PHILIPPINE SPORTS COMMISSION
REHABILITATION AND UPGRADING OF MEDICAL AND SCIENTIFIC ATHLETES SERVICES BUILDING

I. OBJECTIVE

The objective of the project is to Rehabilitate and Upgrade the of Medical and Scientific Athletes Services Building.

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II. BASIC INFORMATION

Project Name : **Rehabilitation and Upgrading of Medical and Scientific Athletes Services Building**

Location : Rizal Memorial Sports Complex, Pablo Ocampo Sr. Street Malate Manila

III. APPROVED BUDGET FOR THE CONTRACT

₱ 183,909,839.07 (One Hundred Eighty-Three Million, Nine Hundred Nine Thousand, Eight Hundred Thirty-Nine Pesos and Seven Hundredths of Centavos)

IV. QUALIFICATION

- The Contractor must have valid PCAB license Category A with principal classification of General Engineering.
- The Contractor must have PCAB ARCC rating of Medium B for Building.
- The Contractor must be ISO 9001 Certified.
- The Contractor must be in sound financial standing with annual turnover/gross billings of at least 50% of the ABC.
- The Contractor must have complete construction of a structure with at least contract value of 50% of the ABC.
- The Contractor must have a licensed Civil Engineer, Electrical Engineer, Mechanical Engineer, Sanitary Engineer, Materials Engineer and Safety Officers.
- All engineers must have an experience in the construction/rehabilitation of structures such as sports facilities and the like.
- The Company must have at least ten (10) years of experience in rehabilitation works.

V. SCOPE OF WORK

1. Mobilization of materials, manpower and equipment.
2. Removal of unwanted Structures.
3. Hauling of debris.
4. Provision for temporary Facilities.
5. Dismantling, removal and replacement of existing ceiling, doors and wooden partition.
6. Removal and removal of Wushu Signage.

7. Re-sanding, Polishing and application of polyurethane on wooden Flooring.
8. Removal and Replacement of existing floor and wall tiles.
9. Provide access of PWD at Main entrance, GYM and clinic.
10. Scrapping, removal, surface preparation and repainting of interior and exterior wall of the building.
11. Repainting of existing roofing application of anti-rust and water proof painting.
12. Removal and replacement of existing panel boards. Lighting fixtures, outlet, electrical wirings and switches.
13. Removal and replacement of existing sewer and water lines.
14. Replacement of existing water tanks.
15. Removal and replacements of existing toilet fixtures.
16. Provision of PWD toilet and shower.
17. Removal and replacement of glass main entrance door with logo.
18. Removal and replacements of existing glass windows.
19. Supply and installation of fire detection system, telephone system, LAN system and CCTV System.
20. Supply and installation of sprinkler system including fire pump and water tank.
21. Hauling of debris.
22. Demobilization.

GENERAL REQUIREMENTS

SECTION 1 : DEFINITION OF TERMS

1.1 **CONTRACTOR** shall mean the person, company or firm whose proposal has been accepted by the Owner and includes is personally authorized representative, successors or permitted assignees. He is responsible to the Owner thru the Project Manager and Construction Manager.

1.2 **CONTRACT** shall mean the written agreement entered into by the Owner and the Contractor for the performance of work shown on the drawings and as described in the Specification, including the information for Bidders, the Proposal and all bid documents issued by the Owner prior to the opening of bids.

1.3 **SPECIFICATION** shall mean written or printed description of work to be done describing qualities of materials and mode of construction.

1.4 **DRAWINGS** shall mean the drawings issued together with the Specification to prospective bidders, showing the location, characteristics, extent, form and details of the work to be done under the Contract.

1.5 **APPROVED** means approval in writing including subsequent written information of previous verbal approval. "Approval" shall also mean the same thing abovementioned.

SECTION 2 : DRAWINGS AND SPECIFICATION

2.1 It is the intent of the specification and drawings that all materials, labor, tools, equipment and plant and services, supervision, which are required to dully complete the work as shown and specified therein are to be done so by the Contractor.

2.2 The Drawings and Specification are meant to be complementary to each other and what is called for by one shall be called for by both.

Any apparent conflict between the Drawings and Specification and any controversial or unclear points in either shall in writing to Architect. Failure of the contractor to inform the architect within fifteen (15) calendar days after the award of contract, the final decision of the architect is executory for

implementation. The contractor shall report ring during construction. At the completion of the work, said copy of the plans shall be submitted to the owner for its copy and file.

SECTION 3 : REFERENCE LINES AND ELEVATION

3.1 The Contractor shall establish stakes, marking lines and elevation required for construction work, referred from reference points and elevation pointed out by Engineer/Architect. The contractor shall be responsible for maintaining the correct alignment and position of these stakes as required by the Engineer throughout the life of the Contract. The Contractor shall use surveyor's transit in determining all control lines and elevation required for the construction work.

SECTION 4 : MATERIALS AND EQUIPMENT INCORPORATED IN THE WORK

4.1 All materials and equipment to be incorporated in the work shall be new, of current manufacture and conforming to the requirements of the drawings and the specification. The Project Manager may require the contractor to its manufacturer of materials to make actual testing of samples prior to installation. For all approved materials, the contractor shall submit a warranty certificate to the owner during, on or before the turnover of the project.

4.2 Mere inspection, acceptance and certification for payment of any equipment or materials as part of the work which are found defective, non-complying after inspection does not release the contractor from the responsibility of replacing or repairing it at his own expense.

SECTION 5 : CONTRACTOR'S RESPONSIBILITY OF THE CONTRACT WORK

5.1 The Contractor shall be responsible for the complete work or portion thereof until that it is wholly turned over and accepted by the Owner through the Project Manager or Construction Manager. He shall repair or restore and rebuild at his expense any damage thereto due to faults and action of elements, or other causes except damages due to enforceable or cataclysmic natural phenomena.

5.2 For accidents:

5.2.1 The contractor shall bear all losses or damages from accidents, which may occur to a person or persons on account of the prosecutors of work until possession is taken over by the Owner.

5.2.2 The contractor shall hold himself of solely responsible for all liabilities under the existing compensation laws regarding injuries and/or death of workmen connected with this work.

SECTION 6 : LAWS, RULES AND REGULATION

6.1 The Contractor shall comply with all national and local laws, rules and regulations regarding the health and safety or workmen, wages, labor codes, tax laws, buildings and construction rules and regulation and shall save the Owner, Architects, Engineers and The Project Manager or CM harmless in any third party claims and liabilities resulting from Contractor's noncompliance therewith.

SECTION 7: PERMITS AND LICENSES

7.1 The Contractor at his expense shall obtain all necessary permits and licenses and charges, taxes, and fees for the lawful prosecution of the contract.

SECTION 8 : CONTRACT TIME

8.1 The work to be done under this Contract shall consist of furnishing of all labor, materials (except those furnished by the Owner or by Others) equipment, supervision, facilities and performing all other related works necessary for the complete construction within the time specified in the Proposed Time Schedule attached in strict compliance with the contract drawings, specification and other related documents. The Bidders shall examine the site, drawings, specification schedules and all instruct. Failure to do so will be at the Bidder's that is aware of any concurs with all of the requirements or condition incorporated in the invitation to bid.

SECTION 9 : PROGRESS SCHEDULES

9.1 The Contractor shall submit progress schedules showing the order of his proposed work sequences complete with the dates within which such work sequences will be started and completed. Such schedules shall be submitted within seven (7) calendar days after the receipt of Notice To Award/To Proceed and subject to the approval of the Construction Manager and Owner. The contractor shall also submit their S-curve, Critical Path Method (CPM), and Bar chart for the project. This should follow the prescribed form.

SECTION 10 : SANITARY PROVISION AND FIRE PROTECTION

10.1 The Contractor's employees and men shall use designated comfort rooms outside the construction site and he shall be responsible for clean up of such comfort rooms upon leaving the place of work each day and after completion of the project.

10.2 The Contractor shall provide, as many portable fire extinguishers deemed necessary while performing the work.

10.3 The Contractor shall take extra care in the storage of flammable materials.

10.4 There shall be no smoking, cooking or eating allowed at the site premises during and after work. Eating, and smoking shall only be allowed at a designated area, and the contractor shall be responsible for proper clean up thereafter.

SECTION 11: AUTHORITY OF THE PROJECT MANAGER/ CONSTRUCTION MANAGER

11.1 The Project Manager/Construction Manager shall decide on any and all quest, which may arise as to the quality and acceptability of materials furnished and work performed and as to the manner of performance and rate of progress of work, and shall decide on all , which may arise as to the acceptable fulfilment of the terms of the Contract.

SECTION 12 : ADJUSTMENTS OF DISPUTES

12.1 Claims for adjustments of disputes must be made and submitted in writing by the Contractor within ten (10) days after the date of issue of the order dealing therewith and any disagreement with the interpretation of the plans and/or the Specification, made by the Engineer/Architect, must likewise be asserted and submitted in writing by the Contractor within ten (10) days from the date of such interpretation.

SECTION 13 : INSPECTION

13.1 The Project Manager/Construction Manager shall be allowed access to all parts of the work at all times and shall be furnished such information and assistance by the contractor as may be required to make a complete and detailed inspection.

SECTION 14 : REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

14.1 Any defective work whether the result of poor workmanship of defective materials, damages through carelessness, or of other cause, found to exist prior to acceptance of or final payment for the work, shall be removed immediately, replaced by work and materials conforming to the Specification, or shall be remedied otherwise in an acceptable manner.

14.2 Work done contrary to or regardless of the instruct of the Project Manager or C.M. work done beyond the lines shown on the plans or as given, except as therein provided, or extra work correction work done without authority will be considered as unauthorized and will not be paid for. All correction work of any description and removal and replacement of unsatisfactory materials shall be done at the contractor's expense.

SECTION 15 : FINAL INSPECTION

15.1 Upon due notice from the Contractor of presumptive completion of the entire project, the Project Manager or Construction Manager shall make a semi final inspection, and if all construction contemplated by the contract is found completed to his satisfaction, such inspection shall constitute final acceptance and the contractor shall be notified of such acceptance in writing ten (10) days or as soon as thereafter as practicable.

15.2 If, however, at any semi-final inspection, any work in whole or in part is found unsatisfactory, the Project Manager or Construction Manager. shall give the contractor instruct which he shall forthwith comply with and execute. Another inspection shall be made which shall constitute the final inspection if the work has been found complete & satisfactorily implemented.

SECTION 16 : SUPERINTENDENCE AND SUPERVISION

16.1 The Contractor shall assign a competent Project Engineer and necessary assistants such as Architectural Draftsman, Engineers and Safety Engineer, satisfactory to the Construction Manager and Project Technical Group. The Superintendent shall represent the Contractor at his absence and all direct given to him by the construction shall be as binding as if given to the Contractor.

SECTION 17 : AS-BUILT DRAWINGS

17.1 The Contractor shall maintain at the jobsite two sets of full sized contract drawings showing any deviation which have been made from the contract drawings, including buried or concealed construction and utility features which are revealed during the course of construction special attention shall be given to recording the horizontal and vertical location of all buried utilities that differ from the contract drawings. These drawings shall be available for review by the Project Manager/Construction Manager (CM) at all times. Upon completion of the work the marked 5 sets of prints and one set of reproducible as-built drawings on Mylar or sepia prints shall be delivered to the Project Manager. Requests for partial payments will not be approved if the marked prints are delivered to the Project Manager/Construction Manager.

SECTION 18 : UAP DOCUMENT 301 / OTHER CONDITION

18.1 All applicable articles and clauses of the general condition, which are not in conflict with the condition herein stated, shall form part of this document.

18.2 OTHER CONDITION

18.2.1 Coordinate with the Architect thru the construction manager for any discrepancies found in all drawings and specification before execution of work.

18.2.2 Coordinate with other trades to avoid conflict prior for final implementation of work.

18.2.3 Other materials not mentioned in all construction documents (drawings and specification) but are necessary for the proper completion of the work must be furnished and executed by the contractor without entailing any additional cost involved.

18.2.4 Verify actual condition and dimension in the field of work and fit detail accordingly. Submit shop drawings for Architects final approval prior for final execution and implementation of the work.

SAFETY, SANITATION AND SECURITY REQUIREMENTS

SECTION 1 : CONTRACTOR'S ACCIDENT PREVENTION PLAN FORMAT

1.1 The following guidance is provided for the preparation of contractor accident prevention plans. The accident prevention plan needs to address the following:

A. Administrative Section

1. Administrative responsibilities for affecting the Accident Prevention Plan. (Identification and accountability of Contractor's Safety Engineer Responsible for accident prevention and enforcement of condition stipulated in this section).
2. Local requirements, if any, which must be complied with: i.e., noise control, traffic problems, etc.
3. Plans for layout of temporary construction buildings and facilities.
4. Plans for initial indoctrination, continued safety education, and training for the Contractor's employees.
5. Plans for traffic control and marking of hazards to cover haul roads, street intersect, utilities, restricted areas, etc.
6. Plans for maintaining continued job cleanup, safe access and egress.
7. Plans for fire protection and dealing with emergencies (ambulance service, fires, etc.).
8. Plans for inspection of the jobsite by competent persons including reports to be kept, results of the inspect, and corrective act taken.
9. Procedures to be used for accident investigation.
10. Details of fall protection systems
11. Procedure for security of site, personnel and materials.

B. Accident Reporting

1. All accidents which occur shall be investigated and reported in accordance with requirements of agency having jurisdiction.

C. Prohibit

1. Smoking shall not be allowed within work and storage premises.
2. Drinking of liquor of any kind shall not be allowed within the site.

3. Gambling of any type is strictly prohibited within the site.
4. Carrying of firearms, knives, blades, and other such instruments is strictly prohibited within the site.

SECTION 2 : SANITATION

2.1 Water

1. Adequate supply of potable drinking water shall be supplied to workers.
2. Drinking water shall be dispensed by means which prevents contamination.

2.2 Toilets

1. Toilets shall be so construed that the occupants shall be protected against weather and falling objects.
2. Adequate ventilation and lighting shall be provided and all windows and vents screened.
3. Provision for routinely servicing and cleaning all toilets and disposing of the sewage shall be established before placing toilet facilities into operation. The method of sewage disposal and location selected shall be in accordance with local health regulation.

2.3 Washing Facilities

1. Washing facilities shall be provided to maintain healthful and sanitary condition.
2. Each washing facility shall be maintained in a sanitary condition.

2.4 Food Service

1. Mess facilities shall be operated and maintained in compliance with the health and sanitation authority.
2. An adequate number of sturdy waste receptacles shall be provided in the food service area. They shall be emptied at least daily and maintained in a sanitary condition. They shall be provided with solid tight fitting covers and plastic bag garbage liner.
3. All food service operation shall be carried out in a sanitary manner, kept uncontaminated throughout the storage, preparation, and serving process.
4. Workers shall not be allowed to eat within the project work area. Contractor shall provide a separate area for eating facilities.

2.5 Mosquito and Pest Control

1. Regular mosquito fogging, fumigation and extermination of cockroaches, flies and rodents for workers sleeping quarters and work area shall be conducted once a month during the construction duration.

SECTION 3 : MEDICAL AND FIRST AID REQUIREMENTS

3.1 General

1. Prior to start of work, arrangements shall be made for medical facilities, ambulance service and medical personnel to be available for prompt attention to the injured and consultation on occupational health.
2. Communication and transportation to effectively care for injured workers shall be provided. A properly equipped emergency first aid unit shall be provided during work hours at site.

3. Identification and directional markers shall be provided to readily denote location of first aid stat.
4. When persons are expose to epoxy resins, hydrocarbons, solvents, cement, lime or other dermatitis- producing substances, ointment recommended by the manufacturer for the specific exposure shall be available.
5. First aid station shall be in accordance with the recommendation of a licensed physician.
6. The contents of first aid kits shall be checked by Contractor at least weekly when work is in progress to insure that expended items are replaced.
7. A qualified first aid attendant shall be on duty in the station at all hours when work is in progress.

SECTION 4 : PERSONAL PROTECTION APPAREL AND SAFETY EQUIPMENT

4.1 General

1. Personal protective devices shall be used as required.
2. Hard-hats and shoes shall be worn by all persons who are engaged in work.
3. Welding operation shall require goggles, face masks, shields, or helmets, suitable to the type of work.
4. Drop lines, lanyards and lifelines independently attached or attended, shall be used when performing such work on hazardous areas or other unguarded location.
5. Uniform: All works shall wear T-shirts, color coded and marked by company name per trade. All workers shall wear I.D.
6. Masks and suitable clothing shall be sworn by persons, engaged in work using toxic or harmful substances or producing irritants such as dust or fumes. Gloves shall be provided to workers whose nature of work calls for such protection.

4.2 Protective Headgear

1.1 All persons working on or visiting non-administrative activities (i.e., construction, operation, and maintenance) shall be provided with and required to wear protective headgear.

SECTION 5 : LIGHTING

5.1 General

5.1.1 Construction site offices, stairways, passageways, construction roads and working areas shall be lighted while work is in progress by at least the following minimum light intensities:

LIGHTING INTENSITY

FACILITY NAME OF FUNCTION		FOOT-CANDLES
Accessways – General Indoor	-	5
Accessways – General Outdoor	-	3
Administrative Areas (Offices, Conference Rooms)	-	50
Construction Areas		
- Indoor – General	-	10
- Outdoor – General	-	3
- Concrete Placement Operation	-	10
- Excavation and Fill Areas	-	5
Exitways, Walkways, Ladders, Stairways	-	10
Mechanical and Electrical Equipment Rooms	-	10
First Aid Stat	-	30
Toilets and Wash Rooms	-	10
General Underground Work Areas	-	10

5.1.1 All stairways, floor openings, pits, shafts, excavation, etc. into which people can accidentally fall shall be adequately lighted. Lighting shall be connected to emergency genset. All stairs within the basement construction shall be provided with emergency lights of nickel cadmium rechargeable battery type.

SECTION 6 : MATERIAL HANDLING, STORAGE AND DISPOSAL

6.1 General

6.1.1 All material in bags, containers, bundles, or stored in tiers with loading to be confined within the structure design shall be stacked, limited in height so that it is stable and secured against sliding or collapse.

6.1.2 Access ways shall be kept clear.

6.1.3 Flammable and combustible liquids in a storage building shall be in a NO SMOKING area and separated from combustible construction.

6.1.4 Unauthorized persons shall be prohibited from entering storage areas. All persons shall be in a safe position while materials are being loaded or unloaded.

6.1.5 Materials will not be moved over or suspended above personnel unless positive precaution have been taken to protect the personnel from falling objects.

6.1.6 Persons shall not work or pass under elevation work areas unless protected by overhead protection.

6.1.7 Where the movement of materials may be hazardous to persons, taglines or other devices shall be used to control the loads being handled by hoisting equipment. They shall be nonconductive when used near energized lines.

6.2 Lumber

6.2.1 Lumber shall be stacked to be stable and self-supporting in dry areas.

6.2.2 Reusable lumber shall have all nails withdrawn before it is stacked for storage.

6.3 Floor, Walls and Partition Blocks

6.3.1 Blocks shall be stacked in tiers on solid, level surfaces.

6.3.2 When masonry blocks are stacked higher than 6 feet, the stack shall be tapered back one-half block per tier above the 6-foot level.

6.4 Reinforcing, Sheet and Structural Steel

6.4.1 Reinforcing steel shall be stored in orderly piles away from walkways and roadways.

6.4.2 Structural steel shall be securely piled to prevent members sliding off or the pile toppling over.

6.5 Cylindrical Material

6.5.1 Structural steel, poles, pipe, bar stock, and other cylindrical materials, unless racked shall be stacked and blocked so as to prevent spreading or tilting.

6.6 Sand, Gravel and Crush Stone Operation

6.6.1 Standards for the safe sloping and control of pit walls shall be established and followed by the operation.

6.6.2 Loose, unconsolidated material shall be stripped for a safety distance (at least l0 feet) from the top of pit or quarry walls, and shall be sloped to the angle of repose.

6.6.3 Persons shall not work near or under dangerous banks. Overhanging banks shall be removed and unsafe ground condition shall be corrected, or the areas shall be barricaded and posted.

6.6.4 Baffle boards, screens, cribbing, or other suitable barriers should be provided where movement of material into cuts constitutes a safety hazard.

6.7 Housekeeping

6.7.1 All stairways, passageways, gangways, and accessways shall be kept free of materials, supplies and obstruct at all times.

6.7.2 Loose or light material shall not be stored or left on floors that are not closed in, unless it is safely secured.

6.7.3 Tools, materials, extension cords, hose, or debris shall not cause tripping or other hazard.

6.7.4 Tools, materials, and equipment subject to displacement or falling shall be adequately secured.

6.7.5 Empty bags having contained lime, cement, and other dust-producing material shall be removed periodically as specified by the designated authority.

6.7.6 Protruding nails in scrap boards, planks and timbers shall be removed, hammered in, or bent over flush with the wood unless placed in containers or trucks for removal.

6.7.7 Walkways, runways and sideways shall be kept clear of excavation material or other obstruct and no sideways shall be undermined unless shored to carry a minimum live load of one hundred and twenty-five (l25) pounds per square foot (6l0.3 kg/sm).

6.7.8 Form and scrap lumber and debris shall be cleared from work areas, passageways and stairs in and around building storage yards and other structures.

6.7.9 All storage and construction sites shall be kept free from the accumulation of combustible materials. Regular procedure shall be established for cleanup of the area as specified by the designated authority.

6.7.10 Rubbish or combustible material shall be kept from areas where flammable and combustible liquids are stored, handled, or processed.

6.7.11 Accumulation of flammable and combustible liquids on floors, walls, etc. is prohibited. All spills of flammable and combustible liquids shall be cleaned up immediately.

6.7.12 Contractors shall provide sufficient personnel and equipment to insure compliance with all housekeeping requirements.

6.7.13 Contractors will inspect the work area daily for adequate housekeeping and record unsatisfactory findings on the daily inspection report.

6.8 Waste Material Disposal

6.8.1 Scrap lumber shall be placed in piles or waste material and rubbish shall be placed in containers.

6.8.2 Chutes for debris shall be enclosed except for openings equipped with closures at or about floor level for the insertion of materials. Openings shall not exceed 48 inches (l.22m) in height measured along the wall of the chute. Openings at all stories below the top floor shall be kept closed when not in use.

6.8.3 Whenever materials are dropped to any point lying outside the exterior walls of the building, an enclosed chute shall be used.

6.8.4 When debris that cannot be handled by chutes is dropped, the area onto which the material is dropped shall be enclosed with barricades not less than 42 inches (l.07m) high and not less than 6 feet (l.83m)back from the projected edge of the opening above. Signs warning of the hazard of falling material shall be posted at each level.

SECTION 7 : FIRE PREVENTION

7.1 Fire Protection

7.1.1 Recommendation of NFPA shall be complied within situation not covered in this Section. Where local building codes are established, the most stringent requirements shall apply.

7.1.2 Fires and open flame devices shall not be left unattended.

7.1.3 Smoking shall be prohibited in all areas where flammable combustible, or similar hazardous materials are stored, except in those location specifically designated by the authorities. NO SMOKING signs will be posted in all prohibited areas.

7.2 Flammable and Combustible Materials

7.2.1 All storage, handling, or use of flammable and combustible materials shall be under the supervision of qualified persons.

7.2.2 Electrical lighting shall be the only means used for artificial illumination in areas where flammable materials are present. All electrical equipment and installation shall be in accordance with the National Electrical Code for hazardous location.

SECTION 8 : FIRE PROTECTION

8.1 First Aid Fire Protection

8.1.1 Portable fire extinguishers shall be provided where needed and inspected and maintained in accordance with local Fire Department.

8.1.2 Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition. In accordance with National Fire Protection Association Standard No.l0.

8.1.3 Fire barrels and buckets shall be painted red, marked ”For Fire Only". Barrels shall be kept filled at all times.

8.2 Water Supply and Distribution

8.2.1 Water supply and distribution facilities for firefighting shall be provided and maintained in accordance with recommendation of National Fire Protection Association.

8.2.2 Vehicles, equipment, materials, and supplies shall not be placed so that access to fire hydrants and other firefighting equipment is obstructed.

8.3 Miscellaneous

8.3.1 When outside help is relied upon for fire protection, a written arrangement shall be made. Standpipe and hydrant connect must be compatible with the equipment of the local fire department.

8.3.2 Emergency Fire, Police and Hospital telephone numbers and reporting instruct shall be conspicuously posted.

SECTION 9 : ROPES, SLINGS, CHAINS AND HOOKS

9.1 General

9.1.1 The use of ropes, slings, and chains shall be in accordance with the safe recommendation of their manufacturer and equipment manufacturer. Rigging equipment shall not be loaded in excess of its recommended safe working load as prescribed in latest edition of ANSI B 30.9, Appendix C, and the table in l7.F.0l.

9.1.2 All hooks used to support human loads or loads that pass over personnel shall be closed.

9.1.3 The use of open hooks is prohibited in rigging to lift any load where there is danger of relieving the tension on the hook due to the load or hook catching or fouling.

9.1.4 All equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to insure that it is safe. Defective equipment shall be removed from service.

SECTION 10 : MACHINERY AND MECHANIZED EQUIPMENT

10.1 General

10.1.1 Contractor shall designate a competent person to be responsible for the inspection of all machinery and equipment daily and during use to make sure it is in safe operating condition. Tests shall be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operation systems are in proper working condition.

10.1.2 Machinery or equipment shall not be operation in a manner that will endanger persons or property nor shall the safe operation speeds or loads be exceeded.

10.1.3 All mobile equipment and the area in which they are operational shall be adequately illuminated while work is in progress.

SECTION 11 : RAMPS. RUNWAYS, PLATFORMS, SCAFFOLDS AND TOWERS

11.1 General

11.1.1 Load-bearing structures shall be designed, constructed and maintained in accordance with safety standards and requirement approved by the designated authority. If these structures, including such accessories as braces, brackets, trusses, screw legs and ladders, are damaged or weakened from any cause they shall be repaired or replaced immediately.

11.1.2 Planning shall be supported or braced to prevent excessive spring or deflection and secured and supported to prevent tipping or displacement.

11.1.3 Employees on ramps, scaffolds, roofs, floors, or other working surfaces from which they may fall 6 feet (l.8m) or more or working over dangerous operation shall be protected by guardrails with intermediate rail and toe board, catch platforms, temporary floors, safety nets, safety belts, or equivalent.

11.1.4 Overhead protection shall be provided for area exposed to hazards from falling objects.

11.2 Standard Railing

11.2.1 A standard railing shall consist of top rail, intermediate rail, toe board, and posts, and shall have a vertical height of approximately 42 inches(l.07m) from upper surface of top rail to floor, platform, runaway, or ramp level. The top rail shall be smooth-surfaced throughout the length of the railing. The intermediate rail shall be halfway between the top rail and the floor, platform, runaway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard.

11.2.2 Railings receiving heavy stresses from employees trucking or handling materials shall be provided additional strength by the use of heavier stock, closer spacing of posts, bracing, or by other means.

11.2.3 A stair railing shall be of construction similar to a standard guardrail but the vertical height shall be not more than 34 inches (86.36 cm) nor less that 30 inches (76.2 cm)

from upper surface of top rail to surface of tread in line with face of riser at forward edge of tread.

SECTION 12 : EXCAVATION

12.1 General

12.1.1 The sides of all excavation in which employees are exposed to danger from moving ground shall be guarded by a shoring system, sloping of ground, or other equivalent means. All slopes except for solid rock, hard shale, or cemented sand and gravel shall be excavated to at least the angle of repose. The angle of repose shall be flattened when an excavation has water condition, silty materials, loose boulders, and areas where erosion and slide planes appear.

12.1.2 Diversion ditches, dikes, polyethylene sheets, or other means shall be used to prevent surface water entering an excavation and to provide drainage of the area adjacent to the excavation.

12.1.3 Boulders, stumps, or other materials that may slide or roll into the excavation shall be removed or made safe.

12.1.4 Guardrails, fences, or barricades and warning lights or other illumination maintained from sunset to sunup shall be placed at all excavation which are adjacent to paths, walkways, sidewalks, driveways, and other pedestrian or vehicle thoroughfares.

12.1.5 Walkways or bridges with guardrails shall be provided where people or equipment are required or permitted to cross over excavation.

SECTION 13 : WORK IN CONFINED SPACES

13.1 General

13.1.1 Prior to entry into confined or enclosed spaces, a positive procedure to eliminate or control the hazards shall be established.

13.1.2 Enclosed spaces shall include water tanks, pits, vaults, shafts, or other spaces, or any place with limited ventilation.

13.1.3 Hazards considered shall include toxic material and vapors, flammable and vapors, asphyxiation, and lack of oxygen.

13.1.4 Mechanical exhaust ventilation sufficient to maintain a healthy working atmosphere shall be provided.

13.1.5 Persons working in confined or enclosed spaces shall have a safety harness and life line with an attendant if the atmosphere has oxygen deficiency or contamination sufficient to require respiratory protection. The attendant shall be assigned no other duties. A signal system shall be established.

SECTION 14 : FLOOR AND WALL OPENINGS

14.1 General

14.1.1 All floor and roof holes, such as elevation or pits, sump pits, shafts, stairs, ramps another opening into which persons can accidentally fall shall be guarded by a securely anchored railing with intermediate rail, and toeboard.

TEMPORARY FACILITIES

SECTION 1 : GENERAL

1.1 Summary

1.1.1 This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.

1.1.2 Temporary utilities required include but are not limited to:

1. Water service and distribution.
2. Temporary electric power and light.

1.1.3 Temporary construction and support facilities required include but are not limited to:

1. Field offices and storage sheds.
2. Temporary roads and paving.
3. Sanitary facilities, including drinking water.
4. Dewatering facilities and drains.
5. Temporary enclosures.
6. Hoists and temporary elevation or use
7. Temporary Project identification signs and bulletin boards.
8. Waste disposal services.
9. Rodent and pest control.
10. Construction aids and miscellaneous services and facilities.

1.1.4 Security and protection facilities required include but are not limited to:

1. Temporary fire protection.
2. Barricades, warning signs, lights.
3. Sidewalk bridge or enclosure fence for the site.
4. Environmental protection.

1.2 Submittals

1.2.1 Temporary Utilities: Submit a schedule indicating implementation and termination of each temporary utility within 15 days of the date established for commencement of the work.

1.3 Quality Assurance

1.3.1 Regulation: Comply with industry standards and applicable laws and regulation if authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulation.
3. Utility company regulation.
4. Police, Fire Department and Rescue Squad rules.
5. Environmental protection regulation.

1.3.2 Standards: Comply with NFPA Code 24l, "Building Construction and Demolition Operation,"ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Refer to "Guidelines for Bid Condition for "Temporary Job Utilities and Services," prepared jointly by AGC and ASC, for industry recommendation.

1.3.3 Electrical Services: Comply with NEMA, NECA and UL standards and regulation for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

1.3.4 Inspect : Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certificate and permits.

1.4 Project Condition

1.4.1 Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.

1.4.2 Condition of Use: Keep temporary services and facilities clean and neat in appearance. Operation in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary condition, or public nuisances to develop or persist on the site.

SECTION 2 : PRODUCTS

2.1 Materials

2.1.1 General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

2.1.2 Lumber and Plywood: Comply with requirements as per manufacturer's standards.

2.1.3 Roofing Materials: Provide pre-formed metal roofing on roofs of job built temporary offices, shops and sheds, as approved by the Project Manager.

2.1.4 Paint: Comply with requirements based on manufacturer's standards.

1. For job-built temporary offices, shops, sheds, fences and other exposed lumber and plywood, provide exterior grade acrylic-latex emulsion over exterior primer.
2. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.
3. For interior walls of temporary offices, provide two coats interior latex flat wall paint.

2.1.5 Tarpaulins: Provide waterproof. Fire-resistant, UL labelled tarpaulins with flame-spread rating of l5 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retarding tarpaulins.

2.1.6 Water: Provide potable water approved by local health authorities.

2.1.7 Open-Mesh Fencing : Provide ll-gauge, galvanized 50mm, chain link fabric fencing l800 mm high with galvanized barbed wire top strand and galvanized steel pipe posts, 38mm I.D. for line posts and 64mm I.D. for corner posts, when required by the Project Manager.

2.2 EQUIPMENT

2.2.1 General: Provide new equipment; if acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

2.2.2 Water Hoses: Provide 200mm heavy-duty, abrasion-resistant, flexible rubber hoses 30000 mm long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

2.2.3 Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

2.2.4 Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress

2.2.5 Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

2.2.6 Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes. Provide heated and air-conditioned units on foundation adequate for normal loading.

2.2.7 Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar non-absorbent material.

2.2.8 First aid Supplies : Comply with governing regulation.

2.2.9 Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other location provide hand-carried, portable, UL-rated, class "ABC dry chemical extinguishers or a combination of extinguishers of NFPA recommended classes for the exposures.

2.2.10 Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

SECTION 3 : EXECUTION

3.1 Installation

3.1.1 Use qualified personnel for installation of temporary facilities. Location facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocation and modify facilities as required.

3.1.2 Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

3.2 Temporary Utility Installation

3.2.1 General : Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendation.

1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connect for temporary services. Provide adequate capacity at each stage of construct. Prior to temporary utility availability, provide trucked-in services.
2. Obtain easements to bring temporary utilities to the site, where the Owner's easements cannot be used for that purpose.
3. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Architect, and will not be accepted as a basis of claims for a change order.

3.2.2 Water Service: Install water service and distribution piping of sizes and pressures adequate for construct until permanent water service is in use.

1. Sterilization : Sterilize temporary water piping prior to use.

3.2.3 Temporary Electric Power Services: Provide weather-proof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear.

1. Except where overhead service must be used, install electric power service underground.
2. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be non-metallic sheathed cable where overhead and exposed for surveillance.

3.2.4 Temporary Lighting : Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operation temporary lighting that will fulfil security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operation and traffic.

3.2.5 Sewers and Drainage: If sewers are available, provide temporary connect to remove effluent that can be discharged lawfully. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds and similar facilities. If neither sewers nor drainage facilities can be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off the site in a lawful manner.

1. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways discharge.
2. Connect temporary sewers to the municipal system as directed by the sewer department officials.
3. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. Following heavy use, restore normal condition promptly.

3.2.6 Provide earthen embankments and similar barriers in and around excavation and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 Temporary Construction and Support Facilities Installation

3.3.1 Location field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.

1. Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities under condition acceptable to the Owner.

3.3.2 Provide incombustible construction for offices, shops and sheds location within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 24l.

3.3.3 Field Offices : Provide weather tight temporary offices of sufficient size to accommodate required office personnel at the Project site. Keep the office clean and orderly for use for small progress meetings. Furnish and equip offices as follows:

1. Furnish with a desk and chairs, a 4-drawer file cabinet, plan table and plan rack and a 6-shelf bookcase.
2. Equip with a water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.

3.3.4 Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved including temporary utility service. Sheds may be open shelters or fully enclosed spaces within the building or elsewhere on the site.

3.3.5 Temporary Paving: Construct and maintain temporary roads and paving to adequately support the indicated loading and to withstand exposure to traffic during the construction period. Location temporary paving for roads, storage areas and parking where the same permanent facilities will be location. Review proposed modification to permanent paving with the Architect.

1. Paving: Comply with manufacturer's standards.
2. Coordinate temporary paving development with sub grade grading compaction, installation and stabilization of sub base, and installation of base and finish courses of permanent paving.

3. Install temporary paving to minimize the need to rework the installation and to result in permanent roads and paved areas that are without damage or deterioration when occupied by the Owner.
4. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with weather condition to avoid unsatisfactory results.
5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration and supervision.

3.3.6 Sanitary Facilities include temporary toilets, wash facilities and drinking water fixtures. Comply with regulation and health codes for the type, number, location operation and maintenance of fixtures and facilities. Install where facilities will best service the Project's needs.

1. Provide toilet tissue, paper towels, paper cups and similar disposable materials for each facility. Provide covered waste containers for used material.
2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted.

3.3.7 Wash-Facilities: Install wash facilities supplied with potable water at convenient location for personnel involved in handling materials that require wash-up for a healthy and sanitary condition. Dispose of drainage properly. Supply cleaning compounds appropriate for each condition.

1. Provide safety shower, eye-wash fountains and similar facilities for convenience, safety and sanitary of personnel.

3.3.8 Drinking Water Fixtures: Provide drinking water fountains where indicated, including paper supply.

3.3.9 Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.

1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7 to l3 deg C).

3.3.10 Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operation not directly associated with construction activities dewatering requirements of applicable Division-2 Sect. Where feasible, utilize the same facilities. Maintain the site, excavation and construction free of water.

3.3.11 Temporary Enclosures: Provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operation and similar activities.

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous condition and effects.
2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 200 square meters or less with plywood or similar materials.
3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.

4. Where temporary wood or plywood enclosure exceeds 9.00 square meters in area, use UL-labeled fire-retardant treated material for framing and main sheathing.

3.3.12 Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered “tools and equipment" and not temporary facilities.

3.3.13 Project Identification& Temporary Signs : Prepare project identification and other signs of the size indicated; install signs where indicated to inform the public and persons seeking entrance to the project. Support on posts or framing of preservative treated wood or steel. Do not permit installation of unauthorized signs.

1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.
2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

3.3.14 Temporary Exterior Lighting: Install exterior yard and sign lights so that signs are visible when work is being performed.

3.3.15 Collection & Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 24l for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.

3.3.16 Rodent & Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practice to minimize attraction and harboring of rodents, roaches and other pests. Employ this service to perform extermination and control procedures at regular intervals so the Project will be relatively free of pests and their residues at Substantial Completion. Perform control operation in a lawful manner using environmentally safe materials.

3.3.17 Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 Security and Protection Facilities Installation

3.4.1 Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until substantial completion, or longer as requested by the Architect.

3.4.2 Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA l0 "Standard for Portable Fire Extinguishers" and NFPA 24l "Standard for Safeguarding Construction, Alteration and Demolition Operation".

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe location.
3. Maintain unobstructed access to fire extinguishers, fire hydrants temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
4. Provide supervision of welding operation, combustion type temporary heating units, and similar sources of fire ignition.

3.4.3 Permanent Fire Protection: At the earliest feasible date in each area of the project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.

3.4.4 Barricades, Warning Signs & Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

3.4.5 Enclosure Fence: When excavation begins, install an enclosure fence with lockable entrance gates. Location where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operation. Install in a manner that will prevent people, dogs and other animals from easily entering the site, except by the entrance gates.

3.4.6 Covered Walkway : Erect a structurally adequate protective covered walkway for a passage of persons along the adjacent public street. Coordinate with entrance gates, other facilities and obstruct. Comply with regulation of authorities having jurisdiction.

1. Construct using scaffold or shoring framing, waterproofed wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well drained walkways and similar provision for protection and safe passage. Extend the back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner and Architect.

3.4.7 Security Enclosure & Lock-up: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violation of security.

1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lock-up. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

3.4.8 Environmental Protection: Provide protection, operation temporary facilities and conduct construction in ways and by methods that comply with environmental regulation, and minimize the possibility that air, waterways and subsoil might be contaminated or diluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 Operation, Termination and Removal

3.5.1 Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

3.5.2 Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24 hour day basis where required to achieve indicated results and to avoid possibility of damage.
2. Protection: freezing. Maintain markers for underground lines. Protect from damage during excavation operation.

3.5.3 Termination & Removal: Unless the Architect requests that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than substantial completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.
2. Remove temporary paving that is not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the areas. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances which might impair growth of plant materials or lawns. Repair or replace street paving, curbs and sidewalks at the temporary entrances, as required by the governing authority.
3. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period, including but not limited to :
    a. Replace air filters and clean inside of ductwork and housings.
    b. Replace significantly worn parts and parts that have been subject to unusual operating condition.
    c. Replace lamps that are burned out noticeably dimmed by substantial hours of use.

FINAL CLEANING

SECTION 1 : GENERAL

1.1 Summary

1.1.1 This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.

1.2 Environmental Requirements: Conduct cleaning and waste disposal operation in with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulation.

1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in or sanitary drains.
2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

SECTION 2 : PRODUCTS

2.1 Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that might damage finished surfaces.

SECTION 3: EXECUTION

3.1 Progress Cleaning

3.1.1 Retain all stored items in an orderly arrangement allowing maximum access, not impeding drainage or traffic, and providing the required protection of materials.

3.1.2 Do not allow the accumulation of scrap, debris, waste materials and other items not required for construction of this work.

3.1.3 At least twice each week, and more often if necessary, completely removes all scrap, debris, waste material from the jobsite.

3.1.4 Provide adequate storage for all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the ecology.

3.1.5 Weekly, and more if necessary, inspect all arrangement of materials stored on the site; restack, tidy, or otherwise service all arrangements to meet the requirements of subparagraph "1" above.

3.1.6 Weekly, and more often if necessary, sweep all areas clean, "Clean" for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom.

3.1.7 As required preparatory to installation of succeeding materials, clean the structures or pertinent port thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.

3.1.8 Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) at all times while work is being performed in the space in which finish materials have been installed. "Clean", for the purpose of this subparagraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Project Manager, may be injurious to the finish floor material.

3.2 Final Cleaning

3.2.1 General: Provide final cleaning operation when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instruction.

1. Comply the following cleaning operation before requesting inspection for Certification of Substantial Completion for the entire project or a portion of the project.

3.2.2 Complete the following cleaning operation before requesting inspection for of Substantial Completion for the entire project or a portion of the project.

1. Clean the Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
2. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural

weathering of exterior surfaces. Restore reflective surfaces to their original condition.

3. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
4. Broom clean concrete floors in unoccupied spaces.
5. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
6. Remove labels that are not permanent labels.
7. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that shown evidence of repair or restoration. Do not paint over “UL" and similar labels, including mechanical and electrical name plates.
8. Wipe surfaces of mechanical and electrical equipment, elevation or equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.
9. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
10. Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned out bulbs, and defective and noisy starters in fluorescent and mercury vapor fixtures.
11. Leave the Project clean and ready for occupancy.

3.2.3 Pest Control: Engage an experienced licensed exterminator to make a final inspection, and rid the Project of rodents, insects, and other pests. Comply with regulation of local authorities.

3.2.4 Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installation during the remainder of the construction period.

3.2.5 Compliance: Comply with governing regulation and safety standards for cleaning operation. Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remain after completion of associated construction have become the Owner's property, dispose of these materials as directed.
2. Except as otherwise specifically provided, "clean", for the purpose of this Article, shall be interpreted as meaning the level of cleanliness generally provided by skilled cleaners using commercial quality building maintenance equipment and materials.

3.3 Cleaning During Owner’s Occupancy

3.3.1 Should the Owner requires occupancy of the work or any portion thereof prior to its completion by the Contractor and acceptance by the Owner responsibilities for interim and final cleaning of the occupied spaces shall be as determined by the Project Manager in accordance with the General Condition of the Contract.

SECTION 1 : WALL WORKS

1.1 Contractor to construct, in Ground and Mezzanine Floors, to replace existing damaged double walling drywall partition using 4.5 mm thick fiber cement board on both faces with 0.6mm thick x 100mm x 50mm metal studs on 100mm x 50mm x 0.6mm thick metal tracks. Metal stud framing shall be 600mm on center both ways (horizontal and vertical framing). Contractor to consider necessary consumables and accessories required for drywall construction.

1.2 The contractor to supply and install 10mm thick x 600mm x 600mm granite wall tiles (polished) for all existing toilets. Contractor to remove existing tiles on walls and install new tiles. New wall tiles shall be installed as per manufacturer's standard. Contractor to submit sample for approval. Contractor to apply non-fading, crack-free, antibacterial tile grout, if necessary.

SECTION 2 : WALL FINISHES

2.1 If necessary, for all existing interior walls and column surfaces: contractor shall clean and plaster all damaged surfaces when necessary using skim coat, following the manufacturer's standard, prior to application of one (1) coat flat latex paint primer and two (2) coats semi-gloss latex paint. Contractor to submit paint swatches for approval.

2.2 Existing walls subject for repainting. Contractor to shall clean and plaster all damaged surfaces when necessary using skim coat, following the manufacturer's standard, prior to application of3 (three) coats self-priming flexible elastomeric paint coating. Contractor to submit sample for approval.

2.3 Fiber cement board drywall drop wall painting. Contractor to apply gauze at all joints, putty and sand to cover connect and surface imperfect prior to final application of one (1) coat acrylic latex flat paint primer and apply two (2) coats acrylic latex semi-gloss top coat paint with as per painting manufacturer's specification. Contractor to submit sample for approval.

2.4 Structural Steel framing painting works on steel trusses and accessories. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat as per painting manufacturer's standards specification. Contractor to submit swatches for approval.

2.5 All exposed tubular steel structural members shall be enamel baked painted finish as per painting standards. Contractor to submit sample swatches for approval.

SECTION 3 : FLOOR FINISHES

3.1 For Wushu area with rubberized painted cement floor finish, the contractor to shall apply three (3) new coats of rubberized paint.

3.2 Contractor to retain, repair and clean existing washout pebble floor finishes on 2nd, 3rd, 4th corridors and service stairs.

3.3 Office areas in ground and mezzanine floors shall be installed with rubberized carpet tiles 500mm x 500mm.All existing carpets shall be replaced.

3.4 Vinyl tiles for 5th floor hallway shall be 300mm x 300mm x 1.5mm thick homogenous and resilient type. Contractor to apply self-levelling cement topping at areas subject for vinyl tiles installation as per manufacturer's standard specification.

3.5 For ground floor lobby and hallway, contractor to supply, deliver and install 600mm x 600mm x 10mm non-skid, outdoor granite tiles with heavy-duty tile adhesive and tile grout between joints. Verify architectural plans for actual location and submit sample for approval.

3.6 Contractor to supply, deliver and install 10mm x 600mm x 600mm granite unpolished tiles for toilet flooring. Contractor to use tile adhesive and apply tile grout at joints, submit tile sample and tile grout swatches for approval.

SECTION 4 : CEILING FINISHES

4.1 For all toilets, hallways, athlete's quarters, coach's quarters and corridors, ceiling shall be PVC ceiling panel 10mm thick x 200mm width. Existing ceiling joist shall be repaired if necessary.

4.2 Existing bottom of slab subject for repainting. Contractor to clean and plaster all damaged surfaces when necessary using skimcoat, following the manufacturer's standard, prior to application of 3 (three) coats self-priming flexible elastomeric paint coating. Contractor to submit sample swatches for approval.

SECTION 5 : INDOOR LIGHTING FIXTURES

5.1 Contractor to supply, deliver and install lighting fixture.

- Troffer type luminaire
- With aluminum reflector design & multi-lined satin finished aluminum louvres
- Zinc phosphated steel sheet housing
- White powder coat paint finish
- Mirror finish anodized aluminum reflector
- Available in surfaced & recessed installation
- LED 2x18w
- IP Rating 20

Contractor to submit sample for approval.

SECTION 6 : OUTDOOR LIGHTING FIXTURES

6.1 Flood light. Supply, delivery and installation of 20 watts LED daylight flood light with aluminum and tempered glass casing and high temperature resistant silicone ring. Contractor to submit sample and shop drawing of mounting for approval.

SECTION 7 : DOORS AND WINDOWS

7.1 Glass doors (ground floor main lobby)

a. Glass panel shall be 12mm thick frameless frosted glass.

b. Door handles. 32mm diameter x 900mm height H-type stainless steel handle in satin finish complete with necessary accessories as per manufacturer's standard. Contractor to submit sample for approval.

7.2 Metal doors with louvers Electrical Room @ ground floor

a. Door panel. Gauge 20 B.I. bended sheet panel, with 600mm x 600mm GA 18 metal louver with u-shaped metal frame. Contractor to Contractor to submit shop drawing of louver design prior to fabrication.
b. Door jamb. Gauge 16 50mm x 150mm standard steel door jamb.
c. Hardware.
    a. Hinges – 100mmH heavy duty weld-on rolled steel loose-pin door hinges, install 4 sets per door leaf. Submit sample for approval.
    b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
d. Accessories.
    a. Door closer. Supply, deliver and install adjustable surface mounted door closer with snap on standard arm for 80kg weight door, in satin nickel finish. Contractor to submit sample for approval.
    b. Deadbolt – single cylinder standard duty deadbolt with thumb turn in satin nickel finish. Contractor to submit sample for approval.
    c. Flush bolt. Supply, deliver and install manual flush bolt in stainless steel finish for 1 door panel for all steel double doors.
    d. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
    e. Finish. Contractor to apply one (1) coat epoxy paint primer and two (2) coats epoxy top coat as per painting manufacturer's standard specification. Contractor to submit swatches for approval.

7.3 Wood Panel Doors (for all existing all wooden panel doors)

a. Panel door. 44mm thick kiln dried door panels with 35mm x 114 mm stiles and rails. Contractor to use kiln dried hardwood material for all wood doors.
b. Door jamb. 50mm x 100mm kiln dried solid wood door jamb.
c. Hardware.
    a. Hinges. Use 90mm x 90mm x 4mm loose pin butt hinge. Contractor to provide 4 per door leaf for 2100mm height door leaves and 5 sets per door panel for 2400mm height door leaves.
    b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.
d. Accessories.
    a. Door closer. Supply, deliver and concealed door closer (overhead with slide channel and hold open) for 50kg in satin nickel finish. Contractor to submit sample for approval.
    b. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.
e. Finish. Contractor to apply water based wood stain color with clear gloss top coat lacquer; contractor to follow manufacturer's standards for wood stain and top coat application. Contractor to submit sample for approval.

7.4 Wood Panel Double Doors (for all existing all wooden panel doors)

a. Panel door. 44mm thick kiln dried door panels with 35mm x 114 mm stiles and rails. Contractor to use kiln dried hardwood material for all wood doors.
b. Door jamb. 50mm x 100mm kiln dried solid wood door jamb.

c. Hardware.

a. Hinges. Use 90mm x 90mm x 4mm loose pin butt hinge. Contractor to provide 4 sets per door lead for 2100mm height door leaves and 5 sets per door panel for 2400mm height door leaves.

b. Lockset – use stainless steel standard-duty lever type entrance door lockset in satin nickel finish. Contractor to submit sample for approval.

d. Accessories.

a. Door closer. Supply, deliver and concealed door closer (overhead with slide channel and hold open) for 50kg in satin nickel finish. Contractor to submit sample for approval.

b. Door stopper. Supply, deliver and install stainless steel zinc alloy base door stopper in satin nickel finish with block rubber per door. Contractor to submit sample for approval.

c. Flush bolt. Supply, delivery and installation of 25mm x 150mm stainless steel door flush bolt complete with necessary accessories. Contractor to install 2 sets (head and foot bolt) for 1 door leaf per double door set. Contractor to submit sample for approval.

e. Finish. Contractor to apply water based wood stain color with clear gloss top coat lacquer; contractor to follow manufacturer's standards for wood stain and top coat application. Contractor to submit sample for approval.

SECTION 8 : GLASS WORKS

8.1 Glass partition on ground floor and mezzanine offices shall be installed with frosted sticker 75% area covered, with viewing. Contractor to submit sample for approval.

8.2 Frosted sticker. Contractor to supply, deliver and install frosted sticker at all glass areas. Contractor to submit sample stickers for approval. Contractor to verify with interior designer frosted sticker design.

8.3 Facial Mirror. Contractor to supply, deliver and install new 6mm thick facial mirror with 6mm thick marine plywood backing, complete with black screw 6 x 1, S-5 tox, and dowcorning non-acetic clear sealant for all toilets. Contractor to submit sample for approval.

8.4 Fixed glass window for on existing fixed glass windows. Supply, delivery and installation of 6mm thick clear glass in anodized aluminum frame. Contractor to submit sample section and powder coating swatches for approval.

8.5 Swing glass window for on existing swing glass windows. Supply, delivery and installation of 6mm thick clear glass in anodized aluminum frame. Contractor to submit sample for approval.

8.6 Additional 60x60 cm awning glass window for on shall be added to the existing fixed windows at the Wushu area for additional ventilation. Supply, delivery and installation of 6mm thick clear glass in anodized aluminum frame, awning type. Contractor to submit sample for approval.

SECTION 9 : MASONRY WORKS

9.1 Lavatory Counter shall be 25mm thick granite slab with 100mm height fascia. Contractor to submit shop drawing and granite swatches for approval.

SECTION 10 : TOILET PARTITION

10.1 Contractor to use 20mm thick compact cement board partition with high scratch and impact resistance. Contractor to submit sample for approval.

10.2 Contractor to use stainless steel indicators, rising hinges brackets, 150mmH adjustable foot, and stopper with hook and toilet paper holder. Contractor to submit samples for approval.

10.3 Contractor to supply, deliver and install aluminum edge and corner profile. Contractor to submit sample section for approval.

SECTION 11 : TOILET FIXTURES

11.1 Water closet – 690mmL x 368mmW x 400mmH elongated, wash down, vitreous china made, and flush valve type, top inlet commercial toilet with s-trap. Toilet seat shall be soft-close with antibacterial properties. Contractor to submit sample or proposal for approval.

11.2 Water closet manual flush valve – Water closet flush valve shall be manual type. Submit sample for approval.

11.3 Bidet spray – shall be in stainless steel finish (0.25kg weight). Contractor to submit sample for approval.

11.4 Urinal – 475mm x 690mm x 370mm vitreous china/porcelain, wall hung, top-inlet urinal. Contractor to submit sample for approval.

11.5 Urinal flush valve – Urinal flush valve shall be manual type. Submit sample for approval.

11.6 Lavatory counter top basin (Common toilets) – 600mm x 500mm x 177mm vitreous china/ porcelain, vessel type wash basin with round overflow ring, complete with all pipes and fittings. Contractor to submit sample for approval.

11.7 Basin faucet (Common toilets) – basin faucet shall be manual type. Contractor to submit sample for approval.

11.8 Shower fixture. Contractor to supply, deliver and install stainless steel wall mounted shower pipe with overhead, hand shower and spout complete with brass fittings and accessories. Contractor to submit sample for approval.

11.9 Shower heater. Contractor to supply, deliver and shower heater, bagwan type. Contractor to submit sample for approval.

SECTION 12 : ROOFING REPAINTING WORKS

12.1 Roofing painting material has the following features:

- Corrosion and Rust proof
- Water & fire proof
- Heat insulation and Cooling
- Eco-friendly and energy saving
- With anti-radiation functions
- Easy to apply
- High-quality non-metallic minerals
- Water & fire proof
- Powder Particles
- Aging resistance
- Top thermal insulation nano insulation, waterproof coatings
- Efficient & durable
- Excellent freeze thaw resistance
- Anti-leakage
- Anti-abrasion
- Anti-permeability

SECTION 13 : WATERPROOFING WORKS

13.1 Existing and new toilets, sink and kitchen areas, and its walls from finish floor line water proofing. Apply three (3) coats of flexibond water proofing on all toilets, sink and laundry area.

ELECTRICAL WORKS TECHNICAL SPECIFICATION

PART 1 - GENERAL (BASIC ELECTRICAL MATERIALS & METHODS)

A. CODES, REGULATION AND STANDARDS

The installation of the equipment shall conform to good engineering practice and in particular, comply with the requirements laid down in the following documents or its equivalent, which are mandatory and modified only by specific agreement.

Philippine Electrical Code	PEC
National Electric Code	NEC
Underwriters' Laboratory	UL
American Standard Association	ASA
National Electrical Manufacturer's Association	NEMA
American Society for Testing Materials	ASTM
Local Utility Power Company	LUPC

In addition to the requirements of the codes and specification referred to above, local regulation and suppliers' specification, if any, shall be followed.

B. DRAWINGS AND SPECIFICATION

The Drawings and Specification are meant to be complementary to each other and what is called for by one shall be called for by both.

Any apparent conflict between the Drawings and Specification and any controversial or unclear points in either shall be referred to the Electrical Engineer in Charge for final decision. On the

plans, keep records showing all deviations occurring during construction. At the completion of the work, said copy of the plans shall be submitted to the PSC for its copy and file.

Upon completion of work as described herein the Contractor shall furnish the Owner, at his own expense, Five (5) copies of the “AS BUILT” plans for future reference and maintenance purposes.

C. CORRELATION OF WORK

The Contractor shall coordinate with the the PSC/Owner to determine how and where his work fits with that of other crafts, after familiarizing himself with the plans and specification. This shall be done at the beginning of construction. Should there be any existing doubt at any point, a ruling shall be secured from the PSC/Owner and shall be given time to inspect the work covering this point and to prepare a detail in the form of Drawings and written instruct as required.

D. PERMITS AND INSPECTION

The contractor shall obtain, at his own expense, all the necessary permits and Certificate of Electrical Inspection from the proper government authorities required both for the performance of his work involved and the operation of the system upon completion of work.

The Contractor shall, at his own expense, reproduce the electrical plans for his work to the necessary scale and complete them with the necessary information and requirements as required by the Government approving authorities concerned in issuing permits and Certificate of Electrical Inspection.

E. EXAMINATION OF PREMISES

Perspective bidder is required to examine the Architectural, Structural, Mechanical and Electrical Plans of the Project, to visit the site and carefully take note all the condition thereat and to have informed himself thoroughly under which the electrical work is to be done. No allowance shall subsequently be made in his behalf because of any error on his part. He will be deemed to have done this before submitting his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained.

F. LAYOUT OF WOR

Electrical System layout including outlets, devices, apparatus, and equipment shall be designed by Contractor and shall be approved by PSC.

The exact routing of conduits, location of outlets, devices, apparatus and equipment shall be governed by structural and architectural condition and limitation.

Consult the PSC/Owner for exact location. This is not to be construed to permit redesigning of system; all outlets are to be interconnected as indicated in the drawings.

Location and install equipment-requiring maintenance where it will be readily accessible. Any equipment location without the approval of the PSC or Owner shall be done at the risk of the Contractor.

G. MATERIALS AND WORKMANSHIP

All materials to be installed shall be unused, brand new and shall conform to the applicable standards.

Only skilled workmen using proper tools and equipment shall be employed during the entire course of installation work. All workmanship shall be of the best quality and all work shall be done in accordance with the best practices of the trade involved.

The same job foremen shall be assigned and maintained at the job site during the entire course of the job.

1.1 SUMMARY

A. This Section includes the following:

1. Safety consideration for outdoor substation.
2. Raceways.
3. Building wire and connectors.
4. Supporting materials for electrical components.
5. Electrical identification.
6. Electric metering components.
7. Concrete equipment bases/pads.
8. Cutting and patching for electrical construction.
9. Touchup painting.

1.2 ACRONYMS & ABBREVIATIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. RSC: Rigid steel conduit.

D. LFMC: Liquid tight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit, Unplasticized Polyvinyl Chloride.

F. PEC: Philippine Electrical Code

G. NFPA: National Fire Protection Association

H. ANSI: American National Standards Institute

I. IMC: Intermediate metal conduit

J. MCCB: Molded Case Circuit Breaker

K. ACB: Air Circuit Breaker

L. PVC: Polyvinyl Chloride

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver components in factory-fabricated water resistant packaging.

B. Handle components carefully to avoid damage to components, enclosures and finish.

C. Store components in a clean, dry space and protect from weather.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009 or latest, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Compliant with the Latest Edition of Philippine Electrical Code and National Electrical Code.

1.6 WORK COORDINATION

A. Coordinate chase block-outs, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installation that follow.

1. Set inserts and sleeves in poured-in-place concrete, masonry, and other structural components as they are constructed.

B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C. Coordinate electrical service connect to components furnished by utility companies.

1. Coordinate installation and connection of underground or overhead utility and service, including provision for electric-metering facility.

2. Comply with requirements of the local government and of the utility company.

D. Coordinate location of access for electrical equipment that are concealed/recessed. Access doors and panels as specified Architectural Schedule.

E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.1 SAFETY CONSIDERAT FOR OUTDOOR SUBSTATION

A. Signage: Provide warning signage in English, and/or pictograph indicating "DANGER — HIGH VOLTAGE" according to signage requirements of Section 11.8.

B. Metal Enclosures: Use metal enclosures around all live parts.

C. Locks: Provide key interlocks on switchgear doors to prevent access to live parts.

D. Clearances: Refer to the Latest Edition of the Philippine Electrical Code and National Electrical Safety Code (ANSI C.2) for adequate clearances.

2.2 RACEWAYS/CONDUITS & FITTINGS

A. EMT: ANSI C80.3, zinc-coated steel, with compression fittings.

B. FMC: Zinc-coated steel. ,

C. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.

D. RNC: NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.

E. IMC: ANSI C80.6, UL safety standard 1242, coated in hot galvanized coating on exterior.

F. Raceway Fittings: Specifically designed for the raceway type used.

2.3 CONDUCTORS

A. Conductors, 3.5mm^2 and Smaller: Stranded copper.

B. Conductors, Larger Than 3.5mm^2: Stranded copper.

C. Insulation: Thermoplastic, rated at 75 deg. C minimum.

D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.4 SUPPORTING MATERIALS

A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.

B. Metal Items for Use Outdoors or in Damp Location: Hot-dip galvanized steel.

C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 14-mm-diameter slotted holes at a maximum of 50 mm o.c., in webs.

D. Slotted-Steel Channel Supports: Comply with "Metal Fabrication" for slotted channel framing.

1. Channel Thickness: Selected to suit structural loading.

2. Fittings and Accessories: Products of the same manufacturer as channel supports.

E. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 14-mm- diameter holes at a maximum of 203 mm o.c., in at least one surface.

1. Fittings and Accessories: Products of the same manufacturer as channels and angles.

2. Entire electrical system shall be fully rated.

F. Raceway and Cable Supports: Manufactured clevis hangers, riser and strut clamps, straps, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.

G. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.

H. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

I. Expansion/Anchor: Carbon-steel wedge or sleeve type.

J. Toggle Bolts: All-steel springhead type.

K. Powder-Driven Threaded Studs: Heat-treated steel.

2.5 CONCRETE BASES

A. Concrete Forms and Reinforcement Materials:

B. Concrete: 20.7-MPa, 28-day compressive

2.6 TOUCHUP PAINT

A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.

B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

C. Prevention of Corrosion: For all outdoor application and all indoor application in a harsh environment (salt air). Metallic materials shall be protected against corrosion. Equipment enclosures shall have the standard finish and corrosion resistant coating by the manufacturer when used for most indoor installation.

D. Panelboards: Ability to remove access covers is required for maintenance activities. No equipment shall be mounted within 900 mm of the front of the panel.

E. Field Testing: Final test data shall be provided to the COR for forwarding to the Systems Engineer/Condition Monitoring Office/Predictive Testing Group for inclusion in the Maintenance Database.

2.7 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 1.3- or 3.5-mm(0.052- or 0.138-inch) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of fire stopping.

2.8 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

B. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.

C. Pressure Plates: Stainless steel. Include two for each sealing element.

D. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NEMA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center/top of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installation. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to raceways and piping systems installed at a required slope.

F. Electrical equipment shall be designed and rated to operation in unusual environmental condition such as wind-blown sand, salt atmosphere, flooding, ultraviolet rays due to altitude, high winds, etc. Where standard ratings are not available to match environmental condition, equipment shall be de-rated as required to compensate for factors such as high altitude and ambient temperature. Equipment installed in conditioned spaces shall be designed and rated for the conditioned ambient.

3.2 RACEWAY APPLICATION

A. Use the following raceways for outdoor installation:

1. Exposed: IMC or EMT (with corrosion resistant coating)

2. Concealed: PVC or IMC

3. Underground, Single Run: PVC.

4. Connection to Vibrating Equipment: LFMC.

5. Boxes and Enclosures: NEMA 250 for boxes and Type 4 for enclosures. Unless otherwise indicated.

B. Use the following raceways for indoor installation:

1. Exposed: IMC or EMT

2. Concealed: PVC or IMC

3. Connection to Vibrating Equipment: LFMC; except in wet or damp location, use LFMC.
4. Damp or Wet Location: IMC.

5. Boxes and Enclosures: NEMA 250 for boxes, and Type 1 for enclosures, unless otherwise indicated.

3.3 RACEWAY AND CABLE INSTALLATION

A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.

B. Install raceways and cables at least 150 mm away from parallel runs of water pipes. Location horizontal raceway runs above water piping.

C. Use temporary raceway caps to prevent foreign matter from entering.

D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.

E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.

F. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 25-mm-concrete cover.

1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement/pouring.

2. Space raceways laterally to prevent voids in concrete.

3. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.

G. Install pull string in empty raceways. Use monofilament/nylon plastic line with not less than (90-kg) tensile strength. Leave at least (300 mm) of slack at each end of the pull wire.

H. Install telecommunication and signal system raceways, 50 mm and smaller, in maximum lengths of 45 m and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements in addition to requirements above.

I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 1830-mm flexible conduit. Install LFMC in wet or damp location. Install separate ground conductor across flexible connect.

J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

3.4 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

A. Feeders: Type THHN/THWN insulated conductors in raceway.

B. Underground Feeders and Branch Circuits: Type THWN insulated conductors in raceway.

C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.

D. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

E. LVSG: Type THHN/THWN insulated conductors in raceway and Type "SIS" for control circuits.

3.5 WIRING INSTALLATION

A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

B. Install wiring at outlets with at least 300 mm of slack conductor at each outlet. Pig tailing conductors is not permitted.

C. Connect outlet and component connect to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.6 ELECTRICAL SUPPORTING MATERIALS APPLICATION

A. Damp Location and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.

B. Dry Location: Steel materials.

C. Support Clamps for PVC Raceways: Click-type clamp system.

D. Selection of Supports: Comply with manufacturer's written instruct.

E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 90-kg design load.

3.7 SUPPORT INSTALLATION

A. Install support devices to securely and permanently fasten and support electrical components.

B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide Clamps, Attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D. Size supports for multiple raceway installation so capacity can be increased by a 25 percent minimum in the future.

E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.

F. Install 6-mm diameter or larger threaded steel hanger rods, unless otherwise indicated.

G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 38-mm and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.

H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

I. Simultaneously install vertical raceway supports with conductors.

J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 610 mm from the box.

K. Install metal channel racks for mounting cabinets, panel boards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

L. Install sleeves for cable and raceway penetration of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetration of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

1. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.

2. New Concrete: Concrete inserts with machine screws and bolts.

3. Existing Concrete: Expansion bolts.

4. Delete subparagraph below if powder-actuated devices are prohibited.

5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.

6. Steel: Welded threaded studs or spring-tension clamps on steel.

7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.

8. Light Steel: Sheet-metal screws.

9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.8 IDENTIFICATION MATERIALS AND DEVICES

A. Install at location for most convenient viewing without interference with operation and maintenance of equipment.

B. Coordinate names, abbreviation, colors, and other designation used for electrical identification with corresponding designation indicated in the Contract Documents or required by codes and standards. Use consistent designation throughout Project.

C. Self-Adhesive Identification Products: Clean surfaces before applying.

D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

E. Install continuous underground detectable (WARNING tapes) during trench backfilling, for exterior underground power, control, signal, and communication lines location directly above power and communication lines. Location 150 to 200 mm below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 400 mm, overall, use a single line marker.

F. Color-code 480/230 Volts system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:

1. Phase A: Black

2. Phase B: Red

3. Phase C: Yellow

4. Neutral: White

5. Ground: Green

G. Install warning, caution, and instruction signs where required and needed to ensure safe operation and maintenance of electrical systems and associated systems. Install engraved plastic-laminated instruction signs where instruct are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

H. Install engraved-laminated emergency-operation signs with white letters on red background with minimum 9-mm-high lettering for emergency instruct on power transfer, load shedding, and other emergency operation.

3.9 UTILITY COMPANY ELECTRIC-METERING EQUIPMENT

A. Install equipment according to utility company's requirements. Provide grounding and empty conduits as required by utility company.

3.10 FIRESTOPPING

A. Apply fire stopping to cable and raceway penetration of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

3.11 CONCRETE BASES/PADS

A. Construct concrete bases of dimension indicated, but not less than 100 mm (4 inches) wider, in lateral direct, than supported unit. Follow supported equipment manufacturer's anchorage recommendation and setting templates for anchor-bolt and tie location, unless otherwise indicated. Use 20.7-MPa, 28-day compressive-strength concrete and reinforcement as specified in Division Section "Cast-in-Place Concrete."

3.12 FIELD QUALITY CONTROL

A. Inspect installed components for damage and faulty work, including the follo0wing:

1. Raceways.
2. Building wire and connectors.
3. Supporting materials for electrical components.
4. Electrical identification.
5. Electric-metering components.
6. Concrete bases.
7. Electrical demolition/dismantling.
8. Cutting and patching for electrical construction.
9. Touchup painting.

REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division Section "Painting."

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instruct for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

Electrical Contractor must submit short circuit calculation, load flow analysis, arch flash, protective coordination study with TCC diagram before energized the system.

PART 4 - GENERAL (CONDUCTORS & CABLES)

4.1 SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and termination for wiring systems rated 600 V and less.

B. Related Sect include the following:

1. Division 26-series Sect for single-conductor and multi-conductor cables, cable splices, and termination for electrical distribution systems with 2001 to 35,000 V.

4.2 QUALITY ASSURANCE

A. Testing Agency Qualification: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Subparagraph below is an option. It is a NETA-certified personnel requirement, and the benefit may not be worth the additional expense.

2. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009 (and latest edition), Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with the Latest Edition of Philippine Electrical Code (PEC).

PART 5 - PRODUCTS

5.1 CONDUCTORS AND CABLES

A. Conductor Material: Copper only complying with NEMA WC 5 or 7; stranded conductor for 2.0 mm diameter only, stranded for 3.5 mm^2 and larger. Copper shall be 99 percent conductivity and hard drawn.

B. Conductor Insulation Types: Type THHN-THWN, THW and XLPE.

5.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 6 - EXECUTION

6.1 CONDUCTOR AND INSULATION APPLICAT

A. This Article provides examples of application requirements for conductors and cables. Edit to select wiring methods for the various environments in Project. Add other methods if required.

Revise conductor insulation and cable type designations to suit Project condition, local code, and practice. Refer to NFPA 70 and to UL's "Electrical Construction Equipment Directory 1998" for additional application information about conductor sizes, insulation temperature ratings in cables, and product-use classifications and restrictions.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, and Partition: Type THHN-THWN and THW, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN and THW, single conductors in raceway.

E. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN and THW, group conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partition: Type THHN-THWN and THW, group conductors in raceway.

G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN and THW, group conductors in raceway.

H. Edit first paragraph below to permit direct-buried cable if required.

I. Underground Feeders and Branch Circuits: Type THHN-THWN and THW, group conductors in raceway.

J. Fire Alarm Circuits: Fire Alarm Cable mineral insulation, in raceway.

K. Class 1 Control Circuits: Type THHN-THWN, in raceway.

L. Class 2 Control Circuits: Type THHN-THWN, in raceway.

M. Neutral Conductor: Where a secondary distribution system requires a neutral conductor, a full-sized neutral conductor shall be used throughout the system, such that that neutral conductor is not shared with any other branch circuit or feeder. If the secondary distribution system supports computers or other equipment that generates harmonics, double size neutrals shall be run from the subpanel boards feeding this equipment back to the MDP or service entrance. Neutral buses shall be sized to accommodate these conductors. Insulated equipment grounding conductors run with branch circuits shall be installed such that that conductor is not shared with any other branch circuit.

6.2 INSTALLATION

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tens and sidewall pressure values.

C. Use pulling means; including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Seal around cables penetration fire-rated elements.

F. Identify and color-code conductors and cables.

G. Install outdoor underground feeders in concrete encased duct bank.

H. Each electronic equipment rack shall be fed by an individual circuit breaker protected branch circuit.

6.3 CONNECT

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Delete subparagraph below unless aluminum conductors are specified.

D. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

E. Wiring at Outlets: Install conductor at each outlet, with at least 300 mm of slack.

6.4 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality-control testing:

1. Retain subparagraphs below with any paragraph selected above. Edit to suit Project.

2. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.

3. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.

B. Test Reports: Prepare a written report to record the following:

1. Test procedures used.

2. Test results that comply with requirements.

3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

PART 7 - GENERAL (GROUNDING & BONDING)

7.1 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sect.

B. Standards and Code References:

1. PEC – Philippine Electrical Code, Latest Edition

7.2 QUALITY ASSURANCE

A. Testing Agency Qualification: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association to supervise on-site testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with PEC 2009 (and/or latest edition), Article 2.90 when interconnecting with lightning protection system.

PART 8 - PRODUCTS

8.1 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Section 26 01 01 "Conductors and Cables."

B. Material: Aluminum, copper-clad aluminum, and copper.

C. Equipment Grounding Conductors: Insulated with green-colored insulation.

D. Grounding Electrode Conductors: Stranded copper cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare Copper Conductors: Comply with the following:

1. Solid Conductors: ASTM B 3.
2. Assembly of Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.

G. Copper Bonding Conductors: As follows:

1. Bonding Cable: 100 mm^2 copper conductor.
2. Bonding Conductor: 30 mm^2 or 16 mm^2, stranded copper conductor.
3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 42 mm wide and 1.5 mm thick.
4. Tinned Bonding Jumper: Tinned-copper tape, braided copper conductors, terminated with copper ferrules; 42 mm wide and 1.5 mm thick.

H. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators as shown on drawings.

8.2 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combination of conductors and connected items.

B. Bolted Connectors: Bolted-pressure-type connectors, or compression type.

C. Welded Connectors: Exothermic-welded type, in kit form, and selected per manufacturer's written instruct.

8.3 GROUNDING ELECTRODES

A. Ground Rods: Copper

B. Ground Rods

1. Size: 21 mm diameter by 3000 mm long

C. Test Wells: Provide handholes as shown in the drawings.

PART 9 - EXECUTION

9.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors in direct contact with earth, concrete, masonry, crushed stone and similar materials.

B. In raceways, use insulated equipment-grounding conductors.

C. Exothermic-Welded Connect: Use for connect to structural steel and for underground connect, except those at test wells.

D. Equipment Grounding Conductor Termination: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two bolts.

F. Grounding Bus: Install in electrical room and in rooms housing service equipment, and elsewhere as indicated.

1. Use insulated spacer; space 25.4 mm from wall and support from wall 150 mm above finished floor, unless otherwise indicated.

2. At doors, route the bus up to the top of the doorframe, across the top of the doorway, and down to the specified height above the floor.

G. Underground Grounding Conductors: Use bare-copper conductor, 95 mm^2 minimum. Bury at least 600 mm below grade or bury 300 mm above duct bank when installed as part of the duct bank.

9.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with PEC, Article 2.50, for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by PEC are indicated.

B. Install equipment grounding conductors in all feeders and circuits.

C. Install insulated equipment grounding conductor with circuit conductors for the following items, in addition to those required by PEC:

1. Feeders and branch circuits.

2. Lighting circuits.

3. Receptacle circuits.

4. Single-phase motor and appliance branch circuits.

5. Three-phase motor and appliance branch circuits.

6. Flexible raceway runs.

D. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

E. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch-circuit runs from computer-area power panels or power-distribution units.

F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

G. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for communication cables.

H. Air-Duct Equipment Circuits: Install an equipment grounding conductor to duct-mounted electrical devices operating at 230 V, 60 Hz and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

I. Signal and Communication Systems: For alarm, voice, data, and other communication systems, provide insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, telecommunication rooms, and central equipment location.

J. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch-circuit conductors.

K. Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

9.3 COUNTERPOISE

A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 18 m apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned-copper conductor not less than 100 mm^2 for counterpoise and for tap to building steel. Bury counterpoise not less than 450 mm below grade and 600 mm from building foundation.

9.4 INSTALLATION

A. Ground Rods: Install at least three rods spaced at least one-rod length from each other and location at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 305 mm below finished floor or final grade, unless otherwise indicated.

2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connect without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic-welded connectors for outdoor location, unless a disconnect-type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetration any adjacent parts. Install straps only in location accessible for maintenance.

C. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

D. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

E. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans, blowers, electric heaters, and air cleaners. Use braided-type bonding straps.

F. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

G. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

H. Under Ground (Concrete-Encased Grounding Electrode): Fabricate according to PEC, using a minimum of 6 m of bare copper conductor not smaller than 30 mm^2. If concrete foundation is less than 6 m long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

9.5 CONNECT

A. General: Make connect so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.

2. Make connect with clean, bare metal at points of contact.

3. Make aluminum-to-steel connect with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized steel connect with tin-plated copper jumpers and mechanical clamps.

5. Coat and seal connect having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

B. Exothermic-Welded Connect: Comply with manufacturer's written instruct. Welds that are puffed up or that show convex surface indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Termination: For 10mm^2 and larger, use pressure-type grounding lugs. 10mm^2 and smaller grounding conductors may be terminated with winged pressure-type connectors.

D. Noncontact Metal Raceway Termination: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with a grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connect at Test Wells: Use compression-type connectors on conductors and make bolted- and clamped-type connect between conductors and ground rods.

F. Delete reference to UL 486B in paragraph below if aluminum conductors are not used.

G. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

H. Compression-Type Connect: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

I. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

9.6 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Duct Banks: Install a grounding conductor with at least 50 percent ampacity of the largest phase conductor in the duct bank.

B. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 100 mm will extend above finished floor. If necessary, install ground rod before manhole is placed and provide an 80mm2 bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive tape or heat-shrunk insulating sleeve from 50 mm above to 150 mm below concrete. Seal floor opening with waterproof, non-shrink grout.

C. Connect to Manhole Components: Connect exposed-metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connect with 25mm2 minimum, stranded, hard-drawn copper conductor. Train conductor’s level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

9.7 FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

B. Testing: Perform the following field quality-control testing:

1. After installing grounding system but before permanent electrical circuitry has been energized, test for compliance with requirements.

2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing

natural ground resistance. Perform tests, by the fall-of-potential method according to IEEE 81.

3. Provide drawings location each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observation of weather and other phenomena that may affect test results. Describe measures taken to improve test results. Maximum valve of ground resistance is 5 ohms.

4. Excessive Ground Resistance: If resistance to ground exceeds specified values, drive additional ground rods until resistance meets specified values.

PART 10 - GENERAL (WIRING DEVICES)

10.1 SUMMARY

A. This Section includes the following:

1. Single and duplex receptacles, ground-fault circuit interrupters, and integral surge suppression units.

2. Single- and double-pole snap switches and dimmer switches.

3. Device wall plates.

4. Floor service outlets and multi-outlet assemblies.

10.2 ACRONYMS & ABBREVIATION

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. PVC: Polyvinyl chloride.

D. TVSS: Transient voltage surge suppressor.

10.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C. Field quality-control test reports.

10.4 QUALITY ASSURANCE

A. Source Limitation: Obtain each type of wiring device through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1 and marked for intended use.

C. Comply with the Latest Edition of Philippine Electrical Code (PEC).

PART 11 - PRODUCTS

11.1 WIRING DEVICES, GENERAL

A. Wiring Devices: Provide U.S. NEMA type wiring devices and associated devices, boxes, and covers. Receptacles other than 230-volt general-purpose convenience outlets shall be marked on the cover plates with voltage, amperage, phase, and frequency. Matching plugs shall be provided.

B. Wire and Cable: Select types of insulation according to the application. See the PEC for insulation types, operating temperatures, ambient temperature, and voltage classes. Cable and wire sizes, types, and insulation shall be properly specified by the A/E using Philippine standards in order to obtain the highest quality transmission for security, data, and other signal cables. Provide solid conductors for conductors sized 5.5 mm^2 and smaller. Provide stranded conductors for conductors sized 8.0 mm^2 and larger. Provide copper branch circuits and feeder conductors sized at 125 percent of full load capacity. Use full-sized neutral conductor and a separate ground conductor for each circuit. Circuits and feeders that supply power for electronic equipment may require an oversized neutral to compensate for high harmonic neutral currents. Such feeders must be identified in the design and the neutral increased to a minimum of two times full rated size. Non-metallic sheathed cable ("Romex") is prohibited, and armored or metal clad cable, Types AC or MC is prohibited except as permitted in limited application by DE/EEB.

C. Overload Protection: Copper conductors shall be provided overload protection in accordance with NEC Table 310-6. Overload protection shall not exceed 15A for 2.5 mm^2 conductors, 20A for 3.5 mm^2 conductors or 30A for 5.5 mm^2 conductors.

11.2 RECEPTACLES

Receptacles, General: General-purpose receptacles shall be installed on 15 and 20-amp branch circuits, and shall be of the grounding type with effective grounding contacts.

A. GFCI Receptacles shall not be used. Outlets designated for GFCI protection shall be fed from a GFCI circuit breaker. One GFCI breaker, rated for 10mA ground fault trip, 60Hz, 230V (line to neutral) shall be installed in an enclosure adjacent to the first receptacle in the branch circuit. This breaker will provide ground fault protection for all receptacles in the circuit.

11.3 SWITCHES

A. Single- and Double-Pole Switches:

B. Snap Switches: Heavy-Duty grade, quiet type.

11.4 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 1-mm- thick, brushed stainless steel.
3. Material for Unfinished Spaces: Galvanized steel

11.5 FLOOR SERVICE FITTINGS

11.6 FINISHES

A. Color:

1. All device faceplate shall be approved by the PSC.

PART 12 - EXECUTION

12.1 INSTALLATION

A. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates where possible.

B. Remove wall plates and protect devices and assemblies during painting.

12.2 CONNECT

A. Ground equipment according to Section 26 02 01 "Grounding and Bonding."

B. Connect wiring according to Section 26 01 01 "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

12.3 FIELD QUALITY CONTROL

A. Perform the following field tests and inspect and prepare test reports:

1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.

2. Test GFCI operation with both local and remote fault simulator according to manufacturer's written instruct.

B. Remove malfunctioning units, replace with new units, and retest as specified above.

PART 13 - GENERAL (PANELBOARDS)

13.1 SUMMARY

A. This Section includes load centers and panel boards, over-current protective devices, and associated auxiliary equipment rated 600 V and less for the following types:

1. Lighting and appliance branch-circuit panel boards.

2. Distribution panel boards.

3. Transient voltage surge suppressor panel boards.

13.2 ACRONYMS & ABBREVIATIO

A. Retain abbreviation that remain after this Section has been edited.

B. EMI: Electromagnetic interference.

C. GFCI: Ground-fault circuit interrupter.

D. RFI: Radio-frequency interference.

E. RMS: Root mean square.

F. SPDT: Single pole, double throw.

G. TVSS: Transient voltage surge suppressor.

13.3 SUBMITTALS

A. Product Data: For each type of panel board, over-current protective device, transient voltage suppression device, accessory, and component indicated. Include dimension and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panel board and related equipment.

1. Dimensioned plans, elevation, sect, and details. Show tabulation of installed devices, equipment features, and ratings. Include the following:

    a. Enclosure types and details.

    b. Bus configuration, current, and voltage ratings.

    c. Short-circuit current rating of panel boards and over-current protective devices.

    d. Features, characteristics, ratings, and factory settings of individual over-current protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring.

C. Qualification Data: For testing agency.

D. Field quality-control test reports including the following:
1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

E. Panel board Schedules: For installation in panel boards. Submit final versus after load balancing.

F. Operation and Maintenance Data: For panel boards and components to include in emergency, operation, and maintenance manuals. Include:
1. Manufacturer's written instruct for testing and adjusting over-current protective devices.
2. Time-current curves, including selectable ranges for each type of over-current protective device.

13.4 QUALITY ASSURANCE

A. Testing Agency Qualification: Testing agency that is a member company of the Inter National Electrical Testing Association and that is acceptable to authorities having jurisdiction.

B. Electrical Components, Devices, and Accessories: labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NEMA PB 1.

D. Comply with the Latest Edition of Philippine Electrical Code (PEC).

PROJECT CONDITION

A. Environmental Limitation: Rate equipment for continuous operation under the following condition, unless otherwise indicated:

1. Ambient Temperature: Not exceeding 40 deg C (104 deg F).

2. Altitude: Not exceeding 2000 m (6600 feet).

B. Service Condition: NEMA PB 1, usual service condition, as follows:

1. Ambient temperatures within limits specified.

2. Altitude not exceeding 2000 m (6600 feet).

C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Post or others unless permitted under the following condition and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify COR no fewer than two days in advance of proposed interruption of electrical service.

2. Do not proceed with interruption of electrical service without COR's written permission.

D. Unusual Service Condition: Engine generator equipment and installation shall operation under the following condition.

1. High salt-dust content in the air due to sea-spray evaporation.

13.5 COORDINATION

A. Coordinate layout and installation of panel boards and components with other construction that penetrations walls or is supported by them, including electrical and other types of equipment, raceways, piping and encumbrances to workspace clearance requirements.

13.6 EXTRA MATERIALS

J. Keys: Six spares of each type of panel board cabinet lock.

PART 14 - GENERAL

14.1 FABRICATION AND FEATURES

A. Enclosures: Flush or surface-mounted cabinets. NEMA PB 1, Type 1, to meet environmental condition at installed location.

1. Outdoor Location: NEMA 250, Type 4.

2. Kitchen Areas: NEMA 250, Type 4, stainless steel.

3. Other Wet or Damp Indoor Location: NEMA 250, Type 3R.

4. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7C.

B. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimension; for flush-mounted fronts, overlap box.

C. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

D. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat Beige Color.

E. Directory Card: With transparent protective cover, mounted inside metal frame, inside panel board door.

F. Bus: Hard-drawn copper, 98 percent conductivity.

G. Bus Bars of Power Distribution and Branch Circuit Panel boards: Provide hard drawn copper. The neutral bus shall be isolated from both the ground bus and the cabinet, except at the service entrance or at the output of separately derived systems and shall be grounded in accordance with the Latest Edition of PEC.

H. Main and Neutral Lugs: Compression type suitable for use with conductor material.

I. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to steel enclosure.

J. Service Equipment Label: Labeled for use as service equipment for panel boards with main service disconnect switches.

K. Future Devices: Mounting brackets, bus connect, and necessary appurtenances required for future installation of devices.

L. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from steel enclosure.

M. Neutral Bus: Neutral bus rated 100 percent of phase bus and suitable for nonlinear loads.

N. Split Bus: Vertical buses divided into individual vertical sect.

O. Skirt for Surface-Mounted Panel boards: Same gage and finish as panel board front with flanges for attachment to panel board, wall, and ceiling or floor.

P. Gutter Barrier: Arrange to isolate individual panel sect.

Q. Column-Type/Free Standing Panel boards: Narrow gutter extension, with cover, to overhead pull box equipped with ground and neutral terminal buses. Feed-through Lugs: Compression type suitable for use with conductor material. Location at opposite end of bus from incoming lugs or main device.

R. Provide 10 percent spare circuit breakers, 10 percent spaces for future breakers, and 10 percent overall spare current carrying capacity for future expansion.

14.2 PANELBOARD SHORT-CIRCUIT RATING

A. Fully rated to interrupt symmetrical short-circuit current available at terminals.

14.3 LOAD CENTERS

A. Overcurrent Protective Devices: Bolt-on, full-module circuit breaker.

B. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

14.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Branch Circuit Panel boards: Branch protective devices in panel boards shall be of the bolt-on type circuit breakers. Location of panel boards at the utility area nearest the center of the load. Pane boards shall have main circuit breakers. Where multiple section panel boards are required, each section shall have a main breaker. Size panels as noted above.

B. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

C. Doors: Front mounted with concealed hinges; secured with flush latch with twist lock; keyed alike.

14.5 DISTRIBUTION PANELBOARDS

A. Power Distribution Panel boards serving three-phase motors and other power equipment shall be of circuit breaker type. Size the panel bus, lugs, and circuit breakers to match the ratings indicated in the Overcurrent Protective device coordination system fault level.

B. Doors: Front mounted, except omit in fused-switch panel boards; secured with vault-type latch with twist lock; keyed alike.

C. Main Overcurrent Protective Devices: Circuit breaker.

D. Branch overcurrent protective devices shall be one of the following:

1. For Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

2. For Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

3. Fused switches.

14.6 TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)

A. Transient voltage disturbances from commercial power systems associated with lightning storms and switching surges externally, as well as harmonics generated by adjustable speed drives and SCR power supplies associated with UPS equipment internally may cause stress and damage to electrical equipment. Therefore, transient voltage surge protection is required at the service entrance to all buildings, at all main distribution panels and all secondary power panels. The TVSS protection shall be provided.

14.7 OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 800 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

3. Electronic Trip Unit Circuit Breakers: RMS sensing; field-replaceable rating plug; with the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.

5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.

6. GFCI Circuit Breakers: Single- and two-pole configuration with 30-mA trip sensitivity.

B. Molded-Case Circuit-Breaker Features and Accessories. Standard frame sizes, trip ratings, and number of poles.

1. Lugs: Compression style, suitable for number, size, trip ratings, and material of conductors.

2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

3. Ground-Fault Protection: Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

4. Shunt Trip: 220 or 240 V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

14.8 CONTROLLERS

A. Motor Controllers: Controller equipped for panel board mounting and including the following accessories:

1. Individual control-power transformers.

2. Fuses for control-power transformers.

3. Bimetallic-element overload relay.

4. Melting-alloy overload relay.

5. Indicating lights.

6. Seal-in contact.

7. Four convertible auxiliary contacts.

8. Push buttons.

9. Selector switches.

14.9 ACCESSORY COMPONENTS AND FEATURES

A. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Furnish portable test set to test function of solid-state trip devices without removal from panel board.

C. Fungus Proofing: Permanent fungicidal treatment for panel board interior, including overcurrent protective devices and other components.

15 EXECUTION

15.1 INSTALLATION

A. Install panel boards and accessories according to Manufacturer recommendation.

B. Mounting Heights: Top of trim 1880 mm above finished floor, unless otherwise indicated.

C. Mounting: Plumb and rigid without distortion of enclosure. Mount recessed panel boards with fronts uniformly flush with wall finish.

D. Circuit Directory: Create a directory to indicate installed circuit loads after balancing panel board loads. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

E. Install filler plates in unused spaces.

F. Provision for Future Circuits at Flush Panel boards: Stub four 25mm Ø empty conduits from panel board into accessible ceiling space or space designated to be ceiling space in the future. Stub four 25mm Ø empty conduits into raised floor space or below slab not on grade.

G. Wiring in Panel board Gutters: Arrange conductors into groups and bundle and wrap with wire ties after completing load balancing.

15.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Section 26 00 00 Part 3.8 "Identification Materials and Devices".

B. Panel board Nameplates: Label each panel board with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

15.3 CONNECT

A. Install equipment grounding connection for panel boards with ground continuity to main electrical ground bus.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

15.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each panel board bus, component, connecting supply, feeder, and control circuit.

2. Test continuity of each circuit.

B. Testing: After installing panel boards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panel board. Remove panel fronts so joints and connect are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panel board 11 months after date of Substantial Completion.

2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviation from normal values. Provide calibration record for device.

3. Record of Infrared Scanning: Prepare a certified report that identifies panel boards checked and describes scanning results. Include notation of deficiencies detected, remedial action taken, and observation after remedial action.

15.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

15.6 CLEANING

A. On completion of installation, inspect interior and exterior of panel boards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish

PART 16 - GENERAL GENERATOR SETS (THIS PART IS FOR FUTURE INSTALLATIONS)

PART 17 - PRODUCTS

PART 22 - GENERAL (TRANSFER SWITCH)

SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switch.

2. Automatic open-transition transfer switch.

3. Remote annunciation system.

B. Field Test Reports: Indicate and interpret test and inspection results for compliance with.

SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Dimensioned plans, elevation, sect, and details showing minimum clearances, conductor entry provision, gutter space, installed features and devices, and material lists for each switch specified.

1. Retain subparagraph below if retaining Part 2 "Bypass/Isolation Switches" Article. Single-Line Diagram: Show connect between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provision for each combined transfer switch and bypass/isolation switch.

C. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Division Section "Electrical Supports and Seismic Restraints." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and location and describe mounting and anchorage provision.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

D. Qualification Data: For manufacturer and testing agency.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instruct, including software, where applicable.

22.3 QUALITY ASSURANCE

A. Manufacturer Qualification: Maintain a service center capable of providing emergency maintenance and repairs at Project site with an eight-hour maximum response time.

B. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies (Level 3 or higher), to supervise on-site testing specified in Part 3.

C. Source Limitation: Obtain automatic transfer switch, bypass/isolation switch, non automatic transfer switch, remote annunciators, and remote annunciator and control panels through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for emergency service under UL 1008, by a testing agency acceptable to authorities having jurisdiction.

E. Comply with NEMA ICS 1.

F. Comply with NFPA 70.

G. Comply with NFPA 99.

H. Comply with NFPA 110.

I. Comply with UL 1008, unless requirements of these Specification are stricter.

J. Comply with the latest Philippine Electrical Code (PEC)

22.4 EXTRA MATERIALS

A. Furnish extra parts described in Division 1 at Substantial Completion. Extra parts shall package with protective covering for storage and identified with labels describing contents.

PART 23 - PRODUCTS

23.1 AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110/UL 1008 for Fire pump.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is the same as for electrical operation. Control circuit automatically disconnects from electrical operation during manual operation.

D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operation during manual operation.

E. Signal-before-Transfer Contacts: A set of normally open/normally closed dry contacts operations in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

G. Automatic Open-Transition Transfer Switches: Include the following function and characteristics:

1. Fully automatic make-before-break operation.

2. Load transfer without interruption, through momentary interconnection of both power sources not exceeding 100 mts.

3. Initiation of No-Interruption Transfer: Controlled by in-phase monitor and sensors confirming both sources are present and acceptable.

    a. Initiation occurs without active control of generator set.

    b. Controls ensure closed-transition load transfer closure occurs only when the two sources are within plus or minus 5 electrical degrees, maximum and plus or minus 5 percent maximum voltage difference.

4. Failure of the power source serving the load initiates automatic break-before-make transfer.

H. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

23.2 AUTOMATIC TRANSFER-SWITCH FEATURES

A. Under voltage Sensing for Each Phase of Normal Source: Senses low phase-to-ground voltage on each phase. Pickup voltage is adjustable from 85 to 100 percent of nominal, and dropout voltage

is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent. Provide over/under voltage and frequency sensing for all generator transfer switches to initiate generator start and transfer of power.

B. Time delay for override of normal-source voltage sensing delays transfer and engine start signals. Adjustable from 0.50 to six seconds, and factory set for one second.

C. Voltage/Frequency Lockout Relay: Prevents premature transfer to generator set. Pickup voltage is adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency is adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

D. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes; factory set for 10 minutes. Provides automatic defeat of delay on loss of voltage or sustained under voltage of emergency source, provided normal supply has been restored.

E. Test Switch: Simulates normal-source failure.

F. Switch-Position Pilot Lights: Indicate source to which load is connected.

G. Source-Available Indicating Lights: Supervise sources via transfer-switch, normal- and emergency-source sensing circuits.

1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."

2. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

H. Unassigned Auxiliary Contacts: Two normally open single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.

I. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.

J. Engine Starting Contacts: One isolated, normally closed and one isolated, normally open, rated 10 A at 32-V dc minimum.

K. Engine Shutdown Contacts: Instantaneous. Initiates shutdown sequence at remote engine-generator controls after retransfer of load to normal source.

L. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes; factory set for five minutes. Initiates shutdown at remote engine-generator controls after retransfer of load to normal source.

M. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine-generator set and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

1. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.

2. Push-button programming control with digital display of settings.

3. Integral battery operation of time switch when normal control power is not available.

23.3 REMOTE ANNUNCIATOR SYSTEM

G. Functional Description: Remote annunciator panel annunciates condition for indicated transfer switches. Annunciation includes the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.

2. Switch position.

3. Switch in test mode.

4. Failure of communication link.

5. Remote control.

H. Annunciator Panel: LED, LCD or vacuum fluorescent type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.

2. Label each group indicating transfer switch it monitors, location of switch, and identity of load it serves.

3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.

4. Lamp Test: Push-to-test or lamp-test switch on front panel.

5. Remote control.

23.4 FINISHES

A. Enclosures: Manufacturer's standard enamel over corrosion-resistant pretreatment and primer.

23.5 SOURCE QUALITY CONTROL

A. Factory Test Components, Assembled Switches, and Associated Equipment: Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements.

PART 24 - EXECUTION

24.1 APPLICATION

A. Four-Pole Switches: Where four-pole switches are indicated, install neutral switching.

24.2 INSTALLATION

A. Comply with mounting and anchoring requirements specified in Division 26 Section "Seismic Controls for Electrical Work."

B. Floor-Mounted Switch: Anchor to floor by bolts.

1. Concrete Bases: 100 mm (4 inches) high, reinforced, with chamfered edges. Extend base no more than 50 mm (2 inches) in all direct beyond the maximum dimension of switch, unless otherwise indicated. Cast anchor-bolt inserts into bases. Comply with Division Section "Cast-in-Place Concrete."

C. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.

D. Identify components according to Division 26 Section "Electrical Identification."

24.3 WIRING TO REMOTE COMPONENTS

A. Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner Representative if necessary to accommodate required wiring.

24.4 CONNECT

A. Ground equipment according to Division 26 Section "Grounding and Bonding."

B. Connect wiring according to Division 26 Section "Conductors and Cables."

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

24.5 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, pretest, and adjust field-assembled components and equipment installation, including connect, and to assist in field testing. Report results in writing.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspect and prepare test reports:

C. Perform the following field tests and inspect and prepare test reports:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.

2. Retain paragraph below to require a factory-authorized service representative to perform, or assist Contractor with, field inspections, tests, and adjustments. Retain one of two options to suit Project; delete both to require only an inspection before field testing. Retain one of three paragraphs below. Retain subparagraphs and associated subparagraphs below with either of last two paragraphs above. Edit to suit Project. Delete subparagraphs if testing will be performed by Owner-engaged testing and inspecting agency.

3. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.22.3. Certify compliance with test parameters.

4. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.

    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.

    c. Verify that manual transfer warnings are properly placed.

    d. Perform manual transfer operation.

    e. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

f. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.

g. Simulate loss of phase-to-ground voltage for each phase of normal source.

h. Retain test in first subparagraph below if three-phase undervoltage sensing is specified in Part 2. Test requires advance preparation by testing agency.

i. Verify time-delay settings.

j. Verify pickup and dropout voltages by data readout or inspection of control settings

k. Test bypass/isolation unit functional modes and related automatic transfer-switch operation.

l. Normally require test in first subparagraph below only for critical and extensive installations and for switches rated 1600 A and above in other installations.

m. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.

n. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

a. Verify grounding connect and location and ratings of sensors.

b. Observe reaction of circuit-interrupting devices when simulated fault current is applied at sensors.

6. Coordinate tests with tests of generator and run them concurrently.

7. Report results of tests and inspect in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

8. Remove and replace malfunctioning units and retest as specified above.

24.6 CLEANING

A. After completing equipment installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean equipment internally, on completion of installation, according to manufacturer's written instruct.

24.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's Representative Maintenance personnel to adjust, operation, and maintain transfer switches and related equipment as specified below.

1. Coordinate this training with that for generator equipment.

PART 25 - GENERAL

25.1 SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures with lamps and ballasts.

2. Lighting fixtures mounted on exterior building surfaces.

3. Emergency lighting units.

4. Exit signs.

5. Accessories, including occupancy sensors.

B. Related Sect include the following:

1. Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

2. Division 26 Section "Seismic Controls for Electrical Work".

C. Special lighting fixtures under the scope of works of the Lighting Consultant, Interior Designer, and Landscape Architect Consultant shall be handled by these specialty Consultants.

25.2 DEFINITION, ACRONYMS & ABBREVIATION

A. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.

B. CRI: Color rendering index.

C. CU: Coefficient of utilization.

D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:

1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.

E. RCR: Room cavity ratio.

F. LLD: Lamp Lumen Depreciation, reflect the overall performance of a lamp over its life (mean lumens/rated lumens). Value can be found from lamp manufacturer data.

G. LDD: Luminaire Dirt Depreciation, it is the light loss prior to cleaning dust. LDD is estimated from tables in IESNA lighting handbook.

25.3 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimension.
2. Emergency lighting units including battery and charger.
3. Ballast.
4. Energy-efficiency data.
5. Air and Thermal Performance Data: For air-handling lighting fixtures. Furnish data required in "Submittals" Article in Division 23 Section "Diffusers, Registers, and Grilles."
6. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Division 23 Section "Diffusers, Registers, and Grilles."
7. Life, output, and energy-efficiency data for lamps.
8. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
    a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.
    b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

B. Retain first two subparagraphs below for projects with air-handling lighting fixtures.

C. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimension, weights, and methods of field assembly, components, features, and accessories.

D. Wiring Diagrams: Power and control wiring.

E. Retain paragraph and subparagraphs below if Drawings do not include comprehensive reflected ceiling plans or if Project involves unusual coordination requirements.

F. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
1. Lighting fixtures.
2. Suspended ceiling components.
3. Structural members to which suspension systems for lighting fixtures will be attached.
4. Other items in finished ceiling including the following:
    a. Air outlets and inlets.
    b. Speakers.
    c. Sprinklers.
    d. Smoke and fire detectors.

e. Occupancy sensors

f. Access panels

5. Perimeter moldings.

G. Samples for Verification: Interior lighting fixtures designated for sample submission in Interior Lighting Fixture Schedule. Each sample shall include the following:

1. Lamps: Specified units installed.

2. Accessories: Cords and plugs.

H. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.

I. Qualification Data: For agencies providing photometric data for lighting fixtures.

J. Field quality-control test reports.

K. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

L. Warranties: Special warranties specified in this Section.

25.4 QUALITY ASSURANCE

A. Testing Agency Qualification: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with Latest Edition of the PEC.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

25.5 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrations ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

25.6 WARRANTY

A. Warranty Period: 1 year from date of Substantial Completion. On all lighting fixtures.

25.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 26 - PRODUCTS

26.1 FIXTURES AND COMPONENTS, GENERAL

A. Surface/Recessed Fixtures, LED type, 220V

B. Metal Parts: Free of burrs and sharp corners and edges.

C. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating condition, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

26.2 EXIT SIGNS

A. Description: Comply with NFPA 70 and NFPA 101; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: Fluorescent, 2 for each fixture, 20,000 hours of rated lamp life.
2. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.
3. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
    a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle. Retain subparagraph below to permit periodic test required by codes for emergency equipment to be performed using a hand-held remote device to trigger simulation of loss of normal power in the tested unit.
    f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

g. Master Unit: Comply with requirements above for self-powered exit signs, and provide additional capacity in LED power supply for power connection to remote unit.

26.3 EMERGENCY LIGHTING UNITS

A. Description: Self-contained units complying NFPA 70 and NFPA 101.

1. 1Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life, capable of 90 minutes illumination time.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 75 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.

5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

6. Feature in subparagraph below is optional. Coordinate with Drawings.

7. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.

8. Retain subparagraph below for time-delay option if units are indicated for areas normally lighted by HID fixtures that will not relight for a period after power is restored due to lengthy arc restrike delays.

9. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.

10. Retain subparagraph below to eliminate necessity to manually perform periodic test required by codes for emergency equipment. Verify requirements of authorities having jurisdiction.

11. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and flashing red LED.

26.4 FLUORESCENT EMERGENCY LIGHTING FIXTURES

A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply NFPA 70 and NFPA 101.
1. Emergency Connection: Operation one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
2. Night Light Connection: Operation one fluorescent lamp continuously.
3. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
4. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life, capable of 90 minutes illumination time.
5. Charger: Fully automatic, solid-state, constant-current type.

B. Central Type: Factory installed, full light output, fluorescent emergency ballast to operation lamps indicated from a remote emergency power source.

C. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from light fixture. Comply with UL 924, NFPA 70 and NFPA 101.

1. Emergency Connection: Operation one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.

2. Night Light Connection: Operation one fluorescent lamp in a remote fixture continuously.
3. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.

4. Charger: Fully automatic, solid-state, constant-current type.

5. Housing: NEMA 250, Class 1 enclosure.

26.5 FLUORESCENT LAMPS

A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure (TCLP) test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.

B. T8 rapid-start low-mercury lamps, rated 32 W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours, unless otherwise indicated.

C. T8 rapid-start low-mercury lamps, rated 17 W maximum, nominal length of 24 inches (610 mm), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.

D. Compact Fluorescent Lamps: CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start unless otherwise indicated.

1. 13 W: T4, double tube, rated 900 initial lumens (minimum).
2. 18 W: T4, double tube, rated 1200 initial lumens (minimum).
3. 26 W: T4, double tube, rated 1800 initial lumens (minimum).
4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
6. 55 W: T4, triple tube, rated 4300 initial lumens (minimum).
7. 25W: T5, rated 2900 initial lumens.
8. 54W: T5HO, rated 5000 initial lumens.
9. Low-mercury products may not be available in higher-wattage products in three subparagraphs below. Consult manufacturers.

26.6 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Seismic Control for Electrical Work" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires:

1. ASTM A 641/A 641M “Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire, Class 3, soft temper, zinc-coated steel**,** 12 gage (2.68 mm).

2. BS EN 10244-2:2001 “Steel Wire & Wire Products- Non-Ferrous Metallic Coatings on Steel Wire – Part 2 Zinc or Zinc Alloy”

3. ISO 7989:1988 “Zinc Coatings for Steel Wire

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

H. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

PART 27 - EXECUTION

27.1 ***INSTALLATION***

Electrical Installation shall conform to IEEE C2, NFPA 70, and to the requirements specified herein.

A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
1. Install a minimum of four ceiling support system rods or wires for each fixture. Location not more than 150 mm from fixture corners.

2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.

3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 20-mm metal channels spanning and secured to ceiling tees.

4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Fixture Support: As follows:
1. Pendants and Rods: Where longer than 1200 mm, brace to limit swinging.

2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

4. Continuous Rows: Suspend from cable.

D. Air-Handling Fixtures: Install with dampers closed and ready for adjustment.

E. Adjust amiable fixtures to provide required light intensities.

27.2 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Verify normal operation of each fixture after installation.

C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.

D. Prepare a written report of tests, inspect, observation, and verification indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

E. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

PART 28 – GENERAL (COMMUNICATION CABINETS, RACKS, FRAMES AND ENCLOSURES)

28.1 SUMMARY

This Section includes cable management materials, equipment and installation practices required for a fully operational, certified telecommunication cabling system compliant with all applicable codes and standards.

A. Standard and Codes References:
   1. ANSI/TIA/EIA – 568B.1 and all for Commercial Building Telecommunication Cabling Standard Part 1: General Requirements.
   2. ANSI/TIA/EIA – 569-B and all addenda for Commercial Telecommunication Pathway and Spaces.
   3. ANSI/NECA/BICSI 569-2001 - Standard for Installation Commercial Building Telecommunication Cabling.
   4. PEC – Philippine Electrical Code, Latest Edition.
   5. ANSI/J-STD -607A" Commercial Building Grounding (Earthing) and Bonding Requirements for telecommunication"

28.2 SUBMITTAL

A. Shop drawings: include the following:
   1. Provide detail elevation drawings of each equipment cabinet in the TR's, ER's. Drawing shall be in scale not less than 1.20.
   2. On the drawing include a material schedule of telecom equipment that will be used at each TRs and ERs including manufacture, part number, quantities and function.

B. Provide manufacturer's literature and sample of telecommunication installation materials.

C. Provide resumes and or copies of certificates for field personnel a minimum of six months prior to installation of communication equipment and cabling in accordance with the Quality Assurance section of this specification.

28.3 QUALITY ASSURANCE

A. Contractor Qualification: Contractor shall have on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International (BICSI). The RCDD shall have inspected the work at the completion of the project. Installation field supervisor must be certified by BICSI at the installer level and certified by the manufacturer to install or test the cable. Untrained technician assigned to this project shall be trained and certified at no cost to the Owner Representative.

B. Comply with PEC, ANSI TIA/EIA and BICSI Installation Manual.

28.4 COORDINATION

A. Coordinate the layout and installation of cabinet, racks, frames and enclosures with communication cabling installation, data switches, termination fields and patch panels, and all other equipment to mount inside cabinets, enclosure, racks, etc.

B. Adjust arrangements and location of equipment in ERs and TRs to accommodate and optimize arrangement and space requirements as approved by the Owner representative.

C. Coordinate with other sect as required ensuring that the entire work will be carried out in orderly, complete, and organized fashion.

PART 29 - PRODUCT

29.1 GENERAL

A. Open freestanding equipment rack shall not be permitted

29.2 EQUIPMENT

A. Equipment cabinet shall be either freestanding or wall mounting equipment cabinet/ enclosures and size as required in the drawings. Equipment cabinet shall be modular steel unit and equipped with the following:

1. Fans for ventilation.
2. Hinged doors with reversible swing and lock for protection.
3. Contain rail conforming to EIA rs-310-D standard for mounting standard 482- mm equipment Grounding busbar kit inside equipment rack.
4. Transparent front door and vented rear door.
5. Power strip with surge protection and have minimum of 6-receptacle outlets on the power strip.
6. Vertical wire management extending the full height of the rack including both sides: front and back.
7. Contain knockouts for cable accessed along the top, bottom, or rear panels.
8. Wall mount Equipment cabinets shall be accessible from both front and back access.
9. Freestanding cabinets shall be accessible front and back.

PART 30- EXECUTION

30.1 INSTALLATION

A. Verify the installation method specified by the manufacturer prior to installation.

B. Ensure the cabinets will fit to the footprint allocated prior to attempting installation.

C. Connect ground busbar in cabinet/rack to TBB or TMGB.

D. Securely fasten floor mounted cabinet/racks to the floor with anchors, expansion bolt, etc. coordinate with structural engineer for the proper type and use of bolts.

E. Plan for the space needed for the installation of both equipment and cable.

F. Support the top of the floor mounted cabinet/ racks by bracing it to the wall, support barrier, or ladder rack. Consult a seismic engineer when seismic bracing is required.

G. Plan for the equipment to be installed in the cabinet/rack. Ensure that the open space recommendation adhere to for airflow between electronic equipment. Also ensure that is adequate space for cable so that bend radius and separation requirements are met.

PART 31 –GENERAL

31.1 SUMMARY

A. This Section includes cable management materials, equipment and installation practices required for a fully operational, certified telecommunication cabling system compliant with all applicable codes and standards.

B. Standard and Codes References:

1. ANSI/TIA/EIA – 568B.1 and all for Commercial Building Telecommunication Cabling Standard Part 1: General Requirements.
2. ANSI/TIA/EIA – 569-B and all addenda for Commercial Telecommunication Pathway and Spaces.

C. ANSI/NECA/BICSI 569-2001 - Standard for Installation Commercial Building Telecommunication Cabling.
D. PEC – Philippine Electrical Code, Latest Edition.
E. ANSI/J-STD -607A" Commercial Building Grounding (Earthing) and Bonding Requirements for telecommunication"

31.2 SUBMITTAL

A. Shop drawings: include the following:

1. Provide detailed elevation drawings of each equipment cabinet in the TR's, ER's. Drawing shall be in scale not less than 1.20.
2. On the drawing include a material schedule of telecom equipment that will be used at each TRs and ERs including manufacture, part number, quantities and function.

B. Provide manufacturer's literature and sample of telecommunication installation materials.
C. Provide resumes and or copies of certificates for field personnel a minimum of six months prior to installation of communication equipment and cabling in accordance with the Quality Assurance section of this specification.

31.3 QUALITY ASSURANCE

A. Contractor Qualification: Contractor shall have on staff a Registered Communication Distribution Designer (RCDD) certified by Building Industry Consulting Service International (BICSI). The RCDD shall have inspected the work at the completion of the project. Installation field supervisor must be certified by BICSI at the installer level and certified by the manufacturer to install or test the cable. Untrained technician assigned to this project shall be trained and certified at no cost to the Owner Representative.

B. Obtain cable management and ladder rack and all accessories through one single manufacture.

C. Match the components and interconnection for optimum future performance.

D. Comply with PEC, ANSI TIA/EIA and BICSI Installation Manual.

31.4 COORDINATION

A. Coordinate the work in this section with this section as required ensuring that the entire work will be carried out in orderly, complete and organizes fashion.

PART 32- PRODUCT

32.1 CABLE MANAGEMENT AND LADDER RACKS

A. General Equipment and components shall not be intern=mixed between different manufacturers.
B. Manufacturers: Provide equipment and components from the following manufacturer or manufacturer approved by the Project Director.

C. Ladder rack shall have a maximum load and minimal deflection is 433lb/mm when supported every 1.5 meters.
D. Ladder rack shall be constructed of rectangular steel tubing.
E. All accessories shall be one single manufacturer.
F. Field constructed accessories such as transit; splices, bends, etc are prohibited.
G. Provide radii and bends for smooth cable transit for turns and drops.
H. Radii and bends shall be constructed of the same material as the ladder rack.
I. Provide junction splices to join pieces of ladder rack.
J. Junction for ladder rack shall be used to allow transit in various direct.
K. Junction for ladder rack shall be constructed of solid tubular steel
L. Junction for ladder rack shall be UL listed.
M. Metal D-rings may be used to route and cable inside telecommunication room and equipment rooms.
N. Minimal size of D-rings shall be 50mm.
O. D-ring edges shall be rolled to prevent scratches and nicks of cable jacket.
P. Metal D-rigs shall be corrosion resistant and fire resistant.
Q. Cable straps shall be manufactured for the specific use of bundling cable.

32.2 J-HOOKS

A. Provide equipment from the following manufacturer or manufacturer approved by the Project Director.
B. J-hooks shall have a wide base.
C. J-hooks shall have galvanized finish.

PART 33- EXECUTION

33.1 EXAMINATION

A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for the compliance with space allocation, installation tolerances, hazards to cable installation, and other condition affecting installation. Proceed with the installation only after unsatisfactory condition have been corrected.

33.2 INSTALLATION

A. Comply with all requirements ANSI/TIA/EIA 568-B.1-B.2 and B.3 and EIA 569-B standards.
B. Provide sufficient support for the ladder rack s and installed cables.
C. Install J-hook at 1.22 m or 1.5 m interval.
D. Bridle rings are not allowed.
E. Installation of J-hooks is limited to transit from cable tray to conduit drops. Any other application must be approved by USG.
F. Allowance for change and expansion:
G. Horizontal Distribution Expansion: Provide 25 percent minimum for pathways, number of outlets and termination devices in TR.
H. Backbone Expansion: Provide 50 percent minimum of pathways.
I. Provide horizontal wire management above and below patch panel (copper and fiber) and switches.
J. Provide horizontal wire management on the back of each copper patch panel.
K. For equipment cabinets/enclosures provide vertical cable management extending the full height of the rack including both sides.
L. Cable ties shall be installed loosely, so they do not damage or deform the cable. They shall be able to spin around the bundled cable.
M. Cables may not be bundled with tape, rope, rubber bands, etc.

33.3 GROUNDING

A. Bond all ladder rack and other metallic hardware used for communication distribution to the nearest grounding busbar. Ensure that bonding breaks through paint to bare metallic surface of all painted metallic hardware.

PART 34 - GENERAL - LOCAL AREA NETWORK (LAN) SYSTEM

34.1 SUMMARY

A. This Section includes installation of Local Area Network (LAN) systems that will be used for computer networks and installation of system components and equipment conforming to applicable codes and standards.

B. Related Sect include the following:

1. Consumer Electronics Association (CEA)
   CEA-310-E (2005) Racks, Panels, and Associated equipment

2. Institute of Electrical and Electronics Engineers (IEEE)
   IEEE C62.41 (1991; R1995) Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

3. Underwriters Laboratories (UL)
   UL 1449 (2006) Surge Protective Devices

34.2 SUBMITTALS

A. Make submittals for the LAN system in accordance with the requirements of this specification.

B. The Contractor shall submit a fully technical and mechanical description of every piece of equipment and cables to be used, including manufacturer's technical literature.

C. The Contractor shall provide a description of the methods proposed to show that the actual performance will be in accordance with the specification for technical performance, including necessary test methods, procedures, and equipment that will be used.

D. Submit shop drawings to include the following:

1. System Diagram.

2. Floor plan layouts, sectional view and installation details.

E. Submit samples of cables and other components as required.

F. Submit as-built drawings to include the following:

1. Floor plan layouts, sectional view and installation details.

2. List of major components and their place in the system.

3. Synopsis of the numbering scheme and cross connect log.

G. Submit O&M manuals, including test results.

34.3 QUALITY ASSURANCE

A. Electronic Components: Comply with latest applicable standards of EIA; PEC; standard industry grade; types and ratings commonly available in local distributor without prior written approval from the Project Manager.

B. Entire system, including mounting, installing, connecting, aligning, testing and adjusting, to be the responsibility of one contractor.

C. Engineer in-charged shall be a duly Registered Electronics Engineer supervised by a Professional Electronics Engineer as required by R.A. 9292 and the IRR of revised National Building Code.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 35 - PRODUCTS

35.1 STANDARD PRODUCTS

Material and Equipment to be provided shall be the standard products of a manufacturer regularly engaged in the manufacture of such products, and shall essentially duplicate material and equipment that have been in satisfactory use at least 2 years. All components used in the system shall be commercial designs that comply with the requirements specified.

A. Identical Items

1. Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.

B. Nameplates

1. Each major component of equipment shall have the manufacturer's name, address, model and catalog number, and serial number on a plate secured to the equipment.

35.2 Network Switch

1. Minimum Specifications

- Port**:** 48 RJ-45 connectors for 10BASE-T/100BASE-TX/1000BASE-T with 4 Gigabit combo ports shared between mini-GBIC ports; console port; auto MDI/ MDI-X; auto negotiate/manual setting; RPS port for connectin
- Cabling type: Unshielded twisted pair (UTP) Category 5 or better for 10BASE-T/100BASE-TX; UTP Category 5 Ethernet or better for 1000BASE-T
- Switching capacity: 96 Gbps nonblocking
- MAC table size: 8000
- Number of VLANs: 256 active VLANs (4096 range)
- VLAN :Port-based and 802.1Q tag-based VLANs, protocol-based VLAN, management VLAN, multicast TV VLAN, PVE, GVRP
- Layer 3 options: Static routing; classless interdomain routing (CIDR); 60 static routes; IPv4; forwarding in silicon – wirespeed forwarding of Layer 3 traffic
- Spanning Tree: IEEE 802.1D Spanning Tree ,IEEE 802.1w Rapid Spanning Tree, IEEE 802.1s Multiple Spanning Tree and Fast Linkover

35.3 Computer

- I3 Processor
- 4GB RAM
- 1TB Hard Disk
- Windows 10 Profession OS
- 23-inch Monitor

35.4 UPS BACK UP

- 1500VA

35.5 Equipment Racks

Equipment shall be mounted on 482.6mm and 9 inch racks in accordance with CEA-310-E and located as shown on drawings. Ventilated rear panels, solid side panels, and solid top panels shall be provided. Equipment racks shall be provided with lockable front panels that limit access to equipment. The lockable front shall not cover items that require operator access such as am/fm tuner, CD player, or tape player. Rack cooling shall be through (perforated or louvers in front panels to ensure adequate ventilation of equipment) (top rack mounted fan.) The racks and panels shall be factory finished with a uniform baked enamel over rust inhibiting primer.

35.6 Cables

Cable shall be Cat5, 4 pairs shielded. EMT Conduit shall be used to house the cable.

35.7 Surge Power

A. Power Line Surge Protection

Major components of the system such as network switch and computers, shall have a device, whether internal or external, which provides protection against voltage spikes and current surges originating from commercial power sources per IEEE C62.41 B3 combination waveform. Fuses shall not be used for surge protection. The surge protector shall be rated for a maximum let thru voltage of 350V ac (neutral-to-ground).

B. Signal Surge Protection

Major components of the system shall have internal protection circuits which protects the component from mismatched loads, direct current, and shorted output lines. Communication cables/conductors shall have surge protection installed at each point where it exits or enters a building.

PART 36 - EXECUTION

36.1 INSTALLATION

A. General:

Install all system components and appurtenances in accordance with the manufacturer's instruct and as specified herein.

B. Equipment Racks:

Racks shall be mounted side-by-side and bolted together. Items of the same function shall be grouped together, either vertically or side-by-side.

All connect to power supplies shall utilize standard male plug and female receptacle connectors with the female receptacle being the source side of the connection.

I. Wiring:

Wiring shall be installed in EMT conduit cable tray, or electric metallic tubing. Wiring for signal circuits shall terminate on identified terminal blocks in cabinets and master station enclosures. Cable shield shall be grounded at all points of termination.

J. Grounding:

All grounding practices shall comply with PEC article 2.50. The antenna mast shall be separately grounded. Equipment shall be grounded to the serving panelboard ground bus through a green grounding conductor. Metallic conduits serving the equipment shall be isolated on the equipment end with an insulating bushing to prevent noise from being transferred to the circuit. Equipment racks shall be grounded to the panelboard ground bus utilizing a #8 conductor. Grounding conductor shall be terminated to the rack using connector suitable for that purpose.

36.3 FIELD QUALITY CONTROL

A. Acceptance Tests:

1. After installation has been completed, contractor shall conduct an acceptance test in the presence of contracting officer or its representative, to demonstrate that the equipment operations in accordance with specification requirements. Contractor shall notify the contracting officer (2 weeks) prior to performance of tests. The acceptance tests shall include originating and accepting messages at specified stat, at proper volume levels, without cross-talk or noise from other links or non-designated units.

2. Retesting:
Rectify deficiencies indicated by tests and completely reset work affected by such deficiencies at contractor's expense.

PART 37 - GENERAL (CCTV SYSTEM)

37.1 GENERAL REQUIREMENTS

A. The intent of this specification is to provide a complete security system, (CCTV). All equipment, devices and installation materials required to for the completion of the project shall be furnished whether or not specifically enumerated herein or on the electronic plans. The specification covers minimum requirements and is not intended to preclude provision of equipment or methods that exceeds the requirements.

B. The Contractor or Installer shall review all project plans and specification completely and be familiar with the requirements of the system.

C. The Contractor or Installer shall furnish and install a complete Closed Circuit Television (CCTV) system as shown in the plans and drawings. All installation to be done shall be in accordance with the applicable codes and standards and governed by existing rules and regulation of the locality and Local Government Unit (PSC) and other concerned agencies.

D. CCTV system to be installed shall be IP based and comply with the standard requirements . The system shall be wired as Structured Cabling System (UTP Cabling).

E. The Contractor or Installer shall be responsible for ensuring that a complete, satisfactory and working system is provided.

37.2 QUALITY ASSURANCE

A. Manufacturer: Regularly engaged in the production of CCTV equipment and recording devices, of types, sizes and electrical characteristics required whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installer: Qualified with at least 5 years of successful installation experience on projects with CCTV systems installation work similar to the requirement of this project. The installer shall be an authorized factory representative of the supplied equipment, and employ full time, factory trained technicians.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with the Latest Edition of Philippine Electrical Code (PEC).

37.3 SUBMITTALS

A. Product Data: Submit manufacturer's data on all equipment, and cable, including but not limited to, roughing-in diagrams and instruct for installation, operation and maintenance, suitable for inclusion in maintenance manuals.

B. Shop drawings for the system provided under this section of the specification shall contain but not limited to the following:

1. Specification data sheets on each individual system component.

2. Complete wiring diagrams for all devices and control panels.

3. Conduit layouts on project floor plans, including wire and cable types and count in each conduit run.

4. Mounting details and location of cameras.

5. Battery calculation that substantiate requirement for a minimum standby operation of all CCTV systems and devices for a minimum of 4 hours.

6. Voltage Drop calculation for any voltage outputs to ensure proper operating voltage at the device.

7. Test Plans for all devices.

C. Manuals: Submit simultaneously with the shop drawings, complete operation & maintenance manuals, including technical data sheets. Provide a clear and concise description of operation that gives, in detail, the information required to properly operation the equipment and system. Wiring diagram shall indicate internal wiring for each device and the interconnection between the items of equipment.

D. Provide complete sets of as-built drawing to the owner including any deviation from the submittal data and shop drawings, complete programming, installation, operation and maintenance information including all access codes and user data bases.

PART 38 - PRODUCTS

38.1 SERVER PC

- Intel Xeon CPU 3.3 GHz
- 8GB RAM
- 2x500gb HDD (for every 17 cameras) @ 7000 rpm
- 100/1000 Mbps network card
- Windows Server 2012 R2 Standard

38.2 WORKSTATION PC

- i3-6100 3.7 GHz
- 8GB RAM
- 1TB HDD @ 7200 rpm
- Intel® HD Graphics 530
- 2 x 1 Gigabit Ethernet
- DVD/RW internal drive

- Windows 10 Professional
- 29-inch CIF LCD monitor w/ 9 screens

38.3 360° Outdoor Camera

- Image Sensor: 5 megapixel; Array Format (Active) 2592H x 1944V = 5,038,848 pixels; 1/2.5-inch CMOS Sensor Vandal proof
- Angle of View: 180° hemisphere
- Lens: 185° 1.6mm / F2.0
- Minimum Illumination: 0.2 lux = 50 IRE F/2.0 (6500K)
- Frame Rate: 30fps typical for 1MP resolution and ¼MP resolution, 15fps typical for 2MP resolution and up to 10fps for 4MP full resolution
- Video Motion Detection 16 polygonal regions; configurable response; adjustable characteristics
- On-Board Storage SD card slot
- Networking: CAT5 or better for 100Base-TX
- Protocols: TCP/IP, HTTP, DHCP, DNS, NTP, FTP, SMTP, RSTP, uPNP
- Security: User Account and Password Protection
- Operating Temperature: -40 to +55°C (-40 to +131°F)
- Operating Humidity: Up to 98% (In accordance with BS EN 60068-2-30 Test Db variant 1 using test methodology BS EN 50155)
- IP rating: IP66 / IK10
- Power Source: 12V, 1.0A (min) “LPS or NEC Class 2” power supply or Power over Ethernet (PoE), IEEE standard 802.3af

38.4 360° Indoor Camera

- Lens Field of View: 180º Horizontal, 180º Vertical Angle of View: 180° hemisphere
- Image Sensor: 4072 H x 3046 V, 12.4 MP (approximately), 1/2.3 in. Sony CMOS
- Lens: 185° / F2.0
- Minimum Illumination: 0.1 lux = 50 IRE F/2.0
- Frame Rate: 12 fps typical at maximum resolution
- Video Motion Detection: 8 configurable regions On-Board Storage SD card slot
- Networking: CAT5 or better for 100Base-TX
- Protocols: TCP/IP, HTTP, DHCP, DNS, NTP, FTP, SMTP, RSTP
- Security: Configurable password protection
- SD Card: Built-in SD card slot. Supports cards up to 128 GB capacity. Speed class 10 or higher required
- Analog Video Out Test port for production, not available in normal operation
- Ports: RJ45 for 1000Base-TX, 2.1 mm DC Input jack, 6-pin 1.5 mm Phoenix for external I/O BNC for test video output
- Network Cable Type: RJ45 for 1000Base-TX, 2.1 mm DC Input jack, 6-pin 1.5 mm Phoenix for external I/O BNC for test video output, CAT5 or better for 1000Base-TX
- Operating Humidity: Up to 98% (In accordance with BS EN 60068-2-30 Test Db variant 1 using test methodology BS EN 50155)
- IP rating: IP66 / IK10
- Power Source: 12 VDC, 1.0 A (min) LPS or NEC Class 2 power supply or Power over Ethernet (PoE), IEEE standard 802.3af
- Camera Mount: Indoor Recessed mount
- Housing Material: Aluminum with polymer trim cove

38.4 BULLET TYPE CAMERA

- Resolution: 1920x1080 (2MP)
- Image sensor: progressive scan
- Imager type and size: 1/2.9" CMOS
- Signal system: NTSC/PAL

- Minimum illumination: 0.01Lux @ (F1.2, AGC ON), 0 Lux with IR
- Day night type: IR cut filter with auto switch, night vision with IR
- IR cut filter with auto switch, night vision with IR: ≥ 52dB
- Camera angle adjustment: pan ±180°, tilt 0° to +90°, rotation ±180° (depending on mounting configuration)
- Memory: 2GB RAM. 16MB Flash
- Video compression: H.264 / H.265 / H.264+ / H.265+
- Frame rate: main-stream: 2MP 1080P(1920x1080), 960P(1280x960), 720P(1280x720) @ 1-30fps sub-stream: 2MP 1080P(1920x1080), 960P(1280x960), 720P(1280x720) @ 1-30fps mobile-stream: 720P(1280x720), VGA(640x480), QVGA(320x240) @ 1-30fps
- Video streaming: triple streaming: unicast, multicast, mobilecast
- Protocols: TCP/IP, HTTP, DHCP, DNS, DDNS, RTP/RTSP, PPPoE, SMTP, NTP, UPnP, FTP
- Communication interface: RJ45 10M/100M Ethernet interface
- System compatibility: Onvif v2.6, iOS, Android, 3d Party SDK
- Input voltage: 12VDC ± 10%, PoE (802.3af)
- Power (PoE): 1.5W IR off 6.2W IR on

38.5 VIDEO MANAGEMENT SOFTWARE

- Centralized Management capability
- Supports H.264 video format
- Kerberos authentication

38.6 WIRES AND CONDUIT

A. Wires

- Wiring shall be in accordance to the Philippine Electrical Code (PEC).
- Wiring for CCTV shall be category cables
- Wiring shall be listed or approved by a recognized testing agency.

B. Conduit

- Wiring shall be in accordance to the Philippine Electrical Code (PEC).
- Number of conductors in conduit or raceway shall not exceed to percentage fill specified in Philippine Electrical Code.
- RNC conduit shall be schedule 40 and shall be embedded.

PART 39 - EXECUTION

39.1 INSTALLATION

A. The Contractor shall carefully follow instruction in documentation provided by the manufacturer to insure all steps have been taken to provide a reliable, easy-to-operation system.

B. The Contractor shall be responsible for provision and installation of all system components, conduit and wiring.

C. All equipment shall be tested and configured in accordance with the instruction provided by the manufacturer prior to installation.

G. All firmware found in products shall be the latest and most up-to-date provided by the manufacturer.

H. Installation of equipment devices that pertain to other work in the contract shall be closely coordinated.

I. All installation shall be in strict accordance with the Contract Documents, Manufacturers installation and wiring recommendation and comply with Philippine Electrical Code (PEC).

39.2 FIELD QUALITY CONTROL

A. Recommend the Contractor to perform preliminary walkthrough to check for installation quality, accurate performance of work and to verify engineering diagrams.

39.3 COMMISSIONING

A. Manufacturer's Field Service: Engage a manufacturers' authorized representative to inspect final system connection, perform complete functional test of the system and submit a written report to the designer attesting to satisfactory operation of the system.

B. Testing: The owner representative will procure the services of an independent test firm to perform acceptance testing of each section or the infrastructure and inspect the installation to ensure all work has been performed in accordance with all contract document.

1. All testing will be witnessed by the designer and owner's maintenance representative.

2. The Contractor shall be present during acceptance testing to replace/repair all work that fails

3. Contractor is financially responsible for all cost incurred to the Owner Representative's testing firm due to repair/replacement of failed cable, termination, equipment, etc during acceptance testing

4. Acceptance testing shall not begin until all work is complete.

39.4 TRAINING

A. Training shall be provided by the installer or product manufacturer free of charge to the assigned personnel for proper operation of equipment.

B. All training shall be conducted during normal business hours at a date and time of mutual convenience.

C. Training shall be conducted by a trainer who is factory certified in installation, programming, maintenance and operation of all supplied components.

PART 40 – GENERAL (FIRE ALARM AND FIRE DETECTION SYSTEM)

40.1 GENERAL REQUIREMENTS

A. The work to be done in this Technical Specification consists of the Electrical and Auxiliary Systems and related works, such as but not limited to fabrication, supply, delivery, and installation – complete in all aspects. All works and materials incidental to the completion of the project shall be included herein, except port of works explicitly stated to be done by others. All works shall be in accordance with the latest edition of the Philippine Electrical Code, the regulation of the locality, the manufacturer's standards, the requirements of the utility company and this Specification. This specification provides a broad outline of the required system and associated equipment, but not includes all details of equipment's design and construction.

B. Standards and Codes References:

1. Philippine Electrical Code (PEC)
2. National Building Code of the Philippines (NBCP)
3. Fire Code of the Philippines (RA 9514)
4. Building Industries Consulting Services International (BICSI)

C. A semi-addressable, "open protocol" FDAS shall be provided.

40.2 SUBMITTALS

A. Shop Drawing Include the following:

1. The Electrical Contractor shall prepare and submit for approval to the Design Engineer shop drawings, samples, and cuts of all equipment, wires, wiring devices, and fixtures to be supplied. After final approval by the Engineer, a sufficient number of copies as directed shall be furnished for distribution.

B. Product Data: Provide manufacturer's literature and sample of telecommunication installation materials

C. Qualification: Qualified personnel include individuals who can demonstrate experience on similar system and have the following qualification:

1. Factory trained and certified in fire alarm system design.
2. Licensed or certified by a local authority.

40.3 QUALITY ASSURANCE

A. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems.

B. Comply with PEC, and RA 9514.

40.4 COORDINATION

A. Coordinate the work in this section with other sect as required ensuring that the entire work will be carried out in orderly, complete, and organized fashion.

40.5 SYSTEM REQUIREMENTS

A. Positive alarm sequence provides a timed delay of general alarm signal in a building and at a supervising station. This gives a trained responder up to 3 minutes to investigate the cause of an alarm signal. The time limits to acknowledge the alarm signal and reset the system are designed to assure all alarm system function are actuated in the event personnel are not available to acknowledge, investigate and reset the alarm. The pre-signal feature is usually used only in special occupancies where fire does not necessarily pose an immediate threat to the occupants.

B. The signal from an automatic fire detection device selected for positive alarm sequence operation shall be acknowledge at the control unit by trained personnel within 15 seconds of annunciating in order to initiate the alarm investigation phase. If the signal is not acknowledged within 15 seconds, notification signals in accordance with the building evacuation or relocation plan and remote signals shall be automatically and immediately activated.

C. Trained personnel shall have up to 180 seconds during the alarm investigation phase to evaluate the fire condition and reset the system. If the system is not reset during the investigation phase, notification signals in accordance with the building evacuation or relocation plan and remote signals shall be automatically and immediately activated.

D. If a second automatic fire detector selected for positive alarm sequence is actuated during the alarm investigation phase, notification signals in accordance with the building evacuation or relocation plan and remote signals shall be automatically and immediately activated.

E. The system shall provide means for bypassing the positive alarm sequence.

PART 41 – PRODUCT

41.1 EQUIPMENT

A. Equipment constructed and installed in conformity with the Code shall be listed for the purpose for which it is used. Fire alarm system components shall be installed in accordance with manufactures installation instruction. In accordance with PEC 2009, Article 7.60 fire alarm products must be listed for the specific fire alarm system application for which they are used.

41.2 Fire Alarm Control Panel (FACP)

A. A system component that receives inputs from automatic and manual fire alarm devices and might supply power to detection devices and to a transponder(s) or off premises transmitter(s).

B. FACP shall be properly protected in any possibility of damage by induced transients in accordance with the requirements of Latest Edition of PEC.

C. The FACP shall be key operated, located within a locked enclosure, or arranged to provide equivalent protection against unauthorized use.

D. Minimum Specifications

1. Equipped with USB port or Ethernet port for remote and local programming of the control panel.
2. Addressable device capacity – 120 minimum
3. Programmable software zones - 120 minimum
4. Power input – 120 or 220 VAC
5. Operating Temperature 0 – 49°C/32– 120°F and at a relative humidity 93% ± 2% RH (noncondensing) at 32°C ± 2°C (90°F ± 3°F).

41.3 System Components

A. Heat Sensing Fire Detector. (Rate of Rise)

1. Heat detector shall initiate an alarm when the temperature rises greater than 135˚F.

2. Heat detector shall be ceiling type for semi flush mounted. Provide LED lamp indicator showing that the detector is activated.

3. Minimum Specifications
   a. Operating Temperature Range –20°C to 38°C (–4°F to 100°F)
   b. Relative Humidity 10%-93% non-condensing.
   c. Thermal Ratings Fixed-temperature set point 135°F (57°C).
   d. Voltage Range 15-32 volts DC peak.

B. Smoke Sensing Fire Detector. (Photoelectric)

1. Photoelectric Smoke Detector (Light-Scattering). When smoke particles enter the light path, some of the light is scattered by reflection and refraction onto the sensor. The light signal is processed and used to convey an alarm condition when it meets preset criteria.

2. Minimum Specifications
   a. Sensitivity UL Applications: 0.5% to 4.0% per foot obscuration/ ULC Applications: 0.5% to 3.5% per foot obscuration
   b. Operating Temperature Range: 0°C to 50°C (32°F to 122°F).
   c. Relative Humidity: 10%-93% non-condensing
   d. Thermal Ratings: Fixed-temperature setpoint 135°F (57°C)
   e. Voltage Range: 15-32 volts DC peak

C. Manual Fire alarm Box/Manual Pull Station

1. A manually operated device used to initiate an alarm signal.
2. Minimum Specifications

   a. General**:** Single-action pull station with pigtail connections, hex lock/ Switch contacts are normally open.
   b. Switch Contact Rating: Gold-plated; rating 0.25 A @ 30 VAC or VDC
   c. Auxiliary Contact Circuit: 3.0 A @ 30 VAC or VDC
   d. Voltage Range: 15-32 volts DC peak
   e. Standby Current: 200µA @ 24VDC

D. Siren/Horn with Strobe Light

1. Minimum Specifications
   a. Horn Ratings: 88+ dBA at 16 volts/ Rotary switch for horn tone and two volume selections
   b. Strobe Ratings: Automatic selection of 12- or 24-volt operation at 15 and 30 candela
      Candela Settings: 15, 30, 75, 95, 110, 135, and 185
      1 Flash per second
   c. Operating Temperature: 32°F to 120°F (0°C to 49°C)
   d. Humidity Range: 10 to 93% non-condensing
   e. Nominal Voltage: Regulated 12 DC or regulated 24 DC/FWR1 (full wave rectified)
   f. Operating Voltage Range: 8 to 17.5 V (12 V nominal) or 16 to 33 V (24 V nominal)
   g. Mounting: Wall

41.4 Wires and Conduits.

A. Wires -GENERAL

In the event of fire the cables shall maintain the active safety of electrical circuit integrity at the operating voltage. They shall also have passive safety of flame retardation with a Limiting Oxygen Index of more than 40%, low toxicity, low fire load, low smoke and zero halogen.

Cables shall be suitable for installation in wet or dry location, in conduits, concealed, free on the air, on cable trays or supports and direct underground. Cables that pass the system integrity tests shall be preferred.

The cables shall be tested with LPCB and DIN 4102: Part 12 which assesses the ability of enclosure systems in maintaining the function a cable performance, for a period of time when exposed to a fully developed external fire according to ISO 834 time-temperature curve.

CABLE CONSTRUCTION

Cables to be used shall be manufactured according to relevant standards.

Flexible cables shall have the copper conductors wrapped with glass mica composite tape flame barrier (with special resin bonding material) and be insulated with a non-melt cross linked flexible mineral insulation and mineral sheath.

1. Mechanical properties and termite repellent

Metal Armouring (where necessary for stronger mechanical protection, harmonics /EMC screening and rodent/termite resistant).

The armour shall consist of two overlapping steel tapes for multicore cables. For single core cables copper or aluminum tape armour shall be used.

The armour shall be designed to total enclose the cable maintaining 30% overlapping. This is to prevent termites from penetrating any armouring gap.

Non toxic hard coating materials shall be used for the purpose of termite or rodent resistance.

The cables shall have bending radius of no less than 8 times of the cable diameter for single core cable and 6 times for multicore cable. Insulation materials shall be suitable for continuous operation at 110 °C for 20'000 hours according to IEC 216 or VDE 0304 Pt 21 and all cables shall be tested to the following international standards. 3rd party test certificates and reports shall be submitted to substantiate the compliance to the following international standards.

2. Electrical Fire Performance Standards

- **Electrical Circuit Integrity**

  BS 6387Category CW and Z

  DIN VDE 4102 E30 Part 12

  IEC 60331-11/-21

  EN 50200

- ***Electrical System Integrity Test***

  DIN VDE 4102 E30 Part 12

- ***Flame Retardant Test***

  IEC 60332-1

EN 60332-1

VDE 0482 p.332-1

- ***No Flame Propagation Test***

  IEC 60332-3-21,22,23,24 Category A,B,C,D

  EN 50266-2-4

  VDE 0482 p.266-2-4

- ***Limiting Oxygen Index***

  ASTM D 2863 Insulation > = 40% O_2

  Sheathing >= 40% O_2

- ***Smoke Obscuration***

  DIN VDE 0482 – 1034

  EN 61034

  IEC 61034 the light transmission value of greater than 84% shall be maintained

- ***Halogen Content and Toxicity***

  The cables shall be halogen free and do not release any corrosive emission when subjected to fire.

  Naval Engineering Standards NES 713 with the toxicity index lowerthan 2

  NFC 20 - 454 ITC < = 5 INC < = 95

  Cables shall comply to IEC 60754-1 and 60754-2, and also shall not emit toxic gases and contain very low organic contents. Complying to DIN VDE 0472 - 813 andNES713 NFC 20 -454.

  EN 50267-2-1

  EN 50267-2-2

  VDE 0482 p 267-2-1

  VDE 0482 p 267-2-2

- ***Fuel Element***

  To minimise the generation of heat if subjected to fire, the insulation and sheathing material must not have a heat of combustion greater than 7,700 Btu/lbor 13 kg/gram.

- ***Short Circuit and Overload Resistant***

  Cables shall be able to withstand a short circuit temperature of 280^{o}C for 5 seconds.

- ***Quality Control***

  Companies manufacturing cables shall be accredited to the ISO 9001quality assurance standards and is listed with VDE Testing and Certificate Institute. Thus all the products supplied must carry VDE Certification mark.

- ***Environmental Control***

Companies manufacturing cables shall be accredited to the ISO 14001:2004 environmental accredited and do not supply or use any material that does not fulfill the requirements of RoHS-guideline 2002/95/EC. Neither do use any of the PAH's described in Directive 2005-69-EC. Neither the products contain Perfluorooctanesulphonate (PFOS) or Directive 2006/122/EC, nor are such substances used in the manufacture of products.

3. TESTING & CERTIFICATION

The manufacturer shall provide a Third Party certification from an International Recognized Testing Institute or Fire Laboratory (e.g. LPCB, VDE, ELECTROSUIESS) to ensure that the all fire resistant(FR) cable comply which include the lists above.

The manufacturer of the FR cables shall be certified to ISO 9001 & 14001:2004 International Quality Standard and Environmental Management System. The manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001 & 14001:2004.

4. INSTALLATION

Cables must be securely fixed with steel or copper cable clips or ties (non-magnetic steel for single core cables) to inclined or vertical trays or fixed with steel fasteners to the fire resistant parts of building structure. Steel expanding securing bolts or percussion fastening systems are recommended.

Termination by crimping is recommended. Joints or tap-off in cable runs should be made in folded steel junction or cast iron junction boxes with porcelain terminals.

Flame proof glands are not necessary unless dictated by the class of hazardous location.

Metal glands or close fitting metal bushes are recommended for all cable entries. All joints in cables should be made in such a way as to maintain the fire circuit integrity and the manufacturer shall have a tested jointing system with test reports indicating compliance. Standard applicable include DINVDE 4102

Should cables be installed in areas where they maybe subjected to mechanical damage, then suitable mechanical protection shall be provided. Steel conduit or metal tray covers are recommended.

A. <u>On Cable Tray/Ladder</u>

Cables should be secured with *metal fixings such as stainless steel cable ties, strapping or cable clamps with the following minimum recommended fixing distances:

Vertical, Inclined or Unsupported

For cables or cable bunches of diameter < = 25mm fix every 600 mm
For cables or cable bunches of diameter > = 25mm fix every 300 mm

Horizontal where supported by the ladder or tray - Fix every 1,000mm. Trays/ladders should be fixed to the fire rated elements of the building structure using steel expanding bolts or similar system not incorporating flammable materials such as nylon. Trays and bolts should only be loaded to 50% of the manufacturers recommended maximum.

B. <u>Direct fixing to walls, ceilings and in PVC conduits</u>

Cables/conduits should be secured with *metal saddles (generally galvanized steel) using steel expanding bolts or similar system not incorporating flammable materials such as nylon.

Minimum recommended fixing distances are as follows:-

Vertical, Inclined or Unsupported fix every 600mm

For cables, cable bunches or PVC conduits containing cable bunches of diameter <= 25mm fix every 600 mm.

For cables, cable bunches or PVC conduits containing cable bunches of diameter >= 25mm fix every 300 mm.

Horizontal, where supported by a fire rated surface
Fix every 1,000 mm.

C. Steel Conduits

Conduits should be secured with *metal saddles (generally galvanized steel) using steel expanding bolts or similar system not incorporating flammable materials such as nylon.

Vertical, Inclined or Unsupported

Fix every 600 mm

Horizontal where supported by a fire rated surface

Fix every 1,000 mm

D. Catenary Wire

Cables must be secured to catenary wires using *metal fixings such as stainless steel cable ties or strapping with the following minimum fixing distance.

For cables or cable bunches of diameter <= 25 mm fix every 600 mm

For cables or cable bunches of diameter >= 25 mm fix every 300 mm

Catenary wires should be secured to fire rated elements of the building structure and should be only loaded to 50% of the manufacturers recommended maximum.

E. Unsupported Spans

No unsupported span over 600 mm for cable or cable bunches diameter <= 25 mm.

No unsupported span over 300 mm for cable or cable bunches diameter >= 25 mm.

*Metals such as steel and copper are deemed suitable. Brass is not suitable due to its lower melting point.

These recommendation are considered minimum requirements and should be read in conjunction with local statutory requirements

B. Conduit

1. Conduit shall be in accordance to Philippine Electrical Code (P.E.C.).
2. Number of conductors in conduit or raceway shall not exceed to percentage fill specified in Philippine Electrical Code.
3. RNC conduit shall be scheduled 40 and shall be embedde

PART 42 - GENERAL (TELEPHONE SYSTEMS)

42.1 SUMMARY

A. This Section includes Telephone System and installation of system components and equipment conforming to applicable codes and standards.

B. Related Sect include the following:

1. Consumer Electronics Association (CEA)
   CEA-310-E (2005) Racks, Panels, and Associated equipment

2. Institute of Electrical and Electronics Engineers (IEEE)
   IEEE C62.41 (1991; R1995) Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits

3. Underwriters Laboratories (UL)
   UL 1449 (2006) Surge Protective Devices

42.2 SUBMITTALS

A. Make submittals for the telephone systems in accordance with the requirements of this specification.

B. The Contractor shall submit a fully technical and mechanical description of every piece of equipment and cables to be used, including manufacturer's technical literature.

C. The Contractor shall provide a description of the methods proposed to show that the actual performance will be in accordance with the specification for technical performance, including necessary test methods, procedures, and equipment that will be used.

D. Submit shop drawings to include the following:

1. System Diagram.
2. Floor plan layouts, sectional view and installation details.

E. Submit samples of cables and other components as required.

F. Submit as-built drawings to include the following:

1. Floor plan layouts, sectional view and installation details.
2. List of major components and their place in the system.
3. Synopsis of the numbering scheme and cross connect log.

42.3 QUALITY ASSURANCE

A. Electronic Components: Comply with latest applicable standards of EIA; PEC; standard industry grade; types and ratings commonly available in local distributor without prior written approval from the Project Manager.

B. Entire system, including mounting, installing, connecting, aligning, testing and adjusting, to be the responsibility of one contractor.

C. Engineer in-charged shall be a duly Registered Electronics Engineer supervised by a Professional Electronics Engineer as required by R.A. 9292 and the IRR of revised National Building Code.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in PEC 2009, Article 1.1, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 43 - PRODUCTS

43.1 STANDARD PRODUCTS

Material and Equipment to be provided shall be the standard products of a manufacturer regularly engaged in the manufacture of such products, and shall essentially duplicate material and equipment that have been in satisfactory use at least 2 years. All components used in the system shall be commercial designs that comply with the requirements specified.

A. Identical Items

1. Items of the same classification shall be identical. This requirement includes equipment, modules, assemblies, parts, and components.

B. Nameplates

1. Each major component of equipment shall have the manufacturer's name, address, model and catalog number, and serial number on a plate secured to the equipment.

43.2 PBX System

1. Hybrid IP PBX System
    a. Maximum number of Simple Telephone extensions -64
    b. Control Bus: Original bus (16-bit, 8 MHz, 10 megabytes per second)
    c. Power Input: 100-240 VAC
    d. Maximum Power Failure Tolerance: 300 ms (without using backup batteries)
    e. Memory Backup Duration: 7 years
    f. Temperature – 0 - 40°C Humidity: 10 % to 90 % (non-condensing)
    g. Serial Interface Port: RS232/USB

43.3 Telephone Unit

a. Compatible with IP PBX System
b. Graphical LCD Front Panel
c. 6-levels Handset/Headset Volume
d. Full Duplex Speaker Phone
e. 24 Programmable Keys
f. Ethernet port connection
g. Power Supply: AC Adaptor, and Power over Ethernet (Power over LANTM (IEEE802.3af Class2)compliant) **43.7 Wires & Conduit**

A. **Wires**

- Wiring shall be in accordance to the Philippine Electrical Code (PEC).
- System Wiring shall be Cat5 Cables
- Wiring shall be listed or approved by a recognized testing agency.

B. **Conduit**

- Wiring shall be in accordance to the Philippine Electrical Code (PEC).
- Number of conductors in conduit or raceway shall not exceed to percentage fill specified in Philippine Electrical Code.

- EMT conduit shall be used and shall be embedded.

PART 44 - EXECUTION

44.1 INSTALLATION

A. The Contractor shall carefully follow instruction in documentation provided by the manufacturer to insure all steps have been taken to provide a reliable, easy-to-operation system.

B. The Contractor shall be responsible for provision and installation of all system components, conduit and wiring.

C. All equipment shall be tested and configured in accordance with the instruction provided by the manufacturer prior to installation.

D. All firmware found in products shall be the latest and most up-to-date provided by the manufacturer.

E. Installation of equipment devices that pertain to other work in the contract shall be closely coordinated.

F. All installation shall be in strict accordance with the Contract Documents, Manufacturers installation and wiring recommendation and comply with Philippine Electrical Code (PEC).

44.2 FIELD QUALITY CONTROL

A. Recommend the Contractor to perform preliminary walkthrough to check for installation quality, accurate performance of work and to verify engineering diagrams.

44.3 COMMISSIONING

A. Manufacturer's Field Service: Engage a manufacturers' authorized representative to inspect final system connection, perform complete functional test of the system and submit a written report to the designer attesting to satisfactory operation of the system.

B. Testing: The owner representative will procure the services of an independent test firm to perform acceptance testing of each section or the infrastructure and inspect the installation to ensure all work has been performed in accordance with all contract document.

1. All testing will be witnessed by the designer and owner's maintenance representative.

2. The Contractor shall be present during acceptance testing to replace/repair all work that fails

3. Contractor is financially responsible for all cost incurred to the Owner Representative's testing firm due to repair/replacement of failed cable, termination, equipment, etc during acceptance testing

4. Acceptance testing shall not begin until all work is complete.

C. TRAINING

1. Training shall be provided by the installer or product manufacturer free of charge to the assigned personnel for proper operation of equipment.

2. All training shall be conducted during normal business hours at a date and time of mutual convenience.

3. Training shall be conducted by a trainer who is factory certified in installation, programming, maintenance and operation of all supplied components.

FIRE PROTECTION WORKS TECHNICAL SPECIFICATION

FPS 100 : GENERAL CONDITION

A. The General Condition form a part of these specification and contract.

B. DRAWINGS AND SPECIFICATION

The Drawings and Specification are meant to be complementary to each other and what is called for by one shall be called for by both.

Any apparent conflict between the Drawings and Specification and any controversial or unclear points in either shall be referred to the Mechanical Engineer in Charge for final decision. On the plans, keep records showing all deviate occurring during construction. At the completion of the work, said copy of the plans shall be submitted to the PSC for its copy and file.

Upon completion of work as described herein the Contractor shall furnish the Owner, at his own expense, Five (5) copies of the "AS BUILT" plans for future reference and maintenance purposes.

C. CORRELATION OF WORK

The Fire Protection Contractor shall coordinate with the General Contractor and the PSC/Owner to determine how and where his work fits with that of other crafts, after familiarizing himself with the plans and specification. This shall be done at the beginning of construction. Should there be any existing doubt at any point, a ruling shall be secured from the PSC/Owner and shall be given time to inspect the work covering this point and to prepare a detail in the form of Drawings and written instruct as required.

D. PERMITS AND INSPECTION

The contractor shall obtain, at his own expense, all the necessary permits and Certificate of Mechanical Inspection from the proper government authorities required both for the performance of his work involved and the operation of the system upon completion of work.

The Contractor shall, at his own expense, reproduce the electrical plans for his work to the necessary scale and complete them with the necessary information and requirements as required by the Government approving authorities concerned in issuing permits and Certificate of Electrical Inspection.

E. EXAMINATION OF PREMISES

Perspective bidder is required to examine the Architectural, Structural, Mechanical and Electrical Plans of the Project, to visit the site and carefully take note all the condition thereat and to have informed himself thoroughly under which the electrical work is to be done. No allowance shall subsequently be made in his behalf because of any error on his part. He will be deemed to have done this before submitting his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained.

F. LAYOUT OF WORK

Fire Protection System layout, indicated on the drawings is generally diagrammatic and location of sprinkler heads, pumps, pipes and equipment are approximate.

The exact routing of sprinkler heads, pumps, pipes and equipment shall be governed by structural and architectural condition and limitation.

Consult the PSC/Owner for exact location. This is not to be construed to permit redesigning of system; all outlets are to be interconnected as indicated in the drawings.

Locate and install equipment-requiring maintenance where it will be readily accessible. Any equipment located without the approval of the PSC or Owner shall be done at the risk of the Contractor.

The Owner reserves the right to make any reasonable changes in location of outlets and equipment prior to roughing-in, without involving additional expense.

The Contractor shall be held responsible and pay charges for cutting and patching for piping where sleeves or slots were not installed or where incorrectly located.

G. MATERIALS AND WORKMANSHIP

All materials to be installed shall be unused, brand new and shall conform to the applicable standards.

Only skilled workmen using proper tools and equipment shall be employed during the entire course of installation work. All workmanship shall be of the best quality and all work shall be done in accordance with the best practices of the trade involved.

The same job foremen shall be assigned and maintained at the job site during the entire course of the job.

FPS 200 : WORK NOT INCLUDED

A. The following items of works shall not be a part specifically for Fire Protection Systems

1. All cutting and patching shall be made by the General Contractor, except us a specifically noted and modified herein.

2. All electric power wirings, except that are furnished as an integral part of factory assembled equipment, except as otherwise specified herein shall be by Electrical Contractor.

3. Supply and installation of fire doors shall be by General Contractor.

4. Fire alarm and fire station for the alarm system shall be by Electrical Contractor.

FPS 300 : APPLICABLE SPECIFICATION CODES, ORDINANCES, PERMITS AND FEES

A. The work covered in this contract is to be installed according to the specification, codes, ordinances and requirements of the following:

1. Fire Code of the Philippines
2. National Building Code of the Philippines
3. Fire Department Ordinances of concerned municipality.
4. NFPA Codes References:

NFPA NO.10	-	latest edition
NFPA NO.13	-	latest edition
NFPA NO.14	-	latest edition
NFPA NO.20	-	latest edition
NFPA NO.01	-	latest edition
NFPA NO.75	-	latest edition
NFPA NO. 101	-	latest edition

B. All construction permit and fees required for the work shall be obtained by and at the expense of the Contractor. The Contractor’s shall furnish the Architect, the Engineer and the Owner final certificates of inspection and approval from the government authorities having jurisdiction after the completion of the work.

C. The Contractor's shall obtain all necessary allowances, pays, royalties, etc. In connection with the use of any patented device or system and shall save the Owner harmless from any claim or lawsuit arising from such use.

FPS 400 : SHOP DRAWINGS, SAMPLES AND OTHER SUBMITTALS

A. The Contractor's shall prepare and submit for approval the following:

1. Manufacturer's catalog, sheets, marked as necessary to indicate materials or equipment being furnished for the following items :

    a. Sprinkler heads, sprinkler wrench and spare cabinets
    b. Valves, flow controls, test and drain assembly.
    c. Mechanical grooved couplings and flexible connectors.
    d. Riser Supports and sleeves

2. List of miscellaneous materials proposed, including pipe, fittings, valves, etc.
3. Field test reports
4. Such other similar information the Engineer may require.

FPS 500 SUBSTITUTION AND TESTING OF MATERIALS

A. Materials intended to be substituted for these originally specified shall be accepted only after a formal request for substitution, accompanied by:

1. Reasons for substitute;
2. Certificate of test indicating quality, compared to those originally specified
3. Cost comparisons with material originally specified. Requests shall be submitted to the PSC/or Engineer subject for evaluation at least fifteen (15) working days before installation of subject material.

B. Cost of testing of materials, whether on originally specified items or on substitute, shall be to the account of the Contractor.

C. Results of tests shall be submitted to the PSC /or Engineer for evaluation at least fifteen (15) days before the material is due for installation on the Jobsite.

FPS 600 NOTES ON DRAWINGS :

A. The Drawings show the general arrangement of all piping. However, where local and/or actual condition at the Jobsite necessitate a deviation or rearrangement, the Contractor's shall prepare and submit the new arrangement/shop drawings for the PSC's and/or Engineers final approval.

B. Small scale drawings do not possibly indicate all offset, fittings and other parts of the system required. The Contractor shall arrange such work accordingly, furnishing such valves, hangers, supports, fittings, trims and its accessories as may be required to complete the system in accordance to NFPA-13 Standard Installation of Sprinkler System.

FPS 700 : WORKMANSHIP AND COORDINATION OF WORK WITH OTHERS

A. The Contractor shall be held fully responsible for the work of any manufacturer or sub - contractor supplying materials to or performing work for; as it is intended that the entire Fire Protection System shall be ready in every respect for satisfactory and efficient operation when finally delivered to the Owners.

B. The Contractor shall assume full responsibility and shall provide the services of a qualified Engineer to supervise the complete installation of equipment and to conduct the final acceptance tests.

C. The work throughout shall be executed in the most thorough and satisfactory manner in accordance with the best practices of the trade.

FPS 800 : SPRINKLER HEADS

A. Type : Automatic. Quick response. Standard 15 mm Ø diameter orifice, bulb type, upright, pendent or sidewall heads. Pendent heads (recessed type) shall be provided with aluminum escutcheon or approved equivalent to fit into ceiling boards or ceiling runners. Flush or concealed type pendent units shall be accepted as substitute. Heads shall be UL Inc. listed or FM approved.

B. Head Rating and Type :

Common Area	Standard quick response, pendent, semi-recessed type sprinkler heads rating @ 135^0 F to 165^0 F (for use in maximum ceiling temp. of 100^0 F)	Chrome finish
Kitchen Area	Standard quick response, pendent, semi-recessed type sprinkler heads rating @ 212^0 F	Chrome finish

C. Pipe Thread and Valve Seat - 15 mm diameter nominal (Conventional).

- 20 mm diameter nominal (extended).

D. Spare Sprinkler Heads:

Furnished spare heads as required in the code and maintenance service part list for a period of at least one (1) year reckoned from the date after termination of warranty.

	(165 °F)	*(212 °F)*
1. Upright Type	-24 pcs.	6 pcs.
2. Semi Recessed Pendent Type	-24 pcs.	6 pcs.
3. Sidewall Type		
3.1 Standard Type -	24 pcs.	6 pcs.
3.2 Extended Coverage Type -	24 pcs.	6 pcs.
4. Flushed / Concealed Type -	12 pcs.	6 pcs

E. Sprinkler Tong - 3 pcs. required

F. Sprinkler Wrench - 3 pcs. required

FPS 900 : FIRE HOSE CABINETS

A. Fire hose valve and cabinets assembly as shall be UL listed and FM approved and to match Bureau of Fire Protection requirement.

Hose - 40 mm Ø X 30.00 meter single jacketed rubber-lined finish.

Nozzle - combination fog and solid stream, 40 mm Ø chrome plated.

Rack - semi-automatic, chrome plated.

Angle Valve type, Pressure Reducing /or restricting Valve

- 40 mm Ø chrome plated polished trim provided with nipple and union patent for exceeding 100 PSI upstream working pressure and set at 70 PSI downstream working pressure. Use ordinary Angle valve for upstream working pressure below 100 PSI.

Hose Nipple - for components, shall be chrome plated. Provide two (2) universal spannel wrenches.

B. Cabinet -full flush mounting door with anodized cal-colored aluminum for all glass plate, frame and box shall be No.18 gauge steel with white interior baked enamel finishes over primer. Cabinet size shall contain the above components.

FPW 1000 : WALL HYDRANTS (FIRE HOSE VALVES)

A. Shall be UL listed straight globe female x male assembly provided with valves, caps and chains or approved equal and to match Fire Department requirements/or Bureau of Fire Protection.

B. Type : - Single outlet connection 65 mmØ x 150 mmØ.

C. Finish: - Cast brass valve with red hand-wheel
- Polished brass caps and chains.

D. Shall be female NPT inlet x male hose thread outlet provided with caps and chains.

FPS 1100 : PORTABLE FIRE EXTINGUISHERS

A. Furnish and install as indicated on the drawings. Units shall be approved by the Fire Department having jurisdiction and UL listed. Mounting shall be inside fire hose cabinets and as shown on drawings.

B. Types and Location

1.	10 lbs. PFE, FE-36	-	Common areas
2.	50 lbs. PFE, FE-36 Wheeled Type	-	Utility areas

C. Types and quantity of portable fire extinguisher shall be as per final approval and recommendation of Local Fire Department having jurisdiction.

D. A metal name plate indicating indelible letters of the correct specification and/or standard catalog product of the Portable Fire Extinguisher and the reputable manufacturer brand name and UL Listing shall be properly attached to the assembly at a location such that the information written thereon can be conveniently read by all concerned.

FPS 1200 : PIPINGS - GENERAL

A. Where American Standards are specified, other approved national or local standards may be acceptable, provided copies of these standard Specifications are forwarded to the Engineer for his approval.

B. Black iron, schedule 40 standards, conforming to ASTM A-53 for pipe sizes 150 mm Ø and above only.

C. Black iron, schedule 40 standards, conforming to ASTM A-120 for inside building installation (feed mains, cross mains and branch lines).

D. All side piping shall be installed by means of screwed or flanged fittings. Flanged joint shall be used at all sprinkler risers and provided with 1.6 mm thick long fiber asbestos, cross laminated gasket “cranite”.

E. Torch cutting shall not be permitted as means of modifying or repairing sprinkler system.

F. All welding shall be “shop welding” only and shall be done by electric arc welding process.

G. Teflon type shall be used for screwed joints.

FPS 1300 : FITTINGS - GENERAL

A. Sprinkler system fitting shall be extra heavy pattern. Whenever a change in pipe size is made, one piece of reducing fitting shall be used. Provide mechanical grooved couplings at riser pipes of every floor.

B. All fittings shall be of malleable iron fittings.

C. Steel pipe flangers mating with steel equipment flangers shall have the same facing as mating flange.

D. Screwed union shall not be used on pipes larger than 50 mm (2”). Coupling and un of pipes other than screwed type shall be of types approved specifically for sprinkler used.

FPS 1400 : VALVES - GENERAL

A. All valves shall be of the same manufacture for each class of piping and as such as possible, for the entire Project. Valves shall permanently bear affixed stamp or tag indicating manufacturer, catalog number, pressure and temperature ratings of isolation gate valve, OS & Y gate valves, angle valves, check valves, fire alarm check valve, pressure relief valves with all cast iron body with bronze trim.

B. Furnish all valves and accessories material necessary for piping not shown on drawings as follows :

1. Vents and drains for equipment to which piping connect are made.

2. Connect to metering instruments and controls including pressure gauges, thermometer, controllers, traps and appurtenances required for proper functioning on instruments in controls.

3. Temporary valves and accessories required for placing equipment into initial service.

4. Piping 50 mm (2”) and smaller required for proper operation of piping system and equipment, including drain valves required to drain all low points in piping.

C. Valve seats shall be renewable except for forged steel and high pressure cast steel valves where Manufacturer’s standard is integral seats.

D. All valves shall be approved by Factory Manual and Underwriters Laboratories, Inc. (UL listed) in accordance with ANSI B 16.1, class 125.

E. Where required and not noted, provided chain - wheel operated, extending chain for chain operated valves to which 1.2 meters of nearest floor or operating platform of valves.

F. Provide floor stand with flanged faces for bolting to floor or platforms and other special devices where specified or noted on drawings.

G. Provide extension stems, universal joints stem guide bearings and other accessories required to locate floor stands in convenient location with interference with other equipment, piping or building parts.

H. Floor control valves within the building shall be approved indicating wedge gate with electrical contact and which will open when valve is partially or totally put in close position.

FPS 1500 : SWAY BRACES, HANGERS, SUPPORTS AND SEISMIC BRACINGS

A. Sway Bracing: Steel flat bars, structural grade 7 mm minimum thickness, with corrosion protection; shape /or type as shown on plans.

1. Sway Bracings Installation;

1.1 Adequate sway bracing shall be provided to oppose longitudinal or transverse pipe movements.

1.2 Lateral bracings shall withstand a force equal to 50% of the weight of the water contained in piping, valves and fittings. Spacing shall be 40 ft. (12m) maximum distances along main lines.

1.3 Longitudinal bracing shall with stand a force equal to 50% of the weight of crossmain and feedmain within the zone of water contained in piping, valves and fittings. Spacing shall be 80 ft. (24 m) maximum distances along main lines.

1.4 Piping anchorages shall not be secured on two (2) dissimilar parts of the building which will move differently.

B. Pipe Hangers : Steel flat bars, structural grade, 7 mm minimum thickness, with corrosion protection, shape as shown on plans and 13 mm diameter bars with corrosion protection as shown on plans.

1. Hangers Installation;

1.1 Approved inserts may be used for the support of hangers, anchorages in concrete. Expansion shield should be used in a horizontal position on the sides of concrete beams and shall be above the bottom reinforcements.

1.2 Increaser couplings shall be attached immediately adjacent to the expansion shields.

1.3 When pipes 100 mm diameter and larger are supported in the vertical position, the supports shall be at a minimum spacing of 3.0 meters (10’) on center. Holes in concrete for expansion shield shall be made of the proper size and depth, as specified for the type of shield used, to provide a uniform contact with the shield over its entire length and circumference.

1.4 Maximum distance between hangers shall be 3.65 meters (12’) for size 25mm (1”). Provide at least one hanger for each length of branch line, one between each two cross main branches, one hanger for each 4.75 meters (15’) length of feed mains. The distance between the hanger and the center line of upright sprinkler shall be not less than 76 mm (3”).

C. Support on Risers (Four Way Bracing)

Risers shall be adequately supported either by attachments directly to the riser or by hangers located on the horizontal connect close to the risers. Supports shall be provided at the ground level and at each every second floor level and at the top most level of the riser.

D. Seismic Separation Bracing

Seismic separation assembly shall provided at every piping crosses at every construction joints of the building separation assembly shall composed of fittings, pipe and approved victaulic coupling that permits movement in all direct and sufficient to withstand differential motion during earthquake. For nominal 4"Ø (100 mmØ) and above sizes of pipes the separation distances shall not exceed 8 inches (203 m) maximum. For other separation distances and pipe sizes, length and distances should be modified proportionally.

FPS 1600 : PIPES SLEEEVES

A. MATERIALS :

1. Through fittings - cast iron
2. Below Grade-cast iron or standard weight iron pipe
3. Above Grade - steel pipe

B. INSTALLATION :

1. Minimum clearance between the pipe & sleeve shall not be less than 25 mm (1") for pipes, 25 mm (1") to 89 mm (3-½") and 50 mm (2") clearance between pipes 100 mm (4") and larger. The clearance between pipes and sleeves shall be filled with non - combustible flexible materials such as asbestos rope and furnished with semi-hardening mastic flush.

2. Floor sleeves shall extended at least 76 mm (3") above the top of the wearing surface.

3. Drains, fire department connect, test manifolds and other auxiliary pipings connected to risers shall not be cemented into walls or floors.

FPS 1700 : FIRESTOPPING MATERIALS

A. Materials :

1. Firestop compounds and damning materials shall be UL listed and shall conform to the requirements of qualified designers or Manufacturers approved modification, as supported by engineering reports.

2. The penetration seal materials must be unaffected by moisture and must maintain the integrity of the wall or floor assembly for its rated time period when tested in accordance with ASTM E814 (UL 1479). The system shall be UL listed classified for up to and including three (3) hours.

3. Fire stopping materials shall be asbestos and lead free and shall not incorporate oil not require the use of hazardous solvents.

4. All fire stopping materials shall be manufactured by one manufacturer thru out the completion of the project.

5. Do not proceed with installation of fire stop materials when temperatures exceeded the Manufacturer recommendation limitation for installation.

B. PREPARATION

1. Clean substrate of dirt, dust, grease, oil, loose materials, rust or other matter that may affect proper fittings or adhesion of the firestopping materials.

2. Clean metal and glass surfaces with a non-alcohol solvent.

C. INSTALLATION

1. Installation of firestops shall be performed by an applicator / installer qualified and trained by the manufacturer. Installation must be performed in strict accordance with manufacturer's detail installation procedures.

2. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installation and Manufacturer's recommendation.

3. Unless specified and approved all insulation used in conjunction with through penetration shall remain intact and undamaged and may not be removed.
4. Seal holes and penetration to ensure an effective smoke seal.

5. In areas of high traffic, protect firestopping materials from damaged. If the opening is large, install firestopping materials capable of supporting the weight of a human load.

6. Insulation types specified in other sect shall not be installed in lieu of firestopping materials specified herein.

7. All combustible penetrants (e.g. non-metallic or insulated metallic pipes) shall have firestopping using products and system tested in a configuration representative of the field condition.

8. When required to properly contain firestopping materials within opening, damming or packing materials may utilized. Combustible damning material must be move after appropriate curing. Non-combustible damming materials may be left as a permanent components of the firestop system.

D. CLEANING

1. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surface.

2. Leave finished work in neat, clean condition with on evidence of spillovers or damage to adjacent surfaces.

FPS 1800 : PIPE PAINTING

A. Sprinkler heads, valve stems and the like shall not be painted.

B. After installation and test and before the installation of ceiling fixtures or boards, all pipings shall be prime painted and coated with two coats of gloss red quick drying enamel.

C. Paint to be used shall be of low VOC type as specified by the Architect/ Engineer.

FPS 1900 : ALARM AND SUPERVISORY SYSTEM

The supervisory and alarm system shall be integrated with the building Fire Alarm System. The Fire Alarm System annunciator shall indicate the flow valves, and the valve supervisory switches.

FPS 2000 : MARKERS, INSTRUCTION AND IDENTIFICATION SIGNBOARD

These signboards shall be made of gauge No. 14 black iron sheet with baked enamel finish and letter instruction as shown on the plans. Additional signboards shall be mounted on the unobstructed area for easy identification reading. Paints shall be basically gloss fire red and white.

FPS 2100 : ACCEPTANCE TESTS

A. The Contractor shall conduct tests in the presence of inspector or authority having jurisdiction (The Philippine Fire Protection Association of Fire Protection Associates).

B. Isolated leak tests or partial tests of areas may be performed prior to installation of ceiling materials in the area to preclude any damage and during the total system final tests.

C. To remove foreign materials which may have entered the piping during installation of same, flushing or underground connection is required before sprinkler piping is connected.

D. Hydrostatic Tests :

1. Minimum tests pressure shall not be less than to 200PSI on the system pressure. Exceeding System pressure requirements to the minimum test pressure shall be tested applying additional test pressure of 50PSIG on the system for at least twenty four (24) hours minimum.

2. No visible leakage for inside sprinkler piping will be allowed. For underground mains and laid - ins, exceeding the permissible leakage or joints necessary repair shall be made.

3. All control valve water pressure to ensure proper operating tests. Use clean, non - corrosive water.

4. Fire connection shall be tested (part of base building works).

E. The Contractor shall furnish the Owner a written statement to the effect that the work covered by the Contract has been completed and tested, before requesting for final approval of the installation from the Fire Department Authority.

F. Testing of drainage facilities shall be made by opening the main drain valve while the control valve is wide open.

G. Test certificate shall be filled out and signed by the Owner’s and Contractor’s representative.

H. System operation and maintenance chart shall be submitted to the Owners upon completion of the Contract. This shall include, among others, the location of the control valves and care of the new equipment.

FPS 2200 : MINOR MODIFICATION AND TIME COMPLETION

A. The plans as drawn should show condition as accurately as it is possible to indicate them in scale. The plans are diagrammatically and do not necessarily show all fittings, etc. necessary to fit the building condition. The location of valves, fittings and the fixture shown on the plans are approximately. The Contractor shall be responsible for the proper location in order to make them in compliance with Architectural details and instruct.

B. The Contractor shall complete the work herein described in accordance with the specific schedules set by the Owners in accordance with General Contractor's Schedule of Work.

FPS 2300 : GUARANTEE

The Contractor shall guarantee that the installed sprinkler system complies with the requirements of the authorities and free from all defective workmanship and materials and will remain so, for a period of one (1) year from the date to final inspection and acceptance of the work. Any defect appearing within one year shall be corrected by the Contractor at no additional cost to the Owner.

FPS 2400 : CONTRACTOR'S RESPONSIBILITY

A. The Contractor shall provide temporary fire protection system during the construction period. This shall be of sufficient capacity to put any fire that may break out due to construction operation. This is in addition to temporary fire extinguisher required.

B. The Contractor shall identify and save the Owner, the Architect and the Consulting Engineer Harmless from and against all liabilities for damage to property occasioned by any or omission of this Contractor's expenses, legal or otherwise which may be insured by the Owner, the Architect or the Consulting Engineer, in the defense of any claims, action or suits.

C. The General Contractor shall be responsible for the coordination among the different trades on the Jobsite in order to finish the Works in the least possible time, in strict compliance and in accordance with the Plans and Specification.

D. Throughout the construction period open ends of all installed fire lines, crossmain, branch lines, riser nipples, drop nipples and other related pipings shall be kept closed by temporary plugs.

E. All installed fire lines risers, dry stand pipes, FCV and ITC drain line stack and other related pipings shall not be used to conduct dirty construction wash water especially those with cement mixes to avoid possible clogging.

F. Temporary potable water supply shall be made available to construction workers as construction progresses.

G. A temporary human excreta disposal system shall be provided by the Contractor to serve the Workers during the construction period.

PLUMBING WORKS TECHNICAL SPECIFICATION

SECTION 1: GENERAL

A. The General Condition form a part of these Specification and Contract.

B. The Contractor shall submit sample of materials for use for the approval of the owner prior to the acquisition, delivery and installation. The contractor shall assume the cost of and the entire responsibility for any change in the work as shown on the contract drawings, which may be occasioned by approval of materials other than those specified.

C. Drawings and Specification

The Drawings and Specification are meant to be complementary to each other and what is called for by one shall be called for by both.

Any apparent conflict between the Drawings and Specification and any controversial or unclear points in either shall be referred to the Owner and architect for final decision. On the plans, keep records showing all deviation occurring during construction. At the completion of the work, said copy of the plans shall be submitted to the owner its copy and file. Upon completion of work as described herein the Contractor shall furnish the Owner, at his own expense, Five (5) copies of the "AS BUILT" plans for future reference and maintenance purposes.

D. Correlation of Work

The Plumbing and sanitary Contractor shall coordinate with the Architect and the Owner to determine how and where his work fits with that of other crafts, after familiarizing himself with the plans and specification. This shall be done at the beginning of construction. Should there be any existing doubt at any point, a ruling shall be secured from the Owner and shall be given time to inspect the work covering this point and to prepare a detail in the form of Drawings and written instruct as required.

E. Permits and Inspection

The contractor shall obtain, at his own expense, all the necessary permits and Certificate of Plumbing and Sanitary Inspection from the proper government authorities required both for the performance of his work involved and the operation of the system upon completion of work.

The Contractor shall, at his own expense, reproduce the Plumbing and sanitary plans for his work to the necessary scale and complete them with the necessary information and requirements as required by the Government approving authorities concerned in issuing permits and Certificate of Plumbing and Sanitary Inspection.

F. Examination of Premises

Perspective bidder is required to examine the Architectural, Civil and Structural, Mechanical, Electrical, Plumbing and Sanitary Plans of the Project, to visit the site and carefully take note all the condition thereat and to have informed himself thoroughly under which the plumbing and sanitary work is to be done. No allowance shall subsequently be made in his behalf because of any error on his part. He will be deemed to have done this before submitting his proposal and no subsequent claim on the ground of inadequate or inaccurate information will be entertained. All cost implication shall be borne by the contractor.

G. Layout of Work

Plumbing and sanitary System layout, indicated on the drawings is generally diagrammatic and location of equipment, fixtures, others are approximate.

The exact routing of pipes, equipment and others shall be governed by structural and architectural condition and limitation.

Consult the Owner for exact location. This is not to be construed to permit redesigning of system.

Locate and install equipment-requiring maintenance where it will be readily accessible. Any equipment location without the approval of the Owner shall be done at the risk of the Contractor.

The Owner reserves the right to make any reasonable changes in location of equipment and piping, without involving additional expense.

The Contractor shall be held responsible and pay charges for cutting and patching for piping where sleeves or slots were not installed or where incorrectly located.

SECTION 2: WORK NOT INCLUDED

A. Construction of the domestic water tank shall be by General/Specialty Contractor.

B. All electrical power wirings, except that furnished as an integral part of factory assembled equipment except otherwise specified herein, shall be by Electrical Contractor.

C. Painting except as required by the Plumbing Code and as specified herein shall be by General Contractor.

SECTION 3: NOTES ON DRAWINGS

A. The Drawings show the general arrangement of all piping. However, where local and/or actual condition at the jobsite necessitate a deviation or rearrangement, the Contractor shall prepare and submit the new arrangement / shop drawing for the PSC's / Engineers approval.

B. Small scale drawings do not possibly indicate all offset, fittings and other parts of the system required. The Contractor shall arrange such work accordingly, furnishing such fittings, traps valves and accessories as may be required to meet such condition.

SECTION 4: APPLICABLE SPECIFICATION CODES, ORDINANCES, PERMITS AND FEES

A. The work covered in this contract it to be installed according to the specification codes ordinances and requirement of the following:

1. National Plumbing Code of the Philippines
2. The Code on Sanitation of the Philippines
3. Rules and Ordinances of Concerned City or Municipality

B. All construction permits and fees required for the work shall be obtained by and at the expense of the contractor. The contractor shall furnish the Owner final certificates of inspection after the completion of the work.

SECTION 5 : WORKMANSHIP AND COORDINATION WITH TRADES

A. All work shall be performed in first class and neat workmanship by mechanics skilled in their work shall be satisfactory to the Engineer.

B. The Plumbing Contractor is required to refer to the General Condition and to all architectural, structural, electrical, mechanical and fire protection plans and specification and shall investigate all possible interferences and condition affecting his Work.

SECTION 6 : PRODUCT

A. GENERAL

1. Except as specified, the Contractor shall submit for the Engineers approval, two (2) copies of complete materials he proposes to use, within thirty (30) days after award of contract.

2. The Contractor shall assume the cost of and the entire responsibility for any change in the work as shown on contract drawings, which may be occasioned by approval of materials other than those specified.

B. PIPES AND FITTINGS SCHEDULE

1. Cold Water lines – All main distribution lines shall be galvanized steel /or iron, (G.I.) pipe, Schedule 40 standard, conforming to ASTM A-53, with class 300 fittings, flanged connection for 65Ø and larger sizes for all joints connection. For 50Ø and below shall be Schedule 40 standard, conforming to ASTM A-120-69, with class 250 fittings, screwed / threaded for all joints connection. Fittings shall be malleable iron, conforming to ASTM-A197/A, 197M-87 or approved equal.

   All horizontal and lateral water distribution lines and roughing-ins of toilet and shall be high density PPRC (Polypropylene Random Copolymer) class PN-20 Polypropylene pipe material. Fittings shall be fusion weld type, imported conforming to German technology DIN 8077-8078 and ASTM 1281-93.

   For Pumps Piping Layout – shall be galvanized steel /or iron, (G.I.) pipe, Schedule 40 standard, conforming to ASTM A-53, with class 300 fittings, flanged connection for 65Ø and larger sizes for all joints connection. For 50Ø and below shall be Schedule 40 standard, conforming to ASTM A-120-69, with class 250 fittings, screwed / threaded for all joints connection. Fittings shall be malleable iron, conforming to ASTM-A197/A, 197M-87 or approved equal.

   For Submerged pipe at cistern tank – shall be stainless steel pipe (304), Schedule 40 standard, conforming to ASTM A-53, with class 300 fittings, flanged connection for 50Ø and larger sizes for all joints connection. For 50Ø and below shall be Schedule 40 standard, conforming to ASTM A-120-69, with class 250 fittings, screwed / threaded for all joints connection. Fittings shall be malleable iron, conforming to ASTM-A197/A, 197M-87.

2. Hot Water lines – All main distribution lines shall be high density PPRC (Polypropylene Random Copolymer) class PN-20 Polypropylene pipe material. Fittings shall be fusion weld type, imported conforming to German technology DIN 8077-8078 and ASTM 1281-93.

3. Sewer and Kitchen Waste Lines – All new stacks, collectors lateral and branch waste lines shall be polyvinyl chloride pipes (PVC) series 1000.

4. Vent Lines – All new stacks, collectors lateral and branch waste lines shall be polyvinyl chloride pipes (PVC) series 1000.

5. AHU/ACU/FCU Waste Lines -All lateral & branch waste lines from 25 to 40 mmØ shall be polyvinyl chloride class 150 and 50 mmØ and larger, shall be polyvinyl chloride pipes (PVC) series 1000 II. All exposed FCU/AHU drains lines shall be provided with ½" thick elastomeric thermal insulation.

   All Waste Stack and Main Collector Lines - shall be polyvinyl chloride pipes (PVC) series 1000 II. Provide with ½" thick elastomeric thermal insulation. (Provide UV Resistant paint all around for all pipes exposed to weather).

6. Drainage Lines and Downspouts - All new downspouts, collectors lateral and branch waste lines shall be polyvinyl chloride pipes (PVC) series 1000.

7. Sump Pump Discharge Riser – Shall be Black Iron (B.I.) pipe, schedule 40, standard conforming to ASTM A-53/120.

C. VALVES

1. Gate Valve - 50 mm and larger, shall be rising stem outside screw and yoke (OS & Y) flanged connection and shall be iron body with bronze trim, minimum of 200 psig working pressure. For 40 mm and smaller sizes, shall be rising stem /or non-rising stem inside screw female threaded and shall be bronze finished minimum of 200 psig working pressure.

2. Check Valve for CPS Pump - 50 mm Ø & larger shall be iron body lift type check valve has a center guided, spring loaded valve disc with resilient seal bronze or stainless steel removable valve seat with bronze trim, flanged connection, minimum of 200 psig working pressure. 40 mm and smaller, same except female threaded connection.

3. Check Valve for Transfer Pumps – shall be cast iron body ASTM A126 class B, non-slam type with opening and closing speed controls, stainless steel main valve trim and actuator combination water hammer shock absorber or approved equal.

4. Float Valve - shall be hydraulically operational, diaphragm actuated valve with the pilot control and float mechanism mounted on the cover of the main valve. The float posit the pilot control to close the valves when float contacts the upper stop and to open the valve when the float contacts the lower stop.

5. Pressure Reducing and Pressure Sustaining Valve – shall be single seated, hydraulically operated pilot controlled, diaphragm type globe valve. The control system shall consist of a reducing control sensitive to diaphragm pressure changes and pressure sustaining control that is sensed to the main valve inlet.

6. Pressure Relief Valve for Transfer Pumps – shall be a diaphragm type valve to maintain constant upstream pressure to close limits. The valve shall be hydraulically-operational, pilot controlled modulating type, main body at cover to cast iron ASTM A4 with adjustment ranges, 20 to 200 PSIG.

7. Angle Valve Strainer - strainer pattern shall be "Y" or angle strainer body and cover shall be cast iron, nuts and bolts shall be galvanized steel, basket and basket latch shall be stainless steel, body and plug O-Ring-Buna N or Piston.

D. OTHER MATERIALS

1. Drains - as indicated on drawings:
   a. Gutter Drain (GD)
      - Stainless Steel 304, Basket Type Strainer
   b. Deck Drain (DD)
      - Dome type
      - Gray Cast Iron Body, Brass Dome

   c. Parking Slot Drain (PSD)
      - Brass floor with strainer with square/slotted/perforated openings.
   d. Floor Drain @ T&B and common area (FD)
      - Brass floor or/ Stainless 304 with strainer with square/slotted openings.
   e. Floor Drain @ Utility area (FD)
      - Brass floor or/ Stainless 304 with strainer with square/slotted openings.
   f. Floor/Wall Cleanout (FCO/WCO)
      - Gray Cast Iron with Brass or/ Stainless cleanout/plug
   g. Trench Grating
      - Gray Cast Iron or/ Steel grating with Frame
   h. Area Drain
      (300mm x 300mm)
      - Gray Cast Iron or/ Brass

E. OUTDOORS PLUMBING APPURTENANCES:
1. Drainage Junction Boxes – 140 kg/cm3 reinforced concrete with pre - cast reinforced concrete cover.
2. Drainage Manhole - 140 kg/cm3 reinforced concrete with pre-cast reinforced concrete cover.
3. Oil Interceptor/Grease Tank - 210 kg/cm3 reinforced concrete with pre-cast reinforced concrete cover.
4. Sewer Manhole – 140 kg/cm3 reinforced concrete with C.I. grating cover.
5. Street Inlet/Catch Basin - 140 kg/cm3 reinforced concrete with C.I. side inlet grating.
6. Area Drain - 140 kg/cm3 reinforced concrete with C.I. grating cover model U 923 for traffic area and model U 822 for pedestrian area.
7. Catch Basin - 140 kg/cm3 reinforced concrete with pre-cast reinforced concrete cover.
8. Cistern - 210 kg/cm3 reinforced concrete with stainless steel access manhole cover.
9. Thrust Blocks - 140 kg/cm3 plain concrete.

F. JOINTING / FITTINGS

1. Flanged Joint Gasket – Garlock
2. Screwed Joints - U.S. Federal Specification GG-P-251.
3. PVC Pipes and Fittings - PVC cement or as per the Manufacture's recommendation.
4. Hubless CISP – sleeve type coupling.
5. Bell and Spigot – Lead and Oakum
6. Polypropylene Random Copolymer Polypropylene Pipe – fusion welded type.
7. Polyethylene Composite Pipes – compression type (push on type) brass coated fittings.
8. Dissimilar Pipes - Adaptor fittings shall be used.

SECTION 7 : IDENTIFICATION AND APPROVAL OF MATERIALS

A. Each length pipe, fittings, traps, fixtures and device used in the Plumbing System shall have cast, tamped or marked on it, the manufacturer's trade mark or name, the weight, type and classes of product when so required by the Standard.

B. Within thirty (30) days after award of the Contract, the Contractor shall submit for the PSC's approval, the names of suppliers and materials proposed including trade names and/or samples of the materials if deemed necessary.

C. Brand names mentioned in these Specification are only for the purposes of indicating the desired quality and design.

SECTION 8 : SUBSTITUTION AND TESTING OF MATERIALS

A. Materials intended to be substituted for these originally specified shall be accepted only after a formal request for substitution, accompanied by:

1. Reasons for substitution.
2. Certificate of test indicating quality, compared to those originally specified.
3. Cost comparisons with material originally specified. Requests shall be submitted to the Architect for evaluation at least 15 working days.

B. Cost of testing of materials, whether on originally specified items or on substitution, shall be to the account of the Contractor.

C. Results of tests shall be submitted to the Architect for evaluation at least 15 days before the material is due for installation on the Jobsite.

SECTION 9 : SEWER, WASTE, DRAIN AND VENT PIPES

A. GENERAL

1. Underground sewer, waste and drain pipes and fittings shall be polyvinyl chloride (PVC) pipes, unless specifically noted. Soil and waste pipe above ground shall be polyvinyl chloride pipes for laterals, stacks and main collector pipes. Waste pipes above ground shall be PVC pipes. Fittings for soil and waste pipings above ground shall be sleeve type coupling and gasket joints and PVC fitting or as specified.

2. All sewer, soil & drainage pipes shall be pitched 6 mm per 300 mm but in no case flatter than 3 mm per 300 mm.

B. SUPPORTS

1. Horizontal lines shall be supported by well secured length heavy duty strap hangers or floor chairs as required. Vertical lines shall be secured strongly by hooks to the building frame and a suitable bracket or chairs shall be provided at the floors from which they start.
2. PVC pipes in trenches under the ground shall be laid true to line and grade on a stable and suitably prepared foundation, each section of the pipe being properly bedded.
3. In soft ground liable to settlement, a gravel base 300 mm deep and twice the width of the pipe shall be rolled or tamped. Backfilling shall be carefully placed and tamped for the purpose, in such a manner that the pipe lines or connect are not disturbed.

C. TRAPS

1. Every plumbing fixtures shall be separately trapped by a vented water sealed trap as close to the fixture outlets as the condition allow, but in no case at a distance greater than 600 mm. In case of the upper or the only fixture on a soil extended full size through the roof, a vent shall not be required when said fixture has its center stack. Traps shall be of the same diameter as the waste pipes from the fixtures, which they shall serve, all traps shall have a water seal of at least 32 millimeters with a brass thumbscrew cleanout at the bottom of the seal.

D. VENT

1. Vent shall be taken from the crown of the fixtures, except for water closet traps, in which case, the branch line shall be vented below and trap and above all small waste inlets, so connected as to prevent obstruct. Each vent pipe shall be run separately above the fixtures into the adjacent soil pipes, a distance not more than 1.50 meters. If more than this distance, the vent shall run independently through the roof.
2. A vent line shall be wherever practicable, directs extension of a soil or waste line.
3. Main vent risers at 4.5 meters along or more shall be connected at the roof with the main water or soil pipes below the lowest vent outlet with a forty-five degree (45d) connection.
4. All vertical soil or vent pipes shall be carried up at least 600 mm above the roof of the building and the open side ends are to be entirely and securely covered with gals. 16 mesh copper cloth.
5. Vent pipes in roof spaces shall be run as close as possible to the underside of roof with horizontal piping pitched down to stacks without forming traps. Where an end or circuit vent pipe from fixtures it shall be connected into the main vent or vent stack.

E. ROUGHING-IN

1. Roughing-in for pipes and fixtures shall be carried along with the building construction. Correctly located openings of proper sizes shall be provided where required in the walls and floors for the passage of pipes all items to be embedded in concrete shall be thoroughly clean and free from all rust, scale and paint.

F. FITTINGS

1. All changes in pipes sizes on sewer, waste and drain lines shall be made with reducing fittings or reducers. All changes in direction shall be made by the appropriated use of forty-five degrees (45d) wyes, or long sweep bends, except that sanitary tees may be used on vertical stacks. Short quarter bends or elbows may be used in soil and waste lines where the change in direction is from the horizontal to the vertical and on the discharge from the water closet.

G. JOINTS AND CONNECT

1. All joints shall be air and water tight. For joining pipes, the following shall be used:
   1.1 Hubless cast iron soil and waste pipes and fittings, sleeve coupling gasket joints. Bell and spigot shall be oakum and lead
   1.2 Galvanized wrought iron or steel pipe screwed or threaded joints, use Teflon tape.
   1.3 Lead to cast iron pipes : Adaptor fittings, screwed and hubless coupling gasket joints.
   1.4 Concrete pipes : bell and spigot or tongue and groove.
   1.5 Polyvinyl chloride (PVC) pipes, socket type with PVC cement.
   1.6 Polypropylene pipes, fusion weld type.
   1.7 Cross-link composite aluminum pipe- compression type (push-on type) brass coated fittings.

SECTION 10: WATER DISTRIBUTION SYSTEM

A. INSTALLATION

1. The pipings shall be extended to all fixtures, outlets and equipment from the gate valves installed in the branch near the riser.
2. Un shall be provided where required for disconnection.
3. All pipes shall be cut accurately to measurements and shall be worked into place without springing or facing. Care shall be taken so as hot to weaken the structural port of the building.
4. All service pipes valves and fittings shall be kept at sufficient distance from work to permit finished covering not less than 15 mm from such work or from finished covering on the different service.
5. Changes in pipes shall be made with reducing fittings.
6. Accessible Contraction-expansion joints shall be made wherein necessary. Horizontal runs of pipe over 15 m. in the length shall be anchored to wall or the supporting structure midway on the run to force expansion and contraction equally towards the ends.

B. HOSE BIBBS

1. All hose bibbs general area shall be 15mmØ with male tapered threads standard hose connection brass finished.

C. WATER DISTRIBUTION LINES

1. Installation
   1.1 The hot and cold water piping system shall be pitched toward fixtures and riser for proper air relief. Provide drain cocks at low points for drainage system. Pitch line 25 mm x 7.6 m.
   1.2 Horizontal runs of pipe 15 m in length shall be anchored to the supporting structure midway on the run to give allowances for equal expansion and contraction of pipes.

1.3 Un and approved threaded connector shall be provided where required for connection and tapping for other types of hot and cold water lines materials to main distribution lines and risers.

SECTION 11 : EXCAVATION, PIPE LAYING AND BACKFILLING

A. EXCAVATION / TRENCHES

1. Trenches for all underground pipe lines shall be excavated to the required depths and grades. Bell holes shall be provided so that pipe will rest on well-tamped solid ground for its entire length. Where rock is encountered, excavation shall extend to a depth 150 mm below the pipe bottom and other approved filling materials.
2. Materials
   a. Pipe Laying

      Do not lay damaged or defective pipe. Laying of pipe shall proceed beginning at lower end of the pipeline. Pipe shall not be laid in water or when the trench condition or weather is unsuitable for such works. Remove water from trenches by sump pumping or other approved methods. Lay pipe to be established grade line. Orient perforated on the bottom half of the pipe. Lay bell and spigot or tongue and groove type pipe with the bell or groove end upstream. Obtain approval for pipe in place before backfilling.

   b. Jointing - Porous Concrete Pipes installed with mortar joints.
   c. Materials for backfilling shall be free of debris or big rocks. Backfill shall be placed in horizontal layers, properly moistened and compacted to an optimum density that will prevent excessive settlement and shrinkage.

B. COMPACTION

Compact each layer or lift of material specified so that the in-place density tested is not less than percentage of maximum density.

TABLE 1		
	Percent ASTM D1557 Maximum Density	
FILL, EMBANKMENT and BACKFILL	Cohesive Material	Cohesion-less Material
General Fill and General backfill	85	90
Under sidewalks and grease areas	85	90
General Backfill and General Fill besides structures	90	95
Under Roadway, top 300 mm Sub-grade (Top of fill backfill or cut)	95	100
Under sidewalks to 300 mm	93	98

C. CONCRETE PROTECTION

All pipes laid and installed underground at 1.0 ft (300 mm) and below natural grade level shall be protected with Class B concrete casing, a minimum or 100 mm around the pipe perimeter and 250 mm below the finish grade.

D. FINISH OPERATION (SITE GRADING)

Grade to finish indicated within 30 mm grade areas to drain water away from structure and to provide suitable surfaces for moving machines. Existing grades which are to remain but are disturbed by the Contractor’s operation shall be restored as specified herein.

SECTION 12 : MISCELLANEOUS

A. CLEANOUTS

Cleanouts shall be of the same size as the pipe, the location of which is extended to an easily accessible place.

B. TRAPS

1. Every plumbing fixtures of equipment requiring connect to the drainage system shall be equipped with a trap.
2. Each trap shall be placed as near as possible to the fixture. No fixture shall be double - trapped.

C. VALVES AND HOSE BIBBS

1. Valves shall be provided on all water supplies to fixtures as specified.
2. Hose bibbs shall be made of brass with 15 mm make male inlet thread hexagon shoulders and 20 mm connect.

D. PIPE HANGERS INSERTS AND SUPPORTS

1. Horizontal runs of pipe shall be hung with adjustable wrought iron or malleable iron pipe hangers spaced not over 3 m apart, except hub and spigot soil pipes which shall have hangers spaced not over 1.52 m apart and located near the hub.
2. Hangers shall have short turn buckles or other approved means of adjustment.
3. Inserts shall be of cast steel and shall be of type to received machine bolt or nut after installation.
4. Vertical runs of pipes shall be supported by wrought iron clamps or collars spaced not more than 9 m apart.
5. Water and Vent Pipes - 65 mm and larger; band type 6.4 mm x 25 mm flat mild steel or black iron with 15 mm round rod with plates and nuts; 50 mm and smaller split ring type with 10 mm iron rods with inserts plates; toggle bolts, clamps or expansion shield.

E. PIPES SLEEVES

1. Pipes sleeves shall be installed and properly secured in place at all points where pipes pass through masonry or concrete.
2. Pipe sleeves shall be of sufficient diameter to provide approximately 6.1 mm clearance around the pipe of insulation.
3. Pipe sleeves in walls and partition shall be of cast iron, wrought iron or steel pipe. Pipes sleeves in concrete beams or concrete slabs shall be wrought iron or steel pipe.
4. Pipe sleeves on footings shall be cast iron or steel and shall be not less than 100 mm larger in diameter than the pipe to be installed.
5. Where pipes pass through waterproofing membrane, the sleeves shall be provided with an integral flange or clamping device to which a flashing shield can be soldered.

6. The space between the pipes and sleeves shall be made water tight by inserting and filling approved filler material and the remaining void space shall provided with approved fire rated sealer /or fire stopping materials thoroughly.

SECTION 13 : FIRESTOPPING MATERIALS

A. MATERIALS

1. Firestop compounds and damning materials shall be UL listed and shall conform to the requirements of qualified designers or manufacturers approved modification, as supported by engineering reports.
2. The penetration seal materials must be unaffected by moisture and must maintain the integrity of the wall or floor assembly for its rated time period when tested in accordance with ASTM E814 (UL 1479). The system shall be UL listed classified for up to and including 3 hours.
3. Fire stopping materials shall be asbestos and lead free and shall not incorporate oil nor require the use of hazardous solvents.
4. All fire stopping materials shall be manufactured by one manufacturer thru out the completion of the project.
5. Do not proceed with installation of fire stop materials when temperatures exceeded the manufacturer recommendation limitat for installation.

B. PREPARATION

1. Clean substrate of dirt, dust, grease, oil, loose materials, rust or other matter that may affect proper fittings or adhesion of the firestopping materials.
2. Clean metal and glass surfaces with a non-alcohol solvent.

C. INSTALLATION

1. Installation of firestops shall be performed by an applicator / installer qualified and trained by the manufacturer. Installation must be performed in strict accordance with manufacturer's detail installation procedures.
2. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installation and manufacturer's recommendation.
3. Unless specified and approved all insulation used in conjunction with through penetration shall remain intact and undamaged and may not be removed.
4. Seal holes and penetration to ensure an effective smoke seal.
5. In areas of high traffic, protect firestopping materials from damaged. If the opening is large, install firestopping materials capable of supporting the weight of a human load.
6. Insulation types specified in other sect shall not be installed in lieu of firestopping materials specified herein.
7. All combustible penetrants (e.g. non-metallic or insulated metallic pipes) shall be firestopping using products and system tested in a configuration representative of the field condition.
8. When required to properly contain firestopping materials within opening, damming or packing materials may utilized. Combustible damning material must be move after appropriate curing. Non-combustible damming materials may be left as permanent components of the firestop system.

D. CLEANING

1. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surface.
2. Leave finished work in neat, clean condition with on evidence of spill over or damage to adjacent surfaces.

SECTION 14 : PLUMBING FIXTURES, FITTINGS, AND ACCESSORIES

Refer to Architectural Specification.

SECTION 15 : PUMPS

A. GENERAL

1. All equipment shall be supplied from reputable firms engaged in the manufacture of each particular item similar. The entire assembly as installed shall be given a start - up and test run to prove that all the specification have been met before acceptance by the Owner. The test duration shall be 24 hours. Submittal of the Certificate of Test to the Owners shall be a condition of final payment.
2. The Specification herein stated are basic guide only. Other items not so indicated but which are obviously necessary for the proper operation of system as intended shall be supplied in accordance with accepted engineering standards.
3. The equipment shall be guaranteed for a period of at least one (1) year of trouble free operation. The supplier of equipment shall certify to the availability of spare parts locally and service in case of system breakdowns within a period of at least three (3) years. Manuals of operation and maintenance & lists of spare parts shall be supplied together with the equipment. Submittal of Warranty Certificate shall be on condition to the final payment.
4. The supplier shall submit at least two (2) copies of pumps performances curves showing among others, the pump rating and pump efficiency, properly marked thereon.
5. Accessories to be supplied for each group shall include one non- slam type check valve, and two (2) gate valves, of size equal to the size of pump discharge and suction and rated minimum of 300 psig for transfer pump and 150 psig for booster pumps. Also, one pressure gauge for each set of pumps and pipe fittings necessary for complete installation shall provided. The pressure gauge shall be 100 mm face diameter and shall be reading from 0 psi (or 0 kg/cm) to 100 psi (or 7 kg/cm).
6. Price quoted shall include cost delivery of all quoted items to the jobsite. Pump and motor installation dimension drawings shall be submitted together with the quotation.
7. The brands, names and place of manufacture of pump, motor, valves, controls & all accessories where applicable shall be indicated in the quotation. Also, a description of pump impellers being offered shall be included.
8. A metal nameplate indicating in indelible letters the correct specification of the pump and motor shall be properly attached to the assembly at a location such that the information written thereon can be conveniently read by all concerned.
9. A separate price shall be quoted for installation work and preparation submittal of as installed drawings.

B. TRANSFER PUMPS (TP 4-6):

1. Number of Units : Three (3) units identical
2. Capacity : 90 GPM vs. 35 Ft. (TDH), 1.5 HP each.
3. Type : Shall be Vertical In-line or/ Horizontal Centrifugal Pump with electric motor on a common base (skid mounted type), suitable for pumping domestic water supply, by positive suction from the water tank complete with valves, control and accessories.
4. Electric Motor Drive : 230V, 1-Phase, 60 cycles, 1750 rpm, open drip proof 1.5 HP.

5. Motor Controls : Reduced wye delta voltage magnetic starter, H-O-A switches, overload relays, and alternators.
6. Accessories : Vibration insulation at pump base, flexible connector /or victaulic coupling, y-strainer, non-slam type with opening and closing speed controls check valves, diaphragm type surge pressure relief valves, pressure gauges and gate valves at discharge lines, electrode type water level control at cistern or equal to prevent pumps from running dry and electrode type water level switch at elevation tank to pump's controller.

7. Operation: The lead pump TP-1 shall fill the two (2) overhead water tanks to 50% of its storage capacity. As the water exceeds the mid water level, the level electrode shall send signal to the pump controller activating TP-2 to start. TP-1 and TP-2 shall run in tandem to fill the overhead tanks in 100% capacity, and TP-3 shall be on stand-by mode. When the water level reaches the high water level, the liquid electrode shall send signal to duty pump (TP-1 and TP-2) to stop. On the next operation cycle, TP-2 shall operation to fill at 50% capacity and TP-3 shall operation as the water exceeds the mid water level to fill at 100% capacity, and TP-1 shall be on stand-by mode. The operating cycle is intended to avoid wear and tear of the pumping equipment.

C. BOOSTER PUMPS (BP 4-6):

1. Numbers of Units: Three (3) units identical

1.1 System Requirements:

Pump No. 1 : 50 GPM vs. 125 FT. TDH, 2.5 HP
Pump No. 2 : 50 GPM vs. 125 FT. TDH, 2.5 HP
Pump No. 3 : 50 GPM vs. 125 FT. TDH, 2.5 HP

2. Type of Pump: The pump and motor shall be horizontal end suction type /vertical in-line, closed or flexi-coupled to the electric motor, or a common base (skid mounted type).

3. Electric Motor Drive : shall be variable speed motor for variable frequency drive operation, 230 volts, 1-phase, 60 cycles.

4. Motor Controls : There shall be factory wired and programmed UL labelled control panel with NEMA I enclosure. Components within the panel shall include; molded case circuit breaker per motor, magnetic starters with three-coil thermal overload protection, H-O-A switches, one control circuit protection thermal detection test button, control circuit relays, standby pumps relay, flow switch indicating light, pump failure light, duty pump reset & pump alternator components mounted in gauge, one suction-pressure gauge & two discharge pressure gauge. The relometer flow switch shall be factory mounted for approval prior to installation.

5. Operation : Automatic Start/Stop operation through alarm signal from hydropneumatic tank pressure switch. BP-1 shall handle the demand load of 0-50%. BP-2 shall operation as the demand load exceeded 50%. BP-1 and BP-2 shall run in tandem to supply 50-100% demand, and BP-3 shall be on stand-by mode. On the next operating cycle, BP-2 will operation to handle 0-50% of the demand, and BP-3 shall operation as the demand load exceeded 50% to supply up to 100% demand, and BP-1 shall be on stand-by mode. The operating cycle is intended to avoid wear and tear of the pumping equipment. A 38 mm Auxiliary Control Valve shall be furnished with 250 lbs., ASA screwed connection for each pump. The pressure reducing and non-slam check type with adjustable flow control device for modulating valve action at flows; have a cast iron body with bronze trim; have a range adjustment suitable to the system and be present by the manufacturer for the desired system pressure.

A thermal sensing and thermal purge system detector shall be furnished to prevent overheating of the pump. The thermal purge mounting in the discharge line between the pumps and the control valve. Either temperature switch shall automatically open the purge valve at approximately 1000 F and purge the pump of all warm water. Upon sufficient pipe in temperature, the temperature switch shall be connected through the control and operation of the purge valve. The purge valve shall be screwed connect and designed for 400 volts, 60 hertz, A.C. operation.

The system shall also be furnished with an automatically start to provide water at constant pressure.

6. Accessories: Vibration insulating hose connect at suction and discharge line, electrode type water level control or equal to prevent pumps from running dry.

D. EMERGENCY SUMP PUMP (SP 1-3):

1.	Number of Units	:	One (1) set Triplex Pump
2.	Capacity of Pump	:	140 GPM vs. 40 FT. (TDH), 3 to 5 HP.
3.	Type	:	The pumps shall be submersible non-clog cutter type.
4.	Mounting	:	Submersible, inside sump pit locationed at ground floor parking as shown on plans.
5.	Electric Motor	:	480 Volts, 3-phase, 60 hertz, 3 to 5 HP.
6.	Motor Controls	:	Weather proof full voltage magnetic starter, H-O-A switches, float liquid level controls, overload current relays and alternators, for automatic operation and to alternate the pumps in service and start the second pump if one pump cannot handle the load, soft start and stop.
7.	Accessories	:	Access manhole, guide rails, lifting chains, Flexible connector /or Victaulic coupling, swing type check valves, gate valves at discharge lines, electrode type water level control or equal to starts and stops pumps alternately and run simultaneously in case of high water level and trigger emergency alarm in case excessive high water level occur.

SECTION 16 : WATER RESERVOIR

A. DOMESTIC WATER TANK

1. Specification and requirements
   a. Fiberglass Reinforced Plastic (FRP) modular domestic water storage tank, refer to Structural Consultant Engineer for structural details.
   b. Furnish necessary piping and equipment and perform all labor required for the satisfactory completion of the system.
   c. Domestic water storage tank capacity;

Domestic Water Tank = 19,300 U.S. Gallons
Two (2) compartments

Location : Ground Floor Pumproom

d. All structural design analysis shall conform to the latest Building Codes and National Structural Codes for Building (NSCB) or refer to the Structural Consultant Engineer.

2. Piping, Fittings. And Miscellaneous metal works
   a. Furnish and install all pipes fittings, valves, specials, pipe supports, miscellaneous metal work and all required appurtenances. All materials installed shall be stainless steel unless otherwise noted and a product of a reputable Manufacturer all through out the project and shall be installed as shown on the plans complete with its accessories for the satisfactory completion of the entire system.
   b. All materials furnished and installed shall be new and guaranteed free from defect in design, materials and workmanship.
   c. Adequate protective measures shall be provided to protect pipes, fittings, valves and all other materials from damage or injury during storage and installation.

3. Flanges, Gaskets and Bolts
   a. Flanges shall be a product of a reputable Manufacturer all throughout the Project. Material shall be stainless steel and conform in dimension and drilling to ASA B-16.1 Class 125.
   b. Gaskets shall be a product of a reputable Manufacturer all throughout the project.
   c. Bolts shall be standard square head machine bolts with heavy, hot, pressed hexagon nuts. Threads shall conform to ASA B-1.1, coarse thread series, Class 2 fit.

4. Manholes, Frames and Cover
   a. All casting for manhole frames shall be a product of a reputable Manufacturer all throughout the Project. Material shall be stainless steel free from warps, cracks, holes, swells and cold shuts and approximately 3 mm thick.
   b. All casting shall conform to the requirements of AWWA-D-100-67 or approved equal standard requirements.

5. Ladder Rungs
   a. Ladder Rungs shall be a product of a reputable Manufacturer's all throughout the project. Material shall be of 20 mm diameter round stainless steel bar mounted on the walls or as shown on drawings or as specified.

B. INSTALLATION

1. All pipes shall be carefully placed and supported at the proper lines and grade where possible shall be sloped to permit complete draining.

2. Piping runs shown on Drawing shall be followed as closely as possible, except for minor adjustments to avoid adverse-effect on architectural and/or structural features. If major relocation is required, they shall be subjected to the approval of the Architect.

3. Carefully inspect all pipe and fittings before installation. Inspection of pipe shall include light tapping with a hammer to detect cracks of defects. No pipe fittings or valves which are cracked or shown defects shall be used.

4. Piping shall be properly supported by suitable anchors, brackets, or hangers. Vertical pipes shall be anchored by suitable galvanized steel straps. Pipe supports shall be provided as shown on the Plans and whenever else necessary to prevent stain on joints or to facilitate taking down pipe.

5. Piping through the Walls - Where the pipe pass through walls, care shall be exercised to insure this joints are watertight.

C. TEST FOR WATER

1. Tightness of Completed Tank - The completed reinforced concrete ground and elevated water tanks shall be tested for water-tightness by filling it up with clean water after cleaning out all dirt and debris inside the tank. The water shall be allowed to stand for a minimum period of twenty four (24) hours reckoned from the time the free -board line was reached during filling up. After the 24 hours period there shall be no drop in water level in the tank more than 40 mm, otherwise, the leaks shall be located and plugged properly and test for water -tightness be repeated.

D. DEFECTIVE WORK

1. If the inspection or test shows any defect, such defective work or material shall be replaced and the test shall be repeated until satisfactory to the Owner.
2. All repairs to piping shall be made with new material at the expense of the Contractor.
3. No caulking of screwed joints of holes will be accepted.

E. TEST CERTIFICATE

Test Certificate shall be filled out and signed by the Owner's representative.

SECTION 17 : CENTRAL OIL INTERCEPTOR (FOR GENSET ROOM)

A. Furnish and install where indicated on the drawing. Central oil interceptor shall be complete with oil interceptor system, venting system, intake and discharge piping, test and suction line, oil storage tank and all fittings and accessories necessary for complete oil intercepting system, ready for use.

B. The oil interceptor for Genset shall be reinforced concrete construction with inlet and outlet size shall be both 100 mmØ.

SECTION 18 : CENTRAL GREASE INTERCEPTORS

A. Furnish and install where indicated on the drawing. Central grease interceptor shall be complete with grease interceptor system, venting system, intake and discharge piping, test and suction line, grease storage tank and all fittings and accessories necessary for complete grease intercepting system, ready for use.

B. The grease interceptor shall be reinforced concrete construction with a flow rate capacity of 1,000 gals/day. Inlet and outlet size shall be both 150 mmØ.

SECTION 19 : WATER HEATERS

A. Type of Water Heater

1. Instantaneous Single-point electric water heater (EWH) specified herein shall be rated at 230 volts, single phase, 3.5 kW as specified on drawings.

B. A metal name plate indicating indelible letters of the correct specification and/or standard catalog product of the water heater and the reputable manufacturer brand name shall be properly attached to the assembly at a location such that the information written thereon can be conveniently read by all concerned.

C. Accessories: stainless steel all bracket support check valve relief valve, union patentee gate valve and drain valve.

SECTION 20: SITE PLUMBING UTILITIES

A. GENERAL

1. The entire site plumbing utilities system shall be laid out and installed consistent throughout with the given slopes in the plans. Pipe joints and connect to area drains, catch basin and junction boxes shall posses such leak proof and seepage proof integrity achievable with the works called for under this particular section of the Specification.

2. Junction Boxes for storms and sanitary (sewer) drainage lines outside the building shall be cast-in place reinforced concrete sect and pre-cast concrete cover.

3. Trench excavation and backfilling shall be as specified in excavation, trenching and backfilling for utility system.

4. Exterior Drainage Pipe
   a. Installation:
   Bedding surfaces shall provide a firm foundation, carefully shaped thru to line and grade.

B. EXCAVATION FOR STORM AND SANITARY (SEWER DRAINAGE SYSTEM)

1. General: The Contractor shall do all excavation of whatever substances encountered below depth shown on drawings. Excavated materials not required for fill or backfill shall be removed of by the Contractor. Excavation for accessories to have 300 mm minimum and 60 mm maximum clearance in all side. Excavation shall not carried below the required depth. Excess excavation below required level shall be backfilled at the Contractor's expense with earth, sand, gravel, or concrete, as directed by Engineer, and thoroughly tamped unstable soil shall be removed and replaced with gravel or crushed stone, which shall be thoroughly tamped.

   The Engineer shall determine the depth of removal of unstable soil. Ground adjacent to all excavation shall be graded to prevent water running. The Contractor shall remove by pumping or other means approved by the Engineer any water accumulated in excavation and keep trench unwatered until the bedding is complete.

2. Trench Excavation: Banks of trenches shall be vertical. Soft materials shall be reported to the Engineer. In rock, excavation shall be carried 200 mm below bottom

of pipe. Loose earth or gravel shall be used for backfill, and tamped thoroughly and rounded to receive pipe as above.

3. Rock Excavation: Rock excavation shall include removal of boulders larger than ½ m3 in volume and ledge rock concrete or masonry structures that required drilling in volume and ledge rock concrete.

4. Bracing and Shoring: The Contractor shall do all bracing sheathing and shoring necessary to perform and protect all excavation as indicated on the plans, as required for safety, as directed by the Engineer, or to conform to governing laws.

C. TESTING

Test: Test for workmanship on utility lines shall be conducted in accordance with the applicable utility specification before backfilling.

D. BACKFILLING

1. Backfilling: After pipes have been tested and approved, backfilling shall be done with approved material free for large clods or stones.

   a. Trenches Backfill material; shall be placed evenly and carefully around and over pipe in 150 mm maximum layers. Each layer shall be thoroughly and carefully tamped until 300 mm of cover exists over pipe. The remainder of backfill material shall be placed, moistened and compacted. Water settling will not be permitted in clay soils. it may be required at the option of the Engineer in sandy soils.
   b. Trench under areas to be paved; Material shall be placed in 200 mm maximum layer after filling 300 mm above pipe as previously described. Each layer shall be compacted to density equal to that of adjacent original material so that pavement can be placed immediately.
   c. Structures; All forms, trash, and debris shall be removed and cleared away. Approved backfill material may be from excavation or borrow, it shall be free form rock, lumber or debris. Backfill material shall be placed symmetrically on all side in eight inch maximum layers. Each layer shall be moistened and compacted with mechanical or brand tampers. In area to be paved, each layer shall be compacted to density equal to that of adjacent materials so that pavement can be placed immediately.
2. Maintenance: The Contractor shall refill for settlement of all backfilled areas.

3. Clean-up: The Contractor shall clean-up and dispose of all excess materials, trash wood forms and other debris.

SECTION 21 : TESTING AND DISINFECT

A. DRAINAGE SYSTEM TEST

1. The entire sewer, waste and storm drainage and venting systems shall have all necessary openings which can be plugged to permit the entire system to be filled with water to the level of the highest stack vent/or vent stack above the roof.

2. The system shall hold this water for a full sixty (60) minutes and there shall be no drop of more than 100 mm.

3. Each section of pipeline shall be slowly filled with water at the specified test pressure, measured at the point of the lowest elevation. During the filling of the pipe, in and before applying the test pressure, all air shall be expelled from the pipe line. During the test; all expose pipes, fittings, valves joints and couplings will be carefully examined. If found to be cracked or defective, the Contractor shall rectify defects at his own expense. The test shall be repeated until satisfactory results have been obtained.

B. PRESSURE TESTS FOR WATER LINES

1. After the pipe have been installed, the joints completed and with joints exposed for examination, all newly installed pipe or any valve section therefore, shall be subjected to hydrostatic pressure 1 ½ the designed working pressure of the system or as specified by the Engineer.

2. The duration of each pressure test shall be at least two (2) hours unless otherwise specified by the Engineer.

3. Each section of pipeline shall be slowly filled with water and the specified test pressure, measured at the point of lowest elevation, shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. During the filling of the pipe and before applying the test pressure, all air shall be expelled from the pipe line. To accomplish this type, it shall be made, if necessary, at point of highest elevation, and after completion of the test the taps shall be tightly plugged unless otherwise specified. During the test, all exposed pipes, fittings, valves, joints and couplings will be carefully examined. If found to be cracked or defective, the Contractor shall remove and replace with sound materials at his expense. The test shall then be repeated until satisfactory results are obtained.

C. DEFECTIVE WORK

1. If the inspection or test shows any defect, such defective work or material shall be replaced and the test shall be repeated until satisfactory to the Architect /or Engineer.

2. All repairs to piping shall be made with new material at the expense of the contractor.

3. No caulking of screwed joints of holes will be accepted.

D. DISINFECTION OF WATER DISTRIBUTION SYSTEM AND WATER TANKS (as per AWWA C-601)

1. The entire water system shall be thoroughly flushed and disinfected with chlorine before it is placed on operation. Water tanks shall be washed and swabbed.

2. Chlorination materials shall be liquid chlorine or hypochlorite, as specified and shall be introduced into the water line in a manner approved by the Engineer. Tanks shall be thoroughly cleaned of all debris, dirt or dust before swabbing.

3. The chlorine dosage shall be such as to provide not less than fifty parts per million (50 PPM) or available chlorine.

4. Following a contact period of not less than sixteen (16) hours, the heavily chlorinated water shall be flushed from the system with clean water until the residual chlorine content is not greater than two tenth (.20 PPM). All valves in water lines being sterilized shall be opened and closed several times during the sixteen (16) hour chlorinating period.

SECTION 22 : CLEANING

A. All exposed metal surface shall be free of grease dirt or other foreign materials.

B. Chrome or nickel plated pipings, fittings and trimmings shall be polished upon completion.

C. All plumbing fixtures shall be properly protected from use and damage during the construction stage. The fixtures shall be cleaned to the satisfaction of the Architect /or Engineer upon completion and prior to acceptance of work.

D. All equipment, pipes, valves and fittings shall be cleaned of grease and sludge which may have accumulated. Any clogging, discoloration or damage to other parts of the building due to the system shall be repaired by the Contractor.

SECTION 23 : PAINTING AND PROTECT

A. All exterior of pipings to be installed in or through concrete floor fill or fill floors and underground shall be given one coat of acid resisting paint having a bituminous base.

B. Pipe hanger supports an all other iron work in concealed spaces shall be painted with one coat of asphalt.

C. Exposed galvanized iron pipes and fittings that are asphalt coated shall be given two coats of shellac prior to application of two coats of all paint as directed by the Architect of his authorized representative.

SECTION 24 : COLOR CODE FOR EXPOSED PIPES

A. All exposed pipings shall be adequately and durably identified by distinctive colored paints as follows:

ITEM	**COLOR CODE**
Cold water pipe	Blue
Hot water pipe	Blue w/red band @1.0m O.C.
Storm water pipe	Aluminum
Sewage pipe	Black
Vent pipe	Green
Waste pipe	Gray
FCU/AHU drain pipe	Gray w/white band @1.0m O.C.

SECTION 25 : WARRANTY AND "AS-BUILT" PLANS

A. All works, equipment and fixtures shall be guaranteed by the Contractor for satisfactory service for a minimum period for one (1) year.

B. The Contractor shall submit to the Owner, in reproducible form plus three (3) sets of white prints, the complete plans of the entire system as actually built. The cost of those shall be borne by the Contractor. Submittal of "AS-BUILT" Plans shall be a condition to final payment.

C. Equipment that should have the Owner (s) your minimum guaranteed against defective designs, materials and workmanship.

SECTION 26 : RESPONSIBILITY

A. The Contractor's shall provide temporary fire protection system during the construction period. This shall be of sufficient capacity to put any fire that may break out due to construction operation. This is in addition to temporary fire extinguisher required.

B. The Contractor's shall identify and save the Owner, the Architect and the Consulting Engineer harmless from and against all liabilities for damage to property occasioned by any or omission of this Contractor's expenses, legal or otherwise which may be insured by the Owner, the Architect or the Consulting Engineer, in the defense of any claims, action or suits.

C. The General Contractor shall be responsible for the coordination among the different trades on the jobsite in order to finish the Works in the least possible time, in strict compliance and in accordance with the Plans and Specification.

D. Throughout the construction period open ends of all installed drainage, sewer and vents lines, water lines and other related pipings shall be kept closed by temporary plugs.

E. All installed drainage, sewer and vents lines, water lines and other related pipings shall not be used to conduct dirty construction wash water especially those with cement mixes to avoid possible clogging.

F. A temporary potable water supply shall be made available to construction workers as construction progresses.

G. A temporary human excreta disposal system shall be provided by the Contractor to serve the Workers during the construction period.

GENERAL NOTES

The contractor shall be responsible in securing the necessary permits/ licenses (Building, Electrical, Mechanical, Sanitary/Plumbing, Electronics & Communication and Fire Safety) from the Local Government Units (LGU's) and other government agencies in connection with the implementation of the Rehabilitation and Upgrading of Medical and Scientific

Athletes Services Building, Rizal Memorial Sports Complex, Pablo Ocampo Street Malate Manila.

Other materials and workmanship not included on the above list but found necessary to complete the work shall be for the account of the contractor.

Sub-contractor/ suppliers of major finishing materials (ceiling panel, tile, glass, waterproofing, paint, etc) shall be a local or multi-national company with wholly owned Philippine subsidiary and shall have a similar local project of supply and installation of the above stated materials.

Sub-contractor of major finishing materials (ceiling panel, ceramic tiles, etc.) shall be a ***member of association of specialists on cleaning and restoration.***

The contractor shall be responsible for the safety measures during the implementation of the project and ***must submit methodologies*** in every finishing material required in the project.

Branded materials stated in the plans and specifications are the designer's reference of quality standards.

These products can be replaced provided that the replacement are approved of the same or higher quality.

The contractor shall ***coordinate with PSC Project Architects, Engineers and Coordinators*** in connection with the implementation of the project so as not to hamper with PSC operations.

The contractor is required to have the necessary and appropriate tools, instruments and equipment for the proper implementation of the project.

The contractor shall submit the as built plans to PSC after the completion of the project.

It is assumed that the bidder shall have full knowledge of the work and site condition, shall have reviewed the plans and specifications and bid documents, and thus warrants the availability of the work and materials upon submission of his bid proposal.

The contractor shall coordinate all aspects of the works in order to ensure a harmonious progress without interruptions, delays of modifications to work already completed.

The prospective bidder/ contractor shall possess and submits with the eligibility documents a valid track record in undertaking related works.

All electrical and other related facilities/ equipment not included in the program of works that will be affected during the implementation of the project should be done at no additional cost to PSC authority.

A. PREVENTION OF ACCIDENT AND PUBLIC NUISSANCE

General

The Contractor shall formulate adequate control measures in accordance with the relevant local laws and regulations regarding prevention of accidents, fires and public nuisances during the execution of the work.

The Contractor shall ensure that his workmen are aware, and shall so instruct the workmen, of good and safe working practices.

The Contractor's safety plan shall take into account, among other items, working in Restricted
Areas, Contractor's Equipment; hand held power tools; percussion guns; air compressors and hoses; electrical equipment; fuels; use of dust masks, ear protectors, safety helmets and safety lines.

Prevention of Accidents

The Contractor shall formulate a safety plan for work at the Site to provide proper protection, especially at such places in the airfield Restricted Areas.

Pollution Control

The Contractor shall take all necessary steps to minimize noise, vibration, dust, soot, and other pollution resulting from the execution of the work.

PERIOD OF WORK

The Contractor shall complete the work within One Hundred twenty days (120) calendar days and working twenty four hours per week (24/7) upon receipt of the Notice to Proceed.

CONTRACTORS RISK AND WARRANTY SECURITY

1. The Contractor shall assume full responsibility for the works from the time of construction commenced up to final acceptance by the Procuring Entity's Representative/s and shall be held responsible for any damage or destruction of the works except those occasioned by force majeure. The Contractor shall be fully responsible for the safety, protection, security and convenience of his personnel, third parties and public at large, as well as the works, equipments, fabrication and installation and the like to be affected by his construction works and deliveries.

2. The defects liability period shall be one (1) year from the contract completion. The certificate of acceptance shall be issued by PSC after all defects have been corrected.

ACCEPTANCE OF THE PROJECT

Certificate of Acceptance will be issued upon approval of the END USER and the Head of the Procuring Entity.