRIC CABLES AND FLEXIBLE CORDS	IS:8130
SHUNT CAPACITORS FOR POWER SYSTEMS	IS:2834-1954
HRC CARTRIDGE FUSES AND LINKS UP TO 660 VOLTS	IS:2208
HRC FUSES HAVING RUPTURING CAPACITY OF 50 KA	IS:9224
AC ELECTRICITY METERS: PART – 1 GENERAL REQUIREMENETS	

File No: GGL-F&A,IR & Admin-2025-12-151677

AND TESTS

IS:772 PART 1

DIRECT ACTING ELECTRICAL INDICATING INSTRUMENTS

IS:1248

CURRENT TRANSFORMERS

IS:2705

ELECTRICAL RELAYS FOR POWER SYSTEMS PROTECTION	IS:3231
PHOSPHATE TREATMENT OF IRON AND STEEL FOR PROTECTION AGAINST CORROSION	IS:3618
GUIDE FOR MARKING OF INSULATED CONDUCTOR	IS:5578
CODE OF PRACTICE OF PHOSPHATING OF IRON AND STEEL	IS:6005
FACTORY BUILT ASSEMBLIES OF SWITCHGEAR AND CONTROL- GEAR FOR VOLTAGES UPTO AND INCLUDING 1000V AC AND 1200V DC.	IS:8623
GUIDE FOR UNIFORM SYSTEM MARKING AND IDENTIFICATION OF CONDUCTORS AND APPARATUS TERMINALS	IS:11353
LOW VOLTAGE FUSES	IS:13703
LV SWITCHGEAR AND CONTROL GEAR (PART 1 TO PART 5)	IS:13947
STRUCTURE CONSTRUCTION (IP-54)	IS:2147
MINIATURE CIRCUIT BREAKER (MCB) 1965	BS:3871PART-1
IS:8825 (1996)	
FUSE	IS:2000-1962
AIR CIRCUIT BREAKER	IS:2516 PART 1,2,3
CONTACTORS	IS:2959 & BS:775
DIGITAL METER	IS:13779
ELECTRICAL POWER & CONTROL WIRING CONNECTION WIRING INSIDE THE MODULE FOR POWER, CONTROL PROTECTION	IS:694 & IS:8130
DANGER NOTICE PLATE IS:5-1978	IS:2551-1982 &
MCCB IS:8623-2	IEC 60439-2 /
SFU & IEC 60947-3	IS:13947 (PART-3)
ELCB IS.,CEE 27	BS 3871 & 4293,

STRUCTURE :

The PCCs, MCCs & PDBs shall be metal clad enclosed and be fabricated out of high quality CRCA sheet, suitable for indoor installation, front operated and floor mounting type.

CRCA sheet steel used in the construction of PCCs / MCCs / PDBs shall be 2 mm thick for structure, 1.6 mm thick for doors, covers shrouds and 3 mm thick for gland plate and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet shall be seam welded, all welding slag grounded off and welding pits wiped smooth with plumber metal.

The PCCs / MCCs / PDBs shall be totally enclosed, completely dust and vermin proof and degree of protection being no less than IP-54 confirming to IS 2147. Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust proof. All doors and covers shall be fully gasketed with neoprene gaskets and shall be lockable.

All panels and covers shall be properly fitted and secured with the frame, and holes in the panel correctly positioned. Fixing screw shall enter into holes taped into an adequate thickness of metal or provided with bolts and nuts. Self-threading screws shall not be used in the construction of PCCs / MCCs / PDBs.

A base channel of 75 mm x 75 mm x 5 mm or as per the weight of the panel shall be provided at the bottom.

PCCs / MCCs / PDBs shall be arranged in multi-tier formation. The PCCs / MCCs / PDBs shall be of adequate size to facilitate enough space for maintenance and cooling. The size of the PCCs / MCCs / PDBs shall be designed in such a way that the internal space is sufficient for hot air movement, and the electrical component does not attain temperature more than 40 degree Celsius. Openings shall provide for natural ventilation, but the said openings shall be screened with fine weld mesh.

Knockout holes of appropriate size and number shall be provided in the PCCs / MCCs / PDBs in conformity with number, and size of incoming and outgoing conduits / cables.

Alternatively the PCCs / MCCs / PDBs shall provide with removable sheet plates at top and bottom to drill holes for cable / conduit entry at site.

The PCCs / MCCs / PDBs shall be designed to facilitate easy inspection, maintenance and repair.

The PCCs / MCCs / PDBs shall be sufficiently rugged in design and shall support the equipment without distortion under normal and short circuit condition they shall be suitable braced for short circuit duty

PROTECTION CLASS:

All the indoor PCCs / MCCs / PDBs shall have protection class of IP - 54.

POWDER COATING:

All sheet steel material shall undergo seven-tank process after all the necessary shearing and other mechanical works are completed. After the seven-tank process powder coating treatment shall be adopted using powder of reputed make. After the powder coating is complete welding in the panel or any sort of shearing, bending or cutting activity shall not be done. The colour shall be Siemens Grey 631 / RAL 7032.

CIRCUIT COMPARTMENT:

Each circuit breaker and switch fuse units shall be housed in separate compartments and shall be enclosed on all sides. Sheet steel hinged lockable door shall be duly inter locked with the breaker / switch fuse units in ON and OFF position. Safety interlocks shall be provided for non-opening of the door when the breaker is in ON position.

The door shall not form integral part of the draw out position of the circuit breaker. All instruments and indicating lamp shall be mounted on the compartment door. Sheet steel barriers shall be provided between the tires in a vertical section.

INSTRUMENT COMPARTMENT :

Separate and adequate compartment shall provide for accommodating instruments, indicating lamp, control contactors, relays and control fuses etc. These components shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, switch fuse units, bus bars and connections.

BUSBARS :

The busbar shall be air insulated and made high quality, high conductivity, high strength copper and as per relevant IS code. The busbar shall be for three phases and neutral system with separate neutral and earth bar. The busbar and interconnection between busbar and various components shall be of high conductivity, hard drawn, electrolytic copper. The busbar shall be of rectangular cross section designed to withstand full load current for phase busbar and full rated current for neutral busbar and shall be extensible type on either side. The busbar shall be rated for the frame size of the main incoming breaker. The busbar shall have uniform cross section throughout the length. Ratio of 1 sqmm = 1.2 A shall be adopted for tinned copper bus bars.

The busbar and interconnection shall be insulated with heat shrinkable PVC sleeves and be colour coded in red, Yellow, Blue and Black to identify the three phases and neutral of the system. The busbar shall be supported on unbreakable, non-hygroscopic DMC insulated supports at sufficiently close interval to prevent busbar sag and shall effectively withstand electromagnetic stresses in the event of short circuit capacity of 50 KA RMS symmetrical for one second and a peak short circuit withstand of 105 KA minimum.

The busbar shall be housed in a separate compartment. The busbar shall be isolated with 3 mm thick FRC sheet to avoid any accidental contact. The busbar shall be arranged such that minimum clearances between the busbar are maintained as per below.

Between phases	:	27 mm min.
Between phases and neutral	:	25 mm min.
Between phases and earth	:	25 mm min.
Between neutral and earth	:	23 mm min.

All busbar connection shall be done by drilling holes in busbars and connecting by chromium plated bolt and nuts. Additional cross section of busbar shall be provided in all PCCs / MCCs / PDBs to cover-up the holes drilled in the busbars. Spring and flat washers shall be used for tightening the bolts.

All connection between busbar and circuit breaker / switches and between circuit breaker/ switches and cable terminals shall be through solid copper strips of proper size to carry full rated current. These strips shall be insulated with insulating strips.

ELECTRICAL POWER & CONTROL WIRING CONNECTION :

Terminal for both incoming and outgoing cable shall be suitable for 1100 volts grade, aluminum/copper conductor PVC insulated and sheathed, armoured cable and shall be suitable

for connections of solder less sockets for the cable size as indicated on the appended drawing for the PCCs, MCCs, PDBs.

Both control and power wiring shall be brought out in cable alley for ease of external connections, operation and maintenance.

Both control and power terminals shall be properly shrouded.

10% spare terminal shall be provided on each terminal block. Sufficient terminals shall be provided on each terminal block so that not more than one outgoing wire connected per terminal.

Terminal strip for power and control shall preferably be separated from each other by suitable barriers of enclosures.

Wiring inside the module for power, control protection and instrument etc. shall be done with use of 1100 V conforming to IS 694 and IS 8130. Power wiring inside the starter module shall be rated for full current rating of contactor, but not less than 4 sq mm cross section area. For current transformer circuits, 2.5 sq mm-copper conductor wire shall be used. Other control wiring shall be done with 1.5 sq mm copper conductor wires. Wires for connections to the door shall be flexible. All conductors shall be crimped with solder less sockets at the ends before connections are made to the terminals.

Control power for the motor starter module shall be taken from the respective module switchgear outgoing from R phase and Neutral. Control wiring shall have control fuse (HRC type).

Particular care shall be taken to ensure neat and orderly laying of the wiring. Identification ferrules shall be tagged to all the wire termination for ease of identification and to facilitate and testing.

"CUPAL" washers shall be used for all copper and aluminum connections.

Final wiring diagram of the PCC, MCC, PDB power and control circuit with ferrules number shall be submitted along with the PCC/MCC/PDB as one of the documents.

TERMINALS :

The outgoing terminals and neutral link shall be brought out to a cable alley suitably located and accessible from the panel front. The current transformer for instrument metering shall be mounted on the disconnecting type terminal blocks. No direct connection of incoming and outgoing cables to internal components connection of the distribution board is permitted. Only one conductor may be connected in one terminal.

WIREWAYS :

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

CABLE COMPARTMENT:

Cable compartment of adequate size shall be provided in the PCCs, MCCs, and PDBS for easy termination of all incoming and outgoing cables entering from top. Adequate support shall be provided in the cable compartment.

EARTHING :

Copper earth busbar of minimum 25 mm x 6 mm size shall be provided in the PCCs, MCCs, PDBS for the entire length of panel. As per the rating of the main busbars the size of earthing busbar shall be decided. The framework of the PCCs, MCCs, PDBs shall be connected to this earth

busbar. Provisions shall be made for connection from earth busbar to the main earthing bar coming from the earth pit on both sides of the PCCs, MCCs, PDBs.

The earth continuity conductor of each incoming and outgoing feeder shall be connected to this earth bar. The armour shall be properly connected with earthing clamp and the clamp shall be ultimately bounded with the earth bar.

LABELS:

Engraved Aluminium sheet labels shall be provided on all incoming and outgoing feeders. Single line circuit diagram showing the arrangements of circuit inside the distribution board shall be pasted on inside of the panel door and covered with transparent laminated plastic sheet.

NAME PLATE :

A name plate with panel designation in bold letter shall be fixed at top of the central in panel. A separate name plate giving feeder details shall be provided for each feeder module door.

Inside the feeder compartment, the electrical component, equipments, accessories like switchgear, contactor, lamp, relays etc. shall suitably be identified by providing stickers.

Engraved nameplates shall be of Aluminium strip of black colour and silver letters format. Nameplate shall be fastened by counter sunk screws / riveted and not by adhesives.

DANGER NOTICE PLATE :

The danger plate shall be affixed in a permanent manner on operating side of the panel.

The danger notice plate shall indicate danger notice both in Hindi and English and with a sign of skull and bones.

The danger notice plate in general shall meet to requirements of local inspecting authorities.

Overall dimension of the danger notice plate shall be 200 mm wide and 150 mm high. The danger notice plate shall be made from minimum 1.6 mm thick mild steel sheet and after due pre- treatment to the plate, the same shall be painted white with vitreous enamel paint on both front and rear surface of the plate.

The letter, the figure, the conventional skull and bones shall etc. shall be positioned on the plate as per recommendations of IS : 2551-1982.

The said letter, the figure and the sign of skull and bones be painted in single red colour as per IS: 5-1978.

The danger plate shall have rounded corners. Locations of fixing holes for the plate shall be decided to suit design of the panel.

The danger notice plate, if possible, be of ISI certification mark.

INTERNAL COMPONENTS:

The PCC / MCC / PDB shall be equipped complete with all type of required number of air circuit breakers, switch fuse unit, contactor, relays, fuses, meters, instruments, indicating lamps, push buttons, equipment, fittings, busbar, cable boxes, cable glands etc. and all the necessary internal connections /wiring as required and as indicated on relevant drawings. Components necessary for proper complete functioning of the PCC / MCC / PDB but not indicated on the drawings shall be supplied and installed on the PCC / MCC / PDB.

All part of the PCC / MCC/ PDB carrying current including the components, connections, joints and instruments shall be capable of carrying their specified rated current continuously, without temperature rise exceeding the acceptable values of the relevant specifications at any part of the PCC / MCC / PDB.

All units of the same rating and specifications shall be fully interchangeable.

INSPECTIONS / TESTING:

Each equipment should inspect and witness by client & consultant as per approved QAP.

The PCC / MCC / PDB shall be inspected and checked as per inspection manual of the PCC / MCC / PDB manufacturer.

Various electrical components and accessories of the PCC / MCC / PDB shall be checked as per drawing for the respective PCC / MCC / PDB.

The PCC / MCC / PDB shall be checked for rigid mounting, earthing connections, proper rating and size of components, internal wiring, etc.

All mechanical fasteners and electrical connections shall be checked and tightened before installation.

Type test:

Type test certificates for all switchgears shall be provided.

Routine Test:

Prior to dispatch of the PCC / MCC / PDB following tests shall be carried out.

Mechanical endurance test shall be carried out by closing and opening of all the ACB's, MCB's switches etc.

Over voltage and Insulation resistance test shall be carried out between phases and between phase to earth bus, keeping the isolating switch in ON position. Similar test shall be carried out keeping the isolating switch in closed position.

All the interlocks, controls and tripping mechanism of the switchgears shall be tested for their proper functioning.

High voltage test, Continuity test, Control circuit test shall be carried out.

L. T. SWITCHGEARS:

GENERAL:

The type, size, and rating of the components shall be as indicated on the relevant single line diagrams.

MINIATURE CIRCUIT BREAKER (MCB):

Miniature circuit breakers shall be quick make and break and break type conform with British standard BS: 3871 (Part-I) 1965 and IS: 8825 (1996). The housing of MCBs shall be heat resistant and having high impact strength. The fault current of MCBs shall not be less than 10000 amps, at 230 volts. The MCBs shall be flush mounted and shall be provided with trip free manual operating mechanism with mechanical "ON" and "OFF" indications.

The circuit breaker dollies shall be of trip free pattern to prevent closing the breaker on a faulty current.

The MCB contact shall be silver nickel and silver graphite alloy and tip coated with silver. Proper arc chutes shall be provided to quench the arc immediately. MCB's shall be provided with magnetic fluid plunger relay for over current and short circuit protection. The over load or short circuit devices shall have a common trip bar in the case of DP and TPN miniature circuit breakers. All the MCB's shall be tested and certified as per Indian Standard, prior to Installation.

FUSE:

Fuses shall be of high rupturing capacity (HRC) fuse links and shall be in accordance with IS : 2000- 1962 and having rupturing capacity of not less than 35 MVA at 415 Volts.

MOULDED CASE CIRCUIT BREAKER:

The MCCB shall be air break type and having quick make quick break with trip free operating mechanism.

Housing of the MCCB shall be of heat resistant and flame retardant insulating material.

Operating handle of the MCCB shall be in front and clearly indicate ON / OFF / TRIP positions.

The electrical contact of the circuit breaker shall be of high conducting non-deteriorating silver alloy contacts.

The MCCB shall be provided with microprocessor based trip units. All the releases shall operate on common trip busbar so that in case of operation of any one of the releases in any of the three phases, it will cut off all the three phases and thereby single phasing of the system is avoided.

The MCCB whenever called for in the drawings shall provide an earth fault relay.

The MCCB shall provide two sets of extra auxiliary contacts with connections for additional controls at future date.

CONTACTORS:

The contactor shall meet with the requirements of IS: 2959 and BS: 775.

The contactors shall have minimum making and breaking capacity in accordance with utilization category AC 3 and shall be suitable for minimum class II intermittent duty.

If the contactor forms part of a distribution board then a separate enclosure is not required, but the installation of the contactor shall be such that it is not possible to make an accidental contact with live parts.

APFC Relay with Contactors and Capacitors

Automatic Power factor correction relay shall be provided in separate compartment with Contactors, CT's, MCB and Power capacitors. Separate MCB shall be provided for each capacitor in compartment to protect short circuits/overload. APFC Relay shall be 4 stage with approved make. Each Contactor should have provision of discharge resistors.

TRIVECTOR METER:

Flush mount 96 x 96 x 80 mm load manager type Enercon EM 6400 or equivalent meter of accuracy class 1 as per IS 13779 shall be provided. The meter shall be accurate on distorted waveforms; simultaneous sampling of voltage and amperes shall be done. It shall have low burden on PT and CT shall have bright display, shall view 3 parameters together shall have auto scaling from kilo to mega to giga units, shall have programmable CT, PT ratios with built in phase analyser. Auto scrolling shall be programmable as per user choice and communication with PC; PLC DCS shall be possible through RS 485 serial port. It shall be dust proof, tamper proof with data import export option and 10 years back up of integrated data.

Parameters to be monitored shall be Frequency, Line to line and average and line to neutral and average voltage, phase wise and average current, phase wise and total KVA, KW and P.F. reading and KWH monitoring.

User programmable facility for delta 2e and star 3e measurement, C.T. and P.T. ratios, sliding window auto sync. And auto scrolling of parameters shall be available.

Sensing shall be 3 phase, 4 wire measuring True RMS with voltage input range of 110 to 415 V nominal and current input of 5 amps or 1 amps as per field configuration. Current range shall be from 50 mA to 7.5 A and burden on PT or CT shall be app 0.2 VA.

Accuracy for kW / kWh shall be as per IS 1377 / CBIP88 and for all other parameters shall be +/- 0.5% of full scale + 0.5% of reading + 1 digit. Digital readout shall be of 3 rows of 4 digits each (12.5 mm size) with 7 segments bright red LED. Input frequency shall be 50Hz / 60Hz +/- 5%. Power factor range shall be 0.5 lag – unit – 0.8 lead.

Resolution for power parameters shall be for 4 digits and energy parameters shall be 8 digits. Display update shall be at every 15 seconds for demand parameters and 1 sec for other parameters. Display sequence shall be parameter followed by value. Temperature range shall be 0-50°C and humidity <95% non-condensing.

Display pages shall be as follows: Instantaneous – VLL,

A avg., F

VLn, A avg., F

Individual pages of above parameters.

Integrated - KVA, kW, PF
kVAh
KWh
Run hours On hours Interruption

CURRENT TRANSFORMER:

Where called for, CT's shall provide for current measuring. Each phase shall be provided with separate CT of class I accuracy and VA burden as shown in SLD for operation of associated metering and controls. Current transformer shall be in accordance with IS: 2705 - 1964 as amended up to date.

PUSH BUTTON:

The push button unit shall comprise of the contact element, a fixing holder, and push button actuator. The push button shall be momentary contact type. The contacts shall be of silver alloy and rated at 10 Amps. Continuous current rating. The actuator shall be of stranded type and colour as per its usage for ON, OFF and Trip.

INDICATING LAMP:

The push button unit shall comprise of the contact element, a fixing holder, and push button actuator. The push button shall be momentary contact type. The contacts shall be of silver alloy and rated at 10 Amps. Continuous current rating. The actuator shall be of stranded type and colour as per its usage for ON, OFF and Trip. Push button shall be of self-glowing type with LED lamp.

Indicating Lamp shall be LED type and shall supplied complete with translucent covers to diffuse the lamp light. Indicating lamps shall be part of push buttons.

Colour shade for the indicating lamps shall be as below: ON indicating

lamp	:	Green
OFF indicating lamp	:	Red
TRIP indicating lamp	:	Amber
PHASE indicating lamp	:	Red, Yellow, and Blue.

VENDORS DATA: TO BE SUBMITTED WITH OFFER:**Approved Makes:**

Vendor shall provide information on the offered make and Cat nos. of items offered for respective Panels:

Sr. No.	Item Description	Specified Make	Vendor Confirmation
1.0	Air Circuit Breakers Ics=Icu=Ics(1sec)	Schneider Master Pack NW/NSX range with Micrologic 6.0A releases and equi. of L&T U power with UW MTX 3.5EC releases / Siemens 3WL with ETU45B breaker.	
2.0	MCCB – Ics = Icu – above and including 250Amps	Schneider Compact range with Microprocessor release / L & T Dsine range(TM release) with RC 10 (MP releases) / Siemens 3VL series.	
2.0A	MCCB till 250A	Thermal magnetic - adjustable	
3.0	MCB	SchneiderActi9/Legrand DX3/Siemens/Indo asian	
4.0	SFU	Schneider/L&T/Siemens	
5.0	Capacitors – APP type	Siemens EPCOS / L&T	
6.0	Contactors	Schneider /Legrand/ABB / Siemens / L&T	
7.0	Starters	As above	
8.0	CRCA sheet	Tata / SAIL	
9.0	Gaskets	Neoprene	

10.0	Meters	Schneider / L&T / Trinity / Elmeasure	
11.0	Indicating lamps - LED	Schneider / Siemens / L & T - ESBEE	
12.0	Push Buttons	Schneider / Siemens / L & T - ESBEE	
13.0	Connectors	Wago / Connectwell / Elmex	
14.0	C.T.s – cast resin type.	Kappa / Ashmore / A.E	
15.0	RTPFC Panel	Datar / shreem	
16.0	Selector Switches	Schneider / L&T / Salzer	

CABLE LAYING AND TRENCHES WITH TRAYS

A SPECIFICATIONS

CABLE TRENCH

Cable trench shall be dug to the minimum depth of 1.2 mtr and the width shall dependent on the no of cables to be kept with the layer of brick in between two cables.

BRICKS

The bricks shall be hand or machine moulded and made from suitable soils and kiln burnt. They shall be free from cracks, flaws and modules of free lime. They shall have smooth rectangular faces with sharp corners and shall be uniform in colour. The bricks shall be moulded with a frog of size 100 mm. x 40 mm., and 10 mm. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 6 m. B – grade brick shall be used.

SAND

Sand shall be natural sand, clean, well graded, hard, strong, durable and gritty. Sand particles should be free from injurious amounts of dust, clay, kankar nodules, soft or flaky particles of shale, alkali, salts, organic matter loam, mica or other deleterious substances and shall be got approved from the CLIENT AND/OR ITS ARCHITECT. The sand shall not contain more than 8% of silt as determined by field test, if necessary the sand shall be washed to make it clean. The sand used by civil agency shall be used.

CABLE TRAYS

Cable trays shall be fabricated from Hot Dip GI and channels of 14 gauge and shall be powder coated with 7 tank process if specified. The design shall be ladder type with optional cover. Shall be fixed or suspended from the ceiling with the help of suspenders which shall have adequate diameter to sustain the weight of the cables and channels. Also if necessary anchor fasteners shall be used for grouting purpose.

WORKMANSHIP

The cable shall be laid side by side in trench with brick covering on all the three sides. The trench shall be such that sharp bends shall be avoided while laying the cable. The bedding of fine sand under the cable shall be not less than 6 mm. The trench shall be terminated in Manholes with specified size of R.C.C. hume pipes as shown in drawing. Cable markers shall be provided throughout the route of cable at 10 mtrs distance. The trenches shall be refilled after the cable are laid and the Ground level shall be done as per original after pressing the same. The cables shall be checked for insulation resistance and continuity tests shall be carried out.

MODE OF MEASUREMENT

The cable laying shall be measured in rmt. The trenches dug and refilled shall be measured in cu. Mtr. The bricks and sand bedding shall be measured in rmt. The cable trays shall be measured in rmt.

1.1 KV GRADE L.T. CABLES AND CABLE TERMINATION:

SPECIFICATIONS L. T. XLPE CABLE: GENERAL:

The medium voltage cables shall be supplied, laid, connected, tested and commissioned in accordance with the drawings, specifications, relevant Indian Standards specifications, manufacturer's instructions. The cables shall be delivered at site in the original drums with manufacturer's name, size and type clearly written on the drums.

All cables shall be adequately protected against any risk of mechanical damage to which they may be liable in normal conditions of handling during transportation, loading, unloading etc.

The cable shall be supplied in single length i.e. without any intermediate joint or cut unless specifically approved by the client.

The cable ends shall be suitably sealed against entry of moisture, dust, water etc. with cable compound as per standard practise.

CONDUCTOR:

Uncoated, annealed copper / aluminium, of high conductivity, upto 4 mm² size the conductor shall be solid and above 4 mm² the conductors shall be concentrically stranded as per IEC : 228.

INSULATION :

Cross link polyethylene (XLPE) extruded insulation rated at 70°C.

CORE IDENTIFICATION:

Two core	:	Red and Black
Three core	:	Red, Yellow and Blue
Four core	:	Red, Yellow, Blue and Black
Single core	:	Green, Yellow for earthing.

Black shall always be used for neutral.

ASSEMBLY:

Two, three or four insulated conductors shall be laid up, filled with non-hygroscopic material and covered with an additional layer of thermoplastic material.

ARMOUR:

Galvanised steel flat strip / round strips applied helically in single layers complete with covering the assembly of cores.

For cable size upto 10 sq mm : Armour of 1.4 mm dia G.I. round wire

For cable size above 10 sq mm : Armour of 4 mm wide 0.8 mm thick GI strip

SHEATH:

ST -2 PVC along with polypropylene fillers to be provided.

Inner sheath shall be extruded type and shall be compatible with the insulation provided for the cables.

Outer sheath shall be of an extruded type layer of suitable PVC material compatible with the specified ambient temp. of 50°C and operating temperature of cables. The sheath shall be resistant to water, ultra violet radiation, fungus, termite and rodent attacks. The colour of outer sheath shall be black.

Sequential length marking along with size and other standard parameters shall be required at every 1.0 mtr on the outer sheath.

TESTING:

Finished cable tests at manufacturers works : The finished cables shall be tested at manufacturer's works for all the routine tests for all the length and size of cables to be delivered at site and the certificate for the same shall be furnished to client. If required the cables shall be tested in presence of the client's representative.

Voltage test: Each core of cable shall be tested at room temperature at 3 KV A.C. R.M.S. for duration of 5 minutes.

Conductor resistance test: The D.C. resistance of each conductor shall be measured at room temperature and the results shall be corrected to 20°C to check the compliance with the values specified in the IS 8130 – 1976.

Cable tests before and after laying cables at site:

Insulation resistance test between phases, phase to neutral and phase to earth. Continuity test of all the phases, neutral and earth continuity conductor.

Earth resistance test of all the phases and neutral.

All the tests shall be carried out in accordance with the relevant IS code of practice and Indian Electricity Rules. The vendor shall provide necessary instruments, equipments and labour for conducting the above tests and shall bear all the expenses in connection with such tests. All tests shall be carried out in the presence of client and the results shall be prescribed in forms and submitted.

CABLE MARKING:

The outer sheath shall be legibly embossed at every meter with following legend:

ELECTRIC CABLE: 1100 V, SIZE: __C X __MM² with Manufacturers name, year of manufacturing and ISI symbol.

SEALING DRUMMING AND PACKING:

After tests at manufacturer's works, both ends of the cables shall be sealed to prevent the ingress of moisture during transportation and storage.

Cable shall be supplied in length of 500 mtrs or as required in non-returnable drums of sufficiently sturdy construction.

Cables of more than 250 meters shall also be supplied in non-returnable drums. The spindle hole shall be minimum 110 mm in diameter.

Each drum shall bear on the outside flange, legibly and indelibly in the English literature, a distinguishing number, the manufacturer's name and particulars of the cable i.e. voltage grade, length, conductor size, cable type, insulation type, and gross weight shall also be clearly visible. The direction for rolling shall be indicated by an arrow. The drum flange shall also be marked with manufacturer's name and year of manufacturing etc.

CABLE TERMINATION:

Cable terminations shall be made with aluminium crimped type solder less lugs for all aluminium cables and stud type terminals. For copper cables copper crimped solder less lugs shall be used.

Crimping shall be done with the help of hydraulically operated crimping tool.

For joints where by cable is with aluminium conductor and bus bars are aluminium, bimetallic lugs shall be used with compound. CUPAL type of washers shall be used.

Crimping tool shall be used for crimping any size of cable.

CABLE GLANDS:

Cable glands shall be of brass single compression type. Generally single compression type cable glands shall be used for indoor protected locations and double compression type shall be used for outdoor locations.

FERRULES:

Ferrules shall be of self-sticking type and shall be employed to designate the various cores of the control cable by the terminal numbers to which the cores are connected, for ease in identification and maintenance.

CABLE JOINTS:

Kit type joint shall be done and filled with insulating compound. The joint should be for 1.1 KV grade insulation.

WORKMANSHIP

Cables shall be laid in the routes marked in the drawings. Where the route is not marked, the Contractor shall mark it out on the drawings and also on the site and obtain the approval of the CLIENT AND/OR ITS ARCHITECT before laying the cable. Procurement of cables shall be on the basis of actual site measurements and the quantities shown in the schedule of work shall be regarded as a guide only.

Cables shall be laid on walls, cable trays, inside shafts or trenches. Saddling or support for the cable shall not be more than 500 mm apart. Plastic identification tags shall be provided at every 30 m.

Cables shall be bent to a radius not less than 12 (twelve) times the overall diameter of the cable or in accordance with the manufacturer's recommendations whichever is higher.

In the case of cables buried directly in ground, the cable route shall be parallel or perpendicular to roadways, walls etc unless marked on drawing by architect / consultant. Cables shall be laid on an excavated, graded trench, over a sand or soft earth cushion to provide protection against abrasion.

Cables shall be protected with brick or cement tiles on all the three sides as shown on drawings. Width of excavated trenches shall be as per drawings. Back fill over buried cables shall be with a minimum earth cover of 750 mm to 1000 mm. The cables shall be provided with cables markers at every 10 meters and at all loop points.

All cables shall be full runs from panel to panel without any joints or splices. Cables shall be identified at end termination indicating the feeder number and the Panel/Distribution board from where it is being laid. Cable termination for conductors up to 4 sq.mm. may be insertion type and all higher sizes shall have compression type lugs. Cable termination shall have necessary brass glands. The end termination shall be insulated with a minimum of six half-lapped layers of PVC tape. Cable armouring shall be earthed at both ends.

In case of cables entering the buildings. It would be done duly only through pipes. The pipes shall be laid in slant position, so that no rainwater may enter the building. After the cables are tested the pipes shall be sealed with M. seal & then tarpaulin, shall be wrapped around the cable for making the entry watertight.

Testing: MV cables shall be tested upon installation with a 500V Meggar and the following readings established:

Continuity on all phases. Insulation Resistance.

Between conductors.

All conductors and ground.

All test readings shall be recorded and shall form part of the completion documentation.

Cable joints shall be done as per regular practice and check shall be carried out for loose connections and leakages. Insulation cutting shall be done properly taking care that no area of the conductor remains exposed. Crimping shall be done with the help of hydraulic tool. Proper insulation tape shall be applied at the cable and lug joint.

Format for cable testing certificate:

Drum no. from which cable is taken _____ :

Cable from _____ to _____

Length of run of this cable ____mtr

Insulation resistance test

between core 1 to earth _____mega-ohm

between core 2 to earth _____mega-ohm

between core 3 to earth _____mega-ohm

between core 1 to core 2 _____mega-ohm

between core 2 to core 3 _____mega-ohm

between core 1 to core 3 _____mega-ohm

duration used :

High voltage test :	Voltage	Duration
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between core and earth between individual cores

MODE OF MEASUREMENT

The cables shall be measured in rmt and terminations on unit basis.

DISTRIBUTION BOARDS:

SPECIFICATIONS

Distribution boards shall be fabricated from 14 gauge M.S. sheet or shall be readymade as specified in the make of material list. It shall be of double door type with hinged (lockable if required) door suitable for recessed mounting in wall. Distribution boards shall be powder coated with 7-tank process application.

The distribution boards shall be provided with phase barriers, wiring channels to accommodate wires and individual per phase neutral links. There shall be separate or individual earth link as per requirement. Proper arrangement shall be made for mounting of MCB’s and other accessories. Identifications shall be made as per site installations and SLD.

Distribution boards shall meet with the requirements of IS 2675 and marking arrangement of bus bars shall be in accordance with I.S. standards.

Bus bars shall be suitable for the incoming switch rating and sized for a temperature rise of 35° C over the ambient. Each board shall have two separate earthing terminals. Circuit diagram indicating the load distribution shall be pasted on the inside of the DB as instructed. One earthing terminal for single phase and two terminals for 3 phase DB's shall be provided with an earth strip connecting the studs and the outgoing ECU earth bar.

The top and the bottom faces of the D.B. shall be provided for conduit entry of minimum 1” dia. The faces if asked shall be kept detachable.

All outgoing feeders shall terminate on a terminal strip which in turn is interconnected to the MCB/Fuse base by means of insulated single conductor copper wires as follows

Up to 15 A	2.5 sq.mm.	40 A	10 sq.mm.
25 A	4.0 sq.mm.	63 A	16 sq.mm.
32 A	6.0 sq.mm.		

Each DB shall have indicating lamps preferably neon type denoting power availability in the board after the switch indicating lamps shall be complete with fuses.

MINIATURE CIRCUIT BREAKERS (MCB) :

MCB's shall have quick make and break non-welding self-wiping silver alloy contacts for 10 KA short circuit both on the manual and automatic operation. Each pole of the breaker shall be provided with inverse time thermal over load and instantaneous over current tripping elements, with trip-free mechanism. In case of multi-pole breakers, the tripping must be on all the poles and operating handle shall be common. Breakers must conform to BS 3871 with facility for locking in OFF position. Pressure clamp terminals for stranded/solid conductor insertion are acceptable up to 4 sq.mm. Aluminium or 2.5 sq.mm. Copper and for higher ratings, the terminals shall be suitably shrouded. Wherever MCB isolators are specified they are without the tripping elements.

RCCB / ELCB

The RCCB should suffice **all** the requirements of IS as per code IS - 12640 - 1988. The RCA should be current operated and not on line voltage.

The RCCB should ensure mainly the following functions:

Measurement of the fault current value.

Comparison of the fault current with a reference value.

The RCCB should have a toroidal transformer which has the main conductors of primary (P - N) which check the sum of the current close to zero.

All metal parts should be inherently resistant to corrosion and treated to make them corrosion resistant.

It should be truly current operated.

It should operate on core balance toroidal transformer.

Its accuracy should be $\pm 5\%$.

It should operate even in case of neutral failure.

It should trip at a present leakage current within 100 mA

Its enclosure should be as per IP 30.

Its mechanical operation life should be more than 20,000 operations.

It should provide full protection as envisaged by IE rules - 61-A, 71 - ee, 73 - ee, 1985 and also rule 50 of IE rule 1956.

It should conform to all national and international standards like IS: 8828-1993, IS: 12640-1988, BS 4293 - 1983, CEE 27 (International commission Rules for the approved of electrical equipment).

WORKMANSHIP

The D.B. shall be properly grouted in the wall in concealed manner taking care that the powder coating is not scratched and dents are not formed on the D.B. The MCBs and ELCBs. In the distribution boards shall be fixed as per the circuit details provided. All the wires terminating in the MCBs and the ELCBs shall be lugged for proper contact and ferrules depicting the circuit nos shall be provided. D.B.s mounted in concealed manner shall have a groove around it so as to save the finish of the plaster and colour during future opening of the door. The distribution boards shall have circuit chart tagged on the door for future maintenance. Danger notice plates shall be fitted to the distribution boards with screws and not stuck so as to assure its presence for a longer duration.

MODE OF MEASUREMENT

The distribution boards shall be measured in nos. and the MCBs and ELCBs shall be measured in nos. separately.

INTERNAL WIRING

SPECIFICATIONS

RIGID PVC AND FLEXIBLE PVC FRLS LHSFT CONDUITS:

All conduits shall be rigid PVC alloy low in halogens pipe having minimum wall thickness of medium gauge 1.6 to 2.0 approved by F.I.A. & I.S.I. and shall conform to IS 9537 part 3 and complying with

fire safety standards classification V-0. The temperature stability shall be from –20°C - +80°C and also shall be UV stabilised.

Up to 38 mm diameter in slab - minimum 1.8 mm. wall thickness. Up to 38 mm diameter

in floor - minimum 2.0 mm. wall thickness. Above 40 mm. diameter - minimum 2.2 mm.

wall thickness.

Flexible conduits shall be formed from a continuous length of spirally wound interlocked steel strip with a fused zinc coating on both sides. The conduit shall be terminated in brass adapters.

ACCESSORIES:

PVC conduit fittings such as bends, elbows, reducers, chase nipples, split couplings, plugs etc. shall be specifically designed and manufactured for their particular application. All conduit fittings shall conform to IS: 2667-1964 and IS: 3857-1966. All fitting associated with galvanized conduit shall also be galvanized.

WIRES:

All wires shall be single core multi-strand/ flexible copper or single strand Copper (if specified in BOQ), PVC insulated **FRLS** grade as per IS: 694 and shall be 660 V\1100 V.

All wires shall be colour coded as follows:

<u>Phase</u>	<u>Colour of wire</u>
R	Red
Y	Yellow
B	Blue
N	Black
Earth	Green (insulated)
Control (If any)	Grey
All off wires	Same as Phase wire

SWITCHES & SOCKETS:

Switches shall be modular type with silver-coated contacts. Sockets shall be 5 pins with switch and plate type cover. Combination of multiple switch units and sockets should be used to minimize the switch boxes.

For heavy duty, metal clad sockets with M.C.B / Isolator mounted in a galvanized steel box shall be provided.

SWITCH PLATE AND BOX:

Plates of the same make, as that of switches shall be used with the modular range. Also M.S. boxes shall be taken as switch boxes.

WORKMANSHIP

The size of conduit shall be selected in accordance with the number of wires permitted under table given below. The minimum size of the conduit shall be 25 mm diameter unless otherwise indicated or approved. Size of wires shall not be less than 1.0 sq.mm. Copper or 2.5 sq.mm. Aluminium.

Nominal Dia of wires (mm)	Nominal Cross sec. Area (mm ²)	20 mm		25 mm		32 mm		38 mm	
		S	B	S	B	S	B	S	B
1/2.40	1.50	4	3	8	6	15	9	--	--
1/1.80	2.50	4	2	6	4	10	8	--	--
1/2.24	4.00	2	2	4	3	8	6	--	--
1/2.80	6.00	1	--	4	3	6	6	--	--
1/3.55	10.00	1	--	3	2	5	4	6	5

S - runs of conduits which have distance not exceeding 4.25 m. between draw boxes & which do not deflect from the straight by an angle more than 15 degree.

B - runs of conduits, which deflect, from the straight by more than 15°.

Conduits shall be kept at a minimum distance of 100 mm. from the pipes of other non-electrical services. And maintain minimum 300 mm distance between telephones, TV & Computer piping.

Separate conduits/raceways shall be used for:

Normal lights and 5 A 3 pin sockets on lighting circuit. Separate conduit shall be laid

from D.B. to switch board.

Power outlets - 15 A 3 pin 20 A/30 A, 2 pin scraping earth metal clad sockets. Emergency lighting.

Telephones.

Fire alarm system.

Public address system & Music system.

For all other voltages higher or lower than 230 V.

T.V. Antenna. Water level guard.

Computer Wiring

Wiring for short extensions to outlets in hung ceiling or to vibrating equipments, motors etc., shall be installed in flexible conduits. Otherwise rigid conduits shall be used. No flexible extension shall exceed 1.25 m.

Conduits run on surfaces shall be supported on metal 12 mm. thick G.I. pressure saddles which in turn are properly screwed to the wall or ceiling. Saddles shall be at intervals of not more than 500

mm. Fixing screws shall be with round or cheese head and of rust-proof materials. Exposed conduits shall be neatly run parallel or at right angles to the walls of the building. Unseemly conduit bends and offsets shall be avoided by using fabricated mild steel junction/pull through boxes for better appearances. No cross-over of conduits shall be allowed unless it is necessary and entire conduit installation shall be clean and neat in appearance.

Conduits embedded into the walls shall be fixed by means of staples at not more than 500 mm. intervals. Chases in the walls shall be neatly made and refilled after laying the conduit and brought to the finish of the wall but the building Contractor will do final finish.

Conduits buried in concrete structure shall be put in position and securely fastened to the reinforcement and got approved by the CLIENT AND/OR ITS ARCHITECT, before the concrete is poured. Proper care shall be taken to ensure that the conduits are neither dislocated nor choked at the time of pouring the concrete suitable fish wires shall be drawn in all conduits before they are embedded.

Where conduit passes through expansion joints in the building, adequate expansion fittings shall be used to take care of any relative movement.

Inspection boxes shall be provided for periodical inspection to facilitate withdrawal and removal of wires. Such inspection boxes shall be flush with the wall or ceiling in the case of concealed conduits. Inspection boxes shall be spaced at not more than 12 meters apart or two 90° solid bends or equal. All junction and switch boxes shall be covered by 6 mm clear plate. These junction boxes shall form part of point wiring or conduit wiring as the case may be including the cost of removing the cover for painting and re-fixing. No separate charges shall be allowed except where specially mentioned.

Conduits shall be free from sharp edges and burrs and the threading free from grease or oil. The entire system of conduits must be completely installed and rendered electrically continuous before the conductors are pulled in. Conduits should terminate in junction boxes of not less than 32 mm. deep.

An insulated earth wire of copper rated capacity shall be run in each conduit. Lighting & Power

Wiring:

All final branch circuits for lighting and appliances shall be single conductor/ stranded/ flexible wires run inside conduits. The conduit shall be properly connected or jointed into sockets, bends, and junction boxes.

Branch circuit conductor sizes shall be as shown in the schedule of quantities and or drawings.

All circuits shall preferably be kept in a separate conduit up to the Distribution Board. No other wiring shall be bunched in the same conduit except those belonging to the same phase. Each lighting branch circuit shall not have more than ten outlets or 800 watts whichever is lower. Each conduit shall not hold more than three branch circuits.

Flexible cords for connection to appliances, fans and pendants shall be 650/1100 V grade (three or four cores i.e. with insulated neutral wire of same size) with tinned stranded copper wires, insulated, twisted and sheathed with strengthening cord. Colour of sheath shall be subject to the CLIENT AND/OR ITS ARCHITECT'S approval.

Looping system of wiring shall be used. Wires shall not be jointed. Where joints are unavoidable, they shall be made through approved mechanical connectors. No such joints shall be made unless the length of the sub-circuit, sub-main or main is more than the length of the standard coil.

Control switches shall be connected in the phase conductors only and shall be 'ON' when knob is down. Switches shall be fixed in 3 mm. thick painted or galvanized steel boxes with cover plates as specified. Cadmium plated brass screws shall be used.

Power wiring shall be distinctly separate from lighting wiring. Conduits not less than 25 mm. and wires not less than 2.5 sq.mm. copper shall be used.

Every conductor shall be provided with identification ferrules at both ends matching the drawings. Testing: the entire installation shall be tested for:

Insulation resistance. Earth continuity.

Polarity of single pole switches.

General: All the wiring switch board, outlet points shall be done in a concealed manner in wall & slab in PVC conduit of minimum 25 mm dia. (medium gauge) & with 650v / 1100v grade PVC insulated flexible copper conductor wire. The switches should be modular with moulded cover plates, blank plates for outlet boxes. The accessories, connectors, sockets, should be fixed with brass chrome / cadmium plated machine screw. For fan points the rates should be with hum -free type 300 W regulators as required to complete the point wiring. The wiring shall be as per IS: 732 and IS: 4648. The wiring shall be done in a looping manner so as to avoid junction boxes at any place. All the looping shall be done only in the switchboard and outlet points. The size of the wire shall be as per the specification. Colour code shall be strictly followed.

The size of wires shall as follow:

25-32 Amp. metal clad points:

Phase / Neutral 6.0 mm²

Earth 4.0 mm²

20 Amp. outlet points :

Phase / Neutral 4.0 mm²

Earth 2.5 mm²

Two nos. of 15 Amps. socket outlet connected in parallel from DB to first outlet

Phase / Neutral 4.0 mm²

Earth 2.5 mm²

from first outlet to second outlet. Phase / Neutral 2.5 mm²

Earth 2.5 mm²

Light, fans, exhaust fan, 5 Amp. On board plug point, two way light points, bell point etc from switch to outlet.

Phase / Neutral 1.5 mm²

Earth 1.0 mm²

From D.B. to switch board – lighting / 5 A socket etc – i.e. circuit mains part of point wiring

Phase / Neutral 2.5 m m²

Earth 2.5 m m²

15/20 Amps. Socket outlet for AC (Single Phase/Three Phase) / Geyser Phase / Neutral 4.0 m m²

Earth 2.5 m m²

15/20 Amps. Socket outlet for appliances or looped from sockets with 4 sq mm ckt. Phase / Neutral 2.5 m m²

Earth 2.5 m m²

Separate pipes shall be laid for off wires and circuit mains.

Circuit mains of same phase shall be drawn in one pipe with prior permission/discussion with the consultant.

Separate phase, neutral and earthing wire of sizes recommended by consultant shall be drawn for each and every circuit mains.

Mains for lighting and on board plug points shall be of one-size higher wires than those used in off.

The point definition shall be conducting and wiring from D.B. to S.B. and there from to final outlet point including switches and accessories, junction boxes, fan boxes, zarri work with cement –sand etc of approved make.

MODE OF MEASUREMENT

The items shall be measured on unit basis or on Mtr. basis as per BOQ.

LIGHT FIXTURES

SPECIFICATIONS

Light fixtures as mentioned in the BOQ with the catalogue nos. and makes shall be installed. The fixtures shall be complete with ballast and shall be prewired by the manufacturer.

Fans of the approved makes and size shown in the drawing shall be used and install in the hook type M.S. box used by the CLIENT.

WORKMANSHIP

The fixture shall be installed on wall / ceiling as directed and as per manufacturer's instruction, with necessary accessories for surface, concealed, suspended from ceiling, bracket mounting etc. The

job also includes connection of fixture with respective outlet point with heat resistant wires through heat resistance sleeve and PVC connector. The exhaust fan shall be installed complete with M.S. angle iron mounting frame/ ring, G.I. louvers, wire mesh and plug at the end of the cord including wiring & earthing etc. Proper earthing shall be provided to the fixtures

MODE OF MEASUREMENT

The unit rate shall be considered for fitting one fixture. The rate shall include following

All fixing accessories, mounting bracket, ballast condensers and control gear wherever applicable. Supplying and fixing Ball and socket joints wherever required.

Earthing of fittings.

Electrical connections to fittings/fans from the junction box/ceiling rose. Installation and interconnection of Electronic regulators for ceiling fans. Supplying and fixing 300 mm. GI down rod for ceiling fans.

EARTHING

Specification

Chemical Earthing Earth Rod

The Earth Rod shall be mentioned in earthing schematic. Length of copper bonded steel rod shall be 10 feet.

The minimum copper bonding thickness is 250 microns. Copper bonding on the steel rod is through Nickel interface.

Gives lowest possible resistance to ground also resist to corrosion.

It shall be molecularly bonded with copper to high strength steel cores. The life of the earth rod shall be minimum 20 years.

Earth resistance of $< 3\Omega$ shall be achieved at farthest point for normal earthing & $< 1\Omega$ shall be achieved at farthest point for clean earthing.

Ground enhancing material

Necessary amount of GEM shall be used as soil tests as per site requirement & approval engineers.

Earth strips / wires

The earthing conductor (protective conductor from earth electrode up to the main earthing terminal/earth bus, as the case may be) shall be of copper / Al. of at least 98% conductivity confirming to I.S. 3043, and in the form of wire or strip as specified.

The size & material of earthing conductor and nos. of earth pits are as specified in drg. Though contractor shall confirm the same as per local CEIG dept. requirements & any changes required for the same is within scope of contractor.

Shop drawings / execution

The contractor shall be responsible to prepare shop drawings for routes of complete system along with necessary calculations before execution for approvals along with location of pits as per site condition. The drawings given by consultant are indicative and it shall be contractor's responsibility to achieve the necessary values for earthing. Contractor shall also incorporate necessary requirements as per local codes / approving authorities.

Following activities shall be carried out for the earthing station Minimum 3 mtr. centre to centre distance between two earth pits. The bore should be minimum 10ft deep.

All earth pits of same category shall be interlinked with insulated cable.

The earth conductors (Cu. / Al.) inside the building shall be properly clamped / supported on the wall with Galvanized Iron clamps and Mild Steel Zinc Passivated screws / bolts. The conductors outside the building shall be laid at least 600 mm. below the finished ground level or as per site condition as approved by engineer.

Identification on Earth Pits with Paints as per instruction of Client/Consultant shall be made, Earthing Markers with specified tested value in Ohms shall be installed nearby earth pits.

The earth conductors shall either terminate on earthing socket provided on the equipment or shall be fastened to the foundation bolt and / or on frames of the equipment. The earthing connection to equipment body shall be done after removing paint and other oily substances from the body and then properly be finished.

For termination / connectors for the earth strip / wires; factory fabricated connectors shall be used. Braising and other local means for joining shall be not carried out. The connectors shall be tested as per BS EN 50164 : 2000.

Mode of Measurement

Earthing stations shall be measured in units whereas earthing strips and wires shall be measured in rmt.

TELEPHONE, COMPUTER & IT SYSTEM

SPECIFICATIONS

TELEPHONE CABLES AND WIRES:

The type of cables and the services shall be as follows:

Indoor – Multi pair PVC sheath armoured / un-armoured as specified 0.6 mm tin Cu. Cable. Outside – Multi pair

PVC sheath armoured / jelly filled as specified 0.6 mm tin Cu. Cable.

All multi core cables and wires shall be of tinned copper conductor of not less than 0.6 mm dia and shall be colour coded twisted pairs with rip cord.

The conductor resistance shall be less than 150 ohms per KM and the insulation resistance between the conductors not less than 50 mega ohms and the nominal capacitance of about 0.1 microfarad per kilometre.

Cables laid underground or locations subject to dampness and flooding shall be filled with polyethylene compound and shall have sufficient protection against moisture and water ingress.

All armouring shall be of galvanized steel wires and protected against corrosion by an outer sheath of PVC in the case of indoor cables and polyethylene in the case of outdoor cables. Outer sheathing must be fire retarding and anti-termite.

All un-armoured single core cables and inner sheath of armoured cables shall be provided with ripcord.

TELEPHONE TAG BLOCKS:

The telephone tag blocks shall be suitable for the multi core telephone cables and shall have two terminal blocks, cross connect type. All incoming and outgoing cables shall be terminated on separate terminal blocks and termination shall be silver soldered. The cross connecting jumpers shall be insulated wires of same diameter and screw connected.

The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosure shall be painted with 2 coats of red oxide and stove enamelled.

TELEPHONE OUTLET SOCKET:

Telephone outlet socket shall be of the same make as that of the switches and accessories. The outlet sockets shall consist of 2 A 2 Pair polyethylene connector in M.S.I / PVC boxes with switch plate of the same make as that of switches and telephone socket. The telephone outlet socket unless and otherwise specified shall be jack type and not pin type.

COMPUTER WIRES:

The computer wires shall be of 4 pair enhanced Cat 5 category and shall be of the makes as specified in the tender. The wires used shall be as per the specifications laid down by AVAYA for the certification of the network installed.

COMPUTER DATA OUTLET SOCKETS:

The computer sockets shall be of e Cat 5 category and of the make specified in the tender. The sockets shall be installed in the plates of the modular switches range to be used. The sockets shall be crimped using crimping tool with the Cat 5e wire.

For clean room application the plates shall be of SS 316 with no sharp edges. FLOOR RACEWAY:

Floor raceway of hot dip galvanised / aluminium sheet of 14 g / 2.0 mm shall be used and the dimensions for the same shall be as per the BOQ. The raceways shall be as per the make specified in the tender. The raceways shall be free of any sort of welding edges or other sharp edges to protect cutting of wires during pulling. The raceways shall be laid with use of junction boxes fabricated from 14 g hot dip GI as per drawing.

EPABX SYSTEM:**Features****Required or Not**

Technology	PCM TDM
KTS Support	Yes
ISDN BRI & PRI	Yes
E & M Support	Yes
E1 Support	Yes
Hybrid technology	Yes
External Caller ID display on Console and Key phone	Yes
External Music	Yes
Paging Port	Yes
Conference facility	Yes-8 Party
Memory Storage	32 MB Secure Digital (SD) RAM
DISA Card	Yes. 4 Port. 64 different messages.
8 minutes storage	
DOSA Feature	Yes
VoIP	Yes. Open Industry standard
System connectivity	V.24 Port and USB Port built in on system
Range of Key phone	Yes
Auto Redial on Key Phones	Yes
Back Lit Key Phones	Yes
USB/Comp. connectivity on Key phones	Digital-XDP. Also USB
No. of keys on Key Phones	9 to 37 keys
DSS Connectivity	60 keys
Supports PC Console	Yes
OHCA on Key Phone	Yes
Jog Dialer/Navigator Keys	4 Navigator Keys
Absence messages	Yes, On Key phones and also simple phones
Incoming call routing based on caller ID	Yes
Two way recording of external call	Yes
Personal greeting to external caller	Yes
MS Outlook integration	Yes

POP UP of incoming caller	Yes
WEB Site/URL integration	Yes
Call details/log of incoming callers	Yes
Tenant Facility	Yes
System modes	3. Day, night and lunch
Appointment reminders	Yes
19 inch variants	Yes

WORKMANSHIP

All cables shall be on cable racks and neatly stitched together.

The connection at the tag blocks shall be silver soldered so as to achieve minimum contact resistance.

The final branch connections with single pair cables in conduits and the maximum number of cables in each conduit shall be as follows:

Conduit	diameter	Max. No. of cables
Inch	mm.	
3/4"	20	2 Nos. single pair
1"	25	6 Nos. single pair
1¼"	32	12 Nos. single pair
1½"	40	18 Nos. single pair

The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosure shall be painted with 2 coats of red oxide and stove enamelled.

VARIOUS CODES FOR ELECTRICAL WORKS

APPLICABLE IS STANDARDS

METERS (MEASURING) FOR ANALOG METERS	IS:1248-1986
INSTALLATION AND MAINTENANCE OF SWITCH GEARS	IS:3072-1975
CODE OF PRACTICE FOR EARTHING	IS:3043
H.T. AIR BREAKER, SWITCH GEARS AND FUSES FOR	
VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4047-1977
SELECTION, INSTALLATION AND MAINTENANCE OF FUSES	IS:8106-1966
UP TO 650 VOLTS	
GENERAL REQUIREMENTS FOR SWITCH GEAR AND	IS:4237-1967
GEAR FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	

7.	<u>DEGREE OF PROTECTION PROVIDED BY ENCLOSURES FOR LV S/GEARS</u>	<u>IS:2147-1962</u>
8.	<u>INSULATED CONDUCTOR RATING</u>	<u>IS:8084-1972</u>
9.	<u>ENCLOSED DISTRIBUTION FUSE BOARDS AND CUT-OUTS FOR VOLTAGE NOT EXCEEDING 1000 VOLTS</u>	<u>IS:2675-1983</u>
10.	<u>MINIATURE CIRCUIT BREAKER</u>	<u>IS:8828-1978</u>
11.	<u>FUSE WIRE USED IN RE-WEARABLE TYPE ELECTRIC FUSES UP TO 650 VOLTS</u>	<u>IS:9926-1981</u>
12.	<u>PVC INSULATED ELECTRIC CABLES HEAVY DUTY</u>	<u>IS:1554 (PART I)</u>
13.	<u>RECOMMENDED CURRENT RATING FOR CABLES</u>	<u>IS:3961(PART II)</u>
14.	<u>COPPER CONDUCTOR IN INSULATED CABLES AND CORES</u>	<u>IS:2982</u>
15.	<u>CONDUCTOR FOR INSULATED ELECTRIC CABLES AND FLEXIBLE CORDS</u>	<u>IS:8130</u>
16.	<u>MILD STEEL WIRES, STRIPS AND TAPES FOR ARMOURING CABLES</u>	<u>IS:3975</u>
17.	<u>PVC INSULATION AND SHEATH OF ELECTRIC CABLES</u>	<u>IS:5831</u>
18.	<u>ALUMINIUM CONDUCTOR FOR INSULATED CABLES</u>	<u>IS:1753</u>
19.	<u>PVC INSULATED AND PVC SHEATHED SOLID ALUMINIUM CONDUCTOR CABLES OF VOLTAGE RATING NOT EXCEEDING 1100 VOLTS</u>	<u>IS:4288</u>
20.	<u>RECOMMENDED CURRENT RATING FOR CABLE</u>	<u>IS: 961</u>
21.	<u>CODE OF PRACTICE FOR ELECTRICAL WIRING INSTALLATION SYSTEM VOLTAGE NOT EXCEEDING 650 VOLTS</u>	<u>IS: 732</u>
22.	<u>CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL) ELECTRICAL INSTALLATION</u>	<u>IS: 1646</u>
23.	<u>RIGID STEEL CONDUITS FOR ELECTRICAL WIRING</u>	<u>IS:1653</u>
24.	<u>FITTINGS FOR RIGID STEEL CONDUITS FOR ELECTRICAL WIRING</u>	<u>IS:2667</u>
25.	<u>FLEXIBLE STEEL CONDUIT FOR ELECTRICAL WIRING</u>	<u>IS:3480</u>
26.	<u>ACCESSORIES FOR RIGID STEEL CONDUITS FOR</u>	<u>IS:3837</u>

28.	RIGID NON-METALLIC CONDUITS FOR ELECTRICAL WIRING	IS:2509
29.	FLEXIBLE (PLAYABLE) NON-METALLIC CONDUITS FOR ELECTRICAL INSTALLATION	IS:6946
30.	THREE PIN PLUGS AND SOCKETS	IS:1293
31.	CONDUCTORS FOR INSULATED ELECTRICAL CABLES AND FLEXIBLE CODES	IS:8180
32.	SPECIFICATION FOR CONDUIT FOR ELECTRICAL INSTALLATION	IS:9537-1980
33.	ACCESSORIES FOR NON-METALLIC CONDUITS FOR ELECTRICAL WIRING	IS:3419
34.	SWITCHES	IS:3854
35.	PLUGS	IS:6538
36.	SHUNT CAPACITORS FOR POWER SYSTEMS	IS:2834-1954
37.	HRC CARTRIDGE FUSES AND LINKS UP TO 660 VOLTS	IS:2208
38.	GENERAL AND SAFETY REQUIREMENT FOR LIGHTING FITTINGS	IS:1913-1969
39.	CODE OF PRACTICE FOR LIGHTING PUBLIC THOROUGHFARES	IS:2944-1981
40.	WATERPROOF ELECTRIC LIGHTING FITTINGS	IS:3528
41.	WATER TIGHT ELECTRIC LIGHTING FITTING	IS:3553-1966
42.	MILD STEEL TUBULAR AND OTHER WROUGHT STEEL PIPE FITTING	IS:1239-1958
43.	LUMINARIES FOR STREET LIGHT	IS:2149-1970
44.	HRC FUSES HAVING RUPTURING CAPACITY OF 90 KA	IS:9224
45.	EXHAUST FAN	IS:2312-1967
46.	CLASS I CEILING FAN	IS:374-1979
47.	DANGER NOTICE BOARDS	IS: 2551

NOTE:

All codes and standards means the latest where not specified otherwise the installation shall generally follow the Indian Standard codes of practice or relevant British Standard Codes of Practice in the absence of corresponding Indian Standards.

PLEASE FOLLOW:

Indian Electricity Act of 1910 and rules issued there under revised up to date.

Special Attention should be given to Rule No. 50.

Regulations for electrical equipment in building issued by The Bombay Regional Council of insurance Association of India.

ANNEXURE-III
APPROVED MATERIAL MAKE REFERENCE

INTERIOR WORK : APPROVED MATERIAL MAKE LIST			
Sr.No.	ITEM	APPROVED MAKE	REMARK
A	BUILDING MATERIAL		
1	GENERAL :	FOLLOWING MAKES OR THEIR EQUIVALENT ARE RECOMMENDED	
1.1	CEMENT 53 GRADE	AMBUJA / HATHI / ULTRATECH / J. K. CEMENT	
1.2	FINE SAND	COARSE CLEAN RIVER SAND FREE FROM SALT & OTHER IMPURITIES	FROM SABARMATI RIVER &/OR LOCALLY AVAILABLE GOOD QUALITY FINE SAND AS PER BIS STANDARD.
1.3	COARSE AGGREGATE (KAPCHI AND GRIT)	SEVALIYA QUARRY / VATRAK APPROVED MATERIAL	AS PER BIS STANDARD
1.5	BRICK (BURNT CLAY BRICKS)	COMPRESSIVE STRENGTH OF 35 KG/CM2	
1.6	FLY ASH BRICKS	A. E. C. / SUMAN ROYAL BRICK / DEVJIT BRICK	APPROVED FLY ASH BRICKS CAN BE USED IN PLACE OF BURNT CLAY BRICKS
1.7	SIPOREX / LIGHT WEIGHT BLOCK	AAC OR EQUIVALENT	
1.8	WATER PROOFING COMPOUNDS	CICO, SIEKO, MAXROTH, SAMROCK, ROFF	
1.9	PEST CONTROL	PCI / GODREJ OR EQUIVALENT	
2	TILES :		
2.1	VITRIFIED TILES 600 X 600 MM / 800 x800mm (MIRROR FINISH/MATT/ANTI SKID FINISH)	NITCO / KAJARIYA / RAK / ASIAN / SOMANY / JOHNSON	FITTING AS PER COMPANY SPECIFICATION ONLY
2.2	RECTIFIED TILES 600 X 600 MM / 800 x 800mm (MATT/ANTI SKID FINISH)	NITCO / KAJARIYA / RAK / ASIAN / SOMANY / JOHNSON	FITTING AS PER COMPANY SPECIFICATION ONLY
2.3	CERAMIC / GLAZED TILES (300 x 450 / 300 x 300)	NITCO / KAJARIYA / RAK / ASIAN / SOMANY / JOHNSON	FITTING AS PER COMPANY SPECIFICATION ONLY
2.4	TILE FIXING ADHESIVE	PIDILITE / FOSROC/ LATICRETE/BAL / INNOVA/ KERAKOL OR EQUIVALENT	APPLICATION AS PER COMPANY SPECIFICATION ONLY
2.5	TILE JOINT GROUT	PIDILITE / FOSROC/ LATICRETE/BAL / INNOVA/ KERAKOL OR EQUIVALENT	
3	PLUMBING :		
3.1	PVC PIPES AND FITTINGS	ASTRAL / SUPREME / PRINCE	FITTING AS PER COMPANY SPECIFICATION ONLY

3.2	UPVC / CPVC PIPE	ASTRAL / SUPREME / PRINCE	FITTING AS PER COMPANY SPECIFICATION ONLY
3.3	UPVC / CPVC ALBO'S AND OTHER JOINTS	ASTRAL / SUPREME / PRINCE	FITTING AS PER COMPANY SPECIFICATION ONLY
3.4	PLUMBING FITTING	JAQUAR (florentine series) / HINDWARE	FITTING AS PER COMPANY SPECIFICATION ONLY

4	SANITARY WARE :		
4.1	EWC	CERA / HINDWARE / PARRY WARE/JAQUAR	FITTING AS PER COMPANY SPECIFICATION ONLY
4.2	WASH BASIN	CERA / HINDWARE / PARRY WARE/JAQUAR	FITTING AS PER COMPANY SPECIFICATION ONLY
4.3	URINAL	CERA / HINDWARE / PARRY WARE/JAQUAR	FITTING AS PER COMPANY SPECIFICATION ONLY
4.4	TOILET ACCESSORIES- towel rail, robe hook, soap dish, toilet paper holder	JAQUAR /HINDWARE/PARRYWARE	FITTING AS PER COMPANY SPECIFICATION ONLY
5	FALSE CEILING / FLOORING :		
5.1	GYPSUM FALSE CEILING	GYPROC , SAINT GOBAIN & EQUIVALENT (Gypboard of 12.5 mm thick)	GYPSERRA - WITH COMPANY SECTION / SPECIFICATIONS ONLY- IT SHALL BE EXECUTED AS PER COMPANY SPECIFICATION
5.2	TILE BASE GRID CEILING (Mineral Fiber)	ARMSTRONG OR EQUIVALENT	COMPANY SECTION / SPECIFICATIONS ONLY- IT SHALL BE EXECUTED
5.3	TILE BASE GRID CEILING (METAL TILE)	ARMSTRONG OR EQUIVALENT	COMPANY SECTION / SPECIFICATIONS ONLY- IT SHALL BE EXECUTED
5.4	BAFFLE CEILING	ARMSTRONG OR EQUIVALENT	COMPANY SECTION / SPECIFICATIONS ONLY- IT SHALL BE EXECUTED
5.5	FALSE FLOORING	FLEXI / TAF/UNITILE	AS PER THE STANDARD
5.6	CARPET	INTERFACE /MILLCANE	COLOR & FINISH AS SUGGESTED BY THE ARCHITECT & CLIENT
5.7	WOODEN FLOORING	ARMSTRONG / WONDER FLOOR / PARGO / UNITEX /MOHAWK / ROYAL TOUCH	COLOR & FINISH AS SUGGESTED BY THE ARCHITECT & CLIENT
5.8	VINYL FLOORING	TARKET T / GERFLOR / ARMSTRONG	COLOR & FINISH AS SUGGESTED BY THE ARCHITECT & CLIENT
B	WOOD/BLOCK BOARD/PLYWOOD/LA MINATES		
6.1	WOOD	TEAK WOOD	1ST QUALITY IMPORTED, 95% IN EVEN COLOR WITHOUT KNOTS,JOINTS & BEND WOOD, 8% MOISTURE CONTENT
6.2	PVC EDGE BAND	RIHEAU, SIDMARK	FIXING WITH COMPANY RECOMMENDED GLUE IN EDGE BANDING MACHINE

6.3	WOOD VENEER	URO / NATURAL VENEER (Turakhia Veneer) / GREEN/ CENTURY	
7.1	BLOCK BOARD	GREEN PLY / CENTURY	AS PER ISI STANDARD
7.2	PLY WOOD	GREEN PLY / CENTURY	IS 303 (MR is a water resistant plywood from the house of Ply and is the only water resistant ply in this plywood price range. This affordable grade plywood is bend-resistant and weather-resistant, making it dimensionally stable and swell proof. MR is Borer and Termite proof and comes with a 5 year warranty.) AS SUGGESTED BY THE ARCHITECT & CLIENT
7.3	PLY WOOD (B. W. P.)	GREEN PLY / CENTURY	IS 710 (The asli waterproof plywood of the country, 710 is part of the affordable range offered by Ply. With a uniform rate throughout the country, this plywood offers great value for your money. It is gapless, has enhanced resistance to bending, and possesses superior strength. Sainik 710 comes with a warranty of 8 years. (AS SUGGESTED BY THE ARCHITECT & CLIENT)
7.4	M.D.F BOARD	GREEN PLY / CENTURY/ ACTION TESA	INT. GRADE MANUFACTURED FROM AGROBASED LIGNOCELLULOSIC FIBRES MARKED IS 12406- 1988
7.5	PRELAMINATED PARTICLE BOARD	MARINO/ CENTURY / ASSOCIATED/ ACTION TESA	AS PER THE STANDARD
7.6	FLUSH DOOR	GREEN PLY / CENTURY	AS PER THE STANDARD
7.7	FIRE DOOR	SHAKTI/RADIANT/ SEHGAL	AS PER THE STANDARD
8	LAMINATES :		
8.1	1.0MM THICKNESS	AICA /GREEN LAM/CENTURY/ MERINO/ASSOCIATE	COLOR & FINISH AS SUGGESTED BY THE ARCHITECT & CLIENT
8.2	1.5 MM THICKNESS	AICA /GREEN LAM/CENTURY/ MERINO/ASSOCIATE	COLOR & FINISH AS SUGGESTED BY THE ARCHITECT & CLIENT
8.3	0.8 MM THICKNESS FOR CURVICA	AICA /GREEN LAM/CENTURY/ MERINO/ASSOCIATE	COLOR & FINISH AS SUGGESTED BY THE ARCHITECT & CLIENT
8.4	COMPACT SHEET	MERINO/GREEN LAM/ CENTURY	AS PER THE STANDARD
C	HARDWARE ITEMS		
9	GENERAL :		
9.1	ADHESIVES	FEVICOL, VEMICOL, ARALDITE	
9.2	SCREW	GKW / RK / I.T.C / NETTLE FOLD	
9.3	NAILS	MEHTA / CHAKRA (FRESH & WITHOUT RUSTING)	
9.4	SEALENT	GE/ HAFELE/ PEDILITE	

10	LOCKS :		
10.1	MULTIPURPOSE SET	ENOX / EBCO / GODREJ /OZONE/ HETTICH/ HAFELE/ DORMA/ DOORSET/INGERSOLL RAND OR EQUIVALENT	ROUND HOUSING IN VERTICAL OR HORIZONTAL
1.2	NIGHT LATCH (S.S BRUSH FINISH)	ENOX / EBCO / GODREJ /OZONE/ HETTICH/ HAFELE/ DORMA/ DOORSET INGERSOLL RAND OR EQUIVALENT	
1.3	MORTISE LOCK	ENOX / EBCO / GODREJ /OZONE/ HETTICH/ HAFELE/ DORMA/ DOORSET	
1.4	DEAD LOCK	ENOX / EBCO / GODREJ /OZONE/ HETTICH/ HAFELE/ DORMA/ DOORSET	6 LEVER - PIN CYLINDER TYPE WITH FLUSH TYPE KEY
1.5	ALLEN KEY	ENOX / EBCO / GODREJ /OZONE/ HETTICH/ HAFELE/ DORMA/ DOORSET	
11	FIXTURES :		
11.1	HINGES (STORAGE UNITS)	HAFELE/ HATTICH/ ENOX/EBCO/ OZONE	
11.2	HINGES OF DOOR	HAFELE/ HATTICH/ ENOX/EBCO/ PALLADIUM/ OZONE	
11.3	DRAWER CHANNEL/ TELESCOPIC CHANNEL/ METABOX	HAFELE/ HATTICH/ ENOX/EBCO/ OZONE	
11.4	SLIDING MECHANISM	HAFELE/ HATTICH/ ENOX/EBCO/ OZONE	
11.5	TOWER BOLTS	HAFELE/ HATTICH/ ENOX/EBCO/ OZONE	S.S BRUSH FINISH- LENGTH AS REQ.
11.6	HANDLES	HAFELE/ HATTICH/ ENOX/EBCO/ OZONE/KICH	S.S MATT FINISH- BOW SHAPE OR CONCEALED TYPE - LENGTH AS REQ. WITH COMMON PIN FOR HANDLES IN PAIR
11.7	MEGNET	HAFELE/ HATTICH/ ENOX/EBCO/ OZONE	SMALL/ BIG AS REQ.
11.8	GLASS BRACKET	HAFELE/ HATTICH/ ENOX/EBCO/ OZONE	POCKET BRACKET- 8MM & 12 MM TH X 50MMSSL PLATED - F TYPE
11.9	STUDS	HAFELE/ HATTICH/ ENOX/EBCO/ OZONE/KICH	SS MATT FINISH- LENGTH AS REQ.
12	DOOR OPENING FIXTURE		
12.1	DOOR CLOSERS	DOOR SET / OZONE / DORMA/ GODREJ	GOLDEN/ SILVER IN COLOR- ON APPROVAL UPTO 50KG DOOR
12.2	FLOOR SPRING	DOOR SET / OZONE / DORMA/ GODREJ	HOLD OPEN TYPE- HEAVY DUTY/ OZONE- UPTO 3'W-7400/ UPTO 4'- 8400/ UPTO 5'-9400/ STERLING FS 3000
12.3	DOOR STOPPER	HAFELE/ HATTICH/ ENOX/EBCO/ OZONE/KICH	SS MATT FINISH- PUSH TYPE ONLY
13	COMPUTER RELATED FIXTURES		
13.1	CABLE M'GER	EBCO/ INNOFITT	S.S L PLATED- 3" DIA

13.2	KEY BOARD	EBCO / INNOFITT	MS. BALCK PC WITH HEAVY BALL BEARING SLIDE -25" LONG WITH SOFT PAD
13.3	C.P.U HOLDER	INNOFITT / EBCO	WITH SWIVEL & PULL OUT TYPE-TOP MOUNT OR FIXED SIDE MOUNTED AS SUGGESTED
14	ALUMINIUM SECTIONS/ S.S SHEETS		
14.1	AL. SECTIONS	JINDAL/ BANCO / HINDALCO/ BALCO	MINIMUM 1.5 MM THICK
14.2	IMPORTED ALUMINUM SECTION FOR PARTITION	JEB / ALLOY / APTON / KUBIK	
14.3	ALUMINIUM SKIRTING	BOTTOM LINE / TESCO / INSIDE SPACES	
15	GLASS & MIRRORS		
15.1	GLASS	SAINT GOBIN / MODI GUARD / ASAHI	FLOAT GLASS IN VARIOUS TH. AS REQ.
15.2	MIRRORS	SAINT GOBIN / MODI GUARD / ASAHI	
15.3	LACQUERED GLASS	SAINT GOBIN / ASAHI	
D	FINISHES		
16	SURFACE FINISH		
16.1	POLISH- MELAMINE	ASIAN / MRF/ICI/ JUTON	
16.2	PAINTS	ASIAN PAINTS / ICI / NEROLAC / BERGER/JOTUN	SATIN ENAMEL/ FLAT/ DUCO/ SHADE & FINISH AS SUGGESTED
16.3	TEXTURES / SPREY PAINT	NOVA / LUXTURE / DUROTEX/JOTUN/ ASIAN/ICI	ON SAMPLE APPROVAL BASIS- TO BE EXECUTED BY COMPANYS APPROVED APPLICATOR ONLY
16.4	POWDER COATING	SHADE, FINISH & MFG COMPANY ON APPROVAL BASIS- 55 TO 65 MICRONS BY GIVING PRETREATMENT THE MATERIAL AND PHOSPHATED BEFORE POWDER COATING AND THERMOSET POWDER COATING BY APPLYING EPOXY HYBRINDES IN SUGGESTED SHADE/ FINISH - BY SEVEN TANK PROCESS ONLY	
16.5	COLOR ANODISE	SHADE, FINISH & MFG COMPANY ON APPROVAL BASIS	
16.6	VINYLE	3M / LG/ARMSTRONG	AS PER APPROVE SAMPLE
16.7	FROSTED FILM	3M / LG / GARWARY	AS PER APPROVE SAMPLE
16.8	ACOUSTIC PANELLING	TRANQUIL / TECHNO/ECOTONE	AS PER APPROVE SAMPLE
16.9	WALL PAPER	ARTE / ENGRAPHICS / MARSHALL	AS PER APPROVE SAMPLE
16.10	ROCK WOOL/GLASS WOOL	ABAD / TWIGA/s	AS PER APPROVE SAMPLE
17	FOAM/ RUBBER/ TAPESTRY		
17.1	RUBBER	GEO/ MM FROM	PENCIL HOLE VARIOUS THICKNESS AS REQ.

17.2	FOAM	SLEEPWELL/ KURLON	40 DENSITY- VARIOUS THICKNESS AS REQ
17.3	GASKET	PVC OR EPDM	AS PER REQ
18	SURFACE TREATMENT		
18.1	ALU.COMP.PANEL	ALUDECOR/ EURO BOND /TIME/ALSTRONG	3MM THICK EXTERIOR GRADE- COLOR AND FINISH
18.2	Anti skid Tape	3M/ EURONICS	AS PER APPROVE SAMPLE
19	ROLLER BLIND	VISTA / HUNTER DOUGLAS	COLOR & FINISH AS SUGGESTED BY THE ARCHITECT & CLIENT
20	MODULAR FURNITURE	HNI / FEATHERLITE/WIPRO/GODREJ/MONARCH/LE MODULAR / AFC	WITH PRIOR APPROVAL OF CLIENT COLOR & FINISH AS SUGGESTED BY THE ARCHITECT & CLIENT
21	COMPACTOR STORAGE	GODREJ/KOMPRESS/METHODEX	
22	CHAIR	HAWORTH/HERMAN MILLER/ FEATHERLITE/MERRYFAIR/HNI/EXCLUSIFF	AS PER APPROVE SAMPLE
23	AIR CONDITIONER	Samsung / Blue Star/ LG/ Voltas/Daikin/Carrier Midea	

ELECTRICAL WORK : APPROVED MATERIAL MAKE LIST			
Sr.No.	ITEM	APPROVED MAKE	REMARK
1.0	M.C.B / M.C.C.B / E.L.M.C.B / DB	Legrand (M.D.S / Merlin Gerin) , L&T, Hager, ABB, Schneider	
2.0	Wires (FRLS)	Polycab / Finolex / RR Cables	
3.0	Cables	Polycab/ Finolex/ RR Cables / Avocab	
4.0	Conduit (PVC)	Precision/ Polycab/ Finolex/ Vraj	
5.0	Switches and Sockets	M.K / Crabtree/ ABB/ Legrand / Norysis	
6.0	Wall Mounted Fans	Crompton/ Havels/ Usha/ Orient	
7.0	Telephone & Data wires & Cables-cat-6	D-link / AMP / legrand / Morlex	
8.0	Tube / Bulbs / PI Tubes	Philips / GE/ wipro/crompton greaves	

9.0	Flexible Wire for Speaker	Polycab / Finolex/ RR Cables / Avocab	
10.0	Switchgear Equipment	L & T / Siemens / Legrand/ ABB / Schneider	
11.0	Aluminium Trunking Pipe / junction boxes	Jindal/ Hindalco/ Tata	
12.0	Cable tray , Raceways & JB	MK/ legrand/ Stalwart/ Profab	
13.0	P. A System	Philips / Sony /bose / Ahuja	
14.0	Emergency Lighting System	Prolite / Panasonic / Orpat / Bajaj	
15.0	Lighting Fittings	Wipro / Philips / GE /Crompton /BAJAJ	
16.0	Chemical Earthing	True Power/ ASHLOK/ JEFT/OBO	
17.0	Camera	HIKVISION/ Dahua /CP Plus/ Honeywell	
18.0	Fire Alaram System	Cease Fire/ Honeywell/ GST/Axis	
19.0	MAIN PANEL	CPRI APPROVED PANEL BUILDER - Aproved by Consultant	
20.0	Access Control	Honeywell/Matrix/Zkteco/Essl/Mantr a or Standerd Make - Approved by Consultant	

TOILET AREA: APPROVED MATERIAL MAKE LIST

TOILET AREA : APPROVED MATERIAL MAKE LIST			
Sr.No.	ITEM	APPROVED MAKE	REMARK
		FOLLOWING MAKES OR THEIR EQUIVALENT ARE RECOMMENDED	
1.0	KAJARIA Make _Flooring	FOG PERLA_ KAJARIA MAKE (Size : 600mm x 600mm)	

2.0	KAJARIA Make_ Wall Dado	FOG PERLA_ KAJARIA MAKE (Size : 600mm x 600mm)	
3.0	WC (Wall Mounted)	Cear Make _ Campbell Mini Cat No: -S1041104	
4.0	Urinal	Cera Make _ Capriana Urinal Cat No : - S4020112	
5.0	Wash Basin - Wall Hung	Cera Make _ Cadel Cat No:- S2040121	
6.0	Wash Basin - Under Counter	Cera Make _ CAMRY Cat No :- S2030105	
7.0	CONCEALED TANK	Cera Make_CONCEALED CISTERN WITH PLATE	
8.0	Angle Cocks	Jaquar Florentine series Cat no FLR-5053N	
9.0	Concealed stop cock Cocks	Jaquar Florentine series Cat no FLR-6081N	
10.0	Two way Bib Cock For EWC	Jaquar Florentine series Cat no FLR-5041N	
11.0	Pillar cock for Basins	Jaquar Florentine series Cat no FLR-5011N	
12.0	Swan Neck Taps for Sinks	Jaquar Florentine series Cat no FLR-5347N	
13.0	Health Faucet	Jaquar Cat no ALD 573	
14.0	Towel Ring	Jaquar continental series Cat no 1121N	
15.0	Towel Rod	Jaquar continental series Cat no 1111N	
16.0	Toilet paper holder	Jaquar continental series Cat no 1151N	

17.0	Soap Dish	Jaquar stealth series ACN-1131N	
18.0	Robe Hooks	Jaquar continental series Cat no 1161N	
19.0	S.S. SINK	NIRALI/Carysil/Franke Artisan/Hafele	

NOTE:

- 1 WHERE OTHER MATERIALS ARE PROPOSED TO USE, THOSE SHOULD BE GOT APPROVED BY ARCHITECT/CONSULTANT /CLIENT BEFORE EXECUTION OF PARTICULAR ITEM. IN CASE OF NON-AVAILABILITY OF ANY MATERIAL OF SPECIFIED MAKE, THE ALTERNATIVE SHOULD BE USED WITH APPROVAL OF ARCHITECT / CLIENT.
ONLY AFTER ITS DUE APPROVED IN WRITING BY THE EMPLOYER OR THE ARCHITECT. THE MATERIAL SHALL BE USED IN PREFENTIAL ORDER ONLY. THE CONTRATOR WILL HAVE TO TAKE NECESSAY MATERIAL TEST AT HIS OWN COST FOR
- 2 VARIOUS MATERIALS PERIODICALLY OR AS AND WHEN REQUIRED BY THE ARCHITECT /CONSULTANT/ CLIENT. THE MATERIALS SHOULD BE GOT TESTED IN AN APPROVED LABORATORY AND TEST REPORTS IN DUPLICATE SHOLD BE SUBMITTED TO THE ARCHITECT.
- 3 WHEREVER EQUIVALENT WORD WRITTEN, THE PRODUCT SHALL BE APPROVED BY ARCHITECT /CONSULTANT /CLIENT BEFORE EXECUTION OF PARTICULAR ITEM.
THE CONTRACTOR IS SUPPOSED TO PROVIDE ANY OF THE ABOVE MENTINED PRODUCTS AS
- 4 ASKED BY ARCHITECT & IT WILL BE THE PREROGATIVE OF ARCHITECT / CLIENT TO CHOOSE ANY OF THE ABOVE MENTIONED PRODUCTS.
CLIENT RESERVES ALL THE RIGHTS TO ADD OR CHANGE AND DEVEATE ANY OF MATERILA APPROVED MAKE AS PER THEIR NEED AND CONTRACTOR HAS TO FULLFILL THE REQUIREMENT.

ANNEXURE – IV

PAYMENT TERMS, PROJECT TIMELINE AND LABOUR COMPLIANCE

A. PAYMENT TERMS:

Payment shall be made against submission of Correct Bill in staggered instalments as under...

- i) 1st payment : 30% of Total work order value on completion of work of 30 % of Total work order value within 30 days from date of mobilization
- ii) 2nd payment: Additional 40 % of Total work order value on completion of work of 80 % of Total work order value within 50 days from date of mobilization
- iii) Final payment: Balance value as per the actual work done on Final completion of entire work, final bill checking and handling over the Premises.

Owner's decision regarding the above shall be final and binding to the Contractor.

Contractor shall at it's own cost, effect, as required as per the act, take necessary insurance in respect of the staff to be employed or engaged by the Contractor in connection with the rendering of services & shall comply with provision of ESI, Workman compensation act, payment of wages act, EPF & the other rules & regulation that may be applicable to them now or that may be introduced by the Government.

The Contractor will have to furnish the statement showing the names & wages of all the employees engaged by the contractor in connection with rendering of aforesaid services to Owner. Contractor's failure to fulfil any of the obligations hereunder and or rules framed, Owner shall be entitled to stop the monthly payment or entitled to recover from monthly bill without prejudice to it's any other rights under the law.

B. MODE OF MEASUREMENT:

Billing will be done as per actual work done and shall be submitted by contractor, verified & approved by the Project Management Consultant/ Architect / Owner authorized person. Owner reserves the right to increase / decrease the quantity or replace the Scope of Work or delete them at any stage of the work.

C. PENALTY /INCENTIVE:

Owner can recover penalty amount from monthly invoices, if the Contractor neglects to execute his duties as per the HSE standards, Scope of Work or unnecessarily delays completion of work during execution of Contract. The amount of such recovery shall be as shown below for the given parameters or mutually determined in consideration of the consequence of Contractors' neglect.

Sr.No	Parameter	Service Level Agreement	Penalty	Incentive
1	Delay in completion timeline	Delay in work completion period	Rs. 5000/- for the first week and after that Rs.1000/- per day	NIL

2	Incident Reporting	Not Reporting any incident occurring at the Work place	Rs. 3000/- for the first instance Rs. 5000/- for the second instance	NIL
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			For third instance the same shall lead to termination of the contract	
3	Quality of Work (Civil)	The work shall conform to specifications as described in the SOR and shall be finished properly The installation should not get damaged within one year of installation	Repair work to be done free of cost within 7 days of intimation No response within 7 days – Rs. 500/day of delay	
4	Site Clearance	After culmination of the job the site shall be cleared latest within the next 2 days.	Rs.5000/- if site not cleared within 2 days Addl. Rs.500/- thereof for each additional day of delay	NIL
5	Asset Damage	Any Damage to the asset/station of Owner	Reimbursement of the damage at actual	NIL
6	Child labour	Employment of labor above 18 years age.	It's mandatory requirement so non-compliance of the same shall lead to termination of the contract	NIL
7	Legal Compliance	Compliance to all legal requirement specified	Owner reserves the right to terminate the Contract in case of any NC	NIL
8	Documentation	Progress Report to be submitted as per frequency decided by Work in Charge	Rs. 1000/- per instance	NIL
9	HSE Compliance	Wearing of PPE's and using of other safety equipments	Rs. 1000/- per instance for the first & second instances Rs. 3000/- per instance for the third & fourth instances Rs. 5000/- for the fifth & sixth instances For instances after this, the respective contractor staff shall be terminated immediately	

		Stoppage of work due to HSE noncompliance (i.e. Safety Pass port, I-Card, Absence of Site Supervisor etc.)	Rs. 3000/- for the first instance Rs. 5000/- for the second instance Rs. 7000/- for third instance For fourth instance the same shall lead to terminate the contract	
10	Extra & Excess Items	Work executed without prior email approval from GGL	Payment shall not be made and Rs. 5000/- penalty be imposed	

In Case if Contractor does not respond immediately to intimations of any dispute/controversy, company reserves the rights of solve the dispute/controversy at Contractor's cost and risk. In case Owner under takes the dispute/controversy expense of such dispute/controversy shall be debited actual to the Contractor for each such instance.

The maximum penalty arising out of any non-compliance as mentioned above shall not exceed 10% of the Contract Value.

D. CONTRACT PERIOD AND COMPLETION TIMELINE:

The Period of Contract shall be **120** days (4 months) from the date of Award of Contract However, the project has to be completed within **45** days from the date of mobilization (Mobilization In 10 days), and it will be reviewed for further extension, if required.

The Contractor shall abide all the terms & condition of contract. In case of breach of any of the terms & condition, the Owner shall be at liberty to terminate the contract without any notice to Contractor and Contractor shall have no claim for compensation of any loss that he may incur on this account.

The Contractor shall be responsible for carrying out the works as per the schedule provided and its timely achievement as per the milestones indicated. Contractor shall make up any time loss due to delays attributable to him by providing extra resources to complete the work / milestone within the stipulated time.

Specified work shall be started immediately after intimation from Owner. Any delay beyond this period due to unavoidable circumstances shall be allowed only after approval from Owner Project Manager. Any Complaint forwarded by Owner designated representative shall be resolved within 24 hours.

Contractor shall submit the measurement sheet/report duly signed by responsible person and plan of compacted work within time specified.

E. STATUTORY REQUIREMENTS:

The Contractor shall be responsible for the payment of all salaries/wages, allowance, emoluments, gratuity and such other payment etc. as may be paid to the Contractor under minimum wages act/law or statutory rules applicable to the employee and the Contractor shall discharge all such liabilities promptly and keep the Owner indemnified all such payment/liabilities.

The Contractor shall be responsible for payment of contribution under Employees State Insurance Act, Provident Fund Act, Minimum Wages Act and other statutory payment required to be made under and law or statutory rules or regulations for the time being applicable to the staff engaged by the Contractor for work at the Owner's premises and the Contractor shall discharge all such liabilities promptly and keep Owner indemnified from same at all the time.

The Owner shall not be responsible for death, injury or accidents to the employees engaged by the Contractor. In view of above Contractor shall take workmen's compensation policy/Group personal accident policy for the average number of persons being engaged Contractor at a time. The Contractor would take appropriate insurance coverage under the Workmen's Compensation Act/Group Personal Accident Policy for the number of persons engaged by him at any point of time. The Contractor shall submit the copies of these policies to the Company

All payment required to be made by the Contractor referred to in the proceeding clauses shall, if the Owner has to make or required to pay the same, be recoverable from the Contractor out of any monies payable by the Owner and the Owner shall be at liberty without prejudice to its other right and remedies, to deduct the said amount from any amount due by the Owner to the Contractor.

The Contractor shall submit the copies of registration certificates, licenses required under the PF Act, ESI Act, Contract Labour (Regulation & Abolition) Act and such other legislation. The contractor shall also submit copies of documents evidencing contribution to the ESI/PF and abstract of Wage Register/Payment Register as per the provisions of the Minimum Wages Act, up to previous 2 months while raising the first invoice and up to the previous month for every subsequent bill thereafter. The contractor shall comply strictly with the provisions of the Minimum Wages Act and other labour legislations whether Central, State or local. Owner (Owner) shall be entitled to withhold all or any part of the payment amount in the event of non-submission/of the documents/noncompliance with the laws as above. Contractor shall submit a copy of each of the document to Owner

The Contractor shall indemnify and keep indemnified the Owner and its Officers/Servants and agents from and against all third party claims whatsoever including but not limited to property loss and damage, personnel accident injury or death etc.

The Contractor shall be solely and exclusively responsible for employing persons in execution of this contract. The company shall have no liability whatsoever concerning the Contractor's employees in any respect.

The Contractor shall provide at his cost to all staff and workmen directly or indirectly employed in the works all amenities for securing proper working and living conditions at the site and at the labour camp. The Contractor shall also provide medical facilities at the site as per rules in force in relation to strength of their staff and workmen deployed at site.

Contractor shall provide Identity Card to their employees.

Contractor shall ensure that employees/workers engaged in the job must be given at least 1 day off per week.

ANNEXURE – V

HEALTH SAFETY & ENVIRONMENT

- 1.1.** Contractor shall develop a health, safety and environment (HSE) plan that addresses the HSE risks specific to the Work and the management of controls to eliminate reduce or mitigate these risks.
- 1.2.** Contractor shall ensure that it's Health, Safety and Environment (HSE) Management System, its Safety policy and its Project HSE Plan are compatible with Company's HSE policy and objectives.
- 1.3.** Contractor shall ensure that its HSE policy and HSE Plan are available at the Site to all Company's Personnel and Contractor's Personnel in their working languages, and shall ensure that all Contractors' Personnel comply with the requirements of both the HSE Policy and the HSE Plan.
- 1.4.** Contractor shall ensure its personnel are:
- 1.5.** Medically, physically and mentally fit to carry out the duties to which they are assigned in respect of the work.
- 1.6.** Technically competent and experienced in the tasks assigned to them.
- 1.7.** Ensure competency training and subsequent assessment from Owner to all personal who will be deputed.
- 1.8.** Contractor's employees must use normally accepted and designated paths, walkways, or routes in going to, from, and within sites, buildings and other places of employment. "Short cuts" are prohibited.
- 1.9.** On completion of the contract, close out report shall be completed jointly with Owner contract holder covering evaluation of overall HSE performance & improvement area based on lesson learnt.
- 1.10.** Contractor should ensure an injury free incident free workplace and protect People from harm caused by work activities
- 1.11.** Contractor shall arrange work related PPE as per HSE Guidelines - PPE to his manpower and ensure to wear it during the execution of job. Owner reserves the rights to impose penalty if proper use of agreed PPE's are not found on site. Owner reserves the rights to periodically inspect these PPEs and to demand for availability of better quality of any PPE if that particular type of PPE is not meeting Owner's requirements. Owner reserves the rights to impose penalty if proper use of agreed PPE's are not found on site. Owner reserves the rights to periodically inspect these PPEs and to demand for availability of better quality of any PPE if that particular type of PPE is not meeting Owner's requirements.
- 1.12.** Contractor shall ensure that all the HSE requirements are properly discussed for any sub-contracted activities with the staff employed to do the sub-contracted activity. No such activity shall be performed without clearance from Owner Work In-Charge.
- 1.13.** Contractor shall strictly abide by the work permit system & Safe Control of Operation Procedures wherever applicable and explained by the Owner work in-charge
- 1.14.** Contractor shall not indulge in any work during night time and if ever required Owner would provide proper lighting arrangement at that time.
- 1.15.** Contractor shall ensure adequate transportation, storage and handling of material to prevent any

damage which may impair safe performance of the equipment / material etc. All the storage of material will be in the contractor's scope and at the contractors store/ site.

- 1.16.** Contractor shall ensure safe manual handling (both individual handling & team handling) of materials / equipment to prevent any injury caused to self and third party.
- 1.17.** Contractor shall not carry out any work at any premises under construction. Permission & Instruction must be sought from Owner's supervisor in case of exceptional circumstances.

- 1.18. Emergency arrangement as agreed with Owner like Fire extinguisher, Communication system, First aid box, etc. shall be ensured at site as directed by Owner appropriately.
- 1.19. Contractor shall erect & install warning sign boards and hard barricades at work place during the course of execution of job (i.e. "Work in progress" etc.). The barricades shall be erected as per the requirement of Owner.
- 1.20. Contractors shall ensure that all temporary scaffolds, cordons, sign boards etc. erected for purpose of the assigned job are promptly removed following completion of the job
- 1.21. Wooden / insulated handles shall be used for manual tools to avoid any electricity hazards related to potential live underground electric cables
- 1.22. Any cable/wire found during execution of job shall be considered as live and care shall be taken accordingly.
- 1.23. During the execution of work, you should ensure that it should not obstruct any or all other routine activities performed by other agencies.
- 1.24. Contractors must ensure that before using tools, appliances, machines, vehicles, or other equipment, the same are in safe working condition. Defective items must be repaired or removed from service promptly
- 1.25. Working at height shall not be undertaken without first ensuring the adequate personal protective equipment (e.g. Safety Belt with fall arrestor, Scaffolds, Petzel Eqpt. Safety net etc.) & is subject to Owner's permit to work.
- 1.26. Working at height shall not be done during night time and adverse weather conditions
- 1.27. Nothing shall be thrown or dropped from any higher levels during working at height
- 1.28. Scrapping and disposal of the excess soil shall be done by the Contractor to ensure proper housekeeping is maintained
- 1.29. No trenches to be left open or unattended overnight for any reason what so ever, if needed shall be adequately protected by means of barricading, posting suitable warning signs and pictorials
- 1.30. Trench wall / excavated soil shall be adequately protected to prevent any potential collapse.
- 1.31. Suitable and strong scaffolds should be provided for workmen for all works that cannot be done safely from ground. Medical certificate to be provided for the persons who are working at height above 2 meters. The certificate shall be provided before the commencement of work.
- 1.32. No portable single ladder shall be over 02 meters in length. The width between the side rails shall not be less than 30 cm. (clear) and the distance between two adjacent rungs shall not be more than 30 cm. When a ladder is used an extra mazdoor shall be engaged for holding the ladder.
- 1.33. The excavated material shall not be placed within 1.5 meters of the edge of the trench or half of the depth of the trench whichever is more. All trenches and excavations shall be provided with necessary fencing and lighting.
- 1.34. Every opening in the floor of a building or in a working platform should be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1 meter.
- 1.35. No floor, roof or other part of the structure shall be so over loaded with debris or material so as to render it unsafe.
- 1.36. Workers employed on mixing and handling material such as asphalt, cement mortar or concrete and lime mortar shall be provided with appropriate PPE's as required as per the job.
- 1.37. Contractor shall submit medical test report of their employees/staff before starting of job.

- 1.38. The Personnel deployed should have been first aid trained for electrical related hazard to rescue personnel and have knowledge of fighting electrical fires
- 1.39. The personnel shall stop the work and inform Owner authorities in case the safety conditions are not met e.g. absence /improper electrical mat placements
- 1.40. Contractor shall ensure that all the equipments & safety devices are inspected & certified by competent person & are suitable for use.
- 1.41. Contractor shall adhere to safe construction practice and guard against hazards and unsafe working conditions and shall comply with safety standards
- 1.42. Contractor shall ensure good standard of housekeeping while work to avoid slip, trip & fall hazard. Work place inspection (WPI) shall be carried out by supervisor and initiate action to close out all observations.
- 1.43. The Contractor shall intimate the Owner the requirement of training required to its staff well in advance.
- 1.44. Contractor shall inform all his employees that smoking inside the office premises as well as sites is strictly prohibited
- 1.45. Contractor shall take note that any electrical open wires, loose connections, hot running of equipment, open panels electrical boards, broken electrical switches etc. shall be promptly reported as hazards and until they get repaired a board of DANGER shall be displayed to caution the nearby persons.
- 1.46. Lock out and tag out shall be conducted after de-energization and double checked before starting any jobs. In case of conducting job for the purpose of fault finding & monitoring of voltage & current it is to be considered live working and all PPE'S to be worn to avoid exposure of flash arc current.
- 1.47. Contractor shall ensure that in isolated rooms or areas no single working shall be allowed /followed.
- 1.48. All work to be carried out at site under valid Permit to Work from Owner work in charge. Contractor to give at least 24 hours prior notice to Owner work in charge so as to arrange for the work permit
- 1.49. Contractor's personnel shall not smoke or resort to misuse of drugs, medicines or alcohol while on duty. Contractor shall also ensure that in no case the ability of his employees to carry out their assigned duty is impaired by use of the substances mentioned herein
- 1.50. Action arises due to incident investigation, audit/inspection and hazard reporting etc. shall be closed out by Contractor as per timeline given by Owner.
- 1.51. All portable electrical tools shall be double insulated type and of a reputed brand. In case double insulated tools are not available, proper ELCB protection shall be ensured. Equipment, cables & cords which are unsafe, defective or having temporary joints shall be prohibited. Use of battery operated tools or pneumatic tools shall be verified before using such electrical equipment. The contractor shall develop sound system to ensure that each electrical equipment is regularly checked and certified by an external agency to ensure safe usage on site. The contractor shall maintain records of such checks, which are available for verification by Owner.
- 1.52. The Contractor shall ensure that all workings personnel attend Owner's safety trainings as per intimation given by Owner.
- 1.53. Contractor shall take note that the use of open wires in sockets, use of wires with tape joints shall not be accepted at work place or site.

- 1.54.** Contractor shall report Hazards, Near miss promptly to Owner work in charge. In case of any injury or an accident at the site, the contractor shall immediately inform the Engineer of the incident and further take immediate steps to take the injured person(s) to any of the Owner nominated hospitals. The payments for such hospitalization and treatment shall be initially borne by Owner and shall be subsequently recovered from the Running Bills of the Contractor.
- 1.55.** Before Work at height, Contractor shall ensure that:
- 1.56.** No work is to be proceed unless a risk assessment has been carried out
- 1.57.** Obtain authorization or valid PTW before taking job on working at height
- 1.58.** The PTW must have detailed scope, clearly identifying hazards, associated risk and control measures
- 1.59.** All personal must be trained and competent to carry out the intended task
- 1.60.** Use specified fall-prevention equipment
- 1.61.** Ensure close supervision and buddy support
- 1.62.** Wherever possible use a fixed Ladder or Scaffold with handrails
- 1.63.** Always maintain three point contact
- 1.64.** Check all equipments / PPEs and safety devices, including:
- Safety harness
 - Fall arrestor, with a maximum lanyard length of 2 meters
 - Double-action, self-locking snap hooks for every connection
- 1.65.** During Execution of work at height, Contractor shall ensure that:
- 1.66.** Wear safety harness and connect fall arrestor at all times
- 1.67.** The fall arrestor must be connected to minimize the fall, overhead is best, with a proper anchor
- 1.68.** Check for any loose objects
- 1.69.** Secure all tools and equipment at all times, with 100% tie-off
- 1.70.** Stop work if weather conditions are unfavorable and the task is no longer safe
- 1.71.** Before conducting any lifting operations, Contractor shall ensure the following:
- 1.72.** A Lifting Plan is in Place
- 1.73.** The Safe Working Load will not be Exceed
- 1.74.** All Lifting equipment and safety device have been examined before use and are in good condition
- 1.75.** The Risk of dropped objects has been assessed/mitigated
- 1.76.** Personnel & Public are kept clear of the lift path
- 1.77.** Use Safe Lifting Technique
- 1.78.** Availability of valid safety passport, PTW & SSRA (Site specific risk assessment)
- 1.79.** Contractor shall keep First-Aid Kit available during the execution of work. First-Aid Kit shall have following as Minimum contents as per HSE guidelines.
- Cotton Gauge Pads – 1 (Pack of 10)
 - Cotton Bandage (Large and Medium) - 5 each

- Cotton wool - 2 Packs (Medium size)
- Wooden Splints (8 Nos) (Optional)
- Adhesive Bandage (Medium, small) - 2 each
- Anti-septic Solution (Savlon) 1 100ml bottle
- Pair of Sterile Hand Gloves – 1pairs
- Pair of Scissors - 1
- Tourniquet - 1

1.80. Other HSE Conditions as per attached Level-II Exhibit & Owner Life Saves.

2. Permits & Authorizations:

Contractor shall apply and obtain all necessary permits for the work to be performed as per Owner HSE standards. Joint (Owner/Contractor) inspection shall be done at work place as and when required.

For any work covered under company's work permit system, as informed by the engineer in charge, the contractor shall collect the work permit or extension of work permit from engineer in charge at Owner office on day to day basis.

Contractor shall carry out the work normally within the official duty hours of Company. The Concerned Supervisor must ratify any deviation from the normal working hours. No Work shall be carried out without permission of Owner Company representative beyond the official duty hours.

All work to be carried out at site under valid Permit to Work from Owner work in charge. Contractor to give at least 24 hours prior notice to Owner work in charge so as to arrange for the work permit

Contractor's deputed manpower should always carry his Identity Card and display it at Owner sites / office as well as sites. The I-Card shall be provided by Contractor.

The Contractor shall submit all documents required for the issuance of safety passport like medical certificate, competency certificate etc.

Contractor shall depute competent manpower at site, which have Owner Safety Passport. Owner will provide basic training for the same. Service Provider shall commence the work only after receiving of Safety Training & Safety Passport.

Contractor shall work only during day light normally from 9:00 hrs to 18:00 hrs. Work during late evening or night is not encouraged / not allowed.

In case of urgency / priority, Owner may allow night work with special permit to work and stringent safety precautions. Service Provider shall arrange proper lighting arrangement.

HSE Guidelines:

All activities shall be carried out as per Owner documented procedure and HSE requirement and deviation from it shall be dealt with very strictly.

Contractor shall observe all prevailing HSE norms & labour laws applicable to them during the period of contract.

The work site would be on case to case basis, but no additional transportation charges/miscellaneous charges would be paid apart from the rate agreed upon.

Contractor shall not allot/ subcontract for any or part of the above job.

Contractor shall strictly adhere to the environment norms as per the existing local rules and Owner's environment management system.

Very high standard of Owner's health, safety & environment management system shall be observed in the connected services by the Contractor and workman engaged by the Contractor.

During manually handling of material, care should be taken that a material does not fall on leg / hand. Clear understanding required amongst the persons while handling materials.

Contractor shall ensure that each work site has a drinking water facility and First Aid Kit for the work force.

Contractor shall ensure that persons trained in first aid treatment, fire fighting and has undergone competency training.

All personnel working project shall be medically, physically and mentally fit to carry out the duties to which they are assigned in respect of the work. Medical report and certificate shall be produced before starting work at site.

Any breach of the HSE Exhibit shall be deemed by the Company to be a material breach of the terms of the Contract between the parties and the Company shall be entitled to take appropriate action including instructing the Service Provider to (a) Remedy the breach; (b) Suspend Work or (c) Terminate the Contract.

Contractor shall arrange four wheeler vehicles having with Safety Seat belts and defensive driver for Transporting Materials, Labor/Manpower & Machineries. Only Defensive Trained Driver shall permit to use Four Wheeler during execution of job. Owner shall support to conduct defensive driving training to Service Provider driver.

Road Traffic Safety

Owner has a goal of achieving zero injuries and is committed to foster a culture which promotes and enhances road safety and endeavours to increase awareness of the risks associated with road safety thereby creating responsibilities among its Contractor to minimize the various risks associated with road travel.

Road Safety is one of the top 10 life savers of Owner. A road accident / incident can be eliminated or controlled by ensuring safe vehicle standards, safe driving standards and a well-planned journey management.

Vehicles used for transportation shall be compliant with, but not limited to, the following points:

The vehicle provided by Contractor must have valid road permit & registration provided by the local authorities

The vehicle shall be driven by a person who is certified for handling of heavy vehicles by a competent authority. Approval from RTO as per Central Motor Vehicles Rules 1989 is must.

Contractor shall ensure that the Driver must carry Driving License / RTO / Insurance copy / Vehicle fitness certificate / PUC documents / Photo ID & shows appropriate authority of buyer.

Electrical Safety:

Only experienced & competent persons having valid licenses shall be allowed to work on electrical facilities

All electrical tools should get inspected and maintained on a regular basis by a competent electrician and complete records kept. Fit for Purpose tag / Safety Passport shall be displayed (maintained at site) on working equipment / portable electrical equipment. Non-working/faulty/damaged equipment shall be tagged "Non-working" and shall be kept a site.

Contractor shall use proper industrial extension board along with ELCB. ELCB shall be tested on daily basis. Double insulated Low voltage portable electrical tools should generally be used.

Use appliances / tools with 3 pin plugs and connect them to 3 pin sockets only. Connect one appliance / tool to one socket only.

Avoid using temporarily electrical connections and extension. Never place bare wire ends in a socket.

Always remember to switch off appliance / tools after use from local switch and main switch.

Loose cloths, finger ring, bracelets, metallic wrist watch etc. should not be used / worn.

All electrical tools should be earthed, unless they are "all insulated" or "double insulated" tools which do not require earthing.

Electrical safety items such as gloves, insulating mats, hoods etc. to be used while maintenance on electrical installation.

Temporary or permanent storage of any materials must not be allowed within 3 feet of any electrical panel or electrical equipment

PPE and other Safety requirements

Sr. No.	Item
1	PPE:
1.1	Fire retardant suit/ Fire retardant coverall
1.2	Hard hat suitable for normal work
1.3	Safety goggles
1.4	Safety shoes
1.5	Gum boot with metal toe
1.6	Rubber hand gloves
1.7	Cotton hand gloves
1.8	Reflective jacket
1.9	Full body safety harness
	Ear plugs

	Respiratory masks
2	Hard Barricading (1.2 m high)
2.1	Shoring of excavated area
2.2	Ladder/scaffoldings
3	Warning boards
4	Fire Extinguisher

Designation	PPEs								
	Fire suit	retardant	Hard hats	Safety shoes	Cotton gloves	Rubber gloves	Designation	PPEs	Full body harness
Engineer	✓		✓	✓				✓	
Supervisor			✓	✓				✓	
Mason			✓	✓		✓			
Labour for excavation / material shifting work			✓			✓	✓	✓	
Carpenter/ PLUMBER			✓	✓	✓			✓	
Fitter			✓	✓	✓			✓	
Welder	✓		✓	✓	✓			✓	
Mechanical equipment operator			✓	✓	✓			✓	
Labour for concrete work			✓		✓		✓	✓	
Working at ht.			✓	✓	✓			✓	✓

Annexure – 1

Medical fitness check-up matrix for contract personnel

Medical Assessment Required		TYPES OF ACTIVITIES							
		PE/ Steel Welding	Working at Height	CNG Fillers	Plumber	Canteen / Food handlers	Security	Drivers	Operators-Terminal Compressor
Personal Details									
	Name	R	R	R	R	R	R	R	R
	Age	R	R	R	R	R	R	R	R
	Sex	R	R	R	R	R	R	R	R
History									
	Present Complaints	R	R	R	R	R	R	R	R
	Past Complaints	R	R	R	R	R	R	R	R
Family History ¹	Diabetes	R	R	R	R	R	R	R	R
	T.B., IHD		R			R		R	
	High B.P.	R	R	R	R	R	R	R	R
	Addictions	R	R	R	R	R	R	R	R
Personal	Medicines	R	R	R	R	R	R	R	R
	Diet	R	R	R	R	R	R	R	R
	Hygiene	R	R	R	R	R	R	R	R
Physical Examination									
	Height	R	R	R	R	R	R	R	R
	Weight	R	R	R	R	R	R	R	R
	B.P.	R	R	R	R	R	R	R	R
	Pulse	R	R	R	R	R	R	R	R
Vision Test	Near	R	R	R	R	R	R	R	R
	Far	R	R	R	R	R	R	R	R
	Colour Blindness							R	
	Night Vision							R	
Systemic Examination									
	CVS		R		R				
	CNS		R		R	R		R	
	Respiratory (Spirometer)	R	R	R	R	R			R
	Ear, Nose and Throat	R	R	R	R	R	R	R	R
	Audiometry								R
	Hearing ability							R	
Clinical Examinations									
Blood	Blood Group ²	R	R	R	R	R	R	R	R
	FBS ³		R	R	R	R	R		
	PPBS		R	R	R	R	R		
X-Rays	Chest PA view					if directed by Physician			
Other special test									
Serum WIDAL Test						R			
Hepatitis A						R			
Stool - Colliform						R			
Mont dx test						R			
Skin Examination for Dermatitis						R			

LIFE SAVERS - FOLLOW LIFE SAVER RULES TO AVOID ACCIDENTS			
			
Safe System of Work (SSoW) - Before commencement of any job, ensure that: - Hazards are identified and appropriate control measures are in place - An appropriate emergency/ rescue plan is in place - Obtain Permit to Work (PTW) authorization from issuing authority as applicable to the job - Ensure that approved PTW mentions detailed scope of work, and must have clearly identified hazards, associated risks and necessary control measures - Carry out Job Safety Analysis (JSA) - Ensure the jobs performed by trained & competent personnel - Ensure safety critical jobs being supervised by competent supervisor - Ensure material, tools and equipment required for performing the job are fit for purpose - Prior to commencing a job on isolated facilities, get confirmed all electrical & mechanical isolations (e.g. Gas installation, Gas pipe section, equipment, etc.) by authorized person and follow Lockout & Tagout (LOTO) system - Wear appropriate Personal Protective Equipment (PPE) for the concerned job - Provide cautionary instructions to people about exposure to hazards in vicinity of worksite - Intervene and stop the unsafe job/site - If unsure about job to perform safely, stop the job and discuss with supervisor/ manager - Follow Management of Change (MOC) process for changes to plant/equipment	 Excavation, Manual Boring and Horizontal Directional Drilling Excavation - Follow "Safe System of Work" Life Saver rules - Identify, locate and protect all underground utilities (e.g. power cable, gas pipeline, etc.) as necessary - Use insulated crowbar / pickaxe for manual excavation - Identify & mitigate the hazards as necessary e.g. contaminated soil, equipment movement, traffic, etc. - Follow correct trench protection techniques as per soil conditions like benching by step cut, "V" shape slopping or shoring - Keep excavated soil away from edge of trench / pit - For any change in ground conditions, stop work and consult supervisor - Keep children away from pit / trench / work sites - Display warning signs, use appropriate barricades at work area and provide easy means for getting in and out of trench / pit - Make provision of proper cross over trench for pedestrian as required Manual Boring - Follow "Safe System of Work" Life Saver rules - Identify, locate and protect all underground utilities (e.g. power cable, gas pipeline, etc.) as necessary - Use insulated crowbar / pickaxe for manual excavation - Identify & mitigate the hazards as necessary e.g. contaminated soil, equipment movement, traffic, etc. - Follow correct trench protection techniques as per soil conditions like benching by step cut, "V" shape slopping or shoring - Keep excavated soil away from edge of trench / pit - For any change in ground conditions, stop work and consult supervisor - Keep children away from pit / trench / work sites - Display warning signs, use appropriate barricades at work area and provide easy means for getting in and out of trench / pit - Make provision of proper cross over trench for pedestrian as required Horizontal Directional Drilling (HDD) - Follow "Safe System of Work" Life Saver rules - Identify, locate and protect all underground utilities (e.g. power cable, gas pipeline, etc.) as necessary - Identify & mitigate the hazards as necessary e.g. contaminated soil, equipment movement, traffic, etc. - Before starting HDD operation, ensure: - Approved lift plan in place - HDD entry and exit locations are clearly marked - Capacity of HDD drilling rig is adequate - Proper earthing / grounding of machine - Cable strike alarm in working conditions - Moving gas out of machine are guarded - Our rigger of HDD machine are working and rigidly put on stable & firm ground - Availability of braking equipment / device - Crane is in good condition - During drilling operation, do ensure: - That track movement of the drilling tool is as per approved bore plan - Auto greasing of machine rod - That entry of unauthorized personnel in the work area is prohibited - Normal / emergency activity is carried out while HDD machine in operation	 - Check with gas detector and ensure there is no flammable gas inside confined space - Ensure there is no chemical fume inside confined space - Always use buddy system, ensure standby personnel is available and is always in contact with the person(s) in the confined space - Do not allow unauthorized entry inside confined space - If rescue needed, - Standby personnel (buddy) to stand outside confined space and call for help of rescue team - Allow only authorized rescue team member with all necessary Personal Protective Equipment to enter inside confined space - Ensure provision of suitable access & egress Lifting Operation - Follow "Safe System of Work" Life Saver rules - Ensure approved lift plan in place - Use only correct, approved and certified lifting equipment, tools & tactics and safety devices - Work according to a lift plan that is discussed, understood and followed by everyone involved in the job - Do not exceed safe working load limit - Ensure lifting equipment are working on stable & firm ground - Do not allow anyone under the lifted load or in the lift path - Ensure operator of lifting equipment and signaller are always in contact - In case of rough weather condition, stop the lifting operation and wait till condition is normal	
Gas Escape Handling - Follow "Safe System of Work" Life Saver rules - In case of gas escape inside premises, open doors & windows to ventilate the escaped gas - Give priority to protecting life - Control the potential ignition sources within gas affected area / zone e.g. Do not permit smoking / naked flame / use of phone / operation of electrical switches, etc. - Check for presence of Gas with gas detector, identify gas affected area and if required, evacuate persons to a safe place - Seek help of local authorities as required to stop traffic & people away - Isolate / turn off gas supply as early as possible - Continuously monitor for presence of gas in atmosphere - Seek help of fire department and ambulance services as required - Post leak repair, carry out leak check to ensure soundness of repaired leak as well as ensure there is no other gas leakage in the area	 Work at Height - Follow "Safe System of Work" Life Saver rules - Use only approved and certified working at height equipment e.g. rope access system (RAPS), scaffold, ladder, etc. - Give preference to safe working platform in place of rope access system or wherever possible for carrying out work at height - Always use fall arrest or shoring: - Double action self-locking snap hooks - Proper end or preferably mounted overhead that limits free fall to two meters - If using a rope access system, ensure use of fall arrest harness - Select safe routes for installation of lines & lateral - Never carry out any work at height when near an overhead power line - Secure all tools and equipment - Clearly display warning signs and have the area restricted below the workplace - Stop the work in adverse weather conditions i.e. rain, heavy wind, poor work lights etc.	 Electrical - Follow "Safe System of Work" Life Saver rules - Ensure isolation of all connected power sources and use of lockout & tagout (LOTO) before commencement of electrical job - Consider all conductors are live unless proved dead with a certified testing instrument - Ensure earthing of all electrical equipment and use of three pin plug and socket - Never insert open wires in the socket, always use plug & socket - All electrical work are to be done by certified electrical person and licensed contractor only - Use portable electrical equipment with double insulation protection - Ensure E.C.B./RCCB are used and in working conditions - Verify equipment and material being used are in rated capacity - Ensure use of appropriate PPE like certified insulated gloves etc. - Prohibit entry of unauthorized person in electrical installation area - Do not use damaged electrical equipment	 Driving - Always wear seatbelt while driving / travelling in the passenger or commercial vehicle - Obey speed limits - Obey traffic rules, traffic signs and signals - Never use mobile phones or any other communication device while driving - Always wear crash helmets while riding two wheeler - Ensure proper condition of legs and so on two wheeler - Plan your journey in advance considering route, duration, road condition and weather condition - Never drive or allow driving when driver is fatigued or under influence of substance like alcohol, pain killers, anti depressants, recreational drugs etc. - Avoid use of hand mobile / phone while driving on highways and / or roads - Ensure vehicle is fit for purpose - Ensure periodic inspection, servicing and maintenance of vehicles - Never exceed passenger limits in vehicle nor allow unauthorized person in driver's cabin of hazardous goods vehicles