

Section VI. Specifications

Notes on Specifications

A set of precise and clear specifications is a prerequisite for Bidders to respond realistically and competitively to the requirements of the Procuring Entity without qualifying or conditioning their Bids. In the context of international competitive bidding, the specifications must be drafted to permit the widest possible competition and, at the same time, present a clear statement of the required standards of workmanship, materials, and performance of the goods and services to be procured. Only if this is done will the objectives of economy, efficiency, and fairness in procurement be realized, responsiveness of Bids be ensured, and the subsequent task of bid evaluation facilitated. The specifications should require that all goods and materials to be incorporated in the Works be new, unused, of the most recent or current models, and incorporate all recent improvements in design and materials unless provided otherwise in the Contract.

Samples of specifications from previous similar projects are useful in this respect. The use of metric units is mandatory. Most specifications are normally written specially by the Procuring Entity or its representative to suit the Works at hand. There is no standard set of Specifications for universal application in all sectors in all regions, but there are established principles and practices, which are reflected in these PBDs.

There are considerable advantages in standardizing General Specifications for repetitive Works in recognized public sectors, such as highways, ports, railways, urban housing, irrigation, and water supply, in the same country or region where similar conditions prevail. The General Specifications should cover all classes of workmanship, materials, and equipment commonly involved in construction, although not necessarily to be used in a particular Works Contract. Deletions or addenda should then adapt the General Specifications to the particular Works.

Care must be taken in drafting specifications to ensure that they are not restrictive. In the specification of standards for goods, materials, and workmanship, recognized international standards should be used as much as possible. Where other particular standards are used, whether national standards or other standards, the specifications should state that goods, materials, and workmanship that meet other authoritative standards, and which ensure substantially equal or higher quality than the standards mentioned, will also be acceptable. The following clause may be inserted in the SCC.

Sample Clause: Equivalency of Standards and Codes

Wherever reference is made in the Contract to specific standards and codes to be met by the goods and materials to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract. Where such standards and codes are national, or relate to a particular country or region, other authoritative standards that ensure a substantially equal or higher quality than the standards and codes specified will be accepted subject to the Procuring Entity's Representative's prior review and written consent. Differences between the standards specified and the proposed alternative standards shall be fully described in writing by the Contractor and submitted to the Procuring Entity's Representative at least twenty-eight (28)

days prior to the date when the Contractor desires the Procuring Entity's Representative's consent. In the event the Procuring Entity's Representative determines that such proposed deviations do not ensure substantially equal or higher quality, the Contractor shall comply with the standards specified in the documents.

These notes are intended only as information for the Procuring Entity or the person drafting the Bidding Documents. They should not be included in the final Bidding Documents.

STAGE I - ARCHITECTURAL AND ENGINEERING (A&E) DESIGN OF FIT-OUT AND LANDSCAPE WORKS:

Deliverables	Deadline/Timeline	
<p>1. Detailed program of work, approach, work plan and schedule for the implementation of the contract works.</p> <ul style="list-style-type: none"> i. The order in which it intends to carry out the work including anticipated timing for each stage of design/detailed engineering design; ii. Periods for review of specific outputs and any other submissions and approvals; iii. General description of the design methods to be adopted; iv. Number and names of personnel to be assigned for each phase of the work; 	<p>Note: Within fourteen (14) Calendar Days after issuance of NTP</p>	
<p>2. Reconnaissance, Engineering Surveys and On-Site Investigations.</p>		
<p>3. Preparation of Preliminary Plans, Elevations, Specification Outlines, Preliminary Cost Estimates, Value Engineering/ Value Analysis Study and other specific recommendations by the Consultant for the Fit-Out and Landscape Design for Architectural/ Civil (Wall/ Partition Works Design: Detailed Connections, Doors and Windows, Ceiling Works), Sanitary/ Plumbing (Plumbing System of additional toilets and integration to main system), Electro-Mechanical (AC System location design of indoor units and integration system of what is on site, Lighting and Power System including perimeter walls, guard houses, etc., Lighting Fixtures including Parking System using lights), Auxiliary Works/ Network/ Cabling/ Data System (BMS in close coordination with ITDS), Fire Detection and Alarm System (Smoke Detector and Sprinkler Location Plan), CATV System, PA/BGM System (Acoustical Design and Sound System for Press Room, Conference and Meetings Rooms), Telephone System, Security/ CCTV System integrated with BMS, Furnishings (Furniture Design, Cabinetries,</p>	<p style="text-align: center;">Note: Within three hundred fourteen (314) Calendar Days from receipt of NTP.</p> <p style="text-align: center;">Note: Within forty-five (45) Calendar Days from receipt of 1st Deliverables</p>	

<p>Counters), Landscaping Works (Details and Planting Methodology, Drainage and Watering System, Front Perimeter Wall Design, Guard Houses, Front Landscape & Gate Design, Balconies plants and shrubbery) and Specialty Works (Shades and Curtains, etc.) for Approval before Final Design.</p>		
<p>4. Submission of Final Plans of Approved Preliminary Plan for Fit-Outs and Design for Architectural/Civil, Sanitary/Plumbing, Electro-Mechanical, Network/ Cabling/ BMS, Fire Detection and Alarm System, Furnishings, Specialty Works and Landscaping Works including Working Drawings, Technical Specifications, Detailed Cost Estimates for permit purposes, wherever required, and Bid Documents.</p>	<p>Note: Within ninety (90) Calendar Days from receipt of NTP</p>	
<p>5. Approval of Final Plans duly signed and sealed by respective professionals for Fit-Outs and Design for Architectural/ Civil, Sanitary/ Plumbing, Electro-Mechanical, Network/ Cabling/ BMS, Fire Detection and Alarm System, Furnishings, Specialty Works and Landscaping Works including Working Drawings, Technical Specifications, Detailed Cost Estimates for permit purposes, wherever required, and Bid Documents.</p>	<p>Note: Within one hundred ten (110) Calendar Days from receipt of NTP</p>	

STAGE II – CONSTRUCTION OF ESSENTIAL MEFPS AND OTHER SUPPORTING CIVIL WORKS:

ELECTRICAL SPECIFICATIONS

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

- A. Provide all materials and equipment and perform all the work necessary for the complete execution of all the electrical works as shown on the electrical drawings and specifications. Except as otherwise excluded, and which without excluding the generality of the foregoing, shall include but not limited to the following principal items of work:
1. Complete power service entrance including concreting works.
 2. Building power and grounding systems.
 3. Power distribution equipment, including normal and emergency distribution and lighting/power panelboards, and automatic transfer switches.
 4. A system of lighting and power wiring including all feeders, branch circuits and connection to all devices and motors.
 5. Main feeders from service transformers to distribution panelboards and from generating set to automatic transfer switches.
 6. All lighting fixtures, exit light and battery operated emergency lighting units including all lamps.
 7. High voltage primary feeder from utility primary metering to each unit substation.
 8. Installation and connection of electrical equipment such as fuel pumps' controllers etc.
 9. Securing of electrical wiring permit, certificate of final inspections, and utility connections.
 10. Complete testing of all electrical systems.
 11. Complete directories, signages and painting of all electrical work and equipment.
 12. Grouting or fire proof sealing of openings in floors and walls after all raceways or ducts are in place and sealing of all such openings if not used.

If anything has been omitted or not enumerated in the specifications and the plans of any item of work, which is necessary and usually furnished with the materials and

standard practice in electrical installations, then such items must be are hereby included in this electrical work.

1.2 APPLICATION

- A. This section applies to all sections of Division 16, "Electrical" of this project except as specified otherwise in each individual section.

1.3 ADDITIONAL ELECTRICAL WORK

- A. Receive, handle, set and connect certain electrical equipment furnished by the Owner.
- B. Provide excavation, backfill, concrete, structural supports, miscellaneous materials, and labor for complete installation of items specified under this division unless otherwise shown.

1.4 SUBMITTALS

- A. Obtain approval before procurement, fabrication, or delivery of items to the jobsite. Partial submittals will not be acceptable and will be returned without review. Submittals shall include the manufacturer's name, trade name, place of manufacture, catalog model or number, nameplate data, size, layout, dimensions, capacity, project specification and paragraph reference.

1. Shop Drawings: In addition to the requirements of the Contract Clauses, shop drawings shall meet the following requirements. Drawings shall be a minimum of 20 inches by 30 inches in size, except as specified otherwise. Drawings shall include wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to assure a coordinated installation.

Wiring diagrams shall identify circuit terminals and indicate the internal wiring for each item of equipment and the interconnection between each item of equipment. Drawings shall indicate adequate clearance for operation, maintenance, and replacement of operating equipment devices. If equipment is disapproved, revise drawings to show acceptable equipment and resubmit.

2. Manufacturer's Data: Submittals for each manufactured items shall be current manufacturer's descriptive literature of catalogued products, equipment drawings, diagrams, performance and characteristics curves, and catalog cuts.
3. Publication Compliance: Where equipment or materials are specified to conform to industry and technical society publications of organizations such as Philippine National Standards (PNS), Japanese Industrial Standards (JIS), International Electrotechnical Commission (IEC), British Standards (BS), American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), and Underwriters Laboratories Inc. (UL), submit

proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Engineer. In lieu of the label or listing, submit a certificate from an approved independent testing organization, adequately equipped and competent to perform such services, stating that the item has been tested in accordance with the specified organization's test methods and that the item conform to the specified organization's publication.

Certificates of Compliance: Submit manufacturer's certifications as required on products, materials, finish, and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for this contract. Preprinted certifications and copies of previously submitted documents will not be acceptable. The manufacturer's certifications shall name the appropriate products, equipment, or materials and the publication specified as controlling the quality of that item. Certification shall not contain statements to imply that the item does not meet requirements specified, such as "as good as"; "achieve the same end use and results as materials formulated in accordance with the referenced publications"; or "equal or exceed the service and performance of the specified materials." Certificates shall be printed on the manufacturer's letterhead and shall be signed by the manufacturer's official authorized to sign certificates of compliance.

- B. Contractor's failure to submit proper shop drawings and obtain approval of the equipment, material or devices prior to manufacturing, delivery on the jobsite and installation shall not be reason to initiate change order or allow for additional compensation to the contractor, when changes are necessary to comply with requirements of the specifications or drawings.

1.5 CONNECTION TO OTHER EQUIPMENT

- A. Complete manufacturer's detailed shop drawings wiring and connection diagrams of equipment requiring electrical connection will be provided as specified elsewhere. Contractor shall obtain drawings at the time they are needed.
- B. Work that must be altered because of contractor's failure to obtain shop drawings shall be corrected, without additions to the contract price.

1.6 COORDINATION DRAWINGS

- A. Drawing are diagrammatic and show general location of conduit and equipment, exact location of conduit and equipment not located by dimensions on drawing shall be determined when equipment and mechanical drawings are available. Contractor shall use these drawings to coordinate installation of electrical equipment. Contractor shall submit coordination drawings to Owner's Representative before installation of equipment with consideration given to interference and appearance.

1.7 OPERATION AND MAINTENANCE MANUAL

- A. Submit as required for systems and equipment indicated in the technical sections. Furnish three copies, bound in hardback binders or an approved equivalent. Furnish one complete manual prior to performance of systems or equipment tests, and furnish the remaining manuals prior to contract completion. Inscribe the following identification on the cover: the words "OPERATION AND MAINTENANCE MANUAL," the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment. Include a table of contents and assemble the manual to conform to the table of contents, with the table sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in. The manual shall include:
1. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the system or equipment.
 2. A control sequence describing startup, operation, and shutdown.
 3. Description of the function of each principal items of equipment.
 4. Installation and maintenance instructions.
 5. Safety precautions.
 6. Diagrams and illustrations.
 7. Testing methods.
 8. Performance data.
 9. Lubrication schedule including type, grade, temperature range, and frequency.
 10. Parts List: The list shall indicate sources of supply, recommended spare parts, price, shipping weight and name of servicing organization.
 11. Appendix: List qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.

1.8 POSTED OPERATING INSTRUCTIONS

- A. Furnish approve operating instructions for systems and equipment indicated in the technical sections for use by operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment including start-up, property adjustment, operating, lubrication, shutdown, safety

precautions, procedure in the event of equipment failure, and other items of instructions as recommended by the manufacturer of each system or equipment. Provide weather-resistant materials or weatherproof enclosures for operating instructions exposed to the weather. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

1.9 INSTRUCTION TO OWNER PERSONNEL

- A. Where indicated in the technical sections, furnish the services of competent instructors to give full instruction to owner personnel in the adjustment, operation, and maintenance of systems and equipment, including pertinent safety requirements as required. Each instructor shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory as well as practical operation and maintenance work. Instruction shall be given during the first regular work week after the equipment of system has been accepted and turned over to the owner for regular operation. The number of man-days (8-hours) of instruction furnished shall be as specified in each individual sections. Instructions to owner personnel shall be at no cost to the Owner.

1.10 DELIVERY AND STORAGE

- A. Handle, store, and protect equipment and materials in accordance with the manufacturer's recommendations and with the requirements of Philippine Electrical Code. Replace damaged or defective items with new items.

1.11 CATALOGUE PRODUCTS/SERVICE AVAILABILITY

- A. Materials and equipment shall be current products by manufacturers regularly engaged in the production of such products. Products shall have been in satisfactory commercial or industrial use for 2 years prior to bid opening. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The 2-year period shall be satisfactorily completed by a product for sale on the commercial market through advertisements or manufacturer's catalogs. Product having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6000 hours, exclusively of the manufacturers' factory or laboratory tests, is furnished. The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

1.12 MANUFACTURER'S RECOMMENDATIONS

- A. Where installation procedures or any part thereof are required to be in accordance with manufacturer's recommendations, furnish printed copies of the recommendations prior to installation. Installation of the item shall not proceed until recommendations are received. Failure to furnish recommendations shall be cause for rejection of the equipment or material.

1.13 RECORD DRAWINGS

- A. Contractor shall keep in field, and open for inspection by the Owner's Representative, an accurate current, progressive record of actual installation of electrical system. On completion of work, contractor shall deliver to Owner's Representative, marked prints showing actual routing of conduits and ducts, location and elevation of outlets, circuit numbers of lighting and power circuits, installation details of lighting fixtures, power panels, etc.
- B. Contractor will be permitted to make changes to meet field conditions or material delivery conditions which may arise. However, in each instance, proposed change must be submitted in form of drawings or sketches for approval and acceptance by Owner's Representative.

1.14 CODES, PERMITS, INSPECTIONS, AND OWNER REQUIREMENTS

- A. Work shall comply with the latest requirements of Philippine Electrical Code, Building Rules and Regulations, Local Ordinances, and such other statutory provisions that pertain to this class of work. Such code, rules, regulations and local ordinances are to be considered part of these Contract Documents.
- B. Contractor shall, at his own expense, obtain necessary permit for construction and performance of work specified.
- C. Contractor shall, at his own expense, secure Certificate of Final Inspection and approval from Electrician's Office of the City or Municipality prior to final approval of the work.

1.15 ELECTRICAL CHARACTERISTICS

Electrical characteristics for this project shall be as-shown primary, three-phase, 4 wire, 60 hertz, 400 volts secondary, three-phase, line to line and 230 volts, single phase, line to neutral or as indicated on the drawings. Final connections to the power distribution system at utility power lines shall be made by the Contractor as directed by Electric Utility Company.

1.16 ELECTRICAL REQUIREMENTS

- A. Furnish motors, controllers, contactors and disconnects with their respective pieces of equipment not covered under the mechanical contract and or as shown on the drawings. Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors will not be permitted. Control voltage for controllers and contactors shall not exceed 120 volts nominal. Provide control wiring and conduit under the section specifying the associated equipment. Control wiring and conduit shall conform to the requirements of the section specifying the associated equipment.

PART 2 EXECUTION

2.1 PAINTING OF EQUIPMENT

- A. Factory Applied: Electrical equipment shall have factory-applied painting systems which shall, as a minimum meet the requirements of NEMA ICS 6 corrosion-resistance test or approved equal.
- B. Field Applied: Paint electrical equipment as required to match finish or to meet safety criteria.

BASIC MATERIALS AND METHODS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 DESCRIPTION OF THE WORK

- A. This section of the specifications covers the basic materials, wiring and construction methods to be provided for the electrical work under sections of these specifications.

1.2 CONCRETE AND EARTHWORK

- A. Concrete work shall conform to Section "Cast-in-Place Concrete" and earthwork shall conform to Section "Earthwork". The Contractor shall be responsible for the correct location of foundation and anchor bolts for electrical equipment.

PART 2 PRODUCTS

2.1 MATERIALS

- A. The Contractor shall provide material necessary for the proper execution of the work. The materials shall be new and the best of their respective kinds for the use intended. The Contractor shall furnish a complete list of materials and equipment he proposes to use, including delivery dates, subject to the approval of the Owner's Representative, in writing, before ordering the same.
- B. Materials shall be listed and labeled by the Philippine Standards (PS) and internationally recognized laboratories where listing service is provided for the type of material specified material shall also meet the applicable standards of NEMA and Local Regulations. Installation shall be strictly in accordance with the requirements of the Philippine Electrical Code.

2.2 ELECTRICAL TAPE (600 VOLT WIRING)

- A. Tape shall be polyvinyl chloride, minimum 0.18 mm thickness.
- B. Tape shall be PS rated at 80°C and shall maintain flexibility and adhesion from -18°C to +38°C.

2.3 TERMINAL LUGS AND CONNECTORS

- A. Terminal and wire connections shall be made using solderless, bolt type lugs. Connectors shall be tin plated copper construction.

2.4 ELECTRICAL SUPPORT DEVICES

- A. Junction boxes, cabinets, switches and other electrical equipment shall be rigidly supported by attachment to the building structure prior to the installation of conduit.
- B. Rigid steel conduits shall be supported with one hole malleable iron clamps at intervals not greater than 3 meters and within 0.6 meter of a bend or outlet box.
- C. Groups of exposed parallel conduits shall be supported by trapeze hangers or metal framing.

2.5 METAL FRAMING

- A. Metal framing for support of electrical equipment and conduit runs shall normally be of steel strip cold formed. Aluminum framing shall be furnished only when so noted. One side shall have a continuous slot with unturned clamping ridges on each side. Attachments shall be made to the framing member by means of hardened, toothed, slotted nuts held in place within the member by an attached spring.
 - 1. Framing and attachment fittings shall be made from hot rolled, pickled and oiled steel plates or strip.
 - 2. Nuts shall be made from steel bar stock, case hardened after machining. Nut shall be rectangular and shaped to permit a quarter turn after insertion into channel slot and prevent any further turning of the nut.
 - 3. Channel and parts shall be carefully cleaned and bonderized, then dip painted with a corrosion resistant primer and oven baked. Where so noted, the finish shall be hot-dipped galvanized after manufacturing operations are completed zinc weight shall be 56 grams per 0.09 sm. of surface.
 - 4. Parts, screws and nuts shall be coated with zinc electrolytically.

2.6 HANGER RODS

- A. Hanger rods shall be galvanized steel or cadmium plated, 6 mm minimum diameter.
 - 1. Hardware rods shall be fastened to structural steel members with suitable beam clamps or to concrete inserts set flush to the surface.

2.7 **HARDWARE FINISH**

- A. Hardware finish for concrete inserts, pipe straps, nuts, bolts, washers, screws, etc. shall be galvanized or cadmium plated.

2.8 **MISCELLANEOUS**

- A. The Contractor shall furnish and install necessary locknuts, bushings, pipe clamps, ground clamps, supports, pull boxes, mounting bolts, inserts, lugs and such other materials, as may be necessary and proper in the execution of this work.

PART 3 EXECUTION

3.1 **LABOR AND SUPERVISION**

- A. Workmanship shall be in accordance with best practices of trade. Electrical work shall be installed under direct supervision of an electrical engineer.

3.2 **LAYOUT AND COORDINATION**

- A. Contractor shall be responsible for laying out work on site in conformance with contract documents and shall be responsible for damage caused by reason of inaccuracy on his part. Contractor shall take field measurements necessary for his work and shall be responsible for their accuracy.
- B. Contractor shall coordinate location of equipment, conduit, outlets, etc. in proper relationship to work specified elsewhere. When other work interferes with this locations, Contractor shall bring matter to attention of Owner's Representative whose decision will be final as to which shall take precedence. Where this is not done, Owner's Representative reserves right to make such changes in work as are necessary to avoid interference, and such changes shall not be considered as extra work.
- C. Contractor shall carefully refer to room dimensions, door swings and locations of other equipment for location of outlets. In the event of discrepancy with electrical drawings, Owner requirement shall govern. Provide electrical service and connections to items so requiring in other divisions. Contractor shall check such drawings and specifications, other than electrical, to so determine.
- D. Ceiling lighting fixture outlets shall be located for symmetrical installation of lighting fixtures between beams, walls, breaks in ceilings, etc. unless specifically shown or dimensioned on the drawings.

- E. Contractor shall keep himself fully informed of progress of general construction, and shall install his work that is concealed and built into building, in place, insufficient time to ensure proper location, without delays to work of other trades. Properly attend electrical work during progress of building-in to prevent misalignment of and damages to electrical work.

3.3 **CUTTING AND PATCHING**

- A. Do cutting, fitting or patching of work that may be required to make its several parts come together properly, and fit it to receive, or be received by work of others, shown upon or reasonably implied by the drawings and specifications.
- B. Avoid cutting into work of others by using sleeves, inserts, chases, etc. The Contractor, in whose work it shall be necessary to use these methods, shall build same into his work, but this Contractor shall be responsible for the correct size and location of same, and shall furnish sleeves and inserts.
- C. If necessary to cut into the work of another Contractor it shall be done by that Contractor, at this Contractor's expense or by this Contractor with the consent of the other Contractor. Patching made necessary by such cutting shall be executed in the same manner.
- D. Cutting shall be done with such tools and methods as will prevent damage to surrounding building areas or equipment, and shall be performed in a neat and orderly manner.
- E. Building structural members shall not be drilled, punched, cut, burned, or welded without approval of Owner's Representative. This Contractor will be responsible for damage he inflicts on the building structure.

3.4 **DAMAGE TO OTHER WORK**

- A. This Contractor shall be held responsible for damage to other work caused by this work, or through the neglect of this workmen. Patching and repairing of damaged work shall be done by workmen of the proper trade, but the cost of same shall be paid for this Contractor.

3.5 **PAINTING**

- A. Patched wall surfaces, boxes, or other equipment installed will be finish painted under other sections of these specifications.
- B. Factory finished equipment shall be handled with care, to avoid marring the finish. Finishes damaged during installation shall be repaired to the satisfaction of the Architect/Engineer to Owner's Representative by this Contractor. Also, prime coats shall be made and kept intact by this Contractor.

- B. Operate each wall switch with circuit energized and verify proper operation.
- C. Verify that each receptacle device is energized.
- D. Test each receptacle device for proper polarity.
- E. Test each GFCI receptacle device for proper operation.

3.5 **ADJUSTMENT & CLEANING**

Clean installed work.

Clean exposed surfaces to remove splatters and restore finish.

Adjust devices and wall plates to be flush and level. Where outlet boxes are not within 4mm of the finish wall surface, install an extension ring or reinstall outlet box to bring it to within 4mm of the surface in order to provide secure support for the device.

Protect all devices and plates from paint and construction material. All devices and plates shall be clean, undamaged and unscratched.

LIGHTING FIXTURES

PART 1 – GENERAL

DESCRIPTION

The work required under this section consists of the supply, installation, testing and commissioning of the lighting fixtures and associated equipment and materials.

QUALITY ASSURANCE

- A. Industry Referenced Standards: The following specifications and standards are incorporated into and become part of this specification by reference. Except where a specific date is given, the issue in effect (including amendments, addenda, revisions, supplements and errata) on the date of invitation for bids, shall apply. In text, such specifications and standards are referenced to be basic designation only.

International Electrotechnical Commission (IEC)

The National Fire Protection Association:
National Electrical Code
Underwriter's Laboratories, Inc.

- A. Polyvinyl Chloride (PVC) Conduit shall be schedule 40 heavy wall rated for 90 C conductors and UL listed for aboveground and underground uses in accordance with PEC article 5.6.3. Conduit shall conform to NEMA TC-2 and UL -651 standards.
- B. Fittings such as couplings, elbows, offsets, conduit adapters, etc. shall be fabricated from same material as conduit.

PART 3 EXECUTION

3.1 APPLICATION

- A. Unless otherwise indicated all types of conduit shall be Intermediate metal conduit to be installed for exposed interior wiring, in concrete slabs, in exterior walls, for exposed exterior wiring, and as shown on drawings except as may be specifically accepted elsewhere in the specifications.
- B. Rigid PVC conduit shall be used for underground work only as indicated in the drawings. The conduit shall be concrete encased under paved areas and other location as noted on the drawings. PVC conduit shall also be used in corrosive areas as defined on the drawings, and concealed in floors and walls whenever possible.
- C. All 20 mm and 25 mm diameter conduit sizes if embedded in concrete shall be Rigid PVC conduit and remaining type and sizes of conduit shall be rigid steel conduit or unless otherwise indicated in the drawing.
- D. Flexible liquidtight PVC jacketed steel conduit shall be used for connections to motors and equipment subject to vibration and in wet or damp locations.
- E. Pendant mounted lighting fixtures shall be supported using rigid steel conduit without exception.
- F. Minimum size conduit shall be 15 mm unless otherwise noted.

3.2 INSTALLATION

- A. Exposed conduit shall be run parallel or perpendicular to building walls and shall be kept as inconspicuous as possible.
- B. Conduits shall be concealed in walls and floors, wherever possible. In areas where there are dropped ceilings, conduits shall be installed above ceiling.
- C. Conduits and cable trays may be exposed in mechanical equipment rooms.
- D. Concealed conduit shall be run in straight lines with long sweep bends and offsets.
- E. Conduit entries through building walls below grade shall be made watertight by means of manufactured fittings. Fittings shall provide sleeve through wall having neoprene

ring gasket which can be compressed for positive seal between entering conduit and fitting body.

- F. Underground conduits entering areas below grade shall be arranged to drain water that may enter conduit system. Where possible conduits shall pitch away from building to exterior manholes. Junction boxes at conduit entries within building shall be provided with drain holes.
- G. Where conduits penetrate fire walls or partitions, pack openings with mineral fiber or approved insulation to maintain integrity of fire barriers.
- H. Conduit connections to pull boxes, safety switches, etc. shall be made by use of double steel locknuts. The conduit system, including pullboxes, shall form a continuously conductive grounding system.
- I. Conduits shall be protected immediately after installation by means of installing flat, noncorrosive, metallic discs and steel bushings at each end. Discs shall not be removed until necessary for pulling cable. Prior to pulling of cables, steel bushings and metallic discs shall be removed and phenolic insulating bushings shall be installed on end of each conduit of 25 mm size and over.
- J. No horizontal runs of conduits may be installed in masonry walls, except by specific permission of the Owner's representative.
- K. Conduit shall be substantially supported by pipe straps, or suitable clamps or hangers. Attached to structure of building to provide substantial and rigid installation. Joint use of hangers with heating and plumbing lines will not be permitted.
- L. Expansion joints shall be provided in conduit systems that cross building expansion joints or for raceways exceeding 30 meters. Bonding straps shall be used to provide continuous ground around expansion joint.
- M. For 20 mm and 25 mm diameter size Rigid PVC conduit embedded in concrete, provide special fitting such as adapter for joining or connecting between PVC and rigid steel conduit. Adapter fitting shall be embedded in concrete and there will be no exposed part of PVC conduit.

3.3 CONDUIT IN SLABS

- A. Conduits in structural slabs shall be placed between upper and lower layers of reinforcing steel and shall be spaced at least 200 mm apart. 20 mm conduits may be used in 110 mm and thicker slabs. 25 mm conduits may be used in 130 mm and thicker slabs. Maximum conduit size shall be 40 mm in structural concrete slabs. Conduits running parallel to slab supports such as columns, beams and walls shall not be installed less than 300 mm from such elements. Conduits shall have a minimum of 40 mm of concrete all around.

WIRES AND CABLES FOR 0-600 V CIRCUITS and POWER CABLES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Provide building wires, power cables, control cables, flexible cords, splices, taps, and terminations as required for electrical work covered by the Contract Documents.

PART 2 PRODUCTS

2.1 BUILDING WIRES FOR 600 VOLTS AND LESS

- A. General
 - 1. Conductors shall be new and shall show the name and trademark of the manufacturer and shall be tagged showing acceptance by Underwriter's Laboratories. Conductors shall be identified in accordance with Philippine Electrical Code color coding. Conductors shall be 600 volt insulated and shall be 3.5 mm² or larger unless otherwise noted. Sizes larger than 3.5 mm² are noted on the drawings.
 - 5. Conductors shall be stranded copper.
 - 6. Conductors used in fluorescent fixture channels shall be rated 90°C.
 - 7. Conductors for power circuits shall be type THHN/THWN.
 - 8. Equipment grounding conductors shall be green or have the ends taped with green tape and shall be type TW.
 - 6. Conductors for wiring in high ambient areas shall be stranded flexible tinned copper. Silicone rubber insulated with heat and moisture resistant glass braid jacket, rated 200°C intermittent operating temperature, 180°C continuous.
- B. Insulation Types shall be as follows:
 - 1. Type THHN conductor insulation shall be polyvinyl chloride plastic. Rating shall be 90°C in wet or dry locations.
- C. Approved Product Manufacturers or approved equal.
 - 1. Insulated copper, annealed conductors:

2.2 FLEXIBLE CORDS

- A. Flexible cords shall be furnished for pendent connections to lighting fixtures and connections to portable equipment.

2.3 CONTROL CABLE

- A. Multiple conductor control cables shall be rated 600 Volts, shall have outer jacket as specified, and be suitable for installation in open, air, ducts, conduit, or direct burial.
- B. Conductors: Stranded soft copper or number shown.
- C. Insulation: As specified below with stranded IPCEA Color Coding.

2.4 POWER CABLE

- A. Power cables shall be rated as specified, 133% shall have outer jacket as specified, and be suitable for installation in open or direct burial.
- B. Conductors: Copper
- C. Insulation: XLPE Insulation, Extruded Semi-Conductive Conductor
- D. Temperature: 90 degrees C up to 250 degrees C short circuit condition

PART 3 EXECUTION

3.1 CONDUCTOR INSTALLATION

- A. Interiors of conduit shall be clean and dry before pulling wire. If dirt or moisture has entered conduits contractor shall swab them clean.
- B. Care shall be exercised while installing wire in conduits so as not to injure conductor insulation. Use only UL listed wire pulling lubricants for pulling-in conductors.
- C. Free ends and loops of wire at boxes and enclosures shall be pushed back in box and protected by blank covers or other means until the interior painting or decorating work is completed.

3.2 CONDUCTOR IDENTIFICATION

- A. The conductors of branch circuits for power and lighting shall be color coded for identification purposes in accordance with Article 5.3 of the Philippine Electrical Code. Refer to Section 16055 of these specifications.
- B. Power feeders for 600 volts and below shall be color coded by using permanent-colored, non - aging insulating tape.

- C. Branch circuits shall be connected as numbered on drawings. Test and permanently tag by circuit number each circuit wire, except neutrals, in panel gutter before connecting to panels, using numbered tapes.
- D. Terminal strips shall be lettered or numbered, and numbered or lettered tapes shall be attached to conductors connected through terminal strips.

3.3 SPLICES, TAPS AND TERMINATIONS

- A. Splices and taps of conductors 5.5 mm² and smaller shall be made using electrical spring connectors with vinyl insulating caps.
- B. Splices and taps of conductors larger than 5.5 mm² shall all be made by split-bolt type connectors. Finished splice or tap shall be insulated with one layer of vinyl backed mastic followed by two half-lapped layers of electrical tape or premolded caps or heat shrinkable tubing.
- C. Feeder conductors shall be terminated with pressure bolt type lugs.
- D. Conductors for other than feeders shall be terminated using pressure bolt type terminals. Where connections are to be made under screw heads only, install insulated crimp type spade lugs on stranded wire ends before connections are made.
- E. Connectors shall contain only one wire unless listed for multiple conductors.
- F. Feeder cables shall be continuous without splices.

3.4 TESTING

- A. Continuity shall be checked by means of a DC test device using a bell or buzzer. Circuit and phase identification tags shall comply with 3.2 above.
- B. Lighting circuit shall be identified and shall pass operational tests to see that the circuits perform functions for which they are designed.
- C. Cable connections must pass a visual inspection for workmanship and conformance with standard practice.
- D. Conductors and leads shall be tested for continuity. Feeder and branch circuits shall be given a megger test using 1000 volt motor driven megger.
 - 1. Megger tests shall be made between one conductor and ground with the other conductors grounded. Each conductor shall be tested in the same manner. Megger readings for cables connected at both ends shall be recorded.
 - 2. Each feeder conductor shall be meggered with the cable connected to the open breaker at the equipment. Connections at the other end of each of these cables shall be as follows:
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WIRING DEVICES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Device plates and decorative box covers.
- D. Access floor box.

1.2 RELATED SECTIONS

- A. Section 16130 - Boxes.

1.3 REFERENCES

- A. Philippine Electrical Code
- B. NECA - Standard of Installation.
- C. NEMA WD 1 - General Requirements for Wiring Devices.
- D. NEMA WD 6 - Wiring Device -- Dimensional Requirements.
- E. NFPA 70 - National Electrical Code.
- F. PEC - Philippine Electrical Code

1.4 SUBMITTALS

- A. Product Data: Submit three (3) manufacturer's sample or catalog information showing each dimensions, colors, configuration and etc. Final selection shall be made by the Architect.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70 or PEC.
- B. Provide Products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 WALL SWITCHES

- A. Description: NEMA WD 1, Heavy-Duty, AC only general-use snap switch.
- B. Body and Handle: Ivory plastic with toggle handle.
- C. Ratings:
 - 1. Voltage: 300 volts, AC.
 - 2. Current: 15 amperes.
- D. Ratings: Match branch circuit and load characteristics.

2.2 RECEPTACLES

- A. Description: NEMA WD 1, Heavy-duty general use receptacle.
- B. Device Body: Ivory plastic.
- C. Configuration: NEMA WD 6, type as specified and indicated.
- D. Convenience Receptacle: Type as indicated.
- E. General purpose receptacle are 20 ampere 250 volt 3 pin grounding type.
- F. GFCI Receptacle: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

2.3 WALL PLATES

- A. Decorative Cover Plate: Ivory, smooth plastic, modern plate.
- B. Jumbo Cover Plate: Ivory, smooth plastic, modern plate.
- C. Weatherproof Cover Plate: Gasketed cast metal with gasketed device cover. Weatherproof accessories are to be of non-corroding metal or polycarbonate enclosure with a IP56 rating.

DIGITAL KILOWATT-HOUR METER

- A. Manufacturers or approved equal.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions prior to beginning work.
- B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 INSTALLATION

Install in accordance with NECA "Standard of Installation."

- B. Install switches with OFF position down.
- C. Install receptacles with grounding pole .
- D. Install decorative plates on switch and receptacle in finished areas.
- E. Connect wiring devices by wrapping conductor around screw terminal.
Use jumbo size plates for outlets installed in masonry walls.

Connect the grounding terminal of each device to the equipment grounding conductor of the circuit and connect to the metallic outlet box grounding lug with a pig-tail conductor. The connection shall be made with a conductor pig-tail such that removal of the device will not interrupt the ground continuity of the downstream devices.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Install wall switch 1.2 m above finished floor.
- B. Install convenience receptacle 300 mm above finished floor.
- C. Install convenience receptacle 150 mm above counter or backsplash of counter.

3.4 FIELD QUALITY CONTROL

- A. Inspect each wiring device for defects.