

09 00 00	FINISHES
09 67 0	Fluid-Applied Flooring

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Technical Architectural Drawings
- 1.1.2 Specifications
- 1.1.3 Requests for Interpretation
- 1.1.4 Product Samples and Brochures
- 1.1.5 Manufacturer's Data Sheets and Certificates
- 1.1.6 Material Safety Data Sheets
- 1.1.7 Work Program and Methodology Submittals

1.2 SUMMARY

This section includes standard performance and high performance fluid-applied flooring systems. Comply with areas of application as indicated in the drawings.

1.3 RELATED SECTIONS

- 1.3.1 Concrete Finishes

1.4 GENERAL PROVISION

- 1.4.1 *Secure approval from architect for final finish style and application. Submit finish samples. Refer to the Submittal portion of this section for details.*
- 1.4.2 Coordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.
- 1.4.3 Conduct pre-installation meeting months prior to commencing work of this Section to verify project on-site installations and project requirements, substrate conditions and coordination with other building sub-trades, and to review manufacturer's installation instructions and manufacturer's warranty requirements.
 - 1.4.3.1 **MOCK-UPS: Mock-Up:** Construct mock-up where in obscure areas. Mock-up areas shall be 2m x 2m in dimensions, using proposed procedures, colors, textures, finishes and quality of work to judge quality of work, substrate preparation, operation of equipment and material application.
 - 1.4.3.2 Do not proceed with work completion prior to written acceptance of mock-up. When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain part of finished work.
 - 1.4.3.3 Assemble and install components only when temperatures are suitable to the requirements of the manufacturer. Maintain materials, substrates, and surrounding temperature suitable to manufacturer's required conditions.

1.5 MAINTENANCE, DELIVERY, STORAGE & HANDLING

- 1.5.1 *Deliver materials in manufacturer's original packaging with identification labels intact and in sizes suitable to the project.*
- 1.5.2 Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
- 1.5.3 Comply with local codes in the proper disposal of waste materials.

1.6 SUBMITTALS

1.6.1 PRODUCT APPROVAL ATTACHMENTS

- 1.6.1.1 Manufacturer's product data, including manufacturer's SPEC-DATA product sheet.
- 1.6.1.2 Manufacturer's installation instructions.
- 1.6.1.3 Catalog pages illustrating products to be incorporated into project.
- 1.6.1.4 Material Safety Data Sheets (MSDS) of manufacturer-required products.

1.6.2 EXECUTION APPROVAL ATTACHMENTS

- 1.6.2.1 Submit 300 x 300 mm samples of each fluid-applied flooring system specified to show color and texture with specified coats cascaded.

- 1.6.2.2 Submit shop drawings/ plans indicating extents of area to receive application
- 1.6.2.3 Submit detailed work methodology complying with manufacturer's requirements.

1.7 QUALITY ASSURANCE

1.7.1 Source manufacturers with experience in manufacturing components similar to or exceeding requirements of the project. Manufacturers shall have sufficient capacity to produce and deliver required materials without causing delay in work. Manufacturers shall be capable of providing field service inspection.

1.7.2

1.8 WARRANTIES

1.8.1 Warrant applications and installations from manufacturers able to provide five (5) year warranty.

1.8.2 Comply with manufacturer's requirements for warranty.

2. PART 2 PRODUCTS

2.1 GENERAL MATERIALS

2.1.1 Unless otherwise indicated, provide factory-mixed coatings.

2.1.2 When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application.

2.1.3 Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

2.1.4 VOCs need to be confirmed by using the products EDS sheets.

2.1.5 Submit all pertinent product data as needed to complete project. Facilitate submittals in one set.

2.2 GENERAL PROPERTIES OF FLOORING ONE CURED:

2.2.1 COMPRESSIVE STRENGTH: 8,590psi, comply with ASTM C579

2.2.2 TENSILE STRENGTH: 2,500psi, comply with ASTM D 638

2.2.3 FLEXURAL STRENGTH: 5,100psi, comply with ASTM D 790

2.2.4 HARDNESS, SHORE: 85, comply with ASTM D 2240

2.2.5 BOND STRENGTH: >400 comply with ASTM D 4541

2.2.6 ABRASION RESISTANCE: 5mg loss, comply with ASTM D 4060

2.2.7 WATER ABSORPTION: <0.1%, comply with ASTM C 413

2.2.8 RESISTANCE TO FUNGI GROWTH: comply with ASTM G21

2.3 PRIMERS

2.3.1 Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the approved manufacturer.

2.4 POLYURETHANE CONCRETE SEALER

2.4.1 Use clear, water based matte finish, with two-component urethane resin. Part A component shall be thoroughly mixed with part B component, or as instructed and warranted by manufacturer. Initial appearance of product shall be milky white when wet and clear when dry.

2.4.2 Comply with substrate preparation requirements by manufacturer.

2.4.3 Material shall be resistant to oil, gasoline, water, salt, and chlorine. Compliant to ASTM D-1308

2.4.4 Material shall be resistant to tire-marks.

2.4.5 GLOSS: 25 for 1 coat

2.4.6 PRACTICAL COVERAGE: 14 to 28 sqm per 4 liters/coat, depending on substrate porosity

2.4.7 SURFACE DRY: 1 hour, allow for 2 hours in between recoats.

2.4.8 DRY THROUGH: 24 hours for foot traffic, 72 hours for vehicular traffic

2.4.9 THINNING: as required by manufacturer and as certified compatible

2.4.10 Application by roller or spray gun

2.5 ACCESSORIES:

2.5.1 COATING APPLICATION ACCESSORIES: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and cleanup materials required, per manufacturer's specifications.

3. PART 3 EXECUTION

3.1 GENERAL EXAMINATION AND PREPARATION

- 3.1.1 Verify that conditions of substrates previously installed under other sections or contracts are acceptable for product installation in accordance with manufacturer's instructions prior to fluid-applied flooring installation.
- 3.1.2 Remedy all unacceptable conditions. Remove all items not necessary that affects quality of work. Coordinate schedules with construction manager.
- 3.1.3 Do not proceed with work completion until all substrates and preparations are acceptable.
- 3.1.4 If substrate is concrete, ensure that the surfaces have been properly cured in accordance to requirements by the manufacturer. Follow manufacturer procedures.
- 3.1.5 Test moisture content of concrete. Match manufacturer's requirements.

3.2 GENERAL APPLICATION

- 3.2.1 Comply with COSH and other safety requirements as specified by manufacturer.
- 3.2.2 Comply with Exterior painting section of this specification for detailed application requirements.
- 3.2.3 Apply components in accordance with manufacturer's written instructions.
- 3.2.4 Remove oil and grease by detergent cleaning. Dry surface areas prior to application.
- 3.2.5 Unless otherwise advised by manufacturer, acid etch smooth surfaces for improved adhesion. Use acids compliant to manufacturer's product.
- 3.2.6 Finished texture of acid wash smooth concrete shall be similar to 40-60 grit sandpaper.

3.3 CLEANING AND PROTECTION

- 3.3.1 Remove surplus materials, rubbish, tools and equipment from project site. Dispose properly in accordance to local codes.
- 3.3.2 Protect installed product from any damages during construction. In case of damages, repair any damaged surface prior to substantial turnover.
- 3.3.3 Repair any damages incurred to adjacent materials during installation of material. Verify that conditions of substrates previously installed under other sections or contracts are acceptable for product installation in accordance with manufacturer's instructions prior to fluid-applied flooring installation.

END OF SECTION

09 00 00	FINISHES
09 96 5	A. CEILING SUSPENSION ASSEMBLIES

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Technical Architectural Drawings
- 1.1.2 Specifications
- 1.1.3 Requests for Interpretation
- 1.1.4 Product Samples and Brochures
- 1.1.5 Manufacturer's Data Sheets and Certificates
- 1.1.6 Material Safety Data Sheets
- 1.1.7 Work Program and Methodology Submittals

1.2 SUMMARY

This section includes provisions on mirrors as installed in toilet areas and other areas as indicated on the drawings.

1.3 RELATED SECTIONS

- 1.3.1 Ceiling Finishes

1.4 GENERAL PROVISION

1.4.1 Furnish all materials, labor, equipment, plant, and tools required to complete: Ceilings of fiber cement board (FCB or "ficem") panels; and Exposed suspension systems. All pertinent provisions of the General Conditions form part of this Section.

1.5 SUBMITTALS

1.5.1 PRODUCT APPROVAL ATTACHMENTS

- 1.5.1.1 Product data for each type of product specified.

1.5.2 EXECUTION APPROVAL ATTACHMENTS

- 1.5.2.1 Coordination drawings for reflected ceiling plans drawn accurately to scale and coordinating penetrations and ceiling mounted items. Show the following:
 - 1.5.2.1.1 Ceiling suspension system members. Method of attaching suspension system hangers to building structure.
 - 1.5.2.1.2 Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special moldings at walls, column penetrations, and other junctures of ficem board ceilings with adjoining construction.
 - 1.5.2.1.3 Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
 - 1.5.2.1.4 Product test reports from a qualified independent testing agency that based on its testing of current products for compliance of ficem board panel ceilings and components with requirements.

1.6 QUALITY ASSURANCE

- 1.6.1 **INSTALLER QUALIFICATIONS:** Engage an experienced Installer who has completed ficem board panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- 1.6.2 **SINGLE-SOURCE RESPONSIBILITY FOR CEILING PANEL UNITS:** Obtain each type of ficem board ceiling panel from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- 1.6.3 **SINGLE-SOURCE RESPONSIBILITY FOR SUSPENSION SYSTEM:** Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.7 WARRANTIES

1.7.1 Warranties shall include replacement of item in case of cracks or defects in ficem board and other damages occurring due to undue cause.

2. PART 2 PRODUCTS

2.1 Ceiling Board

- 2.1.1 Fiber cement board 4.5mm; paint finish Odorless Anti-Bacterial Latex paint flat White.
- 2.1.2 Ceiling joist triple furring .5mm thick
- 2.1.3 1/4" thk marine plywood in wooden frame(see Reflected Ceiling Plans and Details)
Refer to Technical Working drawings for coverage of area of application.
- 2.1.4 Use 5mm Pvc Panel (see Reflected Ceiling Plans and Details)
- 2.1.5 Use 4mm Aluminum composite panel for Eaves (see Reflected Ceiling Plans and Details)

3. PART 3 EXECUTION

3.1 EXAMINATION

- 3.1.1 COORDINATION: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- 3.1.2 Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.
- 3.1.3 Measure each ceiling area and establish the layout of ficem board panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

3.2 INSTALLATION

- 3.2.1 GENERAL: Install ficem board panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
- 3.2.2 Suspend ceiling hangers from building's structural members and as follows:
 - 3.2.2.1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
 - 3.2.2.2 Splay hangers only where required and if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3.2.2.3 Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with the location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 3.2.2.4 Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 3.2.2.5 Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to

which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.

3.2.2.6 Secure bracing wires to ceiling suspension members and to supports with a minimum of 4 tight turns. Fasten bracing wires to concrete with cast-in-place or post-installed anchors. Install edge moldings and trim of type indicated at perimeter of ficem board ceiling area and where necessary to conceal edges of ficem board panels. Apply ficem board sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.2.2.7 Screw attach moldings to substrate at intervals not over 16 inches (400 mm) O.C. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.18 mm in 3.66 m). Miter corners accurately and connect securely. Do not use exposed fasteners, including pop rivets, on moldings and trim. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

3.2.2.8 Install ficem board panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit. Arrange ficem board panels in the manner indicated on reflected ceiling plans.

3.2.2.9 For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3.2.2.10 Install hold-down clips in areas indicated and in areas required by governing regulations, or for fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise indicated or required. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.3 CLEANING AND PROTECTION

3.3.1 Clean exposed surfaces of ficem board panel ceilings, including trim, edge moldings, and suspension system members.

3.3.2 Comply with manufacturer's instructions for cleaning and touchup of minor finish damage.

3.3.3 Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

09 00 00	FINISHES	
09 96 5	Painting	

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Technical Architectural Drawings
- 1.1.2 Specifications
- 1.1.3 Requests for Interpretation
- 1.1.4 Product Samples and Brochures
- 1.1.5 Manufacturer's Data Sheets and Certificates
- 1.1.6 Material Safety Data Sheets
- 1.1.7 Work Program and Methodology Submittals

1.2 SUMMARY

This section includes provisions on painting works as indicated in the technical working drawings, particularly painting and varnishing works, and other painting applications as needed to complete the project.

1.3 RELATED SECTIONS

- 1.3.1 Metal Fabrications
- 1.3.2 Exterior Walls
- 1.3.3 Interior Walls
- 1.3.4 See drawings for location, quantity and extent of surfaces to receive paint and varnish.
- 1.3.5 All pertinent provisions of the General Conditions form part of this Section.

1.4 GENERAL PROVISION

- 1.4.1 Only use appropriate painting products on surface areas.
- 1.4.2 Comply with gloss levels as specified herein or on technical working drawings.
- 1.4.3 Furnish rags, paint brushes, rollers, air brush equipment, masking tapes, and other similar accessories as needed to complete work indicated.

1.5 MAINTENANCE, DELIVERY AND STORAGE

- 1.5.1 Furnish extra materials from the same products applied for maintenance purposes to owner upon substantial completion.
- 1.5.2 Store materials in tightly covered containers that are accurately labeled. Keep containers in well ventilated areas with comfortable ambient temperatures as prescribed by manufacturers.
- 1.5.3 Paint containers shall be free of foreign materials and residue.
- 1.5.4 Store unused rags, brushes, and other accessories in clean and dry storage areas.
- 1.5.5 Store used rags, brushes, and other accessories such that it does not impeded the working environment of other construction trades. Ensure that used materials are not stored such that it becomes a safety hazard.

1.6 SUBMITTALS

1.6.1 PRODUCT APPROVAL ATTACHMENTS

- 1.6.1.1 Submit color swatches for each type of product for approval. Color swatches should indicate type of finish. Include surface preparation requirements and application instructions. Indicate coat requirements. Attach shop drawings cross referencing the location of application areas and full extent of painting coverage.

1.6.2 EXECUTION APPROVAL ATTACHMENTS

1.6.3 Submit detailed work methodology. Indicate number of coats per paint product to be applied. Manufacturer's instructions are acceptable

1.7 QUALITY ASSURANCE

1.7.1 Establish a mock-up for each surface type with a different painting material. Do not proceed with painting the complete assembly without the approval of the architect.

1.7.2 Only source from manufacturers with minimum of 15 year experience in the market, manufacturing products as specified.

1.7.3 Only contract/employ paint applicators with significant experience from a project of the same size, scale, and type as this project. Contract paint applicators with experience in applying paint products on metal surfaces.

1.7.4 Source primers, undercoat paints, and the finish coats from one and the same manufacturer to ensure compatibility. Comply with manufacturer's prescriptions on coating requirements and methods of application.

1.8 WARRANTIES

1.8.1 Warrant for repainting and repair if the following failures occur within one year of substantial completion: water penetration through paint coating, deterioration of coating beyond normal weathering, alligatoring, blistering, chalking, cracking/flaking, efflorescence, nail head rusting, peeling, poor alkali resistance.

2. PART 2 PRODUCTS

2.1 Surface Preparation:

2.1.1 All new concrete surfaces with form oils or any separating agents adhering to the surface shall be eliminated by thorough application of masonry neutralizer accordingly.

2.1.2 Repair all surface imperfections with suitable putty using a knife. Allow to dry for at least 24 hours.

2.2.1 Exterior paint: Apply Permaplast K201 mix with Portland cement to correct surface imperfection.

2.2.1.2 Primer: (1 coat) Permacoat B701

2.2.1.3 Top Coat: (2 coats) Permacoat Semi-Gloss B715

2.2.1.4 Color: Verify Architect(company premix)

2.2.1.5 Texture Finish: Eggshell/Mongo finish finely Flattened

2.2.2 Interior finishes: Apply Permaplast K201 mix with Portland cement to correct surface imperfection.

2.2.2.2 Primer: (1 coat) Permacoat B701

2.2.2.3 Top Coat: (2 coats) Permacoat Semi-Gloss B715

2.2.2.4 Color: Verify Architect(company premix)

2.2.2.5 Texture Finish: Eggshell finish finely Flattened

2.2.3 Steel doors, jambs, grill works, and metal raceway

2.2.3.1 Primered with 2 coats zinc chromate epoxy grey (yellow for jambs).

2.2.3.2 Apply 2 coats - Top coats acrylic automotive finish. Primer: Mc Gills

2.2.3.3 Acrylic primer. Top coat: Mc Gills acrylic top coat.

2.2.3.4 Color- verify architect.

2.2.4 Architectural and structural pipes

2.2.4.1 Metal etching for all metals except G.I

2.2.4.2 Primered with 2 coats prime guard.(option epoxy primer grey)

- 2.2.4.3 Apply 2 coats —aqua epoxy. Airless Spray application
- 2.2.4.4 Color (verify architect).

2 PART 3 EXECUTION

2.2 EXAMINATION AND PREPARATION

- 2.2.5.2 Wipe metal surface with rag soaked in paint thinner to remove dust, dirt, grease, oil, wax, and other foreign matter. Clean field welds and bolted connections. Remove grease and oil residue.
- 2.2.5.3 Use metal etchers as prescribed by the manufacturer.
- 2.2.5.4 Use wire brush to scrape rusted materials.
- 2.2.5.5 After scraping rust, use water to wash surfaces clean and dry for at least 15 minutes before application of primer.
- 2.2.5.6 Comply with manufacturer's written instructions as warranted.
- 2.2.5.7 Ensure adhesion of approved material to substrates.

2.3 APPLICATION

- 2.3.5 Prime and finish all metal assemblies prior to any installation on project.
- 2.3.6 Use applicators and techniques suited for the quality coating of the substrates.
- 2.3.7 Do not apply to wet or damp surfaces.
- 2.3.8 Uniformly apply coatings using methods prescribed by manufacturer. Do not allow runs, sags, brush marks and inconsistent sheens.
- 2.3.9 Apply as many coats as necessary for uniform appearance.
- 2.3.10 Paint surfaces behind movable equipment and furniture.
- 2.3.11 Paint backsides to match exposed surfaces.
- 2.3.12 Paint access panels, including back sides, removable hinges and covers, and other items to match exposed surfaces.
- 2.3.13 Primers may be omitted if fabrications are factory-primed.
- 2.3.14 Comply with manufacturer's written instructions for application conditions.
- 2.3.15 Do not apply finish coats in imminent weather.
- 2.3.16 Ensure that application is uniform.

2.4 INSPECTION OF FINISHED SURFACES PRIOR TO ACCEPTANCE

- 2.4.5 Secure approval from architect as endorsed by construction supervisor.
- 2.4.6 Installed fabrications shall be repainted and re-finished in case of any damages incurred during installation. Final installed fabrication permanently fixed to the project shall be in good condition.
- 2.4.7 Rejected surfaces shall be made good by the Contractor.
- 2.4.8 MASONRY (NEW SURFACE):
 - 2.4.8.2.1 All areas to be painted must be dry and free of dirt, grease, oil, dust, loose grit or mortar and other contaminants.
 - 2.4.8.2.2 Treat with Concrete Neutralizer at least a week prior to painting. Apply sufficient coats, let dry, then brush off white crystals that form on the surface.
 - 2.4.8.2.3 Apply one coat Concrete Primer & Sealer.
 - 2.4.8.2.4 Fill up all hairline cracks and crevices with Concrete Putty. Allow to dry, sand smooth, dust off, then spot prime before applying finish coats.
- 2.4.9 WOOD (NEW SURFACE):
 - 2.4.9.2 All areas to be painted must be dry and free of dirt, dust, grease, oil and other foreign matter.
 - 2.4.9.3 Sand surface until wood is smooth to touch and no splinters or rough edges remain.
 - 2.4.9.4 Dust off completely, then wipe with clean rag.
 - 2.4.9.5 Apply one coat of Interior Primer & Sealer or Exterior Wood Primer.

2.4.9.6 Fill nail holes, cracks, dents and damaged areas with Plastic Wood Dough or Glazing Putty.

2.4.10 METAL (NEW SURFACE):

2.4.10.2 Remove dust, dirt, grease, oil, wax, loose scales and other contaminants by wiping with rag soaked in lacquer thinner or naphtha.

2.4.10.3 Sand, wire brush or scrape all rusty metal exposed to the weather for some time.

2.4.10.4 Treat surface with Rust Converter. Let stand overnight, then wipe off white residue with clean rag soaked in lacquer thinner or naphtha.

2.4.10.5 Apply one coat yellow zinc chromate primer. Let dry overnight before finishing with one or two coats of recommended topcoat.

2.4.11 The following conditions are considered unacceptable:

2.4.11.2 Brush/roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.

2.4.11.3 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.

2.4.11.4 Damage due to touching before paint is sufficiently dry or other contributory cause.

2.4.11.5 Damage due to application on moist surfaces or caused by inadequate protection from the weather.

2.4.11.6 Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.)

2.4.11.7 Visible defects are evident, i.e. lack of uniformity or color, sheen, and texture across full surface area.

2.5 CLEANING AND PROTECTION

2.5.5 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

2.5.6 After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

2.5.7 Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

2.5.8 At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

10 00 00	SPECIALTIES
10 80 1	Toilet and Bath Accessories

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Technical Architectural Drawings
- 1.1.2 Specifications
- 1.1.3 Requests for Interpretation
- 1.1.4 Product Samples and Brochures
- 1.1.5 Manufacturer's Data Sheets and Certificates
- 1.1.6 Material Safety Data Sheets
- 1.1.7 Work Program and Methodology Submittals

1.2 SUMMARY

This section includes provisions on toilet and bath accessories as needed for project completion. Accessories include:

- 1.2.1 Tissue Dispensers
- 1.2.2 Soap Dispensers and Holders
- 1.2.3 Grab Bars
- 1.2.4 Towel Bars
- 1.2.5 Curtain Holder
- 1.2.6 Other accessories as needed and indicated

1.3 RELATED SECTIONS

- 1.3.1 Mirrors
- 1.3.2 Interior Architectural Woodwork
- 1.3.3 Rough Carpentry
- 1.3.4 Hardware

1.4 GENERAL PROVISION

- 1.4.1 Furnish all insets and anchorages required to set accessories in concrete as structurally stable as possible.
- 1.4.2 Verify accessory locations on technical working drawings.

1.5 SUBMITTALS

1.5.1 PRODUCT APPROVAL ATTACHMENTS

- 1.5.1.1 Submit full-size samples of units to the Architect for design review and approval. Submitted samples shall show actual finish, type, and make of material for installation.

1.5.2 EXECUTION APPROVAL ATTACHMENTS

- 1.5.2.1 Shop drawings showing setting locations of accessories based on actual site measurements. Indicate distances from nearest finish lines both measure horizontally and vertically. Indicate actual tile joints on shop drawings if any.

1.6 QUALITY ASSURANCE

- 1.6.1 Ensure that all finishes installed are approved. Use appropriate anchorages, of stainless steel make to ensure structural stability of installation.
- 1.6.2 Ensure that installed accessories do not fall off due to rustication of anchors and inserts.

2. PART 2 PRODUCTS

2.1 GENERAL MATERIALS

- 2.1.1 Verify finish of material approved by architect.
- 2.1.2 Stainless Steel: AISI Type 302, with polished No. 4 finish, 22 gauge (0.34") minimum, unless otherwise indicated.
- 2.1.3 Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

2.1.4 Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

3. PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Comply with manufacturer's written instructions and methods. Use fasteners as prescribed by manufacturer to be appropriate to the substrate.

3.1.2 Ensure that all installation is plumb, level, and firmly attached to heights indicated as approved.

3.2 CLEANING AND ADJUSTING

3.2.1 Adjust toilet accessories for proper and smooth operation.

3.2.2 Clean and polish all exposed surfaces after removal of temporary labels and protective coatings.

END OF SECTION

DIVISION 12
FURNISHINGS

12 00 00	FURNISHINGS
12 36 61.16	Solid Surface Countertops

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Technical Architectural Drawings
- 1.1.2 Specifications
- 1.1.3 Requests for Interpretation
- 1.1.4 Product Samples and Brochures
- 1.1.5 Manufacturer's Data Sheets and Certificates
- 1.1.6 Material Safety Data Sheets
- 1.1.7 Work Program and Methodology Submittals

1.2 SUMMARY

This section includes provisions on solid surface countertops as indicated in the following areas:

- 1.2.1 Pantry/Kitchen/ Toilet
- 1.2.2 Information and Display Counters
- 1.2.3 Other parts of the project as indicated on technical working drawings

1.3 RELATED SECTIONS

- 1.3.1 Plumbing Fixtures Section
- 1.3.2 Interior Architectural Woodwork
- 1.3.3 Rough Carpentry

1.4 GENERAL PROVISIONS

- 1.4.1.1 Comply with dimensions as indicated in technical working drawings.
- 1.4.1.2 Verify actual dimensions of countertops prior to fabrication. Check and coordinate location of utilities. Fabricate countertops such that utilities are not affected in functionality.

1.5 SUBMITTALS

1.5.1 PRODUCT APPROVAL ATTACHMENTS

Submit product data, including:

- 1.5.1.1 Material description and product code
- 1.5.1.2 Samples for selection at least 100mm x 100mm in size. Show final edging of material.
- 1.5.1.3 Submit data on adhesives to be used for countertop installation. Include brand of adhesive and instructions on installation detailing surface preparations.

1.5.2 EXECUTION APPROVAL ATTACHMENTS

- 1.5.2.1 Submit detailed requirements for subsurface preparation.
- 1.5.2.2 Submit manufacturer's required detailed installation methodology, indicating corner blocks needed. Methodology shall clearly indicate surface preparations and tolerances.

1.6 QUALITY ASSURANCE

- 1.6.1 Source from a bonafide fabricator of countertops with skilled installers.
- 1.6.2 Source from fabricators with timely and good in-service records.

1.7 WARRANTIES

- 1.7.1 Comply with warranty requirements by manufacturer

2. PART 2 PRODUCTS

- 2.1 Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1. Color and pattern for the approval of the architect.
- 2.2 Composite Wood Products: Ensure to be free from urea formaldehyde
- 2.3 ADHESIVES: Use product as recommended and compliant to manufacturer's warranties and conditions. Use adhesives compliant to Food and Drug Administration.
- 2.4 Use sealants to seal in countertops. Use appropriate joint sealants as needed by the manufacturer.

3. PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

Examine substrates and surface area to receive countertops. Check substrates to be compliant with manufacturer's requirements. Check for installation tolerances, cleanliness, surface damages, and similar surface preparation requirements.

3.2 FABRICATION

Fabricate countertops according to solid surface material manufacturer's written instructions. Prepare countertops for field cutting openings for counter-mounted fixtures, if any. Drill countertops in shop for plumbing fittings and similar items. Verify actual dimensions prior to drilling.

3.3 JOINTS:

No joints allowed within 450mm of sink, countertop, or any countertop section. Bond joints with adhesive and draw tight during setting. Mask surface areas with joints.

3.4 EDGE:

Front and Side Edge of countertops; Front: standard straight and flat, slightly eased at top and bottom. Seek approval from the architect for final edging.

3.5 BACKSPLASH AND END SPLASH:

Top Edge: Standard straight and flat, slightly eased at corner.

3.6 INSTALLATION:

3.6.1 TOLERANCES:

Countertop level tolerances: 3mm in 2.4m, maximum 6mm. Maximum vertical difference between connected planes of two units: 0.4mm.

3.6.2 FASTEN:

Comply with manufacturer's requirements for installation. Always apply sealants to wall gaps.

3.7 CLEANING AND PROTECTION

3.7.1 Protect completed installations with a protective film covering until such time that substantial completion is attained.

END OF SECTION

DIVISION 13
SPECIAL CONSTRUCTION

13 00 00	SPECIAL CONSTRUCTION
13 85 0	Detection and Alarm

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Technical Architectural Drawings
- 1.1.2 Specifications
- 1.1.3 Requests for Interpretation
- 1.1.4 Product Samples and Brochures
- 1.1.5 Manufacturer's Data Sheets and Certificates
- 1.1.6 Material Safety Data Sheets
- 1.1.7 Work Program and Methodology Submittals

1.2 SUMMARY

This section includes provisions on Smoke Detection systems as needed by the project. Included in provisions are the furnishing, installation, and connection of the fire alarm equipment to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control units, fire safety control devices, annunciators, power supplies, and wiring as shown on the drawings and specified. The fire alarm system shall not be combined with other systems such as building automation, energy management, security, etc.

1.3 RELATED SECTIONS

- 1.3.1 Electrical Fixtures

1.4 GENERAL PROVISION

- 1.4.1 Comply with requirements of local and national codes.
- 1.4.2 Ensure that equipment installed are compatible. Source from a single manufacturer to ensure fit.
- 1.4.3 Comply with designer's specifications as indicated on technical working drawings.
- 1.4.4 Turnover operation manuals to owner upon substantial completion.

1.5 MAINTENANCE

- 1.5.1 Test functionality of smoke detection systems prior to substantial turnover.

1.6 SUBMITTALS

1.6.1 PRODUCT APPROVAL ATTACHMENTS

- 1.6.1.1 PRODUCT DATA, including operation manuals, installation procedures.

1.6.2 EXECUTION APPROVAL ATTACHMENTS

- 1.6.2.1 SHOP DRAWINGS
Show locations of Smoke Detectors on floor plans. Show measurements as per actual site conditions. Show wiring diagrams.

1.7 QUALITY ASSURANCE

Source all equipment and pertinent accessories to complete the system from a single manufacturer to ensure compatibility.

1.8 WARRANTIES

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation.

2. **PART 2 PRODUCTS**

2.1 **BATTERY OPERATED SMOKE DETECTORS**

2.1.1 Unless otherwise specified by designer, Smoke detectors shall be photoelectric type and UL listed for use with the fire alarm control unit being furnished.

2.1.2 Smoke detectors shall be addressable type complying with applicable UL Standards for system type detectors. Smoke detectors shall be installed in accordance with the manufacturer's recommendations and NFPA 72.

2.1.3 Detectors shall have an indication lamp to denote an alarm condition. Provide remote indicator lamps and identification plates where detectors are concealed from view. Locate the remote indicator lamps and identification plates flush mounted on walls so they can be observed from a normal standing position.

2.1.4 All spot type and duct type detectors installed shall be of the photoelectric type.

2.1.5 Photoelectric detectors shall be factory calibrated and readily field adjustable. The sensitivity of any photoelectric detector shall be factory set at 3.0 plus or minus 0.25 percent obscuration per foot.

2.1.6 Detectors shall provide a visual trouble indication if they drift out of sensitivity range or fail internal diagnostics. Detectors shall also provide visual indication of sensitivity level upon testing. Detectors, along with the fire alarm control units shall be UL listed for testing the sensitivity of the detectors.

2.1.7 Battery shall be of the sealed, maintenance free type, 24-volt nominal

2.2 **ALARM BELLS**

2.2.1 Shall be electric, single stroke or vibrating, heavy duty, under dome, solenoid type.

2.2.2 Unless otherwise shown on the drawings, shall be 6 inches (150 mm) diameter and have a minimum nominal rating of 80 dBA at 10 feet (3,000 mm).

2.2.3 Mount on removable adapter plates on outlet boxes.

2.2.4 Bells located outdoors shall be weatherproof type with metal housing and protective grille.

2.3 **CONDUITS, WIRING, AND ACCESSORIES**

Comply with requirements by Electrical Engineer.

3. **PART 3 EXECUTION**

3.1 **GENERAL INSTALLATION**

3.1.1 Installation shall be in accordance with local codes, as shown on the drawings, and as recommended by the major equipment manufacturer. Fire alarm wiring shall be installed in conduit. All conduit and wire shall be installed in accordance with all applicable codes.

3.1.2 All conduits, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in *unfinished areas*.

3.1.3 All new and reused exposed conduits shall be painted in accordance with Section 09 91 00, PAINTING to match surrounding finished areas and red in unfinished areas.

3.1.4 All smoke detectors shall be installed on ceiling, surface mounted.

3.1.5 Check that the entire alarm system is fully functional upon substantial turnover. Repair and replace dysfunctional units so as to comply.

END OF SECTION

DIVISION 15
SANITARY

15 00 00	SANITARY
15 41 00	Plumbing Fixture

1. PART 1 GENERAL

1.1 RELATED DOCUMENTS

- 1.1.1 Technical Architectural Drawings
- 1.1.2 Specifications
- 1.1.3 Requests for Interpretation
- 1.1.4 Product Samples and Brochures
- 1.1.5 Manufacturer's Data Sheets and Certificates
- 1.1.6 Material Safety Data Sheets
- 1.1.7 Work 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

- 1.3.1 Joint Sealants
- 1.3.2 Solid Surface Countertops

1.4 GENERAL PROVISION

- 1.4.1 Where 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.
- 1.4.2 Use Polypropylene (PPRC) pipes and fittings for Cold Water System.
- 1.4.3 Use Poly Vinyl Chloride (PVC Orange) equivalent to Series 1000 and drainage pattern fittings or use High-Density Polyethylene (HDPE).
- 1.4.4 Use solvent cement joint on rubber-o-ring.
- 1.4.5 Use PVC Series 1000 for all downspouts and all underground storm drainage as indicated in the drawings or use High-Density Polyethylene (HDPE).
- 1.4.6 Use PVC Series 1000 for all soil stacks, vent pipes and sanitary drainage piping system. Or use High-Density Polyethylene (HDPE).
- 1.4.7 Pipe sleeves should be 25mm larger than the size of the pipe specified for plumbing lines.
- 1.4.8 Tap-Tee connections for all lavatories and kitchen sinks.
- 1.4.9 Gate valves of branches to supply fixture shall be Crane PN-36 bronze gate 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

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

1.6 SUBMITTALS

1.6.1 PRODUCT 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.

1.6.2 EXECUTION APPROVAL ATTACHMENTS

Submit hydraulic, pressure, and leak test methodology.

1.7 QUALITY ASSURANCE

1.7.1 Check 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.

1.7.2 Conduct 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

2.1.1 Use 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).

2.1.2 Elongated siphon action bowls, with vortex flushing technology.

2.1.3 Chinaware on water closet 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 PANTRY 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

3.1.1 Check plumb-ness and levels prior to installation. Ensure alignment of fixtures.

3.1.2 Check roughing-ins to be consistent with technical working drawings.

3.1.3 Wall hanging lavatories shall be installed with gasket seals.

3.1.4 Install escutcheons at each wall, floor, and ceiling penetration in exposed finish locations, and within cabinets and millwork.

3.1.5 Seal fixture to walls, floor, and ceiling using mildew-resistant silicone.

3.2 PROTECTION, ADJUSTING, AND CLEANING

3.2.1 Replace all damaged and malfunctioning fixtures, fittings, controls, and other parts of the plumbing system affecting full functionality.

3.2.2 Provide protective covering for installed fixture and fittings.

3.2.3 Do not allow temporary use of fixtures and facilities until substantial turnover.

END OF SECTION

DIVISION 16
ELECTRICAL

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 DR'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.

16.3.7 POSTED OPERATING INSTRUCTIONS

- A. Furnish approved 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 section. 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 on 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 15mm ϕ 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-drawn 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 approximate; 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' 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 ABI. 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 [75oC 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 advise 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°C - +50°C 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 advise 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