DIVISION 15
SANITARY

15 00 00	SANITARY	
15 41 00	Plumbing Fixture	

1. PART 1 GENERAL
   1.1 RELATED DOCUMENTS
   1.1.1Technical Architectural Drawings
   1.1.2Specifications
   1.1.3Requests for Interpretation
   1.1.4Product Samples and Brochures
   1.1.5Manufacturer's Data Sheets and Certificates
   1.1.6Material Safety Data Sheets
   1.1.7Work Program and Methodology Submittals

   1.2 SUMMARY
   This section includes provisions on the performance requirements of plumbing fixtures, fittings, trims, and all plumbing accessories required to complete the project.

   1.3 RELATED SECTIONS
   1.3.1Joint Sealants
   1.3.2Solid Surface Countertops

   1.4 GENERAL PROVISION
   1.4.1Where indicated on the technical working drawings, provide tank-type water closet, lavatory, urinal, and other accessories necessary to complete toilet and bath units as indicated in the technical plans and drawings.
   1.4.2Use Polypropylene (PPRC) pipes and fittings for Cold Water System.
   1.4.3Use Poly Vinyl Chloride (PVC Orange) equivalent to Series 1000 and drainage pattern fittings or use High-Density Polyethylene (HDPE).
   1.4.4Use solvent cement joint on rubber-o-ring.
   1.4.5Use PVC Series 1000 for all downspouts and all underground storm drainage as indicated in the drawings or use High-Density Polyethylene (HDPE).
   1.4.6Use PVC Series 1000 for all soil stacks, vent pipes and sanitary drainage piping system. Or use High-Density Polyethylene (HDPE).
   1.4.7Pipe sleeves should be 25mm larger than the size of the pipe specified for plumbing lines.
   1.4.8Tap-Tee connections for all lavatories and kitchen sinks.
   1.4.9Gate valves of branches to supply fixture shall be Crane PN-36 bronze bate valve.
   1.4.10 Floor drains at toilets shall be ASA or METMA M-249-13 or approved equal.

   1.5 MAINTANANCE, DELIVERY, STORAGE, AND HANDLING
   1.5.1Conduct hydraulic and pressure tests at regular intervals from the completed time of installation.
   1.5.2Conduct leak tests and immediately repair dysfunctional lines.
   1.5.3Deliver plumbing fixtures in sealed protective packaging.
   1.5.4Store plumbing fixtures on dry locations. Contain in properly labeled boxes. Include in labels the psi capacity of fixtures, especially check valves and gate valves.
   1.5.5Turnover extra materials to owner if materials are considered

   1.6 SUBMITTALS

   1.6.1PRODUCT APPROVAL ATTACHMENTS
   Submit technical product data of plumbing fixtures to be installed. Include samples as required by architect. Include technical data of booster pumps and other necessary plumbing equipment, stating machine brand, product serial number, and brand. Submit maintenance requirements of each machine type, including

instructions and source manufacturers for replaceable parts.

1.6.2EXECUTION APPROVAL ATTACHMENTS
Submit hydraulic, pressure, and leak test methodology.

1.7 QUALITY ASSURANCE
1.7.1Check that fixtures used are free of hairline cracks and factory defects. Replace all defective pipes, fittings, and fixtures. Do not install defective pipes and fixtures.
1.7.2Conduct leak, hydraulic and pressure tests at substantial completion of project, prior to project turnover.

1.8 WARRANTIES
Warrant all plumbing installations to be fully functional for (2) years.

2. PART 2 PRODUCTS
   2.1 WATER CLOSET
   2.1.1Use dual flush water closets with ultra high efficiency. Full flush water discharge shall be approximately 4.8 Lpf/1.28 gpf and partial flush approximately (3.4 Lpf/0/92 gpf).
   2.1.2Elongated siphon action bowls, with vortex flushing technology.
   2.1.3Chinaware on watercloset shall comply with ASME A112.19.2/CSA B45.1

   2.2 LAVATORY FAUCET
   Use single control kitchen faucet with a forged brass body and metal lever handle, complete with washerless ceramic disc valve.

   2.3 PANRTY FAUCET
   Use single control kitchen faucet with a forged brass body and metal lever handle, complete with washerless ceramic disc valve.

   2.4 SHOWER SET
   Use shower sets complete with hand showers and overhead showers. Shower control shall be single-control, of lever-type handle.

   2.5 LAVATORY
   Use surface mounted or wall hung wash basins of rectangular shape.

   2.6 GREASE TRAP
   Use stainless steel grease trap with capacity of at least 4 gallons per minute. Grease trap shall have at least two chambers, complete with a perforated filtration basket.

   2.7 STAINLESS SINK
   No section of the sink shall be less than 0.80mm thick. Provide supporting fixtures, drains, and similar accessories to complete installation.

   2.8 FITTINGS
   Provide heavy-duty fittings as needed to complete the installation. Ensure fittings are compatible with installed fittings. Check manufacturer's requirements.

   2.9 FIXTURE SUPPORTS
   Ensure that fixture supports are structurally sound and stable.

3. PART 3 EXECUTION
   3.1 INSTALLATION
   3.1.1Check plumb-ness and levels prior to installation. Ensure alignment of fixtures.
   3.1.2Check roughig-ins to be consistent with technical working drawings.
   3.1.3Wall hanging lavatories shall be installed with gasket seals.

3.1.4Install escutcheons at each wall, floor, and ceiling penetration in exposed finish locations, and within cabinets and millwork.
3.1.5Seal fixture to walls, floor, and ceiling using mildew-resistant silicone.

3.2 PROTECTION, ADJUSTING, AND CLEANING
3.2.1Replace all damaged and malfunctioning fixtures, fittings, controls, and other parts of the plumbing system affecting full functionality.
3.2.2Provide protective covering for installed fixture and fittings.
3.2.3Do not allow temporary use of fixtures and facilities until substantial turnover.

END OF SECTION

16 00 00	ELECTRICAL
16 51 00	

16.1 SCOPE

The work contained in this section includes furnishing of all labor, equipment, tools and materials and performing all operations, including cutting, channeling and chasing necessary for the installation of complete wiring and conduit system, electrical equipment and electric service connection in accordance with this specification unless required otherwise in the drawings.

16.2 APPLICABLE DOCUMENTS

The following specifications, standard and codes of the issues listed in this paragraph (latest edition) but referred to hereinafter by basic designation only shall form part of this specification to the extent required by the references thereto.

NFPA	National Fire Protection Association
PEC	Philippine Electrical Code
NEA	National Electrification Administration
NEMA	National Electrical Manufacturer"s Association
NEC	National Electrical Code
ABI	Molded Case Circuit Breakers
ICI	Industrial Control
UL	Underwriters" Laboratories, Inc.
UL50	Cabinet and boxes
UL57	Electric Lighting Fixtures
UL67	Panelboards
AWPA	American Wood Preservers Association
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
C80.1	Rigid Steel Conduit

16.3 GENERAL PROVISION

16.3.1 GENERAL

Provide all materials and equipment and perform all the work necessary for the complete execution of all the electrical works as shown on the electrical drawings and specifications. Except as otherwise excluded, and which without excluding the generality of the foregoing, shall include but not limited to the following principal items of the work:

1. Complete power service entrance including concreting works.
2. Building, power and grounding systems.
3. Power distribution equipment, including normal and emergency distribution and lighting/power panelboards, and automatic transfer switches.
4. A system of lighting and power conduiting and wiring including all feeders, branch circuits and connection to all devices and motors.
5. Main feeders from service entrance to distribution panelboards, from generating set to automatic transfer switches and solar panelboards to automatic transfer switch.
6. All lighting fixtures, exit light and battery operated emergency lighting units including all lamps.
7. Installation and connection of electrical equipment such as fuel pumps controllers etc. Except as otherwise noted on plans.

8. Complete installation of
8. Securing and all payments from building permit to electrical wiring permit, certificate of final inspections, and utility connections.
9. Complete testing of all electrical systems.
10. Complete directories, signages and painting of all electrical work and equipment.
11. Grouting or fire proof sealing of openings in floors and walls after all raceways or ducts are in place and sealing of all such openings if not used.
12. If anything has been omitted or not enumerated in the specifications and the plans of any item of work, which is necessary and usually furnished with the materials and standard practice in electrical installations, then such items must be are hereby included in this electrical work.
13. Provide excavation, backfill, concrete, structural supports, miscellaneous materials, and labor for complete installation of items specified under this division unless otherwise shown.

16.3.2 APPLICATION

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

16.3.3 SUBMITTALS

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

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

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

2. Manufacturer"s Data: Submittals for each manufactured items shall be current manufacturer"s descriptive literature of cataloged products, equipment drawings, diagrams, performance and characteristics curves, and catalog cuts.
3. Publication Compliance: Where equipment or materials are specified to conform to industry and technical society publications of organizations such as Philippine National Standards (PNS), Japanese Industrial Standards (JIS), International Electrotechnical Commission (IEC), British Standards (BS), American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), and Underwriters Laboratories, Inc. UL), submit proof of such compliance. The label or listing by the specified organization will be acceptable evidence of compliance. In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" whenever it appears. Interpret references in these publications to the "authority having jurisdiction", or words of similar meaning, to mean the Engineer. In lieu of the label or listing, submit a certificate from an approved independent testing organization, adequately equipped and competent to perform such services, stating that the item has been tested in accordance with the specified organization"s test methods and that the item conform to the specified organization"s publication.
4. Certificates of Compliance: Submit manufacturer"s certifications as required on product, materials, finish and equipment indicated in the technical sections. Certifications shall be documents prepared specifically for

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

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

16.3.4 CONNECTION TO OTHER EQUIPMENT

A. Complete manufacturer"s detailed shop drawings wiring and connection diagram of equipment requiring electrical connection will be provided as specified elsewhere. Contractor shall obtain drawings at the time they are needed.

B. Work that must be altered because of contractor"s failure to obtain shop drawings shall be corrected, without additions to the contract price.

16.3.5 COORDINATION DRAWINGS

A. Drawing are diagrammatic and show general location of conduit and equipment, exact location of conduit and equipment not located by dimensions on drawing shall be determined when equipment and mechanical drawings are available.

Contractor shall use these drawings to coordinate installation of electrical equipment. Contractor shall submit coordination drawings to IPFDU"s Representative before installation of equipment with consideration given to interference and appearance.

16.3.6 OPERATION AND MAINTENANCE MANUAL

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

8. Complete installation of
8. Securing and all payments from building permit to electrical wiring permit, certificate of final inspections, and utility connections.
9. Complete testing of all electrical systems.
10. Complete directories, signages and painting of all electrical work and equipment.
11. Grouting or fire proof sealing of openings in floors and walls after all raceways or ducts are in place and sealing of all such openings if not used.
12. If anything has been omitted or not enumerated in the specifications and the plans of any item of work, which is necessary and usually furnished with the materials and standard practice in electrical installations, then such items must be are hereby included in this electrical work.
13. Provide excavation, backfill, concrete, structural supports, miscellaneous materials, and labor for complete installation of items specified under this division unless otherwise shown.

16.3.2 APPLICATION

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

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

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

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Contractor shall use these drawings to coordinate installation of electrical equipment. Contractor shall submit coordination drawings to IPFDU"s Representative before installation of equipment with consideration given to interference and appearance.

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   1. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the system or equipment.
   2. A control sequence describing startup, operation, and shutdown.
   3. Description of the function of each principal items of equipment.
   4. Installation and maintenance instructions.
   5. Safety precautions.
   6. Diagrams and illustrations.
   7. Testing methods.
   8. Performance data.
   9. Lubrication schedule including type, grade, temperature range, and frequency.
   10. Parts List: The list shall indicate sources of supply, recommended spare parts, price, shipping weight and name of servicing organization.
   11. Appendix: List qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.

16.3.7 POSTED OPERATING INSTRUCTIONS

A. Furnish approve operating instructions for system and equipment indicated in the technical sections for use by operation and maintenance personnel.

B. Operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment including start-up, property adjustment, operating, lubrication, shutdown, safety precautions, procedure in the event of equipment failure, and other items of instructions as recommended by the manufacturer of each system or equipment. Provide weather-resistant materials or weatherproof enclosures for operating instructions exposed to the weather. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

16.3.8 INSTRUCTION TO OWNER PERSONNEL

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

16.3.9 DELIVERY AND STORAGE

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

16.3.10 CATALOGUED PRODUCTIONS/SERVICE AVAILABILITY

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

16.3.11 MANUFACTURER'S RECOMMENDATIONS

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

16.3.12 RECORD DRAWINGS

A. Contractor shall keep in field, and open for inspection by the Owner"s Representative, an accurate current, progressive record of actual installation of electrical system. On completion of work, contractor shall deliver to Owner"s Representative, marked prints showing actual routing of conduits and ducts, location and elevation of outlets, circuit numbers of lighting and power circuits, installation details of lighting fixtures, power panels, etc.

B. Contractor will be permitted to make changes to meet field conditions or material delivery conditions which may arise. However, in each instance, proposed change must be submitted in form of drawings or sketches for approval and acceptance by Owner"s Representative.

16.3.13 CODES, PERMITS, INSPECTIONS, AND OWNER REQUIREMENTS

A. Work shall comply with the latest requirements of Philippine Electrical Code, Building Rules and Regulations, Local Ordinances, and such other statutory provisions that pertain to this class of work. Such code, rules, regulations and local ordinances are to be considered part of these Contract Documents.

B. Contractor shall, at his own expense, obtain necessary permit for construction and performance of work specified.

C. Contractor shall, at his own expense, secure Certificate of Final Inspection and approval from Electrician"s Office of the City or Municipality prior to final approval of the work.

16.3.14 ELECTRIC CHARACTERISTICS

A. Electrical characteristics for this project shall be 240V, three-phase, 3 wire, 60 hertz, or as indicated on the drawings. Final connections to the power distribution system at utility power lines shall be made by the Contractor as directed by Electric Utility Company.

16.3.15 ELECTRIC REQUIREMENTS

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

16.3.16 GENERAL NOTES

A. All electrical works herein shall be executed by experience men under the supervision of a duly registered electrical engineer, works shall be neatly placed securely fastened and properly finished.

B. Materials shall be new and shall conform to provisions of the underwriter"s laboratories Inc. In every case where such a standard has been established.

C. All conduits embedded in concrete for power, lighting and auxiliary system including service entrance conduits shall be PVC. Conduits run concealed in ceiling and between wood partitions shall be Intermediate metallic conduit or conduit for power feeder risers and motor circuits shall be intermediate metallic conduit.

D. Electrical trade size shall be used, a minimum of 15mmϕ for conduits and in no case shall there be not more than the equivalent of four quarter bends in any one run.

E. Conduits shall be protected against damage during construction all ends of conduits shall be plugged to prevent the entrance of water, moisture and foreign matter after installation.

F. Single conductor insulated thermoplastic, 600V wires shall be used in conduit, and minimum size of wires shall be 3.5 mm2 THHN/THWN for all lighting and power system.

G. Upon completion of electrical construction work, the following tests shall be performed by the constructor inclusive of the installation to be reported in details on form approved by the owner"s representative.

a. Insulation resistance test, 500VDC
b. Ground resistance test (5ohms)
c. Operational test
d. Phase sequence test

H. All branch circuit feeders shall be provided with additional ground wire in accordance with the Philippine Electrical Code Table 4.2.9.5 even where it is not shown on drawing. Equipment grounding shall be as shown on drawings.

I. Trade contractors shall provide controllers for electrically operated equipment, e.g. HVAC, fire protection, sanitary system and other special systems, including wiring from controller to the equipment.

J. All raceways wall and floor penetrations shall be provided with fire barrier of the approved type.

K. All junction boxes that are exposed to weather shall use weatherproof enclosure type FS cast steel box.

L. A removable circuit directory shall be provided for each panelboard for field marking of function and number of each branch circuit. All directories shall be of in corrodible material with matching clear plastic holder or jacket.

M. All electrical circuits shall be wired according to the panelboard schedule.

N. All receptacle outlets shall be grounding type.

O. All exit lights and emergency shall be wired ahead of the local switch

P. Color coding of wires shall be as follows
   A. Neutral — white
   B. Ground — green
   C. Line 1 — black
   D. Line 2 — red
   E. Line 3 — blue

16.4 PRODUCTS

16.4.1.1 Standard Products

All materials shall be new and high quality which shall conform to the specification and other applicable standards as to its location and purpose. All materials shall meet the requirements of Bureau of Product Standards and shall bear the inspection label whenever standards have been established. The contractor shall submit to the project engineer and owner for approval shop drawings, catalog data or samples of materials and electrical equipment before procurement.

16.4.2 Approval of Materials

The Contractor shall submit for approval a complete description of all materials to be used in the work. The description shall include catalog numbers, illustrations, diagrams, dimensional data, etc., as required to describe fully the materials.

16.4.3 Conduit and Conduit Fittings

Conduit shall be rigid metal conduit, hot dip galvanized, conforming to ANSI Standard C80.1, "American Standard Specifications for Rigid Steel Conduit, Zinc Coated" unless shown otherwise in the drawings. The conduit fittings and covers, shall be galvanized, sherardized or cadmium plated, grey iron or malleable iron casting. Composite rubber gasket shall be provided on all openings requiring covers. Outlets and pull boxes shall be of size and type shown in the drawings.

16.4.4 Wires and Cables

A. All wires shall be copper, soft-dawn and annealed of 98% conductivity. These shall be smooth and true and of a cylindrical form and within 1% of the actual size called for.

B. All wires shall comply with Bureau of Product Standards and shall bear the PS label.

C. Wires shall be as manufactured locally as approved by the engineer.

16.4.5 Outlets

Each outlet in the wiring or raceway system shall be provided with an outlet box to suit the conditions encountered. Boxes for exposed work or in wet locations shall be of the cast metal type having threaded hubs. Boxes for concealed work shall be the cadmium-plated or zinc-coated sheet metal type. Each box shall have sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of the National Electrical Code / Philippine Electrical Code. Boxes shall not be less than 40mm deep unless lower boxes are required by structural conditions that are specifically approved by the Architect. Ceiling and bracket outlet boxes shall not be less than 100mm octagonal except that smaller boxes may be used where required by the particular fixtures to be installed. Switch and receptacle boxes shall be approximately 100mm x 54mm x 40mm. Telephone outlets shall be 100mm square except that 100mm x" 54mm x 40mm boxes may be used where only one raceway enters the outlet. Boxes installed in concealed locations shall be set flush with the finished surfaces and shall be provided with the proper extension rings or plaster covers where required. Boxes shall be installed in a rigid satisfactory manner and shall be supported by bars hangers in frame construction or shall be fastened directly with wood. Location of outlets shown on the drawings are approximates; the Contractor shall study the building each outlet so that the lighting

fixtures are symmetrically located according to the room layout. When necessary, with the approval of the Architect, outlets shall be relocated to avoid interference with mechanical equipment or structural features.

16.4.6 Pull Boxes, Junction and Utility Boxes

Junction, utility and pull boxes shall be of code gauge steel and shall be provided as required for pulling of wires. Utility box for receptacles and switches shall be deep type 50mm x 100mm x 50mm. Pull boxes when installed shall be accessible. Splices and taps in any system shall be made only at junction boxes.

16.4.7 Device Plates

Device Plates of the one-piece shall be provided for all outlets to suit the devices installed. Plates for concealed work shall be bakelite ivory. Screws shall be of metal with oval heads, having color to match the finish of the plate. Plates shall be installed with all four edges. In continuous contact with similar devices. Plaster fillings shall not be permitted. Plates fillings shall be installed vertically, use of sectional-type device plates shall not be permitted. Device plates for telephone and inter-communication outlets shall have 10mm opening in the center.

All wiring devices cover plates shall be of modern plate or as selected by the Architect or Owner.

16.4.8 Wiring Devices

Receptacle shall be of the type and rating as shown in the drawings.

A. Wall receptacles shall be flush mounted, duplex, rated 10 or 15 amperes 250 volts for convenience receptacles, and 20 or 50 amperes for air condition units or other special purpose outlets.
B. Type and color of receptacles shall be coordinated with the Architect as manufactured locally or approved equal by the Architect.
C. Wall switches shall be rated to or 15 amperes 250 volts and shall be thumbler operation and quiet type.
D. Type and color shall be as selected by the Architect and should be the same type and brand as the receptacles.

16.4.9 Panelboards

A. Panelboards shall be of the dead-front safety type conforming to Underwriters"

B. Laboratories, Inc., standard for panelboard UL67, and provided with the size and number of circuits as indicated. Panelboard shall be the automatic circuit breaker type.

   1) Circuit breaker shall be molded bolt-in type with frame size and trip settings as shown on the drawings. Molded case circuit breakers shall conform to NEMA standard publication AB1. Tripping mechanism shall be thermal-magnetic with minimum interrupting capacity of 10,000 amperes.

   2) Lighting and power panelboard shall be equipped with circuit breakers as indicated in the plans. Circuit breakers shall be bolt-on type. Enclosure shall be NEMA 1 and provided with directory and lock. Circuit breakers shall be as manufactured locally as approved by the architect.

C. Automatic Transfer Switch

   a. Automatic Transfer switches shall be furnished and installed at locations as shown on the drawings. Automatic Transfer switch shall be breaker type complete with intelligence circuit.

   b. Automatic Transfer Switches shall be manufactured in accordance with the following standards.

      UL 98 — Enclosed Switches
      NEMA KS 1 — Enclosed Switches
      NEMA 250 — Enclosures for Electrical Equipment

c. Provide outline drawings with dimensions, and equipment ratings for voltage, amperage and short circuit.

D. SWITCH INTERIOR

1. All switches shall have switchblades that are visible when the switch is OFF and the cover is open.

2. Lugs shall be front removable and UL Listed for aluminum or copper [75o C conductors (30-100 Ampere) or 75oC conductors (200-600 Ampere)].

All current carrying parts shall be plated to resist corrosion.

E. SWITCH MECHANISM

Switch operating mechanism shall be quick-make, quick-break (60,100 and 200 ampere, 2-pole and 3-pole devices). Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.

100 ampere, 3-pole Type 1 devices shall be supplied with a quick make, quick break dual cover interlock mechanism to prevent opening of the switch cover when the switch is ON and prevent turning the switch ON when cover is open. The interlock mechanism shall be capable of being bypassed by use of a special key supplied with the device.

16.4.10 Lamp and Lighting Fixtures

Lamp and lighting fixtures of type and sizes as specified in the drawings shall be furnished and installed complete.

1) Incandescent lamps shall be inside frosted lamp, 220 volts, wattage as indicated in the plan.
2) Fluorescent lamps shall be the pre-heat type, cool white color characteristics and shall have complete HPF ballast and starter. Or led driver.
3) Wall switches shall be of the totally enclosed type. Bodies shall be thermosetting plastic compound. Wiring terminals shall be of the screw type. Not more than three switches shall be installed in a single plate position.
4) Fixtures shall conform to Underwriters'' Laboratories, Inc. standard UL57. Fixtures are designated by letters and illustrated on the drawings. Illustrations shall be indicative of the general type desired and shall not restrict selection to fixtures of any particular manufacturer. Fixtures of similar design and equivalent light distribution and brightness characteristics having equal finish and quality may be acceptable but subject to the approval of the Architect.
5) Furnish all materials specified herein or indicated on the drawings.
6) All lighting fixtures, ballasts and lighting controls shall be UL listed and bear a UL label or IEC equivalent.
7) Fixtures shall be selected from fixture schedule from the description of the fixture with consideration to mounting, number and types of lamps, and reference notes contained in the fixture schedule and in accordance with these specifications. The fixture catalogue number is provided for easy reference only.
8) Ballasts and transformers shall be suitably rated for operation on electrical system voltage to which they are to be connected.
9) Acceptable Manufacturers: Philips, GE or approved equal.
10) Source bulbs from a single manufacturer for uniformity of color rendering indices.
11) Source all casing/luminaires from a single manufacturer to ensure uniformity.
12) Replace all dysfunctional accessories with new ones. All electrical and lighting fixtures shall be fully functional upon turnover of project.
13) Warrant lighting devices for two (2) years, or as required by legal codes.
14) PIN LIGHTS, RECESSED TYPE
    i. CASING: Recessed; ceiling mounted, flushed type, circular disc shape, 116mm diameter. Body of casing shall be of aluminum or steel make, hairline or satin finish.

    ii. 10-90% down-lighting.
    iii. LAMPS/BULBS: LED Type, Warm White Color
15) COVE/CANAL LIGHTING
    i. CASING: Surface mounted, ballast case, body of casing shall be of powder coated aluminum white
    ii. 10-90% down-lighting.
    iii. LAMPS/BULBS: Slim Type Tube CFL, Warm White Color, 36WATTS
16) SURFACE MOUNTED SLIM TYPE CFL
    i. CASING: Surface mounted, ballast case, body of casing shall be of powder coated aluminum white
    ii. 10-90% down-lighting.
    iii. LAMPS/BULBS: Slim Type Tube CFL, Warm White Color, 18WATTS
17) WALL LAMP
    i. CASING: Wall mount, square/cube/Rectangular, shall be of aluminum make powder coated black, matte finish.
    ii. Use square type direct-indirect lighting, with 60-90% uplight and 60-90% downlight.
    iii. Maximum width of fixture shall be 120mm.
    iv. LAMPS/BULBS: LED Type, Warm White Color
18) DROPPED LIGHT
    i. CASING: 0.30M diameter, for architect's approval
    ii. LAMPS/BULB LED Type, Warm White Color
    iii. Verify suspension distances with architect
19) PENDANT LIGHT/ DROPPED LIGHT
    i. CASING: 2.0M diameter, for architect's approval
    ii. LAMPS/BULB LED Type, Warm White Color
    iii. Verify suspension distances with architect
20) UPLIGHT
    i. CASING: Recessed; floor mounted, flushed type, circular disc shape, 116mm diameter. Body of casing shall be of aluminum or steel make, hairline or satin finish.
    ii. 10-90% uplighting. Use LED lamps bulbs only.
    iii. LAMPS/BULBS: LED Type, Warm White Color
21) SPOT LIGHTS
    i. Use lightweight spotlights manufactured from aluminum, coated in powder black color, matte finish.
    ii. WATTAGE: For architect's approval, specific to area/location of installation.
    iii. ROTATION: 350 degrees
    iv. ADJUSTMENT: 180 degrees
    v. WIDTH: 95mm
    vi. Comply voltage requirements with local conditions and code.
    vii. LAMPS/BULB LED Type, Warm White Color

16.4.11 EXECUTION

A. EXAMINATION AND PREPARATION

1. Check all luminaires are in good conditions.
2. Verify locations of all luminaires, including surface mounting, matching wattage and lumens. Verify indicated mounting heights from top to bottom on approved shop drawings.
3. Comply with locations of switches, receptacles, lights, motors, etc. outlets as shown on technical working drawings. Contractor shall use good judgment in placing the preceding items to eliminate all interference with ducts, piping, etc.

B. INSTALLATION

1. When installing service electrical utilities, install such that facilitation of service maintenance, repair, and component replacement is not obstructed.

C. CLEANING AND PROTECTION

1. Replace all broken parts, i.e. ballasts, lamps, and casings damaged during construction.
2. Ensure luminaires are dust free at the time of substantial completion.
3. Turnover extra material fixtures to owner for maintenance and parts replacements.

16.5 CCTV SYSTEM

16.5.1 General

The contractor shall furnish and install a complete, operational, Closed Circuit Television system as shown on the drawing and in accordance with these specifications.

All equipment, devices, materials and installation methods shall be applicable to the purpose/function, location and weather condition.

All equipment to be installed shall be brand new and shall include all accessory equipment required whether or not specifically mentioned in these specifications. If latest model of the indicated components herein are available, the contractor shall furnished the said latest model.

Any deviation from these specifications shall require the submittal of the proposed substitute's technical specification sheets and/or manufacturer's brochure properly highlighted to show that the proposed substitution/s meet or exceed the material and operational specifications set herein. Incomplete submittals may be rejected without the need of explanation.

Contractor shall also coordinate with the owner/user and/or architect the exact location of DVR and monitors prior to layout of conduits and cables.

16.5.2 Submittals

Manufacturers Submit data for all materials and equipment to be incorporated in the work. Submit shop drawings for the overall system and each major component. Drawing shall illustrate how each item of equipment will function, system schematic diagram, one line diagram and equipment layout. Submit three copies of operating and maintenance manual.

16.5.3 SYSTEM COMPONENTS

The system components shall consist of Indoor and outdoor Cameras, Digital Video Recorders, and Monitors.

Indoor Camera

- IP Rating: IP66
- Horizontal Resolution: 640 TVL, Effio-E DSP
- Minimum Illumination: 0.1 Lux at F1.2 (0 Lux When IR LED On)
- Lens: 3.6mm Fixed Lens
- S/N Ratio: More Than 52dB
- IR LEDs: 850µm, 24 IRS
- IR Distance: 70ft Depending on Scene Reflectance
- Day/Night: Auto ICR (IR Cut-Filter Removal)
- Video Standard: NTSC
- Electronic Shutter: Auto: 1/60-1/15,000 Sec
- Video Output: 1.0Vp-p, 75Ω, BNC

- Power Consumption: 4W, (Maximum 6.5 W with ICR On)
- Power Supply: DC 12V, 1.25A
- Operating Temperature: -20 oC-50oC (-4 oF-122oF)
- Dimensions Weight: 4.7"(D)x3.9"(H), 0.88 lb

Outdoor Camera

- High Resolution CCTV camera lens: 650 TV Lines Color and 700 TV Lines
- B&W
- 2.8-12mm Auto Iris Vari-Focal Lens, able to be manually zoomed in up to
- 12mm
- Superior low light video surveillance down to 0.00003 LUX before using IR
- Weather Resistant (IP66 rating) + corrosion-free housing
- Adjustable IR (Infrared) LED for a wide or narrow Infrared beam
- 42 IR LEDs for zero light viewing range of up to 200 feet
- Includes Smart IR, for a dynamically calibrated Infrared image
- Automatic Day & Night Vision Modes w/Mechanically Switching IR Cut Filter
- Digital Noise Reduction (DNR)
- On screen display (OSD) for settings customizations (brightness, etc)
- Dual Voltage Support: DC12V (1000mA) or AC 24V

DIGITAL VIDEO RECORDER (DVR)

- 16 channel Multiplexer Recorder
- Supports 2 SATA HDDs or 1 DVD-RW + 2 SATA HDDs, 2 USB Ports/Host, RJ45
- Network Port
- HDMI output (1280x1024), CVBS output (1 CH/BNC)
- Synchronous Playback 16CH simultaneously, with remote controller
- Capable for networking operations, LAN, WAN, and Internet and alarm notification thru E-mail and SMS.
- 4CH/1CH Alarm Input/output
- Timer/Motion detection record mode\

MONITOR

- The contractor shall furnish one (1) surveillance unit high-resolution, 19" HDMI input Monitor.

PERIPHERAL EQUIPMENT/ACCESSORIES

To avoid problems in synchronization and to prevent accidental shutdown of power supplies to individual cameras, all cameras shall be powered from a main 24VAC power Supply to be installed at the main console. The power supply shall have sufficient output to support all cameras in the system plus 24% extra capacity.

Provide Uninterruptible Power Supply (UPS) with required capacity to load up all the equipment and accessories.

All peripheral equipment such as mounting hardware, ground fault isolators, etc. not specifically mentioned but required for the installation of a complete system operating as specified herein shall be furnished.

16.5.4 CONTRACTOR'S RESPONSIBILITY

Upon award of contract, the contractor shall examine all construction plans and site conditions to ensure that all requirements for a proper installation are as shown on bid drawings. Should any discrepancy be seen or if provisions or locations on bid drawings are not suitable for the equipment to be furnished, it shall be the responsibility of the contractor to advice the owner through the consulting engineer and architect in a timely manner. Failure to do so shall

render the contractor liable for any additional material and/or equipment required for the proper installation and operation of the system.

Contractor shall also coordinate with the owner/user and/or architect the exact location of DVR and monitors prior to layout of conduits and cables.

16.5.5 GUARANTEE

All equipment to be furnished herein shall be guaranteed for one (1) full year to be free from defects in material and workmanship under normal use. The contractor shall have on hand service units and parts for any and all components in the system, which may require future service and/ or maintenance so as to minimize system down time.

16.6 STAND ALONE FIRE DETECTION AND ALARM SYSTEM (FDAS)

16.6.1 GENERAL:

The Contractor shall furnish and install a complete, operational Fire Detection and Alarm System (FDAS) as shown on the drawings and as covered by these specifications.

The entire installations shall conform to the latest edition of NEC Article 760 and NFA 72. All wiring shall be Circuit integrity (CI) type cable, UL Listed brand.

The entire system shall be the standard products of one manufacturer except where indicated and to ensure that it meets stringent Life Safety the Underwriter's Laboratories, Inc shall list standards. (UL) and Factory Mutual, Inc. (FM).

Only a duly authorized representative shall install the entire system of the manufacturer who shall be able to refer to existing similar installations 10 years or older in proper operation.

Any deviations or substitutions from these specifications shall require submittals to the consulting engineer for approval of original manufacturer's brochures, technical manuals and an original manufacturer's certification that the substitution proposed meets and/or exceeds the operational and material specifications set herein. The brochures and technical manuals shall clearly indicate by highlighting all particular entries showing conclusively point-by-point that the specifications are indeed met or exceeded. Acceptance of the system for installation shall not be construed to indicate that compliance with specifications has been attained. This shall be determined upon actual testing and observation of system operational features.

All FDAS panels, devices and components shall be of the latest model of its series, old models shall not be accepted. Indicated model in this specifications are current models, offer latest models available in the market.

. 16.5.2 Submittals

Manufacturers Submit data for all materials and equipment to be incorporated in the work. Submit shop drawings for the overall system and each major component. Drawing shall illustrate how each item of equipment will function, system schematic diagram, one line diagram and equipment layout. Submit three copies of operating and maintenance manual.

16.5.3 SYSTEM COMPONENTS

- Stand Alone Smoke Detector (here called smoke detector for short) detects smoke produced by a fire and gives alarm signals in time.
- Using optical smoke sensing parts and art of state production technologies, it has a stable performance, esthetical appearance and can be easily installed, no commission required. It is designed to monitor fires may occur in places such as houses, all kinds of shops, pubs, bars and etc.
- Built-in a buzzer can give an alarming sound aloud and silence it. Two AA 1.5V LR6 alkaline batteries will be operating up to three years.

- Power supply: 2 AA 1.5V LR6 alkaline batteries, operates up to 3 years or so.
- Indicator: Red, flashes in every 45 seconds in normal condition.
- Sound Level > 80dB@3m
- Network Output C+, C-: Maximum 30 smoke detectors in one system, available for optional use.
- Detection Area: 60m2 -100m2 6) Operating Environment: Temperature: -10℃ - +50℃ Relative Humidity≤ 95%, non- condensing
- Dimension: 120mm x 58mm(D x H, with base)
- Material of Enclosure: ABS
- Weight: 181g(without base)
- Mounting Hole Distance: 50mm-74mm

16.5.4 CONTRACTOR'S RESPONSIBILITY

Upon award of contract, the contractor shall examine all construction plans and site conditions to ensure that all requirements for a proper installation are as shown on bid drawings. Should any discrepancy be seen or if provisions or locations on bid drawings are not suitable for the equipment to be furnished, it shall be the responsibility of the contractor to advice the owner through the consulting engineer and architect in a timely manner. Failure to do so shall render the contractor liable for any additional material and/or equipment required for the proper installation and operation of the system.

Contractor shall also coordinate with the owner/user and/or architect the exact location of DVR and monitors prior to layout of conduits and cables.

16.5.5 GUARANTEE

All equipment to be furnished herein shall be guaranteed for one (1) full year to be free from defects in material and workmanship under normal use. The contractor shall have on hand service units and parts for any and all components in the system, which may require future service and/ or maintenance so as to minimize system down time.

END OF SECTION

DIVISION 17
MECHANICAL

17 00 00	MECHANICAL	
16 51 00		

17.1 AIR-CONDITIONING SPECIFICATIONS

17.1.1 GENERAL

This section shall include all labor, materials, equipment and the performance of all operations and connection with the supply and installation work of the air conditioning units, complete in strict accordance with this part of specifications and the applicable drawings and subject to the terms & conditions of the contract.

17.1.2 SCOPE OF WORK

a. WORK INCLUDED:

This includes furnishing of all materials, labor equipment & accessories for the complete installation, testing & adjustment, ready for use of proposed air-conditioning System. Drawing and specifications are considered as mutually explanatory and all works called for by one and not the other shall be performed as though called for by both. In cases of conflicting information, the Architect and Engineer shall be notified at once in writing. Where incidental equipment or appurtenances are required, and not listed as shown, same shall be furnished as required for a complete air conditioning system. The work shall include, but not necessarily be limited to the following item.

1. Supply and installation of air-conditioning units as required in plans.
2. Supply & installation of liquid and suction lines as shown on plans.
3. Supply and installation of supports.
4. Furnish & install the insulated refrigerant copper tube and fittings
5. between the fan coil units and the air cooled condensing units for the
6. split type air-conditioning equipment.
7. Supply & install the insulated condensate drain pipe from the
8. different fan coil units to the nearest drain outlets.
9. Supply & install all the required equipment mounting supports on
10. wall/ceiling for the fan coil units and the foundation/support
11. requirement of the air cooled condensing units.
12. Testing & commissioning of entire system.

b. Drawings are intended to show general arrangement and approximate physical sizes of equipment diagrammatically. Every bolt, nut brace, struts, etc., is not necessarily indicated or specified; all such items as maybe required, necessary or incidental to the proper and dependable operation of each system being a requirement of this contract whether specifically referred to or not, must be supplied.

c. Work included in this specification shall consist of, but is not necessarily limited to the following items;
   - Arrange for, obtain and bear the cost of necessary permits, bonds and fees for the Mechanical work.
   - All permits fees, private or government shall be paid by the contractor.
   - Chipping & plastering works necessary for the area covered in the installation of air conditioning units.
   - Furnish shop drawing and certificates of inspection.
   - Periodically remove from the jobsite all rubbish and debris resulting from the mechanical work

d. The Contractor shall be deemed to visit the site and acquaint himself with the existing site conditions, means of access and take into account any feature that may affect his tender. No claim for his neglect to do so nor out of any misunderstanding on his part on these conditions shall be entertained. The Contractor shall be responsible for the proper coordination with other trade contractors

17.1.3 APPLICABLE SPECIFICATION, CODES, ORDINANCES, PERMITS AND FEES

17.1.3.1 The work covered in is to install according to the specifications, codes, ordinances and requirements of the following;

- The Philippine Mechanical Code
- National Building Code

- Philippine Electrical Code
- NFA No. 18 National Fire Code
- National Plumbing Code of the Philippines

17.1.3.2 All construction permits and fees required for the work shall obtain by and at the expense of the Contractor. The Contractor shall furnish the Architect, the Engineer and the Owner the final certificates of inspection and approval from the proper government authorities after the completion of work.

17.1.3.3 The Contractor shall obtain all necessary allowances, pay 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.

17.1.4 SHOP DRAWINGS, SAMPLES AND OTHER SUBMITTALS

17.1.4.1 The Contractor shall prepare and submit for the following;

- Manufacturers catalogue sheets, marked as necessary to
- indicate materials or equipment being furnished for the
- following items.
- Air-conditioning Units
- List of miscellaneous materials proposed including pipes,
- insulation, etc. identifying manufacturer and type.
- Field Test Report.
- Such other similar information the Engineering may require.

17.1.5 ACCEPTANCE TEST

17.1.5.1 Acceptance of the work shall be conditions on successful tests of the entire system.

17.1.5.2 Test requirement laid out in the standards for the installation of air-conditioning unit system. The Contractor shall furnish the Owner a written statement to the effect that the work covered by the Contractor shall conduct test in the presence of inspector or authority having jurisdiction.

17.1.5.3 Test certificate shall be filled out and signed by the Owner's and Contractor's representative.

17.1.5.4 System operation and maintenance chart shall be submitted to the Owners upon completion of the Contract.

17.1.6 WORKMANSHIP AND COORDINATION OF WORK WITH OTHERS

17.1.6.1 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 Air-Conditioning system shall be ready in every respect for satisfactory and efficient operation when finally delivered to the Owners.

17.1.6.2 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.

17.1.6.3 The work throughout shall be executed in the most thorough and satisfactory manner in accordance of the trade.

17.1.6.4 Unless otherwise indicated or specified, all materials and equipment shall be installed in accordance with the manufacturer's recommendation and in accordance with Philippine Mechanical Code. Cutting structural members for passage of pipes and pipe hangers fastening will not be permitted.

17.1.7 AIRCONDITIONING UNITS

17.1.7.1 PRECISION AIR-CONDITIONING / AIR-CONDITIONING UNITS Split Type / Variable Refrigerant Type (VRF) Air Conditioning Units

Air conditioning units shall be split / VRF type, factory assembled, tested and pre-wired. They shall have the capacities at operating conditions as shown on the equipment schedule.

17.1.8 HANGERS & SUPPORT

17.1.8.1 Pipe Hangers: Steel flat bars, structural grade 7mm minimum thickness, with corrosion protection, shape/type as shown on plan and 13mm diameter bars with corrosion protection as shown on plans.

17.1.8.2 Hangers Installation

- Approved inserts may be used for the support of hangers, anchorage in concrete expansion shield should be used in a horizontal position of the side of the concrete beams and shall be above the bottom reinforcements.
- Increase couplings shall be attached immediately adjacent to the expansion shield.

17.1.9 PIPE SLEEVES

17.1.9.1 Pipe passing through concrete or masonry walls or concrete floors shall be provided with pipe sleeves fitted into place at the same time of construction. Each sleeve shall extend through its respective walls or floor, and be cut flush with each surface. Sleeves in bearing walls, waterproofing membrane floors and wet areas shall be steel pipe or cast iron pipes. Sleeves in non-bearing walls, floors, or ceiling may be steel pipe, cast iron pipe or galvanized sheet metal with lock type longitudinal beam.

17.1.10 MINOR MODIFICATIONS AND TIME COMPLETION

17.1.10.1 The plans as drawn should show conditions as accurately as it is possible to indicate them in scale. The plans are diagrammatically and do not necessarily show all fittings, it's necessary to fit the building conditions. The locations of valve fittings and the fixture shown on the plans are approximate. The Contractor shall be responsible for the proper location in order to make them coordinate with architectural details and instruction.

END OF SECTION

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