SECTION26 05 00
BASIC ELECTRICAL MATERIALSAND METHODS

PART 1 - GENERAL

1.01 GENERAL REFERENCE:

A. The work of this Section is integral with the whole of the Contract Documents and is not intended to be interpreted outside that context.

B. The work of this Section is integral with General Conditions of the Contract and the requirements of Division 1.

1.02 DESCRIPTION:

A. General Extent of Contract Works:

1. The Electrical Installation Contractor, herein referred to as the 'Contractor' within this Section and all other Division 16 Sections of these specifications shall carry out all electrical works complete in accordance with the requirements of the Contract Documents.

B. Related Works Specified Elsewhere:

1.	Grounding and Bonding	-	Section 270526
2.	Electrical Identification	-	Section 260553
3.	Building Wire & Cables	-	Section 260519
4.	Raceway & Boxes	-	Section 260533
5.	Cable Trays	-	Section 260536
6.	Under floor Raceway Assemblies	-	Section 260543
7.	Wiring Devices	-	Section 262726
8.	Electrical Work For Substation	-	Section 16210
9.	Diesel Generator	-	Section 263213
10.	Distribution Boards	-	Section 262716
11.	Motor Control Centers	-	Section 262419
12.	Lighting Fixtures	-	Section 265000

13.	Lightning Protection System	-	Section 264123
14.	Telecommunication System	-	Section 273200
15.	Integrated Fire Alarm	-	Section 16721
16.	Public Address System	-	Section 275116
17.	Interactive TV system	-	Section 271500
18.	Automatic Transfer Switch	-	Section 263626

C. Scope of Work:

1. The supply and installation of all services, equipment, components, accessories and fittings required for the operation of the project to the extent specified and detailed on the Drawings and Specifications including two years maintenance after provisional hand over.

2. Builder's work in connection with the Electrical Installations, including supply, necessary inserts and sleeves.

3. Dimensions not shown/not capable of being determined in/from the drawings shall have to be measured by the Contractor.

4. Any work which can be reasonably inferred as necessary for the safe, satisfactory operation of each system, whether such work is specified or shown on Drawings or not.

5. All work should be carried out as per MOE, MOC & KFB regulation and specification whether or not the work is specified or shown on drawing or need to be change without any extra binding to Owner.

6. The supply and installation of cables, conduits, boxes and termination points, for the motors, starters, controls and the like for the Heating, Ventilation and Air-conditioning and Plumbing services. (The supply and final connections of such equipment is specified in Division 15 Mechanical).

7. The supply and installation of the cables and termination points for fire fighting pumps should be done as per Ministry of Energy and KFB regulation and requirements.

8. Arranging for installation of permanent power supply by the Ministry of Energy including submission of all necessary documents to the Ministry, and carrying all necessary approvals.

9. Attending upon the supply authority installation mains power supply and carrying out primary and secondary injection tests.

10. Arranging and carrying all necessary approvals with the Ministry of Communication (MOC) for the Telephone System.

11. Arranging and carrying all necessary approvals with Kuwait Fire Brigade (KFB) for Fire Alarm System.

D. Climatic Conditions:

1. The Climate in Kuwait is normally dry but periods of very high humidity lasting for a few days are liable to occur at any time of the year and a humidity of 100% at 30°C has been recorded.

   Violent sand and dust storms of several hours duration occur and even on comparatively still days, fine dust is carried in suspension in the atmosphere.

   All apparatus and equipment shall, therefore, be so designed and constructed that they operate satisfactorily and without any deterious effect for prolonged and continuous periods in the conditions stated above and at the following ambient temperature conditions:

   a. Maximum Sun radiation temperature in Summer - 84°C.

   b. Maximum ambient temperature in Summer - 52°C

   c. Average max. ambient temperature in Summer - 45°C

   d. Minimum ambient temperature in Winter - -6°C

   The Altitude of Kuwait may be taken as sea level.

2. The temperatures quoted above make no allowance for heat generated from equipment itself or from any other equipment in the vicinity.

3. The capacity and ratings of all electrical equipment and materials given are, unless otherwise indicated Kuwait climatic conditions. Provide the basis of the derating factory applied in each case.

4. Where specific sizes are indicated e.g. cable sizes, due allowances have been made in the design for the climatic conditions of Kuwait and derating has been applied.

5. Where no ratings or sizes are indicated for components and other accessories, supply equipment which will give trouble free service in the ambient conditions stated above.

E. Electricity Supply:

1.The power supply authority will make available ,at the incoming terminal of the Main Low Tension Panel 3 phase ,4 wire,415 volt ,50 Hz supply of adequate capacity and having the following tolerances:

   a. Voltage: 415V 3phase/240V single phase +or -6%
   b. Frequency: 50 Hz + or-4%

2.Phase rotation of supply to BS 158
3.Neutral:Solidly earthed
4.Fault Level:31MVA at 415V at substation MLTP
5.Earthing:TT system.
6.Obtain confirmation from the Supply Authority of the size and number of cables they will be

provide to Main switchboards. Allow for adequate and appropriate cable and boxes.

F. Documentation:

1. The indication and/or description of any item on the Drawings or in the Specification, unless otherwise specifically stated, implies an instruction to supply and fix such items.

2. Notes on Drawings referring to individual items of work take precedence over the Specification.

3. Drawings show the general run of cables, raceways, etc. and the approximate location of equipment and utilities symbols and schematic diagrams of no dimensional significance. Dimensions not shown on or which cannot be determined from Drawings shall have to be measured by the Contractor. Do not scale drawings to obtain locations.

1.03 QUALITY ASSURANCE:

A. Installer's Qualifications:

1. Electrical installer shall be registered at the Central Tenders Committee as Class 4

2. Testing and Commissioning of equipment and services of specified nature shall be supervised by the manufacturer technical representative(s).

B. Codes and Standards:

1. All supplies and services offered in response to this specification shall be to the latest standards.

2. The design, equipment and installation requirements will generally comply with the standards and recommendations laid down by the following:

a. Regulations for Electrical Installations as issued by the Ministry of Energy (MOE), Kuwait.

b. General Specification for Electrical Installation MINISTRY OF ENERGY/S-1 issued by the Ministry of Energy, Kuwait.

c. Regulations for Electrical Installations as issued by the Institution of Electrical Engineers (I.E.E), London (for points not included in Ministry of Energy Regulations).

d. Recommendations for Lighting Installations as issued by the Chartered Institute of Building Services, London.

e. Standards relating to Electrical Installations and equipments as issued by International Electrotechnical Commission (I.E.C) and British Standards Institute (BSI).

f. Regulations for telephone system installation as issued by the Ministry of Communication (MOC), Kuwait.

g. Regulations for Fire Alarm System installation as issued by the Kuwait Fire Brigade (KFB) Kuwait.

h. Regulation for electrical connection for fire pumps as issued by K.F.B.

References in the Regulations to electricity supply characteristics and other particulars which obviously do not apply to prevailing conditions on site will be ignored.

1.04 SUBMISSIONS:

A. Shop Drawings, Product Data and Samples:

1. The term 'shop drawings' includes fabrication, erection , layout and setting out drawings; manufacturer's standard drawings, schedules, descriptive literature, illustrations, catalogues and brochures, performance and test data; wiring and control diagrams, and other drawings and descriptive data pertaining to materials, equipment, duct and conduit systems, control systems and methods of construction as required to show that materials, equipment, or systems and position thereof, conform to the Contract Documents. The term 'manufactured' applies to standard units usually mass produced. The term 'fabricated' means items specifically assembled or made out of selected materials to meet individual design requirements. Shop drawings shall establish actual detail of all manufactured or fabricated items, indicate proper relation to adjoining work, amplify design details of electrical equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions. The Contractor shall submit for approval, and obtain in due time to conform to the Contract Programme, all shop and installation drawings based on the design drawings approved by the MINISTRY OF ENERGY and all other relevant Municipality Authorities.

2. The Contractor, immediately after being awarded the said Contract, shall prepare and submit shop drawings and samples. Shop drawings and samples shall be submitted with such promptness as to cause no delay in his own work nor to any other Contractor. No extensions of time will be granted because of failure to have shop drawings and samples submitted in ample time to allow for processing.

3. Provide shop drawings, to a scale not smaller than the corresponding layout drawings, showing the following and obtain approval before commencing work:

a. Exact runs and sizes of conduits, cables, cable trays and trunking.

b. Layout drawings for each separate electrical installation showing the actual locations of points, suitably identified, the locations of switchboards and distribution boards, details and types of fittings.

c. Schedules of points, indicating how the various outlets are connected to the distribution boards, size of circuit wiring, the rating of the protective device and the type and size of appliance of fitting.

d. Schematic diagram of connection of distribution boards, and equipments to main switchboards showing sizes of feeders, etc.

e. Underground cable layout for the different services, showing routes, sizes and types of cables.

f. G.A. Drawing and foundation details for each equipment shall be submitted for approval.

g. Any other data necessary for the proper maintenance of the installations.

4. Drawings shall be standard size. Lettering shall be stenciled. Shop drawings and samples shall be properly identified with the name of the Project, the Contractor, the Sub-Contractor, and the date.

5. Final coordination of electrical works with mechanical, structural and architectural work will be carried out from complete shop drawings and sufficient time shall be allowed for coordination and checking of shop drawings and calculations after shop drawings are submitted.

6. Individual shop drawings shall be submitted following the distribution of the coordination drawings and shall bear a stamp indicating that the work has been coordinated with other trades.

7. The term 'samples' includes natural materials, for fabricated items, equipment, devices, appliances, or parts thereof as specified and other samples as may be required to determine whether kind, quality, construction, workmanship, finish, color and other characteristics of materials conform to requirements of the Contract Documents. Samples shall establish kind, quality, and other required characteristics of various parts of the work. Indicate details of construction, dimensions, capacities, weights and electrical performance characteristic of equipment or material.

8. Except for finish, color and other aesthetic matters left to the Engineer's decision by the Contract Documents, the Engineer's review and approval of shop drawings and samples submitted by Contractor is for general conformance with the design concept and information given in the Contract Documents is only for the convenience of the Engineer in following the work and shall not relieve the Contractor from responsibility for any deviations from the requirements of the Contract Documents. The Engineer's review and approval shall not be construed as a complete check nor shall it relieve Contractor from responsibility for error of any sort in shop drawings or schedules, or from the necessity of furnishing any work required by the Contract Documents which may have been omitted on the shop drawings. The Engineer's review and approval of a separate item shall not indicate review and approval of the complete assembly in which it functions.

B. Progress Drawings:

1. Provide and keep on the job at all times, one complete and separate set of blackline prints of the electrical work on which shall be clearly, neatly and accurately noted, promptly as the work progress, all architectural and electrical changes, revisions and additions to the work. Whatever work is installed otherwise than as shown on the Contract drawings, such changes shall be noted.

2. Indicate daily progress on these prints by coloring in the various conduit, fixtures, apparatus and associated installation works erected.

C. As-built Drawings:

1. At the conclusion of work, prepare and submit complete set of 1 No. mother print of polyester and six (6) white paper print of 'As-built Drawings'.

2. These drawings shall be titled "As-built Drawings" and shall be prepared from the marked up progress prints. Submit "As-built Drawings" to the Engineer for review and approval.

D. CD Rom Diskettes:

3 Copies of CD from 'As fitted' drawings shall be submitted along with drawings above mentioned.

E. Contractor's Site Electrical Engineer.

1. The Contractor shall appoint one graduate Electrical Engineer with 10 years experience in similar works and registered with Kuwait Society of Engineers, and Ministry of Energy for the supervision of the Electrical Installation Works. The name, qualifications and experience of the nominated Engineers shall be submitted to the Engineer for approval within 15 days of the receipt of the order to commence the works.

F. Operation and Maintenance Data:

1. The Contractor shall provide operation and maintenance data for incorporation into a maintenance manual.

2. Include in operations and maintenance data:

a. Details of design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

b. Technical data, product data, supplemented by bulletins, component illustrations and exploded views, technical descriptions of items and parts listed.

c. Wiring and schematic diagrams and performance data.

d. Names and addresses of local suppliers for items included in maintenance manuals.

e. Operating manuals shall include full details of all normal engineering and maintenance switching operations.

G. The shop drawings,product data samples, progress drawings, As Built Drawings micro films and operation and maintenance data is applicable for all equipment to be supplied and installed by the Contractor.

1.05 MAINTENANCE

A. Contractor shall ensure maintenance including preventive maintenance during the Contract Maintenance Period (**Two years after the final handing over).**

B. Provide all necessary maintenance and operation staff experienced in both mechanical and electrical work such as engineers, foremen, operators, mechanics, electricians, helpers, etc., for effective maintenance and operation of all systems. The required Maintenance Staff of the Contractor is given in the Schedule attached at the end of this Section. Submit to the Engineer for approval qualification and experience details of all maintenance and operation staff.

C. The Contractor shall inform the Engineer of details of maintenance inspections which he proposes to undertake during the maintenance period and any precautions, warnings and safety measures to be taken in order to comply with any statutory requirements relating to equipment and systems.

DETAILS OF CONTRACTOR'S SITE STAFF FOR MAINTENANCE

1.06 GUARANTEE:

A. Manufacturers shall provide their standard guarantees for products furnished under this Contract. However, such guarantees shall be in addition to and not in lieu of all other liabilities which manufacturers and the Contractor may have by law or by other provisions of the Contract Documents.

B. All materials, items of equipment and workmanship furnished under this Contract shall carry standard warranty against all defects in materials and workmanship. Any faults due to defective or improper material, equipment, workmanship or Contractor's design which develop shall be made good, forthwith, by and at the expense of the Contractor, including all other damage done to areas, materials and other systems resulting from this failure.

C. Guarantee that all elements of the systems are of sufficient capacity to meet the specified performance requirements as set forth herein or as indicated.

D. Upon receipt of notice from the Engineer, of failure of any part of system or equipment during the period of maintenance, the affected parts shall be replaced.

1.06a SPARE PARTS

A. GENERAL

1. Provide sufficient spare parts as follows. Submit to the Engineer a list of all spare parts required for a further one year operation and maintenance from the date of issue of the Maintenance Certificate.

2. Spare parts required include but not necessary limited to those listed below. The quantities for each item or equipment shall be as recommended by the manufacturer.

3. Store spare parts in a room designated by the Engineer.

B. MAIN SWITCH BOARD

1. 20% spare moulded case circuit breakers of a different frame sizes, but in any case not less than 1 nos. circuit breaker of each size.
2. 10% spare indicating lamps,control fuses for each indicating lamp in the switchgear.
3. One set of complete tools box required for switchgear maintenance.

C. DISTRIBUTION BOARDS

For distribution boards and switchboards provide the following spare parts :

a. one way spare circuit breakers for different rating of mccb's.for Light & Power
b. One set spare HRC fuses for different rating.

c. 20 % spare of load break switch (isolators) of each size.

d. 20 % spare of COELCB of each size.

D. DISCONNECTING SWITCHES

For disconnect switches provide the following spare parts :

a. 10 % spare switch of each size.

E. CIRCUIT ACCESSORIES

1. Plug Fuses.
Furnish five percent (10 %) of the number of each size and type of fuses installed, but in any case not less than size fuses of each sizes.

2. Wall Switches.
Provide five percent (10%) of the number of each size and type of wall switch installed.

3. Socket Outlets.
Provide five percent (10 %) of the number of each size and type installed.

4. Provide five percent (10 %) lamps of each size and type for indicating panels and pilot lights installed for different systems.

1.07 JOB CONDITIONS:

A. Sequencing:

1. Lay electrical works in advance of pouring concrete slabs and construction walls. Obtain Engineer's approval before commencing builder's work in connection with electrical installation.

2. Before the permanent electricity supply is connected the electrical installations must be complete, tested and approved by the Engineer, MINISTRY OF ENERGY, MOC & KFB, and as-built drawings must be submitted and approved by MINISTRY OF ENERGY, MOC & KFB.

B. Coordination:

1. Check with other trades to ensure equipment and material can be installed in space provided.

2. Provide other trades with information necessary for them to execute their work.

3. Details on Drawings which are specific regarding dimensions and locations, are for information purposes coordinate with other trades to ensure work can be installed as indicated.

1.08 SEGREGATION OF SERVICES:

A. Electrical services shall be segregated as specified throughout the installation to obviate the following:

1. Electrical interference from one circuit to another.

2. A fault on one circuit affecting another.

3. Unnecessary fire damage.

4. Difficulties in circuit identification.

5. Voltage limits for general safety.

B. All conduits and trunking shall be kept clear or other services except where intentionally earthed or bonded. Generally, conduits and trunking shall be kept 150mm away from and below hot water and 75mm away from other services.

C. Unless specifically indicated otherwise ,normal, emergency ,low voltage cables and wiring shall be segregated throughout the installation generally in the following manner:-

1. Armored and sheathed catalyst: where more than one tray has been specified or is necessary to accommodate the number of cables on a run ,where practical segregation shall be achieved by dedicating each tray to either normal and emergency services, where normal and emergency cables have to run together in trays, duct or trenches ,they shall be formed in two group ,one normal and one emergency.

2. Insulated conductors :Insulated conductor circuits shall, where possible , be segregated throughout by enclosure in separate conduits , trunking or trunking compartments.

D Fire Alarms

1. Fire alarm cables shall be segregated from other services throughout and be either armored and sheathed cables or insulated conductors enclosed in conduit or trunking ,as indicate on the drawing.

1.09 TESTING AND COMMISSIONING:

A. General:

1. The Engineer shall be authorized to inspect, examine and test at any reasonable time and in the premises of the manufacturer, the quality of the material used for the equipment to be supplied. He shall also be authorized to verify the qualifications of the staff employed by the manufacturer.

2. Should part of the equipment be subcontracted to another manufacturer, the Contractor shall ensure that the Engineer is authorized to inspect, examine and test the equipment in the premises of the Sub-Contractor.

3. These inspections, examinations and tests shall not relieve the Contractor in any case from his contractual responsibility and commitments.

4. The Contractor shall notify the Engineer in writing at least 15 days beforehand of the date and place at which any equipment shall be available for tests to be made according to the provisions of the Contract. Should the Engineer not have appeared at the place indicated within ten days following the date indicated by the Contractor, the latter shall proceed with the tests and it shall be deemed that they had been witnessed by the Engineer. The Contractor shall send the Engineer duly certified copies of the results of the tests.

5. The Engineer shall notify the Contractor of his intentions to attend the test 24 hours beforehand.

6. Should the Contractor provide for tests to be made in the premises of the Contractor or any Sub-Contractor or suppliers, the Contractor shall afford any assistance, labour, materials, electricity, fuel supplies, equipment and instrument required and which can be reasonably requested for these tests.

B. Testing:

1. On completion of the entire electrical installation work of any separate or distinct part thereof, notify the Engineer, in writing, that the complete part of the electrical work is ready for inspection. Before doing so, perform initial trial tests. Test, correct, adjust, balance, regulate, etc., the section concerned as necessary until required conditions are obtained.

2. The inspection of the Contractors work shall be carried out in the presence of the Engineer and in accordance with the requirements of Section 'E' of the IEE 'Regulations for Electrical Equipment of Buildings' and shall comprise of but not to limited to:

   a. Effectiveness of earthing.

   b. Insulation resistance test.

   c. Test of ring circuit continuity.

   d. Operation tests of relays, interlocks and any other protective and control device to ensure correct functioning.

   The results and readings obtained shall be equal or better than the requirements of the IEE and the Ministry of Energy Regulations and these shall be recorded on forms similar to the ones described in the IEE Regulations.

3. Supply all instruments and tools required for carrying out the tests.

4. In case the above mentioned tests are satisfactory and no errors or faults appeared in the installation, submit the necessary test forms, duly filled, to the Ministry of Energy and Water and to repeat, if necessary, the tests in the presence of Ministry of Energy Inspector.

5. Follow-up and make all necessary arrangements with the Ministry of Energy and Water and the Ministry of Communications for the purpose of providing permanent electricity supply and telephone service. Also provide all facilities and attendance to Ministry of Energy for any other tests carried out before energizing the installation.

6. No extra cost shall be paid to the Contractor for the necessary arrangements with MOE/MOC for the connection of services.

PART 2 PRODUCTS

2.01 LABELS:

A. For switchboards and panel boards:

1. Engraved lamacoid name plates, black with 6mm high white lettering.

B. For Distribution Switches and Circuit Breakers:

1. Where individually enclosed or in sub-station switchboards and panel boards without doors : engraved lamacoid name plates, black with 3mm high white lettering.

2. In panel boards with doors : directories mounted behind transparent plastic covers in metal frames.

C. Wiring identification:

1. Identify wiring with permanent numbered wire markers (Ferrule type) on both ends of phase conductors of feeders and branch circuit wiring, on each conductor in paved board, all control wires etc.

2. Maintain phase sequence and color coding throughout.

3. Color code to standards above as specified elsewhere.

4. Use color coded wires in communication cables, matched throughout system.

D. Conduit and Cable Identification:

1. Color code conduits and metallic sheathed cables.

2. Code with plastic tape or paint and points where conduit or cable enters wall, ceiling or floor, at 15m intervals.

3. Color to be 25mm wide prime color and 20mm wide auxiliary color to standards above.

E. Switch Plates:

For Device Plates of local toggle switches, toggle switch type motor starters, pilot lights and the like, whose junction is not readily apparent:

1. Plates to be engraved with 3mm high letters describing equipment controlled or indicated.

F. For Bus-bars:

1. Phase identification letters shall be stamped into the metal of the bus-bars of each phase of the main buses in each switchboard and panel board.

2. Letters shall be visible without disassembling current carrying of supporting elements.

G. For Doors:

1. Where switchboard rooms, cable changers, metal screened spaces and the like contain

electric power cables, bus bars or equipment operating at voltages exceeding 600 V: enameled sheet metal, red on white, reading "Danger - High Voltage".

H. For Rooms:

1. To switchboard rooms, electric closets, metal screened spaces assigned to electrical equipment, and the like: enameled sheet metal, red on white, reading "Electrical Equipment Room - No Storage Permitted.

I. Languages:

1. Nameplates with directional, operational or warning labels shall be in Arabic and English.

2.02 FABRICATION:

A. Steel Frames:

1. Steel frames and like components shall be thoroughly cleaned to remove all scale, rust, oil and grease, treated with an approved rust inhibiting solution and painted with two undercoats and one coat gloss finish before leaving the factory. Supply an adequate quantity of paint for final touching up on site.

2.03 STANDARD PRODUCTS:

A. Materials and equipment to be provided shall be the standard catalogue products of manufacturers regularly engaged in the manufacture of products conforming to these specifications and shall essentially duplicate materials and equipment that have been in satisfactory use for a minimum of five (5) years.

B. Where two or more units of the same class of equipment are required, these units shall be product of a single manufacturer.

2.04 EQUIPMENT AND MATERIALS APPROVAL:

A. Approval of materials and equipment shall be based on latest manufacturer's published data.

B. Complete and detailed information of all materials and equipment to be incorporated in the work shall be submitted. Submit detailed description and specifications, catalogue cuts, installation data, diagrams, dimensions, controls and any other data required to demonstrate compliance with the Contract Documents. Each item submitted shall be referenced to the applicable paragraph in the Specification.

C. At the request of the Engineer, submit a sample of any equipment or material for further study before approval. Where samples are required by the Engineer, the period required to obtain the sample will be taken into account when scheduling approvals.

D. Only approved materials shall be employed at the site. All materials installed which are not approved shall be removed and reinstated by approved ones.

E. All equipment and materials to be supplied and installed should be from the approved VEC lists of KNPC. However, Vendor’s name for equipment, materials and accessories which are not included in the VEC list are mentioned in the relevant sections of the Specifications.

2.05 DELIVERY AND PACKING:

A. The Contractor shall include for packing, shipment and delivery to site of all equipment and materials necessary for the completion and satisfactory working of the installation.

B. Each item shall be adequately protected and packed and be clearly marked to ensure the safe conveyance and delivery to site.

2.06 MOUNTING HEIGHT OF ACCESSORIES:

A. Unless indicated otherwise on Drawings or Specification Sections, the mounting height of accessories shall be as indicated herein on the Schedule of Mounting Heights.

B. Mounting heights shall be measured between the centerline of the item concerned and the finished floor level.

C. The following is the schedule of mounting height except under floor system:

1. Lighting switches, equipment and appliance control switches and regulators, including the manual controls of heating and ventilation systems, push buttons, and any other item containing manual controls for the operation or regulation of any system or facility, shall be mounted at 1200mm above finished floor level, unless indicated otherwise.

2. Socket outlets shall be mounted at 300mm other than in kitchens, plant room, switch rooms. The sockets above any work bench, where socket outlets shall be mounted at 1200mm above finished floor level.

4. Telephone outlets shall be mounted at a height of 300mm wall mounted telephone instrument outlets shall be mounted at a height of 1200mm above finished floor level.

2.07 ACCESSORIES:

A. Accessories installed throughout the Contract Works shall, unless indicated otherwise, match in color, style and manufacture. Situation where this is impracticable shall be brought to the Engineer's attention prior to work being put in hand

B. The cover plates of flush-mounted accessories shall be fixed square and flush with the building surface.

2.08 FINISHES:

A. Shop finish metal enclosure surfaces by removal of rust and scale, cleaning, application of rust resistant primer inside and outside and at least two coats of finish enamel.

PART 3 EXECUTION

3.01 PREPARATION:

A. Setting out:

1. Obtain from the Engineer details of final position of all equipment and accessories before commencing installation thereof.

2. Set out the work to conform to:

   a. The diagrammatic intent of the Drawings, and

   b. Dimensions indicated on approved shop drawings.

3.02 LABELING:

A. For Switchboards and Panel Boards.

1. Fix on front, externally by riveting.

B. For Distribution Switches and Circuit Breakers.

1. Nameplates on individually enclosed units and units in power centers, switchboards and panel boards without doors: fix on front externally.

2. Directories in panel boards with doors: fix on inside frame of door.

C. "Danger - High Voltage" Signs:

1. Fix on external face of doors of switchboard rooms, cable chambers, metal screened spaces, and the like containing electric power cabling.

D. Primary Gear:

1. Fix a stenciled "mimic bus" diagram on front face.

2. Diagram shall show schematically the bussing and switching arrangement.

3. Primary gear containing switching equipment whose blades are alive when open shall have warning signs to that effect.

E. Outlet Boxes, Junction Boxes and Cabinets:

1. When used in conjunction with empty raceways for wires of a future system: mark indelibly on the inside, denoting the system.

3.03 WORKMANSHIP:

A. The entire work provided in this specification shall be constructed and finished in every respect in a workmanlike and substantial manner. The Contractor shall provide the systems in accordance with the best trade practice and to the satisfaction of the Engineer.

B. Keep others fully informed as to the shape, size and position of all openings required for apparatus and give full information sufficiently in advance of the work so that all openings may be built in advance. Provide and install all sleeves, supports, etc., hereinafter specified or required.

C. Obtain detailed information from the manufacturers of apparatus as to the proper method of installation and connection same. Obtain all information from others which may be necessary to facilitate work and the completion of the whole project.

D. Provide the services of an experienced superintendent and section foreman, who shall be continuously in charge of the erection of the electrical work, together with all necessary skilled

workmen, helpers and laborers, required to properly unload, transfer, erect and connect up, adjust, start, operate and test the system.

E. Before installing any work, verify that it does not interfere with clearance required for other work. Notice of adverse conditions shall be forwarded in writing to the Engineer's Representative before any work in question is installed. If notification is not made, and work installed causes interference with the contemplated design, make such changes in his work as directed by the Engineer to permit the installation of all work of the Project, at no additional cost to the owner.

F. Conduit and ducts shall be run as straight and direct as possible in general forming right angles with or parallel with walls or piping and neatly spaced, with risers erected plumb and true. Maintain a clearance of at least 25mm between finished coverings and adjoining work. Approved ceiling height shall be obtained from Architectural Drawings.

G. All equipment and accessories shall operate without objectionable noise or vibration. Should operation of any of the equipment or systems produce noise or vibration which is, in the opinion of the Engineer objectionable, make change in equipment and do all work necessary to eliminate the objectionable noise or vibration at no additional cost.

H. Wherever possible services shall not cross expansion joints. Where this is unavoidable the services shall accommodate the design movement without damage, by use of approved expansion couplings/flexible conduit arrangement.

3.04 PROTECTION:

A. The Contractor shall be responsible for his work and equipment until finally inspected, tested and accepted, carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

B. Protect work and material of other trades from damage that might be caused by his workmen and make good damage thus caused.

3.05 LAYOUT OF WORK:

A. The electrical drawings show the general arrangement of the work and the approximate locations of equipment. Refer to all other drawings to verify all spaces and conditions affecting work of this Section. The construction of the building in certain places may disclose the inaccessibility of equipment apparatus if placed in locations shown on the drawings.

B. Notify the Engineer of conflicting requirements. Where departures from the drawings are deemed necessary, details of such departures and reasons therefore shall be submitted to the Engineer for approval.

C. No such departures shall be made without prior written approval of the Engineer.

D. Conduit and ducts shall be run in wall chases, recesses, pipe shafts and ceilings except where indicated otherwise. Arrange work accordingly.

E. All equipment and apparatus such as motors, switchgear, panels, controls etc shall be installed as to be readily accessible for operation and maintenance.

3.06 PROTECTION:

A. Protect exposed live equipment during construction for personnel safety.

B. Shield and mark live parts "LIVE 240 VOLTS" or with appropriate voltage in English and Arabic.

C. Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of an electrician.

END OF SECTION